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Report on the

Intercountry meeting on measles/rubella control and elimination

Amman, Jordan
17–20 November 2013



World Health
Organization

Regional Office for the Eastern Mediterranean

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1. INTRODUCTION

An intercountry meeting on measles and rubella control and elimination was organized by the World Health Organization (WHO) Regional Office for the Eastern Mediterranean in Amman, Jordan, on 17–20 November 2013. Participants from all countries of the Eastern Mediterranean Region except Djibouti, Kuwait, Iraq, Somalia and United Arab Emirates attended the meeting. Also in attendance were members of the Regional Immunization Technical Advisory Group (RTAG), chairpersons of national immunization technical advisory groups (NITAGs), representatives of the United Nations Children's Fund (UNICEF) headquarters, regional and country offices, the Centers for Disease Control and Prevention (CDC), Atlanta, and WHO staff from headquarters, the Regional Office and country offices.

The objectives of the meeting were to:

- review and follow-up on the progress of implementing the strategic plan for measles/rubella elimination;
- review achievements of measles/rubella surveillance indicator targets;
- review the measles/rubella elimination validation process in countries close to elimination;
- review and update the national plans for strengthening the measles/rubella control and elimination programme.

Dr Jaouad Mahjour, Director of the Division of Communicable Disease Control, WHO Regional Office for the Eastern Mediterranean, delivered the opening message from Dr Ala Alwan, WHO Regional Director for the Eastern Mediterranean. In his message, the Regional Director noted that the measles elimination goal was set in 1997, when the Regional Committee for the Eastern Mediterranean issued a resolution adopting the regional target of measles elimination by 2010 (resolution EM/RC44/R.6). Dr Alwan noted that since then, implementation of elimination strategies in countries had led to a significant decrease in measles morbidity and mortality in the Region. Based on WHO/UNICEF estimates, routine measles-containing vaccine (MCV) coverage had increased during the past decade, from 79% in 2000 to 85% in 2010, and all countries of the Region had implemented measles catch-up immunization campaigns. During the same period, the number of reported measles cases had dropped by 74% from 38 592 in 2000 to 10 072 in 2010. Nine countries had reported a measles incidence of < 1 case per million persons in the context of a well-functioning nationwide measles case-based surveillance system in 2010. The Region had achieved the target of measles mortality reduction in 2007, three years before the target date of 2010, he said.

However, the target of measles elimination by 2010 had not been achieved and the target date had been postponed to 2015, Dr Alwan noted. Moreover, with the challenges that had faced the Region during the past three years, the Region had witnessed a serious resurgence of measles. Based on WHO-UNICEF estimates, MCV coverage had decreased from 85% in 2010 to 84% in 2011 and to 83% in 2012, due to the delayed and inadequate implementation of follow-up vaccination campaigns in some countries. Accordingly, several countries, especially Afghanistan, Pakistan, Somalia, Sudan and Yemen, had experienced

large outbreaks, with 36 456 measles cases reported in 2012. The crisis in Syria and the influx of refugees to neighbouring countries had been associated with measles outbreaks in Syria itself, as well as Iraq, Jordan and Lebanon, all countries that had been reporting zero or very low measles incidence during the preceding three years. Much effort was being made by countries, supported by partners, to curb outbreaks and achieve the control and elimination targets. According to WHO-UNICEF estimates, 10 countries had maintained MCV coverage of 95% or more in 2012. During 2012 through September 2013, around 55 million children had been vaccinated through measles supplementary immunization activities in Afghanistan, Djibouti, Pakistan, Somalia, South Sudan and Yemen. Pakistan and Sudan were also implementing national supplementary immunization activities targeting children up to 10 and 15 years, respectively. In response to the outbreaks in Syria and surrounding countries, Iraq, Jordan, Lebanon and Syria had implemented supplementary measles campaigns nationwide or targeting refugee-receiving areas. In addition, synchronized measles and rubella vaccine (MR) or measles, mumps and rubella vaccine (MMR) campaigns were being implemented in Syria and Jordan.

The Regional Director said that there had been a significant improvement in the performance of measles case-based surveillance in most countries in the Region. All countries were implementing measles case-based surveillance with laboratory confirmation, with 21 (91%) countries implementing surveillance nationwide, and two countries, Somalia and South Sudan, conducting sentinel surveillance. Measles surveillance performance indicators were also improving and as a result of the increased capacity of the measles laboratory network, much progress had been made towards identifying locally-circulating measles genotypes. To date, 21 (91%) countries had characterized circulating measles viruses while the occupied Palestinian territory was unable to do so, as it had continued to maintain its measles-free status for the past three years.

Dr Alwan further observed that the substantial efforts and investment being made in measles elimination provided a golden opportunity for controlling or eliminating rubella/congenital rubella syndrome (CRS) as well. Currently, 16 countries in the Region had introduced the rubella vaccine into their Expanded Programme on Immunization (EPI) schedule and 13 had developed a national target for rubella and CRS elimination. Thirteen (13) countries had achieved coverage of $\geq 90\%$ with a first dose of rubella-containing vaccine (RCV) in 2012 and rubella laboratory case-based surveillance had been integrated with measles surveillance in all countries, resulting in a significant drop in the number of reported cases. Dr Alwan noted that new GAVI Alliance window for supporting measles and rubella catch-up campaigns was an opportunity to enhance introduction of rubella vaccine in the remaining countries and intensify measles/rubella control and elimination activities. Yemen was the first of the GAVI-eligible countries to have seized this opportunity and had obtained GAVI approval for the introduction of RCV in 2014.

The Regional Director pointed out that the Region was witnessing unprecedented events, including conflicts and compromised security, massive population displacement, floods and famine. Such situations had negatively affected implementation of planned activities, including supplementary immunization activities, field visits for supervision, monitoring and evaluation, and supplies and logistics. They had also resulted in a significant

increase in the cost of implementation of planned activities, especially supplementary immunization activities. Endemicity of wild poliovirus in Afghanistan and Pakistan and, in early 2013, re-emergence of polio cases in Somalia, South Sudan and, lately, Syria, added to the challenges. Curbing the current resurgence of measles and achieving measles elimination would require sustained efforts and higher input from countries, as well as continuous collaboration and support by partners, he said.

Dr Alwan observed that the current target of regional measles elimination by 2015 was only two years away. Greater efforts and suitable approaches are needed in order to reach inaccessible areas, especially those inaccessible due to insecurity. Intensive efforts should be dedicated during the coming period to reach all unreached people with two doses of measles vaccine. The allocation of the necessary resources by governments and partners was also needed to conduct follow-up measles supplementary immunization activities in a timely and effective way. Above all, Dr Alwan concluded, intensive efforts were needed to ensure quality: the quality of reported data on routine vaccination coverage and the use of this data to address gaps; the quality of supplementary immunization activities; the quality of disease surveillance; and the quality of the actions taken based on the evidence.

2. GLOBAL AND REGIONAL UPDATES

2.1 Global situation of measles and rubella

Dr Robert Perry, WHO headquarters

The global measles targets for 2015 are reaching $\geq 90\%$ coverage nationally and $\geq 80\%$ coverage in all districts, reducing incidence to < 5 cases per million population, and reducing estimated measles mortality by 95% compared to estimates for 2000. Measles elimination goals have been established in all six WHO regions and two (Region of the Americas and the European Region) have rubella elimination goals. Global measles vaccination coverage and the proportion of countries reaching $\geq 90\%$ coverage nationally, though much higher than in 2000, have plateaued over the past few years.

Measles-containing vaccine second dose (MCV2) had become part of the routine schedule in 150 of 194 countries (77%) by 2013, with six additional countries likely to introduce a second dose in the routine schedule in 2014–2015. In 2012, 42 measles supplementary immunization activities reached 139 million children in 32 countries, with 76% including one or more additional interventions. So far in 2013, over 64 million children have been reached in 10 countries. In a few countries reported coverage has been low and SIA administrative coverage is often misleading, with up to 18 percentage points higher coverage reported than that documented by coverage surveys. Globally, the incidence of measles decreased from 2011 to 2012, after the steady increases witnessed since 2008, while the proportion of countries with incidence < 5 per million rose from 2000 to 2008, but has steadily decreased since then. Estimated measles mortality decreased by 78% during 2000–2012.

By 2012, 133 countries were offering RCV in their routine immunization schedule. supplementary immunization activities with RCV have been conducted or are planned in 16

countries during 2013–2015, and all will be followed by the introduction of RCV into the routine schedule. As of end 2012, RCV coverage in the global birth cohort had reached 43%.

The Region of the Americas continues to maintain measles and rubella elimination. The combined vaccination strategies of “catch-up, keep-up, follow-up and speed-up” have successfully stopped endemic measles transmission since 2002 and rubella since 2009, though importations continually challenge the system. In the Western Pacific Region, regional incidence declined dramatically with the implementation of nationwide catch-up campaigns in China. The resurgence of cases in 2013 was largely caused by outbreaks in China that are affecting children < 5 years of age and young adults. The African Region saw a resurgence in 2010–2012 that was restricted to 1–2 countries in each year. Over two-thirds of cases were reported from Malawi alone in 2010 and from Democratic Republic of the Congo alone in 2011 and 2012. In 2013, both Nigeria and Democratic Republic of the Congo have experienced large outbreaks, affecting primarily children < 10 years in Democratic Republic of the Congo and children < 5 years in Nigeria.

The Eastern Mediterranean Region has shown a steady decline in cases with the rise in routine coverage and implementation of catch-up campaigns, but the level of routine coverage has not been high enough to prevent large outbreaks from occurring. In the European Region, after many years of declining cases, the last few years have seen outbreaks in different countries, such as Bulgaria, France, Ukraine and, recently, Georgia and Turkey. Some outbreaks, such as that in Turkey, reflect recent gaps in the routine immunization programme, with mostly younger cases. The age of cases in the United Kingdom matches the years of the MMR autism scare, while in Germany and Georgia the age of cases reflects longer periods of low coverage with the second dose. Rubella outbreaks are also occurring in the European Region, such as in Romania in 2012 and Poland in 2013, affecting age groups not well covered by previous vaccination efforts and leading to many CRS cases. The South-East Asia Region has seen a slower decline in cases, related to late implementation of a second dose in India, but surveillance before and after the recent catch-up campaign revealed a sharp decline in the number of outbreaks and outbreak-related cases. To make progress, however, the two large countries of the Region, India and Indonesia, need to close immunity gaps left by the < 80% routine coverage with the first dose.

The Strategic Advisory Group of Experts (SAGE) on Immunization reviewed the status report on measles and rubella elimination at its meeting in early November 2013. While SAGE welcomed the news that the South-East Asia Region has established a measles elimination target for 2020, it concluded that the 2015 global targets, as well as regional elimination targets in the European Region (2015), Eastern Mediterranean Region (2015) and African Region (2020), will not be achieved. SAGE emphasized that in order to achieve measles elimination vaccination coverage needs to be > 95% for two doses of MCV administered through routine immunization or routine immunization and supplementary immunization.

SAGE urges countries achieving $\geq 80\%$ measles coverage through routine immunization or supplementary immunization, or both, to take the opportunity offered by measles elimination activities to introduce RCVs. SAGE strongly recommends that RCV be

given with the first dose of MCV and that countries use the same vaccine for both routine doses: either MR and MR or MMR and MMR. SAGE also recommends that any supplementary immunization activities conducted to fill in immunity gaps in adults should include both males and females.

SAGE further recommends that whenever the number of pre-school children who are susceptible to measles approaches the equivalent of one birth cohort, the country needs to conduct a national follow-up SIA using MCV to prevent an outbreak of measles. No single rule or criterion for determining the target age range for measles or MR supplementary immunization activities can be established. SAGE recommends that countries integrate, if available, all surveillance, demographic, survey and seroprevalence data together with vaccination coverage information, history of MCV and RCV use, and local knowledge, to determine the age distribution of susceptibility and hence the target age range of measles and MR supplementary immunization activities.

SAGE further recommends that all health workers should be immune to measles and rubella (once rubella has been introduced into the national programme). Verification of vaccination and/or immunity should be integrated into standard infection control guidelines or other health worker standards of care. For health workers with patient contact, documentation of immunity should be required before signing a contract or entering into a training programme. SAGE recommends that standard infection control measures should be enforced to prevent or reduce the spread of measles and rubella, and that regions and countries should develop plans to operationalize these recommendations.

2.2 Measles control/elimination in the Eastern Mediterranean Region

Dr Nadia Teleb, WHO Regional Office for the Eastern Mediterranean

In 1997, the countries of the Region adopted a regional target of measles elimination by 2010 (resolution EM/RC44/R.6). As the target was not achieved, the Regional Committee for the Eastern Mediterranean in 2011 resolved to postpone the target date to 2015 (resolution EM/RC58/R.5). The regional strategy for measles elimination calls for achieving at least 95% coverage with two doses of MCV at national level and in each district. This vaccination coverage can be achieved by routine vaccination alone or supplemented by periodic supplementary immunization activities. Strengthening measles case-based laboratory surveillance to reach the set measles surveillance performance indicators is fundamental for verification of measles cases reduction and measles elimination in any country.

Based on WHO-UNICEF estimates, routine vaccination coverage for first dose of measles-containing vaccine (MCV1) for the Region increased from 70% in 1997 to 83% in 2012. Twenty (20) countries are providing two routine doses of measles vaccine with variable levels of coverage, while Morocco, Somalia and South Sudan are still using only one dose of routine measles vaccine. Ten (10) countries reached 95% coverage at the national level with two doses of routine measles vaccine in 2012. In addition, all countries have implemented nationwide catch-up campaigns and supplementary immunization activities are being implemented by those countries in need of them. Reported measles cases were reduced by 88% in the Region between 1998 and 2012. However, a resurgence of measles has occurred in

several countries of the Region, including Afghanistan, Pakistan, Somalia, Sudan and Yemen, with 36 456 cases being reported in 2012 compared to only 10 072 cases in 2010.

This resurgence is due to a failure to reach or sustain the desired population immunity that stems from a failure to reach the level of measles vaccination coverage necessary to interrupt measles transmission or, at least, keep transmission low. The worrying issue is that this resurgence has occurred in some countries that had been reporting high routine coverage with two doses and/or high SIA coverage. A substantial proportion of the measles cases reported during these outbreaks has occurred among cohorts reported to have been vaccinated, but a large percentage of these cases have been proven, by case investigation, to be unvaccinated, which raises concerns about the quality of reported routine vaccination data and the quality of the implemented supplementary immunization activities. The delay in implementation of follow-up supplementary immunization activities, whether due to the security situation or inadequate funding, is also behind the occurrence of outbreaks in other countries. However, improved surveillance might have contributed to the increased number of cases reported.

Measles case-based surveillance has improved significantly during the past few years. Currently, 20 countries are implementing case-based surveillance nationwide and the remaining three countries are moving towards it. A measles validation committee has been established in only eight countries so far. For 2013 so far, seven countries have reported a measles incidence < 2 per million, with three of these reporting no cases.

3. PROGRESS IN ACHIEVING AND SUSTAINING HIGH POPULATION IMMUNITY AGAINST MEASLES

3.1 Maintaining low measles incidence: the experience of Palestine

Dr Jehad A. Ahmed, Ministry of Health

The occupied Palestinian territory consists of the two separated areas of the West Bank and Gaza Strip. These two areas consist of 16 governorates. The Palestinian population in these areas is 4 168 858, of which 50.8% are male and 49.2% are female. The total number of reported live births is 121 493; 64 614 (53.2%) in the West Bank and 56 879 (47.8%) in the Gaza Strip. The infant mortality rate is 13.5/100 000 and the below-5 mortality rate is 18/100 000. There is coverage of more than 99% for all vaccines, which is reflected in the reduction seen in the incidence of vaccine preventable diseases.

In 1969, measles vaccine was introduced at nine months, and then in 1988 MMR was introduced at 15 months, and finally in 2009 two doses of MMR were introduced at 12 months and 18 months. The coverage rate of MCV (2000 to 2013) is above 99%, while for RCV coverage is nearly 98%. The case definition adopted is a febrile rash illness and a confirmed case as being immunoglobulin M (IgM) positive. During 2012, 120 samples were tested and all were discarded except one positive case and no genotype obtained.

A surveillance system for measles/rubella and CRS has been implemented for over 20 years with immediate reporting from physicians (public and private) and notification done

within 48 hours, as well as weekly zero reporting. A rubella campaign was conducted in March 2013 for all females aged 6 to 12 years and a measles campaign was conducted for all children aged 2 to 12 years in November 2013.

3.2 Measles outbreaks in Syria and neighbouring countries: the situation, country responses and future plans

3.2.1 Syria

Dr Nidal Abo Rachid, Ministry of Health

Syria introduced the first and second dose of MMR at 12 and 18 months, respectively, in 2008. Vaccination coverage dropped from 99% in 2010 to as low as 77% in November 2013 for the first dose and a similar trend has been observed for the second dose, which dropped to 67% during the same period. As a result of this decline in national measles coverage, Syria has experienced a measles outbreak since November 2012, with 424 total measles cases reported up to September 2013, of which 269 were laboratory confirmed. Cases have been seen all over the country, mostly affecting the unvaccinated. The main challenges facing the national surveillance system are: difficulties in delivering vaccines at all levels, poor notification from doctors (especially in the private sector), difficulties in collecting specimens and delivering them to the central laboratory, difficulties in determining the target population due to population displacement in all governorates, and difficulties in reaching clinics and hospitals for active surveillance. Future plans include raising awareness about immunization through a continuous media campaign and continuing to give vitamin A every six months to children under five.

3.2.2 Jordan

Dr Mohamad Ratib Surour, Ministry of Health

A measles outbreak started in February 2013 when two cases of measles in a 15 months-old Syrian and 18 month-old Iranian were reported, with 120 measles cases notified to date. Epidemiological investigation of cases has revealed that most cases were below 20 years of age and were distributed in the northern governorates where Syrian refugees are most populous. More than 60% of cases were in Syrian refugees (both within the camps and outside them). The majority of cases were unvaccinated or of unknown vaccination status.

A rapid response team has been established and activities include a line list of suspected measles, follow-up of contacts and searching for new cases, immediate reporting of new cases, detecting the index case, confirming a measles outbreak through laboratory sampling (blood sample and throat swab), mapping of case distribution, preparation of an epidemic curve, applying control measures (case isolation, treatment, health education and outreach activities), reporting and documentation. In addition, emergency measles outbreak response measures have been implemented, including vaccination around the case (in April and May 2013). A measles/polio/vitamin A campaign was implemented at the Zaatari and Emirati Jordanian camps (covering 71 000 individuals up to 30 years). Furthermore, in June and July 2013, an out-of-camp measles/vitamin A campaign was implemented in two governorates bordering Syria and Iraq (covering 622 000 children up to 15 years). Recently, in November

2013, a campaign has been initiated with MR vaccine (up to 20 years), oral polio vaccine (OPV) (0–59 months) and vitamin A (6–59 months). In addition, intensified measles/rubella (rash and fever) surveillance is being undertaken.

3.2.3 Lebanon

Mrs Rabha Charaf-Eddine, Ministry of Public Health

In 2013, Lebanon experienced a large scale measles outbreak affecting Lebanese and displaced Syrians mainly aged from nine months to 18 years. In response to this situation, a nationwide measles campaign was conducted in four Office of the United Nations High Commissioner for Refugees (UNHCR) registration centres, with 16 mobile units deployed to cover the vaccination of children living in tented settlements and fixed vaccination points established at border entry points with Syria. A total of 1968 cases were identified, of which 852 were laboratory confirmed, with the majority in children less than five years of age. The activities have also included plans to improve routine vaccination at all primary health care centres and dispensaries, and to provide free vaccination services for all. In addition, a nationwide campaign will be conducted in April 2014 using MMR.

3.3 Ensuring high quality campaigns: planning measles supplementary immunization activities in Sudan and using lessons learnt from previous activities

Dr Selma Abdullah Al Hag, Federal Ministry of Health

In Sudan, a measles catch-up campaign was conducted in two phases during 2004–2005 targeting a population of 646 848 and follow-up campaigns were conducted in four rounds during 2007–2008 (targeting 666 249) and in 2010–2011 (targeting 233 236). Geographical coverage by independent monitoring in 2010–2011 was 96%. Immunity gaps identified from previous campaigns, and delayed implementation of the follow-up and response campaigns in 2007–2008 and 2010–2011, due to lack of funds, have created a build-up of susceptible populations. Problems also include the use of a susceptibility profile model that was unhelpful in identifying the age group to be targeted, pockets of low coverage within the overall high coverage, a lack of coverage monitoring by catchment area, identified low coverage areas where no corrective action was undertaken, and a lack of validation of coverage. Sudan has experienced several outbreaks that started at the end of 2010 before the start of the follow-up campaigns. The majority of cases were above five years in 2010, 2011 and 2012, and 80% of reported cases were unvaccinated, 19.3% vaccinated with only one dose and only 7% vaccinated with two doses. Routine coverage is still lagging behind the measles elimination coverage target of 95% for both MCV1 and MCV2.

With support from WHO and UNICEF, Sudan will implement a one round nationwide measles campaign from 24 November to 1 December 2013. The target population is 15 295 794, aged 9 months to 15 years. Micro-planning will be conducted at locality level by catchment area with special plans being prepared for hard-to-reach populations and for schools, kindergartens and *khalawi* in the first five days of the campaign. The emphasis is on intensifying federal and state supervision of high-risk areas with daily monitoring and corrective action. Ongoing review of the campaign's reported coverage and feedback will be undertaken at operation rooms at different levels. Independent monitors will start monitoring

on the fourth day and corrective action will be taken accordingly. Other measures to improve the quality of SIA campaigns will be taken, including performance-based incentives to enhance accountability, lot quality assurance sampling, external auditors to evaluate the campaign and a post-campaign coverage survey. The monitoring of performance quality indicators for measles supplementary immunization activities will also include indicators that assess campaign coverage, training, supplies, the quality of the performance of teams, geographical coverage of inaccessible areas, and children vaccinated for the first time. The challenges are many and include targeting pockets of susceptible children above 15 years, increasing social mobilization and raising community awareness on measles elimination activities.

3.4 Group work: reviewing country situations of measles elimination in relation to population immunity

Participants from countries were divided into five groups: Pakistan; Afghanistan, Somalia and Sudan; Egypt, Jordan, Lebanon, Palestine and Syria; Iran (Islamic Republic of), Libya, Morocco, Tunisia and Yemen; and Bahrain, Oman, Qatar and Saudi Arabia. They were asked to: review measles population immunity in each country; analyse data presented by countries and identify immunity gaps in each country; review regional measles target and discuss and recommend measures to maintain and/or improve population immunity; review implementation of planned activities for improving population immunity since the regional measles meeting in 2012; and specify planned activities for 2013–2014 for reaching high population immunity for MCV1 and MCV2 as part of country plans for measles elimination.

Each country gave a short presentation on the current situation of measles vaccination coverage at the national and district level, current situation of disease occurrence, planned activities to improve vaccination coverage to reach the elimination target, available resources and gaps. After the country presentations, there was group discussion and feedback. Each of the groups presented a summary presentation to the plenary addressing the country measles/vaccination coverage, implementation of planned activities for 2012–2013, the challenges facing measles elimination, planned activities for 2013–2014, and the needed and available resources and the gaps.

4. REGIONAL LABORATORY NETWORK FOR MEASLES/RUBELLA

4.1 New tools for laboratory diagnosis

Dr M Mulders, WHO headquarters

Public Health England has been comparing alternative collection devices to the Oracol saliva collection device. They have identified some materials with the potential for increased absorption and elution. Devices for collecting and extracting have also been investigated and will be assessed in a field study. A point-of-care test is being developed with lateral flow testing using capture technology for detecting immunoglobulin G (IgG) and IgM for measles, initially. Lateral flow device readers have also been investigated for enhancing the sensitivity of point-of-care devices. The Bill and Melinda Gates Foundation is funding a project with a

number of groups (including Public Health England), to evaluate these tools as a mechanism to quickly and accurately evaluate immunity in a population in the field.

4.2 Progress with national measles laboratory surveillance

4.2.1 Egypt

The national measles laboratory (NML) at the central public health laboratory has good capacity. The personnel are highly experienced and competent, with a staff capacity of two doctors, one chemist and one technician, who perform to high quality performance standards. The laboratory runs smoothly, with good management of the laboratory environment. The laboratory focal point has attended a WHO training workshop on measles and rubella virus detection and sequencing, and has participated in pilot proficiency molecular tests for measles and rubella, obtaining very good validated results.

The NML is well-organized and its infrastructure has been upgraded with good laboratory facilities for serology, molecular techniques including nucleic acid sequencing and virus isolation, and with sections for specimen reception and an office. Internal and external quality control procedures are well implemented, as is biosafety. The NML has been accredited by WHO and maintains a very high proficiency and accuracy of laboratory output. It has a very good record for its data, laboratory equipment and supplies, and has a very dependable equipment maintenance system.

As the country gets closer to measles elimination, the NML has intensified measles virus detection activities to identify the circulating virus by sequencing measles virus locally. In January 2013, the B3 genotype was identified in a small outbreak. Communication and coordination between the EPI and laboratory personnel has been improved by having regular meetings and the collection of clinical specimens for measles and rubella virus detection has increased. However, the laboratory staff is not involved in measles surveillance training, collection of specimens, handling specimens and transportation. The challenges that NML faces include specimens arriving late and incomplete information.

4.2.2 Lebanon

The NML is at Rafiq Hariri University Hospital. The laboratory is well set up and has dedicated areas for specimen reception, offices and a special section for serology and molecular techniques including sequencing. It is modern laboratory, spacious, well-equipped and well-managed. There is a quality control unit in the laboratory for monitoring and calibrating equipment. The laboratory personnel are well-trained for the different laboratory units. The laboratory focal point attended a WHO training workshop on measles and rubella virus detection and sequencing, and participated in pilot proficiency molecular tests for measles and rubella obtaining very good validated results. A laboratory has been established for molecular and genotype testing of measles and rubella. For the first time, in 2013, multiple measles virus genotypes B3, D8 and H1 were generated at the NML and were reported to Measles Nucleotide Surveillance (MeaNs) and GenBank.

In 2013, a huge measles outbreak occurred which increased the laboratory workload considerably. As 80% of cases were reported from hospitals, indicating underreporting from private and ambulatory settings, the actual size of the outbreak could have been larger than the reported cases. While there is satisfactory coordination and team work between laboratory staff and the EPI on measles elimination activities, more efforts are required for consistency in result sharing. Some of the challenges faced include incomplete information on received specimens and limited resources to curb outbreaks and for the laboratory supplies required to provide timely result reports.

4.2.3 Pakistan

The NML in Pakistan is a part of the virology department at the National Institute of Health in Islamabad. The laboratory consists of five separate rooms for serology and molecular testing. During 2007–2012, the laboratory was run by just one virologist with an extra technician provided by WHO in 2012. Molecular testing, such as polymerase chain reaction (PCR) and sequencing, started in 2007. The NML has also been providing services to Afghanistan for serology validation since 2007 and for genotyping since 2008.

4.2.4 Syria

The NML is at the public health laboratory at the Ministry of Health and has maintained the quality of laboratory performance indicators to a high standard. The NML is integrated with the national polio laboratory and shares office and laboratory space. The laboratory is spacious and well-organized, with sufficient experienced staff, consisting of two senior specialists and five medical technologists, to handle the current workload. The NML has been accredited by WHO and there is a good understanding of the value of quality assurance/quality control and the importance of biosafety. The proficiency and accuracy of the laboratory is very high.

The staff attended a training workshop organized by WHO on detection of measles virus and genotyping. This has enhanced the laboratory's capacity for using molecular techniques, which has led to improvements in measles virus isolation and detection using PCR techniques. The circulating measles virus genotype between 2003 and 2009 has been identified as D4. For two years, from 2010 to 2011, there was no measles (IgM positive) in Syria and the country was about to eliminate it, but cases appeared from 2012 to date due to the crisis in the country. There is excellent collaboration between the NML and the measles focal point in the EPI, with almost daily contact by phone and regular meetings. The challenges for the NML include the loss of trained staff, transportation difficulties that affect vaccination, the lack of a carrier for shipping infectious materials in cold condition, the need to enhance surveillance, obtaining sampling from conflict areas and the procurement of laboratory supplies due to the embargo.

4.3 Group discussion

The importance of molecular epidemiology was discussed. In 2012, eight countries in the Region reported measles cases confirmed by IgM, but no genotype information was

reported. The number of samples collected from outbreaks is low and some countries with outbreaks have not collected any samples. There is a need to improve genotype surveillance especially in relation to specimen collection for virus detection. For example, Pakistan and Saudi Arabia have found B3 but have not sent virus details to genotype databases. The success of a laboratory's accreditation review, based on its performance in reporting identified measles or rubella virus genotype to the WHO/MeaNs genotype database, will determine whether it is fully accredited or not. Laboratories are encouraged to submit the results of their molecular epidemiology.

In addition, summary results of the 12 regional laboratories that are members of the WHO Measles and Rubella Laboratory Network (LabNet) and participated in a pilot external quality control initiative undertaken by CDC were presented and discussed. The genotyping reverse transcription (RT)-PCR assays performed well and almost all laboratories reported the correct results with minimal cross-contamination in standard, endpoint RT-PCR assays. Most laboratories correctly identified the genotypes and results were reported in a timely manner. A standard protocol for a quality control programme for molecular methods has been developed for use by LabNet to initiate a yearly quality control programme for molecular methods: in 2014 the number of participating laboratories will be limited to four countries per region. Four regional members of LabNet have applied to be included, including the two regional reference laboratories in the Islamic Republic of Iran and Pakistan.

The outcome report of the 2012 measles/rubella proficiency tests was discussed. Overall, the laboratories in the Region maintained their excellent results from previous years. However, there are three criteria for the evaluation of results: 1) validity of test results; 2) provision of required enlisted information (date panel received, date tested, assay kit batch number and expiry date, cut off and not using expired kit); and 3) results reported within 14 days. All laboratory performances in test validity in the Region were excellent, but there were some weaknesses in the second and third criteria. Laboratory officers were asked to take action to meet these criteria.

Information was provided regarding the revision of the LabNet accreditation checklist. The checklist is reviewed as part of a regular review process and to pre-empt the requirements of the verification committees monitoring progress towards, and achievement of, elimination. The revision includes the introduction of a new molecular proficiency testing programme and the strengthening of other quality assurance/quality control activities as well as clarification of some ambiguous language. The details of the new draft checklist were described. The new accreditation checklist will come into use in 2014.

5. MEASLES/RUBELLA SURVEILLANCE: PROGRESS IN ACHIEVING THE TARGET OF MEASLES SURVEILLANCE PERFORMANCE INDICATORS

5.1 Measles surveillance indicators and the situation of measles/rubella surveillance in the Region

Dr E. El Sayed, WHO Regional Office for the Eastern Mediterranean

By the end of 2012, with the exception of Djibouti, Somalia and South Sudan, all countries in the Eastern Mediterranean Region had established measles case-based surveillance supported by an accredited measles laboratory network at regional and national levels. Surveillance has shown that a 90% reduction in reported measles cases has been achieved in the Region in the period 1980–2012. Regional MCV1 coverage has reached 83%, according to WHO-UNICEF immunization coverage estimates made in 2012. Surveillance performance indicators are monitored nationally and by WHO according to the recommended global measles surveillance core indicators published in 2011. According to the data, 15 countries have achieved ≥ 2 discarded measles cases per 100 000 population at national level in 2012 and only four countries in the Region have an adequacy of investigation less than 80%. In 2012, the reporting rate for the Region was 65%, for adequacy of investigation it was 74%, for laboratory confirmation it was 87% and for viral detection it was 70%. Timeliness of specimens transport within five days was 61% and timeliness of reporting laboratory results within four days was 87%. Thirteen (13) countries in the Region have 100% final classification of suspect measles cases. In 14 countries measles classification is done by a surveillance officer, in four countries it is done as recommended by expert committees, and the method was unknown in five countries.

Among the strengths of the regional network of measles case-based surveillance are the presence of a well-established surveillance network infrastructure in 21 out of 23 countries, the move towards nationwide case-based surveillance, the presence of an accreditation system and that targets have been achieved for most surveillance performance indicators at national levels. Surveillance reviews have been conducted in Sudan and Yemen, and a validation of measles elimination status preparatory visit was conducted to Bahrain in 2012. Nevertheless, the quality of measles/rubella case-based surveillance in countries close to elimination needs to be strengthened. Identified gaps include the use of surveillance data to guide response interventions and/or modify strategies, and the need to improve the quality of case investigation (travel history/index case), enhance the role of measles expert committees and establish CRS surveillance. However, the main challenge is to maintain measles/rubella surveillance functions and activities during the security crises facing many countries in the Region.

5.2 Global update on the measles/rubella laboratory network

Dr M Mulders, WHO headquarters

LabNet, coordinated by WHO, currently consists of 691 laboratories. It is a multi-tiered structure consisting of global specialized, regional reference and national laboratories. Additionally, some countries have nominated subnational or provincial laboratories. In 2012, almost 50 000 of 240 000 suspect measles and rubella cases were confirmed by LabNet, with

the same numbers confirmed in the first nine months of 2013. The performance of the network laboratories is monitored and assessed by WHO, based on workload, reporting timeliness and completeness, confirmatory testing, implementation of good laboratory procedures, quality assurance and quality control measures, and proficiency testing. The overall performance is high, with almost all laboratories accredited by WHO and 220 laboratories participating in the annual proficiency testing programme with very good results. With several WHO regions targeting elimination of measles and rubella, a process of verification of elimination is being implemented. The role of the laboratories will gain increasing importance as performance indicators are based on laboratory evidence. All testing should be conducted at, or under supervision of, a WHO-accredited laboratory. Furthermore, data is required on laboratory investigation rates (all suspect cases need to be laboratory confirmed) and discard rates (2:100 000), as well as on genotype surveillance and seroprevalence.

Genotype surveillance has become an important tool for the measles/rubella programme. Genotype diversity, including baseline information, can provide evidence on the progress of elimination. The decreasing variety of virus lineages and their eventual disappearance can demonstrate the success of disease intervention programmes. Although WHO databases contain a valuable amount of data, data is lacking from many countries, particularly for rubella virus. Furthermore, care should be taken not to over-interpret the sequence data, as sequence identity, particularly for measles, cannot be used to link outbreaks if epidemiological information is not provided. Therefore, it is critical that specimens, when sent to the laboratory, are provided with this data. Linking laboratory and epidemiological data is critical for the programme.

The increasing workload is becoming a challenge for LabNet now that regions are moving towards elimination of measles and are introducing rubella control or elimination goals. LabNet continues to have high staff turn-over and limited human and financial resources. Public health authorities are therefore urged to recognize and support their laboratories, taking their increasing role into consideration.

5.3 The regional measles/rubella laboratory network: progress and challenges

Dr H. Ahmed, WHO Regional Office for the Eastern Mediterranean

All countries in the Region have established national measles and rubella laboratories, served by WHO trained staff, to support and provide the EPI with reliable measles laboratory data which are in line with WHO standards. LabNet has the capacity to accommodate diagnostic requirements for measles/rubella case-base surveillance as well as serological diagnostic capacity. In 18 of the 23 countries there is well-established virus detection by RT-PCR or virus isolation in cell culture. In addition to the two regional reference laboratories in Tunis and Muscat, four other countries (Egypt, Islamic Republic of Iran, Morocco and Pakistan) have virus sequencing capacity.

From January to September 2013, 13 155 sera samples were received and tested at LabNet laboratories. Of these, 9896 (75%) were found to be IgM positive for measles and

1671 were positive for rubella IgM. A large proportion of the tests for measles came from Pakistan and Sudan due to the large outbreaks in those countries.

LabNet meets laboratory performance indicators for quality of testing and timeliness of reporting. All countries, except the three with the highest number of outbreak cases (Pakistan, Sudan and Yemen), reported laboratory results within four days. All participating countries passed the global proficiency panel, achieving 22 scores of 100% and one country receiving 80% for measles; the same scores were obtained for rubella. For validation, LabNet demonstrated good concordance in serum testing and virus detection.

Since 2007, WHO has put more emphasis on capacity-building in molecular techniques for virus detection, as the Region moves closer towards measles elimination and increasing importance is placed on tracking the virus to monitor progress in achieving measles elimination goals. The RT-PCR assay and genotyping pilot proficiency test distributed in September 2012 was reported to CDC, with almost all laboratories reporting correct results with minimal cross-contamination in standard, endpoint RT-PCR assays of the distributed samples after each training workshop.

In the Region, the identified measles genotypes are C2, B3, D4, D5, D6, D7, D8, D9 and H1. Before 2011, the predominant genotype was D4. However in 2011 and 2013, circulation of the B3 measles virus seemed to be more pronounced in the Region, with D4 accounting for 13% and B3 for 67% of the identified measles virus genotypes. However, in Palestine and South Sudan the baseline genotype information is not yet known, with Palestine not having a measles case for the past three years. Countries with reported measles cases are encouraged to monitor circulating measles virus by improving collection of clinical specimens (throat swab, urine or oral fluid) for virus detection and genotyping. Rubella genotype information is available from some countries in the Region, demonstrating genotypes 1E, 1G and 2B.

Challenges for the network include the high cost of serological and molecular laboratory testing of measles and rubella as the number of tests and assays increase in the elimination phase. Also, measles case classification and timely reporting of measles virus genotype and sequence to the WHO genotype database or to MeaNs remain a challenge.

In conclusion, LabNet continues to meet WHO criteria for accreditation and to maintain high quality proficiency. More laboratories have the capacity to perform virus culture and RT-PCR which are valuable laboratory tools to support the elimination programme. There is improved strain surveillance for measles viruses, but limited baseline data on rubella viruses.

5.4 Measles surveillance in the Region: success and challenges

5.4.1 Islamic Republic of Iran

Dr Seyed Mohsen Zahraei, Ministry of Health and Medical Education

Historically, measles has been a well-diagnosed infectious disease and important public health problem in the Islamic Republic of Iran. Immunization against measles started in 1967

and there has been increasing coverage over time. The total population based on the latest census in 2011 is 75 million, and the percentage of people aged < 15 and < 5 years was 25% and 8%, respectively. The Islamic Republic of Iran officially accepted the regional measles elimination objective in 2001 and has pledged to achieve measles/rubella elimination by 2015.

According to the recommendations of the NITAG, two doses of measles vaccine were administered at 9 and 15 months from 1984 until the catch-up immunization campaign with measles and rubella vaccine in December 2003. Since then, children have been given MMR at 12 months and six years. In 2008, on the basis of measles epidemiology, the age at the second dose of MMR was decreased to 18 months. Coverage of MCV1 and MCV2 has been > 95% at the national level since 1992 and 1996, respectively. Coverage of the catch-up campaign was around 99%. Based on the multiple-indicator demographic and health survey (MIDHS) survey, coverage of MMR1 and MMR2 in 2011 was more than 95%.

Surveillance indicators have been monitored since introduction of case-based surveillance in 2004. Nationally, the suspected measles reporting rate was 3.6 and 4.9 in 2011 and 2012, respectively. Since 2006, > 80% of all suspected cases have had a clinical sample and the samples collection rate increased to 94% in 2012. Completeness of investigation has been > 95% since 2006. There were some small outbreaks in Sistan va Baluchestan province in the south-eastern part of the country in 2012 and the first nine months of 2013, with a total number of confirmed measles cases of 230 and 110 in 2012 and 2013, respectively. Measles outbreaks were mainly due to importation from beyond the eastern borders.

Several sero-surveys were done before and after the MR mass campaign in 2003. Before rubella vaccine introduction in the EPI, sero-immunity against rubella in children aged 5–9 years old and women of child-bearing age was 64% and 96%, respectively, but after the campaign the sero-immunity in different age groups from 5 to 35 years increased to more than 97%. Since 2004, the number of confirmed rubella cases has been less than 20 per year and the incidence rate for 2012 was 0.24 per million. Based on a good immunization service with high MCV1 and MCV2 coverage at national and subnational level and a robust surveillance system with good performance indicators, the country is on course to achieve the goal of measles/rubella elimination.

5.4.2 Pakistan

Dr Rana Muhammad Safdar, Ministry of Health Services, Regulation and Coordination

Since 2012, Pakistan has adopted integrated vaccine-preventable disease surveillance, including case-based measles surveillance. The main components of the surveillance are routine weekly reporting, alert verification, outbreak detection and investigation. There are 5045 reporting sites and total case finding has shown an increasing trend over the last few years, reaching 8000 measles cases in 2013 (November). Laboratory performance indicators have also been improving.

The main system challenges are the timeliness and completeness of zero reporting, missing data in investigation reports, low rates of specimen collection (especially oral/pharyngeal swabs), lack of final classification of reported cases, low public sector

reporting to the surveillance network, lack of private sector involvement in the absence of a legal framework, and data collection being unlinked to a timely response. Management challenges include human resource constraints at district and provincial levels, inadequate data analysis capacity at district level, lack of proper monitoring and feedback, inadequate logistics support at provincial and district level, no specific financial allocation for surveillance and response, and poor accountability.

The way forward is to establish expert review committees at provincial and federal levels, conduct regular surveillance review meetings for feedback to districts, develop a specific plan of action for strengthening surveillance at the district level, implement strict monitoring of surveillance indicators linked to accountability, involve the private sector through a legislative framework and advocacy, effectively utilize lady health workers, pilot innovative interventions for online reporting of cases, and enhance coordination with the disease early warning system (DEWS) for an appropriate response.

5.5 Situation of measles/rubella elimination in countries: process and findings

5.5.1 Oman

Dr Idris Saleh Al Abaidani, Ministry of Health

Measles vaccine was introduced in the early 1980s at nine months and coverage has been above 90% since 1989. Similarly, rubella vaccine was introduced along with a second dose of measles vaccine (as MR) at 15 months in 1994. Since 1994, rubella coverage has been above 95%. The priority status for measles and rubella was upgraded in 1993, with both diseases being shifted from group B to group A. A mass campaign with MR was conducted in Oman in March 1994 following the last nationwide concurrent outbreak of measles and rubella in 1992–93. The target population was 15 months to 18 years. A single dose of MR was given irrespective of previous immunization status and the campaign achieved over 94% coverage.

Case-based rash illness surveillance was launched in April 1996. All rash illness cases were subjected to serological testing for measles as well as rubella (using IgM enzyme-linked immunosorbent assay). If a blood sample was not taken, the case was classified as clinically- or epidemiologically-linked. Urine samples were collected from all rash illness cases for measles virus isolation. Fever and rash illness surveillance has been further strengthened since 2005 with the development of standardized case definition and a laboratory investigation protocol. Measles/rubella (rash illness) weekly negative reporting was launched in January 1995 at 22 sentinel sites countrywide. The existing infrastructure for acute flaccid paralysis (AFP) and neonatal tetanus (NNT) surveillance was utilized for this purpose. The number of reporting sentinel sites has been increased to 52.

In terms of epidemiological investigation, all outbreaks of measles are investigated with particular reference to age, vaccination status and history of travel. Attempts are made to find the index case and data are analysed for evaluation of the programme. Overall, measles endogenous incidence is 0 per million population.

5.5.2 Bahrain

Dr Jaleela Sayed Jawad, Ministry of Health

Measles elimination is one of the Ministry of Health's priorities in Bahrain. The marked reduction in the incidence of measles can be attributed to the introduction of measles vaccine in the immunization schedule in 1974 and of MMR since 1985. High (> 95%) measles, MMR1 and MMR2 coverage has been attained. A strong surveillance system is in place that contributes to the reduction of cases and ensures that control measures are in place in a timely and complete fashion, along with a well-established laboratory system that tests all suspected cases and reports results on time. The number of measles cases has shown a marked reduction in the past decade and the country has reported zero indigenous cases since 2010, with the only measles case reported in 2013 being a non-Bahraini adult case. Bahrain is implementing different strategies to ensure a sustained high immunity profile among the community and is studying various strategies to sustain the achievement and prevent importation.

5.6 Group work: reviewing country situations of measles/rubella surveillance

The five working groups undertook a measles surveillance exercise. The groups were asked to review the situation of measles/rubella surveillance in the Region, the quality of surveillance (indicators, criteria and targets), measles surveillance in countries, achieving and maintaining strong measles/rubella surveillance, challenges in establishing adequate surveillance, and the process of documentation and verification of measles/rubella elimination. Each country gave a presentation covering measles surveillance performance indicators, gaps identified and root causes for low performance of measles surveillance, as well as data elements to collect and the country plan for 2013–2014. The groups prepared a joint group presentation that was given to the plenary covering the current situation of measles surveillance performance indicators by country, planned activities for 2012–2013, countries achieving elimination criteria, plans for initiation of the validation process for countries moving towards elimination, action plans for reaching elimination, and the needed and available resources and gaps.

6. ENHANCING RUBELLA AND CRS CONTROL AND ELIMINATION IN THE EASTERN MEDITERRANEAN REGION

6.1 Target age groups for measles/rubella campaigns for rubella vaccines

Dr G. Grant, Centers for Disease Control and Prevention, Atlanta

At the November 2013 SAGE meeting, recommendations were made regarding the use of measles and rubella vaccine. Two sets of recommendations were discussed: 1) identification of appropriate targets for supplementary immunization activities; and 2) use of RCV in the routine immunization programme. A third important set of recommendations regarding measles/rubella vaccination of health workers was introduced during the global measles/rubella update on the first day.

The SAGE measles/rubella working group discussed determining the appropriate age-ranges for measles follow-up campaigns. Mathematical models that identify cut-offs and

criteria for determining the most appropriate age range require further improvement. Until further information is available, countries should implement campaigns when the number of susceptible children of pre-school age is equal to one birth cohort. Data quality needs to be improved as accurate data is necessary for good estimates of susceptibility.

For determining targets for wide age range campaigns (including RCV introduction campaigns), it was recommended that planners review as many data sources as possible to determine population susceptibility for measles and rubella in order to make a decision. Data may include measles/rubella surveillance, immunization coverage, and sero-survey and outbreak data. The age range should be determined in order to reach the appropriate population, using the susceptibility pattern of either measles or rubella, whichever is wider. In addition, countries wishing to “speed-up” elimination activities may also use expanded age range campaigns to fill immunity gaps, as has been done in the Region of the Americas.

Countries are also encouraged to optimize the use of RCV. Optimization includes using the same vaccine for both doses in the routine measles schedule, meaning that rubella and measles are always given together (MR or MMR). This reduces missed opportunities and decreases the risk of reporting and/or administrative errors. It is also recommended that all countries give RCV with the first measles dose. It was noted that the position paper recommends all preventive supplementary immunization activities for measles to use an RCV and to target both males and females.

6.2 Rubella/CRS surveillance: requirements and opportunities for establishing CRS surveillance in low-resource countries

Dr G. Grant, Centers for Disease Control and Prevention, Atlanta

While rubella is moderately contagious and presents mild infection, its impact is drastic when women contract it during pregnancy as it may result in CRS. The primary goal of rubella vaccination is to prevent CRS, and monitoring vaccination requires methods to document the impact of the vaccination programme and to document the elimination of rubella as well as CRS. Establishing CRS surveillance in developing countries is feasible and realistic, and establishing surveillance of the capacity of each country requires some extra efforts to establish, but is not difficult to maintain.

Surveillance to detect rubella disease is integrated with measles through febrile rash illness surveillance with laboratory results to determine final classification, though rubella surveillance differs from measles in several ways. One difference is in interpreting data, where rubella cases are underreported relative to measles due to lower case detection. A second difference is in the importance of determining pregnancy during case investigation, as pregnant rubella cases must have follow-up of pregnancy outcomes and evaluation of live births for CRS.

Surveillance for CRS requires evaluation of suspected infant CRS cases. As 50% of mothers who give birth to infants with CRS are asymptomatic, case ascertainment should occur through two methods: first, through CRS-specific surveillance identifying suspect infant CRS cases in the health system; and second, by identification of infants born to confirmed

pregnant rubella cases identified through febrile rash illness surveillance. Cases can be classified according to existing case definitions for clinically- and laboratory-confirmed CRS cases based upon clinical and laboratory data.

Implementation of a CRS surveillance system requires well-structured guidelines with a clear algorithm or protocol for the diagnosing, testing and reporting of cases, education material for health care providers (including hospital guidelines) and contact isolation for infants with CRS (to prevent transmission). CRS surveillance works well with an enthusiastic, committed rubella/CRS surveillance coordinator. Examples of CRS surveillance established in developing countries exists, including post-outbreak surveillance and nationwide monitoring systems.

Indicators for CRS elimination are not available at the global level. The Region of the Americas used a review of data from various sources over a three-year period to validate elimination. Other rubella indicators are the same as measles surveillance indicators.

6.3 Oman's experience with rubella/CRS control and elimination efforts

Oman adopted the goal of CRS elimination by 2005. The last case of CRS was reported in 2001, while one case of congenital rubella infection (CRI) was reported in 2008. All living cases of CRS in the national registry are reviewed on an annual basis using special referral forms. Neither death nor secondary complications have been observed among the CRS cases followed. Active and passive surveillance is in place. The national target has already been met.

7. POLIO ERADICATION INITIATIVE: STRENGTHENING ROUTINE IMMUNIZATION AND INTRODUCTION OF IPV VACCINE

7.1 PEI Endgame Strategy: an overview and the way forward

Dr R. Eggers, WHO headquarters

The strategic framework for the sequential withdrawal of Sabin strains, starting with OPV type 2, states that trivalent OPV (tOPV) must be replaced with bivalent OPV (bOPV) in a synchronized manner globally for risk mitigation. The framework includes at least one dose of inactivated polio vaccine (IPV) to be included in the routine immunization programme (starting > 6 months before the switch from tOPV to bOPV). In addition, to proactively address the Sabin type 2 burden of paralytic disease (2012 marked the first year with more paralytic cases due to the vaccine), regardless of the fate of the eradication initiative, since wild type 2 poliovirus was eradicated in 1999, we can lock in the type 2 gains forever, and accelerate eradication and boost types 1 and 3 immunity with bOPV and IPV.

The pre-requisites for the tOPV-bOPV switch are:

- validation of persistent type 2 circulating vaccine-derived poliovirus elimination (cVDPV2) and type 2 wild poliovirus (WPV2) eradication
- stockpile of monovalent OPV2 (mOPV2) and response capacity (and guidelines)

- surveillance and international notification of Sabin, Sabin-like and cVDPV2
- availability of licensed bOPV in all OPV-using countries
- affordable IPV options for all OPV-using countries includes realization of low-cost and easy-to-administer IPV options (i.e. new intradermal, fractional dose and adjuvanted IPV formulations, Sabin IPV formulations and new delivery technologies such as needle-free injections)
- containment phase II for cVDPV2 and WPV2 and phase I for Sabin type 2.

SAGE recommends that all countries should add at least one dose of IPV to the national routine immunization schedule to:

- reduce the risk of paralytic polio if exposed to a type 2 virus after OPV2 withdrawal
- improve response to the future use of a monovalent type 2 polio vaccine in the case of an outbreak
- reduce transmission of a reintroduced type 2 virus
- boost immunity to the remaining wild poliovirus serotypes 1 and 3.

SAGE also reaffirms the importance of removing the type 2 component of the OPV from routine immunization programmes globally in the near term in order to:

- eliminate the most common cause of vaccine-associated polio outbreaks
- eliminate the vaccine-associated paralytic poliomyelitis (VAPP) associated with this serotype
- secure the serotype-specific gains that have occurred to date in global eradication
- enhance the efficacy of the OPV to protect against and eliminate the remaining type 1 and 3 wild virus serotypes.

Countries introducing one dose of IPV into the routine immunization schedule should administer that dose at or after 14 weeks of age, in addition to the 3–4 doses of OPV in the primary series. As IPV immunogenicity is highest after 14 weeks of age due to lower maternal antibodies at that time, IPV administration at 14 weeks or later maximizes the benefit of IPV to protect children against type 2 poliovirus after OPV type 2 cessation, while helping to close immunity gaps to type 1 and 3 virus.

In countries with primary immunization contacts at 6, 10 and 14 weeks of age or 2, 3 and 4 months of age, the IPV dose should be added at the diphtheria-tetanus-pertussis vaccine 3 (DPT3)/OPV3 contact and with the 2, 4 and 6 months schedule, the IPV dose could be added at the DPT3/OPV3 contact, though DPT2/OPV2 can also be considered. For children vaccinated with bOPV who failed to receive IPV, this can be given at any subsequent immunization contact.

For those starting the routine immunization schedule late (age > 3 months), the IPV dose should be administered at the first immunization contact. SAGE recommends that countries have flexibility to consider alternative schedules (e.g. earlier IPV administration) based on local conditions (e.g. documented risk of VAPP prior to four months of age).

The Endgame Strategy targets for routine immunization strengthening are to:

- develop annual national immunization coverage improvement plans in at least five priority countries by 2013
- dedicate > 50% of WHO/UNICEF polio-funded field staff time to immunization strengthening tasks by 2014
- increase DPT3 coverage by 10% per year in high risk districts in at least five priority countries with coverage improvement plans by 2014
- percentage of immunization sessions conducted of those that were planned (proposed additional indicator for focus countries).

7.2 Switching from tOPV to bOPV: countries introducing IPV among GAVI Alliance-eligible countries

Dr Ezzedine Mohsni, WHO Regional Office for the Eastern Mediterranean

Twelve (12) countries in the Eastern Mediterranean Region have not yet introduced IPV into their routine immunization programme. There are operational issues that relate to: the type of schedule, in particular the age for providing the mandatory dose; procedures to reach high coverage figures, in particular in countries with weak delivery systems; the impact of vaccine introduction on cold chain capacity; vaccine regulation; and financing, in particular for non-GAVI Alliance-eligible countries. Regarding the switch from tOPV to bOPV (valid for all countries), there are regulatory issues related to bOPV registration and the feasibility of stopping tOPV at the same time in all countries of the world. NITAGS have an important role in advising national programmes on all these matters.

Each country presented their plans for introducing IPV and the switch from tOPV to bOPV, along with the challenges they are expecting to face, and the support they might need from WHO and other partners (including CDC, GAVI Alliance and UNICEF) in order to implement them.

8. CONCLUSIONS

- Substantial progress has been made by several countries of the Eastern Mediterranean Region towards achieving measles elimination, including Bahrain and Palestine that have reported zero cases for the past three years and Oman that had no endemic cases in 2013. In addition, national validation committees for measles elimination and expert review committees have been established in several countries of the Region.
- Despite this progress, there is concern over the continued high incidence of measles in several countries and a need to scale-up efforts to meet the measles elimination target by 2015. Of particular concern, are countries that have experienced delays in implementation of measles follow-up supplementary immunization activities due to shortfalls in funding, insecurity and inaccessibility, resulting in the occurrence of major outbreaks.
- National immunization programmes in some countries are facing considerable management challenges in increasing vaccination coverage, introducing new vaccines, maintaining or achieving polio eradication, and achieving measles elimination by 2015.

Frequent turnover of staff leads to disruption in management continuity and negatively impacts programme effectiveness.

- It has been challenging for several countries to achieve and sustain high population-based immunity. Of particular concern is the recurrence of outbreaks in countries despite their implementation of supplementary immunization activities. The analysis by Sudan of the lessons learnt from previous supplementary immunization activities and outbreak investigations, and the preparations for upcoming supplementary immunization activities, will be helpful in this respect.
- Several countries with high routine vaccination coverage and high SIA administrative coverage have reported large outbreaks of measles.
- There has been an emergence of anti-vaccine sentiment and non-compliant caretakers in several countries which is of concern.
- Integrated epidemiological and laboratory-based surveillance is required in order to obtain surveillance performance indicators. Virus detection and genotyping is one of the weakest areas of laboratory surveillance in the Region.

9. RECOMMENDATIONS

To Member States

Strengthening the technical and managerial capacity of national immunization programmes

1. To ensure continuity of high quality measles elimination activities, ministries of health should consider the following:
 - decreasing the frequency of programme staff turnover and ensuring new programme managers are well-briefed and made aware of all aspects of EPI by outgoing managers; if a manager with limited experience is appointed, there should be an adequate transition period to hand over responsibilities.
 - instituting a system for pre-service and in-service training for programmes technically supported by partners.
 - empowering national and provincial programme managers to implement strategies to improve routine immunization and eliminate measles through assignment of administrative authority to their offices for the accountability of district immunization officers and other programme management staff.
2. NITAGs should analyse the human capacity of programmes and utilize the Regional Committee resolution on strengthening programme management for recommending, advocating and mobilizing resources for improving the structure and management capacity of immunization programmes.
3. The significant human resource capacity of the Global Polio Eradication Initiative should be utilized to support routine immunization strengthening.
4. Countries and partners should utilize the significant human resource capacity of the Global Polio Eradication Initiative to support measles elimination activities, especially in countries with significant number of Global Polio Eradication Initiative staff (Afghanistan, Pakistan and Somalia).

Improving population immunity to achieve the regional elimination target

5. All children should be provided with two doses of measles vaccine, even if they have dropped out of the routine vaccination schedule. Programmes should have policies and relevant operational plans to “catch-up” children who miss the routine MCV. If not already in place, programmes should develop national policies to require and verify up-to-date vaccination status for all immunization programme vaccines including two doses of MCV at school entry.
6. Programmes should develop policies to engage the private sector, academia and professional societies to support eradication, elimination and control activities and engage them in planning, implementing and evaluating these activities.
7. Programmes should develop and implement appropriate strategies to reach high risk, minority and children in security-compromised and hard-to-reach areas with at least two doses of MCV at appropriate spacing. Programmes should work with local partners in conflict zones and across borders to develop strategies to identify and provide services for children in affected areas to ensure they are provided all EPI vaccines during the first two years of life.
8. Programmes should ensure high quality supplementary immunization activities through the following measures:
 - mobilizing the necessary resources (domestic and partner) for timely implementation of supplementary immunization activities
 - developing a good plan of action using WHO SIA guidelines to ensure proper planning and implementation of supplementary immunization activities including use of a dashboard to monitor key preparedness indicators at the pre-campaign, intra-campaign and post-campaign stages; campaigns should not be implemented unless pre-campaign indicators are met at all levels
 - conducting post-SIA coverage evaluation surveys and implementing mop-up activities where needed
 - exchanging information on planned supplementary immunization activities and synchronizing cross-border activities where possible.

Improving the quality of vaccination coverage data

9. Countries reporting high coverage of routine measles vaccination, including those with low reported measles incidence and those experiencing frequent outbreaks/high endemicity, should consider validating the measles vaccination coverage data using data quality self-assessment, lot quality assurance sampling and/or coverage evaluation surveys.
10. Countries experiencing significant measles outbreaks among vaccinated populations should implement appropriate studies to examine the quality of vaccination certification of confirmed measles cases and apply corrective measures.

Advocacy, communication and social mobilization

11. Countries should identify a focal point to strengthen programme communication/advocacy/social mobilization activities and develop a comprehensive strategy to ensure:
 - political and financial commitment towards measles elimination among the highest national health authorities
 - community awareness on measles elimination to increase community demand for measles vaccination
 - engagement of partners, including the private sector, academic institutions, religious leaders and nongovernmental organizations.

Improving measles, rubella, and vaccine-preventable disease surveillance

12. Countries that have introduced rubella vaccine should undertake surveillance of CRS to document its ongoing impact and countries considering rubella vaccine introduction should undertake surveillance of CRS to estimate disease burden and for making evidence-based decisions on the introduction of the vaccine.
13. Countries with multiple reporting systems should develop an integrated vaccine-preventable disease surveillance system that meets their needs and is the source of official government data.
14. With the assistance of WHO, all countries should develop a monthly EPI feedback bulletin to all programme stakeholders and reporting sources that includes feedback of key routine immunization coverage and measles/rubella surveillance activities and indicators.

Laboratory-based surveillance of measles and rubella

15. Appropriate clinical specimens from measles and rubella cases should be collected, in a timely manner, for genotype analysis. Representative specimens from outbreaks should be forward to the designated WHO-accredited sequencing laboratory. Both genotype baseline information and data from ongoing outbreaks should be made available to the WHO LabNet.
16. As part of their commitment to measles elimination, national health authorities should provide human and financial resources to support specimen collection, transport and the costs of laboratory-based surveillance for measles and rubella.

Verification of measles elimination

17. All countries should take advantage of existing polio national expert groups to establish measles expert review groups to classify measles cases based on WHO guidelines.
18. All countries that have not established a measles elimination verification committee should do so immediately using WHO guidelines.

Introduction of IPV

19. All countries should review the SAGE recommendations and make a plan, by June 2014, to implement objective 2 of the Endgame Strategy including IPV introduction and switching from tOPV to bOPV.

To WHO and partners

20. WHO should support measles/rubella elimination reviews in Egypt, Islamic Republic of Iran, Oman, Palestine and Tunisia within the next 12 months.
21. WHO, UNICEF and partners should assist countries in developing comprehensive communication strategies to enhance measles/rubella elimination activities.
22. WHO should develop terms of reference for expert review committees by 1 January 2014.
23. WHO should provide technical support for rubella/CRS surveillance as requested by Member States.
24. WHO should provide technical assistance for countries to develop an IPV introduction plan.
25. WHO should explore revitalization of Operation MECACAR to coordinate measles elimination across regions.

Annex 1**PROGRAMME****Sunday, 17 November 2013**

08:30–09:00 Registration

09:00–09:30

Opening session

Message from Dr Ala Alwan, WHO Regional Director for the Eastern Mediterranean *Dr J. Mahjour, WHO/EMRO*

Message from H.E. Dr Ali Hyasat, Minister of Health, Jordan

Introduction of participants, election of the Chairman and adoption of the Programme

Session I. Global and regional updates

09:30–09:50 Global situation of measles and rubella

Dr R. Perry, WHO/HQ

09:50–10:10 Measles control/elimination in the Eastern Mediterranean Region

Dr N. Teleb, WHO/EMRO

10:10–11:00 Discussion

Session II. Progress in achieving and sustaining high population immunity against measles11:00–11:30 Maintaining low measles incidence:
Palestine*EPI managers*

Tunisia

11:30–11:45 Discussion

11:45–12:45 Measles outbreaks in Syria and neighbouring countries: the situation, country responses and future plans

Syria

EPI managers

Jordan

Iraq

Lebanon

12:45–13:00 Discussion

13:00–13:15 Ensuring high quality: planning measles supplementary immunization activities in Sudan and using lessons learnt from previous supplementary immunization activities

EPI/Sudan

13:15–13:25 Discussion

13:25–14:30 Introduction to group work

Dr E. El Sayed, WHO/EMRO

- 14:30–17:00 Group work: reviewing country situations of measles/rubella control and elimination in relation to population immunity
 Group 1: Pakistan
 Group 2: Afghanistan, Djibouti, Somalia, South Sudan, Sudan
 Group 3: Egypt, Iraq, Jordan, Lebanon, Palestine, Syria
 Group 4: Iran (Islamic Republic of), Libya, Morocco, Tunisia, Yemen
 Group 5: Bahrain, Oman, Qatar, Kuwait, Saudi Arabia, United Arab Emirates

Parallel session for laboratory participants. Measles/rubella Eastern Mediterranean Region laboratory network

- 14:30–14:50 New tools for laboratory diagnosis of measles/rubella *Dr M. Mulders, WHO/HQ*
- 14:50–15:00 Discussion
- 15:00–15:40 Progress with national measles laboratory surveillance
 Egypt
 Lebanon
 Pakistan
 Syria *NML Focal Points*
- 15:40–16:15 Discussion
- 16:15–17:00 Group discussion
 Final protocol on measles/rubella molecular assays list country participation to global PT panel
 Reporting measles/rubella virus genotype: countries reporting measles/rubella virus genotype VS not reporting what is the barrier
 Outcome report of 2012 measles and rubella PT and introduction of revised accreditation check list
- 17:15–18:15 RTAG/facilitators meeting

Monday, 18 November 2013

- 08:30–10:30 Group work: progress towards achieving high population immunity

Session III. Measles/rubella surveillance: progress in achieving the target of measles/rubella surveillance performance indicators

- 10:30–11:00 Measles/rubella surveillance indicators and the situation of measles/rubella surveillance in the Region *Dr E. El Sayed, WHO/EMRO*
- 11:00–11:15 Global update on the measles/rubella laboratory network *Dr M. Mulders WHO/HQ*
- 11:15–11:30 The measles/rubella laboratory network in the Eastern Mediterranean Region: progress and challenges *Dr H. Ahmed WHO/EMRO*
- 11:30–11:45 Regional measles/rubella molecular surveillance *Dr H. Triki RRL, Tunisia*
- 11:45–12:15 Discussion
- 12:15–12:45 Measles surveillance in the Region: success and challenges
 Islamic Republic of Iran *EPI Manager*
 Pakistan *EPI Manager*

12:45–14:00	Discussion	
14:00–14:30	The situation of measles/rubella elimination in countries: process and findings	
	Oman	<i>EPI Manager</i>
	Bahrain	<i>EPI Manager</i>
14:30–14:50	Discussion	
14:50–15:00	Introduction to group work	<i>Dr H. Ahmed</i> <i>WHO/EMRO</i>
15:00–17:00	Group work: reviewing countries' situation of measles/rubella surveillance	
	Group 1: Pakistan	
	Group 2: Afghanistan, Djibouti, Somalia, South Sudan, Sudan	
	Group 3: Egypt, Iraq, Jordan, Lebanon, Palestine, Syria	
	Group 4: Islamic Republic of Iran, Libya, Morocco, Tunisia, Yemen	
	Group 5: Bahrain, Oman, Qatar, Kuwait, Saudi Arabia, United Arab Emirates	

Tuesday, 19 November 2013

08:30–11:00	Group work (continued)	
11:00–12:00	Preparation of group presentation	
12:00–15:05	Group work presentation: towards achieving measles/rubella control/elimination	

Session IV. Enhancing rubella and CRS control and elimination in the Eastern Mediterranean Region

15:05–15:20	Target age groups for measles/rubella campaigns for rubella vaccine	<i>Dr G. Grant</i> <i>CDC Atlanta</i>
15:20–15:35	Discussion	
15:35–15:50	Introducing/enhancing use of rubella vaccine in the remaining Eastern Mediterranean Region countries: progress, challenges and next steps	<i>Moderator</i> <i>Dr H. Bashour</i> <i>RTAG Chairperson</i>
	Afghanistan	
	Djibouti	
	Pakistan	
15:50–16:15	Discussion	
16:15–16:30	Progress, challenges and next steps	<i>Moderator</i> <i>Dr H. Bashour</i> <i>RTAG Chairperson</i>
	Somalia	
	South Sudan	
	Sudan	
16:30–16:50	Discussion	
16:50–17:05	Progress, challenges and next steps	<i>Moderator</i> <i>Dr H. Bashour</i> <i>RTAG Chairperson</i>
	Yemen	
	Morocco	
	Tunisia	
17:05–17:15	Discussion	
17:30–18:30	RTAG/facilitators meeting	

Wednesday, 20 November 2013

08:30–09:00	Rubella/CRS surveillance: requirements and opportunities for establishing CRS surveillance in low resource countries	<i>Dr G. Grant</i> <i>CDC Atlanta</i>
09:00–09:15	Discussion	

09:15–09:30	Oman’s experience with rubella/CRS control and elimination efforts	<i>EPI Manager</i>
09:30–09:45	Indicators of achievement rubella/CRS elimination	<i>Dr G. Grant</i>
09:45–10:00	Discussion	
10:00–11:00	Wrap-up of measles/rubella sessions	
Session V. Polio Eradication Initiative Endgame Strategy: strengthening routine immunization and introduction of IPV		
11:00–12:00	PEI Endgame Strategy: Overview and the way forward Vaccination against polio Switch from tOPV to bOPV: Policy, technical, financial and programmatic implications Introduction of IPV, global and regional situation IPV availability Advocacy and communication in relation to switch from tOPV to bOPV and introduction of IPV	<i>Dr R. Eggers WHO/HQ</i>
12:00–12:30	Discussion	
12:30–12:45	GAVI window for supporting IPV introduction	<i>Dr K. Aung GAVI Alliance Secretariat</i>
12:45–14:00	Discussion	
14:00–15:45	Discussion Switching from tOPV to bOPV: countries plans and potential challenges Plans for introduction of IPV in the remaining countries: (GAVI Alliance-eligible countries and middle income countries)	<i>Moderator Dr E. Mohsni WHO/EMRO</i>
15:45–16:30	Recommendations and way forward	
16:30	Closing session	

Annex 2

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