

EXPANDED  
PROGRAMME  
ON IMMUNIZATION



Measles Control in the 1990s:  
Plan of Action for  
Global Measles Control



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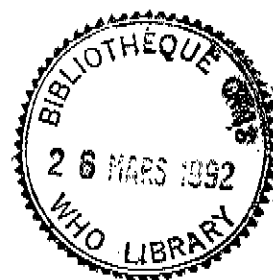
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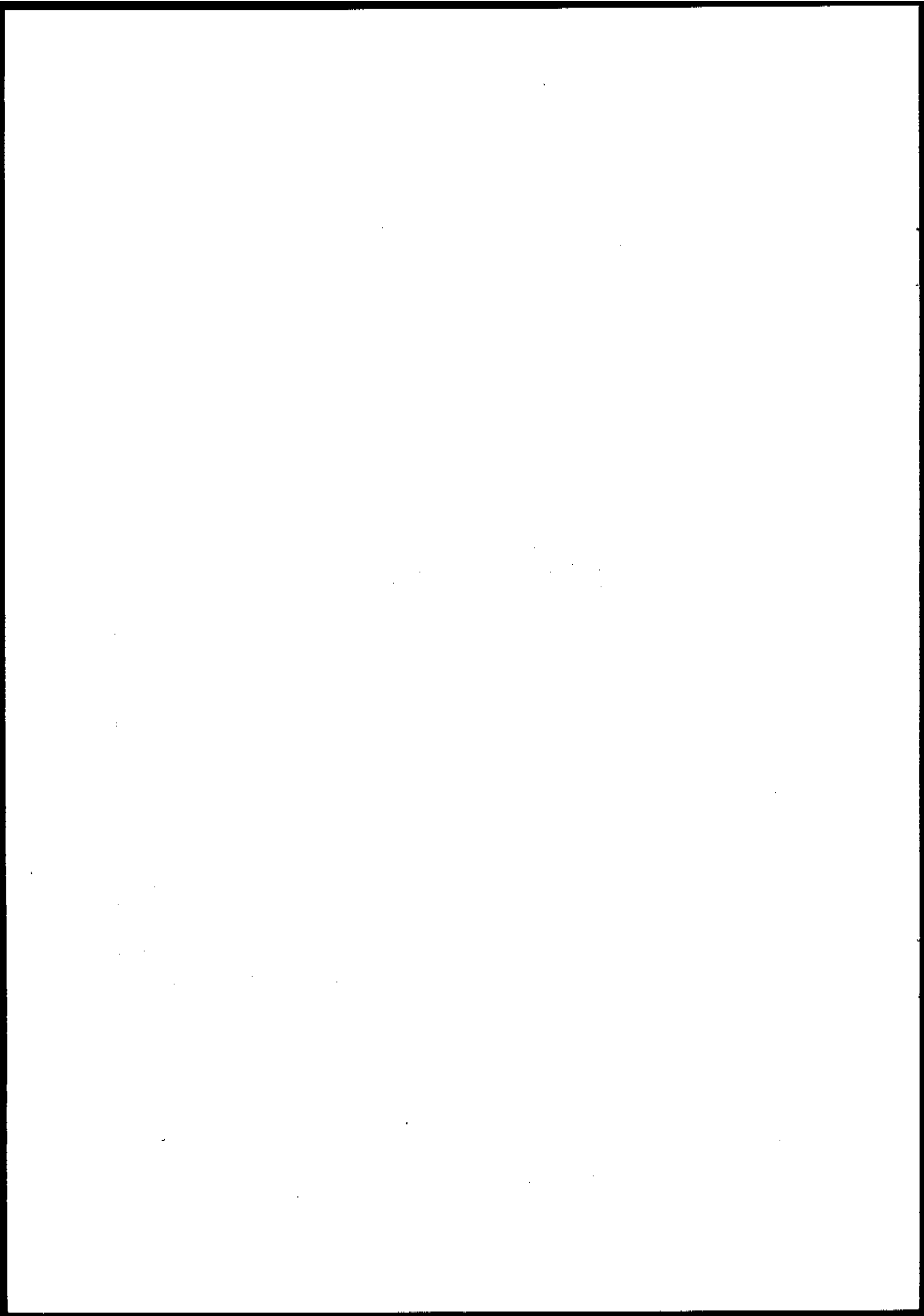
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## I. INTRODUCTION

### 1.1. Background

As part of a broad based push towards the year 1995 and beyond, the EPI has been challenged by the World Health Assembly to control measles, the EPI target disease with the greatest impact on child health. Measles ranks as one of the leading causes of childhood mortality in the world. Its impact on the lives of millions of young children every year, particularly in developing countries, indicates the urgent need for the continued reduction in measles incidence. In light of this, the World Health Assembly has called for a reduction in measles incidence of 90% from pre-immunization levels by 1995. This goal can only be reached and sustained through accelerating the EPI as a whole.

Before the EPI, there were an estimated 130 million cases and deaths of measles and about 3 million deaths due to measles each year. Without immunization, virtually all children contract measles. The EPI has resulted in a dramatic reduction in both measles morbidity and mortality. It is estimated that approximately 80% of the world's children less than one year of age received measles vaccine in 1990.

Estimates of the total number of measles cases occurring in the developing world for 1990 were 29 million ill with 880 000 deaths. Thus measles is responsible for more deaths more deaths than any other EPI target disease. Complications from measles include diarrhoea, pneumonia, otitis media, blindness and encephalitis, leaving many thousands of children disabled each year.

Not only is measles an acute illness which causes death and complications, the longer term impact of the infection is increasingly being recognized. For many months after the acute attack, the effects of an attack of measles can be seen in the reduced survival rates of infected infants. When compared with those not infected, children who are infected with measles virus may survive the acute disease, but have a greatly increased chance of dying from a variety of causes over the following months. The younger the age of infection, the more noticeable is the effect of this delayed mortality. It is therefore imperative to protect children at the youngest possible age. The true impact of measles virus infection is much greater than is actually recorded in the number of acute deaths generally attributed to measles, making the control of this disease an even greater priority.

## **1.2. Accelerated EPI**

Intensification of measles control needs to take place within the wider context of an accelerated EPI and of Primary Health Care (PHC). Poliomyelitis has been singled out for eradication by the year 2000, with excellent progress being made in all Regions. Neonatal tetanus has been targeted for elimination by the year 1995, and progress has been rapid, particularly in the African Region.

One of the reasons for targeting measles is that it may be considered as an indicator for the control of other target diseases, being the last vaccine to be given in the present EPI schedule. If the incidence of reported cases of measles is markedly reduced, it is most likely that other EPI target diseases are controlled as well.

In addition, the surveillance system for measles and other reportable diseases are similar. Reporting for pertussis and diphtheria may be more complicated due to the difficulty of a clinical diagnosis. But measles is generally easier to recognize, and therefore more likely to be reported. It is probable that an improvement in reporting completeness for measles will also improve reporting completeness for other infectious diseases.

## **1.3. Sustainability**

The ultimate global target is total eradication of measles virus from the globe. The date for eradication has not yet been set, and it is to be expected that measles virus will continue circulating in communities for the immediate future. Any relaxation in control efforts will not only result in lack of progress in disease reduction, but there is likely to be a resurgence of cases. The measles virus can be expected to sweep back and infect everyone (regardless of age) who has not been infected already and who remains unimmunized. For epidemiological as well as humanitarian reasons, any measles control activity must be sustainable in the long term. The future of any such initiative must also be viewed within the context of the sustainability of the overall EPI to control effectively other targeted diseases and the strengthening of PHC.

In many developing countries, support from outside sources will be required for the foreseeable future to improve surveillance efforts and to achieve and sustain high coverage. In the least developed countries, this may need to include recurrent costs as well.

#### **1.4. Measles eradication and control plans**

While eradication is the clear goal on which all sights must be set, there are many steps on the way to that goal which must first involve the control of the disease. For the present, the global target is disease reduction as a prelude to eradication. There is still much to be learned regarding the control of measles, especially with regard to eradication.

The European Region has adopted the target of no indigenous measles by the year 2000. In April of 1990, the English Speaking Caribbean countries, supported by PAHO/WHO, adopted a Plan of Action for the elimination of indigenous transmission of measles virus in their sub-region by 1995. From their experiences, new approaches should emerge.

## II. GLOBAL PLAN OF ACTION 1991-1995

### 2.1. Global measles goal

The EPI has its basis in resolution WHA 27.57, adopted by the World Health Assembly (WHA) in May 1974. General programme policies include the EPI goal of providing immunization services for all children of the world (resolution WHA 30.53, 1977) with a current target of 90% coverage by the year 2000 with all antigens. In 1989, the WHA defined a specific goal for measles control:

- A reduction in measles incidence of 90% from pre-immunization levels by 1995.

In September 1990, Heads of State and other world leaders met at the **World Summit for Children**. This resulted in the **World Declaration on the Survival, Protection and Development of Children and Plan of Action for Implementing the World Declaration**. This declaration contained goals relating to children, including goal C (iii) which specifically identifies measles:

*"Reduction by 95 per cent in measles deaths and reduction by 90 per cent of measles cases compared to pre-immunization levels by 1995, as a major step to the global eradication of measles in the longer run."*

### 2.2. Measles control objectives

To achieve the global measles goals, EPI has set specific measles control objectives:

- *By 1995, all countries will have a disease surveillance system in place capable of timely reporting of measles from all districts.*
- *By 1995, measles vaccine coverage of at least 90% of children by one year of age will be achieved both at the country, region and district levels.*
- *By 1995, case fatality rates from measles will be reduced to less than 1% in all countries.*

While the ultimate goal of measles control is eradication, the best strategies to achieve this goal have not yet been defined. The lessons learned from countries and regions already embarked on elimination efforts could form the basis for global eradication strategies.

### 2.3. Components of measles plan of action

Strategies for achieving the 1995 measles control target have been identified by Foster et al<sup>1</sup>. Similar to this, the Expanded Programme on Immunization proposes a global plan of action which consists of two main parts:

- Continue to strengthen national programmes' capability to immunize their children with all appropriate vaccines and to deliver other PHC services.
- Initiate strategies required for measles control which are distinct from other activities already carried out.

#### 2.3.1. Continue to strengthen national programmes' capability to immunize their children with all appropriate vaccines and to deliver other PHC services.

- Identify and immunize all eligible children in high risk areas and groups, especially the urban poor. (*See section 5*).
- Develop complete and timely disease surveillance as a management tool to focus control activities. (*See section 6*).
- Reduce missed opportunities. (*See section 5.5*).
- Develop appropriate communications and social participation. Effective community participation in disease surveillance and control activities will be needed to reach and sustain the goals of measles control. (*See section 8*).

#### 2.3.2. Initiate strategies required for measles control which are distinct from other activities already carried out.

- Raise and sustain coverage with measles vaccine in all districts and communities in the first year of life using strategies that have the greatest impact on interrupting transmission of measles virus in urban populations. (*See section 5*).
- Reduce mortality from measles to a minimum by treating complications of measles aggressively. (*See section 9.1*).

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<sup>1</sup>. Foster SO, McFarland D, John M. Measles. Health Sector Review Priorities. Population, Health, and Nutrition Division, Population and Human Resources, The World Bank, Washington DC 20433, July 1991.

- Provide vitamin A supplementation with immunization services in vitamin A-deficient areas. *(See section 9.2).*
- Treat cases of measles with vitamin A in vitamin A-deficient areas. *(See section 9.3).*

#### **2.4 EPI/WHO tasks**

To achieve the above points for action, EPI Geneva will undertake the following activities in close co-operation with UNICEF and other long-standing partners in EPI:

- Develop guidelines for national programme managers which will enable them to control measles. *(See section 10.2).*
- Develop and test new strategies for control of measles with special emphasis on interrupting transmission of measles virus in densely populated urban areas. *(See section 10.2).*
- Ensure a global supply of appropriate measles vaccine. *(See section 10.2).*
- Encourage the development and testing of new measles vaccines for use at younger ages. *(See section 8.6 and appendix 2).*
- Be a catalyst for donor support for the measles initiative in a way which will strengthen the whole immunization programme. *(See section 11.1).*

### III. MEASURING MEASLES CONTROL OBJECTIVES

#### 3.1 Surveillance

Further development of surveillance methods will be required to measure progress towards achieving the actual goals set by the World Health Assembly.

#### 3.2. Coverage

Because high coverage is a fundamental component to reduce measles cases, achieving coverage levels of 90% or greater is an important sub-goal. Tools presently available to programme managers permit reasonably accurate estimates of immunization coverage. It is recognized that countries may be able to achieve control of measles under certain epidemiological conditions (eg sparsely populated areas) with less than 90% coverage.

#### 3.3. Observed number of cases.

Measurement of the numbers of measles cases is a primary indicator in assessing *trends* in measles control.

Counting cases may not always be easy because of insufficiently developed surveillance systems and the relatively low proportion of cases which present at health centers. The possibility of subclinical cases is an additional complication of this issue. Further development is needed in this area.

The ultimate success of an eradication programme will depend on the ability of the surveillance system to detect EVERY case of measles.

#### 3.4. Observed number of deaths.

Every death from measles should be regarded as an opportunity to communicate to the public and health policy makers the importance of measles immunization. There are formidable technical difficulties in identifying measles deaths, as well as a broad variation in case fatality rates attributable to measles virus infection. Outbreak investigations can be a useful opportunity to estimate measles mortality.

### **3.5. Case fatality rates.**

EPI/WHO has a responsibility to monitor progress towards global goals. In countries with accurate surveillance systems capable of accurate reporting of measles deaths, country reports will be used in this monitoring. In countries not yet able to report measles deaths accurately, deaths will be estimated using the most appropriate values for vaccine efficacy and case fatality rates.

While measures of hospital CFRs produce biased results which are not appropriate to calculate the number of deaths occurring in a country, direct measurement of the CFR may be useful in a hospital setting as a tool to measure improved case management.

Even though measles cases will continue to occur beyond 1995, the impact of measles can be lessened by a reduction in the case fatality rate. This facet of the measles control programme will be an important component until eradication is achieved (see Chapter IX on treatment). Case fatality rates reflect a country's ability to provide adequate and appropriate primary health care to children with acute measles.

## **IV. SITUATION ANALYSIS**

### **4.1. Disease incidence**

Measles cases reported to WHO have declined since the introduction of the first measles vaccines in the 1960's. Figure 1 displays the annual reported number of measles cases during the period 1974-1989. Some countries (both industrialized and developing) experienced more than 99 percent reduction in incidence of reported disease. However, in recent years, the number of cases in some of those countries has increased, although still far below the pre-vaccine era levels. Outbreaks have occurred principally among pre-school-aged children, due to a number of causes. In developing countries, measles remains endemic in most areas, with the largest proportion of cases reported to occur in children under 5 years, and with up to 25% below 9 months of age.

### **4.2. Coverage**

By 1982, virtually all countries had incorporated measles vaccine into their immunization programmes. Since 1983, coverage with measles vaccine has increased annually, so that by 1990, the overall estimated coverage with measles vaccine was 80% by one year of age (Figure 2). However, there is a wide range of coverage between regions and between countries within regions. For instance, about half of all African countries have coverage levels below 60%.

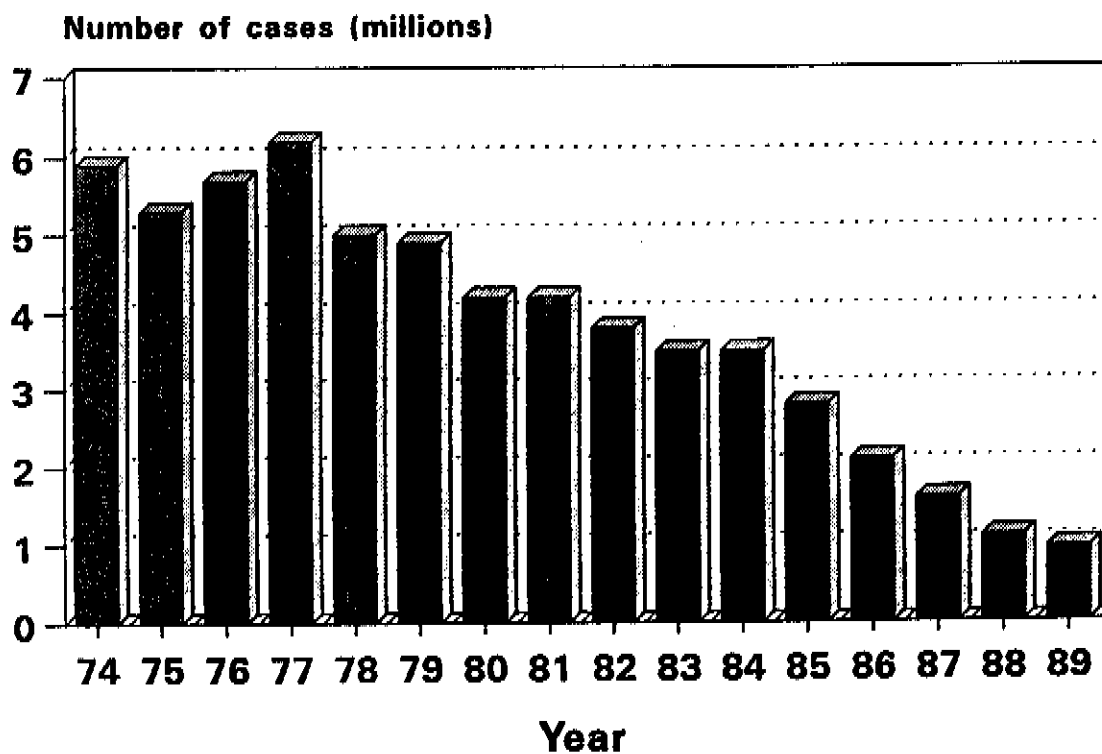
### **4.3. Changing epidemiology**

The epidemiology of measles changes rapidly with increasing coverage. At low levels of coverage, outbreaks of measles are expected to occur. Some countries with moderately high coverage levels have also reported outbreaks in children outside the current target age group for immunization. This is an expected consequence of an immunization programme whose target age group has been children under 1 year of age, and does not necessarily indicate programme failure.

Another expected result of high coverage levels is a relative increase in the proportion (but not the absolute number) of cases which occurs among children previously immunized.

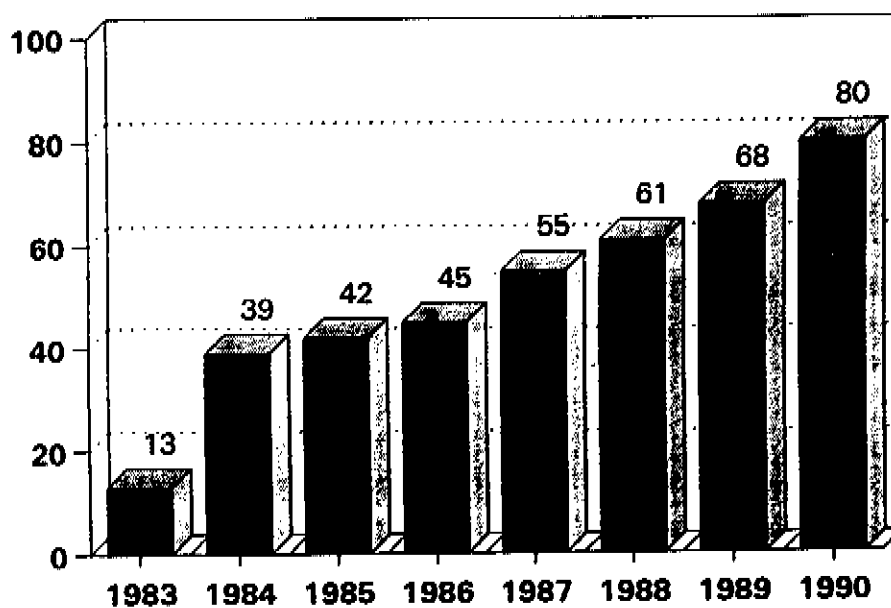
After reaching high coverage levels, a period of low measles incidence may follow for a number of years. This period of temporary low incidence may be followed by an epidemic of considerable size. However, the inter-epidemic periods can be expected to become increasingly long in programmes with high coverage.

**FIGURE 1**  
**Number of Cases of Measles Reported Globally**  
**1974 - 1989**



Source: information provided to WHO

**FIGURE 2**  
**Global Coverage with Measles Vaccine**  
**1983 - 1990**



Source: information supplied to WHO

## V. STRATEGIES FOR RAISING AND MAINTAINING COVERAGE

### 5.1. Primary target

Where measles is endemic, children less than 1 year of age are the primary target for immunization. All children should receive one dose of potent measles vaccine as early in life as recommended for the vaccine in use. The exact age of immunization will be determined by the type of vaccine available and the epidemiological situation within a country.

### 5.2. Secondary target groups

Despite the maturation of many immunization programmes, sections of the population frequently have much lower levels of coverage than the average, requiring intensified measles immunization strategies to reach them. Effective surveillance is needed which can be used at the district level (and even at the neighbourhood level in big cities) to identify such groups.

When epidemiological information indicates that children outside the primary target group are a major source of circulating measles virus, or a significant proportion of older children are found to be susceptible, targeting such groups is indicated. Efforts to immunize such secondary groups play a role mainly in intermediate or late stages of control. Such efforts should not, however, jeopardize high and sustained immunization coverage levels in the primary target group.

In 1991 it became evident that global measles vaccine supply was fragile, and that policy changes such as targeting secondary target groups might place an additional strain on this supply. Any national policy for widening the target must first consider whether the supply of measles vaccine can be ensured.

The following groups may need to be considered:

- Pre-school children. In countries where measles coverage over the last few years has been medium high, there may be a large proportion of pre-school aged children (1 -5 year olds) who have not received measles vaccine, and who may not have had measles disease.
- School entry children. The same considerations apply for children entering school. Depending upon the epidemiological situation, children entering school may be screened and offered missed immunizations. Some countries have found legislation insisting on

evidence of immunization at school entry helpful in identifying and immunizing unimmunized children.

- School children. There are countries where measles vaccine coverage has been high enough for several years to change the epidemiology of the disease, resulting in a long period of temporary low incidence. As a result, there may now exist considerable numbers of school-aged children who are unimmunized and have not yet been infected with measles virus.

### 5.3. High risk groups and areas.

High risk groups or areas require intensified measles control measures. High risk *areas* are typically areas where there is a high density of population, areas which fall into the lowest quarter of measles immunization coverage, or areas which have high numbers of measles cases or deaths. Such high risk areas will differ from country to country and will change as the programme matures. Efforts at enumerating high risk districts for measles control need to be integrated into more generalized efforts to identify high risk areas for other diseases such as neonatal tetanus, poliomyelitis, acute respiratory infections and other communicable diseases, as considerable overlap is likely.

These *groups* are known to be at high risk for measles and its complications :

- Urban poor. In many countries the economically disadvantaged form large pockets of susceptibles. Protecting children in this group is critical to controlling measles.
- Ethnic minorities. These groups are sometimes under-served, or have cultural beliefs which restrict their access to health services or acceptance of immunization. Such groups may form large pockets of susceptibles, and require special attention.
- Children admitted to hospitals. There is a danger of nosocomial outbreaks of measles in children admitted to hospital. To avoid such outbreaks and the potential spread to the community, all children from the age of 6 months of age who are admitted to hospital should be immunized with measles vaccine. If they are immunized using standard measles vaccine at an age earlier than is normally recommended for that country, they should be re-immunized with a second dose at the normally recommended age (eg nine months).
- Refugees. Even before a measles case occurs in a refugee camp, special immunization activities should be instituted.

#### **5.4. Two dose schedule**

Two doses of measles vaccine are already recommended by WHO/EPI for certain groups which are at high risk of measles death, such as infants in refugee camps and infants admitted to hospital before the scheduled age of immunization. WHO does not currently recommend a two dose schedule for developing countries because it is felt priority must be given to reaching every infant with one dose at an appropriate age.

However, two dose strategies are being used routinely in some countries. Some developed countries which have measles elimination goals and which have achieved high coverage with one dose of vaccine have also adopted two dose schedules.

The purpose of the second dose is to reduce the number of susceptibles in older age groups who either were not immunized or did not respond to the first dose of vaccine. Countries using these schedules should evaluate the impact of a two dose schedule in increasing overall coverage and protection, the effect on coverage with the first dose and drop-out rates. More field-based research will need to be undertaken before the benefits and disadvantages of a two dose regime will be more fully understood.

#### **5.5. Missed opportunities.**

Missed opportunities for immunization, which are a major impediment to improving measles vaccine coverage, will be reduced by use of a health record card which includes space for recording attendance for clinical care. Fixed service facilities should be studied to determine reasons why children were not immunized. Any deficiencies should be corrected.

#### **5.6. Strategies for delivery.**

- Fixed services. Clinic-based services should offer immunization at times and frequencies appropriate for, and convenient to, the target population.
- Outreach services. These services may need to be offered at fixed locations for populations at less than a day's travel from the base clinic.
- Mobile teams. Mobile teams may need to operate in areas too remote to be served easily by fixed or outreach services.
- Special activities. The campaign approach should be considered where the health infrastructure has not been successful in dramatically raising coverage. Such activities take a variety of forms; they may consist of publicity campaigns alone or be coupled with

the provision of immunization and other services. Campaigns should offer all EPI antigens including TT for women of child bearing age. Such campaigns may be nationwide or targeted to problem geographical areas. Specific age groups may also be targeted. Such campaigns may be on one or more days or take place during an entire week or month. Immunization may be carried out at existing clinics, at additional temporary clinics or even through door-to-door visits made by teams. Countries should select what is most appropriate for their needs.

- Urban strategies. In large urban areas, special consideration needs to be given to ways to improve coverage. Indeed, controlling measles in the huge urban sprawls of the 1990s may be the key to interrupting transmission. There is some evidence that rural transmission (in situations of lower population density) can be achieved with quite modest coverage. But coverage of over 95% may not be enough in densely populated areas. The urban poor need specific approaches to meet their special circumstances. New strategies to cope with this problem are of the highest priority.

- Rural strategies. Problems of access to care will require creative solutions for rural communities e.g. providing outreach activities in villages. Dispersed rural populations and nomads will require equally imaginative but different approaches. Services at watering holes and markets are possible solutions.

## VI. SURVEILLANCE AND MONITORING

### 6.1. Surveillance as part of EPI

As coverage rises, increasing the sensitivity of surveillance systems becomes critical in the control and evaluation of measles activities. Surveillance for measles should be used as a management tool. It is important to define those actions which will follow surveillance information. Decentralizing surveillance will assist in local action.

### 6.2. Surveillance Activities

- Basic reporting system. Routine reporting should form the basis of surveillance for measles control as well as other infectious and notifiable diseases. In some instances, this basic routine reporting system is already well defined and in place. However, in many countries it is not operational, therefore, together with the efforts being made for neonatal tetanus elimination and for polio eradication, it will be necessary to revitalize this routine reporting system, ensuring timely and complete reporting.

Surveillance should be standardized, and timely feedback should be provided routinely. The frequency of reporting needs to be defined - countries should move towards monthly reporting of cases and immediate reporting of outbreaks. Standardized information needs to be developed for reporting measles cases and outbreaks, allowing countries to adopt a uniform system for global reporting. A uniform case definition should be disseminated and used by all staff (see appendix 3).

All countries will need to review their surveillance systems and take steps to correct any problems in reporting. Reports should be made at monthly intervals and should be submitted even if no cases are recorded during that time period.

- Hospital reporting. Hospital reporting should already be an integral part of the reporting system. At a minimum, countries should assure that reporting takes place from key hospitals likely to see measles cases. At best, where measles is infrequent, every case of measles admitted to hospital will be reported at once.

- Extended activities. As immunization coverage increases, additional steps should be taken to improve surveillance. Facilities which might be contacted (if not already included) are all acute care public and private hospitals, community clinics, pharmacies, etc. In many cities, private practitioners see a majority of cases of measles and they should be considered an important source of reporting.

In many countries, measles is still considered to be a normal childhood occurrence, and when parents suspect measles, the child is often kept at home, without seeking the assistance of the health sector. Families, neighbours, kindergartens and school teachers should be educated about the disease and encouraged to report suspected cases to health workers as early as possible. This will increase the possibility that children with complications receive appropriate treatment as well as improving reporting.

### 6.3. Information to collect

- Coverage. This may be collected by the routine system or by survey. The data should be organized and presented by district. Data analysis can now be computerized with "COSAS", a specially designed computer programme. Such coverage data should be used to prioritize activities. Because of the difficulties inherent in routine information systems, coverage surveys may need to be performed in many countries. To identify high risk districts, it may be appropriate to undertake coverage surveys directed at target populations likely to be under-served, eg the urban poor.

- Number of cases. As a minimum, the number of cases in each district should be reported and presented. This information should be reviewed and organized geographically and based on monthly time-periods. Simple rates can be calculated by using population data.

- Additional information. As routine reporting improves, coverage increases and measles becomes infrequent, countries will need to start collecting additional information on each case, including:

*name, address, age, date of onset of disease and rash, immunization status and age at immunization, contact with other measles case, whether case is meeting the case definition.*

### 6.4. Uses of surveillance data

The principle uses of surveillance data are to indicate programme progress, identify potential problems and direct programme activities to the areas of greatest need. As coverage and surveillance improves, additional information obtained about cases may be used to evaluate the age distribution of cases and to assess whether vaccine policies are targeting the appropriate age groups. Surveillance data may also help in evaluating the adequacy of the cold chain.

### **6.5. Quality indicators**

- Completeness of reporting. At every level of the health system, some type of record should be maintained to keep track of all reports. Each level of supervision should be able to determine the completeness of reporting for a given reporting period.
- Timeliness of reports. Reports must be received within a reasonable time period (certainly within one month). Routine evaluation of the promptness of reporting is an important evaluation tool.

### **6.6. Response to Outbreaks**

Outbreaks are still to be expected even in immunized populations. It has become clear that as measles outbreaks become unacceptable, demands for outbreak control grow. However, control measures, particularly if applied late in an epidemic, may not be effective. Outbreaks should be seen as excellent opportunities to analyze why they occurred, identify high risk areas or groups, and measure vaccine efficacy.

In areas of low coverage, response resources are best used to improve routine immunization coverage. Outbreaks should not, therefore, be responded to by immunization interventions in most areas with low or medium coverage.

Nevertheless, in many countries, immunization programmes have reduced measles incidence, so that health workers and the public expect measles outbreaks not to occur. When outbreaks do occur in such countries, they generate strong political and social pressure for a response. Therefore, such countries will need to develop plans for the response to outbreaks.

Guidelines on outbreak investigation and control will be refined (see EPI/GEN/84/6 for existing guidelines).

Offering appropriate treatment to children with complications of measles is important in an outbreak situation.

## VII. TECHNICAL ASPECTS

### 7.1. The right vaccine.

All measles vaccines should meet WHO requirements regardless of strain, potency or recommended age of administration. Experience from administration of millions of doses of measles vaccine proves this is a very safe vaccine. In a public health setting there are virtually no contraindications to providing measles vaccine.

### 7.2 The prospect of administration before nine months

During the 1980's, data became available on the use of the Edmonston Zagreb (EZ) strain. This strain appeared more immunogenic, and therefore better able to overcome interference from maternal antibody when the appropriate potency was used, thus making possible its administration to infants younger than nine months of age. The lower age limit has yet to be established, however it appears that infants as young as six months of age exhibit good antibody response.

In 1989 WHO recommended the use of the EZ vaccine produced in Zagreb and at high potency for administration at six months of age in countries in which measles before nine months is a significant cause of death.

By October 1991, three additional makes of measles vaccine had been shown to be suitable for use at six months of age. However, high titer vaccine has proven to be more costly than expected. In addition, some subsequent studies have reported lower immunogenicity than was seen in early trials. And, while the high titer vaccines had appeared to be safe, concerns were raised during 1991 about rare potential adverse events. Although at present there are insufficient data to recommend changes in policy regarding use of high titer EZ measles vaccine at six months of age, at its October 1991 meeting, the EPI Research and Development Group recommended a complete reevaluation of the immunogenicity, efficacy and safety of measles vaccines for use at this age. Manufacturers of high-titer EZ vaccine and countries actually using the vaccine were informed of their concerns and the process of reevaluation.

Over the next few years, more trials are anticipated of candidate measles vaccines, and it is possible that vaccine will become available which will allow the minimum age of administration to fall to lower than six months of age.

### 7.3. Immunization schedule.

Measles vaccine should be administered as soon as possible after the age recommended by the national advisory body with a vaccine of appropriate potency. WHO recommends this advice be formulated according to the local epidemiology of measles. The nationally recommended age of immunization presently falls into three broad categories:

- at 12-15 months (most industrialized countries)
  - at 9 months (most developing countries)
  - at 6 months (those countries with a high incidence of measles before nine months).
- Vaccine for implementation of this schedule is not yet available.

The EPI Global Advisory Group periodically advises as to the availability of vaccines and recommended schedules. There is the need for, and the expectation that within the next decade there will be developed, a vaccine which can be given in the first few weeks of life. However, existing measles vaccines have proved themselves extremely safe and effective at the recommended ages, and there can be no justification for waiting for a new measles vaccine before embarking on massive global measles control efforts.

## **VIII. SUPPORTING ACTIVITIES**

### **8.1. Cold chain**

Measles vaccines are heat sensitive. Particular attention must be paid to transport and storage conditions of the vaccine. Any cold chain deficiencies need to be identified and corrected.

### **8.2. Training**

Planning workshops will be an opportunity to train staff on available tools and methods to control measles as well as other target diseases. Training material will be prepared and made available to all levels of the programme. Training will emphasize methods, raising and sustaining coverage and monitoring progress. Where possible, training will be extended to assist planning in other PHC activities.

### **8.3. Information dissemination**

Information dissemination within countries and throughout each Region is an important part of this intensification programme. The development of national technical advisory groups to advise on the implementation of PHC policies will be critical in making recommendations and reviewing the progress of the measles control effort along with other disease control initiatives. Journals and newsletters and other appropriate outlets should be used to inform health workers and health professionals about the initiative.

### **8.4. Targeted messages**

National programmes need to discover, by appropriate social science research, what is the most appropriate information to provide to the public. Communications consultants should be used to craft communications packages using a wide range of media.

Education of mothers can be improved with a standardized routine statement including information on when to return for immunization and the danger of EPI diseases. Such statements should be repeated at all health center contacts.

### **8.5. Supervision**

Supervision is a key activity to both measles control and all activities within the EPI. Adequate numbers and quality of staff need to be identified for field supervision, focusing on identified problems, appropriate solutions and monitoring of progress.

## **8.6. Research**

Both in technical and operational areas, support for research will be provided through EPI. Research needs will continue to be identified by the EPI with assistance from advisory bodies. The EPI measles research priorities are carefully dovetailed into those of the WHO Programme for Vaccine Development (PVD) which has the responsibility for developing new and improved measles vaccines. Together, these initiatives comprise WHO's Measles Programme. Key research issues identified to date are included in appendix 2.

## **IX. TREATMENT**

### **9.1. Death reduction target**

A major strategy for measles control is the lowering of its impact on mortality to a minimum. The global goal is for a reduction of 95% compared with pre-immunization levels by 1995. This must in part be achieved by treating complications of measles aggressively.

The death reduction target will not be achieved easily in the short term by simply increasing coverage. Even before coverage becomes high enough to reduce the number of cases of measles, improved management of cases may be able to reduce case fatality significantly so that deaths are averted. The interaction of measles with malnutrition, vitamin A deficiency, diarrhoea and other complications such as chest infections is complex. It underlines the importance of a multi-disciplinary approach. Other programmes in WHO have already produced guidelines on the management of diarrhoea, acute respiratory infections and proper nutritional practices. The measles control initiative is an opportunity for WHO and Ministry of Health units to combine skills and resources to reduce this mortality to a minimum.

Appropriate training for treatment should be developed. Training establishments should be encouraged to include case management of measles in their curricula. Outside of national immunization programmes, private practitioners should be a target for this training. It follows that part of the response to outbreaks should include provision of treatment for cases.

The logistics, storage and distribution of appropriate PHC drugs required to treat measles complications must be strengthened. Training will be to no avail if drugs are not available at the contact point with patients.

## **9.2. Supplementation with vitamin A**

There is good evidence to indicate that measles is an important risk factor for the development of severe vitamin A deficiency and blindness due to corneal damage. Children living in vitamin A-deficient areas are at risk from this complication. WHO recommends children in such areas should be provided with vitamin A supplementation. One way to reach children in need of vitamin A supplementation is to administer it at the same time as vaccine administration in the EPI.

## **9.3. Treatment with vitamin A**

Vitamin A supplements need to be available for treatment of measles in all areas where measles mortality is a serious problem. Acute cases of measles should be treated with vitamin A in vitamin A-deficient areas. This reduces both morbidity and mortality in severe measles cases. Children with measles and living in vitamin A-deficient areas should be given large doses of vitamin A supplementation following WHO/UNICEF guidelines.

## **X. RESPONSIBILITIES**

### **10.1. The Global Team**

Such a massive human endeavour as global control of measles cannot be claimed as the right or activity of one organization or group. On the contrary, it will only be by the combined efforts of many groups, individuals and organizations that success will be achieved. It is anticipated that WHO will provide technical leadership. Support will be sought from donor governments, other United Nations partners including UNICEF, UNDP, UNHCR and UNIDO, Non-Governmental Organizations (especially those already participating in supporting immunization activities), and other interested parties such as industry.

UNICEF will continue to be a major provider for measles control, especially in developing countries. This includes supplying vaccine, provision of equipment for cold chain and injections, implementation of training programmes, and promotion of communication efforts aimed at increasing demand for immunization services. WHO and UNICEF will continue to work closely together to ensure that their activities are complementary at all levels of operation.

### **10.2. WHO at global level**

WHO will develop guidelines for national programme managers which will enable them to control measles. WHO will also develop and test new strategies for control of measles with special emphasis on interrupting transmission of measles virus in densely populated urban areas. To provide guidance for such activities of the intensification effort, the WHO/EPI Global Advisory Group (GAG), composed of experts in the field of immunizations will continue the role of recommending programme strategies. Recommendations of the GAG will be published and distributed. Advice is offered to the WHO Secretariat on technical matters by the Technical Consultative Meeting, the first meeting having been held in April 1991.

Strategies to achieve required vaccine coverage will be reviewed periodically. The recommendations for immunization activities, including scheduling, and the choice of vaccines, will be made on an annual basis. The EPI will assist in the identification of research needs and oversee the progress of the studies under way, review protocols and results. The GAG will review progress and problems encountered in the measles intensification effort at its regular meetings.

Technical assistance in all areas of programme operations will be available through WHO, including epidemiologists, cold chain specialists, economists, and communications experts.

Materials such as Field Guides, Investigation Forms, and other training materials need to be developed and adapted to country situations and integrated into existing materials where possible.

To assist in training, WHO will prepare a combined field manual on target disease control activities. WHO will provide technical assistance to Regions and countries for the adaptation of the manual to local needs, as well as provide assistance in the planning and execution of training courses and workshops.

It has become increasingly necessary over recent years for WHO (in cooperation with other partners in the EPI) to play a part in ensuring an adequate global supply of appropriate measles vaccine. This role will continue.

### **10.3. WHO Regions**

Each WHO Regional Office will coordinate all activities related to the intensification effort within its Region. All reports and requests from the field for assistance will go through the Regional EPI Office, which will in turn coordinate assistance as needed from other units within WHO. This is critical to ensure a consistent, coordinated effort in Regional activities.

It is estimated that EPI epidemiologists and technical advisors will need to be placed at the Regional level. These advisors will be responsible for several countries and serve as technical advisors on an international basis. Such advisors will assist and cooperate in assessing needs for special intervention in the countries assigned to them, participate in the investigation teams' visits, and provide direct technical support as needed. These advisors will assist the Ministries of Health with the planning and implementation of the intensification activities.

There is a need for additional professional personnel available to the EPI Regional offices who are able to assist in the coordination of activities related to epidemiological surveillance, outbreak investigation, immunization strategy design, and provision of other technical assistance.

### **10.4. Country level**

Each country will need to develop a plan for the intensification of measles control within a framework of the overall PHC plan. Where necessary, technical cooperation will be provided by WHO for the drafting of country work plans. Full inventories of existing resources will need to be made, with identification of needs to be completed. Placement of

long-term EPI technical advisors will be considered for the larger countries. It is critical that seed funding be available at the time of design of the plans of action and signing of agreements with donors that will be partners with Government in the measles control effort. Inter-agency Coordinating Committees (ICC's) as recommended by the GAG should be developed in all Regions and countries to review overall EPI plans as well as measles, polio and neonatal tetanus disease control initiatives, and to ensure that EPI contributes to PHC plans.

At the time of preparation of the national work plans, participation of other international agencies should be encouraged to ensure the necessary level of donor coordination. All resources necessary to achieve the goal of intensification should be identified in the plans of action, with high priority given to the acquisition of these resources.

As each donor agency has its own mandate, the presence of their representatives will ensure that the individual mandates are met and thereby avoid the all too common duplication of efforts that have occurred when there are independent project designs. The National Plan of Action will identify the roles of all of the participating agencies in the country's effort.

The EPI national office should assist in the activities at all levels; insure that training needs are identified, and that training courses addressing these needs are organized. This office should serve as the focal point for identification of all external cooperation and coordination of extra-sectorial assistance related to immunization.

Every country should have an individual responsible for providing epidemiological information to the programme management. In addition there should exist a functional collaboration between individuals responsible for EPI and MCH and the epidemiologist. Appropriate training at all levels should be given.

WHO country and inter-country level personnel will need to work closely with counterparts in the MOH. A major objective of these advisors should be to strengthen national surveillance activities.

## **XI. COST REQUIREMENTS**

The well-defined goals for the control of measles are measurable and cost effective, and can only be reached and sustained through acceleration of the EPI. As a consequence, controlling measles will have a highly beneficial effect on other EPI and MCH activities, resulting in a dramatic decrease in the incidence of other targeted EPI diseases. WHO will be a catalyst for donor support for the measles initiative in a way which will strengthen the whole immunization programme. This broad perspective should have a strong appeal to heads of state and specialized agencies supporting immunization efforts. Communities must be made aware of the benefits of controlling measles so that they demand improved immunization services. Therefore, it is necessary that each country's leadership strongly endorses the proposal and that external agencies are committed to the goal, together with WHO and UNICEF.

### **11.1. WHO**

To meet the objectives by 1995, it is expected that EPI will need to raise approximately US\$ 13.56 million per year additional funding for its own purposes as identified in appendix 1. The extra resources needed are mainly in the development of surveillance units, research and training. The need for additional staff at Regional, intercountry and country levels will be reduced if the planned recruitment of immunization staff as part of the polio initiative is implemented. Monies should ideally be made available at the time of design of the country plans of action to permit the immediate implementation of activities.

WHO will coordinate with all participating agencies to procure the necessary funding to guarantee the achievement of the measles control goal and thereby the acceleration of the whole EPI. National Inter-Agency Coordinating Committees are the natural forum for coordination at the national level.

### **11.2. Regions**

Regional control initiatives, including the polio eradication campaign for the Americas, clearly demonstrate the important role WHO Regional Offices play in disease control strategies. Adequate support will need to be made available for salaries and travel of staff devoted to Regional programme implementation and coordination. These resources will ideally be raised within the Region with additional support from EPI Geneva.

### **11.3 Country**

Most resource requirements for measles control will be needed at country level. This will need to be raised by the programme from regular Ministry sources, a range of other sources

within the country (such as voluntary organizations), and from bilateral donors such as USAID, donor governments and NGOs.

When individual country plans are designed, cost figures will need to be identified and should include salaries for additional personnel, transportation costs, per diem, expenditures for control activities, vehicles, gasoline, vaccine and cold chain equipment. All recurrent and capital expenditures should be taken into account in the programme design. Budgets should also include the cost of media time and production of educational materials.

Recognizing the limited resources available within the Ministries of Health in many countries, it will be crucial to concentrate efforts on the mobilization of country resources to complement those available. To this end, coordination between different sectors of the government will be essential to estimate the potential of existing resources and to mobilize the necessary additional resources. The education and agriculture sectors, social security and other organizations will be essential elements in this endeavour.

Finally, communities and community groups will be called on to collaborate and add their resources and talents towards the achievement of the objectives. Private voluntary organizations, religious groups, and mass media organizations should also be tapped to assist in promotional activities, distribution of supplies and participation in immunization activities. A cooperative strategy should be developed to combine actions of the countries in each Region, and technical cooperation between countries for purposes of planning, implementation, and evaluation of programmes.

All resource mobilization should aim to provide commitment and funds which will continue beyond the 1995 goals, so that the successes of the EPI will continue and expand to other interventions and other primary health care development.

## **XII. CONCLUSIONS AND RECOMMENDATIONS**

1. Steps which need to be taken to control measles will be instrumental in strengthening primary health care in the decade of the 1990's. Reaching the disease reduction target can be totally justified in humanitarian terms and will additionally have a benefit on the rest of the EPI and reduction of other target diseases.
2. Every programme should achieve a reduction in measles deaths of 95% and measles cases of 90% from pre-immunization levels by 1995. Since achieving high coverage is a fundamental component of the strategy to reduce measles, achieving 90% or greater coverage is an important sub-goal. Case fatality rates should be reduced to less than 1%. Further development of surveillance methods will be required to measure progress toward achieving the actual goals.
3. The ultimate goal is measles eradication. However, the best strategies to achieve this goal have not yet been elucidated. The lessons learned from countries and regions already embarked on elimination efforts could form the basis for global eradication strategies.
4. Increasing coverage and improving disease surveillance are the two key elements in improved measles control. To reach the WHA disease reduction goal, every programme should have a disease surveillance system in place capable of complete and timely reporting of measles from all districts.
5. Where measles is endemic, children less than a year of age are generally the primary target. All children should receive at least one dose of potent measles vaccine which meets WHO requirements as early in life as recommended for the vaccine in use. The exact age of immunization will be determined by the available vaccines and the epidemiological situation in the country.
6. Identifying and reaching high risk groups are essential for measles control. Controlling measles in cities may be critical to global measles control. A major initiative is needed to reach and immunize the urban poor who live in situations that facilitate the continued transmission of the disease. Other special efforts may need to be mounted for remote rural situations, ethnic minorities and refugee camps. Measles vaccine should be offered in a range of situations including fixed clinics, outreach services, mobile teams, and during special activities.
7. Outbreaks are likely to occur even in areas with medium to high coverage. Data from outbreaks in those areas should be collected and analyzed to allow fine tuning of immunization efforts. An aggressive response to outbreaks which includes control activities

immunization efforts. An aggressive response to outbreaks which includes control activities will be required for those countries embarking on national or regional elimination efforts. For other areas, outbreak control activities are generally an inefficient use of limited resources unless coverage is already 90% or higher.

8. Countries should produce or review guidelines to health workers for treatment of measles. Vitamin A should be used for treatment of severe measles in areas where vitamin A deficiency is a recognized public health problem and should be considered for such severe cases in other areas as well. Vitamin A supplements for treatment should be available at all levels of the health service system.

9. Research into the control of measles should include the search for new vaccines, exploring alternative routes and strategies for administration, and identifying attitudes to immunization and other primary health care interventions using social science techniques.

10. In many developing countries, support from outside sources will be required for the foreseeable future. To strengthen the EPI so that the measles disease reduction target can be met, additional resources must be obtained. However, any investment under the umbrella of measles control will automatically benefit the whole of EPI. The extra resources sought are mainly in the area of additional staff and strengthening surveillance systems. While WHO will be looking to raising up to US\$ 13.56 millions per year over the next five years, national programmes should be attempting to mobilize whatever resources are available in their own country.

## APPENDIX I CASE DEFINITION OF MEASLES

### Case definition

A uniform case definition should be adopted. For operational purposes, the following definition is proposed:

- Generalized maculo-papular rash of 3 or more days duration, AND
- History of fever 38°C (101°F) or more, (if not measured, "HOT" to touch), AND
- At least one of the following: cough, coryza or conjunctivitis.

An additional definition is needed for helping field workers to identify cases of measles which occurred within the previous two weeks but who are no longer acutely ill. This definition will need further development.

## APPENDIX 2 MEASLES RESEARCH TOPICS

The following are research topics already identified by the EPI Research and Development Group:

- develop and test new strategies for control including evaluation of *immunization days* as a strategy for measles eradication.
- assess short and long-term *safety, immunogenicity, clinical efficacy* and antibody duration following administration of measles vaccine in children younger than 9 months.
- examine the utility of *alternative routes* of administration of different strains of measles vaccines.
- assess the *impact* of measles and measles immunization on under-five mortality in developing countries in different WHO Regions.
- conduct studies of the impact of *two-dose* measles immunization schedules in urban and rural settings.
- evaluate the effect of *maternal antibody* on the quantitative and qualitative aspects of humoral and cell mediated immune response to measles vaccines
- examine the efficacy of measles immunization shortly *after exposure* in preventing disease transmission
- determine the biological mechanisms for the apparent superiority of Edmonston-Zagreb vaccine *strains* compared with other vaccine strains at equivalent doses in infants less than 9 months of age
- provide a better understanding of the basis for *primary vaccine failure and waning immunity*
- examine systemic and mucosal *immune responses* to specific measles viral protein following infection or immunization
- develop realistic *animal models* that mirror human disease for evaluation of safety, reactogenicity and efficacy of candidate measles vaccines

- develop *recombinant measles vaccines* (using carriers such as vaccinia or adenovirus)
- develop safe and effective *subunit* measles vaccines
- investigate the outcome of *reimmunization* of infants who have been shown to be vaccine failures
- investigate the use of *adjuvants* with measles subunit vaccines
- develop *slow release* measles vaccines
- develop *social research* to learn more about the public's perceptions of disease and attitude toward immunization, and to determine the best methods of communication.
- develop a rapid *diagnostic* field test for the measles virus.
- *cost benefit* analysis of measles control and eradication.