

SIXTH MEETING OF THE EUROPEAN REGIONAL VERIFICATION COMMISSION FOR MEASLES AND RUBELLA ELIMINATION (RVC)

15–17 June 2017
Bucharest, Romania



Abstract

The European Regional Verification Commission for Measles and Rubella Elimination (RVC) met for the sixth time on 15–17 June in Bucharest, Romania. The 7-member panel evaluated 51 national annual status updates (ASUs) for 2016 submitted by national verification committees (NVCs). The RVC concluded that, by the end of 2016, 42 Member States provided evidence to demonstrate that endemic transmission of measles was interrupted. Of these, 33 have eliminated endemic transmission for at least 36 months. Endemic rubella transmission was interrupted in 37 Member States, of which 33 have eliminated endemic rubella for at least 36 months. Thirty-one Member States provided evidence for the elimination of both measles and rubella.

Keywords

Immunization programs
Disease eradication
Measles - prevention and control
Rubella - prevention and control
Europe

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Abbreviations

ASU	annual status update
CRS	congenital rubella syndrome
ECDC	European Centre for Disease Prevention and Control
EVAP	European Vaccine Action Plan
GVAP	Global Vaccine Action Plan
MCV	measles-containing vaccine
MCV1	first dose of measles-containing vaccine
MCV2	second dose of measles-containing vaccine
MeaNS	WHO Measles nucleotide surveillance database
MMR	measles-mumps-rubella vaccine
MR LabNet	WHO European Measles and Rubella Laboratory Network
MRCV	measles- and rubella-containing vaccine
MRCV1	first dose MCRV
MRCV2	second dose MCRV
NVC	national verification committee for measles and rubella elimination
PAHO	Pan American Health Organization
RCC	European Regional Certification Commission for Poliomyelitis Eradication
RubeNS	WHO Rubella nucleotide surveillance database
RCV	rubella-containing vaccine
RVC	European Regional Verification Commission for Measles and Rubella Elimination
SIA	supplementary immunization activity
UNICEF	United Nations Children's Fund
US CDC	United States Centers for Disease Control and Prevention
VPI	WHO Regional Office for Europe, Vaccine-preventable Diseases and Immunization programme

Executive summary

The European Regional Verification Commission for Measles and Rubella Elimination (RVC) is an independent panel of experts established by the WHO Regional Office for Europe to evaluate the measles and rubella status of WHO Member States. The RVC met for the sixth time on 15–17 June 2017 in Bucharest, Romania to evaluate annual status updates (ASUs) for 2016 received from the 51 Member States in the Region that have initiated the verification process and established a national verification committee for measles and rubella elimination (NVC). The meeting included face-to-face discussions with representatives of the Romanian NVC and of the Romanian Ministry of Health and the National Institute of Public Health on the ongoing measles outbreak situation in Romania, related challenges and planned response activities. The RVC acknowledged the efforts being made to improve vaccination coverage in Romania and recognized that the effectiveness of the outbreak response is challenged by the complex political circumstances in the country in 2016 and thus far in 2017. The proposed new legislation on immunization is expected to mitigate some of the challenges and to lead to an increase in vaccination coverage in general; but more, innovative measures will probably also be required.

The RVC concluded that based on reports submitted, at the end of 2016, endemic measles transmission had been interrupted in 42 (79%) of the 53 Member States in the WHO European Region and endemic rubella transmission had been interrupted in 37 Member States (70%) for a period of at least 12 months. Thirty-three Member States (62%) provided evidence to demonstrate the elimination of endemic transmission of measles (interruption for at least 36 months), and 33 (62%) for the elimination of endemic transmission of rubella. Thirty-one Member States (58%) provided evidence for the elimination of both measles and rubella transmission. A further 2 Member States (4%) provided evidence for the interruption of measles transmission for a period of 24 months and 7 (13%) for interruption of transmission for 12 months. Two Member States (4%) provided evidence for interruption of rubella transmission for 24 months and 2 (4%) for interruption of transmission for 12 months. Nine Member States (17%) were considered to have endemic measles transmission in 2016, and 14 (26%) to have endemic rubella transmission. Nine Member States (17%) were considered to remain endemic for both measles and rubella. The RVC was unable to review the measles and rubella status of 2 Member States (Monaco and San Marino).

The low quality of measles, rubella and congenital rubella syndrome (CRS) surveillance in some countries and suboptimal quality of surveillance data presented in the ASUs are concerning. Sensitivity of surveillance systems in many countries appears to be extremely low, making absence

of confirmed cases questionable. The RVC noted once again that despite some improvements, the quality of CRS surveillance systems and data presented in the ASUs remain suboptimal in many countries. Although most Member States are now reporting genomic sequence data on measles virus detections to the WHO Measles nucleotide surveillance database (MeaNS) the amount of data on rubella sequences reported to the WHO Rubella nucleotide surveillance database (RubeNS) remains very low. Laboratory surveillance data weigh heavily in determining whether a country has sufficiently demonstrated interruption of measles and/or rubella. Lack of information on laboratory-confirmed cases and rubella virus genotypes therefore obliged the RVC to consider a number of countries that may have actually interrupted rubella transmission as still endemic.

Ensuring that adequate specimens from at least 80% of suspected measles, rubella and CRS cases are collected and tested in WHO-accredited laboratories or laboratories of known and documented proficiency¹ has become paramount. A number of Member States have not been able to document the proficiency of laboratories that are testing the specimens and the RVC has therefore been obliged to question the quality of the laboratory segment of surveillance data from these countries.

Advancement of the annual RVC meeting, from October to June, was accomplished in 2017, resulting in a more timely assessment of measles and rubella elimination status. Modifications made to the ASU review process, including a redistribution of countries among RVC and Secretariat members based on measles and rubella elimination status in the previous year, introduction of two primary reviewers for priority countries and changes to the responsibilities of the laboratory expert member of the RVC, have effectively streamlined the review process.

¹ A proficient laboratory is WHO accredited and/or has an established quality assurance programme with oversight by a WHO-accredited laboratory.

Source : Eliminating measles and rubella, Framework for the verification process in the WHO European Region 2014

Background

The RVC was established by the WHO Regional Office for Europe (Regional Office) in 2012 as an independent expert body with the mission to evaluate the annual documentation submitted by NVCs of Member States, in order to verify the elimination of measles and rubella in the European Region (the Region). The Vaccine-preventable Diseases and Immunization programme (VPI) of the Regional Office serves as the Secretariat to the RVC.

The RVC holds annual meetings to determine the status of measles and rubella elimination in the Region based on reports and additional documents prepared and submitted by the NVCs. These reports include information on measles and rubella epidemiology, molecular epidemiology, the analysis of population immunity and immunization programme performance, the quality of surveillance, and changes that may have occurred since the last report, together with additional information to support the NVC conclusion on measles and rubella elimination status.

At its Fifth meeting in 2016, the RVC stressed that face-to-face meetings with country representatives are important to provide the RVC with a broader understanding of Member States' challenges, but also for Member States to gain a better understanding of the verification requirements and process. The RVC proposed holding the next RVC meeting in a geographical location which would facilitate communication with NVCs of measles- and/or rubella-endemic Member States. National health authorities in Romania agreed to host the Sixth RVC meeting in Bucharest, Romania, to facilitate this communication as well as further collaboration between the national health authorities and technical officers of VPI in addressing the current measles outbreak.

Scope and purpose of the meeting

At its Sixth meeting on 15–17 June 2017, the RVC reviewed the submitted ASUs, evaluated the status of measles and rubella transmission during 2016 in Member States of the Region and based on its conclusions for 2016 and previous years decided upon the elimination status per Member State.

The objectives of the meeting were:

- to inform the RVC about current epidemiology of measles and rubella in the European Region and VPI activities in support of measles and rubella elimination, as well as global developments on measles and rubella control and elimination;

- to review the NVCs' ASUs for 2016 and all other documentation that NVCs provided towards documenting the absence of endemic measles and rubella transmission in their countries;
- to assess and define the status of transmission of measles and rubella in each Member State and in the Region in 2016;
- to declare the diseases' elimination where achieved and declare the status of measles and rubella in the European Region in 2016 in line with elimination targets;
- to initiate preparation of the RVC's measles and rubella elimination status report for 2016;
- to plan verification activities in 2017–2018 and beyond, considering the role of the RVC in advocating for continuation of elimination efforts at national and regional levels;
- to assess RVC working procedures and verification process requirements.

Introduction and opening remarks

The Sixth meeting of the RVC was held 15–17 June 2017 in Bucharest, Romania. Participants were welcomed to Romania by the Minister of Health, Dr Florian Bodog. He expressed his delight at having the opportunity to discuss with WHO and international experts the challenges and recent experience in measles and rubella elimination in Romania. He said the Ministry of Health is fully committed to working with WHO and the international partners in eliminating measles and rubella and increasing public health security.

Mr Robb Butler, VPI Programme Manager, welcomed the participants on behalf of the WHO Regional Director. He expressed gratitude to the Romanian Ministry of Health for its affirmative response to the WHO proposal to conduct this RVC meeting in Bucharest, providing an opportunity for detailed discussions between the RVC and the Romanian NVC, representatives of the Ministry of Health and national public health experts on activities and challenges related to measles and rubella elimination and verification, but also on the ongoing measles outbreak situation, challenges faced in responding to the outbreak, and actions taken and planned for stopping transmission and preventing future outbreaks.

The meeting was opened by the RVC chair, Dr Günter Pfaff. On behalf of the RVC he expressed gratitude for the opportunity to convene the meeting in Bucharest and to be given the opportunity to meet with representatives from Romania. Close dialogue between the RVC and national representatives is essential to gain better understanding of the circumstances and challenges faced

in each Member State. Ms Corina Pop, State Secretary in the Romanian Ministry of Health underlined concerns about the current measles outbreak in the country and the readiness of the national representatives present at the meeting to discuss the current situation and further activities with the RVC and WHO.

Rapporteur for the meeting was Dr Ray Sanders.

Status of measles and rubella elimination: global and regional update

The RVC Secretariat (VPI) and representatives of WHO headquarters and the WHO Regional Office of the Americas/Pan American Health Organization (PAHO) provided updates on the current epidemiology of measles and rubella in the European Region and globally, progress towards regional elimination goals and experience of countries in the Region of Americas in achieving measles and rubella elimination and verification of these achievements.

Global update

Dr Minal Patel, WHO headquarters, informed the meeting that progress toward global elimination of measles has slowed. Based on routinely collected coverage data from Member States, immunization coverage with the first dose of measles-containing vaccine (MCV1) has plateaued at about 85% and only 119 (61%) of Member States reported MCV1 coverage of $\geq 90\%$ in 2015. Immunization coverage with the second dose of measles-containing vaccine (MCV2) has increased steadily reaching 61% in 2015 and 160 (82%) Member States introduced MCV2 into their immunization schedules. There has been little change in the global measles case load since 2009, with 254 000 cases reported in 2015. The global 2015 measles control milestones were not achieved, and except in the Region of the Americas, progress towards regional elimination targets is off track. Large outbreaks of measles continue to occur in all WHO regions.

Global coverage with rubella-containing vaccine (RCV) remains low at approximately 48% in 2016. A significant reason for the low global coverage is that 45 Member States, mainly in sub-Saharan Africa and the southeast Asia region, have yet to introduce rubella vaccine. Global incidence of rubella fell from 350 cases per million population in 2000 to 3.3 cases per million in 2015. Some regions have seen an increase in rubella cases despite vaccination efforts, largely due to improvements in surveillance for rubella. However, rubella continues to be under-reported in many countries.

Member States of all WHO regions have agreed to pursue measles and rubella elimination in line with established region-specific indicators and targets. Some countries have confirmed their

commitment by strengthening surveillance and introducing case-based reporting. Where the elimination verification process has not yet been established, some countries are pushing to initiate verification activities and create NVCs.

At the same time, many countries are challenged with decreasing coverage, especially those affected by conflicts, other political and economic issues, or weak and fragile health systems. Many countries are challenged with ongoing outbreaks and a high endemic burden of other diseases in addition to measles and rubella, and their health systems are struggling to cope. Due to these issues, some regions have not yet established a rubella elimination target.

There has been a measles resurgence and large outbreaks following importations in a number of countries that have interrupted endemic transmission of disease. Even countries that have achieved elimination must therefore make continuous efforts and dedicate substantial resources to prevent reestablishment of measles and rubella as endemic diseases.

The Global Vaccine Action Plan (GVAP) and its regional adaptations demonstrate Member States' willingness and readiness to eliminate measles and rubella. Continued exchange of experiences and successful practices in disease elimination and verification is appreciated and useful for all countries.

European regional update

Dr Patrick O'Connor, VPI, informed the meeting that large numbers of measles cases and large outbreaks continue to occur each year despite regional MCV1 coverage being maintained above 90% for more than 15 years. In 2016, 5133 cases of measles were reported from 33 Member States in the Region; 2432 cases were reported from Romania alone. Measles outbreaks in Romania, Italy, the United Kingdom and Germany accounted for 82% of all cases reported in the Region in 2016. Of the measles cases with adequate data reported for 2016 (a total of 5014 cases), approximately 12% of cases were less than 1 year of age and approximately 26% were 20 years of age or above.

Vaccination status was known in 90% (4568/5014 cases) and 87% of these were unvaccinated.

Outbreaks of rubella have also continued, with 1326 cases reported in 2016. 1144 (86%) of these were reported from Poland. It remains of concern that many reported rubella cases continue to be classified on a clinical basis alone, without laboratory confirmation, making interpretation of the true epidemiological situation difficult.

The RVC concluded at its Fifth meeting, in October 2016, that 37 Member States had interrupted endemic measles transmission and 35 Member States had interrupted endemic rubella transmission

by the end of 2015. Measles elimination was verified in 24 Member States, and rubella elimination verified in 24. Fourteen Member States remained endemic for both measles and rubella.

Verification of measles and rubella elimination in the WHO Region of the Americas

Dr Desirée Pastor, PAHO, described efforts to achieve and maintain measles and rubella elimination in the Americas. The last endemic measles case in the Region of the Americas was reported in Venezuela 2002 and the last endemic rubella case was reported in Argentina in 2009. This achievement was a result of increasing regional vaccination coverage with the measles-mumps-rubella vaccine (MMR) to $\geq 95\%$ through routine programmes, together with extensive catch-up and follow-up campaigns in almost all Latin American and Caribbean countries. Rubella elimination required additional speed-up campaigns for adolescents and adults during the early 2000s. The incidence of import-related measles cases in the post-elimination period between 2003 and 2010 was relatively stable, with an annual average of 153 cases. However, between 2011 and 2015, major outbreaks occurred in Brazil, Canada, Ecuador, and the United States. In response to the threat of import-related cases, mass vaccination campaigns were conducted in both urban and rural areas using tailored strategies to reach at-risk populations, such as communities living near borders or indigenous communities, including synchronized vaccination campaigns. Technical assistance was provided to a number of Member States to ensure the implementation of high-quality follow-up campaigns.

A significant role in achieving and maintaining measles and rubella elimination in the Americas was played by the PAHO Revolving Fund, in supplying vaccines at the lowest cost to countries, and by the Regional Measles and Rubella Laboratory Network.

After six years of documenting the interruption of endemic rubella virus transmission, the Region of the Americas verified elimination (was declared free of endemic rubella) in April 2015. In September 2016, the Region was also declared free of endemic measles. However, the Region remains at risk of importation of both diseases and a major challenge now is to maintain a high level of vaccination coverage and high-quality surveillance until global eradication can be achieved. Evidence is accumulating that measles and rubella surveillance sensitivity in the Region as a whole is beginning to decline due to competing priorities with other disease surveillance activities, including for diseases that exhibit similar rash patterns, such as Zika.

To maintain the gains that have been made in the Region, endorsement of the Plan of Action to Sustain the Elimination of Measles, Rubella and CRS, 2018–2023 will be sought at the Pan American Sanitary Conference in September 2017.

Activities on measles and rubella elimination and verification in Romania and current situation with ongoing measles outbreak

Dr Monica Luminos, chair of the Romanian NVC, reported on initiation of the verification process in Romania in 2014, the NVC's operating procedures and the NVC's activities related to the current measles outbreak. The NVC contributes to measles and rubella elimination activities in the country on an ongoing basis, for example in preparation of the National Action Plan for Measles and Rubella Elimination and in preparation of measles outbreak response activities. The NVC also shared its opinions on a new immunization law and a delay in its approval and implementation (due to changes in governmental and Ministry of Health structures) with the national health authorities and public health system. Dr Luminos stressed that good cooperation between the NVC and its Secretariat (the national public health system) is critical for success.

In its ASU for 2016, the NVC pointed to low routine immunization coverage and low population immunity, and the lack of targeted supplemental immunization activities (SIAs) to address these gaps, as the main reasons for the current outbreak and continued transmission among the large pool of susceptible populations following virus importation. The NVC is aware that surveillance data indicate multiple importations of measles viruses in 2016 and changes in circulating genotypes, but continuous transmission led to the NVC's conclusion that Romania remained endemic for both measles and rubella in 2016.

Dr Aurora Stanescu, epidemiologist from the National Institute of Public Health in Romania, elaborated on the measles and rubella epidemiological situation in 2016 and 2017 on behalf of the national public health system and as NVC Secretariat, stressing the completed, ongoing and planned outbreak response activities.

As of the date of the meeting, 2435 confirmed measles cases were reported for 2016 and measles incidence was 123.2 per million population. 6743 measles cases were reported from the beginning of the outbreak until June 2017. Among these cases, 30 deaths were reported, 11 in 2016 and 19 in the period January –June 2017. 41 of 42 districts reported measles cases.

Most cases occurred in infants <1 year of age, with almost all cases <3 years of age. Of the 2435 confirmed measles cases for 2016, 2197 (90%) had no history of measles vaccination. Of the 30 measles-related deaths, 19 (64%) were ≤1 year of age and 87% of the recorded deaths had no history of vaccination against measles; many had pre-existing health conditions. Measles B3

genotype strains identified in the 2016 outbreak are different to the endemic measles genotype (D4, identified in Romania in the 2004–2006 and 2010–2012 outbreaks).

Mostly affected were communities with suboptimal vaccination coverage. Children whose families frequently travel abroad (e.g. to Italy) and/or move between districts within the country are commonly unimmunized. Some families do not have access to family doctor services, and others do not seek immunization for their children because of the frequent family travel. The current outbreak began in the northwest of the country and has shown progressive spread to other areas over time.

Thirteen confirmed rubella cases gave a rubella incidence rate of 0.66 per million population. A total of 4 probable CRS cases, with clinical signs but no epidemiological links were also reported.

Routine immunization programme coverage with MMR is suboptimal: in 2016 coverage was 86.5% with the first dose, and 74.7% with the second dose. The immunization calendar changed in April 2015, so that the second dose is now administered at 5 years of age rather than at 7 years of age. Twenty-four districts (out of 42) had coverage below 90% for the first dose of MMR and 39 districts below 90% for the second dose.

To control the outbreak, SIAs with MMR were conducted in the period March to November 2016 for unvaccinated children in the most-affected areas according to the national schedule. In the second half of 2016, the immunization programme was modified to include children 9 to 12 months of age. SIAs targeting unimmunized and incompletely immunized children in age cohorts from 9 months to 9 years at the national level started in December 2016 and are ongoing. SIA coverage, however, is relatively low, with 51% immunized among 9–11-month-old infants and 64% immunized among 1–4-year-olds. Challenges have been experienced in establishing collaboration with family doctors on provision of SIAs and outbreak response, and in improving surveillance activities. Increased efforts are underway by public health professionals and the association of family doctors to promote immunization among the general population and healthcare workers specifically.

Discussion

The RVC thanked and commended the NVC for its detailed and open presentation and discussion, and acknowledged the challenges facing the NVC and the country. The RVC welcomed the opportunity to learn how the NVC was established and utilizes its capacities, and to see recognition of the NVC's opinions and position by the national health authorities and public health system. The RVC would be interested to continue collaboration with the NVC and is ready to provide any support needed.

The RVC noted efforts made by the national health authorities and public health system to increase vaccination coverage, including conducting catch-up campaigns and lowering the vaccination age for receipt of the first dose of MMR to 9 months. It was concerning to learn that a very vocal anti-vaccination lobby exists and has been influencing parents in Romania, encouraging vaccine hesitancy particularly among parents belonging to the higher-educated social groupings. All participants in discussions agreed that the focus of new campaigns should be on more effective interaction with parents to inform them of the benefits of vaccination. It was encouraging to learn that the majority of professional societies, civil society representatives and other participants in a wide-scale debate over the proposed new immunization law, organized by the Ministry of Health, appear to be in favour of immunization and the law.

VPI and Romanian health authorities discussed ongoing collaborative activities and WHO support for the country in addressing immunity gaps and low routine immunization coverage, vaccine supply issues, organization and funding of immunization services and vaccine delivery, and strengthening SIAs to cover all susceptible populations. In light of competing priorities in the health sector and the complex political environment in Romania over the past two years, the RVC was encouraged to learn of increased political engagement and looks forward to high-level priority action to improve immunization services and routine coverage. The RVC requested that the NVC include updates on immunization legislation, advocacy activities, and increasing capacities and pro-vaccination attitudes among healthcare workers in the next ASU.

Activities of the Secretariat

The RVC Secretariat updated the RVC on activities related to the verification process conducted since the previous annual RVC meeting in 2016.

Dr Dragan Jankovic informed the RVC that the Secretariat's timeliness in finalizing deliverables (including the meeting report) improved considerably following the Fifth RVC meeting compared to previous years. Recommendations made during the Fifth RVC meeting related to organization of the Secretariat's work, particularly related to its collaboration with priority countries, were implemented.

The change in the annual schedule of RVC activities agreed to at the Fifth RVC meeting did not significantly affect receipt of ASUs from Member States, however the last ASU covering 2016 was in fact received during the RVC meeting. This positive result was due in large part to dedicated follow-up by the Secretariat, consultants and secondment staff from the United States Centers for Disease Control and Prevention (US CDC). The schedule change creates an overlap of RVC and European

Regional Certification Commission for Poliomyelitis Eradication (RCC) preparation activities in the first half of the calendar year and will be feasible in the coming years only if similar support is assured and provided to VPI, in its role as Secretariat for both RCC and RVC.

Dr Siddhartha Datta updated the RVC on activities conducted by VPI in support of countries that were deemed still endemic for measles and/or rubella by the RVC in its Fifth meeting in 2016 and therefore identified as priorities for additional support. Based on available data, country profiles are being created for all priority countries. The profiles will be presented to the individual countries for their validation of the data before further use.

Several missions were conducted to priority countries to provide support, including in preparation of the ASU for 2016. Technical assistance, capacity building, coordination of European Immunization Week 2017 and outbreak response support were provided to the countries in the Region. The VPI also supported a meeting of the NVCs of the German-speaking countries and participated in the annual meeting of the Scandinavian Verification Committee. Accreditation visits to the measles-rubella national reference laboratories were conducted in eight countries. VPI and the European Centre for Disease Prevention and Control (ECDC) continued their coordination on issues related to measles and rubella elimination in the Region.

Dr Datta also presented the rationale and limitations of using the measles programmatic risk assessment tool that WHO headquarters recently shared, and provided a suggested way forward on using this tool in the countries of Region.

Dr Myriam Ben Mamou (VPI) and Dr Irja Davidkin (RVC member with expertise in measles and rubella virology) presented their work related to the laboratory segment of the ASUs. In line with Dr Davidkin's new coordinating role within the RVC for laboratory-related assessments (as agreed by the RVC prior to the annual meeting), laboratory data provided in the ASUs is reviewed by Dr Davidkin and the Secretariat and supplemented with relevant additional information from the WHO European Measles-Rubella Laboratory Network (MR LabNet) and annual laboratory accreditation reviews. All regional charts, graphs, tables and maps are then developed by the Secretariat and provided along with additional analysis from Dr Davidkin to the RVC. In analysing the data, priority is given to endemic Member States, those close to achieving elimination status and those at risk of losing achieved elimination status.

The RVC was reminded that surveillance performance and the quality and availability of data in the ASUs and in MeaNS and RubeNS vary and are not optimal in all Member States. In some ASUs, the

NVCs reported that most testing was done by laboratories that are either not proficient or have unknown proficiency. In other ASUs data on the type of laboratories used is not provided. The rate of laboratory investigation of suspected measles cases is generally adequate, but the rate of investigation of rubella cases continues to be insufficient in Member States that report the highest number of rubella cases. Some countries were not able to document this indicator. Likewise, the rate of measles viral detection (genotyping) is satisfactory for 60% of Member States reporting measles cases, whereas 95% of countries reporting rubella cases were either not able to document this indicator or had insufficient performance.

Dr Ben Mamou and Dr Davidkin stressed that collaboration between laboratory staff, epidemiologists and the NVC is vital for the verification process, for gaining adequate and complete understanding of the diseases' epidemiology and for documenting their status. It is of utmost importance that laboratory data be interpreted in conjunction with epidemiological information. Molecular epidemiology, linking genetic and epidemiological data, is critical for documenting elimination.

The regional verification process is therefore a key agenda item of all laboratory accreditation visits and all MR LabNet meetings and trainings, some of which are attended by RVC members. Strengthening the linkage between the ASU template and laboratory reporting to the WHO sequence surveillance databases MeaNS and RubeNS helps to ensure the availability of information and adequate completion of the ASU.

The RVC was also informed about upcoming changes to the MR LabNet, with the creation and appointing of new reference laboratories in some countries, and about efforts to strengthen national laboratory networks in some priority countries.

RVC review of submitted reports and updates

In line with the framework for the verification process in the WHO European Region², the RVC members were invited to make their judgments in accordance with the definition of elimination provided in the framework document. Reports from Member States were allocated to RVC members for preliminary review and presented at the meeting by major components: disease epidemiology; surveillance performance; population immunity and any supplemental information available.

² Eliminating measles and rubella: framework for the verification process in the WHO European Region. The Regional Office for Europe of the World Health Organization, 2014. Available online at http://www.euro.who.int/__data/assets/pdf_file/0009/247356/Eliminating-measles-and-rubella-Framework-for-the-verification-process-in-the-WHO-European-Region.pdf

Conclusions for each Member State for 2016 are provided in Annex 1, together with a Regional summary of measles and rubella status for 2016 and elimination status by Member State. Specific comments on the conclusions for each country are provided in Annex 2. The list of participants is provided in Annex 3.

As in previous years, the quality and completeness of data were still lacking in some ASUs, and in some cases this problem persisted even after multiple interventions and inputs from the Secretariat to counterparts in countries. The Secretariat will pay attention to recognized challenges and provide further support to these countries in the coming year. The Secretariat stressed that ensuring surveillance quality and data quality is an ongoing challenge and also a priority area in VPI's routine work.

Conclusions and recommendations

The RVC noted that it remains confident that regional progress towards measles and rubella elimination continues to be made. It acknowledged and greatly appreciates the continued personal interest, support and advocacy of the Regional Director and senior staff of the Regional Office.

The RVC furthermore thanked the Regional Office for the opportunity to conduct a face-to-face meeting with representatives from Romania, and the representatives from the NVC, the Ministry of Health and the National Institute of Public Health of Romania for their open, honest and thorough deliberations during the discussion. The RVC acknowledged the efforts being made to improve vaccination coverage in Romania, particularly in vulnerable communities, and recognized that efforts are challenged by the current political complexities. The RVC expects that improvements in vaccine procurement and supply and the proposed new legislation on immunization will mitigate challenges to achieve high routine vaccination coverage, but noted that more, innovative measures will probably also be required.. RVC considered that greater efforts and strengthened SIAs would be needed to increase vaccination coverage among infants and children aged 9 months to 5 years and to end the current measles outbreak.

The RVC acknowledged the ongoing partnerships of the Regional Office with the United Nations Children's Fund (UNICEF), US CDC and ECDC and expressed appreciation for these partners' participation in promoting and supporting country efforts to achieve measles and rubella elimination.

ASUs for 2016 were received from all 51 Member States that have initiated the verification process and established NVCs. However, 24 of the 51 reports were received after the agreed deadline for submission. While there has generally been improvement in the quality of reports, as in previous years several NVCs either failed to provide the requested information on the quality of surveillance indicators, or the information provided was incomplete or incorrectly calculated. Despite requests from the RVC, some NVCs continued to use alternative self-developed surveillance indicators that are incompatible with those requested, or are of uncertain value to assess surveillance quality. Once again, the RVC noted that vaccination coverage data was not provided in several ASUs, or the information was outdated or difficult to interpret due to insufficient information on data sources and methods used to estimate coverage, making it impossible to realistically assess population immunity. The RVC Secretariat commended all efforts by the Secretariat to clarify or obtain additional information where needed, resolve conflicting data during country missions and communicate with counterparts in countries.

The RVC concluded that based on reports submitted, at the end 2016:

- 42 (79%) of the 53 Member States in the European Region had interrupted endemic measles transmission;
- 37 Member States (70%) had interrupted endemic rubella transmission;
- 33 (62%) Member States had demonstrated elimination of endemic transmission of measles for at least 36 months;
- 33 (62%) Member States had demonstrated elimination of endemic transmission of rubella for at least 36 months;
- 2 (4%) Member States had interrupted measles transmission for 24 months;
- 2 (4%) Member States had interrupted rubella transmission for 24 months;
- 7 (13%) Member States had interrupted measles transmission for 12 months;
- 2 (4%) Member States had interrupted rubella transmission for 12 months;
- 9 (17%) Member States were endemic for measles transmission;
- 14 (26%) Member States were endemic for rubella transmission;
- 9 (17%) Member States were endemic for both measles and rubella transmission.

The RVC was unable to review the measles and rubella status of two (4%) Member States: Monaco and San Marino.

The RVC acknowledged the success of appointing technical coordinators among the Secretariat staff to more effectively target priority countries, sustain coordination and provide technical support, as well as the benefit of increasing the Secretariat's capacities with consultants and secondees.

Modifications made to the ASU review process, with a redistribution of countries among RVC and Secretariat members based on measles and rubella elimination status, introduction of two primary reviewers for priority countries and changes to the responsibilities of the laboratory expert member of the RVC have effectively streamlined the review process, allowing RVC members to reach their decision on the elimination status in a timelier manner than in the past. These practices should be continued in future annual reviews.

The RVC again noted that despite continued improvement, the extent and quality of surveillance remains suboptimal in many countries, and especially in regards to rubella and CRS. As the Region moves towards measles and rubella elimination, the ability to distinguish between remaining endemic transmission and import-related sporadic cases becomes crucial to the verification process. It is of utmost importance that laboratory data be interpreted in conjunction with epidemiological information. The RVC recommends the use of maps showing the geographic distribution of

confirmed and discarded cases of measles and rubella. Molecular epidemiology of sporadic cases and chains of transmission, linking genetic and epidemiological data, is critical for documenting elimination. It is also paramount that measles and rubella suspected cases are detected, reported and adequate samples from at least 80% of suspected case are collected and tested in WHO-accredited laboratories or laboratories of known and documented proficiency. In reviewing the 2016 reports, the RVC relied substantially on available genotyping data to determine whether the evidence provided supported the conclusion that reported cases were not due to endemic transmission. Most Member States are now reporting measles virus genomic sequence data to MeaNS, but the volume of sequence data reported to RubeNS remains very low. The importance of genomic sequence data, and thus the ability to detect and document chains of transmission, will continue to rise as more Member States achieve interruption of transmission. The RVC recognized the critical role of MeaNS and RubeNS in supporting comprehensive analyses of measles and rubella viral sequences and acknowledged their invaluable contribution to the verification process.

The RVC reiterated its proposal to conduct more missions to Member States and strengthen communications with the NVCs as this contributes significantly to the RVC's understanding of the challenges and situations in the different countries and provides a larger evidence base from which conclusions can be drawn.

Advancement of the annual RVC meeting from October to June resulted in a more timely assessment of measles and elimination status, the outcome of which can be used more effectively to promote regional achievements and advocate for elimination. The RVC proposed further enhancements which will be investigated by the Secretariat for discussion with the RVC.

Uncertainties around the assessment of vaccination coverage data provided and difficulty in understanding the level of protection or susceptibility in a population remain of concern to the RVC. This concern is compounded by the absence of current or recent data in some Member States. It would be helpful to the RVC if the Secretariat could explore the possibilities of developing country immunity profiles that could be used to assess the likelihood and identify locations of pockets of susceptibility to measles or rubella.

Recommendations

- To NVCs
 - With gratitude for their adherence to the revised annual calendar for the verification process, the RVC requests that NVCs make every effort to provide a comprehensive

ASU in advance of the agreed deadline for submission provided by the WHO Secretariat.

- Submitted ASUs should include an explanation for any missing, incomplete or alternative information and provide supporting documentation where possible.
- ASUs that include surveillance performance indicators other than those recommended by WHO should include clear definitions of those indicators and an explanation of how they are used to demonstrate the quality of measles and rubella surveillance.
- NVCs are again urged to ensure that all available information on current vaccination coverage at national and subnational levels is provided in the ASU. This information should include the source of data and methodology used to estimate coverage.
- To Member States
 - With gratitude to national public health systems for adhering to the revised annual calendar for the verification process, the RVC reiterates its reminder that national health authorities are responsible for ensuring that adequate information and documentation on imported and import-related measles and rubella cases, including available epidemiological information and details on the geographical source of the importation, are provided to their NVC for inclusion in the ASU. Preparation of high-quality ASUs requires the active collaboration of national health agencies and experts with the NVC.
 - The RVC urges Member States to fully implement the immunization and surveillance strategies and activities outlined in the relevant WHO documents, and to ensure that the following are in place and adequately supported:
 - sustained high routine immunization coverage with two doses of measles- and rubella-containing vaccines, with the vaccines given on-time as per the national immunization calendar;
 - supplemental activities focused on susceptible populations;
 - high-quality measles and rubella surveillance, which entails collection of adequate clinical specimens, laboratory testing and classification/confirmation of at least 80% of suspected cases, and genotyping of at least 80% of chains of transmission and sporadic cases through the WHO-accredited laboratories of the MR LabNet and/or proficient laboratories.

- Member States are urged to ensure that laboratory testing is conducted by WHO-accredited laboratories or laboratories of documented proficiency.
- To the Secretariat
 - The RVC encourages the WHO Secretariat to investigate opportunities to extend the current arrangement of RVC telephone conferencing to include more advanced online conferencing and information sharing capacities and tools (e.g. using a platform such as WebEx).
 - The RVC invites the Secretariat to continue developing reporting requirements for documenting elimination status in Member States that have failed to establish NVCs (Monaco and San Marino), and to consider conducting missions to these Member States as an option;
 - The Secretariat is urged to invite the participation of RVC members in planned country visits, to facilitate their review and promotion of measles and rubella elimination activities and to provide information and advice related to the verification process.

Annex 1. Results of the RVC review of reports and documents submitted by NVCs

Table 1. RVC conclusions on measles and rubella elimination status in Member States in 2016

Country	Measles elimination status, 2016	Rubella elimination status, 2016
Albania	Eliminated	Eliminated
Andorra	Eliminated	Eliminated
Armenia	Eliminated	Eliminated
Austria	Interrupted 12 months*	Interrupted 24 months
Azerbaijan	Eliminated	Eliminated
Belarus	Eliminated	Eliminated
Belgium	Endemic	Endemic
Bosnia and Herzegovina	Endemic	Endemic
Bulgaria	Eliminated	Interrupted 12 months
Croatia	Eliminated	Eliminated
Cyprus	Eliminated	Eliminated
Czech Republic	Eliminated	Eliminated
Denmark	Eliminated	Endemic
Estonia	Eliminated	Eliminated
Finland	Eliminated	Eliminated
France	Endemic	Endemic
Georgia	Endemic	Endemic
Germany	Interrupted 12 months	Endemic
Greece	Eliminated	Eliminated
Hungary	Eliminated	Eliminated
Iceland	Eliminated	Eliminated
Ireland	Interrupted 24 months	Eliminated
Israel	Eliminated	Eliminated
Italy	Endemic	Endemic
Kazakhstan	Endemic	Endemic
Kyrgyzstan	Interrupted 12 months	Interrupted 12 months
Latvia	Eliminated	Eliminated
Lithuania	Eliminated	Eliminated
Luxembourg	Eliminated	Eliminated
Malta	Eliminated	Eliminated
Monaco	Verification process not initiated	Verification process not initiated
Montenegro	Eliminated	Eliminated
Netherlands	Eliminated	Eliminated
Norway	Eliminated	Eliminated

Country	Measles elimination status, 2016	Rubella elimination status, 2016
Poland	Interrupted 12 months	Endemic
Portugal	Eliminated	Eliminated
Republic of Moldova	Eliminated	Eliminated
Romania	Endemic	Endemic
Russian Federation	Interrupted 12 months*	Interrupted 24 months
San Marino	Verification process not initiated	Verification process not initiated
Serbia	Endemic	Endemic
Slovakia	Eliminated	Eliminated
Slovenia	Eliminated	Eliminated
Spain	Eliminated	Eliminated
Sweden	Eliminated	Eliminated
Switzerland	Interrupted 12 months	Endemic
Tajikistan	Eliminated	Eliminated
The former Yugoslav Republic of Macedonia	Interrupted 24 months	Eliminated
Turkey	Interrupted 12 months	Endemic
Turkmenistan	Eliminated	Eliminated
Ukraine	Endemic	Endemic
United Kingdom of Great Britain and Northern Ireland	Eliminated	Eliminated
Uzbekistan	Eliminated	Eliminated

*Interruption of endemic measles virus transmission was achieved in Austria and the Russian Federation in August/September 2015.

Table 2: Number of Member States of the WHO European Region by measles and rubella elimination status 2016

Country status	Measles		Rubella	
	Number	%	Number	%
Eliminated	33	62	33	62
Interrupted for 24 months	2	4	2	4
Interrupted for 12 months	7	13	2	4
Endemic	9	17	14	26
No process	2	4	2	4
Total	53	100	53	100

Annex 2. RVC conclusions on status of measles and rubella elimination in countries of the WHO European Region in 2016

a) Countries that sustained or achieved elimination of measles and rubella for at least 36 month (in alphabetical order)

Albania Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Albania in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the continued efforts by Albania in maintaining high routine vaccination coverage and for conducting a mop-up campaign. The RVC requests more information on laboratory surveillance and a more detailed explanation of the methodology used to estimate vaccination coverage.	

Andorra Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Andorra in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC acknowledges the country's efforts to provide all required information in the ASU and the increase in MRCV2 coverage in 2016. The RVC urges the national health authorities to consider additional activities to further increase MRCV2 coverage.	

Armenia Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Armenia in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the national health authorities for responding positively to previous RVC comments. As in the previous year, the RVC strongly recommends inclusion of measles genotyping data in future ASUs.	

Azerbaijan Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Azerbaijan in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC	

congratulates Azerbaijan for maintaining high coverage with both MRCV doses and for strengthening surveillance activities, but urges the national public health authorities to consider additional activities to improve the sensitivity of surveillance.

Belarus Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Belarus in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC congratulates Belarus for maintaining high coverage with both MRCV doses and for activities to provide immunization to migrants. The RVC appreciates that the country's ASU included a detailed description and analysis of a measles outbreak, and commends the country on its response measures.	

Croatia Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Croatia in 2016. Considering the RVC's conclusions about the interrupted status of measles and rubella transmission in the country in 2014 and 2015, it is pleased to declare that Croatia has achieved elimination of measles and rubella. The RVC commends Croatia for this achievement, but emphasizes to the NVC the need for more comprehensive data in the ASU, especially in regards to surveillance performance. The RVC recommends the inclusion of measles and rubella genotyping data in future ASUs. The RVC urges national health authorities and the public health system to consider all feasible activities, as stated in WHO regional guidelines, to increase routine immunization coverage with both MRCV doses to levels required to achieve and maintain population immunity and to prevent reestablishment of endemic transmission.	

Cyprus Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Cyprus in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the programmatic initiatives including development of the measles and rubella action plan and introduction of the personal immunization record system. The RVC acknowledges the increase in MRCV2 coverage in 2016 and commends the activities undertaken to provide immunization to the migrants and refugee population. RVC urges the national health authorities to consider additional activities to improve the MRCV coverage in the country.	

Czech Republic	Measles eliminated.
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Status of measles and rubella elimination in 2016	Rubella eliminated.
<p>The RVC concluded that endemic transmission of both measles and rubella remained interrupted in the Czech Republic in 2016 and confirmed that measles and rubella elimination has been sustained. The RVC commends the NVC, national health authorities and public health system on this achievement, but emphasizes to the NVC the need for more comprehensive data in the ASU, especially in regards to surveillance performance. The RVC also urges both the NVC and national health authorities to adjust routine procedures, in line with WHO recommendations and guidelines, to enable adequate surveillance and to improve the collection and submission in the ASU of immunization coverage data. The RVC is concerned that, based on the limited data currently available in the ASU, surveillance performance appears to be suboptimal and it is not possible to assess routine immunization coverage in 2016.</p>	

Estonia	Measles eliminated.
Status of measles and rubella elimination in 2016	Rubella eliminated.
<p>The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Estonia in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the NVC on the clear and comprehensive report provided and recommends the inclusion of measles genotyping data in future ASUs. The RVC urges the national health authorities to consider further efforts to improve surveillance performance and maintain immunization coverage of $\geq 95\%$ with both doses of MRCV at national and subnational levels.</p>	

Finland	Measles eliminated.
Status of measles and rubella elimination in 2016	Rubella eliminated.
<p>The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Finland in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the NVC on this achievement and anticipates that the immunization and surveillance programmes will perform at an elimination-standard level in the coming years.</p>	

Greece	Measles eliminated.
Status of measles and rubella elimination in 2016	Rubella eliminated.
<p>The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Greece in 2016. Considering the RVC's conclusions on the interrupted status of measles and rubella transmission in 2014 and 2015, it is pleased to declare that Greece has achieved elimination of both measles and rubella. The RVC commends Greece on this achievement. The RVC also commends the national health authorities on the surveillance and immunization activities carried out for the migrant</p>	

and refugee population, but urges them to improve measles and rubella surveillance sensitivity and to consider a system of routine collection of MRCV coverage data by subnational levels. The RVC requests the NVC to provide detailed epidemiological information on measles and rubella cases (suspected, discarded and confirmed) and consistent information about the proficiency of laboratories providing measles and rubella investigations in the next ASU.

Hungary Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Hungary in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends Hungary for sustaining a very high level of population immunity. It urges the NVC and national health authorities to strengthen measles and rubella surveillance to the level considered adequate (with a rate of measles and rubella discarded cases $\geq 2/100\ 000$) and to improve the way in which surveillance performance is presented in the ASU in order to facilitate better documentation of the elimination status.	

Iceland Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Iceland in 2016. Considering the RVC's conclusions about the interrupted status of measles and rubella transmission in the country in 2014 and 2015, it is pleased to declare that Iceland has achieved elimination of measles and rubella. The RVC commends the country for this achievement, but requests the NVC to provide an analysis and interpretation of data about possible imported measles cases, including measles genotyping data in future ASUs. The RVC urges the national health authorities to maintain immunization coverage of $\geq 95\%$ with both doses of MRCV.	

Israel Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Israel in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the NVC, national health authorities and public health system on this achievement but would appreciate further explanation from the NVC and national health authorities of the vaccination coverage data provided, particularly the immunization status of the 24% of children not included in	

the computerized database. The NVC should consider looking for any additional evidence that confirms similarly high immunization coverage in that part of the population.

Latvia Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Latvia in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the NVC, national health authorities and public health system on this achievement, but emphasizes its concerns over the suboptimal quality of surveillance and the declining vaccination coverage. The RVC urges the national health authorities to take additional steps to address these issues in line with WHO recommendations.	

Lithuania Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Lithuania in 2016. Considering the RVC's conclusions about the interrupted status of measles and rubella transmission in the country in 2014 and 2015, it is pleased to declare that Lithuania has achieved elimination of measles and rubella. The RVC commends Lithuania for this achievement, but also emphasizes its concerns over the apparent population immunity gaps revealed by seroprevalence studies. The RVC urges additional efforts to close immunity gaps, to maintain immunization coverage of $\geq 95\%$ with both doses of MRCV at national and subnational levels and to improve the laboratory segment of surveillance.	

Luxembourg Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Luxembourg in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the NVC and national health authorities on this achievement, and anticipates improvements in the immunization programme and surveillance and a more detailed ASU next year.	

Malta Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
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The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Malta in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the NVC, national health authorities and public health system for providing additional information and clarifications on the ASU. The RVC remains concerned about the declining MRCV2 and low MRCV1 coverage in 2016, and urge the national health authorities to consider appropriate measures to address the declining trend in coverage.

Montenegro Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
<p>The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Montenegro in 2016. Considering the RVC's conclusions about the interrupted status of measles and rubella transmission in the country in 2014 and 2015, it is pleased to declare that Montenegro has achieved elimination of measles and rubella. Efforts to reach and immunize the at-risk Roma population are recognized and endorsed. However, the RVC emphasizes that laboratory testing of specimens from suspected cases should be routinely performed at WHO-accredited laboratories or laboratories of known proficiency, and acknowledges with satisfaction that work is in progress to establish a national measles and rubella reference laboratory. The RVC is also concerned about the continuing decline in vaccination coverage resulting in a dangerously large accumulation of susceptible children across the country, which presents a high risk for re-establishing endemic transmission. The RVC urges the national health authorities and public health system to consider all additional activities, in line with WHO guidelines, to address these issues.</p>	

Netherlands Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
<p>The RVC concluded that endemic transmission of both measles and rubella remained interrupted in the Netherlands in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the NVC, national health authorities and public health system on this achievement, but is concerned about the quality of surveillance, based on information provided in the ASU. The RVC urges the national health authorities to make further efforts to strengthen measles and rubella surveillance to the level considered adequate (with a rate of measles and rubella discarded cases $\geq 2/100\ 000$) and to improve the way in which surveillance performance is presented in the ASU to facilitate better documentation of the elimination status.</p>	

Norway Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
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The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Norway in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends SVC on the clear and comprehensive report provided, and anticipates that the national public health system will maintain the high level of performance in the coming years.

Portugal Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Portugal in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC appreciates the issues identified by the NVC on surveillance performance and declining MRVC coverage and shares similar concerns. The RVC urges national health authorities to undertake necessary measures to improve the surveillance performance and address the declining vaccination coverage.	

Republic of Moldova Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Republic of Moldova in 2016. The RVC confirmed that measles elimination has been sustained and, considering its conclusions about the interrupted status of rubella transmission in the country in 2014 and 2015, the RVC is pleased to declare that the Republic of Moldova has achieved elimination of rubella. The RVC urges the national health authorities and public health system to consider all additional activities, in line with WHO guidelines, to achieve and maintain immunization coverage of $\geq 95\%$ with both doses of MRCV at national and subnational levels and encourages efforts to reduce the negative impact of the anti-vaccination lobby. The RVC emphasizes to the national health authorities the need for further surveillance strengthening.	

Slovakia Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Slovakia in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the NVC, national health authorities and public health system on this achievement, but urges the NVC to provide a more comprehensive ASU in future, which should include WHO-recommended surveillance performance indicators and would allow more precise and in-depth review	

of the elimination status by the RVC. The RVC emphasizes to the national health authorities that surveillance sensitivity needs further strengthening, and anticipates that the national public health system will maintain high routine vaccination coverage.

Slovenia Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
<p>The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Slovenia in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the NVC, national health authorities and public health system on this achievement but would appreciate further clarification from the NVC and national health authorities on surveillance performance indicators, with an explanation of how they document the presence of high-quality surveillance in the next ASU. The RVC also requests from the NVC an update on immunization coverage among the identified underimmunized subpopulation. The RVC encourages the national health authorities and public health system to consider activities that will ensure timely collection of routine immunization coverage data.</p>	

Spain Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
<p>The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Spain in 2016. The RVC confirmed that rubella elimination has been sustained and, considering the conclusions of the interrupted status of measles transmission in 2014 and 2015, the RVC is pleased to declare that Spain has achieved elimination of measles. The RVC commends Spain on the improvements made in case investigation, laboratory confirmation and genotyping, and providing additional information on rubella through review of CRS cases in hospital registries. The RVC urges the national health authorities to maintain high-quality surveillance and take appropriate measures to ensure high MRCV coverage.</p>	

Sweden Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
<p>The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Sweden in 2016. The RVC confirmed that measles elimination has been sustained and, considering its</p>	

conclusions about the interrupted status of rubella transmission in the country in 2014 and 2015, the RVC is pleased to declare that Sweden has achieved elimination of rubella. The RVC commends the SVC on this achievement, and anticipates that Sweden's national public health system will maintain a high level of performance in the coming years.

Tajikistan Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
<p>The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Tajikistan in 2016, and confirmed that measles and rubella elimination has been sustained. However, the RVC is seriously concerned about reported measles cases in 2016, which place the country at high risk for reestablishment of endemic measles transmission. The RVC urges improvement in the rate of viral detection of measles and rubella through the submission of specimens to a WHO-accredited regional reference laboratory for genotyping. The RVC emphasizes to the NVC, national health authorities and public health system that full documentation of the measles outbreak and outbreak response activities (immunization campaign) in 2016 and 2017, with a clear description of cases and the timeline of the outbreak, need to be submitted with the next ASU. Based on a review of the submitted ASU for 2017 and other required documentation, the RVC will decide whether measles transmission has been reestablished in the country, and if so when.</p>	

Turkmenistan Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
<p>The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Turkmenistan in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the NVC, national health authorities and public health system on this achievement and anticipates that the high level of performance will be maintained in the coming years.</p>	

United Kingdom of Great Britain and Northern Ireland Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
<p>The RVC concluded that endemic transmission of both measles and rubella remained interrupted in the United Kingdom of Great Britain and Northern Ireland in 2016. The RVC confirmed that rubella elimination has been sustained and, considering its conclusions about the interrupted status of measles transmission in the country in 2014 and 2015, the RVC is pleased to declare that the United Kingdom of Great Britain and Northern Ireland has achieved elimination of measles. While commending this achievement, the RVC would appreciate receiving information on steps being taken to access case-based measles and rubella surveillance data from Scotland, which would allow for development of standard surveillance indicators for the United Kingdom as a whole. The RVC invites the NVC and</p>	

national health authorities to implement modifications that will lead to submission of comprehensive data in the ASU in future. The RVC anticipates that the national public health system will maintain high-quality surveillance and high routine immunization coverage.

Uzbekistan Status of measles and rubella elimination in 2016	Measles eliminated. Rubella eliminated.
<p>The RVC concluded that endemic transmission of both measles and rubella remained interrupted in Uzbekistan in 2016, and confirmed that measles and rubella elimination has been sustained. The RVC commends the NVC, national health authorities and public health system on this achievement, but urges consideration of additional activities to improve the quality of reporting and surveillance of measles, rubella and CRS. The RVC reiterates that molecular genotyping of measles and rubella viruses is crucial in the elimination period and should be performed for positive cases. The RVC anticipates that the national public health system will maintain high routine immunization coverage with coverage monitoring at subnational levels.</p>	

- b) Countries that have interrupted measles and rubella transmission as of 2016 for different periods of time, but have not yet sustained interruption of both diseases for 36 months (in alphabetical order)

Austria

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles interrupted (2016 data to be used by the RVC to reassess the status and period of interrupted endemic transmission). Rubella interrupted for 12 months.
Epidemiology	Measles incidence was 3.1/million population, with 27 cases. Five outbreaks (with 2–6 cases each) lasted <12 months. Measles D8 and B3 genotypes were identified. There were 3 rubella cases (2 laboratory confirmed), all in young adult males. Zero CRS cases were reported.
Surveillance performance	Based on a high rate of discarded cases (4.4/100 000, based on specimens sent to the laboratory), measles surveillance sensitivity was considered adequate.
Population immunity	Reported MRCV1 coverage was >95% and MRCV2 coverage was 89% (2015 data). No coverage data available at subnational level.
Supplementary information	Various efforts were made to raise public awareness about measles and the importance of vaccination. MRCV vaccination coverage was evaluated using a new mathematical, agent-based, dynamic model that was applied to 2015 data.
Specific comments to country	The RVC commends the NVC, national health authorities and public health system on sustained interruption of measles and rubella transmission. The RVC anticipates that coverage data from modelling will be used to effectively target efforts to reduce susceptibility. The RVC urges the national health authorities to improve the rate of viral detection of rubella and assure that national and subnational immunization coverage data are available in time for inclusion in future ASUs.
Status of measles and rubella elimination, 2016	Measles interrupted 12 months. Rubella interrupted 24 months.

Bulgaria

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles eliminated. Rubella endemic.
Epidemiology	Measles incidence was 0.01/million population. The single imported measles case identified in 2016 had H1 measles virus genotype. Rubella incidence was 0.04/million population, with both cases classified as clinically compatible (and one probably having been a rash following vaccination). Zero CRS cases were reported.
Surveillance performance	Measles and rubella surveillance sensitivity are unacceptably low, with only 2 suspected measles cases and 5 suspected rubella cases reported. The rate of discarded cases for both measles and rubella is below the required standards to ascertain the surveillance sensitivity.
Population immunity	Reported MRCV1 coverage was 92% and MRCV2 coverage was 88%. MRCV1 or MRCV2 coverage was <90% in 15 out of 28 regions.
Supplementary information	No information provided.
Specific comments to country	The RVC commends the NVC, national health authorities and public health system on sustained interruption of measles transmission and achieving interruption of rubella transmission. The RVC welcomes recent steps undertaken to improve surveillance performance. The RVC invites the national health authorities and the NVC to consider conducting a targeted retrospective CRS survey using established WHO case definitions to report the absence of any missed cases in view of reported clinically compatible rubella cases in the country. The RVC urges the national health authorities to improve the rate of viral detection of rubella and to take adequate measures to further improve both MRCV1 and MRCV2 coverage.
Status of measles and rubella elimination, 2016	Measles eliminated. Rubella interrupted 12 months.

Ireland

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles interrupted for 12 months. Rubella eliminated.
Epidemiology	Measles incidence was 8.7/million population with an outbreak of 40 laboratory-confirmed import-related cases occurring during April to September. Measles virus genotype B3 was identified in outbreak cases. Rubella incidence was 0.2/million population. Zero CRS cases were reported.
Surveillance performance	Rate of discarded cases for measles was 3.4/100 000, and rate of discarded cases for rubella was 0.3/100 000. It is difficult to assess rubella surveillance performance with the data submitted in the ASU, as different values are presented in the epidemiological segment and in the laboratory segment of the ASU.
Population immunity	Reported MRCV1 coverage was 92%, and MRCV2 coverage was 89–91%. There were 9 subnational administrative units with MRCV1 and/or MRCV2 coverage <90%.
Supplementary information	No information provided.
Specific comments to country	The RVC commends the NVC, national health authorities and public health system on sustained elimination of rubella and interruption of measles transmission. The RVC is concerned about the low vaccination coverage in some areas, particularly around the capital city of Dublin, and urges that steps be taken to increase population immunity in all areas. The RVC urges the national health authorities to improve the rate of viral detection of rubella.
Status of measles and rubella elimination, 2016	Measles interrupted for 24 months. Rubella eliminated.

Kyrgyzstan

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles endemic. Rubella endemic.
Epidemiology	No measles cases were reported in 2016. Rubella incidence was 0.5/million population, with 3 laboratory-confirmed cases. The source of infection was not identified and no information was provided on rubella genotyping. Zero CRS cases were reported.
Surveillance performance	Timeliness and completeness of reporting was 88.8% and the rate of laboratory investigations was 100%. The rate of discarded measles cases was 2.5/100 000 and the rate of discarded rubella cases was 2.4/100 000. Representativeness of reporting of discarded cases was 88.8%.
Population immunity	Reported MRCV1 coverage was 98.8% and MRCV2 coverage was 98.2%. Mop-up vaccinations were conducted in April (European Immunization Week) and in September 2016.
Supplementary information	No information provided.
Specific comments to country	The RVC commends the NVC, national health authorities and public health system on achieving interruption of measles and rubella transmission. The RVC also commends the NVC on the quality of the report provided. The RVC would appreciate receiving further information on rubella, particularly laboratory confirmation and genotyping results. The RVC reiterates that for elimination purposes it is essential to have genotype information for all sporadic cases tested positive for either measles or rubella and this information should be included in the next ASU.
Status of measles and rubella elimination, 2016	Measles interrupted 12 months. Rubella interrupted 12 months.

Russian Federation

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles interrupted (2016 data to be used by the RVC to reassess the status and period of interrupted endemic transmission). Rubella interrupted for 12 months.
Epidemiology	<p>Measles incidence was 1.2/million population (178 cases, 173 laboratory confirmed). A total of 12 import-related outbreaks reported, involving 118 cases (2 to 76 cases per outbreak). The age distribution of cases included 46% <5 years of age and 38% \geq20 years. Several chains and sporadic cases linked to importation of measles virus D8 (D8-Frankfurt) and H1 variants were identified.</p> <p>Rubella incidence was 0.3/million population (38 cases, 34 laboratory confirmed). 3 outbreaks reported with 2 to 26 cases and the 2B genotype was identified. 87% of cases were \geq20 years of age.</p> <p>Zero CRS cases were reported.</p>
Surveillance performance	With the exception of rubella viral detection (33.3%), all reported surveillance performance indicators meet or exceed targets. High-quality laboratory information was provided.
Population immunity	<p>Reported MCV1/RCV1 coverage was 97.7/ 97.7% and MCV2/RCV2 coverage was 97.0/96.8%.</p> <p>Immunization targeting measles- and rubella- susceptible individuals identified during serological monitoring was conducted. SIAs were also targeted towards unvaccinated populations, healthcare workers, education workers, etc., reaching 192 652 people.</p> <p>Additions have been made to the immunization schedule with introduction of measles immunization of adults aged 36 to 55 in professional risk groups, who are unvaccinated, incompletely vaccinated, or have no immunization data or disease history.</p>
Supplementary information	Data from a seroprevalence study on measles and rubella population immunity suggests a high level of seronegativity for measles in some age groups (16-17 years of age: 2628/12086 (21.7%))
Specific comments to country	The RVC commends the NVC, national health authorities and public health system on sustained interruption of measles and rubella transmission, and on the high quality of ASU and laboratory information provided. A more detailed explanation of the seroprevalence study conducted, including an explanation of methods and results would be appreciated.
Status of measles and rubella elimination, 2016	<p>Measles interrupted 12 months.</p> <p>Rubella interrupted 24 months.</p>

The former Yugoslav Republic of Macedonia

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles interrupted for 12 months. Rubella interrupted for 24 months.
Epidemiology	Zero measles, rubella and CRS cases were reported.
Surveillance performance	The incomplete data submitted in the ASU does not present a clear picture of surveillance and its performance. Surveillance appears to be suboptimal (only 3 discarded measles cases reported).
Population immunity	Reported MRCV1 coverage was 82.3% and MRCV2 coverage was 93.3%. However, 8 administrative territories had MRCV1 < 90% and 2 administrative territories had < 90% for both doses. No explanation of the low coverage or description of measures taken to address it was provided.
Supplementary information	No at-risk populations were identified.
Specific comments to country	The RVC commends the NVC, national health authorities and public health system on sustained interruption of measles and on achieving rubella elimination. However, the RVC requests from the NVC a clarification of the numerator and denominator used to calculate MRCV coverage. The RVC insists that a more comprehensive ASU is critical for precise and in-depth review of the elimination status. The RVC urges the NVC and national health authorities to work towards improvement of the quality of measles, rubella and CRS surveillance and better reporting in the ASU.
Status of measles and rubella elimination, 2016	Measles interrupted for 24 months. Rubella eliminated.

c) Countries with endemic transmission of measles, rubella or both diseases in 2016 (in alphabetical order)

Belgium

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles endemic. Rubella endemic.
Epidemiology	Measles incidence was 6.3/million population with 78 cases, including 13 clusters of 2-9 cases occurring throughout the year. Cases were reported in all age groups and most were unvaccinated. Genotypes B3 and D8 were identified. No nationwide comprehensive rubella surveillance has been established, but 1 confirmed case was reported. Zero CRS cases were reported.
Surveillance performance	Measles surveillance sensitivity was 1.4/100 000.
Population immunity	Reported MRCV1 coverage was 96% and MRCV2 coverage was 75% in Brussels and Wallonia and 87% in Flanders.
Supplementary information	The results of a serosurvey conducted in 2015 are expected in 2017. Routine vaccination of asylum seekers has been implemented. Free vaccination is offered to all adults 20 to 45 years of age.
Specific comments to country	The RVC appreciates the comprehensive ASU from the NVC and commends efforts being made, but the 2015 decision to maintain the non-notifiable status of rubella constitutes a major constraint to verification of regional rubella elimination.
Status of measles and rubella elimination, 2016	Measles endemic. Rubella endemic.

Bosnia and Herzegovina

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles endemic. Rubella endemic.
Epidemiology	123 measles cases and 15 rubella cases were reported. As data were presented separately from two entities and one district, it is not possible for the RVC to reliably calculate disease incidence at country level. Zero CRS cases were reported.
Surveillance performance	Surveillance performance indicators continue to be below requirements.
Population immunity	Population immunity is low. The reported MRCV1 coverage at country level was 68% (ranging among the two entities and one district from 63.5% in the Federation of Bosnia and Herzegovina (FBiH) to 84.2% in Brcko District), and MRCV2 coverage was 78% (ranging from 74.4% in FBiH to 89% in Brcko District). Coverage has been below acceptable levels for the last three years and has further declined during the past year.
Supplementary information	No supplementary immunization activities have been conducted. High vaccine hesitancy has been reported.
Specific comments to country	<p>The RVC recognizes the complex circumstances and commends the country for continued efforts to put in place strategies to improve coverage and surveillance. The RVC appreciates the NVC's efforts to provide a complete and comprehensive ASU, and encourages the NVC to continue cooperating with the RVC Secretariat in preparation of the next ASU.</p> <p>The RVC is concerned about the size of the susceptible population in the country and urges action to increase measles and rubella immunity in all population groups throughout the country. If SIAs are considered, they should be thoroughly planned, synchronized in both entities and district, and urgently performed. Surveillance needs to be strengthened, including increasing the rates of laboratory investigation and viral detection of measles and rubella through the submission of specimens to a WHO-accredited laboratory for IgM testing and for genotyping.</p> <p>Further activities should be considered as a matter of urgency.</p>
Status of measles and rubella elimination, 2016	<p>Measles endemic.</p> <p>Rubella endemic.</p>

Denmark

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles interrupted 24 months. Rubella endemic.
Epidemiology	In 2016, three cases of measles were notified – all imported from measles-endemic countries and with genotypes known to be present in those countries. No secondary cases resulted from these imported cases. Zero CRS cases were reported.
Surveillance performance	No zero reporting of measles cases. The rate of discarded cases was 1.25/100 000 population. Rubella laboratory testing of measles-negative cases was introduced in late 2016. No nationwide comprehensive rubella surveillance has been established. Only rubella in pregnancy and CRS is currently reported. The national surveillance system for infectious diseases is currently being reviewed with the aim of including mandatory notification of all cases of rubella in 2017.
Population immunity	Reported MRCV1 coverage among 2-year-olds was 91% and MRCV2 coverage among 4-year-olds was 71% (11 territories with <90%).
Supplementary information	In 2016, a new reminder system (letters to parents with children who missed ≥ 1 vaccines) led to an increase of MRCV1 and MRVC2 coverage of 1.3 and 5.0 percentage points respectively, in the intervention cohort of 6½ year-olds compared to a control group that did not receive the reminder letter.
Specific comments to country	The RVC commends the national health authorities and public health system on sustained interruption of measles but continues to call for the implementation of WHO resolutions and guidelines recommending establishment of national rubella surveillance. The RVC is eager to learn about introduction of mandatory rubella surveillance in 2017. The RVC would appreciate if the results of a retrospective review for missed rubella cases would be included in the next ASU. The RVC urges strengthening of immunization programme by timely delivery of MRCV, particularly MRCV2, and improving of surveillance sensitivity to the minimum standard of 2 discarded cases per 100 000 population.
Status of measles and rubella elimination, 2016	Measles eliminated. Rubella endemic.

France

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles endemic. Rubella endemic.
Epidemiology	<p>The reported measles incidence was 1.2/million population, with 79 confirmed cases and nationwide transmission among mostly unvaccinated individuals of all ages. Genotypes B3 and D8 were identified.</p> <p>No nationwide comprehensive rubella surveillance has been established, but 1 confirmed case was reported.</p> <p>Two confirmed CRS cases were reported and classified as imported.</p>
Surveillance performance	Information on surveillance sensitivity was not provided.
Population immunity	Reported MRCV1 coverage was 89% and MRCV2 coverage was 66% among 2-year-olds, based on 2015 survey data
Supplementary information	Rubella is not a notifiable disease in France, but “the NVC has approved the implementation of mandatory registration of rubella”.
Specific comments to country	The RVC is pleased to learn about recent developments in France and would appreciate further information and clarification of the NVC statement on the “mandatory registration of rubella”, particularly whether this will make rubella a notifiable disease in France. The RVC would also appreciate information on steps being taken, if any, to implement case-based measles and rubella surveillance in France to make it possible for RVC to monitor standard surveillance indicators.
Status of measles and rubella elimination, 2016	<p>Measles endemic.</p> <p>Rubella endemic.</p>

Georgia

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles endemic. Rubella endemic.
Epidemiology	<p>The RVC noted a significant decrease of both measles and rubella incidence compared to incidence in the previous three years: 3.8/million population for measles and 3.2 for rubella.</p> <p>10 out of a total of 14 measles cases occurred in children <5 yrs. Most cases reported from Ajara and Tbilisi. A small outbreak (3 measles cases, D8) reported in Tbilisi.</p> <p>12 rubella cases were reported in various age groups.</p> <p>Zero CRS cases reported.</p>
Surveillance performance	An inconsistency in the data on discarded cases resulted in lower rates of discarded cases presented in the ASU. Only 5 cases of measles and 1 of rubella were laboratory confirmed, the rest were clinically compatible. Only one measles case was genotyped, no rubella genotyping was reported.
Population immunity	Reported MRCV1 coverage was 93.4% and MRCV2 coverage was 85.4%. 28 territories reported coverage <90%. Limited mopping-up was conducted throughout the year.
Supplementary information	A series of surveys conducted in 2015–2016 demonstrated that the coverage in three major urban centres was suboptimal and immunization was delayed. There were still a considerable proportion of susceptible individuals among young adults after major measles outbreaks. Susceptibility for rubella was high among persons aged 18–34. Assessment of measles transmission in 2013–2014 outbreaks demonstrated that in most cases adults were the source of transmission.
Specific comments to country	<p>The RVC recognizes the efforts that have been made towards measles and rubella elimination. At the same time, the RVC urges further efforts to achieve and maintain high vaccination coverage with both MRCV doses at all administrative levels through routine and supplemental immunization activities.</p> <p>The RVC also urges efforts to increase the rate of viral detection for rubella cases.</p>
Status of measles and rubella elimination, 2016	<p>Measles endemic.</p> <p>Rubella endemic.</p>

Germany

Component	RVC comment
Status of measles and rubella elimination,2015	Measles endemic. Rubella endemic.
Epidemiology	<p>Measles incidence was 3.3/million population (compared with 29.8/million in 2015), with 326 cases (of which 58 were imported cases) and 34 outbreaks (compared with 224 in 2015) reported from 12 of 16 federal states. The highest incidence was in children 1-4 years of age and 32% of cases were among adults 20 years and older.</p> <p>Measles genotypes B3 and D8 were isolated. However, no single measles virus genotype circulated >12 months based on the data provided.</p> <p>Rubella incidence was 1.1/million population, with 95 cases (of which 2 were imported) in all age groups. No rubella genotypes were isolated.</p> <p>Zero confirmed CRS cases were reported.</p>
Surveillance performance	<p>The quality of surveillance could not be directly assessed because the total number of suspected cases of measles and rubella was not available through routine surveillance. However, data from the national reference laboratory (391 suspected cases) and the laboratory sentinel system (10 350 suspected cases) were included in the ASU. The latter data were used to calculate the 11/100 000 rate of cases tested negative for measles IgM (alternative indicator to rate of discarded cases).</p> <p>The rate of viral detection for measles outbreaks was high 29/34 (85%), though molecular epidemiology was available for only 32% of sporadic measles cases. Only 25% of rubella cases were laboratory confirmed and none had genotype data.</p>
Population immunity	Although national coverage with MRCV1 is high (97%), children are often vaccinated late, especially with MRCV2. Also, there is considerable variation in district-level MRCV1 coverage (56% to 96%).
Supplementary information	<p>Epidemiological surveillance among asylum seekers has been strengthened, with SIAs conducted at local levels in all federal states. Immunization was offered to asylum seekers and refugees shortly after arrival.</p> <p>Measles cases and outbreaks triggered a national media response.</p>
Specific comments to country	<p>The RVC commends the NVC, national health authorities and public health system on interruption of endemic measles transmission in Germany, on the high-quality report provided and on efforts made in recent years aiming at high population immunity and improved viral detection of measles outbreaks.</p> <p>The RVC urges further improvement in the quality of measles and rubella surveillance, including the rate of viral detection of sporadic measles cases and the rates of laboratory investigation and viral detection for rubella. The RVC urges the national health authorities and public health</p>

	system to strengthen activities in line with WHO resolutions and guidelines to achieve and document elimination of rubella as well.
Status of measles and rubella elimination, 2016	Measles interrupted 12 months. Rubella endemic.

Italy

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles endemic. Rubella endemic.
Epidemiology	<p>Reported measles incidence was 13.6/million population. 5 regions reported cases for almost all months in 2016 with most of the cases (57%) above 15 years of age. 91.5% of the cases were unvaccinated across all age groups. Several variants of B3, D8 and H1 genotypes were confirmed.</p> <p>Reported rubella incidence was 0.5/million population. One rubella genotype was reported in RubeNS.</p> <p>The one reported case of laboratory-confirmed CRS was classified as imported.</p>
Surveillance performance	The rate of discarded cases for measles (0.12/100 000) and rubella (0.04/100 000) continued to remain low in 2016. 50% of rubella cases were clinically compatible. The rate of laboratory investigation conducted in WHO-accredited laboratories and non-WHO laboratories of known proficiency was only 18%, which limits epidemiological assessment.
Population immunity	Reported MCV1 coverage was 87.3% and RCV1 coverage was 87.2%. MCV2 coverage was 82.2% and RCV2 coverage was 82.0%. The MRCV1 coverage was <90% in 17 subnational areas while the MRCV2 coverage was <90% in 20 subnational areas.
Supplementary information	The National Plan of Vaccine Prevention 2017–2019 became operational in January 2017 with elimination of measles and rubella as one of the priorities. The administrative regions have started to share the status of their measles epidemiology. Active vaccinations have been carried out among at-risk populations. No additional vaccination activities have been reported in 4 of the 11 regions reporting high numbers of cases in 2016.
Specific comments to country	The RVC appreciates the supplemental documents provided with the ASU and commends Italy on implementing several surveillance and immunization initiatives, including putting into practice the National Plan of Vaccine Prevention and establishing a national network of measles and rubella regional laboratories with a comprehensive national accreditation programme. The RVC urges the national health authorities to consider further measures to improve the subnational vaccination coverage in all administrative territories and to improve the rate of viral detection of measles and rubella through the submission of specimens for genotyping.
Status of measles and rubella elimination, 2016	<p>Measles endemic.</p> <p>Rubella endemic.</p>

Kazakhstan

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles endemic. Rubella endemic.
Epidemiology	Measles incidence was 6.9/million population, with 122 cases laboratory confirmed. Most cases (51%) were ≥ 20 years of age. Genotype H1 was identified for the 3 outbreaks (a total of 105 cases: 3 imported and 102 import-related cases). 17 sporadic measles cases were reported. Rubella incidence was 0.2/million population with 4 laboratory-confirmed cases; genotype was not identified. Zero CRS cases were reported.
Surveillance performance	Timeliness and completeness of reporting, timeliness of investigation and rates of laboratory investigations are adequate. However, surveillance sensitivity is suboptimal with 0.7 measles cases per 100 000 population and 0.7 rubella cases per 100 000 reported. The rate of representativeness of reporting discarded cases is suboptimal.
Population immunity	Reported MRCV1 coverage was 99.4% and MRCV2 coverage was 99.3%, based on administrative data. No immunity gaps were identified.
Supplementary information	Based on clinical evidence, epidemiological data, monitoring of vaccine refusal and the results of laboratory tests in 2016 (including genotyping), the NVC concluded that there is no evidence of the absence of endemic measles genotypes circulating in Kazakhstan. A trend of increasing refusals to vaccinate has been observed and recognized every year since 2013.
Specific comments to country	The RVC agrees with the NVC conclusion that measles and rubella remain endemic, based on lack of evidence to demonstrate otherwise. The RVC urges the national health authorities to improve surveillance quality, expand laboratory investigations of sporadic cases to include the measles and rubella virus genotype in order to clarify endemicity. The RVC notes with concern signals of decline in immunization rates and urges investigation and, if appropriate, measures to address the causes.
Status of measles and rubella elimination, 2016	Measles endemic. Rubella endemic.

Poland

Component	RVC comment
Status of measles and rubella elimination,2015	Measles endemic. Rubella endemic.
Epidemiology	<p>Measles incidence was 2.86/million population based on 133 reported cases. Of these, an outbreak of 120 cases (116 among asylum seekers, 61 of which were 1–4 years of age) occurred between June 2016 and December 2017. Excluding these outbreak cases the incidence was 0.3/million population.</p> <p>D8 was isolated. No known chains of transmission lasted >12 months. Rubella incidence was 28.8 cases/million based on 1106 rubella cases, a decrease to half of the number of cases reported in 2015. No rubella genotype information was provided.</p> <p>Zero CRS cases were reported.</p>
Surveillance performance	<p>Case-based surveillance for measles but not for rubella. Fortnightly reporting of measles including zero reporting takes place to national level from all 16 administrative territories.</p> <p>Excellent timeliness and completeness indicators, though rate of discarded cases is low suggesting poor surveillance sensitivity.</p>
Population immunity	Reported MRCV1 coverage was 96% (among 2-year-olds) and MRCV2 coverage was 96% (among 11-year-olds). Coverage has been at least 95% since 1993 for MCV1. Asylum seekers were identified as an at-risk population for lower coverage.
Supplementary information	MMR has been made free of charge for all adults. A national registry of congenital malformations was implemented 2 years ago. Use of laboratories with unknown proficiency to test samples. Poor immunity in asylum seekers (data based on a small coverage survey sample); targeted immunization campaigns were conducted.
Specific comments to country	The RVC commends the NVC, national health authorities and public health system on interruption of endemic measles transmission in Poland. The RVC is impressed with Poland's measles prevention efforts, noting timeliness and completeness of reporting and high vaccine coverage. The RVC however urges improvement of surveillance sensitivity and introduction of case-based rubella surveillance with laboratory investigation and viral detection of rubella through the submission of specimens to WHO-accredited laboratories for ELISA testing and genotyping. The RVC urges the national health authorities and public health system to strengthen activities in line with WHO resolutions and guidelines to achieve and document elimination of rubella as well.
Status of measles and rubella elimination, 2016	<p>Measles interrupted 12 months.</p> <p>Rubella endemic.</p>

Romania

Component	RVC comment
Status of measles and rubella elimination,2015	Measles endemic. Rubella endemic.
Epidemiology	2435 confirmed measles cases and 13 confirmed rubella cases were reported. The ongoing measles outbreak has spread nationwide and affected all age groups, although 42% of cases were 1 to 4 years of age and the majority of cases were ≤10 years of age. 4 CRS cases were reported (probable cases as per EU definition)
Surveillance performance	The timeliness and completeness of district monthly reporting is adequate. Surveillance sensitivity remains inadequate (<2/100 000). The measles laboratory is fully accredited for measles detection and genotyping, however, the laboratory failed in rubella genotyping.
Population immunity	MRCV1 and MRCV2 coverage in three recent years was <90%. This is reflected in the affected population in the recent outbreak as 90% of reported confirmed measles cases were not vaccinated. Coverage <90% was reported from 24 districts for MRCV1, and from 39 districts for MRCV2. Outbreak-response immunization was initiated in spring 2016 and is ongoing. Activities intensified as of Dec. 2016, and 290 040 people were immunized in the first half of 2017.
Supplementary information	MRCV2 has been given at 5 years of age since April 2015; both 5-year-olds and 7-year-olds were to receive MRCV2 in 2016. Weekly reporting of measles-rubella suspected cases and zero-reporting were initiated in February 2015. A study performed in 2015 showed that 13 districts were at very high risk for measles, 14 at high risk, 12 at medium risk and 3 at low risk, due to the continuing decrease in MRCV coverage.
Specific comments to country	The RVC acknowledges the efforts being made to improve vaccination coverage in Romania, particularly in vulnerable communities, and recognizes that efforts are challenged by the current political climate. The proposed new legislation on immunization is expected to go some way towards mitigation of current challenges to achieve high universal vaccination coverage, but other, innovative, measures will probably also be required. The RVC believes that in order to end the current measles outbreak, greater efforts are needed to increase the vaccination coverage in infants and children aged 9 months to 5 years by strengthening supplementary immunization activities. The RVC urges the health authorities and public health system to strengthen measles and rubella surveillance and to improve its quality, including improving the rate of viral detection of rubella.
Status of measles and rubella elimination,2016	Measles endemic. Rubella endemic.

Serbia

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles endemic. Rubella endemic.
Epidemiology	Measles incidence decreased from 53.7 to 2.1/million population. Measles was confirmed in 15 of 73 suspected cases; all in adults ≥ 30 years of age. Two strains of B3 measles virus genotyping were isolated (last year only D8 was isolated). 5 rubella cases were reported, giving rubella incidence of 0.72/ million population. No data on age or immunization status was reported. Zero CRS cases were reported.
Surveillance performance	Discrepancies were observed in case numbers in different parts of the ASU. It is not clear how many cases were genotyped. Representativeness of reporting discarded measles cases is insufficient, suggesting inadequate surveillance sensitivity. Nationwide comprehensive rubella surveillance is not yet established and the quality of surveillance cannot be assessed because no information was provided on rubella or CRS surveillance indicators.
Population immunity	Reported MRCV1 coverage further declined to 81% and MRCV2 coverage increased to 91.1%. The number of administrative territories with MRCV1 and MRCV2 < 90% increased to 15 of 25 administrative territories (from 11 in 2014), exposing significant population immunity gaps. Lowest coverage with MRCV1 was reported in Belgrade.
Supplementary information	No information provided.
Specific comments to country	RVC commends Serbia on the expansion of genotyping of confirmed cases and reiterates the request to the NVC to include line-lists of discarded suspected cases with results of laboratory investigations for first-level administrative districts. The RVC urges improvement of the quality of measles and rubella surveillance including the rate of viral detection for rubella. With reference to WHO resolutions and guidelines and requirements for immunization coverage of >95% with both doses of MRCV at national and subnational levels within the routine immunization programme, the RVC urges the national health authorities to consider activities to increase routine immunization coverage and to consider conducting SIAs to boost population immunity and prevent outbreaks.
Status of measles and rubella elimination, 2016	Measles endemic. Rubella endemic.

Switzerland

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles endemic. Rubella endemic.
Epidemiology	Measles incidence was 6.4/100 000 population. A total of 65 cases were reported, of which 48 cases (74%) were in 6 outbreaks, none lasting >12 months. 53 cases were non-imported, of which 36 cases (68%) were unvaccinated (mostly >10 years of age). Zero rubella or CRS cases were reported.
Surveillance performance	Significant improvement was reported on all standard and alternative indicators of measles surveillance performance. The measles surveillance quality is still not optimal, with a rate of measles discarded cases of 0.82/100 000. The quality of rubella surveillance cannot be assessed in the absence of a rate of discarded cases.
Population immunity	Reported MRCV1 coverage was around 94% with variations between cantons. MCV2 coverage >95% at 2 years of age was reached in only 1 of 26 cantons.
Supplementary information	Work is in progress to establish a national reference laboratory for measles and rubella.
Specific comments to country	The RVC commends the NVC, national health authorities and public health system on interruption of endemic measles transmission in Switzerland. The RVC commends the national health authorities and encourages them to continue with awareness campaigns for vaccination against measles to close immunity gaps among adults. However, the RVC urges improvement of the quality of measles and rubella surveillance and increasing of MRCV2 at subnational (cantonal) level. The RVC urges the national health authorities and public health system to strengthen activities in line with WHO resolutions and guidelines to achieve and document elimination of rubella as well.
Status of measles and rubella elimination, 2016	Measles interrupted 12 months. Rubella endemic.

Turkey

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles endemic. Rubella endemic.
Epidemiology	Reported measles incidence was 0.11/million population. Out of the 9 confirmed cases identified in 2016, none were among the Turkish resident population. Importation was identified in two of the reported measles outbreaks, which lasted 1–2 months. Several variants of D8 measles virus genotypes were confirmed. Reported rubella incidence was 0.09/million population. 1H rubella genotype was confirmed. Zero CRS cases were reported.
Surveillance performance	Through an integrated syndromic surveillance of rash and fever, cases are tested for both measles and rubella. High-quality surveillance for measles and rubella is ascertained by the rate of discarded cases (2.8/100 000 population), including 60% representativeness of reported discarded cases at subnational level.
Population immunity	Reported MRCV1 coverage was 98% and MRCV2 coverage was 82%. 5 subnational areas had coverage <90% for MRCV1 while 32 subnational areas had coverage <90% for MRCV2.
Supplementary information	SIAAs were conducted in high-risk settings including among Syrian refugees, military personnel and healthcare workers. However, the efficacy and extent of reach of the SIAAs could not be assessed from data in the ASU. Vaccines are provided to the Syrian refugees free of cost.
Specific comments to country	The RVC commends the NVC, national health authorities and public health system on interruption of endemic measles transmission in Turkey. The RVC commends Turkey on immunization activities targeting high-risk populations, including migrants and refugees, and on initiating rubella virus genotyping in 2016. The RVC urges the national health authorities and public health system to strengthen activities in line with WHO resolutions and guidelines to achieve and document elimination of rubella as well.
Status of measles and rubella elimination, 2016	Measles interrupted 12 months. Rubella endemic.

Ukraine

Component	RVC comment
Status of measles and rubella elimination, 2015	Measles endemic. Rubella endemic.
Epidemiology	<p>Reported measles incidence was 2.4/million population, with 102 cases identified in 10 regions, and with 76% of cases reported in one region between September and December. Genotyping data provided evidence of ongoing transmission of D8 (two strains).</p> <p>Reported rubella incidence was 3.5/million population, with 150 cases identified in all but three regions throughout the country. No data on rubella genotyping was provided.</p> <p>Only 47 measles and 2 rubella cases were laboratory confirmed, indicating a high rate of clinically compatible cases.</p> <p>Zero CRS cases were reported.</p>
Surveillance performance	Surveillance indicators failed to meet requirements and/or were incorrectly calculated. Inconsistency in numbers of suspected cases was not explained. Therefore surveillance sensitivity for both diseases cannot be properly assessed. All tests were performed in WHO-accredited and proficient laboratories.
Population immunity	Reported MRCV1 coverage was 45.5% and MRCV2 coverage was 30.2%. There has been a continuous and steep decline in vaccination coverage since 2009. No SIAs were conducted in 2016.
Supplementary information	Neither a national plan for measles and rubella elimination nor statutory documentation on surveillance of measles, rubella and CRS has been developed.
Specific comments to country	The RVC recognizes the complex circumstances but is concerned with absence of strategies to improve coverage and surveillance. The RVC is concerned about the size of the susceptible population in the country and urges action to increase measles and rubella immunity in all population groups throughout the country. If SIAs are considered, they should be thoroughly planned and urgently performed. Surveillance, including genotyping of both measles and rubella, needs to be strengthened and better documented.
Status of measles and rubella elimination, 2016	<p>Measles endemic.</p> <p>Rubella endemic.</p>

Annex 3. List of participants

RVC Members



Dr Gunter M. Pfaff (Chair), Germany

Dr Robin Biellik, Switzerland

Dr Irja Davidkin, Finland

Professor Mira Kojouharova, Bulgaria

Dr Andrei Lobanov, Russian Federation

Dr José Ignacio Santos Preciado, Mexico

Dr John Simpson, United Kingdom of Great Britain and Northern Ireland (not able to attend)

Dr Robert Linkins, United States of America

Professor Susanna Esposito, Italy (not able to attend)

Romania

Professor Florian Bodog, Minister of Health

Professor Dr Corina Pop, State Secretary, Ministry of Health

Dr Amalia Serban, General Director, Directorate for Public Health and Medical Assistance, Ministry of Health

Dr Adriana Pistol, Director, National Center for Communicable Diseases Control and Prevention

Dr Aurora Stanescu, National Center for Communicable Diseases Control and Prevention

Professor Monica Luminos, President, Measles and Rubella Elimination National Verification Committee, Romania

Dr Dorina Craciun, Epidemiologist, Measles and Rubella Elimination National Verification Committee, Romania

UNICEF

Dr Svetlana Stefanet, Immunization Specialist

European Centre for Disease Prevention and Control (ECDC)

Dr Tarik Derrough, Expert Vaccine-preventable Diseases, Surveillance and Response Unit, Vaccine-preventable Diseases Programme

Dr Robert Whittaker, Scientific Officer Vaccine-preventable Diseases, Surveillance and Response Unit, Vaccine-preventable Diseases Programme

WHO headquarters

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Dr Dragan Jankovic, Technical Officer, VPI

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