



EUROPE



**STRATEGIC PLAN
FOR MEASLES
AND CONGENITAL
RUBELLA INFECTION
IN THE EUROPEAN
REGION OF WHO**



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ABSTRACT

*Cover photo:
Proud, pleased and
protected against
measles and rubella,
Moldova 2002.*

Measles and rubella remain important causes of vaccine-preventable disease and death in the European Region of WHO. Although an increasing number of Member States provide highly effective vaccines to prevent both of these diseases as part of their routine Expanded Programme on Immunization programmes, challenges remain to improve coverage in the countries currently using the vaccines and to introduce rubella vaccine in the countries that have not yet implemented a programme. The Strategic Plan for Measles and Congenital Rubella Infection in the European Region of WHO identifies key strategies to meet the targets for the European Region of interrupting indigenous measles transmission and preventing congenital rubella infection (< 1 case of congenital rubella syndrome per 100 000 live births) by 2010. Progress towards meeting these targets will be reviewed in 2005 in accordance with the 2005 global assessment of measles control.

Keywords

MEASLES
RUBELLA
CONGENITAL RUBELLA INFECTION
CONGENITAL RUBELLA SYNDROME
MUMPS
IMMUNIZATION
SURVEILLANCE

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1 INTRODUCTION

Measles is a highly infectious disease that continues to cause mortality and morbidity in both developing and industrialized countries. Globally, measles remains the leading cause of vaccine-preventable childhood mortality, with more than 31 million cases and 777 000 deaths every year (1). The WHO Global Strategic Plan for Measles, published in 2001 (2), provides a broad agenda and framework to ensure a sustainable reduction in measles mortality and to make significant progress towards interrupting measles transmission in regions and countries with elimination objectives. The strategy focuses on strengthening existing immunization services and identifies a joint assessment by 2005 to review progress towards achieving the targets and assessing the feasibility of global eradication of measles.

Measles transmission has been interrupted in a number of countries by the implementation of routine and supplementary immunization programmes with very high vaccination coverage (>95%) (3). However, measles remains an important preventable health problem in countries that continue to have outbreaks and epidemics because of inadequate vaccine coverage. Accelerating activities to interrupt the indigenous transmission of measles can promote equity in health care by providing measles vaccine to underserved and vulnerable populations, by building on existing immunization services and by contributing to the further development of effective health systems (4).

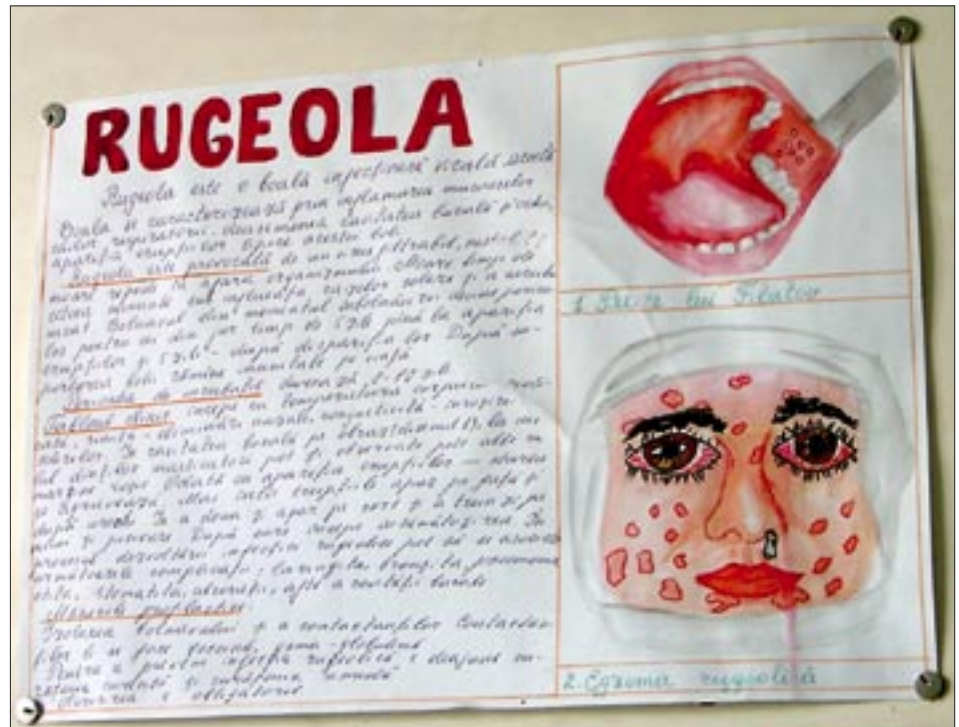
Rubella is usually a mild febrile maculopapular rash illness in childhood. Its public health importance relates to the teratogenic effects of congenital rubella infection (CRI), which can lead to miscarriage, fetal death or the birth of an infant with congenital rubella syndrome (CRS).

Most countries in the European Region of WHO administer combined measles, mumps and rubella vaccine (MMR). Measles and rubella vaccines can induce long-term immunity with an effectiveness of 90–95%. However, interrupting the indigenous transmission of measles requires maintaining very low levels of susceptibility throughout the population (5). Preventing CRI requires maintaining low levels of susceptibility among women of childbearing age.

Most western European countries have used MMR in their childhood immunization programmes for a number of years, although in many the vaccine coverage has been low. Since programmes with low vaccine coverage can reduce rubella virus circulation among children, a larger proportion of unvaccinated children will reach adolescence and adulthood without being infected, creating an increased pool of susceptible women of childbearing age. During a rubella outbreak, these women will have an increased risk for infection, increasing the number of children with CRI and the CRS burden compared with countries where rubella vaccine has never been used (6). Countries with low levels of coverage with rubella vaccine have an op-

portunity to markedly reduce the risk of and burden of CRI by linking prevention activities with accelerated control of measles.

This integrated Strategic Plan focuses on measles and CRI; however, it will also provide an opportunity to enhance mumps control in the countries using MMR. Annex 4 provides details on mumps control.



2 STATUS IN THE EUROPEAN REGION

2.1 BACKGROUND FOR THE DISEASE CONTROL INITIATIVES IN THE EUROPEAN REGION

Almost all countries in the European Region have had measles control programmes for many years. However, in some western European countries, low social awareness of the importance of measles and the need for better risk communication have remained impediments to achieving good measles control. In the newly independent states of the former USSR (NIS), the transition of health care system infrastructure and linking resources to immunization programmes have been the challenges to achieving and maintaining the high degree of population immunity necessary for interrupting indigenous measles transmission. This variation in performance across the Region has resulted in an accumulation of susceptible younger and older people in many countries not maintaining very high coverage with two doses of measles vaccine, posing a threat of future outbreaks. Interrupting indigenous measles transmission and preventing CRI requires that countries strengthen their routine immunization and surveillance programmes and also identify and address susceptible populations.

2.2 PROGRESS IN CONTROLLING MEASLES, RUBELLA AND CONGENITAL RUBELLA INFECTION

Progress in disease control is described here as reported to the WHO Regional Office for Europe by each Member State from 1991 to 2001. As the vaccine programme history, current disease control and reporting practice show some subregional patterns, presentation in this section is by subregion: western Europe (23 countries including Israel), central and eastern Europe (CEE; 16 countries including Turkey) and the NIS (12 countries) (Annex 1).

2.3 IMMUNIZATION POLICY

All countries in the European Region routinely used a live attenuated measles vaccine, the vast majority since the 1980s or before (Annex 1). Only one country had a one-dose policy. All but four countries delivered the first dose of measles vaccine after the first year of life, and the second dose of measles vaccine was delivered between 18 months and 13 years of age. More than 85% of countries in the Region used multi-antigen vaccines or gave two vaccines at the time of the first and/or second dose of measles vaccine. In western Europe, all countries had two-dose MMR programmes. Twelve of 16 CEE countries had one- or two-dose MMR programmes; three had no childhood rubella programme, but two had a programme targeting teenage girls. Only 2 of 12 NIS had one- or two-dose MMR programmes; 10 did not have rubella programmes.

2.4 IMMUNIZATION COVERAGE

2.4.1 Measles



Clinical measles
(Source:
Health Canada)

In 2001, 36 of the 51 countries in the Region reported information on coverage for measles-containing vaccines. Nineteen reported first-dose coverage of > 95%, and 16 reported first- and second-dose coverage of > 95%.

Annex 2 shows a 5-year average for each country. Among the 50 countries with coverage data, coverage levels ranged from 60% to 100%. The population-weighted mean measles vaccine coverage was 78% for 22 western European countries, 89% for the 16 CEE countries and 96% among the 12 NIS. Five CEE countries had undertaken immunization coverage surveys with varying methods, which correlated well with the reported coverage estimated by the administrative method. Ten NIS had undertaken immunization coverage surveys with varying methods during 1999 and 2000, with significant discrepancies in some countries compared with coverage estimates obtained using administrative methods.

Five European countries have undertaken supplementary national campaigns in recent years. The United Kingdom immunized children 5–16 years old in 1994 with measles and rubella vaccine (MR) (7); Romania immunized children 7–18 years old with measles vaccine and girls 15–18 years old with MR in 1999 (8); Albania immunized children 1–15 years old with MR in 2000 (9); Kyrgyzstan immunized people 7–25 years old with MR in 2001 (10); and the Republic of Moldova immunized people 8–19 years old and other students and military personnel 20–23 years old with MR in 2002.

2.4.2 Rubella



Rubella rash
(Source:
Health Canada)

For most countries using rubella vaccine, rubella coverage is identical to the reported measles coverage because MMR is used. The Regional Office has not routinely collected data on rubella vaccine coverage from the two countries that use single-antigen rubella vaccines.

2.5 SURVEILLANCE

2.5.1 Measles

The annual number of measles cases reported in the European Region declined by 78% between 1991 and 2001. Annex 2 shows the average incidence for the five most recent years for which national data are available. All three subregions had marked declines in the total number of measles cases (Fig. 1), although outbreaks have been reported from a number of countries. There are many national surveillance methods for measles, with some countries having none, some having sentinel-based methods and others having national case-based reporting systems. Most countries do not report laboratory-confirmed cases.

| WHO subregion | 1991 | | 2001 | |
|----------------------------|----------------|--------------------------|---------------|--------------------------|
| | No. of cases | % of countries reporting | No. of cases | % of countries reporting |
| Western Europe | 229 447 | 83 | 16 575 | 96 |
| Central and eastern Europe | 31 585 | 100 | 30 782 | 94 |
| Newly independent states | 43 122 | 100 | 20 402 | 100 |
| Total | 304 184 | 92 | 67 759 | 96 |

Table 1: The number of measles cases in the European Region of WHO reported by subregion, 1991 and 2001

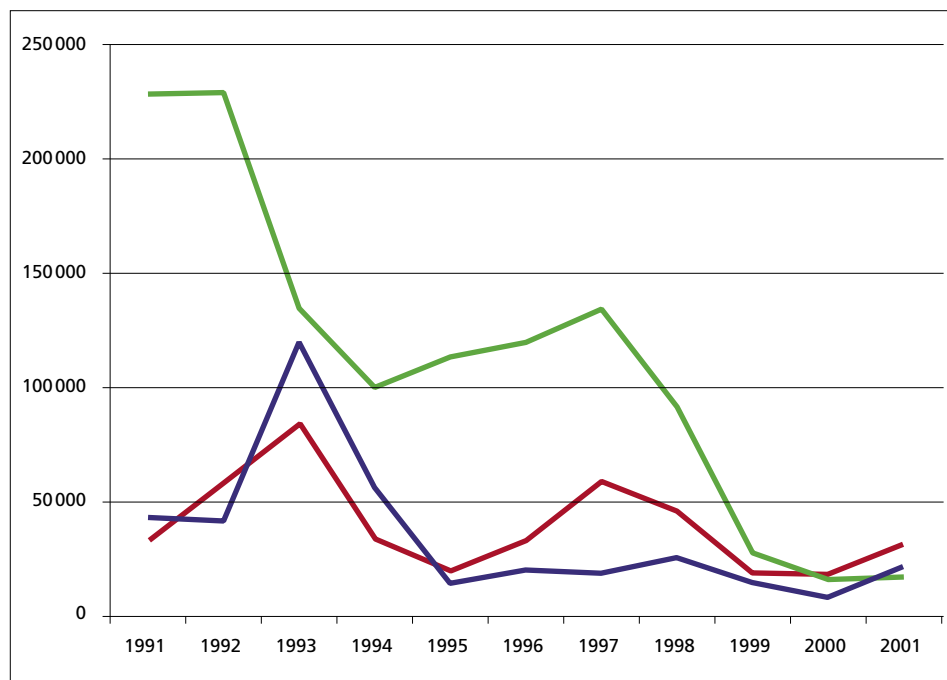


Figure 1: Number of measles cases per year in the European Region, 1991-2001

2.5.2 Rubella and CRI

The reported annual number of rubella cases in the European Region has increased 75% during the last decade (Table 2). While the number has declined in western Europe and in CEE countries, in the NIS rubella continues to circulate freely in most countries, with a large epidemic in 1999–2001 (Fig. 2). Annex 2 shows the 5-year average incidence of rubella by country. Clusters of cases of CRS have occurred recently in southern and eastern Europe (6,11). Many countries do not undertake CRS surveillance or have systems with low sensitivity: 36 countries reported a total of 53 CRS cases in 2000.

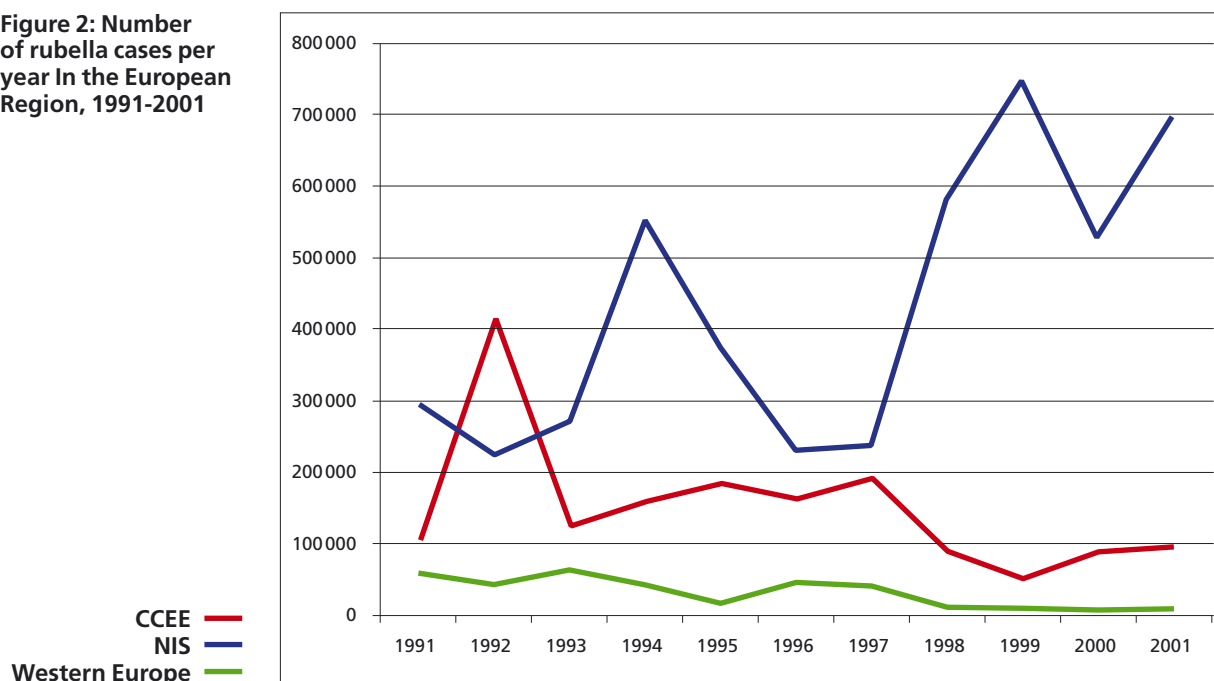
2.6 SEROSURVEILLANCE

Serosurveys, using residual sera, were conducted during 1994–1998 in seven western European countries participating in the European Sero-Epidemiology Network. The observed population susceptibility patterns for both measles and rubella appeared to correlate with the incidence of these diseases detected through disease surveillance (12).

Table 2: The number of rubella cases in the European Region of WHO reported by subregion, 1991 and 2001

| WHO subregion | 1991 | | 2001 | |
|----------------------------|----------------|--------------------------|----------------|--------------------------|
| | No. of cases | % of countries reporting | No. of cases | % of countries reporting |
| Western Europe | 61 680 | 70 | 5 954 | 78 |
| Central and eastern Europe | 106 112 | 94 | 94 642 | 88 |
| Newly independent states | 292 314 | 100 | 704 589 | 100 |
| Total | 460 106 | 84 | 805 185 | 86 |

Figure 2: Number of rubella cases per year in the European Region, 1991-2001



2.7 ECONOMIC COSTS

The costs of measles and measles control have recently been assessed in 10 western European countries and Canada (13). The overall societal costs were estimated to be US \$150 million or US \$0.40 per person; however, the highest costs per capita were estimated to occur in Italy, where vaccine coverage was lowest and the incidence of disease was the highest. This analysis supports the conclusion that good measles control is likely to save money compared with poor control.

Cost-benefit analyses of preventing CRS either with rubella vaccine alone or with MMR have been conducted in Denmark, Finland and Norway (14-16). Benefit-to-cost ratios of greater than one have been reported in all of these studies.

3 THE STRATEGIC PLAN FOR THE EUROPEAN REGION

HEALTH21 (17), the health policy framework prepared by WHO Regional Office for Europe and endorsed by the WHO Regional Committee for Europe in 1998, identified a number of targets for communicable disease control in the European Region, including eliminating measles by 2007 and controlling CRS and mumps by 2010. As a precursor to the targets set, age-specific susceptibility targets necessary to interrupt indigenous measles transmission were established (18). Subregional workshops focusing on the identification of susceptible cohorts and supporting the development of national plans were conducted during 1999–2000, and more than half the Member States participated.

Subsequent progress in developing national plans and taking action has been limited, although interest has increased among Member States. As the current measles target for 2007 is being increasingly recognized as difficult to achieve and combined antigen vaccines containing measles and rubella are being used extensively in the Region, the operational target for measles is now aligned with the HEALTH21 CRS target. An assessment will occur during 2005 in line with the 2005 global assessment of measles control followed by submission of the revised plan to the WHO Regional Committee for Europe for approval.

The overall objectives of the Strategic Plan for 2010 are:

- to interrupt the indigenous transmission of measles;¹ and
- to prevent CRI (< 1 case of CRS per 100 000 live births).

Six key strategies are recommended for meeting these objectives:

- achieving and sustaining very high coverage with two doses of measles vaccine through high-quality routine immunization services;
- providing a second opportunity for measles immunization through supplementary immunization activities to populations susceptible to measles, consistent with national targets for measles control;
- using the opportunity provided by supplementary measles immunization activities to target populations susceptible to rubella where appropriate;
- ensuring protection to women of childbearing age by achieving high coverage with rubella vaccine;
- strengthening surveillance systems by vigorous case investigation and laboratory confirmation; and
- improving the availability of high-quality, valued information for health professionals and the public on the benefits and risks associated with immunization against measles and rubella.

¹ The situation in which sustained virus transmission cannot occur and secondary spread from importation of disease will end naturally without intervention. For additional information, see *Surveillance guidelines for measles and congenital rubella infections in the European Region* (19).

4 AN INTEGRATED STRATEGY FOR CONTROLLING MEASLES AND CONGENITAL RUBELLA INFECTION

Using an integrated immunization approach to achieve accelerated measles and rubella control could significantly reduce both targeted diseases while maximizing programme efficiencies. As of 2002, 78% of countries in the European Region were using combined vaccine. Further, countries approaching the interruption of indigenous measles transmission will find that a large proportion of suspected measles cases are rubella. Decreasing the incidence of rubella will allow countries to strengthen their routine measles surveillance without overburdening the system due to detection of cases of rash and fever illness associated with other viral infections.

The integrated strategy sets priorities for measles control, identifies three stages of measles control and includes options allowing countries flexibility as to whether to include rubella vaccine in their measles control programmes.

Countries developing a national strategy for meeting the objectives of the Strategic Plan need to assess both their current and past levels of measles and rubella control to be able to systematically plan the future activities needed. Countries can categorize their present level of measles and rubella control by estimating the susceptibility of their population. This susceptibility profile can be derived from an assessment of historical age-specific data on disease incidence and vaccine coverage, and if necessary, supplemented with data from standardized serosurveys. Member States can be classified into one of three stages (Table 3).

Stage I: limited measles control

Countries with first-dose measles vaccine coverage consistently $\leq 90\%$ have had an accumulation of susceptible cohorts in the population over time. Measles epidemics continue to occur, with inter-epidemic periods of ≤ 5 years, often in younger age groups with more serious outcomes.

Stage II: measles control

Countries with verified measles vaccine coverage sustained at a high level (90–95%) with at least one dose of measles vaccine continue to have measles epidemics, but with an inter-epidemic period of > 5 years, often primarily affecting older age groups.

Stage III: approaching measles elimination

Countries with measles vaccine coverage sustained at a very high level ($> 95\%$ nationally; $> 90\%$ in all districts) with two opportunities for measles vaccination that have addressed older susceptible age cohorts. There is evidence that transmission of indigenous measles has been interrupted.

Stage IIIa: prevention of CRI is *not* an integrated part of the national plan for measles.

Stage IIIb: prevention of CRI is an integrated part of the national plan for measles.

Countries have historical rubella vaccine coverage sustained at high levels or susceptible cohorts of women of childbearing age have been protected. There is evidence of prevention of CRI, with the incidence of CRS < 1 per 100 000 live births (see the section on immunization).

| Stage | Level of control | Immunization coverage | Epidemiological situation |
|-------|---|--|--|
| IIIb | Approaching measles elimination and prevention of CRI | Maintained very high (>95%) coverage with two doses of measles vaccine and Maintained high coverage with at least one dose of rubella vaccine (>90%) among women of childbearing age | <ul style="list-style-type: none"> • Interruption of indigenous measles transmission • Low level of measles susceptibility in the population • CRS incidence < 1 per 100 000 live births • Low levels of rubella susceptibility among women of childbearing age |
| IIIa | Approaching measles elimination | Maintained, very high (>95%) coverage with two doses of measles vaccine | <ul style="list-style-type: none"> • Interruption of indigenous measles transmission • Low level of measles susceptibility in the population |
| II | Measles control | Maintained high (>90%) coverage with at least one dose of measles vaccine | <ul style="list-style-type: none"> • Low morbidity with periodic measles outbreaks • Measles inter-epidemic period > 5 years |
| I | Limited measles control | Low to moderate (\leq 90%) coverage with measles vaccine | <ul style="list-style-type: none"> • Substantial morbidity with frequent outbreaks • Measles inter-epidemic period \leq 5 years |

Table 3: Stages of control of measles and CRI

5 IMMUNIZATION STRATEGIES

Achieving Stage III control of measles requires reducing the pool of non-immune individuals in the population to the point at which sustained virus transmission cannot occur following an importation (19). The administration of two doses of measles vaccine is necessary, each with very high levels of coverage (> 95%), so that the vast majority of people who do not respond to the first dose of vaccine will develop immunity. Countries will need to sustain high-quality immunization services for children and to identify and address susceptible age cohorts outside the age range of their routine services to meet their measles control targets.

5.1 STRENGTHENING IMMUNIZATION SERVICES FOR A ROUTINE TWO-DOSE SCHEDULE

The requirements of measles vaccination programmes are complex, and economies of scale make the programmes highly cost-effective when other vaccines are routinely given at the same time. The first dose of measles vaccine should be delivered as soon as possible after 12 months of age in successive birth cohorts in an attempt to maintain very high vaccine coverage (> 95%) in each administrative unit. In countries where infants have a high risk of acquiring measles, the first dose of vaccine is administered at 9 months; however, these countries should consider increasing the age of the first dose to ≥ 12 months when the risk of measles has been reduced. The age at which the second dose is given depends on country-specific factors but is often at preschool age.

Country-specific approaches to increase uptake and strengthen the routine programme need to be developed in several areas, including:

- ensuring safe and effective vaccines are available and delivered using safe immunization practices;
- developing and conducting special activities to immunize subgroups that are difficult to reach;
- developing immunization tracking systems to reduce high drop-out rates;
- reducing missed opportunities and inappropriate contraindications;
- training health staff to improve the management of immunization services; and
- developing and implementing information, education and communication materials and activities for both the public and health personnel.

5.2 SUPPLEMENTARY IMMUNIZATION ACTIVITIES

All countries with susceptible cohorts older than the age of the second routine dose or with inadequate first- or second-dose coverage need to develop supplementary immunization strategies aimed at achieving very high (> 95%) coverage among the targeted groups.

Supplementary measles immunization campaigns can be an efficient method of rapidly reducing the number of susceptible individuals in the population and of maintaining this reduction if appropriately implemented (20). The interventions are technically simple, but the operational and logistical challenges are great. Campaigns should be planned very carefully, with particular attention to logistics and the safety of immunization components, and should be linked to action to strengthen surveillance and laboratory capacity. Campaigns can strengthen and enhance routine service. However, poorly planned campaigns can harm routine delivery. A number of factors are important in assessing a country's readiness:

- political commitment to eliminating measles as reflected in sustainable funding;
- a comprehensive multi-year national plan targeting measles elimination;
- technical capacity;
- adequate funding;
- strengthened and sustainable routine programmes; and
- strengthened surveillance and laboratory capacity.

There are three types of supplementary campaigns: catch-up, follow-up and focal.

5.2.1 Catch-up campaigns

Catch-up campaigns are one-time national immunization campaigns targeting multiple cohorts in whom susceptible individuals have accumulated. During the campaign, everyone in the target age group receives a supplementary dose regardless of prior disease or vaccination history. The need and capacity to undertake a catch-up campaign and the age groups to be targeted are critical parts of a national plan to eliminate measles.

The targeted age groups are determined from historical vaccine coverage data and the epidemiology of the disease in the country; serosurveys can also be used to identify the age groups not meeting age-specific susceptibility target levels (18). Catch-up campaigns need to balance the objectives of strategically reducing the number of susceptible people, allowing national targets to be met, while ensuring a cost-efficient approach, considering the ability to reach the targeted populations and the opportunities to improve immunization programme capacity.

All countries with susceptible cohorts older than the age of the second routine dose or with inadequate first- or second-dose coverage need to develop supplementary immunization strategies aimed at achieving very high (>95%) coverage among the targeted groups.

*Safe injection
practices are critical*



5.2.2 Follow-up campaigns

Follow-up campaigns are national mass immunization campaigns conducted periodically (every 3–5 years) to reach children who were not targeted by the previous mass campaign. If a country is unable to maintain very high coverage with first- or second-dose measles vaccine following a catch-up campaign, susceptible people will re-accumulate. In these situations, systematic follow-up campaigns provide a second opportunity, following an assessment based on the disease epidemiology and seroprevalence studies.

5.2.3 Focal campaigns

Focal campaigns aim to target children who have missed routine immunization and previous mass campaigns in specific geographically-limited areas. Vaccinating these children may require intensive immunization efforts, including house-to-house vaccination. Focal campaigns can be used to intervene when necessary to maintain the interruption of transmission. The need for focal campaigns is guided by vaccine coverage data and disease surveillance.

5.3 RECOMMENDED STAGE-SPECIFIC MEASLES IMMUNIZATION ACTIVITIES

5.3.1 Stages I and II

Countries need to establish the political commitment to eliminate measles. This requires advocacy, development of partner support and the development of a national plan of action.

These countries need to strengthen their routine immunization programmes, ensuring timely delivery of two doses of measles vaccine with very high coverage. Country-specific analysis is required to identify the reasons for low coverage and to develop specific strategic approaches to increase uptake and reduce missed opportunities. Effective risk communication and social mobilization are very important activities.

Achievement of very high coverage among children participating in routine immunization programmes will not decrease susceptibility among children who have not received a second dose. Once political commitment is established and routine programmes are strengthened, susceptible cohorts in the population are addressed through well-planned catch-up campaigns to enable countries to enter Stage III.

5.3.2 Stages IIIa and IIIb

In Stage III, continued efforts are required to maintain very high vaccination coverage with two doses through the routine programme. Enhancing surveillance is required to detect and monitor endemic virus transmission, providing evidence of less than adequate vaccine coverage. Effective risk communication related to adverse events following immunization needs to be maintained as well as other strategies to maintain public confidence in vaccine safety.

5.4 PREVENTING CONGENITAL RUBELLA INFECTION

The primary strategies for preventing CRI are to ensure that women of childbearing age have high levels of immunity and to reduce their risk of exposure by decreasing rubella virus circulation in the general population.

Two immunization strategies are available for preventing CRI (11):

- a selective strategy targeting adolescent girls and/or women of childbearing age; or
- a comprehensive strategy consisting of universal vaccination of boys and girls and vaccination of susceptible women of childbearing age.

Either strategy can be coupled with supplementary campaigns, delivering rubella vaccine at high coverage to multiple age cohorts susceptible to rubella. To increase efficiency, these campaigns can be linked to supplementary campaigns for measles.

Careful, long-term planning and political and fiscal commitment are prerequisites to embarking on a programme for childhood rubella vaccination. A decision on which strategy to implement will be based on the perceived burden of disease caused by CR and the availability of sustainable resources (11): Introducing a comprehensive strategy during Stage I is not recommended given the need to achieve very high vaccine coverage levels to avoid an eventual increase in the incidence of CRS; however, introducing a selective strategy could be considered.

Other factors that can support the decision-making process are:

- documented susceptibility of women of childbearing age;
- the strength of the routine immunization programme as indicated by high routine measles coverage;
- infrastructure and resources for immunization programmes for children and adults; and
- capacity for surveillance of CRS and rubella, including the ability to monitor susceptibility to rubella among pregnant women and a commitment to undertake intervention if susceptibility increases.

5.4.1 Selective strategy

A selective strategy provides direct protection to women, although rubella virus will continue to circulate in the general population. High coverage (> 90%) is required among adolescent girls and/or women of childbearing age with a single dose of vaccine to ensure low susceptibility, which should be monitored. In addition to routine immunization of adolescent girls, other approaches include routine antenatal screening with vaccination of those found to be susceptible and opportunistic vaccination of women of childbearing age in settings such as the workplace.

5.4.2 Comprehensive strategy

Vaccination of both boys and girls with very high and validated coverage (> 95%) with a single dose can interrupt rubella transmission. Susceptible women of childbearing age are also targeted, with the aim of achieving high coverage (> 90%). Susceptibility among women of childbearing age should be monitored.

5.5 RECOMMENDED STAGE-SPECIFIC ACTIVITIES FOR PREVENTING CONGENITAL RUBELLA INFECTION

5.5.1 Stage I

Countries not currently using rubella vaccine in their childhood immunization programme should work to strengthen their routine programmes and to increase coverage with measles vaccine.

5.5.2 Stages II and IIIa

Countries are strongly encouraged to implement a comprehensive or a selective strategy. The use of MR for measles catch-up campaigns provides an opportunity to introduce and accelerate the prevention of CRI. An assessment of rubella susceptibility levels among women of childbearing age may assist in deciding whether to include a supplementary rubella vaccination campaign for women older than the upper age limit for the MR campaign.

Countries in which MMR or MR has been used for many years in childhood programmes but without sustained coverage at high levels should assess the susceptibility to rubella among women of childbearing age and implement appropriate interventions to minimize this risk.

Women of childbearing age in countries in Stage I, where rubella vaccine has been used in childhood programmes, may have an especially high risk of having an infant with CRS. Public health officials need to develop immunization programmes to protect these women.

| Stage | Measles immunization | Rubella immunization |
|-------|--|---|
| IIIb | <ul style="list-style-type: none"> Sustain routine immunization coverage (> 95%) nationally with two doses | <ul style="list-style-type: none"> Maintain single-dose coverage of > 90% among women of childbearing age |
| IIIa | <ul style="list-style-type: none"> Offer second immunization opportunities when necessary through supplementary activities (follow-up) | <ul style="list-style-type: none"> Introduce and achieve single-dose coverage > 90% among women of childbearing age |
| II | <ul style="list-style-type: none"> Achieve routine immunization coverage (> 95%) nationally with at least one dose Provide a second immunization opportunity through routine or supplementary activities (catch-up) | |
| I | | |

Table 4: Summary of stage-specific immunization interventions recommended for prevention of measles and rubella in the European Region of WHO

5.5.3 Stage IIIb

Continued efforts are required to maintain high immunization coverage. Countries need to continue to monitor susceptibility among women of childbearing age. If susceptible age groups or hard-to-reach groups of women of childbearing age are identified, supplementary interventions are strongly recommended.



6 SURVEILLANCE STRATEGIES

The surveillance and monitoring activities presented here are general in nature. The *Surveillance guidelines for measles and congenital rubella infection in the European Region (19)* provide more in-depth discussion and describe best practices.

Surveillance needs to be strengthened at all levels and developed as a critical component of the health system. The use of the case definitions developed by WHO is strongly recommended (Annex 4) (21). As the level of disease control increases and

Table 5: Minimum expected surveillance activities for measles and rubella according to stage of control

| Surveillance activity for | LEVEL OF CONTROL | | |
|---------------------------|---|--|--|
| | Stage I | Stage II | Stage III |
| Measles | <ul style="list-style-type: none"> Aggregate national reporting per month by: <ul style="list-style-type: none"> ✓ age-group ✓ immunization and status ✓ geographical location | <ul style="list-style-type: none"> Stage I activities plus Move to case-based surveillance at thenational-level Establishment of capacity for laboratory confirmation | <ul style="list-style-type: none"> National case-based surveillance Investigation of every suspected measles case, including laboratory diagnostic testing |
| Outbreaks and clusters | <ul style="list-style-type: none"> Investigation of outbreaks of suspected measles as resources permit | <ul style="list-style-type: none"> Investigation of all detected outbreaks of suspected measles | <ul style="list-style-type: none"> Investigation of all detected clusters of febrile-rash illness |
| | <ul style="list-style-type: none"> Collect specimens from 5–10 cases from each outbreak to diagnose measles or rubella as the cause and to obtain measles/rubella virus for genotyping | | |
| Outbreak prediction | | <ul style="list-style-type: none"> Undertake outbreak prediction and intervention | |
| CRS | <ul style="list-style-type: none"> Conduct CRS burden study | <ul style="list-style-type: none"> Report total number of CRS cases per year Conduct case-based CRS surveillance in infants 0–11 months of age with laboratory confirmation Monitor rubella susceptibility in women of childbearing age | |
| Rubella | <ul style="list-style-type: none"> Report number of suspected rubella cases by age group and immunization status per month (optional for countries with no rubella immunization programme) | <ul style="list-style-type: none"> Report number of suspected rubella cases by age group and immunization status per month Conduct national case-based surveillance if a comprehensive rubella immunization strategy is in place | |

countries approach the interruption of indigenous measles transmission, sensitive case-based surveillance with laboratory confirmation of all suspected cases is necessary. This enhancement should be done in conjunction with the strengthening of laboratory capacity and before supplementary vaccine campaigns are undertaken. Table 5 outlines the minimum surveillance activities expected for each stage.

6.1 MEASLES SURVEILLANCE

In Stage I, clinical measles cases should be reported and aggregated nationally on a monthly basis according to age group, location and immunization status. If appropriate, countries should consider linking surveillance for severe cases to hospital-based surveillance activities for acute flaccid paralysis. As countries improve measles control and the number of cases decreases, national case-based reporting should be introduced with laboratory confirmation.

Enhanced surveillance for measles cases in Stage III is critical to optimize the detection of possible cases, with national case-based reporting and analysis of laboratory-confirmed cases. The minimum data available on cases need to include age, location, source of infection and immunization status. Surveillance for and the investigation of clusters of febrile-rash illness will be an important component. However, operational research is required to better assess the sensitivity, utility and burden on the public health system of using a clinical case definition for measles (such as febrile-rash illness with conjunctivitis) compared with using febrile-rash illness alone. An assessment of the sensitivity of the case definition used will need to consider the number of other laboratory-confirmed illnesses detected that present with rash and fever (such as parvovirus and enterovirus infection).

All suspected measles cases in Stage III should be assessed in the laboratory using detection of measles-specific immunoglobulin M (IgM) antibody and/or other confirmatory test(s) recognized by WHO. When virus is isolated or detected using genetic methods (such as polymerase chain reaction), a specimen should be submitted for genotyping. The following indicators will be useful in assessing whether measles virus transmission has occurred within a country in Stage III:

- the genotype distribution of circulating measles strains;
- the distribution, size and duration of outbreaks; and
- the target levels of age-specific susceptibility.

6.2 INVESTIGATING AND PREDICTING OUTBREAKS

In Stage I, timely case investigation of outbreaks should be undertaken as resources permit to determine the cause, including laboratory confirmation of 5–10 cases and genotyping, when possible, of any virus isolated. The priority during an outbreak is to reduce measles morbidity by improving case management and to prevent further cases by strengthening routine immunization (22).

When a country moves to Stage II, all detected outbreaks should be investigated and appropriate response taken. Outbreaks should be predicted by monitoring the possible accumulation of susceptible people using routine coverage data, case reports and serological data. This allows timely intervention, such as supplementary immunization, focused when and where necessary to avoid potential outbreaks.

In Stage III, all outbreaks of febrile-rash illness should be investigated, including serological testing and isolation of the virus or its detection using genetic methods (such as polymerase chain reaction). Outbreak prediction remains very important.

6.3 CRS AND RUBELLA SURVEILLANCE

In Stage I, implementing surveillance for CRS should be considered to obtain information on the health burden. This can build political commitment for introducing a sustainable programme for rubella immunization (23).

Surveillance for CRS is strongly encouraged on entry into Stage II or IIIa. If a programme to prevent CRI has been instituted, rubella susceptibility among women of childbearing age should be monitored to allow timely intervention when needed.

In Stage IIIb with a selective strategy for rubella immunization, aggregate reporting of suspected rubella is adequate together with case-based surveillance for CRS. If a comprehensive rubella immunization strategy is in place, national case-based reporting for rubella and CRS is indicated. Cases of febrile-rash illness compatible with measles or rubella should be investigated serologically for both. Rubella susceptibility among women of childbearing age should be monitored.

6.4 MONITORING PROGRAMME PERFORMANCE

A reliable system for monitoring both first- and second-dose measles vaccine coverage should be in place at the national and subnational levels. Vaccine coverage can be monitored using routine reports from immunization posts, allowing pockets of low coverage to be identified. Countries must regularly assess the accuracy of their coverage data, which have been shown to vary in accuracy. Countries that estimate vaccine coverage by administrative methods, by proxy methods (such as the number of doses distributed to clinics) or by using imprecise denominator values should refine these estimates with periodic coverage surveys.

In addition to routine monitoring of vaccine coverage, well standardized and representative serosurveys can assess the susceptibility of population groups to measles and/or rubella, providing a tool for identifying susceptible age groups in the population. This may be important before supplementary campaigns are planned in countries with historical coverage and incidence data of limited quality, potentially reducing costs for supplementary campaigns because population groups are targeted better. These studies should be undertaken with standardized sampling and laboratory methods to ensure comparability.

7 A LABORATORY NETWORK

Laboratory confirmation of suspected measles cases is critical when a country is in Stage II or Stage III. WHO will support the development of a European Region Measles and Rubella Laboratory Network (ERMRLN) to meet the specific needs of the national programmes in the European Region. The ERMRLN will consist of subnational and national laboratories supported by regional reference laboratories linked to the global measles network. A fully functional network requires establishing and strengthening the capacity of national laboratories.

The national and subnational laboratories will be responsible for confirming suspected measles and rubella cases using validated IgM assays and for sending specimens of measles virus for genotyping to a regional reference laboratory. Laboratory assessment and training will be undertaken to establish and strengthen national and subnational laboratory capacity. Standards for quality assurance will be established and monitored through regular accreditation reviews. The establishment of the network will be closely linked to strengthening surveillance capacity and proposed supplementary campaigns (24).

8 HIGH-QUALITY IMMUNIZATION-RELATED INFORMATION

The knowledge and perceptions health professionals and the public have about measles and rubella and the benefits and risks associated with preventing these diseases will be extremely important for public health officials as they seek to increase and maintain the very high levels of immunization coverage required to meet the objectives of the strategic plan. The claim that measles vaccine given as MMR may be associated with a syndrome of inflammatory bowel disease and developmental disorders such as autism (25,26) has led to demands that the three vaccine antigens be administered separately. Although epidemiological studies (27–29) and assessments (30,31) have been published in the medical literature, the concerns of the public and health professionals do not appear to have been adequately addressed. Countries with previously well-immunized populations are now reporting declines in coverage, and outbreaks have occurred in England (32).

A growing number of people are getting their health-related information from the news media and the Internet. WHO, national immunization programmes and nongovernmental organizations need to improve the availability and the quality of information available to the public. According to Stratton et al. (31), “Attention should be given to how the material is perceived and used by those with the right and desire to know – the parents of children about to be immunized or those who believe their child has been adversely affected.” Health agencies and professional and nonprofessional organizations need to work together to ensure that a balanced assessment of benefits and risks is presented in an easily understood way.

9 PRIORITY ACTIONS

A series of steps is required at the national, subregional and regional levels. The highest priority actions are to strengthen routine immunization programmes; however, this requires political commitment, mobilization of resources and support from health professionals and the public.

9.1 STRENGTHEN ROUTINE IMMUNIZATION PROGRAMMES

9.1.1 Development of national plans

Countries need to develop national action plans for measles and rubella based on their identified national targets for these diseases and an assessment of their local epidemiological situation and historical rates of vaccine coverage. These plans should cover at least 5 years and include:

- a situation analysis, including the epidemiology of the diseases and vaccination coverage;
- the rationale for the vaccination strategy chosen;
- disease surveillance capacity, including evaluation of laboratories and programmes;
- activities to implement the recommended strategies;
- vaccine supply and cold-chain logistics;
- training objectives and plans and the supervision of staff;
- indicators for monitoring outcome and performance;
- activities to ensure the safety of injection, including surveillance for and management of adverse events following immunization; and
- a timetable and budget, indicating sources of funding.

The WHO Regional Office for Europe will work with Member States to develop these plans and provide technical assistance as needed.

9.1.2 Ensuring and monitoring injection safety and safe waste disposal

The safety of injections is crucial to ensure that vaccines are delivered appropriately for both routine and supplementary immunization. In particular, undertaking mass campaigns requires careful planning at the national, subnational and district levels to ensure safe injection practices, the availability of sufficient injection safety equipment and adequate disposal of sharps waste.

Sufficient quantities of auto-disable syringes and safety boxes are necessary, together with vaccine of high quality for all mass immunization campaigns (20). Tools have been developed to assist countries in assessing immunization safety and developing and implementing safety plans for routine and supplementary immunization (33). Countries and their partners should ensure that health care workers and the community are thoroughly familiar with safe injection practices.

Some Member States have extensive lists of inappropriate and unfounded contraindications to immunization, resulting in children being inappropriately excluded from immunization. National plans of action should include strategies designed to overcome these barriers such as changing national policies and conducting workshops for local health care workers.



Ensuring and monitoring injection safety and safe waste disposal

9.1.3 Managing adverse events following immunization

Countries need to establish and strengthen surveillance systems for adverse events following immunization to be capable of detecting, monitoring and responding to them. National public health activities should include the development of a robust surveillance system with regular analysis of data and risk communication. WHO will work throughout the European Region to improve the quality of surveillance for adverse events following immunization in routine immunization programmes and during supplementary vaccination campaigns.

9.1.4 Information on immunization for the public and health professionals

The European Region of WHO will work with Member States and professional and lay organizations to increase the availability of high-quality and valued informational materials on these diseases and the benefits and risks associated with control strategies. Countries and nongovernmental organizations need to proactively develop relevant training and educational material to address these potential issues, targeting parents, health care workers and the mass media.

9.2 ENSURING SOCIAL, HEALTH PROFESSIONAL AND POLITICAL SUPPORT

Political commitment at the national and regional levels is essential to accelerate the prevention of measles and CRI and eventually eliminate measles in the European Region of WHO. Epidemiological and economic data can support obtaining this commitment by demonstrating the impact of measles and CRI and the potential economic benefits of controlling and eliminating these diseases. The WHO Regional Office for Europe will work with Member States to identify the specific information needs of policy-makers related to this Strategic Plan.



*Red Cross volunteers
supporting campaign
social mobilization
activities*



9.2.1 Advocacy

Advocacy strategies are needed to encourage political, professional and public support. Social mobilization and promotion will be important components of this advocacy. The WHO Regional Office for Europe will work with Member States and professional and nonprofessional nongovernmental organizations to develop a strong, broadly-based advocacy network.

9.2.2 Mobilizing resources

Substantial resources will be needed to implement the Strategic Plan for Measles and Congenital Rubella Infection in the European Region of WHO. While the overall objectives of the plan are to meet the targets for these two diseases, the goal is to create sustainable, high-quality immunization programmes throughout the Region. The WHO Regional Office for Europe will assess the impact of supplementary campaigns on routine immunization services. The Regional Office will also work closely with Member States, donor agencies and nongovernmental organizations to identify the resources needed for implementation of the Plan.



10 MONITORING

10.1 PERFORMANCE INDICATORS

Stage I

- Validated national coverage for first-dose measles vaccine by age 2 years
- Coverage with second-dose measles vaccine (if offered)
- Completeness and timeliness of monthly surveillance reports
- Percentage of outbreaks with laboratory confirmation
- Percentage of reported cases with core data (age and immunization status) at the first administrative level

Stage II

TARGETS

The indicators from Stage I plus the following:

- Percentage of districts reporting monthly (completeness) ≥ 80%
- Percentage of reported cases with core data (age, immunization status, outcome and location) ≥ 80%
- Percentage of outbreaks with laboratory confirmation ≥ 80%
- Percentage of districts reporting within a month after the reporting period (timeliness) ≥ 80%
- Validated national coverage of first- and second-dose measles vaccine > 90%
- System for reporting adverse events

Stages IIIa and IIIb

TARGETS

The indicators from Stage II plus the following:

- Percentage of sites reporting weekly ≥ 80%
- Percentage of cases² notified ≤ 48 hours after onset of rash ≥ 80%
- Percentage of cases investigated ≤ 48 hours after notification ≥ 80%
- Percentage of cases with adequate specimens³ and laboratory results ≥ 80%
- Percentage of cases with laboratory results within 7 days of detection ≥ 80%
- Percentage of confirmed cases with specimens sent for virus isolation ≥ 80%

² All cases meeting the clinical case definition.

³ One specimen collected within 3–28 days of the onset of rash.

TARGETS

- | | | |
|--|------------------|---|
| ● Rate of suspected measles investigated in the general population | TBD ⁴ | ⁴ > 1 per 100 000 population, but actual number has not yet been determined. |
| ● Percentage of confirmed cases with sources of infection identified | ≥ 80% | |
| ● Percentage of febrile-rash clusters investigated | 100% | |
| ● Validated national coverage for first- and second-dose measles vaccine | > 95% | |
| ● Coverage of first- and second-dose measles vaccine in all districts | > 90% | |

10.2 OUTCOME INDICATORS AND TARGETS

Stages I and II

- Disease incidence reported by month and year

Stages IIIa and IIIb

- Susceptibility profile needed for interruption of indigenous measles transmission (*19*)
- Size of measles outbreaks and number of generations (*19*)
- Measles virus genotype distribution

Stage IIIb

TARGETS

- | | |
|--|-----------------------------|
| ● Annual reported incidence of laboratory-confirmed rubella | < 1 per 100 000 population |
| ● Rubella susceptibility level among women of childbearing age | < 5% |
| ● Annual reported incidence of laboratory-confirmed CRS | < 1 per 100 000 live births |

11 STRATEGIC MILESTONES

By the end of 2002:

- Consultation on Strategic Plan completed
- First issue of *EURO measles quarterly* published and distributed
- National reference laboratories identified for the European Region Measles and Rubella Laboratory Network (ERMRLN)
- Supplementary mass campaign conducted in at least one country

By the end of 2003:

- Surveillance guidelines for measles and CRI in the European Region published
- Regional immunization guidelines finalized
- Regional reference laboratories identified and 60% of Member States served by at least one accredited measles–rubella laboratory
- Resource mobilization strategy implemented
- Immunization information network implemented
- 80% of Member States have prepared national plans of action
- 50% of Member States meet the surveillance performance indicators of the WHO Regional Office for Europe
- 60% of countries administer a first dose of measles vaccine to > 95% of children under 2 years of age
- Supplementary mass campaign conducted in at least three further countries

By the end of 2004:

- ERMRLN fully implemented
- 90% of Member States have prepared national plans of action
- 80% of Member States served by at least one accredited measles–rubella laboratory
- 70% of Member States meet the surveillance performance indicators of the WHO Regional Office for Europe

- 70% of countries administer a first dose of measles vaccine to > 95% of children under 2 years of age
- Supplementary mass campaign conducted in at least four further countries

By the end of 2005:

- Review and revise operational plan for the European Region and seek endorsement of regional Strategic Plan by the WHO Regional Committee for Europe
- 100% of Member States have prepared national plans of action
- 80% of Member States meet the surveillance performance indicators of the WHO Regional Office for Europe
- 80% of countries administer a first dose of measles vaccine to > 95% of children under 2 years of age
- 60% of countries administer a second dose of measles vaccine to > 95% of children
- Supplementary mass campaign conducted in least six further countries
- 60% of countries are at Stage III

By the end of 2006:

- 90% of Member States meet the surveillance performance indicators of the WHO Regional Office for Europe
- Supplementary mass campaign conducted in least three further countries
- 90% of countries administer a first dose of measles vaccine to > 95% of children under 2 years of age
- 70% of countries administer a second dose of measles vaccine to > 95% of children
- 70% of countries are at Stage III

By the end of 2007:

- 90% of Member States meet the surveillance performance indicators of the WHO Regional Office for Europe
- 80% of countries administer a second dose of measles vaccine to > 95% of children
- Supplementary mass campaign conducted in least three further countries
- 80% of countries are at Stage III

ANNEX 1

Population and national immunization policy on measles, mumps and rubella for countries in the European Region of WHO as reported in 2001

| Western Europe | Population | First dose | Age at first dose (months) | Second dose | Age at second dose (years) |
|----------------|------------|------------------|----------------------------|------------------|----------------------------|
| Andorra | 67 118 | MMR ^a | 15 | MMR | 5 |
| Austria | 8 075 072 | MMR | 14 | MMR | 7 |
| Belgium | 10 263 790 | MMR | 15 | MMR | 11–12 |
| Denmark | 5 332 720 | MMR | 15 | MMR | 12 |
| Finland | 5 178 314 | MMR | 14–18 | MMR | 6 |
| France | 59 453 067 | MMR | 12 | MMR | 5 |
| Germany | 82 007 245 | MMR | 11–14 | MMR | 2 |
| Greece | 10 623 459 | MMR | 15 | MMR | 4–6 |
| Iceland | 281 383 | MMR | 18 | MMR | 12 |
| Ireland | 3 841 450 | MMR | 15 | MMR | 4–5 |
| Israel | 6 172 191 | MMR | 12 | MMR | 6 |
| Italy | 57 503 181 | MMR | 15 | MMR ^b | 5–12 |
| Luxembourg | 442 209 | MMR | 15–18 | MMR | 5–7 |
| Malta | 391 754 | MMR | 15 | MMR | 5–7 |
| Monaco | 30 000 | Unknown | | | |
| Netherlands | 15 929 536 | MMR | 14 | MMR | 9 |
| Norway | 4 487 848 | MMR | 15 | MMR | 12 |
| Portugal | 10 033 213 | MMR | 15 | MMR | 5–6 |
| San Marino | 27 399 | MMR | 15 | MMR | 5 |
| Spain | 39 920 668 | MMR | 15 | MMR | 3–6 |
| Sweden | 8 910 000 | MMR | 18 | MMR | 12 |
| Switzerland | 7 169 611 | MMR | 15 | MMR | 2 |
| United Kingdom | 59 541 659 | MMR | 12–15 | MMR | 3–5 |

Source: Mid-year 2001 population data were obtained from the United Nations 2000

^a Measles, mumps and rubella vaccine

^b The second doze of MMR is given routinely only in part of the country

^c Measles and rubella vaccine

^d Measles vaccine

| Central and eastern Europe | Population | First dose | Age at first dose (months) | Second dose | Age at second dose (years) |
|---|-------------|-----------------|----------------------------|-------------|----------------------------|
| Albania | 3 145 213 | MR ^c | 12 | MR | 5 |
| Bosnia and Herzegovina | 4 066 959 | MMR | 15 | MMR | 7 |
| Bulgaria | 7 866 575 | MMR | 13 | MMR | 12 |
| Croatia | 4 655 279 | MMR | 12 | MMR | 6 |
| Czech Republic | 10 260 407 | MMR | 15 | MMR | 2 |
| Estonia | 1 376 727 | MMR | 12 | MMR | 13 |
| Hungary | 9 916 669 | MMR | 15 | MMR | 11 |
| Latvia | 2 405 836 | MMR | 15 | Me+Mumps | 7 |
| Lithuania | 3 689 372 | MMR | 15 | MMR | 12 |
| Poland | 38 576 933 | Me ^d | 13–14 | Me | 7 |
| Romania | 22 387 544 | Me | 9–11 | Me | 7 |
| Slovakia | 5 403 146 | MMR | 14 | MMR | 11 |
| Slovenia | 1 985 320 | MMR | 12–18 | MMR | 7 |
| The former Yugoslav Republic of Macedonia | 2 043 541 | MMR | 13 | MMR | 6 |
| Turkey | 67 632 485 | Me | 9 | Me | 6 |
| Yugoslavia | 10 537 871 | MMR | 12 | MMR | 12 |
| Newly independent states | | | | | |
| Armenia | 3 788 157 | Me+Mumps | 12 | Me | 6 |
| Azerbaijan | 8 096 332 | Me | 12 | Me | 6 |
| Belarus | 10 147 187 | MMR | 12 | MMR | 6 |
| Georgia | 5 238 728 | Me | 12 | Me | 5 |
| Kazakhstan | 16 094 727 | Me+Mumps | 12 | Me | 6 |
| Kyrgyzstan | 4 986 489 | Me+Mumps | 12 | Me | 6 |
| Republic of Moldova | 4 284 743 | Me+Mumps | 12 | No | – |
| Russian Federation | 144 664 289 | Me+Mumps | 12 | Me | 6 |
| Tajikistan | 6 135 466 | Me | 12 | Me | 6 |
| Turkmenistan | 4 835 031 | Me | 9 | Me | 6 |
| Ukraine | 49 111 535 | MMR | 12 | Me | 6 |
| Uzbekistan | 25 256 656 | Me | 9 | Me+Mumps | 1.5 |

ANNEX 2

Reported country-specific vaccination and disease indicators for measles, mumps and rubella for countries in the European Region of WHO

| Western Europe | Measles first-dose coverage (%) ^a | Inter-epidemic period > 5 years ^b | Measles incidence per 100 000 population ^c | Mumps incidence per 100 000 population ^c | Rubella incidence per 100 000 population ^c |
|----------------|--|--|---|---|---|
| Andorra | 90 ^d | NA | 4.6 | 9.7 | 10.9 |
| Austria | 78 | NA | NA | NA | NA |
| Belgium | 77 | No | 32.6 | 47.7 | 2.8 ^d |
| Denmark | 88 | Borderline | 0.5 | 0.5 | 0.0 |
| Finland | 98 | Yes | 0.0 | 0.0 | 0.0 |
| France | 82 | No | 66.6 | 38.9 | NA |
| Germany | 78 | NA | 7.3 | NA | NA |
| Greece | 78 | Yes | 0.6 | 0.6 | 3.0 |
| Iceland | 96 | Yes | 0.0 | 2.4 | 25.7 |
| Ireland | 77 ^d | Yes | 12.6 | 2.5 | 2.2 |
| Israel | 94 | Yes | 0.3 | 0.7 | 0.2 |
| Italy | 60 | No | 17.5 | 46.3 | 16.0 |
| Luxembourg | 91 ^d | Borderline | 0.4 | 0.1 | 0.6 |
| Malta | 60 | Yes | 0.7 | 26.0 | 2.2 |
| Monaco | NA | NA | NA | NA | NA |
| Netherlands | 95 | Yes | 4.3 | 0.2 | 0.1 |
| Norway | 91 | Yes | 0.1 | 0.1 | 0.1 |
| Portugal | 93 | Yes | 0.7 | 65.1 | 1.0 |
| San Marino | 87 ^d | NA | 18.3 | 93.1 | 15.0 |
| Spain | 93 | Yes | 1.5 | 15.6 | 2.9 |
| Sweden | 96 | Yes | 0.4 | 0.3 | 0.0 |
| Switzerland | 99 | NA | 29.3 | 189.4 | 25.7 |
| United Kingdom | 89 | Yes | 0.2 | 0.8 | 0.2 |

NA: not available

^a The mean measles first-dose vaccine coverage (%) over the most recent 5 years, including 2001.

^b The length of the measles inter-epidemic period.

^c The mean annual reported measles or mumps or rubella incidence rate per 100 000 population over the most recent 5 years.

^d The mean annual calculation is based on less than 5 years data.

| Central and eastern Europe | Measles first-dose coverage (%) ^a | Inter-epidemic period > 5 years ^b | Measles incidence per 100 000 population ^c | Mumps incidence per 100 000 population ^c | Rubella incidence per 100 000 population ^c |
|---|--|--|---|---|---|
| Albania | 93 | No | 36.8 | 53.4 | 15.9 |
| Bosnia and Herzegovina | 77 | No | 36.6 | 25.8 | 8.9 |
| Bulgaria | 93 | Yes | 0.5 | 111.9 | 106.2 |
| Croatia | 92 | No | 4.0 | 3.8 | 1.5 |
| Czech Republic | 96 | Yes | 0.1 | 3.2 | 20.0 |
| Estonia | 91 | Yes | 0.8 | 26.7 | 23.2 |
| Hungary | 100 | Yes | 0.1 | 2.1 | 1.0 |
| Latvia | 97 | Yes | 0.1 | 75.9 | 10.4 |
| Lithuania | 97 | Yes | 0.5 | 71.9 | 26.1 |
| Poland | 98 | Yes | 1.5 | 220.4 | 178.0 |
| Romania | 96 | Borderline | 29.7 | 167.1 | 74.8 |
| Slovakia | 99 | Yes | 4.3 | 2.2 | 0.7 |
| Slovenia | 91 | Yes | 0.2 | 2.5 | 1.7 |
| The former Yugoslav Republic of Macedonia | 96 | No | 5.6 | 17.3 | 15.8 |
| Turkey | 81 | No | 34.4 | NA | NA |
| Yugoslavia | 92 | No | 11.3 | 9.7 | 30.2 |
| Newly independent states | | | | | |
| Armenia | 93 | Yes | 5.2 | 117.0 | 40.2 |
| Azerbaijan | 98 | No | 13.6 | 67.0 | 14.7 |
| Belarus | 98 | Borderline | 1.7 | 159.2 | 189.8 |
| Georgia | 87 | No | 3.0 | 37.9 | 24.3 |
| Kazakhstan | 99 | Borderline | 4.7 | 30.4 | 97.6 |
| Kyrgyzstan | 98 | Borderline | 16.1 | 31.9 | 26.1 |
| Republic of Moldova | 96 | No | 11.3 | 127.3 | 73.6 |
| Russian Federation | 95 | Yes | 3.2 | 52.2 | 308.3 |
| Tajikistan | 94 | No | 23.3 | 24.3 | 2.5 |
| Turkmenistan | 98 | No | 8.6 | 40.3 | 4.0 |
| Ukraine | 99 | Borderline | 12.5 | 88.9 | 138.0 |
| Uzbekistan | 95 | Yes | 2.0 | 27.3 | 6.4 |

ANNEX 3

CASE DEFINITIONS RECOMMENDED BY WHO (19)

Febrile-rash illness

- Any person with fever and maculopapular rash

Clinical measles

- Any person in whom a clinician suspects measles infection
or
- Any person with fever *and* maculopapular rash (non-vesicular) and cough, coryza (runny nose) or conjunctivitis (red eyes)

Clinical rubella

- Any person in whom a clinician suspects rubella infection
or
- Any person with fever and maculopapular rash *and* one of the following: cervical, suboccipital or postauricular adenopathy; or arthralgia or arthritis

Laboratory criteria for diagnosis

- Presence of measles- or rubella-specific IgM antibodies

FINAL CASE CLASSIFICATION

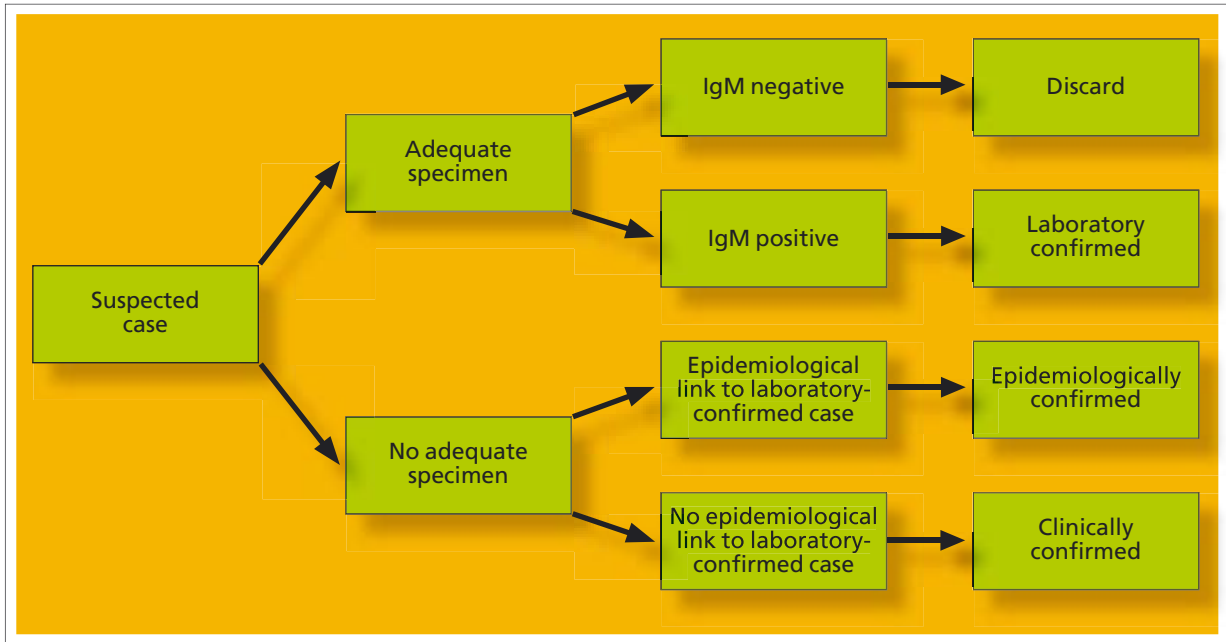
^a Only for countries in Stage II or III

| | |
|--|--|
| Clinically confirmed | A case that meets the clinical case definition. |
| Laboratory confirmed ^a | A case that meets the clinical case definition and is laboratory-confirmed. |
| Epidemiologically confirmed ^a | A case that meets the clinical case definition and is linked epidemiologically to a laboratory-confirmed case. |
| Discarded ^a | A suspected case that does not meet the clinical or the laboratory definition. |

Suspected case of CRS

Any infant less than 1 year of age in whom a health care worker suspects CRS. A health care worker should suspect CRS if there is a maternal history of suspected or

confirmed rubella during pregnancy or when the infant presents with heart disease and/or suspicion of hearing impairment and/or one or more of the following eye signs: white pupil (cataract); diminished vision; pendular movement of the eyes (nystagmus); squint; smaller eye ball (microphthalmia); and larger eye ball (congenital glaucoma).



Clinically confirmed CRS case

One in which a qualified physician detects two of the complications in section A or one from section A and one from section B:

- A) cataracts(s) and/or congenital glaucoma; congenital heart disease; hearing impairment; and pigmentary retinopathy; or
- B) purpura; splenomegaly; microcephaly; developmental delay; meningoencephalitis; radiolucent bone disease; and jaundice with onset within 24 hours after birth.

Algorithm for evaluating suspected cases of measles and rubella

Laboratory-confirmed CRS case

An infant with anti-rubella IgM antibody and who has clinically confirmed CRS.

Congenital rubella infection

An infant with anti-rubella IgM antibody and who does not have clinically confirmed CRS.

ANNEX 4

MUMPS CONTROL IN THE EUROPEAN REGION OF WHO

INTRODUCTION

Mumps is a systemic disease characterized by swelling of one or more of the salivary glands, usually the parotid glands. About 5% of the people with mumps have clinical evidence of central nervous system infection. Orchitis is a common complication after puberty, but sterility rarely occurs. In 2001, almost 200 000 cases were reported in the European Region (34).

PROGRESS IN MUMPS CONTROL IN THE EUROPEAN REGION

Mumps vaccine policy

All countries in western Europe had mumps vaccine in their routine childhood immunization programmes in 2001. Four CEE countries and five NIS had no childhood mumps immunization programme. Mumps vaccine strains vary across the region. The Jeryl Lynn strain was most commonly used in western Europe. However, at least three western European countries recently used the Rubini strain, which is recognized to have lower immunogenicity and efficacy. The Urabe strain was used in a number of countries. In the NIS, the Leningrad 3 strain was used widely until recently.

Mumps immunization strategy

Controlling mumps requires achieving and maintaining high immunization coverage (> 90%) with at least one dose of an efficacious and safe mumps vaccine within a routine programme in infancy (35). Countries that have used the Rubini vaccine should consider options for re-immunizing susceptible individuals using an alternative effective strain of vaccine (35).

Vaccine coverage

For most countries, mumps coverage is identical to reported measles coverage because of the use of MMR. However, for the NIS, where single-antigen mumps vaccine was still used, coverage levels declined in many countries during the mid-1990s because of supply problems with the Leningrad vaccine strain.

Mumps incidence

During the last decade, the reported number of mumps cases in the European Region has declined by 57% (Table 8, Fig. 3). In western Europe, the number of re-

ported cases declined by 81%. The annual number of cases reported in CEE countries declined in 2000, but epidemics occurred during 1998, mainly in the countries with no mumps vaccine in their routine programmes. In the NIS, the number of cases reported increased during the 1990s, with epidemics in several countries in 1998.

| WHO subregion | 1991 | | 2001 | |
|----------------------------|----------------|--------------------------|----------------|--------------------------|
| | No. of cases | % of countries reporting | No. of cases | % of countries reporting |
| Western Europe | 219 090 | 78 | 41 473 | 78 |
| Central and eastern Europe | 122 959 | 94 | 69 456 | 88 |
| Newly independent states | 107 282 | 100 | 80 316 | 100 |
| Total | 449 331 | 88 | 191 245 | 86 |

Table 8: The number of mumps cases in the European Region of WHO reported by subregion, 1991 and 2001

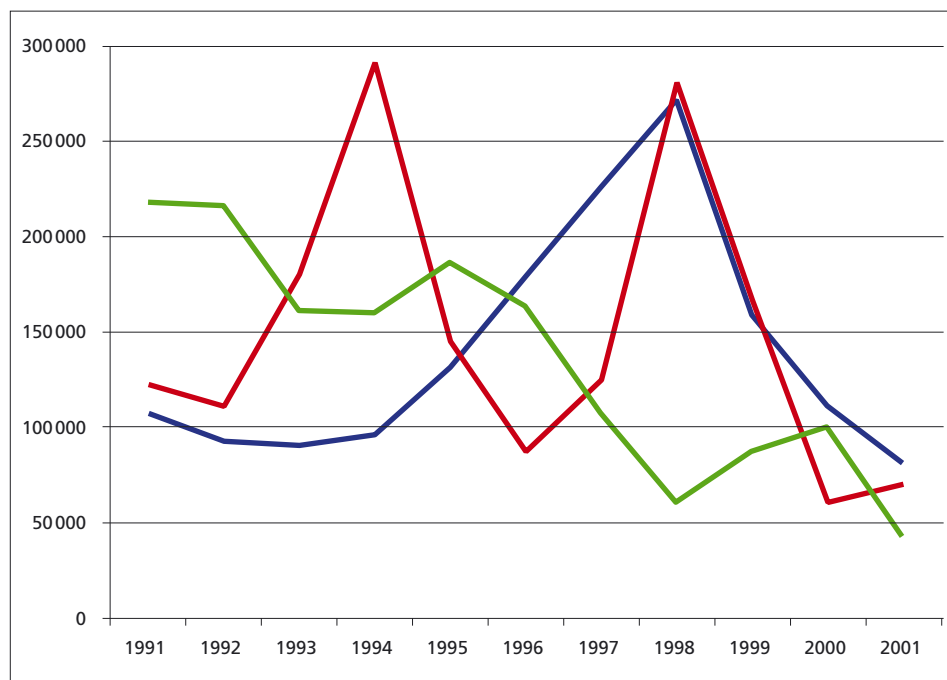


Figure 3. Number of mumps cases per year in the European Region, 1991-2000

HEALTH21 target (17): to achieve mumps control (< 1 case per 100 000 population)

Two key strategies are recommended to achieve mumps control:

- providing high coverage (> 95% in each district and nationally) with one dose of mumps vaccine linked to the first dose of measles vaccine; and
- strengthening mumps surveillance systems.

Stages I-II

For countries not using a mumps component in their national immunization programmes, introducing mumps vaccine at Stage I will provide some protection but may result in a shift of the disease to the older age cohorts and should be avoided at low coverage (< 70–80%). The countries in Stage I with mumps vaccine in their routine programme should concentrate on increasing routine immunization coverage. For the countries in Stage II, introducing mumps immunization could be considered based on country priorities. While use of mumps vaccine as MMR can be considered as part of measles supplementary campaigns, consideration should be given to the resources required, as well as the type of strain used, since outbreaks of vaccine-associated aseptic meningitis have been linked to mass mumps immunization campaigns.

Stage III

Once countries have reached Stage III, continued efforts are required to maintain high (> 90%) immunization coverage with the first dose of mumps vaccine through the routine programme.

Mumps surveillance activity

Stages I-II

Surveillance for mumps should be undertaken using WHO clinical case definitions. It is recommended that the number of suspected mumps cases be reported by age group and immunization status per month. Suspected outbreaks should be investigated.

Stage III

It is recommended that mumps surveillance be case based at the local or district level, but aggregate reporting at the national level would be sufficient, including information on age and immunization status. As the incidence declines, laboratory confirmation of suspected mumps cases can be introduced.

ANNEX 5

GLOSSARY

Congenital rubella syndrome (CRS): One of the possible outcomes of rubella infection in utero, particularly during the first trimester. The birth defects associated with CRS include heart disease, blindness, hearing impairment, and developmental delay or mental retardation.

Congenital rubella infection (CRI): Fetal infection with the rubella virus that can lead to miscarriage, fetal death or the birth of a normal infant or one with some or all the manifestations of CRS.

Measles control: The routine, regular and ongoing use of measles vaccine to reduce measles morbidity and mortality; done in accordance with targets.

Measles elimination: Interruption of endemic transmission in a large geographical area, and sustained transmission does not occur following an imported case.

European Region Measles and Rubella Laboratory Network (ERMRLN):
A network of national, subnational and regional reference laboratories.

Measles, mumps and rubella vaccine (MMR): A trivalent, attenuated live virus vaccine that can induce immunity and provide protection against measles, mumps and rubella.

Measles and rubella vaccine (MR): A bivalent, attenuated live virus vaccine that can induce immunity and provide protection against measles and rubella.

Routine immunization: The regular provision of immunization services to successive cohorts through vaccination at 1) fixed sites, 2) outreach activities and 3) mobile sites, including the routine screening of immunization records.

Rubella control: The routine, regular and ongoing use of rubella vaccine to reduce rubella-associated morbidity and mortality in accordance with targets.

Supplementary immunization: Mass campaigns targeting all children in a defined age group, with the objective of reaching a high proportion of susceptible individuals. Each campaign is conducted over a wide geographical area (such as a province or country) to rapidly reduce the number of susceptible children. It is not usual to conduct screening for vaccination status and prior disease history.



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Measles and rubella remain important causes of vaccine-preventable disease and death in the European Region of WHO.

Although an increasing number of Member States provide highly effective vaccines to prevent both of these diseases as part of their routine Expanded Programme on Immunization programmes, challenges remain to improve coverage in the countries currently using the vaccines and to introduce rubella vaccine in the countries that have not yet implemented a programme.

The Strategic Plan for Measles and Congenital Rubella Infection in the European Region of WHO identifies key strategies to meet the targets for the European Region of interrupting indigenous measles transmission and preventing congenital rubella infection (< 1 case of congenital rubella syndrome per 100 000 live births) by 2010.

World Health Organization
Regional Office for Europe

Scherfigsvej 8,
DK-2100 Copenhagen Ø,
Denmark

Tel.: +45 39 17 17 17

Fax: +45 39 17 18 18

E-mail: postmaster@euro.who.int

Web site: www.euro.who.int