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## *EUROPEAN ADVISORY GROUP ON THE EXPANDED PROGRAMME ON IMMUNIZATION*

Report on the 13th meeting

Paris, France  
10-12 March 1997

1997

EUR/HFA target 5

## TARGET 5

### REDUCING COMMUNICABLE DISEASE

*By the year 2000, there should be no indigenous cases of poliomyelitis, diphtheria, neonatal tetanus, measles, mumps and congenital rubella in the Region and there should be a sustained and continuing reduction in the incidence and adverse consequences of other communicable diseases, notably HIV infection.*

### ABSTRACT

The EAG expressed the belief that whole-cell pertussis vaccine should remain the mainstay of national immunization programmes. Those countries that had already changed to acellular vaccines would need to monitor carefully changes in coverage, efficacy and duration of protection. The possible interference between acellular vaccines and Hib vaccines needed further elucidation.

Experience with Hib vaccines in European countries had been most encouraging, with high coverage achieved and rapid disappearance of invasive Hib manifestations. The EAG recommended that epidemiological surveillance be instituted to demonstrate the burden of disease and supported vaccine use by countries able to afford it.

The EAG recommended that, where there was evidence of wild poliovirus circulation, countries should undertake at least three national immunization days (NIDs). NIDs should only be halted after evidence was available to show that they were no longer needed. Because of the difficulties in providing immunization services for gypsy families and their mobility between European countries, the EAG recommended that WHO, with partner agencies, work with gypsy community leaders to improve poliomyelitis and other immunization services. The EAG was firmly of the view that oral vaccine (OPV) was the vaccine of choice for eradication purposes. The EAG urged countries to postpone any change in vaccination policy until such time as the global poliomyelitis initiative had made more progress and no indigenous cases were reported in Europe.

The EAG was convinced of the benefits of efforts to eliminate measles from Europe. It was agreed that the target date for elimination should be 2007, but this could be accelerated. A plan of action would be necessary for regional activities, with operational milestones and cost estimates. All opportunities should be sought to recruit the support of national and international agencies as soon as possible.

### Keywords

COMMUNICABLE DISEASE CONTROL – methods  
IMMUNIZATION  
WHOOPING COUGH – prevention and control  
POLIOMYELITIS – prevention and control  
MEASLES – prevention and control  
HAEMOPHILUS INFLUENZAE  
EUROPE

## INTRODUCTION

The thirteenth meeting of the European Advisory Group on the Expanded Programme on Immunization (EAG/EPI) was held on 10–12 March 1997 at the International Centre for Childhood and the Family (ICCAF/CIDEF), Paris, France. The meeting was chaired by Dr Norman Begg, the Rapporteur was Dr David M. Salisbury, and the Secretary was Dr Colette Roure. Participants were welcomed to the ICCAF/CIDEF by Dr Nicole Guérin, on behalf of Dr Olivier Brasseur, Director. Dr Guérin described the changes that had led to the formation of ICCAF/CIDEF, a merger between the International Children's Centre and the Institute for Childhood and Family.

### Scope and purpose

The scope and purpose of the meeting were to:

- take forward the recommendations from the previous EAG meeting concerning the introduction of new vaccines, with particular reference to acellular pertussis and *Haemophilus influenzae b*;
- discuss polio immunization strategies in support of the polio eradication initiative;
- discuss and review the strategic plan for measles eradication in the European Region.

### ACELLULAR PERTUSSIS

Within the European Region, there is a spectrum of country experiences with whole-cell pertussis vaccine with some countries having used this vaccine for many years, achieving and maintaining high levels of coverage and reporting relatively little disease. These are mostly southern and eastern European countries. Some countries, such as the United Kingdom, had high levels of coverage in the past, experienced catastrophic declines in coverage with major resurgences of pertussis but have now returned to high coverage and low disease incidence. A further group of countries, including Germany, Italy and Sweden, either have never been able to restore coverage levels following declines or had discontinued the use of pertussis vaccine.

In the light of these experiences, the need for a safe and efficacious alternative appeared to be a priority. Considerable efforts have therefore been dedicated to the development of highly purified acellular pertussis vaccines, and a range of these products from single component pertussis toxoid vaccines to multi-component genetically produced vaccines has now been evaluated. Immunogenicity and reactogenicity studies (phase 2) show that high levels of antibodies can be achieved and there are low levels of reactogenicity when compared with whole-cell vaccines. However, it is clear that both the immunogenicity results and the reactogenicity results are both vaccine-specific and age- or schedule-specific. It is not possible to make generalizations about acellular vaccines in the absence of specific information on both the vaccines and the schedules. Similarly, although some studies have shown higher levels of protective efficacy (phase 3) for acellular vaccines compared with whole-cell products, these results need to be interpreted carefully as non-European whole-cell vaccines were used and the schedules were not those used in the majority of European countries. When European whole-cell vaccines were used as controls, they had equal or higher efficacy than the acellular products. It should also be borne in mind that the phase 3 studies have varied greatly in both study design and in the vaccines that have been employed. This makes comparison between studies insecure.

There is little doubt that in some schedules and compared with some whole-cell vaccines, acellular vaccines are more efficacious and have fewer associated reactions. These are for the most part local reactions and fevers. Where there is ingrained resistance to the use of whole-cell vaccines, acellular vaccines provide good opportunities to improve the control of pertussis. For these reasons, acellular vaccines have been introduced in Denmark, Germany, Ireland, Italy and Sweden.

However, in some schedules and with some vaccines, there is very little difference in reactogenicity between whole-cell and acellular vaccines. The highest efficacy results have been obtained with conventional routinely available European whole-cell vaccines. Costs of acellular vaccines are considerably higher than those of whole-cell products, and cost effectiveness is unlikely to be demonstrable where coverage is already high and disease incidence low. A number of studies have also shown that when acellular vaccines are combined for simultaneous administration with Hib vaccine, the immunogenicity of the Hib vaccine may be reduced. The significance of this finding is not yet clear. There is also a suggestion that the duration of protection after acellular vaccine may be shorter than that following whole-cell vaccine, and some animal studies have pointed to a less reliable T-cell response after acellular vaccines; at this stage, the meaning of these findings is not clear.

### **Recommendation**

The EAG believes that whole-cell pertussis vaccine should remain the mainstay of national immunization programmes until there is good evidence of efficacy from acellular vaccines in routine use, and that they can be shown to be cost-effective. Some countries have already made their choices to change to acellular vaccines, others are reviewing their circumstances, and others are at present satisfied with their whole-cell products. Those countries that have already changed will need to monitor the situation carefully, in part to assess the change in coverage but also to estimate vaccine efficacy in routine use and to study the duration of protection in vaccinees. Because the acellular products have a better profile for minor adverse events, they are more suitable for use as booster vaccines for which they have been shown to be efficacious. The possible interference between acellular pertussis vaccines and Hib vaccines needs further elucidation.

### **HAEMOPHILUS INFLUENZAE B (HIB)**

Experience from a number of countries (France, the United Kingdom, the Scandinavian countries) were reviewed and in all cases Haemophilus influenzae type b (Hib) vaccine had been effectively introduced into routine immunization, high coverage achieved and a dramatic impact on disease incidence recorded. In France, Hib vaccine was originally given by separate injection and is now given combined with DTP and IPV; in the United Kingdom it was initially given by separate injection and latterly combined with DTP; and in Denmark Hib is given by separate injection but simultaneously with DTaP IPV. In all of the above-mentioned countries, Hib vaccine had been very well received by parents and health professionals and surveillance of adverse reactions has demonstrated that remarkably few reactions, other than minor local reactions, occur with this vaccine.

### **Recommendations**

Available data from a number of countries have shown relatively similar levels of invasive Hib disease and the introduction of routine Hib immunization has dramatically reduced its incidence.

Countries considering using routine Hib immunization should first ensure that epidemiological surveillance is able to demonstrate the burden of disease and that the cost of the vaccine can be afforded, without jeopardizing other immunization priorities. Laboratory investigation of Hib infection requires specialized techniques for which dedicated training may be necessary. Opportunities for collaboration with countries that already have such expertise should be sought. The WHO generic protocol for population-based surveillance of Hib (WHO/VRD/GEN/95.05) provides a valuable guide for countries to use in developing services for it.

## POLIOMYELITIS

Overall, the situation as regards polio elimination remains positive. There have been successful national immunization days NIDs which have achieved coverage in excess of 95% in MECACAR countries and the Russian Federation with new polio-free areas involving eight republics of the Caucasus and central Asian republics. In that area, environmental surveillance and AFP surveillance have failed to identify wild polioviruses. Although there had been an epidemic of wild virus polio in Albania that probably followed an importation, the last case had occurred in November 1996. Surveillance is improving with a region-wide AFP rate of 0.65 in 1996 and the certification process has started.

Increasing numbers of AFP cases are being documented in the Region but full laboratory support is being hampered by laboratory bottlenecks. The quality of surveillance remains less satisfactory; only around 55% of cases are being investigated, with two stool samples taken according to a schedule. However, the number of countries with endemic transmission continues to fall: only six were reported in 1996. In that year the total number of cases decreased by 11%, compared to 1995; 90% of the cases were accounted for by the outbreak in Albania.

Activities for 1997 include widening the scope of operation MECACAR – MECACAR Plus, special supplemental activities in Albania, the Russian Federation, Tajikistan, Turkey, Turkmenistan, Ukraine and Yugoslavia. Other priority actions will be to increase coverage in high-risk groups, improve AFP and other surveillance, and expand the certification process.

A number of countries have now held NIDs; in some, three have been held. It is therefore timely to consider what actions need to be taken in such countries in continuation of the efforts to achieve polio elimination from the Region.

### Recommendations

Where there is evidence of wild polio virus circulation, the EAG believe that three annual NIDs should follow. In this regard, the EAG supports the recommendations made by the technical consultation (Report of technical consultation April 1996, WHO/EPI/GEN/96.04).

While there is substantial evidence that polio endemic countries will usually require NIDs for a minimum of three consecutive years, the decision to stop NIDs depends on a number of factors. Regional experience showed that in many countries, NIDs had been required beyond the initial three years primarily because of: ongoing widespread virus circulation, a weak health infrastructure that could not achieve routine OPV 3 coverage of at least 80%, and/or insufficient AFP surveillance to evaluate accurately the impact of the NIDs. NIDs in polio-endemic countries must be conducted until wild polio virus transmission is interrupted. Adequate AFP surveillance is essential in deciding how long to continue NIDs after wild polio virus circulation has been interrupted. The decision to

continue NIDs should be based on the level of routine immunization coverage, the performance of the AFP surveillance system and the perceived risk of introduction of wild polio virus from endemic areas. The decision to continue NIDs should take into account the most efficient use of the resources available for polio eradication.

The above recommendation should be observed and countries should only conclude NIDs after production of evidence that supports the claim that further NIDs are not required. MECACAR countries having done three NIDs, should continue unless they have satisfactory surveillance that demonstrates this lack of need. In particular areas and for particular high-risk populations, subnational immunization days may be appropriate either in conjunction with NIDs or after they have been discontinued.

There has been much population movement throughout the Region, either migrants or refugees. These groups pose high risks for polio transmission and it is incumbent on those managing immunization services to identify specific resources to cope with such populations. The EAG was also aware that in a number of countries the last documented cases of wild virus poliomyelitis had occurred in gypsy populations. Given the movement of these groups among European countries and their difficulties in availing themselves of preventive services, the EAG recommended that there should be a Europe-wide initiative to involve gypsy leaders in ensuring that polio and other immunization services are provided for their communities. Such an action, targeted for 1998, will require the involvement of a number of groups such as WHO, UNICEF, Rotary International, Council of Europe and other partners.

The EAG was aware that a number of countries are considering changes from the exclusive use of OPV to whole or part use of IPV. The EAG was firmly of the view that the vaccine of choice for global eradication of polio is OPV. Recent experience with outbreaks of poliomyelitis in Albania, Greece and Yugoslavia underline the ongoing threat of wild polio virus importation into western Europe. The EAG urges countries to postpone any change in polio vaccination policy until such time as the global polio eradication initiative has made further progress and no indigenous poliomyelitis cases are reported in Europe. Countries considering changes should take careful note of the risks (as well as the potential benefits) that may be involved from such changes, especially from policies that may result in a decreased use of OPV.

## MEASLES

The short term aims are to achieve the reduction of measles morbidity and mortality with the objective of eliminating indigenous measles from the European Region by the year 2007. The specific objectives of the proposed measles elimination strategy are to reduce the estimated proportion of susceptible individuals in the population to low levels by the year 2005 and to maintain these low levels of susceptibility until 2007. It has been estimated that achievement of these objectives will lead to elimination of measles by 2007. The strategy focuses on the reduction of susceptible individuals and the maintenance of low levels of susceptibility and these proportions will differ according to specific age groups. The proportion of susceptible individuals must not exceed 15% in children aged 1-4 years, 10% in 5-9 year olds, 5% in 10-14 year olds and 5% in each cohort of adults above this age. Elimination of measles will depend on all countries in the Region reaching these goals. There are a number of critical steps for this strategy, namely:

1. *Establishing the political commitment to measles elimination*

Although many countries have made substantial efforts to control measles and achieved high levels of coverage, in others coverage of measles vaccine has always been low and control of measles is worse than in many developing countries. This does not reflect a lack of resources, rather the professional and public perception of measles as a mild disease. Despite this poor achievement, some countries are using valuable health care resources to offer a second dose of vaccine where more effective control could be achieved by improving coverage of the first dose. In order to implement the appropriate strategies to eliminate measles, considerable political commitment will be required in almost all countries.

2. *Developing the measles elimination plan based on an assessment of the local epidemiology*

Each country will need to establish a detailed implementation plan, identifying surveillance needs and the potential strategies. Such strategies should be decided on the basis of accurate surveillance data. The elimination plan for each country will take account of where the country lies among three broad groupings of countries based on epidemiology and programmatic details.

3. *Achieving and maintaining high routine immunization coverage for the first dose of measles vaccine, and ensuring high coverage in all geopolitical units*

Countries will need to identify the reasons for poor coverage and the steps necessary to rectify this situation. This may involve undertaking surveys of parental and professional knowledge, attitude and practices, and studies to identify missed opportunities or the application of false contraindications, and the identification of specific problems in low coverage groups, such as ethnic minorities or refugees.

4. *Strengthening the surveillance of measles*

Surveillance of measles must be strengthened in all countries by monitoring measles vaccination coverage, using age-specific data for both first and second doses, and particularly estimating the proportion of children immunized at the first opportunity who receive measles vaccine at the second opportunity. An alternative or supplemental approach will be to perform serological surveillance.

- *Instituting or continuing national level statutory reporting of suspected measles.* Data on measles cases should be collected on a weekly or monthly basis for all geopolitical units. This information should include the age and geographical and vaccination status of suspected cases.
- *Use of standardized case definition.* Where possible, cases reported should be based on a sensitive case definition.
- *Establishing the laboratory resources to assist with measles surveillance.* Laboratory confirmation will be particularly important as measles incidence declines. The use of surveillance indicators, such as the proportion of suspected cases that are laboratory tested and the proportion of tested cases that are confirmed, will be needed. It will be necessary to confirm the diagnosis, to attempt virus isolation on clinical specimens, and to assist with serological surveillance. In countries where virus circulation exists it would be necessary to collect specimens to establish a reference strains bank.
- *Instituting regular analysis and feedback of surveillance and coverage data.* The number of cases reported should be analysed by time, location, and age and vaccination status. The

completeness and timeliness of surveillance reports should be examined. Surveillance data should be made available to those who provide the data at field level.

#### 5. *Estimating the age-specific proportion susceptible to measles*

Coverage in excess of 95% at each of two measles immunizations, maintained for a significant length of time, will prevent the reaccumulation of enough susceptible individuals to allow transmission of measles. This situation can be accelerated once the achievement of high coverage with the first dose has been reached through the implementation of a measles immunization campaign targeted at all school-age children, followed by a routine second dose with high coverage achieved. Single-dose strategies or those where coverage below 90% is achieved will not prevent the reaccumulation of susceptible individuals, although in some circumstances the time between epidemics may be considerably prolonged. The consequences of such late epidemics will be significant morbidity and mortality because of the increasing complications associated with the rising age of measles infection.

In order to predict the potential for future outbreaks and the likely achievement of elimination, and to inform the correct vaccination strategy, an estimate needs to be made of the age-specific proportion of the population susceptible to measles. This can either be obtained by performing serological surveys or estimated by mathematical modelling using other surveillance data. Since serological surveillance is not feasible in all Member States, some may be able to predict the age-specific proportion of susceptible individuals in the population by mathematical modelling based on vaccination coverage data and/or age-specific disease incidence. Such modelling may also be used to inform future strategy by predicting the effects of alternative programmes.

#### 6. *Choosing the appropriate strategy to accelerate measles control*

Based on vaccine efficacy and vaccine coverage, surveillance data, and the estimate of the age-specific proportion of the population susceptible to measles, the appropriate strategy to accelerate measles control must be chosen. In addition to the improvement or maintenance of high first dose coverage, strategies to accelerate measles control may include the use of mass catch-up campaigns and/or the routine use of second doses of vaccine. The appropriate strategy will depend on the current level of control, the predicted level of susceptible individuals, and the time frame for implementation. Other factors that will need to be taken into account in selecting the appropriate strategy will include the costs of delivery of various vaccination programmes, the acceptability of such delivery methods and access to the target population.

#### 7. *Choosing an appropriate strategy to maintain measles elimination*

An important aspect of the elimination strategy is the ability of each country to maintain the proportion of susceptible individuals below the target level. This will be necessary to prevent transmission being re-established following the introduction of measles virus into a population from a neighbouring country or from outside the Region.

### **Regional initiatives**

Many countries have advanced facilities for laboratory diagnosis that are already contributing valuable surveillance data. As more countries participate in laboratory-based surveillance, it will be important to ensure consistency and comparability between countries. At regional level it will be important to establish the support for a laboratory network that will allow standardization of methods for the following laboratory tasks: serological surveillance,

confirmatory testing of cases of measles, and isolation and characterization of strains from confirmed cases of measles.

### **Categorization of countries**

Countries will be divided into three groups according to their measles control/elimination achievements in 1997. Group 1 countries – those close to eliminating measles – have had excellent immunization programmes and will have already interrupted measles transmission. These countries are committed to the goal of measles elimination and efforts will be required to maintain their excellent performance and to establish surveillance methods which can confirm elimination. Data will also be generated that will establish the base line criteria used to evaluate measles surveillance in other countries in the Region as they near elimination.

Group 2 countries – those with good control but a potential for future outbreaks – have achieved considerable success in measles control and additional strategies have either not yet been effectively implemented, or have been implemented relatively recently. For this reason, these countries may still have groups of the population at risk of outbreaks. With improved surveillance and consolidation of the existing immunization programmes and activities to prevent accumulation of susceptible individuals, many countries in this group may move into Group 1 within a short period.

Group 3 countries – those with poor control – are either those where commitment to measles control is poor and surveillance of measles is poor or absent, or those where socioeconomic circumstances are difficult, particularly following recent political unrest or conflict. For more information on the criteria to assist in categorization and the tasks appropriate to countries in each of the categories, please see Annex 1.

### **Monitoring the elimination strategy**

In order to achieve the goal of elimination by the year 2007, countries will need to demonstrate that they have reached specific milestones for coverage and surveillance as detailed in the regional strategic plan for measles elimination.

### **Mathematical modelling of immunization strategies**

Using estimates of age-specific susceptibility, based either on sero surveillance or computation from coverage and surveillance data, it is possible to predict the effect of a number of immunization alternatives as used in some European countries as well as, for instance, in Canada and New Zealand.

### **Cost-benefit studies**

An economic evaluation, comprising incremental cost-effectiveness, budget-impact and cost-benefit analyses, has been undertaken comparing 10 different scenarios in a hypothetical western European country. The scenarios were based on past and future coverage rates, distinguishing between single-dose and two-dose strategies with poor and high coverage and two-dose strategies combined with a campaign. The results of these analyses confirm the incremental effects of implementation of each of these strategies, provided that high coverage is achieved. Increasing the coverage of measles vaccination to elimination levels is a cost-effective use of health care resources, especially if epidemics are prevented. Every incremental elimination effort examined was found to be cost-saving from a social point of view. Some strategies would even result in net savings from the health care payer's perspective. In this respect the analysis clearly showed the advantage of

attaining high coverage for the first dose before introducing the second dose. In an annex to the strategic plan, the results of the economic evaluation will be discussed in more detail. This economic evaluation can be modified for the data from any country in the Region wishing to examine the costs and benefits of modifications to existing strategies in the furtherance of measles elimination.

### **Recommendation**

The EAG was convinced that the elimination strategy, based on identification of susceptibility, was the most appropriate approach for the European Region. Countries will need to categorize their present measles strategies and make appropriate analyses to estimate susceptibility and identify the appropriate way forward. In some countries this will be done using serological surveillance, while in others it will be done on the basis of estimates using immunization coverage data and disease-reporting data. Countries that do not have such historic data could proceed rapidly to identification of susceptibility through the use of sero sampling. The elimination of measles will require the maintenance of high coverage and the absence of disease in some countries for a significantly long period of time. Under such circumstances, the potential seriousness of the disease is no longer apparent and parental and professional concerns of adverse events appear more significant. The global eradication of measles would then allow the stopping of measles immunization and such concerns would no longer be relevant. The EAG agreed that the target for elimination should be set at 2007, but this could be accelerated especially if some western European countries, where measles control is at present of low political priority, were to make a full commitment to elimination.

A number of actions will be necessary for implementation of the measles elimination objective. A plan of action will be necessary for regional activities, including operational milestones and cost estimates. This will require endorsement by the Regional Committee and referral to national governments for action. Each country will have to interpret the regional plan of action in the light of its own circumstances and develop its national plan of action. All opportunities should be sought to recruit the support of national and international agencies as soon as possible.

### **FUTURE WORK OF THE EAG**

It was agreed that the next meeting of the EAG (8-10 December 1997) should concentrate on combination vaccines, side effects and contraindications, progress on poliomyelitis elimination, and new vaccines such as varicella or rota virus. The Regional Office will be preparing for the WHO biennial review and the advice of EAG will be sought for priority planning for immunization programmes.

## Annex 1

## CRITERIA FOR CATEGORIZING MEASLES CONTROL

## GROUP 1: COUNTRIES CLOSE TO ELIMINATION

- Countries in this category will have:* National reporting of suspected measles
- Laboratory confirmation being performed for a high proportion of sporadic cases (at least 1 suspected case per 100 000 population must be tested per year)  
Less than 10% of suspected cases will have been confirmed for the last 5 years
- and*  $\geq 95\%$  coverage dose 1 by age 2 years (for 5 consecutive years or more) and no geopolitical units within the country have a vaccine coverage of  $< 90\%$
- and either*  $\geq 95\%$  coverage of 2 doses (for at least 10 cohorts of children) (with dose 1 given above the age of 12 months)
- or* Age-specific susceptibility is known to be:  
1-4 years  $\leq 15\%$ , 5-9 years  $\leq 10\%$ , 10-14 years  $\leq 5\%$

## GROUP 2: COUNTRIES WITH GOOD CONTROL BUT POTENTIAL FOR FUTURE OUTBREAKS

- Countries in this category will have:* National reporting of suspected measles
- Laboratory resources available for confirmation of sporadic cases
- Some laboratory testing of suspected cases
- Less than 50% of suspected cases which are tested can be confirmed
- and* Coverage dose 1  $\geq 90\%$  by age 2 years for 5 consecutive years (given at or above the age of 12 months)
- and* A stable incidence rate<sup>1</sup> of reported measles over 5 consecutive years or an inter-epidemic period<sup>2†</sup> of  $\geq 5$  years

## GROUP 3: COUNTRIES WITH POOR CONTROL

- Countries in this category will have:* Low ( $< 90\%$ ) or unknown coverage for the first dose of measles vaccine
- or* No national reporting of suspected measles
- or* An inter-epidemic period<sup>3</sup> of less than 5 years.

<sup>1</sup> The highest annual incidence is less than fourfold higher than the lowest rate.

<sup>2</sup> The period between the two most recent years of peak incidence.

<sup>3</sup> The period between the two most recent years of peak incidence.

## JUSTIFICATION FOR THESE CRITERIA

Despite the recognition of the importance of national reporting of measles, the accuracy of routine reporting needs to be evaluated. At low levels of coverage and with poor measles control, the incidence of reported measles will depend on the degree of under-reporting. Therefore, the use of an incidence rate of reported measles as a criterion or a target is not recommended. Without any correction for under-reporting, such rates are not sufficiently accurate to formulate a country's strategy for elimination. In the absence of information on under-reporting in each country, therefore, a criterion based on trends in reported incidence over time will more accurately define the current level of measles control. Countries with good control would expect to have extended the inter-epidemic period to five years or more. In countries with poor control, the inter-epidemic period will be shorter, and they will have experienced an epidemic within the past five years.

With high coverage and better control, the specificity of the clinical diagnosis of measles will be too low to allow accurate monitoring of the programme based on reported cases. Laboratory confirmation in a high proportion of cases is required but a criterion based on the incidence of laboratory-confirmed measles will be prone to differences in the number of cases where laboratory testing is performed. The proportion of cases investigated which are confirmed by laboratory testing will provide an index of the sensitivity of the surveillance based on confirmed cases. To be confident of excluding measles transmission within a country, however, laboratory testing must be performed at an acceptable minimal rate based on the underlying rate of non-measles rash and fever illness.

The precise incidence of non-measles rash and fever illness has not been established and the proportion of such cases which conform to a clinical case definition for measles is unclear. In the United Kingdom during a period of good measles control, a rate of doctor-diagnosed suspected measles of 20 per 100 000 population per year was observed. Some 64% of these cases conformed to the WHO case definition and only 5.3% of these cases could be confirmed as measles by laboratory testing. As rates may vary between countries and over time more experience is required before a final rate is set.

Countries in group 2 should therefore be carrying out some laboratory testing of sporadic cases, and would be expected to confirm less than 50% of suspected cases. For countries in group 1 to demonstrate that surveillance of confirmed cases is sufficiently sensitive will require that at least 1 suspected case per 100 000 population is being tested and that fewer than 10% of such cases should be confirmed. This rate will be refined as more countries near elimination and are able to monitor the rate of laboratory testing.

*Annex 2*

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