SPECIAL COLLABORATION

EPIDEMIOLOGICAL SURVEILLANCE ON MEASLES, RUBELLA AND CONGENITAL RUBELLA SYNDROME. SPAIN

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ABSTRACT

To achieve the goal of eliminating measles and rubella, two key strategies have been defined: to sustain a low level of population susceptibility and to strengthen the surveillance system by rigorous case investigation and rapid control measures implementation.

Surveillance of measles, rubella and CRS are included in the Spanish Surveillance System (RENAVE); surveillance is mandatory, passive, nationwide and case-based with laboratory information integrated. Information flows from sub national to national level (National Centre for Epidemiology) and then, to WHO-Europe via ECDC.

In the final phase of elimination, good surveillance and documented evidences are keys. Information on epidemiology of measles, rubella and CRS cases and outbreaks, pattern of importation, genotypes circulating and performance of measles and rubella surveillance are required at national and international level. Also, all investigated and discarded measles or rubella cases should be reported.

Currently the system faces some challenges gathering information needed to document the elimination. The lower the disease incidence gets, the harder it becomes to identify clinical cases of measles and rubella. Mainly because of the lack of specific prodromal symptoms and the appearance of atypical cases.

Differential diagnosis for fever and rash for both measles and rubella, should be performed in all clinical settings. Subject collection of three clinical specimens will confirm or discard every individual case, and will allow characterization of the virus and pattern of importation.

Keywords: Public health. Epidemiological monitoring. Disease eradication. Measles. Rubella. Spain.

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RESUMEN

Vigilancia epidemiológica en España del sarampión, la rubéola y el síndrome de rubéola congénita

Para alcanzar la eliminación del sarampión y rubéola se precisa mantener un bajo nivel de susceptibilidad en la población y un sistema de vigilancia capaz de identificar a tiempo la circulación de los virus y de implantar medidas rápidas para controlar la transmisión.

En España la vigilancia epidemiológica del sarampión, la rubéola y el síndrome de rubéola congénita está integrada en la Red Nacional de Vigilancia Epidemiológica, en la que participan todos los niveles del Sistema Nacional de Salud, incluidos los laboratorios. En el plano internacional, el Centro Nacional de Epidemiología suministra la información para documentar los progresos hacia la eliminación a OMS-Europa a través del ECDC.

En la última fase de la eliminación la vigilancia está dirigida a documentar la ausencia de casos endémicos aportando evidencias sobre el origen de casos y brotes, patrones de importación de los virus y genotipos circulantes e indicadores de calidad de la vigilancia. Para demostrar que se ha interrumpido la trasmisión endémica no es suficiente con que no se confirmen casos, hay que aportar evidencias de que se identifican sospechas clínicas, se investigan en el laboratorio y se descartan.

Aunque nuestro sistema de vigilancia cumple en general con los objetivos de calidad, actualmente tiene dificultades para detectar sospechas clínicas de sarampión o rubéola. La única manera de mejorar la sensibilidad en la identificación y captación de casos clínicos sería fortalecer la concienciación en el nivel asistencial promoviendo que en el diagnóstico diferencial de todo caso de fiebre y exantema que se presente en cualquier edad, se incluya el incluya el diagnóstico de laboratorio de sarampión y rubéola.

Palabras clave: Vigilancia epidemiológica. Sarampión. Rubéola. Erradicación. España.

INTRODUCTION

Elimination is defined as the absence of endemic measles or rubella cases in a defined geographical area for a period of at least 12 months, in the presence of a well-performing surveillance system. For WHO-Europe to be considered measles or rubella free, a period of 36 months must elapse in all its state members.[1]

Strategies for achieving and maintaining measles and rubella elimination lie in sustaining low population susceptibility levels and having a surveillance system capable of timely identification of virus circulation.

In the final phase of elimination, the "absence of endemic transmission in the territory" shall be documented with:

- information about the outbreak including dynamics, characteristics, size and duration

- the quality of the surveillance system, showing that it is sensitive and specific enough as to identify, confirm and discard all suspected clinical cases

- the provision of virus genotype data supporting endemic transmission has been interrupted.

EPIDEMIOLOGICAL SURVEILLANCE SYSTEM

In 1904, measles, a disease characterized by considerable morbidity and related mortality, was included in the Spanish list of communicable diseases subject to mandatory surveillance and notification.[2] In 1981, MMR (measles, mumps & rubella) vaccine was included in the children's vaccination schedule and rubella became a statutorily notifiable disease (SND), with weekly aggregate case reporting.[3] This same year also saw the introduction of mandatory notification of measles and rubella outbreaks.[3] In 1995, the National Epidemiological Surveillance System (NESS) was set up, the list of SNDs was extended, and the surveillance procedure was modified. Measles and rubella became individualized, notifiable diseases requiring weekly reporting with a set of basic epidemiological data [4,5] (table 1).

In 1998 the WHO Regional Office for Europe (WHO-Europe), following advances achieved in the Region of the Americas, approved the first strategic plan for measles elimination in the European Region. WHO-Europe recommended implementing national plans that embodied fast-track strategies to achieve and sustain elimination in each country. In this regard, once the requirements of high vaccination coverages and very low measles incidence had been met, Spain endorsed the regional commitment, and in 2000 approved the "Plan for Elimination of Measles in Spain".[6] Two strategies were drawn up to ensure the elimination of endemic measles, namely, maintaining immunization coverages higher than 95% with two doses of MMR vaccine across all geographical levels, and strengthening measles surveillance (figure 1).

The goal of enhanced measles surveillance is an early detection of virus transmission within the population. The system must notify and investigate any suspected case; confirm cases only after positive lab-testing; detect urgently any possible outbreak and carry out check and control procedures. The plan provides for coordination of surveillance at the National Centre for Epidemiology (NCE) (Centro Nacional de Epidemiología), and establishes the case definition, laboratory diagnosis, national laboratory network, reporting circuit and investigation of suspected cases.

National Reference Laboratory for Measles and Rubella (NRL-MR) at National Microbiology Centre is a fully accredited WHO-Europe measles and rubella surveillance facility. NRL-MR coordinates national laboratory network. It receives

Table 1
Measles, rubella and congenital rubella surveillance and vaccination programme: chronological summary of historical landmarks in Spain and Europe

Year	Surveillance	Childhood vaccination schedule			
		Vaccination	1st dose coverage	Age of administration	WHO European Region elimination and verification process
1904	Measles included among statutorily notifiable diseases. Weekly aggregate case reporting.				
1979		Vaccination against rubella (prevention of congenital rubella).		Girls at 11 years	
1981	Rubella included in the list of statutorily notifiable diseases (SNDs) with weekly aggregate case reporting. Mandatory notification of measles and rubella outbreaks.	Measles-mumps-rubella (MMR) vaccine in schedule.		15months	
1995	NESS set up. Measles, Rubella and Congenital Rubella Syndrome become diseases requiring individualised case reporting.	Second dose MMR vaccine.		2nd dose at 11-13 years	
1996	National Seroprevalence Survey.				
1998					The "Health for all policy for the twenty-first century" (Health 21) introduces the goal of eliminating endemic measles by 2007.
1999		Second dose of MMR vaccine brought forward.	95%	2nd dose at 3-6 years	
2000	National Measles Elimination Plan: enhanced measles surveillance.				

Table 1
(continue)

Year	Surveillance	Childhood vaccination schedule			
		Vaccination	1st dose coverage	Age of administration	WHO European Region elimination and verification process
2005		Most European countries incorporate rubella vaccination.			Rubella included in the goal of elimination. 2005-2010 Strategic Plan: elimination of endemic measles and rubella, and prevention of Congenital Rubella Infection.
2008	Adaptation of the Rubella and Congenital Rubella Syndrome Surveillance Protocol to the elimination strategy: enhanced rubella and CRS surveillance.				
2010					Elimination goal postponed to 2015, and 2018 set as horizon for certifying the elimination of measles and rubella.
2011					Regional Verification Commission for Measles and Rubella Elimination (RVC) set up.
2012		First and second dose of MMR vaccine brought forward: Interterritorial Council of the National Health System agrees on common vaccination schedule.		1st dose at 12 months; 2nd dose at 3-4 years	Updating of the Surveillance Guidelines for Measles, Rubella and Congenital Rubella Syndrome in the WHO European Region. National Verification Committee for Measles and Rubella Elimination set up.
2013	NESS 2013 Surveillance Protocols: Measles, Rubella and Congenital Rubella Syndrome. adapted to WHO-Europe surveillance guidelines. "Measles and Rubella Elimination Status Report, Spain 2010-2012" drawn up.				For the first time, WHO-Europe requests Member States to submit a "Measles and Rubella Elimination Status Report". WHO-Europe "Package for accelerated action: 2013-2015".

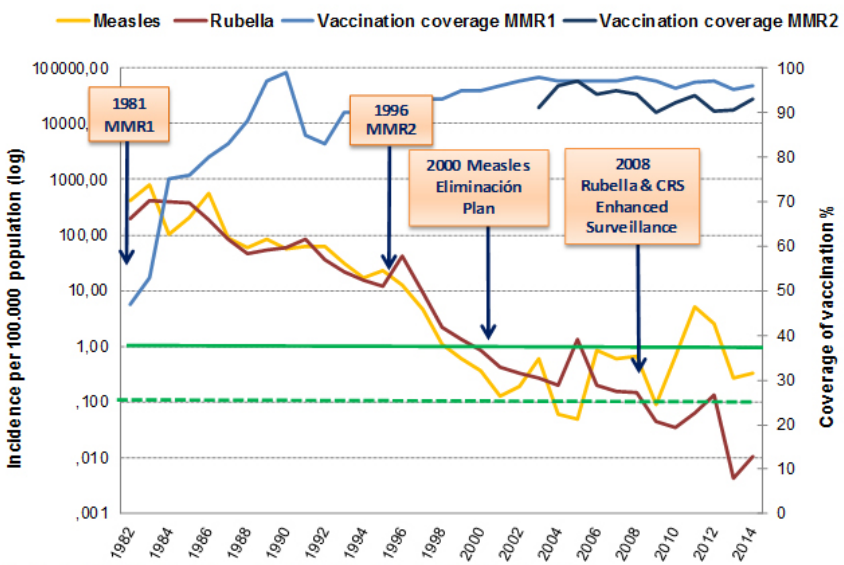
clinical samples from regional laboratories for further characterization of measles and rubella viruses.

The Plan also sets up a bidirectional continuous flow of information at both central and regional levels. Every region will notify cases of measles, rubella and CRS. The NCE will assess, summarize and disseminate periodically all epidemiological information, as well as every performance indicator of the surveillance system.

As European countries incorporate systematic rubella vaccination into their vaccination schedules, WHO-Europe envisages the possibility of adding the goal of eliminating rubella to that of eliminating measles. The 2005-2010 Strategic Plan for the European Region[7] added control of congenital rubella and elimination of endemic rubella to that of elimination of measles. Spain met the requirements of high immunization coverages and low incidence of rubella but, in order to tackle the goal of elimination, it needed to reinforce rubella and CRS surveillance and integrate this into its surveillance of measles. In 2008, the Protocol for Rubella and CRS Surveillance in Spain in the Elimination Phase was approved as an extension to the measles elimination plan (table 1 and figure 1).

An active search within hospital admissions was established in order to make the CRS Surveillance System more comprehensive. The search focused on admissions of children up to 12 months old diagnosed at discharge under code CIE9-MC:771.0 (table 2).

Figure 1
Incidence of measles and rubella. Vaccination coverages with MMR vaccine. Spain, 1982-2014



Plan Nacional de Eliminación de Sarampión y Rubéola. Centro Nacional de Epidemiología. ISCIII. Coberturas de Vacunación. Ministerio de Sanidad, Servicios Sociales e Igualdad. INE: padrón municipal.

Table 2
Congenital Rubella Syndrome (CRS) according to mother's place of origin and year: Spain, 1997-2014

	Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Europe	Spain	1	1							1										3
	Romania																1	1		2
	Poland												1							1
America	Dominican R																1			1
	Colombia									1										3
Africa	Morocco							1	1				1						1	4
	Malawi													1						1
	Equatorial Guinea			1																1
	Unknown									1										1
Asia	Pakistan																1			1
	Philippines	1																		1
Unknown		1	1																	2
Total		3	2	1	0	0	0	1	1	5	0	0	2	1	0	0	3	1	1	21

Sources: Carnicer- Pont D et al. Eliminating congenital rubella syndrome in Spain: does massive immigration have any influence? Eur J Public Health. 2008; 18:688-90. Measles and Rubella Elimination Plan. National Centre for Epidemiology. CIII Institute of Health

MONITORING THE VERIFICATION AND ELIMINATION PROCESS

Notwithstanding the large-sized measles outbreaks which occurred in Europe between 2009 and 2012, important progress has been made towards elimination, and 2018 has been proposed as the time horizon for certifying elimination of measles and rubella in the Region.[9]

WHO-Europe has established a process for verifying such elimination,[10] by adopting strategies similar to those used for eradication of smallpox and elimination of poliomyelitis. To ensure transparency, the process is supervised by an independent panel on the following basis: in each country by its respective National Verification Committee (NVC); and at the regional level by the Regional Verification Commission (RVC).

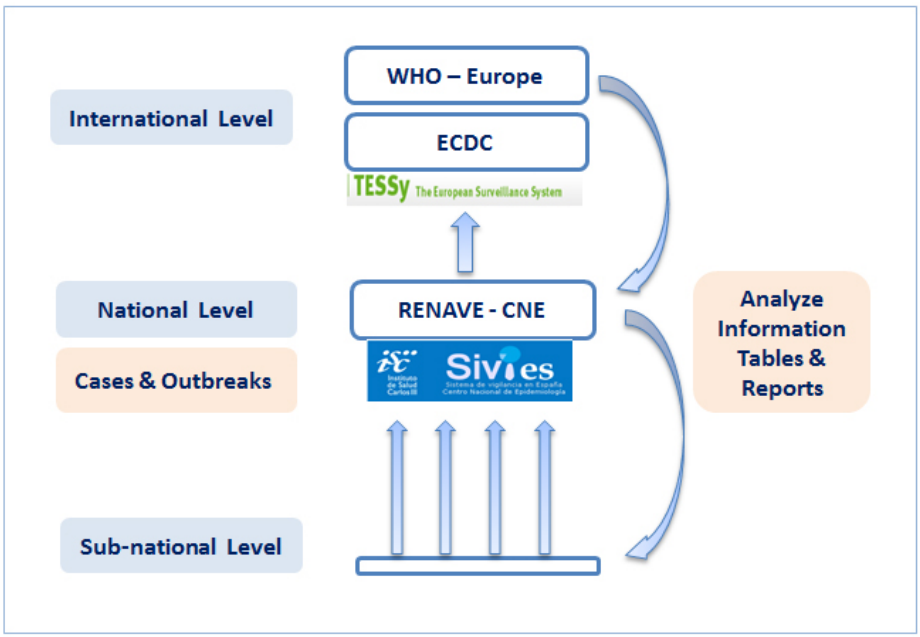
Guidelines for surveillance, investigation and response of measles and rubella outbreaks have been updated.[11,12]

A measles and rubella report is prepared by the NVC on a yearly basis. It contains an update and a summary of the elimination process. The section about surveillance is devoted to documenting that no endemic measles or rubella transmission occurred at national level. It includes detailed information on the epidemiology of cases and outbreaks, molecular epidemiology, and the quality of the surveillance system. The report is submitted to the RVC for evaluation and reviewing which then publishes the results, and its conclusions about the progress achieved in each Member State and in the Region as a whole.[13]

MEASLES, RUBELLA AND CRS SURVEILLANCE IS INTEGRATED INTO THE NESS

The National Epidemiological Surveillance Network is a decentralized surveillance system, coordinated by the Ministry of Health (MoH) and the Carlos IIII Institute of Health. Surveillance is mandatory, passive, it covers the entire

Figure 2
Information circuit: case reporting and feedback



population, it is based on the case definition and it includes laboratory information. SiVieS is the computing platform that manages all information regarding SNDs cases and outbreaks notified to NESS. The NCE looks after the system security (figure 2).

In SND surveillance in general, and in measles and rubella surveillance in particular, all levels of the National Health System (NHS) take part. At a local level, primary- and specialized-care physicians, both public and private, report all suspected cases of measles, rubella and CRS as a matter of urgency to the epidemiological surveillance services of the relevant regional authority. The surveillance services supported by local labs kick start the investigation process, forward samples to the NRL-MR, establish firewall measures to contain the transmission, and notify their counterparts at national level as soon as possible (figure 2).

The NCE receives epidemiological questionnaires of suspected cases of measles, rubella and CRS, which are initially classified as "cases under investigation". These questionnaires are constantly updated until a final case classification is reached.[6] When the magnitude of the outbreak or the spread pattern might require additional coordination measures, an additional report is submitted to the Health Alert and Emergency coordination Centre at the MoH which in turn notifies the EU Early Warning and Response System and the WHO, in accordance with International Health Regulations.[14]

Table 3
Measles and rubella surveillance: case and outbreak definitions

Classification by method of case confirmation	
Laboratory-confirmed case	A suspected case that meets the laboratory criteria for case confirmation.
Epidemiologically linked case	A suspected case that has not been adequately tested by laboratory and that was in contact with a laboratory-confirmed case 7–18 days (measles) or 12-23 days (rubella) before the onset of rash.
Clinically compatible case	A suspected case that has not been adequately tested by laboratory and has not been epidemiologically linked to a confirmed measles or rubella case.
Discarded case	A suspected case that was investigated and discarded, either through negative results of adequate laboratory testing for measles and rubella or by an epidemiological link to a laboratory-confirmed case of another disease; in addition, IgM-positive cases in recent vaccine recipients can be discarded if they meet all of the following criteria: • history of vaccination with relevant vaccine seven days to six weeks prior to specimen collection; • onset of rash 7−14 days after vaccination; • no evidence of virus transmission revealed by active search in community; • and no history of travel to areas in which the virus is known to be circulating.
Classification by origin of infection	
Endemic Case	Laboratory or epidemiologcally-linked confirmed cases of measles or rubell resulting from endemic transmission of measles or rubella virus Endemic Transmission: continuous transmission of indigenous or imported measles or rubella virus that persists for a period of 12months or more in a defined geographical area.
Imported case	A case exposed outside the country during the 7–18 days (measles) or 12–23 days (rubella) prior to rash onset as supported by epidemiological and/or virological evidence
Import-related case	A locally-acquired measles or rubella infection occurring as part of a chain of transmission originating in an imported case, as supported by epidemiological and/or virological evidence. (Note: if transmission of import-related cases persists for 12 months or more, cases are no longer considered as import-related but as endemic).
Measles/Rubella Outbreak	Two o more laboratory-confirmed cases wich are temporally related (with dates of rash onset occurring between 7 and 18 days apart for measles and 2 and 46 days apart for rubella) and epidemiologically or virologically linked or both.

Source: National Measles Elimination Plan. NESS 2013 measles and rubella surveillance protocols. Eliminating measles and rubella. Framework for the verification process in the WHO European Region, 2014. Guidelines for measles and rubella outbreak investigation and response in the WHO European Region, 2013.

Measles and rubella cases are reported monthly to WHO-Europe via the Tessy platform at the European Centre for Disease Control (ECDC) (figure 2).

INVESTIGATION AND FINAL CASE CLASSIFICATION

Any suspected clinical cases of measles and rubella shall be immediately notified and investigated in order to ascertain their source and to implement control measures designed to reduce transmission of infection in the population. In the updated 2013 SND Surveillance Protocols,[14,15] the measles, rubella and CRS protocols incorporate the latest recommendations contained in the WHO-Europe surveillance guidelines regarding the definition and classification of cases and outbreaks, specificity in the study of viruses, discarded cases and alternative diagnosis (table 3).

Epidemiological and laboratory investigation

Epidemiological questionnaires contain demographic information, clinical data (pregnancy details of women at risk of rubella), vaccination records and patient's travel history. To ensure adequate laboratory examination, three clinical samples shall be taken, namely, blood, pharyngeal exudate and urine. The recommended laboratory tests are detection of serum-IgM/IgG antibodies, isolation of the virus, and PCR test in pharyngeal exudate and urine. Integrated measles and rubella surveillance is recommended, i.e., all suspected cases of measles/rubella should undergo tests designed to investigate both infections (with serum-IgM being the test of choice). In the absence of integrated surveillance, discarded cases of measles shall always be examined for rubella and vice versa, and if these cases test negative for both diseases, they should then be additionally negative tested for Parvovirus B19 (very frequent aetiology of febrile exanthema in children)[6,8,14] (table 3).

Molecular biology of virus has seen important advances in the last decade, most notably the measles virus (genotype and haplotype/variant, mutations, phylogenetic studies).

Virological analysis has provided accurate case investigation of measles outbreaks, correct identification of the origin of the infection and appropriate evidence of successful interruption of endemic transmission. Many different haplotypes of measles circulated in Spain in 2013. Therefore no endemic transmission of measles was registered in 2013 within the national territory (figure 3).

Final case classification

Investigation of suspected cases concludes with the final case classification, namely, "confirmed" (by laboratory, epidemiological link or compatible clinical signs and symptoms) or "discarded" (figure 4).

Furthermore, confirmed cases are classified according to source of infection, i.e., imported, import-related, endemic or unknown.

In the final stage of elimination all reported measles and rubella cases would be expected to be confirmed by laboratory or epidemiological link, and be either imported or import-related cases. An imported case of measles or rubella in a highly immunized population will generate few secondary (i.e., import-related) cases and transmission will soon be interrupted due to lack of susceptible individuals. If transmission is sustained beyond 12 months, the case is deemed endemic, and any further cases linked to this outbreak would likewise be endemic (table 3). Compatible cases (not studied in the laboratory or without conclusive results) and cases of unknown origin will indicate a poor-quality investigation (figure 4).

Figure 3
Cases of measles with haplotype: Spain, 2013

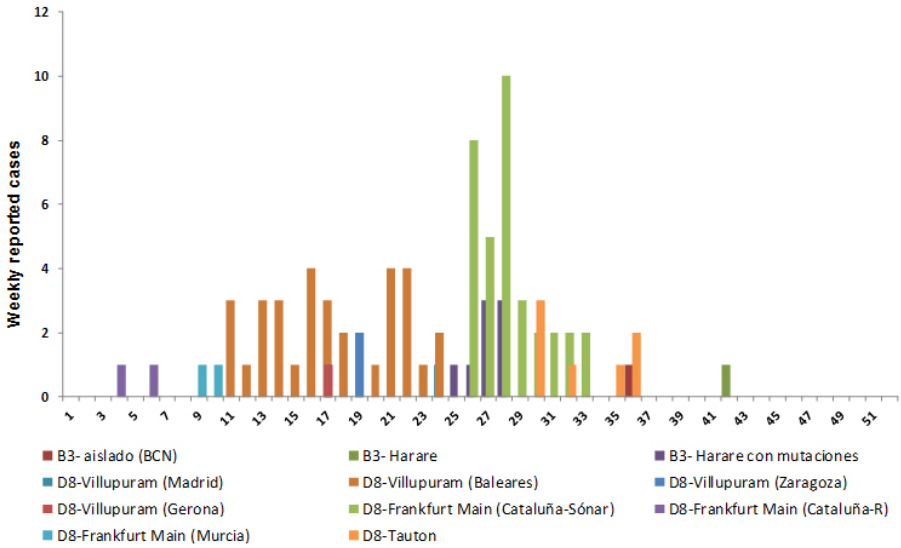
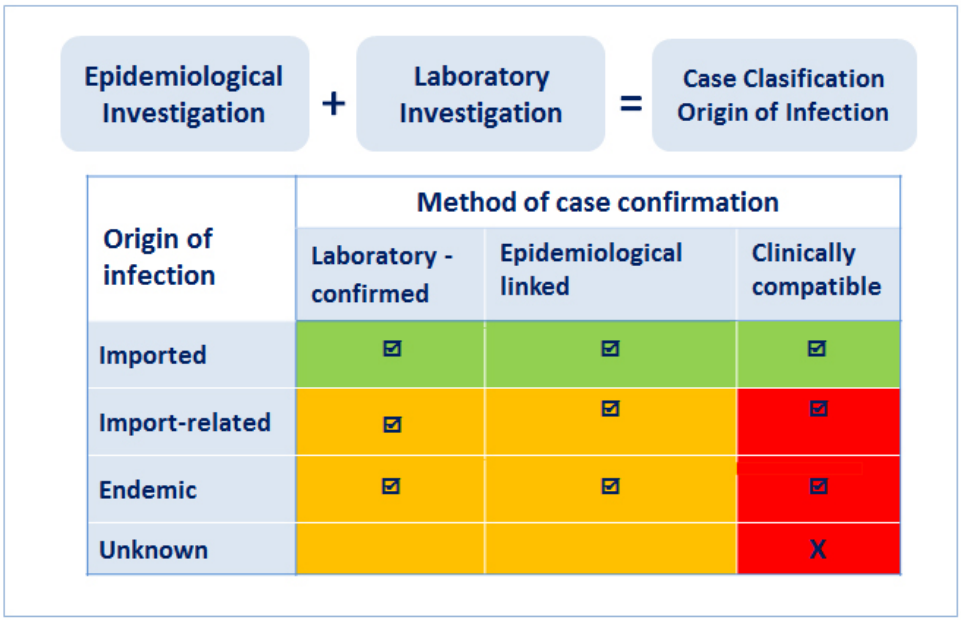


Figure 4
Final case classification



As a territory nears elimination, the proportion of discarded cases over the total amount of cases investigated would be expected to rise. Instead of virus circulation, one would expect to see sporadic cases of measles or rubella; hence, most of the suspected clinical cases of measles or rubella reported and examined by the laboratory will have a different aetiology, infectious or non-infectious. The preferred indicator to rule out measles and rubella is the IgM test. WHO-Europe warns of the hazards of using only PCR results to make a decision. Test standards vary and false negatives are likely when specimens are not adequately collected or the virus count is low. A surveillance system quality indicator in the final elimination phase is the rate of measles or rubella cases investigated and discarded per 100,000 populations. To verify that transmission has been interrupted in a given territory, mere documentation of non-confirmed cases of measles or rubella is not enough. One has to show the surveillance system is detecting suspected cases, these are being investigated, they are being discarded and, if possible, a definitive alternative diagnosis has been successfully reached. In the elimination phase, discarded cases have the same epidemiological value as confirmed cases. All suspected clinical cases reported, investigated and discarded for measles or rubella shall be notified to the NESS, and thence to WHO-Europe. The discarded case rate is a quality indicator of surveillance being conducted.

INFORMATION CIRCUIT

Measles and rubella surveillance is an ongoing feedback-dynamic system, which generates systematic reports (figure 2). The NCE regularly reports to the National Epidemiological Surveillance Network, National Reference Laboratory (NRL-MR), MoH, and Health Alert and Emergency Coordination Centre. A weekly report is drawn up, with updated cumulative tables for the year, showing number and classification of measles, rubella and CRS reported cases (table 4). Similarly, a chart is distributed, showing the situation of measles and rubella outbreaks reported for the running year, the outbreak status, and the main characteristics (number of cases, origin, scope and type of propagation, genotype and haplotype responsible, plus any measures implemented to control the outbreak).

In addition, the NCE publishes an Annual Report on Measles, Rubella and CRS Surveillance in Spain, with a detailed analysis of the surveillance results, the surveillance system quality indicators and any progress made towards elimination in the context of the situation in Europe and around the world.[16,17]

At international level, WHO-Europe periodically sends countries information on reported cases and outbreaks of measles and rubella, and draws up surveillance quality indicators for each of the 53 reporting countries.[18,19] ECDC regularly issues a measles and rubella surveillance report. Summarizing vaccination coverages and measles and rubella status for EU/EEA countries, and assessing progress towards elimination of both diseases.[20]

SURVEILLANCE QUALITY INDICATORS WHO

Verification of interruption of measles and rubella endemic transmission needs not only the absence of confirmed cases, but evidence that suspected cases are being investigated and discarded. Lack of positives shall be documented, national coverage of surveillance system ensured and performance requirements adequately met. WHO-Europe supports a standard set of performance indicators for surveillance systems. Indicators will measure how suitable the first notification to regional authorities of suspected cases is; how adequate investigation for every

Table 4
Classification of suspected cases of measles: cumulative number cases from 1 January 2015 to 27 July 2015 (week 30)

GOBIERNO DE ESPAÑA · MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD · Instituto de Salud Carlos III

Centro Nacional de Epidemiología
Lunes 27 de julio de 2015

CLASIFICACIÓN DE LOS CASOS SOSPECHOSOS DE SARAMPIÓN
Casos acumulados desde 01/01/2015 hasta 27/07/2015 (Semana 30)

CC.AA	Casos notificados (1)	En Investigación	Casos Confirmados					Casos descartados (5)				
	Total	Total	Autóctono (2)	Importado (3)	Rel. con caso importado (4)	Desconoc.	Total	Rubéola	Casos Vacunales	Otro Diagnóstico (6)	Sin Diagnosticar	Total
ANDALUCIA	26	-	-	2	13	2	17	-	-	3	6	9
ARAGÓN	1	-	-	-	1	-	1	-	-	-	-	-
ASTURIAS	-	-	-	-	-	-	-	-	-	-	-	-
BALEARES	4	-	-	-	-	1	1	-	-	-	3	3
CANARIAS	5	-	-	-	-	-	-	-	1	2	2	5
CANTABRIA	1	-	-	-	-	-	-	-	-	-	1	1
C. LA MANCHA	5	-	-	-	-	3	3	-	-	1	1	2
CASTILLA Y LEÓN	1	-	-	-	-	-	-	-	1	-	-	1
CATALUÑA	28	-	-	-	4	3	7	-	1	4	16	21
C. VALENCIANA	7	-	-	-	-	-	-	-	-	3	4	7
EXTREMADURA	-	-	-	-	-	-	-	-	-	-	-	-
GALICIA	-	-	-	-	-	-	-	-	-	-	-	-
MADRID	6	-	-	2	2	1	5	-	1	-	-	1
MURCIA	-	-	-	-	-	-	-	-	-	-	-	-
NAVARRA	1	-	-	-	-	-	-	-	-	1	-	1
PAIS VASCO	-	-	-	-	-	-	-	-	-	-	-	-
RIOJA	-	-	-	-	-	-	-	-	-	-	-	-
CEUTA	-	-	-	-	-	-	-	-	-	-	-	-
MELILLA	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	85	-	-	4	20	10	34	-	4	14	33	51

1: Caso notificado sospechoso: Todo caso que cursa con exantema máculo-papular, fiebre alta y alguno de los siguientes síntomas: tos, coriza o conjuntivitis.
2: Caso confirmado autóctono: Caso notificado confirmado por laboratorio o caso vinculado en espacio y tiempo con un caso confirmado por laboratorio.
3: Caso confirmado importado: Caso notificado confirmado por laboratorio si el país de adquisición de la infección es diferente de España.
4: Caso relacionado con caso importado: Caso que forma parte de la primera cadena de transmisión originada por un caso importado
5: Caso descartado: Caso notificado con muestras de laboratorio negativas al virus del sarampión.
6: Otros diagnósticos: Identificación de otros virus diferentes de Rubéola: Sd. Kawasaki, Infección por estreptococo, Enfermedad mano-pie-boca, Probable reacción alérgica, mononucleosis infecciosa, Roseola infantil por VHH7, Eritema infeccioso, Pustulosis exantemática aguda generalizada, PARVOVIRUS B19

case is followed through; how sensitive the system is according to the rate of investigated and discarded cases for every 100.000 people; how well laboratories perform analyzing the amount of cases being investigated and the percentage of genotype-matched outbreaks; and how capable the overall system is in order to establish the origin of the infection through the rate of unknown cases.[10] Performance indicators help to identify deficiencies in surveillance systems and to come up with improvements. Quality indicators for measles and rubella are calculated annually and included in the status report which is sent to WHO-Europe and in the report on the national elimination plan. Regarding the latter, in 2013 the measles surveillance system failed to achieve the quality goal set for timeliness of notification (late reporting has the effect of delaying implementation of control measures and the appearance of secondary cases more likely) and for the notified and discarded case rate (failure in the identification of suspected cases). By contrast, laboratory investigations, successfully met all quality goals (table 5). In the last phase of the elimination process, the difficulty faced by surveillance lies in clinical suspicion and prompt notification of cases. Once cases enter the circuit, they are properly investigated and classified (table 5).

Table 5
Quality indicators. Measles and rubella surveillance: Spain, 2013

Indicator	Description	Target	Measles	Rubella
Timeliness of notification (Tn)	Percentage of measles or rubella case-based reports to surveillance system submitted within 48 hours of rash onset	≥80%	42.8%	23.0%
Timeliness of investigation (I)	Percentage of suspected measles or rubella cases with an adequate investigation initiated within 48 hours of notification	≥80%	92.2%	64.7%
Rate of laboratory investigation (L)	Percentage of cases suspected for measles or rubella with adequate specimens collected and tested in a proficient laboratory	≥80%	84.2%	94.1%
Rate of discarded cases (D)	The rate of suspected measles or rubella cases investigated and discarded as non-measles or non-rubella cases using laboratory testing in a proficient laboratory and/or epidemiological linkage to another confirmed disease	≥2 casos por 10^5 hab.	0.18	0.03
Viral detection (V)	Percentage of laboratory-confirmed chains of transmission of measles or rubella with samples adequate for viral detection collected and tested in an accredited laboratory	≥80%	72.7%	0.0%
Origin of infection identified (O)	Percentage of measles or rubella cases for which the origin of infection (e.g. imported, import-related or endemic) has been identified	≥80%	96.2%	100%

CONCLUSIONS

Key points in the final phase of elimination of measles and rubella are to maintain surveillance system quality and to record the evidence. Currently, the measles and rubella surveillance system is experiencing difficulties in obtaining all the data required to document elimination. The less frequent measles or rubella incidence is, the more difficult identification of possible cases becomes. Mainly due to: lack of specificity of their onset phases, abnormal cases and cases among individuals previously vaccinated. The only way to enhance sensitivity in the identification of measles and rubella cases would be to raise awareness among healthcare professionals, by recommending laboratory diagnosis of measles and rubella to be included at any age, in the differential diagnosis of all cases of fever and exanthema.

For all suspected cases, three clinical samples (serum, pharyngeal exudate and urine) shall be collected and processed at an appropriate laboratory, in order to confirm or discard the case, characterize the virus, and thereby ascertain the measles- and rubella-importation pattern in the territory.

All suspected cases of measles and rubella that are investigated and later discarded, shall be reported from the regional to the central level. This procedure would improve the quality of surveillance, and also document elimination of endemic transmission of both diseases in our territory.

ACKNOWLEDGEMENTS

We should like to thank all members of staff in charge of measles and rubella surveillance in the National Epidemiological Surveillance Network.

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