EXPANDED PROGRAMME ON IMMUNIZATION

Progress and evaluation report

Following consideration by the Executive Board at its eighty-third session in January 1989, this report, which complements the information provided to the Thirty-ninth World Health Assembly, has been brought up to date for presentation to the Forty-second World Health Assembly. The Programme’s Global Advisory Group reviewed the report in its original form in October 1988 and recommended endorsement of the activities proposed for the 1990s, including the Plan of Action for Global Eradication of Poliomyelitis by the Year 2000 (attached to this document as Annex 2).

Tables showing immunization coverage and estimates of prevented and actual mortality and morbidity are included in Annex 1.

A resolution recommended for consideration by the Health Assembly forms part of resolution EB83.R2 adopted by the Board at its January session.

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1. INTRODUCTION

1.1 During the past 15 years a public health revolution has quietly taken place. Immunization services which were virtually non-existent in developing countries in 1974 now administer the single dose of measles vaccine to half the children of the world (generally by early in their second year of life), the third dose of poliovirus or DPT vaccines to over 60% of children reaching their first birthday, and BCG vaccination to over 60% (see Annex 1, Table 1, and Figures 1 and 2 below). The Expanded Programme on Immunization (EPI) thus now prevents some 1.9 million deaths from measles, pertussis and neonatal tetanus and some 240 000 cases of poliomyelitis annually (Annex 1, Table 2).

Fig. 1. ESTIMATED PERCENTAGE OF CHILDREN IMMUNIZED IN THE FIRST YEAR OF LIFE (BCG, DPT, POLIOVIRUS AND MEASLES VACCINATION) AND PERCENTAGE OF PREGNANT WOMEN IMMUNIZED AGAINST TETANUS, BY WHO REGION (DECEMBER 1988)

1.2 Yet the daily tragedy of vaccine-preventable death and disability continues. Each year nearly three million children die, over 200 000 are paralysed and some 150 000 are blinded by these diseases (Annex 1, Table 3). Immunization levels must be raised to at least 80% for all children of the world by 1990 and at least 90% - in the context of comprehensive maternal and child health services - by the year 2000. This will require continued efforts, particularly in sustaining resources and in improving the management of immunization services.

1.3 The Expanded Programme on Immunization (EPI), like the global smallpox eradication programme before it, provides a compelling demonstration of what can be accomplished when there is unity of purpose. Few believed when EPI was created that the 1990 goal was anything but wishful thinking. But now the dream is being realized. This is because public health and political and community leaders have combined their efforts to make this worldwide Programme succeed, and they have done so because it is inexpensive, easily implemented and easily understood, and because it brings immediate, evident benefits.
Fig. 2 COUNTRIES/AREAS WITH IMMUNIZATION COVERAGE ABOVE AND BELOW 50%: THIRD DOSE OF POLIO VIRUS OR DPT VACCINES, FOR CHILDREN REACHING 12 MONTHS OF AGE (1988)

Coverage:
- 50% and over
- Less than 50%
- No information
1.4 This progress and evaluation report reviews EPI's experience to date, assesses the prospects for attaining its goal of providing immunization services for all children of the world by 1990, and presents new goals and challenges for the coming decade.

2. BACKGROUND

2.1 The Expanded Programme on Immunization has its basis in resolution WHA27.57 adopted by the World Health Assembly in May 1974. General programme policies, including the EPI goal of providing immunization for all children of the world by 1990, were approved in resolution WHA30.53, adopted in May 1977. The importance of EPI as an essential component of maternal and child health and primary health care was emphasized in resolution WHA31.53, adopted in May 1978, and in the Declaration of Alma-Ata in September 1978. In 1982, the Health Assembly warned that progress would have to be accelerated to meet the 1990 goal and urged Member States to take action on a five-point programme (resolution WHA35.31).

2.2 In 1986, the Health Assembly again warned that continuing acceleration of national programmes would be needed to meet the goal and urged Member States to pursue vigorously three general and four specific recommendations by the Director-General for action (resolution WHA39.30). In 1988, in light of EPI's progress the Health Assembly declared the commitment of WHO to the global eradication of poliomyelitis by the year 2000, emphasizing that eradication should be pursued in ways which strengthen the development of EPI as a whole, fostering its contribution in turn to the development of primary health care (resolution WHA41.28).

3. PROGRAMME ORIGINS: BUILDING THE COALITION

3.1 Begun as a collectively sponsored WHO initiative, EPI has now grown to be an operational programme of Member States working with a broad-based network of organizations of the United Nations system, multilateral and bilateral development agencies and private and voluntary groups. The past years have seen the progressive formation of a global immunization coalition, uniting financial support and managerial expertise at international level to meet the needs of country programmes.

3.2 Countries have strongly supported EPI from the beginning. This has been reflected in resolutions adopted by World Health Assemblies over the past decade. More important, countries have taken action resulting in spectacular increases in immunization coverage in recent years.

3.3 International support has been essential for national progress and has grown at an increasing rate with the success of the Programme.

3.4 Some of this support has been used to finance, inter alia, vaccines, injection and sterilization equipment, cold-chain equipment and supplies, and, in some of the least developed countries, subsidies for staff salaries and operating expenses.

3.5 A comprehensive list of all sources of external funding for the Programme would be long indeed; UNICEF is the major provider of vaccines, supplies and equipment. The majority of multilateral and bilateral development agencies and several other organizations of the United Nations system (including the World Bank and UNDP) support the Programme through contributions to WHO and UNICEF, through bilateral contributions specifically for EPI, or through cooperation in broader development initiatives.

3.6 A wide array of other private and voluntary groups (including the Rockefeller Foundation and the "Save the Children" Funds of the Netherlands, the United Kingdom of Great Britain and Northern Ireland and the United States of America) also support the Programme. Rotary International, through its "Polio Plus" initiative, has raised over US$ 200 million for EPI, mainly for the purchase of poliovirus vaccine. Even more important than the funds, however, is the impact which thousands of individual Rotarians
are having through their personal commitment to the immunization cause, lobbying in industrialized countries for more resources for immunization and working with ministries of health in a number of developing countries to promote immunization.

3.7 Technical support from the international community has rivalled financial support in importance. In addition to providing international direction and coordination, WHO has served as the technical authority for EPI. It developed an operations manual and, from it, produced prototype training materials which have been intensively used in national programmes and are revised and extended to cover other primary health care interventions (e.g., in child spacing and vitamin A supplementation). WHO established the basic EPI information system which permits global estimates of immunization coverage and disease incidence. WHO periodically issues technical papers and publishes approximately quarterly "EPI Update", each issue of which summarizes technical information in a particular area.

3.8 WHO has been the leader in introducing improved methods and materials to maintain the "cold chain", the system required to keep vaccines potent in transport between the place of manufacture and the place of use, and in storage. The Organization has collaborated closely with UNICEF in these efforts. During the past decade, this partnership has resulted in a whole new generation of cold-chain equipment becoming available which is specifically designed to meet the needs of immunization programmes in developing countries.

3.9 UNICEF has also collaborated with WHO to strengthen national managerial capacities in immunization, particularly by supporting training activities and by reviewing national programmes with WHO and other collaborators. WHO and UNICEF issue joint statements on technical issues pertaining to a number of primary health care interventions. Recent immunization statements include: "Planning principles for accelerated immunization activities" (1985), "Selection of injection equipment" (1986), "Immunization and AIDS" (1987), and "Vitamin A for measles" (1987). During 1987 and 1988, UNICEF and WHO collaborated in producing material for briefing on accelerating and sustaining national immunization programmes in developing countries, especially for their staff and national programme managers.

3.10 UNICEF has been particularly effective in social mobilization and in eliciting increased financial support for the Programme. The annual publication of The state of the world's children has brought to the attention of world leaders the problems afflicting children in developing countries and the impact that low-cost interventions - including immunization - can have in promoting child survival and development. UNICEF has helped to publicize the dramatic success of Colombia's national immunization days in 1984 and to spread the philosophy and techniques worldwide; national days have become an important element in recent programme acceleration. In 1986, UNICEF initiated the pledge: "We the peoples ....", renewing commitment to the 1990 immunization goal and commemorating the fortieth anniversary of the United Nations (1986). The many signatures obtained from Heads of State and other eminent persons attest to the renown and popularity of the programme.

3.11 In 1984 WHO, UNICEF, the World Bank, UNDP and the Rockefeller Foundation together formed the Task Force for Child Survival. This followed a meeting on the global immunization initiative involving these agencies and leaders in the field of health and development at the Rockefeller facilities in Bellagio, Italy. Follow-up meetings have been held in 1985 in Cartagena, Colombia and in 1988 in Talloires, France, each devoted primarily to immunization but laying increasing emphasis on other aspects of primary health care. The most recent meeting, entitled "Protecting the world's children - an agenda for the 1990s" resulted in the "Declaration of Talloires" which proposed a number of health and development targets, primarily relating to the health of women and children, for the coming decade. These targets are reflected in the proposals being made for EPI in section 6 below.

1 See document WHA41/1988/REC/1, Annex 6.
3.12 Immunization is one of the essential elements of primary health care defined by the International Conference on Primary Health Care held in Alma-Ata (USSR) in 1978. EPI itself is a building-block for primary health care: immunization services, because of their basic simplicity, provide an excellent means for strengthening the health infrastructure to deliver other services at the same time so as to ensure maximum combined benefits for women and children. When children thrive, parents gain the confidence to limit the number of births to the number of children they desire, and this, in turn, provides further health benefits for mother and child.

3.13 EPI has been working in close collaboration with the WHO Diarrhoeal Diseases Control Programme, integrating training materials for combined courses. The two programmes have also developed, in collaboration with the WHO Division of Family Health, a teaching module on child-spacing suitable for inclusion in EPI and/or diarrhoeal disease control courses. During the past year, in collaboration with the Nutrition unit, EPI has worked to introduce vitamin A and iodine supplementation in immunization programmes serving populations at risk from deficiencies in those substances. These activities ensure that EPI serves as a promoter of various interventions while convincing other programmes of the priority of immunization.

3.14 The coalition which has resulted from these many activities reflects a remarkable consensus in a world where so many things go wrong: children should be immunized, children can be immunized, children will be immunized. But the task of the coalition is not yet finished, for universal childhood immunization has yet to be achieved.

4. PROGRESS AT REGIONAL LEVEL

4.1 All WHO regions have made substantial progress since the last report to the Executive Board in 1986. But now, as then, the rate of progress and the levels of immunization largely reflect underlying socioeconomic conditions. Europe and the Americas, the most economically advanced regions, continue to have the strongest immunization programmes, while Africa, economically the poorest Region, continues to have the largest proportion of infants below the 50% level of coverage for the EPI antigens (Figs 1 and 2).

4.2 In the African Region, immunization coverage with the EPI antigens, with the exception of measles and BCG, lags behind the other regions (Figs 1 and 2). As noted in paragraph 4.1, this reflects its level of socioeconomic development and the level of development of the health infrastructure. Coverage has been increasing rapidly, however, partly as a result of initiatives taken during 1986, designated by the Regional Committee for Africa as "African Immunization Year". According to routine reports and national surveys on coverage, the majority of African countries have surpassed 50% coverage for several EPI antigens, but coverage remains low in some; coverage for a third dose of DPT vaccine is less than 20% in Angola, Chad, Equatorial Guinea, Ethiopia, Guinea, Guinea Bissau, Liberia, Mali, and Niger.

4.3 Most countries routinely employ a mixed strategy for vaccine delivery using fixed centres supplemented by scheduled "outreach" activities; less frequently, in more remote areas, mobile teams are employed. In addition, 41 (89%) of the 46 countries in the African Region have accelerated their national immunization programmes. Some have also embarked on urban immunization campaigns.

4.4 Social mobilization and community participation in EPI have been ensured by the involvement of political and religious leaders, and this seems to be particularly effective in the African setting. Rapid progress has been noted in the district health development approach being promoted by the Regional Office; 54% of the 3217 districts in the Region now have district health development committees, plans of action and one or more primary health care programme elements, often including EPI.
4.5 A number of different policies have been adopted by countries to encourage self-reliance in the delivery of immunization services: establishment of a special EPI budget, sharing EPI costs with nongovernmental organizations, and the promotion of community cost-recovery schemes, such as those described in the Bamako Initiative. However, some African countries still depend heavily on external financial support and are likely to require such support well into the future. For all countries, efficient management of scarce financial resources remains a priority.

4.6 Since 1979, an estimated 50,000 people in the African Region have received EPI training. Many national programmes have produced their own training manuals. In more than half of the countries EPI materials have been incorporated in the curricula of health training institutions.

4.7 Regional EPI activities were evaluated in 1982 to identify initial problems, in 1985 to define acceleration strategies, and in 1987 to elaborate measures for sustaining the programme. Since 1977, a total of 88 national programme evaluations and 721 immunization coverage surveys have been carried out.

4.8 Considerable efforts have been made to improve the collection and analysis of data for disease surveillance and on immunization coverage at local, national, and regional levels. Until recently there was no standard reporting procedure and the regional collection of national data and comparison was extremely difficult. In 1988, a standardized biannual reporting form, to include information on disease incidence as well as on immunization coverage and vaccine delivery, was approved by the Regional Directors of UNICEF and WHO. Each national EPI programme manager will submit the same standardized report biannually to the ministry of health, the WHO representative and the UNICEF representative. A second achievement of 1988 was the establishment of an EPI computer information system at the Regional Office. The system is compatible with the headquarters system and it will be extended gradually to countries in the Region.

4.9 Countries have been encouraged to formulate targets in terms of reduction in numbers of cases of diseases, and several countries with well established national programmes and more developed surveillance systems have begun to document such reductions.

4.10 A number of preparatory activities have been undertaken in the Region for the eradication of poliomyelitis: the situation has been assessed in 20 countries; laboratory services have been reviewed in seven countries; a "round table" discussion was held from 8 to 10 August 1988 at the Regional Office to review available information and determine priorities for poliomyelitis eradication. The recommendations of the "round table" were endorsed by the joint WHO/UNICEF Technical Group on Immunization which met from 20 to 23 August 1988 in Nairobi. The Group agreed to serve as a review body to monitor progress and promote inter-agency cooperation in support of the poliomyelitis eradication initiative. If the momentum generated by African Immunization Year is sustained, the eradication of poliomyelitis in the Region will be possible.

4.11 The thirty-eighth session of the Regional Committee, in September 1988, unanimously adopted a resolution on the elimination of neonatal tetanus from the Region by 1995. In collaboration with the Canadian Public Health Association, the "Combating Childhood Communicable Diseases" and "Resources for Child Health" (REACH) projects (United States of America), and UNICEF, the Regional Office organized two workshops in which countries assessed strategies for neonatal tetanus control and drafted plans of action for its elimination. Technical assistance was also provided by the Organization for Coordination and Cooperation in the Control of Major Endemic Diseases (OCCGE) and the Organization for Coordination in the Control of Endemic Diseases in Central Africa (OCEAC). Three more such workshops are planned during the coming months.

4.12 At its meeting in August 1988 the joint UNICEF/WHO Technical Group on Immunization reviewed the yellow fever situation in the Region, including data from recent outbreaks in Nigeria and in Mali. The Group urged yellow-fever endemic countries to consider incorporating yellow fever vaccine into their EPI schedules on a routine basis.
4.13 The Regional Office collaborates with EPI at WHO headquarters in coordinating studies for the "cold chain", trials of new vaccines and equipment, and operational studies such as "missed opportunity" surveys. The initiatives for poliomyelitis eradication and neonatal tetanus elimination are expected to lead to increased operational research in the Region.

4.14 In the Region of the Americas, EPI continues to make progress towards the 1990 targets of immunizing all children and eradicating the indigenous transmission of wild poliovirus from the western hemisphere.

4.15 Coordination among the agencies supporting the programme in the Americas, namely PAHO, UNICEF, USAID, the Inter-American Development Bank, Rotary International and - since the end of 1987 - the Canadian Public Health Association, has ensured smooth implementation of the programme at regional and country levels. More than US$ 90 million have been committed for the period 1987-1991. Intensive national efforts in programme planning and financial analysis produced work plans for the five-year period 1987-1991 for every country in the Region. The work plans are now the framework for programme implementation and inter-agency coordination in support of the country programmes.

4.16 In general, the countries of the Region are improving vaccination coverage as a result of EPI acceleration and the implementation of national vaccination days. In 1988, on the advice of the EPI Technical Advisory Group, the 14 countries in which poliomyelitis is endemic elected to conduct national immunization days at least twice a year. Each of the 14 countries (except Brazil) is including the other EPI antigens in the national days. National vaccination days should be considered a complement to and not a replacement for immunization services offered as part of the basic health services. Positive effects have been observed in several countries, where coverage for measles and DPT vaccines have increased and drop-out rates have declined.

4.17 Surveillance has evolved rapidly and many countries have improved the quality of their information systems. Focus on the district as the primary reporting unit has been an important step forward. Poliomyelitis is now reported weekly by district, including reports of no cases; those of the 14 636 districts at highest risk in the Region are thus readily identified, so that resources may be mobilized to assist them.

4.18 Despite fuller reporting as a result of closer surveillance, the total number of confirmed cases of paralytic poliomyelitis reported decreased in 1987 (635, compared with 907 in 1986), and even further in the first 39 weeks of 1988 (306 cases compared with 464 cases in the first 39 weeks of 1986). The decline in measles and pertussis has continued since 1984, although the data must be interpreted cautiously since surveillance for these diseases is not as well developed as for poliomyelitis. However, the decline of cases in all the subregions is consistent with the respective increase in vaccination coverage.


4.20 There are 1000-2500 cases of neonatal tetanus reported annually in the Region (excluding Brazil). The district focus will allow neonatal tetanus control efforts to be directed to those districts reporting cases, while simultaneously strengthening surveillance.

4.21 In the South-East Asia Region, progress is being monitored through the regional computerized EPI information system, which collects information on reported numbers of cases and deaths from EPI target diseases; reported numbers of children immunized with BCG, DPT, oral poliovirus and measles vaccines; reported numbers of pregnant women or women of child-bearing age immunized with tetanus toxoid; results of immunization coverage surveys; EPI-related training activities; EPI funds; and population denominators. Further exchange of information occurs during yearly or biennial inter-country consultative meetings of EPI managers.
4.22 In national EPI programme reviews, participants are strongly encouraged to identify programme strengths and weaknesses, to recommend ways to improve performance and to refine strategies for programme acceleration. Most countries have held such reviews and are now beginning to conduct follow-up reviews, often combined with other primary health care programmes such as those for diarrhoeal disease control. Increased emphasis is being placed on the assessment of immunization coverage in urban areas and on the development of specific plans for programme acceleration in urban areas. Recent EPI reviews have looked specifically at coverage in Jakarta, Bangkok, and Rangoon City.

4.23 It is important to involve those providing curative facilities more in the implementation of EPI if opportunities for immunization are not to be missed. This has been emphasized by studies in six countries.

4.24 If personnel are inadequately trained in EPI activities the effects are felt at almost all levels. Management skills, including field supervision, particularly need strengthening. In order to improve performance in other primary health care activities, training in both management and technical aspects of EPI has been given high priority in the Region.

4.25 Data from the EPI information system indicate that since 1985 there has been an increase in contributions from governments as well as from external resources. Available funds totalled US$ 19 million in 1985, US$ 30 million in 1986 and US$ 60 million in 1987. A breakdown of 1987 funds by source shows US$ 34.5 million from governments, US$ 1.6 million from WHO, US$ 21 million from UNICEF, US$ 1.1 million from the World Bank, US$ 0.8 million from bilateral agencies, and US$ 1.3 million from private agencies (Rotary International and others).

4.26 In the Democratic People's Republic of Korea, Mongolia, Sri Lanka and Thailand, an overall reduction in morbidity from some target diseases has already demonstrated the impact of EPI. Although measles morbidity is often a good indicator of programme impact, measles immunization coverage in the Region was so low until 1986 that morbidity has not yet been significantly affected by immunization.

4.27 In the European Region, data from 29 Member States presented at the national EPI programme managers' meeting in Budapest in April 1988 showed large variations in the quality and efficiency of national immunization programmes. Because of reported or suspected problems with the "cold chain", formal comprehensive evaluations of "cold chains" have been initiated in 14 countries.

4.28 For most of the target diseases, regional incidence decreased in 1987 compared with 1986: poliomyelitis declined by 6%, diphtheria by 9%, pertussis by 7%, tetanus (total) by 8%. But between 1986 and 1987 the regional incidence of measles increased by 6%.

4.29 Sixteen Member States have already introduced or made plans to introduce measles, mumps and rubella (MMR) vaccine in their national programmes. Procurement problems with rubella vaccine and/or mumps vaccine has made it difficult to implement MMR vaccination in some countries. Although it is too early to demonstrate an impact of this policy on the incidence of measles, mumps, and rubella in the Region as a whole, reduction in the incidence of these diseases has been successfully demonstrated in Norway and Sweden.

4.30 Increased regional support is needed now and in the medium term to further strengthen national programmes, including: development of regional immunization policies; improvement of surveillance and information systems; training of national EPI managers; laboratory support; mobilization of public demand for immunization; programme evaluation; and provision of expert advice, especially in emergency situations.

4.31 Such support will be particularly important in view of the plan of action for the eradication of poliomyelitis from the Region by 1990. Immediate acceleration of national immunization programmes will be necessary if this goal is to be achieved and will provide
the opportunity simultaneously to increase immunization with all EPI antigens. Currently 15 Member States with a total population of 94 million (11% of the regional population) are considered free from poliomyelitis caused by wild poliovirus. However, the recent outbreak of poliomyelitis in Israel shows that there is no room for complacency.

4.32 In the Eastern Mediterranean Region coverage has increased over the past 12 months. Some countries continue to accelerate their EPI activities either through campaign approaches or by strengthening existing delivery services. In almost all countries, EPI has been integrated within primary health care. There is increasing evidence that immunization services are being offered in most health facilities, in both the private and public sectors.

4.33 Acceleration in the Region has been achieved through better intersectoral collaboration and effective social mobilization. Commitments from political, religious and other leaders have been important. Public awareness has been increased, resulting in an enthusiastic reception of services offered. Improvements in immunization coverage suggest that a sustained increase of the order seen during the previous 12 months, if extended to areas or populations where basic services are still inadequate, could put the universal immunization of children by 1990 within reach in most countries of the Region.

4.34 Political unrest, armed conflict, economic depression and lack of manpower have accounted for many of the problems in the five countries where progress was the slowest (Afghanistan, Democratic Yemen, Somalia, Sudan and Yemen). The Regional Office is giving them special attention. They were convened for a special meeting in Khartoum in February 1988, and necessary technical support has been made available to four of them through the reassignment of WHO staff members.

4.35 During the fifth inter-country meeting for EPI programme managers in Cairo in July 1988, progress in the prevention of neonatal tetanus was discussed, problems were identified and solutions were recommended. Participants confirmed that neonatal tetanus is still common in most countries of the Region and that the magnitude of the problem is not sufficiently appreciated by those responsible for health planning and finance. It is estimated that 27 000 deaths from neonatal tetanus were prevented in the Region in 1987; over 100 000 deaths still occurred unnecessarily. All participants in the meeting reaffirmed their commitment to the elimination of neonatal tetanus.

4.36 In pursuit of resolution WHA41.28 of the World Health Assembly a draft plan for the eradication of poliomyelitis in the Region has been prepared. The Regional Director has also established a Technical Advisory Group on this matter. Plans have been made to recruit a full-time medical officer at the Regional Office for poliomyelitis eradication. The Regional Committee at its most recent meeting in Geneva in October 1988 passed a resolution endorsing the regional plan for poliomyelitis eradication.

4.37 In the Western Pacific Region, progress has been achieved in all countries during the past year. This is due at least in part to accelerated activities, particularly in China, Democratic Kampuchea, the Lao People’s Democratic Republic, Papua New Guinea, the Philippines, and Viet Nam.

4.38 China has set a target of 85% coverage at provincial level by the end of 1988 and 85% coverage at district level by 1990. Immunization coverage surveys conducted in the first half of 1988 showed that 12 of 20 provinces surveyed had reached the target ahead of schedule.

4.39 In the Lao People’s Democratic Republic the Government is strongly committed to achieving universal childhood immunization by 1990. While immunization coverage for the country as a whole remains low, it has improved in areas with access to immunization services as a result of social mobilization and health education. Following an intensive acceleration in the first half of 1988, coverage in the Vientiane Municipality rose to 77% for BCG, 70% for measles, 71% for a third dose of oral poliovirus vaccine, and 82% for a second dose of tetanus toxoid.
4.40 Significant improvements have occurred in the Philippines, where the proportion of children fully immunized increased from 21% in 1985 to 62% in 1987. The Philippines EPI disease surveillance system also improved following its computerization and the adoption of standardized formats and schedules for reporting.

4.41 Most developing countries in the Region receive the bulk of their vaccines from UNICEF. However, several countries are involved in vaccine production. China produces all the EPI vaccines, and UNICEF has provided substantial support to upgrade their quality. World Bank funds for the construction of new vaccine-manufacturing facilities are still under negotiation. Viet Nam is producing oral poliovirus vaccine, although it does not yet meet WHO standards. It also produces BCG and DPT vaccine, though not in adequate quantities. The Philippines is self-sufficient in the production of BCG and tetanus toxoid, both of which meet national quality control standards that are similar to WHO standards.

4.42 The technology and equipment for large-scale production of hepatitis B vaccine have been successfully transferred through WHO collaboration from Japan to China. China produced over 9 million doses of hepatitis B vaccine in 1986 and 17 million doses in 1987. Hepatitis B vaccine has been added to the EPI schedule for infants in highly endemic rural areas and big cities of China. WHO also collaborated with Fiji, Samoa and Tonga to establish laboratory facilities to collect and concentrate plasma from high-titre carriers of hepatitis B antigen. The concentrated plasma has been processed into vaccine in Japan and returned to these countries for the immunization of infants in 1988-1989.

4.43 At its session in September 1988 the Regional Committee passed a resolution to eradicate poliomyelitis from the 35 countries or areas of the Region, where incidence has been declining steadily over the past eight years. Seventeen have reported no cases of poliomyelitis for at least 13 years; an additional eight have reported no cases for at least four years; four have reported occasional imported or vaccine-associated cases. Notable decreases have been seen in China, Malaysia, the Philippines, and the Republic of Korea. With further acceleration of EPI activities the prospect remains high for dramatic decreases in poliomyelitis incidence and its eradication from the Region by 1995.

5. REACHING 1990: THE REMAINING BARRIERS

5.1 The figures for coverage in 1987 at first seem daunting. How, by the end of this decade, can immunization levels which took almost 15 years to raise to the 50% mark be boosted to 80% or more? And the issue is not only 1990 and not only immunization. For immunization services must be sustained for the foreseeable future and they must be established in ways which strengthen other elements of primary health care.

5.2 The prospects are, in fact, encouraging. The coverage now being achieved rests on a health infrastructure which has been developed since the beginning of EPI. It was never envisaged that coverage would increase by equal stages each year. Rather, it was expected to remain at low levels for several years to be followed by rapid growth. This is in fact what has happened.

5.3 The programme started by emphasizing training. This had two major objectives: (1) to permit the development of sound national plans which external donors could support; and (2) to provide a "critical mass" of competent immunization managers in each country. Those responsible for national programmes were encouraged to begin operations in relatively limited geographic areas and extend them in a phased manner, so that problems of logistics and training and supervision of peripheral staff could be recognized and solved in the initial areas and systems established or reinforced for effective expansion.
5.4 Only since the mid-1980s had the majority of developing countries had a core immunization infrastructure in place which would permit national immunization coverage to be rapidly increased in a sustained manner. Now global emphasis is on acceleration of national programmes.

5.5 The low levels of immunization coverage in Africa have been noted. But most unimmunized or partially immunized infants in the developing world are found not in Africa but in the largest countries: half are in India, China, Nigeria, Bangladesh and Indonesia, and a third are in India alone (Fig. 3).

5.6 This is good news, because all of these five countries have a high commitment to universal childhood immunization and three of the five have strong existing health infrastructures which permit high coverage levels to be reached and sustained - Nigeria and Bangladesh less so. Despite continued efforts for acceleration they may not attain coverage levels of 80% or above until sometime in the next decade (although experience has shown that surprising progress is possible where political will is strong).

5.7 There are a limited number of countries in which immunization programmes are still in their initial stages. Bangladesh and Ethiopia have coverage of less than 10% for a third dose of oral poliovirus and DPT vaccines. Despite being considered large, they only have about 6.0% of the newborn infants in developing countries as a whole. Eight of the smaller countries which are included in section C of Fig. 3 have similarly low coverage rates (Angola, Chad, Democratic Kampuchea, Democratic Yemen, Equatorial Guinea, Guinea, Mali and Niger). They account for 2.5% of all newborn infants in developing countries. While efforts to accelerate programmes in these countries are urgently needed, they will not be major determinants of coverage rates in the developing world as a whole.

5.8 Fig. 4 provides estimates of what might be expected in developing countries by the end of 1990. It is based on the highest coverage for either a third dose of oral poliovirus or DPT vaccines reported as at December 1988, and projected (by subjective judgement) to the end of 1990, including coverage with measles vaccine and BCG in addition to poliovirus and DPT vaccines.

5.9 The projections are:

- an average increase of some 20% in coverage in the five largest developing countries;

- an increase of some 15% in the 21 remaining largest countries (listed in Annex 1, Table 1); and

- an increase of 15% in the other developing countries.

5.10 Thus, with vigorous efforts, a coverage of some 75% may be obtained by the end of 1990. Projections are always a risk. There are those who will consider them too optimistic while others will expect even greater performance. In any case 80% coverage targets should be attempted, as it sets the stage for the reduction, elimination and eradication proposed for the next decade. In almost all countries far more can be done to increase coverage immediately, using the health staff facilities that are already in place; many children who receive a first dose of vaccine are at present failing to return for subsequent doses. Coverage levels which reach 60% for a third dose of oral poliovirus or DPT vaccines indicate that some 80% of children have already had contacts with health workers for a first dose; with better health education and follow-up, supported by social mobilization, the majority of these children can be fully immunized.
FIG. 3. PROPORTION OF INFANTS UNIMMUNIZED OR PARTIALLY IMMUNIZED (POLIOVIRUS OR DPT VACCINES), DEVELOPING COUNTRIES, AS REPORTED IN 1987

A = India, China, Nigeria, Bangladesh, Indonesia.
B = 21 largest remaining developing countries (see Annex 1, Table 1).
C = Other developing countries.

FIG. 4. HIGHEST COVERAGE FOR THIRD DOSE OF ORAL POLIOVIRUS OR DPT VACCINES IN DEVELOPING COUNTRIES REPORTED FOR 1987 AND PROJECTED FOR 1990

A = India, China, Nigeria, Bangladesh, Indonesia.
B = 21 largest remaining developing countries (see Annex 1, Table 1)
C = Other developing countries
D = Total.
5.11 Many opportunities for immunization are being missed. A particular problem is the failure to immunize eligible children who are brought to health facilities because of sickness. Gambia demonstrates the importance of providing immunization as a part of curative care; most maternal and child health clinics there provide integrated curative and preventive care; 75% coverage for measles immunization is reported - one of the seven highest in Africa; of the children immunized against measles, 76% had been vaccinated during a visit for other treatment (not for well-child care), the most common reason (38%) for non-immunization of those eligible being that the clinic attended did not immunize those attending for other treatment.

5.12 Measles vaccination coverage in developing countries has in past years been substantially lower than that for a third dose of poliovirus or DPT vaccines, mainly because several of the large countries in South-East Asia have only now begun to introduce the vaccine in routine programmes (India, for example, while reporting 64% coverage for a third dose of oral poliovirus vaccine, reported only 44% measles coverage in 1987). There should not be major difficulties in quickly raising measles coverage to levels comparable with the third dose of poliovirus or DPT vaccines, although the fact that the vaccine should not generally be given before the age of nine months (to avoid interference from maternal antibodies) may place some extra demands on the health services to ensure that eligible children are not lost to follow-up.

5.13 Tetanus toxoid coverage for pregnant women is still lower: a mere 23%. The data are not as accurate as for the other EPI antigens, and actual rates of protection of pregnant women and their newborn infants from tetanus may be somewhat higher, as doses of toxoid received prior to the current or most recent pregnancy are often not counted in routine reporting systems or in immunization coverage surveys. Nevertheless, the coverage is almost certainly much lower than that for the other vaccines.

5.14 Although the use of every contact women have with the health services to administer tetanus toxoid to those of childbearing age will help to improve coverage, additional strategies, including special immunization campaigns in certain high-risk areas, will be needed before immunization rates become satisfactory. As noted in section 4, several regions are now intensifying their activities to prevent neonatal tetanus.

5.15 While better immunization strategies are sought, however, the priority in most national programmes is simply to improve the performance of existing staff and facilities. Within the health services this calls for intensified training with particular emphasis on assigning particular responsibility for each task essential for the programme and providing supervision to ensure that it is carried out.

5.16 Community action is also needed. Members of the community can identify eligible children and direct them to immunization services. Members of the community can also exert the pressure required to make immunization services available at times and places convenient to the community and not only to the health worker. And an aroused community can exert the political pressure to ensure a comprehensive array of primary health care services, including immunization.

5.17 More spectacular forms of community mobilization may also be appropriate, as demonstrated by the striking success of national immunization days in a number of countries; for example, Colombia (see paragraph 3.10 above). But care must be taken that acceleration efforts do not preclude sustainability, for unless they can strengthen the permanent health care delivery mechanisms they may actually hamper health services development.

5.18 Augmenting and sustaining immunization coverage implies for many developing countries augmenting and sustaining outside financial support. It would be a tragedy if the international community misunderstood the long-term investment needs of the immunization initiative. For immunization is a permanent service of the health care delivery infrastructure, and many developing countries will require continuing support well into the twenty-first century.
5.19 The outside support required is little enough; the costing studies done in the early 1980s still provide a reasonable guide, particularly if approximate estimates suffice. For the purposes of this report, the cost estimates have been further simplified (United States dollar at 1988 rates):

- **(1)** at US$ 10.00 per fully immunized child, and assuming that 50 million children are immunized yearly with a third dose of oral poliovirus or DPT vaccines:
  
  the total cost will be US$ 500 million per year;

- **(2)** if external support covers 30% of total costs:
  
  the external cost will be US$ 150 million a year;

- **(3)** if costs are doubled to account for full coverage:
  
  the total cost will be US$ 1000 million a year;
  
  the share to be borne by external support will be US$ 300 million a year;

- **(4)** if costs are doubled again to include new vaccines and population growth:
  
  the total cost will be US$ 2000 million a year;
  
  the share to be borne by external support will be US$ 600 million a year.

5.20 Even taking US$ 600 million per year as a rather generous estimate of what might be required in outside support during the next decade, it remains tiny in the context of international development support (the estimate includes funds required for the poliomyelitis eradication initiative, currently estimated to cost some US$ 155 million for the period 1989-2000; see paragraph 6.6).

5.21 Optimism can be expressed about the continuing availability of outside support for EPI. At the first Bellagio meeting, in 1984, the international development agencies gave the assurance that, if developing countries placed immunization high on their own national agendas, outside funds would not be lacking.

5.22 External funding for EPI has up to now largely kept pace with the needs. The poliomyelitis eradication initiative, however, has placed immediate demands on extrabudgetary resources, which need to be increased from their present level of some US$ 5 million to a level of some US$ 15 million to US$ 20 million per year. In anticipation that these additional funds will be forthcoming, EPI has already begun to provide support for poliomyelitis eradication, taking the risk that should they not, WHO headquarters support to regions and countries for routine EPI activities will be compromised.

6. TOWARDS THE YEAR 2000: ACTION NEEDED

**Full use of existing vaccines**

6.1 EPI is already preparing for the challenges of the 1990s: to raise immunization coverage rates where these are not yet satisfactory, and to sustain high coverage in countries where this has been achieved, in continuation of present Programme activities.

**Disease control**

6.2 The primary objective of EPI is not immunization for its own sake, but rather the use of immunization for the control of the target diseases. EPI is already putting increased emphasis on disease control, and will make this an even higher priority during the 1990s; it is concentrating on poliomyelitis, measles and neonatal tetanus.
6.3 In May 1988 the Forty-first World Health Assembly committed the Organization to the global eradication of poliomyelitis by the year 2000 (resolution WHA41.28). The Health Assembly noted that this initiative represented a fitting challenge on the Organization's fortieth anniversary, and an appropriate gift, together with the eradication of smallpox, from the twentieth to the twenty-first century. The Americas and the European and Western Pacific Regions helped to pave the way for this initiative by having already established regional eradication targets to be achieved by or before the year 2000.

6.4 A plan of action for the global eradication of poliomyelitis by the year 2000 was drafted in May 1988 (see Annex 2), based on the work and experiences in the Region of the Americas, and on discussions with national programme managers in Europe during a meeting in Budapest in April 1988 (attended by the EPI Regional Adviser for the Americas). The initial plan has been revised and extended after a series of further discussions and consultations with national programme managers, WHO staff and outside experts. These have included:

- discussions during meetings of national programme managers and regional staff held in the African, South-East Asia, Eastern Mediterranean and Western Pacific Regions between May and August 1988;
- discussions during a meeting of experts convened by the Regional Office for the Eastern Mediterranean on 18 and 19 July 1988, on poliomyelitis eradication in the Region;
- discussions among several divisions and units at WHO headquarters, including the Divisions of Communicable Diseases (and the Diarrhoeal Diseases Control Programme), Family Health, Health Manpower Development, Public Information and Education for Health, and Strengthening of Health Services, and the Biologicals and Rehabilitation units of the Division of Diagnostic, Therapeutic and Rehabilitative Technology, held in July and August 1988;
- detailed review and discussion during an informal consultation of global poliomyelitis experts held in Geneva on 5 and 6 September 1988; and
- a further review by the EPI Global Advisory Group (attended by EPI advisers from all regions) during its meeting of 17-21 October 1988.

6.5 The Plan of Action is reproduced in Annex 2. While the broad strategies outlined in the plan remained largely the same during the consultation process, many of the specific details have changed, and further change is seen as a natural consequence of further programme evolution. This plan has already been used as a framework for developing eradication plans in the African, South-East Asia, European, Eastern Mediterranean and Western Pacific Regions.

6.6 The Plan of Action emphasizes the following strategies:

- raising immunization coverage as quickly as possible with a protective course of administration of poliovirus vaccine and all other antigens included within national immunization programmes to include at least 80% of infants by their first birthday, and throughout the age-group 1-4 years, in each "district" (a geopolitical subdivision within a country which might range from a population of a few hundred thousand to a few million), and to sustain those levels;
- improving disease surveillance, including reporting by district, reporting of "zero cases", investigating outbreaks and applying control measures;
- strengthening laboratory capabilities for isolating and characterizing polioviruses, for vaccine quality control and for viral and serological surveillance;
- creating and maintaining public awareness in order to sustain political and financial commitment to poliomyelitis eradication;
- providing information and education for parents and other community members in order to increase immunization coverage and to improve the detection of cases;
- improving poliomyelitis rehabilitation services; and
- promoting research so as to develop better eradication strategies, including improved poliovirus vaccines or combinations of vaccines.

As recommended in resolution WHA41.28, these strategies will be carried out in ways which strengthen EPI as a whole, fostering its contribution, in turn, to the development of primary health care.

6.7 The Health Assembly noted that poliomyelitis eradication will depend on the political will of countries and the investment of adequate human and financial resources in the programme. The external resources called for in the Plan of Action amount to some US$ 155 million for the period 1989-2000, and some US$ 17 million for the period 1989-1990, over and above the resources required for full implementation of EPI. (The estimate for the overall cost of eradication may well be on the low side; between US$ 155 and 500 million is probably more realistic. For comparison, the cost of the smallpox eradication programme is estimated to have been US$ 300 million.)

6.8 As noted in paragraphs 5.19-5.22, external resources for EPI are currently US$ 150 million per year and will need to rise to US$ 300 million to US$ 600 million during the 1990s. Contributions to the Special Account for the Expanded Programme on Immunization forming part of the Voluntary Fund for Health Promotion will need to increase from their present level of some US$ 5 million per year to US$ 15 million to US$ 20 million to support the poliomyelitis eradication initiative.

6.9 The difficulty of poliomyelitis eradication is not being underestimated. But poliomyelitis is only one of the EPI target diseases, and intensified action is also needed to control two other EPI target diseases which continue to threaten health: measles and neonatal tetanus.

6.10 Despite the success of EPI, measles continues to kill almost 1.6 million children each year (Annex 1, Table 3). Even with better coverage, measles cases which occur before the currently recommended age of immunization of nine months may continue to pose problems. Research is already underway to evaluate a strain of measles vaccine (the Edmonston-Zagreb strain) which may be possible to administer at six months. At the same time, immunization strategies are being examined with a view to bringing this highly infectious and highly lethal disease under better control with the vaccine strains now in widespread use. A target has been set for 1995 to reduce reported measles incidence in all countries to below 40 cases per 100,000 population, a reduction of over 90% from pre-programme levels.

6.11 The drive to control neonatal tetanus provides a direct link between those concerned with immunization and those concerned with safe motherhood, for tetanus immunization and clean delivery practices are both effective in preventing this disease. Neonatal tetanus still causes some 750,000 deaths per year, second only to measles among the EPI target diseases (Annex 1, Table 3). A target date of 1995 has been set for its elimination.

Introducing new or improved vaccines

6.12 One of the original goals of EPI was to put in place a delivery system in developing countries capable of using the new vaccines promised by current investments in research and development. Already, individual developing countries are adding, or are
considering adding, vaccines such as yellow fever, hepatitis B and Japanese encephalitis B vaccines to their national programmes. There are hopes that rotavirus vaccines and improved vaccines against typhoid, shigella and cholera will become available during the coming decade. Leprosy vaccine is currently undergoing field trials, and research continues on vaccines against many other diseases.

6.13 The vaccines already being used in EPI are being improved. New manufacturing techniques have permitted the introduction of an improved inactivated poliovirus vaccine, and oral poliovirus vaccines which diminish the threat of paralysis and improve efficacy in tropical environments seem a possibility. A less reactogenic vaccine against pertussis is being evaluated. The work on the Edmonston-Zagreb strain of measles vaccine has already been mentioned. During the 1990s EPI will continue to advocate the widespread application of vaccines of public health significance, and, through research and development, will collaborate with others to bring new or improved vaccines from the laboratory to broad application.

Promoting other primary health care interventions

6.14 EPI will increasingly promote other primary health care practices which are compatible with the EPI delivery system and target populations. The coverage being achieved by the Programme in infants in their first year of life and their mothers makes it imperative that EPI should promote the application of other practices (including those relating to improved maternal and child nutrition, diarrhoeal diseases control, appropriate birth spacing and, in selected populations, vitamin A and iodine supplementation) which can also contribute to their health.

Research and development

6.15 Research and development will constitute a major priority for EPI in the 1990s. When the Programme was established, it was with the notion that the vaccines, supplies and equipment and knowledge about immunization were all already sufficient to make the Programme a success. The main emphasis was placed on the application of existing knowledge.

6.16 Even so, research and development have been a part of EPI from the beginning. For it quickly became apparent that the material and methods which had served industrialized countries so well needed adaptation for application in developing countries. So equipment for the cold chain was improved, time/temperature monitors were introduced for vaccines, more efficient immunization schedules were proposed, and a more appropriate policy regarding contraindications to immunization was adopted.

6.17 The questions for research and development are multiplying, however, owing partly to the advent of new vaccines and new technologies, but partly to the advanced state of immunization programmes in developing countries, which has revealed many limits to current knowledge about immunization. In particular, questions are being raised concerning approaches needed to assure optimal control of EPI target diseases (and in the case of poliomyelitis, eradication).

6.18 EPI took the first steps to strengthen its research and development capacity in 1987. At that time, funds for the purpose were solicited and received from the Rockefeller Foundation and from UNDP, and an EPI Research and Development Group was established to advise on priorities and monitor progress. The Netherlands added its support to these activities in 1988. EPI will focus on applied research (encompassing the broad areas of biotechnology and epidemiology), in contrast to and to complement more basic research under other WHO programmes (including vaccine development, vaccinology, and the work of the Special Programme for Research and Training in Tropical Diseases, the Special Programme of Research, Development and Research Training in Human Reproduction and the Diarrhoeal Diseases Control Programme).
6.19 The research and development activities of EPI are expected to play an essential role in guiding programme activities in the areas mentioned in the preceding paragraphs.

7. CONCLUSION

7.1 The promise of EPI is being fulfilled. The public health revolution that has quietly been taking place for less than 15 years is continuing. More important than the prevention of some 1.9 million deaths per year from measles, pertussis and neonatal tetanus, EPI has contributed to changing social value systems so that immunization is now recognized as a high priority by both national and international leaders. This support must be sustained to ensure continued programme progress and to set the stage for disease control and eradication, the introduction of new vaccines and the reinforcement of other primary health care interventions which are planned for the decade of the 1990s and which represent stepping-stones to the goal of health for all by the year 2000.
### Table 1. Estimated Immunization Coverage with BCG, DPT, Poliovirus, Measles, and Tetanus Vaccines (December 1988)

<table>
<thead>
<tr>
<th>Country</th>
<th>Newborns surviving to 1 year of age (millions)</th>
<th>Cumulative percentage of infants</th>
<th>Immunization coverage (%)</th>
<th>Children less than 1 year of age</th>
<th>Pregnant women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>BCG</td>
<td>DPT III</td>
<td>Polio III</td>
</tr>
<tr>
<td>1. India(a)</td>
<td>22.56</td>
<td>25</td>
<td>72</td>
<td>73</td>
<td>64</td>
</tr>
<tr>
<td>2. Indonesia(a)</td>
<td>5.15</td>
<td>31</td>
<td>74</td>
<td>61</td>
<td>62</td>
</tr>
<tr>
<td>3. Nigeria(b,c)</td>
<td>4.59</td>
<td>36</td>
<td>37</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>4. Bangladesh(b)</td>
<td>4.15</td>
<td>40</td>
<td>14</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>5. Brazil(b)</td>
<td>4.07</td>
<td>45</td>
<td>66</td>
<td>57</td>
<td>90</td>
</tr>
<tr>
<td>6. Pakistan(b)</td>
<td>4.03</td>
<td>49</td>
<td>72</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>7. Mexico(b)</td>
<td>2.68</td>
<td>52</td>
<td>71</td>
<td>62</td>
<td>97</td>
</tr>
<tr>
<td>8. Ethiopia(b,c)</td>
<td>1.99</td>
<td>55</td>
<td>27</td>
<td>16</td>
<td>6</td>
</tr>
<tr>
<td>9. Islamic Republic of Iran(b)</td>
<td>1.98</td>
<td>57</td>
<td>56</td>
<td>74</td>
<td>74</td>
</tr>
<tr>
<td>10. Philippines(b,c)</td>
<td>1.83</td>
<td>59</td>
<td>92</td>
<td>73</td>
<td>73</td>
</tr>
<tr>
<td>11. Viet Nam(b)</td>
<td>1.78</td>
<td>61</td>
<td>68</td>
<td>61</td>
<td>75</td>
</tr>
<tr>
<td>12. Egypt(b)</td>
<td>1.78</td>
<td>63</td>
<td>72</td>
<td>81</td>
<td>81</td>
</tr>
<tr>
<td>13. Thailand(b)</td>
<td>1.44</td>
<td>64</td>
<td>61</td>
<td>48</td>
<td>47</td>
</tr>
<tr>
<td>14. Turkey(b)</td>
<td>1.41</td>
<td>66</td>
<td>34</td>
<td>71</td>
<td>70</td>
</tr>
<tr>
<td>15. Zaire(b)</td>
<td>1.29</td>
<td>67</td>
<td>54</td>
<td>38</td>
<td>36</td>
</tr>
<tr>
<td>16. South Africa</td>
<td>1.28</td>
<td>69</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>17. Burma(b)</td>
<td>1.17</td>
<td>70</td>
<td>45</td>
<td>23</td>
<td>13</td>
</tr>
<tr>
<td>18. Kenya(b,a)</td>
<td>1.13</td>
<td>71</td>
<td>86</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>19. United Republic of Tanzania(b,d)</td>
<td>1.07</td>
<td>73</td>
<td>94</td>
<td>81</td>
<td>85</td>
</tr>
<tr>
<td>20. Republic of Korea(b)</td>
<td>0.95</td>
<td>74</td>
<td>95</td>
<td>85</td>
<td>93</td>
</tr>
<tr>
<td>21. Sudan(b)</td>
<td>0.94</td>
<td>75</td>
<td>46</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>22. Algeria(b,a)</td>
<td>0.90</td>
<td>76</td>
<td>95</td>
<td>66</td>
<td>66</td>
</tr>
<tr>
<td>23. Colombia(b)</td>
<td>0.88</td>
<td>77</td>
<td>80</td>
<td>58</td>
<td>82</td>
</tr>
<tr>
<td>24. Morocco(b)</td>
<td>0.85</td>
<td>78</td>
<td>87</td>
<td>78</td>
<td>78</td>
</tr>
<tr>
<td>25. Argentina(b,c)</td>
<td>0.75</td>
<td>78</td>
<td>91</td>
<td>75</td>
<td>85</td>
</tr>
<tr>
<td>Total 25 countries</td>
<td>70.63</td>
<td>78</td>
<td>63</td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td>Other developing countries</td>
<td>19.46</td>
<td>22</td>
<td>61</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>Sub-total, developing countries (excluding China)</td>
<td>80.09</td>
<td>100</td>
<td>82</td>
<td>63</td>
<td>55</td>
</tr>
<tr>
<td>China(b,a)</td>
<td>19.94</td>
<td>18</td>
<td>85</td>
<td>75</td>
<td>77</td>
</tr>
<tr>
<td>Total, developing countries (including China)</td>
<td>110.03</td>
<td>100</td>
<td>82</td>
<td>63</td>
<td>55</td>
</tr>
<tr>
<td>Total, industrialized countries</td>
<td>18.11</td>
<td>100</td>
<td>75</td>
<td>59</td>
<td>68</td>
</tr>
<tr>
<td>Global total</td>
<td>128.14</td>
<td>66</td>
<td>60</td>
<td>61</td>
<td>55</td>
</tr>
</tbody>
</table>

1 Developing countries ranked by numbers of surviving infants
(a) = 1986 coverage data.
(b) = 1987 coverage data.
(c) = 1986 coverage data.
(d) = 1985 coverage data.
(s) = Survey data.
(*) Children up to 60 months of age.
... No information available.
<table>
<thead>
<tr>
<th></th>
<th>(a) Newborns</th>
<th>(b) Surviving infants</th>
<th>(c) Prevented neonatal tetanus deaths</th>
<th>(d) Prevented pertussis cases</th>
<th>(e) Prevented measles cases</th>
<th>(f) Prevented measles deaths</th>
<th>(g) Prevented poliomyelitis cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 largest developing countries</td>
<td>77 178</td>
<td>70 633</td>
<td>274</td>
<td>28 357</td>
<td>325</td>
<td>30 803</td>
<td>918</td>
</tr>
<tr>
<td>Other developing countries</td>
<td>21 464</td>
<td>10 558</td>
<td>51</td>
<td>6 594</td>
<td>75</td>
<td>8 546</td>
<td>256</td>
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<tr>
<td>Total, developing countries</td>
<td>98 640</td>
<td>90 191</td>
<td>325</td>
<td>34 950</td>
<td>400</td>
<td>39 349</td>
<td>1 174</td>
</tr>
</tbody>
</table>

(a) Based on 1987 estimated population and crude birth rates.

(b) Based on estimated number of newborns and infant mortality rate.

(c) Based on mortality estimates from surveys or reports, a vaccine efficacy of 0.95 and immunization coverage reported as at December 1988. Countries without data were arbitrarily placed in one of three neonatal tetanus mortality classes: 5, 10 or 15 per thousand live births.

(d) Based on an estimated incidence of 80% of newborns in the absence of an immunization programme, a vaccine efficacy of 0.8 for three doses, and immunization coverage reported as at December 1988.

(e) Based on mortality estimates of one-third of measles deaths, a vaccine efficacy of 0.8 for three doses and immunization coverage reported as at December 1988.

(f) Based on an incidence estimation of 100% surviving newborns in absence of an immunization programme, a vaccine efficacy of 0.95 and immunization coverage reported as at December 1988.

(g) Based on arbitrary case fatality rates ranging from 2% to 4%, a vaccine efficacy of 0.95 and immunization coverage reported as at December 1988.

(h) Based on an estimated incidence of 5 per 1000 newborns in the absence of an immunization programme, a vaccine efficacy of 0.95 and immunization coverage reported as at December 1988.
TABLE 3. ESTIMATED ANNUAL NUMBER OF DEATHS FROM NEONATAL TETANUS, MEASLES AND PERTUSSIS, AND ANNUAL NUMBER OF CASES OF POLIOMYELITIS IN DEVELOPING COUNTRIES, EXCLUDING CHINA (DECEMBER 1988)

<table>
<thead>
<tr>
<th></th>
<th>Deaths from neonatal tetanus (1)</th>
<th>Deaths from measles (2)</th>
<th>Deaths from pertussis (3)</th>
<th>Total deaths</th>
<th>Cumulative percentage of total deaths</th>
<th>Poliomyelitis cases (4)</th>
<th>Cumulative percentage of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(in thousands)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 largest developing countries</td>
<td>590</td>
<td>1 263</td>
<td>402</td>
<td>2 256</td>
<td>70</td>
<td>159</td>
<td>75</td>
</tr>
<tr>
<td>Other developing countries</td>
<td>164</td>
<td>330</td>
<td>121</td>
<td>615</td>
<td>21</td>
<td>53</td>
<td>25</td>
</tr>
<tr>
<td>Total, developing countries</td>
<td>754</td>
<td>1 593</td>
<td>523</td>
<td>2 871</td>
<td>100</td>
<td>212</td>
<td>100</td>
</tr>
</tbody>
</table>

**Note:** Using the immunization coverage data in Table 1, the following assumptions were made:

1. **Neonatal tetanus:** based on survey data or, in the absence of survey, extrapolated from countries with similar socioeconomic conditions.

2. **Measles:** it is assumed that the vaccine efficacy is 95% and that all unimmunized children will contract measles. Coverage is assumed to be "zero" in countries for which data are not available.

3. **Pertussis:** it is assumed that the vaccine efficacy is 80% and that 80% of unimmunized children will contract pertussis. Coverage is assumed to be "zero" in countries for which data are not available.

4. **Poliomyelitis:** in view of the narrow limits of variation of results of poliomyelitis surveys, and in the absence of an immunization programme, a fixed incidence rate of 5 cases per thousand newborns is used. A vaccine efficacy of 95% is assumed. Coverage is assumed to be "zero" in countries for which data are not available.
PLAN OF ACTION FOR GLOBAL ERADICATION OF POLIOMYELITIS BY THE YEAR 2000

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I. INTRODUCTION

In May, 1988, the Forty-first World Health Assembly committed WHO to the global eradication of poliomyelitis by the year 2000 (resolution WHA41.28). The Health Assembly emphasized that eradication efforts should be pursued in ways which strengthen the development of the Expanded Programme on Immunization (EPI), fostering its contribution, in turn, to the development of primary health care.

The Health Assembly had as a background document the "Declaration of Talloires", which also cited this poliomyelitis eradication goal. The Declaration was issued by the Task Force for Child Survival (comprised of WHO, UNICEF, the World Bank, UNDP and the Rockefeller Foundation) following a meeting in March, 1988 in Talloires, France, attended by world leaders in the area of health and development.

This Plan of Action draws on experience gained in the Region of the Americas, which began its drive for poliomyelitis eradication in 1985, and the resulting optimism about the feasibility of using the specialized efforts required for eradication to boost broader aspects of immunization and strengthen other health services.

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The progress of EPI has resulted in optimism about the eradication of poliomyelitis during the next decade. In 1988, coverage rates for a third dose of poliovirus or DPT vaccines in developing countries were over 60%. In response to the EPI goal of providing immunization for all children of the world by 1990 (universal child immunization by 1990, or "UCI-1990"), national and international efforts are being intensified to increase coverage to 80% or more for all antigens included in the Programme by this date. Achieving and sustaining this level is a prerequisite for the global eradication of poliomyelitis.

Improved surveillance of poliomyelitis is essential so that useful information about cases and outbreaks can be used to guide and refine eradication strategies. For example, experience to date suggests that the circulation of wild polioviruses in communities is heavily dependent on intimate person-to-person contact. Large urban areas seem to be foci for particularly intense transmission of polioviruses, and this may play an important role in the transfer of virus to less densely settled populations.

Once freed of endemic transmission, areas within individual countries, and groups of countries, may be less likely to return to an endemic state than had been thought previously, suggesting that global eradication may be approached by eliminating endemic transmission from groups of countries, and underlining the importance of achieving high immunization coverage in urban areas, particularly among socially disadvantaged groups.

In 1987, only some 10% of the 250,000 cases of poliomyelitis estimated to occur in that year were officially reported. Trends in reported cases may be difficult to interpret in coming years since the real decline in incidence may be masked by improvements in disease surveillance making it appear that the incidence of poliomyelitis is increasing - a phenomenon experienced in the course of the smallpox eradication programme.

The strategies outlined in this plan need to remain flexible and evolve on the basis of experience gained in national programmes. Thus the budget estimates which have been provided at this stage (particularly for the later years of the initiative) are mainly intended to indicate orders of magnitude. Both the Plan of Action and the budget estimates will need continuing review and updating in coming years.

II. OBJECTIVES

By the year 2000:

- there should be no case of clinical poliomyelitis associated with wild poliovirus;
- there should be no wild poliovirus identified anywhere in the world after sampling of communities and environments;
- the process of independent certification of global poliomyelitis eradication should begin, so that consideration can be given to stopping poliomyelitis immunization (a three-year period during which active surveillance reveals neither cases nor the circulation of wild polioviruses is currently envisaged).

By the year 1995:

- poliomyelitis eradication, defined as the cessation of indigenous transmission of wild poliovirus, should be achieved in the European and Western Pacific Regions, with formal certification in the Region of the Americas;
- indigenous transmission of wild poliovirus should cease in five or more countries each in the African, Eastern Mediterranean and South-East Asia Regions, preferably in epidemiologically defined zones, and the evidence of "polio-free zones" should be documented in the majority of the remaining countries;

- there should be expansion and strengthening of the network of laboratories which:
  - reliably measure serum antibodies to poliovirus by type,
  - isolate, identify and if necessary carry out intratypic differentiation of, polioviruses from clinical and sewage samples;
  - refer samples as needed for further characterization;

- systems should be established which permit all countries to refer specimens for laboratory diagnosis as required;

- there should be intratypic characterization of poliovirus isolates from all poliomyelitis-like cases/outbreaks through appropriate methods in areas previously considered to be polio-free so that a probable source or sources can be identified;

- there should be annual review/revision of national poliomyelitis eradication plans in countries not yet free from wild poliovirus and development of special action programmes in countries whose infrastructure appears insufficient to permit achievement of the goal by the year 2000; in countries where external resources are required to supplement national resources, national plans are to be developed in collaboration with donors who will be co-signatories to the plan.

By the year 1990:

- monitoring of poliomyelitis incidence and immunization coverage in all countries by "district" (a geopolitical subdivision with a population that could range from a few hundred thousand to a few million);

- reporting poliomyelitis incidence at least monthly by district to regional and global levels;

- review of poliomyelitis status of all countries, and development of poliomyelitis eradication plans in endemic countries;

- confirmation that all countries use vaccines which meet WHO requirements;

- adoption of a standard case definition for cases of poliomyelitis and of standard laboratory diagnostic methods;

- introduction of poliomyelitis eradication training materials for field staff (relating particularly to surveillance and outbreak control), and for laboratory personnel (relating particularly to poliovirus isolation and identification, to vaccine potency testing and to serological tests for poliomyelitis immunity), and initiation of interregional, inter-country and national training programmes;

- establishment of a network of poliomyelitis reference laboratories which are able to isolate and type poliovirus and differentiate vaccine-like from wild poliovirus and which are willing to test specimens from one or more countries for diagnostic purposes;

- validation of simple, rapid tests to confirm the presence of poliovirus in samples taken from individuals and from the environment;
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- pursuit of epidemiological research to better characterize the patterns of spread of wild viruses and to define rapid, effective outbreak control procedures;

- review of current oral poliovirus vaccine formulations to decide whether changes in WHO requirements are warranted, review of combined use of inactivated and oral vaccines and promotion of the further development and testing of new oral poliovirus vaccines with a view to being able to introduce them by 1995;

- establishment in each Region of advisory bodies which will:
  1) review at least annually the progress being achieved to eradicate poliomyelitis in the context of EPI,
  2) offer advice concerning the improvement of programmes in the Region, and
  3) promote coordination and collaboration among the supporters of national programmes, including organizations of the United Nations system, multi- and bilateral development agencies and private/nongovernmental organizations.

III. STRATEGIES

Seven major areas in which action is required have been identified:

1. Immunization coverage
2. Surveillance
3. Laboratory services/vaccine quality control
4. Training
5. Social mobilization
6. Rehabilitation services
7. Research and development

1989-1990

1. Immunization coverage

All countries should attain coverage of at least 80% with a protective course of poliovirus vaccine among infants by their first birthday and among children in each one-year cohort between the ages of 1 and 4 years. This coverage level should be regarded as a management goal for all districts. Interruption of transmission of wild poliovirus may require coverage in excess of 80%, however, especially in areas of high population density, such as periurban slums. By the year 2000, immunization coverage should exceed 90% in all countries. To achieve this, emphasis will be placed on general strengthening of the EPI infrastructure through:

- training,
- improved supervision,
- reduction of missed immunization opportunities,
- adoption of appropriate immunization schedules and strategies, and
- improved social communication activities.

2. Surveillance

National managers should obtain reports of cases, including reports of "zero cases", from each district (or other major geopolitical subdivision) on at least a monthly basis. Monthly reporting, by district, will be introduced progressively, so that by 1995 it will involve all countries. Weekly reporting will become necessary as endemic
transmission is stopped. It is expected that in most countries this information will contribute to the national management information system for primary health care.

Countries should report cases, by district, to the regional and global level on a monthly basis. This should be achieved as rapidly as possible. Countries and regions close to achieving poliomyelitis eradication will need to establish weekly reporting. Feedback should be provided from the global and regional levels beginning at six-monthly intervals, but becoming monthly or weekly as soon as possible.

A clear poliomyelitis case definition is essential for surveillance. All countries should be encouraged to adopt a standard case definition by 1990. For reporting purposes the following is proposed:

A case of poliomyelitis is defined as any patient with acute flaccid paralysis (including any child less than 15 years of age diagnosed to have Guillain-Barré syndrome) for whom no other cause can be identified.

Countries with fewer than 50 cases per year should establish an expert review committee responsible for the final diagnosis of cases reported as poliomyelitis and for their classification as:

- vaccine-associated,
- wild virus/imported,
- wild virus/indigenous, or
- unknown/other.

3. Laboratory services/vaccine Quality Control

Laboratory capabilities for isolating and characterizing polioviruses will be strengthened. A network of international poliomyelitis reference laboratories already exists, and a regional network is being established in the Americas. This reference network will be extended by 1990. Systems for the exchange of samples among reference laboratories and between these laboratories and national programmes will be developed. Prototype kits for the collection and transport of laboratory specimens will be introduced.

WHO will work with countries and vaccine producers to assure that all immunization programmes use vaccines that meet WHO requirements. Continued emphasis on cold-chain management is a complementary strategy for ensuring that vaccine potency is maintained up to the time of administration.

4. Training

EPI is at present revising its training materials to reflect the advanced state of most national programmes in developing countries and their increasing similarity to programmes in industrialized countries. One or more EPI modules will be devoted exclusively to poliomyelitis eradication activities for health workers at different levels. Training materials will also be developed for laboratory personnel, relating particularly to poliovirus isolation, identification and strain differentiation, vaccine potency testing, and serological tests for poliomyelitis immunity. Interregional, inter-country, and national training programmes will be initiated. EPI will also continue its efforts, in conjunction with other WHO programmes, to integrate its training materials into the curricula of institutions training health staff.
5. **Social mobilization**

Creating and maintaining public awareness of the poliomyelitis eradication initiative will be important for sustaining political and financial commitment to the goal of poliomyelitis eradication. WHO should collaborate with other agencies and voluntary organizations to develop appropriate messages for the media and material for lay education. Development of national communication plans including regular media coverage of national, regional, and global progress in immunization coverage and disease control should be encouraged. Progress reports should also be regularly issued to agencies providing support to the EPI.

In recent years political, religious, and community leaders have successfully and enthusiastically participated in social mobilization for acceleration of immunization. Their continued support will be necessary to increase and sustain immunization coverage and may be useful in the development of community surveillance.

6. **Rehabilitation services**

The poliomyelitis eradication initiative is expected to provide an excellent opportunity for strengthening rehabilitation services in developing countries. Eradication efforts will focus public attention on the tragic consequences of poliomyelitis, and will create an environment in which rehabilitation efforts can be expected to receive additional support, particularly from local resources. As the number of cases diminishes, these efforts can become more comprehensive, covering an ever larger proportion of all cases which occur and providing a more extensive array of services to each case.

Rehabilitation efforts undertaken in conjunction with poliomyelitis eradication will support the eradication effort itself, helping to ensure among other things that all cases of poliomyelitis come to the attention of health authorities. The efforts should also contribute to the development of more comprehensive national rehabilitation services by strengthening the health infrastructure and by building community support which can focus on other causes of disability as poliomyelitis disappears from the scene.

Some polio rehabilitation initiatives are already being undertaken internationally, most notably by IMPACT - an organization devoted to the prevention of avoidable disability co-sponsored by WHO, UNICEF and UNDP - and by Rotary International, which is providing some US$ 10 million to support poliomyelitis rehabilitation work. However, the major contributions to these efforts are expected to come from endemic countries, and national rehabilitation services should become increasingly evident during the 1990s.

7. **Research and development**

The development of simple, rapid diagnostic tests for poliomyelitis is an immediate priority. Special studies will be initiated to improve surveillance for poliomyelitis, including:

- the use of simplified tests for confirming infection,
- techniques for detecting wild poliovirus in the environment, and
- methods for stimulating active case reporting.

Operational research will be conducted to define cost-effective methods of interrupting transmission of wild poliovirus. These include strategies for reaching people in peri-urban slums, who are a major challenge to immunization and other primary health care programmes.
Current studies on the optimal formulation of oral poliovirus vaccine for developing countries will be pursued with the objective of making definitive recommendations by 1990 concerning any changes which might be warranted. The combined use of oral and inactivated poliovirus vaccines will be examined. Basic research to develop improved oral vaccines will be promoted.

1991-1995

This period will see increasing application of the strategies developed during the previous period. By 1995 health workers in all countries not considered free of poliomyelitis will have received specific training in eradication techniques. By 1995 reliable surveillance information will be available from every country, by district, on at least a monthly basis. In countries reporting fewer than 10 cases per year, all cases of flaccid paralysis with no other immediately obvious cause will be investigated (including the appropriate application of laboratory confirmation and characterization of the virus(es) concerned), and reported as vaccine-associated, wild virus/imported, wild virus/indigenous, or unknown/other.

1996-2000

This will be the period during which the global drive to eradicate poliomyelitis will be intensified. By 1996, endemic transmission of wild poliovirus should be confined to well-defined areas in 10 to 20 countries. While continuation of routine operations may suffice for some of the countries which are not yet free of poliomyelitis, it is likely that exceptional eradication measures, such as immunization campaigns conducted on a national or smaller scale, will be required in other countries. Some countries will require additional support from outside collaborators for supplies, equipment, and operating costs. In some circumstances the services of international consultants may be called upon to support national managers in the planning, implementation, and analysis of the effectiveness of eradication strategies.

Application of strategies at national level

In the development of national plans for the eradication of poliomyelitis, consideration should be given to immunization coverage rates and the number of cases reported. In the absence of an alternative regional or sub-regional strategy, countries (or areas within countries) can be placed according to these variables in four groups:

Group A - Countries considered to be free of poliomyelitis

These are countries with reliable reporting systems, which have reported no indigenous case of poliomyelitis for at least three years and have achieved a coverage of 80% or more among infants by their first birthday and among children in each one-year cohort between the ages of 1 and 4 years. These countries should maintain their immunization programme. "Zero case" reporting from all districts should be continued. Any reported case should be investigated promptly with full laboratory support to confirm the diagnosis. An expert review committee should be established which would be responsible for final diagnosis of cases and their classification as vaccine-associated, wild virus/indigenous, wild virus/imported, or unknown/other. Outbreak control measures should be rapidly instituted if transmission of wild poliovirus appears likely.
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**Group B - Countries with less than 10 cases per year and coverage rates of over 50%**

Many of these countries may already be free of indigenous transmission of wild poliovirus, cases being imported or vaccine-associated. These countries should review their surveillance systems to assure that all cases are being reported and investigated. Clinical diagnoses should be confirmed through full laboratory testing. Consideration should be given to establishing an expert review committee responsible for final diagnosis of cases and their classification as vaccine-associated, wild virus/indigenous, wild virus/imported, or unknown/other. Countries with indigenous cases should identify common risk factors and undertake special immunization to interrupt transmission. Countries in this group should continue their efforts to achieve high immunization coverage levels.

**Group C - Countries with 10 or more cases per year and coverage rates of over 50%**

In these countries primary emphasis should be placed on improving immunization coverage and strengthening surveillance systems. National or local immunization days or other special strategies may be considered as a means for increasing coverage. Surveillance systems should define areas of continued transmission. Outbreak control and case investigation should be increasingly emphasized in countries or areas within countries in which endemic transmission is almost eliminated. Countries which report fewer than 50 cases per year should provide specimens from each case for laboratory confirmation. They should consider establishing an expert review committee responsible for the final diagnosis of cases reported as poliomyelitis and for their classification as vaccine-associated, wild virus/indigenous, wild virus/imported, or unknown/other.

**Group D - Countries with 10 or more cases of per year of unknown incidence and/or coverage rates of 50% or below or unknown:**

In these countries primary emphasis should be placed on increasing routine immunization coverage. National immunization days or other special strategies may be considered as a means for increasing coverage. These strategies represent a complement to routine services and should include all EPI antigens. Group D countries should also develop surveillance systems, initially focusing on sentinel surveillance. Outbreak control and investigation of cases or outbreaks will be particularly encouraged in areas of the country where coverage exceeds 50%. Laboratory confirmation of clinical diagnoses is not a priority, except in countries or areas within countries where endemic transmission has stopped.

Variations in these strategies may be appropriate. For example, efforts will be made to establish epidemiologically-defined zones consisting of groups of contiguous countries that would benefit from inter-country coordination of eradication strategies. In such circumstances, it may be advisable to emphasize surveillance and outbreak control measures in a "Group D" country if it is thought to be a major focus for export of wild poliovirus to neighbouring countries.

A provisional classification of countries, based on data available to the Programme at headquarters in Geneva as at 1 August 1988, is provided in Figure 1. Of the total global population, 17% lives in Group A countries, 7% in Group B countries, 60% in Group C countries, and 16% in Group D countries (Table 1).
Fig. 1  COUNTRIES/AREAS ACCORDING TO CATEGORY OF POLIO INCIDENCE/COVERAGE, 1 AUGUST 1988
Table 1. Population (in millions) by category of poliomyelitis incidence/coverage, by Region, 1 August 1988

<table>
<thead>
<tr>
<th>Region</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Africa¹</td>
<td>1</td>
</tr>
<tr>
<td>Americas</td>
<td>350</td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>3</td>
</tr>
<tr>
<td>Europe²</td>
<td>287</td>
</tr>
<tr>
<td>South-East Asia</td>
<td>0</td>
</tr>
<tr>
<td>Western Pacific</td>
<td>186</td>
</tr>
<tr>
<td>Total</td>
<td>827</td>
</tr>
</tbody>
</table>

% 17 7 60 16

¹ South Africa excluded.
² The 15 republics of the Soviet Union have each been counted as a separate country/area.

**Group A:** No indigenous cases due to wild virus for the last 3 years and immunization coverage >80%.

**Group B:** Less than 10 cases per year for the last 3 years and immunization coverage >50%.

**Group C:** More than 10 cases per year and immunization coverage >50%.

**Group D:** More than 10 cases per year or unknown incidence and/or immunization coverage <50% or unknown.
IV. WHO RESPONSIBILITIES AT NATIONAL, REGIONAL AND GLOBAL LEVELS

WHO will provide technical leadership in the management and coordination of global poliomyelitis eradication until its completion. Success will depend on this being perceived as a universal challenge, and WHO will actively solicit the collaboration of as wide a spectrum of institutions and individuals as possible. Commitment from governments and individual political/community leaders will be essential. Financial and technical support will be required from multi- and bilateral development agencies, other international agencies, nongovernmental organizations, technical institutions, universities, private and voluntary groups and concerned individuals.

While additional coordinating groups may need to be established at global level, emphasis in the beginning stages will be placed on coordination through the existing activities of the EPI Global Advisory Group and on coordinating groups established within countries and within regions.

WHO activities associated with the poliomyelitis eradication initiative will be conducted as part of the Expanded Programme on Immunization (EPI) in collaboration with other WHO programmes as appropriate. Responsibilities for this initiative will be distributed at national, regional and global levels in the same manner as responsibilities for EPI are distributed.

The most important activities will be those of national health authorities in strengthening their immunization programmes and in stopping the transmission of wild poliovirus within national boundaries. The main responsibilities for planning, resource mobilization, donor coordination, training, implementation, monitoring, evaluation and research are national. WHO will collaborate in these activities through the office of the WHO representative, where such an office has been established, and through support from WHO/EPI staff and consultants assigned at country, inter-country, regional and interregional levels.

WHO regional offices will:

- provide technical support and coordination within the Region;
- prepare regional plans of action based on the results of assessments of national programmes;
- support national managers in planning, donor coordination, training, monitoring, evaluation and research;
- place special emphasis on poliomyelitis surveillance, making available as required reference laboratory services for the diagnosis of poliomyelitis and/or the characterization of the poliovirus isolates;
- provide technical support to national programmes to adapt and develop computer software for management information systems (including disease surveillance);
- provide training to national laboratory staff.

The regional plans of action will address research needs of regional scope, for which purpose regional offices will support national programmes. Regions will engage in regional resource mobilization to the extent possible. Progress within regions will be reviewed and discussed annually by regional EPI advisory bodies and by annual regional or sub-regional meetings of national programme managers. It will be reviewed periodically by the WHO regional committees.
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At the global level EPI will provide overall technical direction for this initiative. It will:

- provide leadership in resource mobilization and donor coordination;
- develop prototype training materials and technical support documents as required;
- promote the development and application of improved disease surveillance and programme monitoring and evaluation techniques;
- support regional offices and national programmes by providing expertise, by assigning short- and long-term staff and by providing funds, particularly to strengthen donor coordination, planning, training, supervision, monitoring and evaluation (including surveillance) and research;
- update and share with regional offices and countries, at least twice a year, global information on immunization coverage, disease incidence and other selected parameters, obtained from national managers through the regional offices;
- promote vaccine quality control activities so as to assure that all countries have the benefit of using poliovirus vaccines which meet WHO requirements;
- promote the development and introduction of improved poliovirus vaccines;
- develop a system of poliomyelitis reference laboratories to which specimens can be sent from national level for poliovirus isolation, serological testing and/or poliovirus characterization;
- strengthen the capacities of national laboratories through training, provision of standard reagents and proficiency testing;
- promote operational research at national level, in collaboration with the regional offices, addressing programme priorities;
- ensure annual review of the global poliomyelitis eradication initiative by the EPI Global Advisory Group, and periodic review by the WHO Executive Board and World Health Assembly;
- certify the global eradication of poliomyelitis.

V. RESOURCE REQUIREMENTS

Resource requirements for the 1990s over and above current support for EPI are estimated as follows: as over 100 million children in developing countries are being immunized each year, the total cost of the programme, estimated as US$ 10.00 per fully immunized child (in United States dollars at 1988 rates), will come to more than US$ 1000 million per year - maybe double if one considers the new vaccines which can be expected to be added to the programme, and the growth in world population. For the most part, external contributions will cover the costs of vaccines, cold-chain equipment, syringes and needles and sterilization equipment. In the least developed countries, it is probable that a portion of operational costs will also need to be covered from external resources.

Most of the costs are being met by developing countries themselves, but external support will continue to be needed, probably in the range of 20%-30% of the total costs. The US$ 150 million per year being invested from external sources in EPI according to an approximate estimate in 1988 will need to be increased to some US$ 300 million in the early 1990s. The partners already engaged in the EPI, particularly UNICEF, multi- and bilateral development agencies and private and voluntary groups, would have to increase and sustain their current contributions to meet this need.
The projections below are also for funds over and above those which are currently being provided to EPI for its global operations. EPI at headquarters in Geneva now receives some US$ 3.7 million in extrabudgetary support per year. The poliomyelitis initiative requires an additional US$ 10-15 million per year. Except for a small contribution from headquarters, the poliomyelitis eradication activities of the Americas are being supported by funds raised within the Region; its requirements, which have already been met through the early 1990s, are not included in the estimates provided below.

Estimated resource requirements are summarized in Table 2. No line items have been provided for social mobilization or rehabilitation; it is expected that they will for the most part be supported from community resources.

### 1989-1990

#### Staff requirements

The primary need during this period is for additional international staff who can help assess the status of national programmes and contribute to programme planning (including donor coordination), monitoring and evaluation. Aided by the findings, they will help in further developing eradication strategies, in developing prototype training materials and in the further development and application of simplified computer-based management information systems at global, regional and national levels (see below).

Initial help will be sought largely through the use of short-term consultants, full-time (core) staff will, however, be recruited as soon as suitable persons can be identified. The full-time staff who are recruited will be expected to constitute a majority of the core staff who will be required at least up to 1995.

A total additional “core” staff of some 20 professionals will be needed, in addition to secretarial staff. Efforts will generally be made, when selecting staffs for interregional posts, to provide flexibility of transfer between regions according to the needs of the Programme. Five professionals will be based at headquarters, five in regional offices and ten in countries within regions, who will have inter-country responsibilities.

National professional staff will be recruited to supplement the work of the international staff. Efforts will be made to recruit young national staff who can profit from the experience for career development.

Short-term consultant services will also be required, and an initial projection of a total 10 person/years per year has been made. Funds for administrative support and travel have also been budgeted.

Total “core” and consultant staff costs will be some US$ 9 000 000.

In addition to the “core” staff and consultants, resources will be needed to support activities in the following areas:

- **Coordination meetings of regional and global advisory bodies and national programme managers**

Advisory bodies have already been established in the Region of the Americas and the European Region. They will be established in the remaining regions during 1989. At present, an annual meeting of each regional advisory body is foreseen. Annual regional meetings of national programme managers will be convened, where possible, in conjunction with the meeting of the regional advisory body. Two meetings will be required in the African Region, one in French and one in English. The combined cost is estimated at
US$ 75 000 per meeting. Excluding the Region of the Americas, six annual meetings, at a total cost of US$ 450 000 per year will be needed, beginning in 1989, together with meetings of experts at global level to advise on specific aspects of the poliomyelitis eradication initiative. Their recommendations will be considered by the EPI Global Advisory Group, which will remain the central advisory body for EPI. A total of US$ 50 000 per year is budgeted for global meetings conducted in addition to the annual meeting of the EPI Global Advisory Group.

The total cost of coordination meetings will be US$ 1 000 000.

Monitoring and surveillance

Two major changes need to be introduced:

- First, national managers must begin analysing their data district by district. General data for the country as a whole, whether it relates to immunization coverage or to disease incidence, will no longer suffice. In a number of countries, building an effective surveillance system will require regular visits to district facilities. The proposal therefore includes the provision of US$ 1 million to ensure the availability of vehicles and fuel for this purpose.

- Secondly, in order to analyse and respond to district data promptly, simplified computerized management information systems are required at national level, and should be linked as rapidly as possible to more peripheral systems as these are progressively introduced. Regional and global systems should be compatible with the data being obtained and analysed at national level.

A considerable amount of software for EPI is already being developed. This work will need to be continuous, however, since these systems will evolve as improved software and hardware become available, and as the needs of national managers evolve. The major need during this period, however, will be for installation of software for national systems and training of national staff in its use. It is hoped that this can be accomplished in approximately 15 countries per year, at a cost of US$ 10 000 per country. An additional US$ 50 000 per year will be needed to continue software development, particularly linking national with district and peripheral systems and making EPI a component of the national management information system for primary health care.

The total monitoring and surveillance cost will be US$ 1 400 000.

Development of training materials and support for training courses

The development and field-testing of training materials is expected to proceed rapidly, given the work already done in PAHO.

After the course materials for immunization programme staff have been developed and field tested, they will be introduced in the current routine EPI training activities within national programmes. As was done to introduce the original EPI materials, inter-country courses of national programme managers will be held in each region (with the exceptions of the Region of the Americas and the European Region), courses in both English and French being held in the African Region. The cost per course is estimated to be US$ 80 000. Special practical courses to permit surveillance supervisors to recognize clinical cases of poliomyelitis and to teach these skills to health workers in communities will also be needed. Five such courses are planned for 1989-1990, at US$ 60 000 per course.

The training for laboratory support will focus on poliovirus isolation and strain differentiation, vaccine potency testing and serological tests for poliomyelitis
antibodies. Only a limited number of laboratories will be engaged in poliomyelitis diagnostic work during this period, and only two courses, both interregional, are envisaged (at US$ 60 000 per course).

The total training costs will be US$ 1 300 000.

Establishment of poliomyelitis reference laboratories

Meetings will have to be convened to obtain a consensus on various standardized test procedures which will form the basis for training (1 meeting per year, US$ 50 000 per meeting). Extra staff, supplies and equipment will be needed to permit the reference laboratories to perform the diagnostic tests required. US$ 500 000 has been budgeted for these purposes.

The total poliomyelitis reference laboratory costs will be US$ 600 000.

Research and development

US$ 500 000 will be used to support the development of improved laboratory diagnostic tests for poliomyelitis that can be reliably used in laboratories with relatively limited capabilities, including the purchase of specialized equipment and the hiring of extra laboratory staff. US$ 600 000 is provided for operational research on cost-effective methods of interrupting the transmission of wild poliovirus.

The optimal formulation of oral poliomyelitis vaccine will require expensive and time-consuming field studies and will only be possible in a limited number of sites. Support for two studies, at a cost of approximately US$ 200 000 each, and for the further development of improved vaccines (another US$ 200 000) is requested. Support is also required to accelerate the testing and introduction of new oral poliovirus vaccines, but probably will not be needed for field trials until after 1990.

The total research and development costs will be US$ 1 700 000.

The total resource requirements for 1989-1990 will thus be US$ 17 000 000 (including programme support cost).

1991-1995

While the activities will be modified to meet the changing needs of the programme, the total annual resources required will remain approximately the same in terms of international staff and training, monitoring and surveillance. Increased resources will be needed for country assessment activities. Recruitment of national professional staff will increase and the cost of staff participation in coordination meetings will increase. Projected travel costs will increase from US$ 500 000 per year during 1989-1990 to US$ 600 000 per year. Laboratory costs will also increase as more national laboratories are developed. While fellowships for laboratory staff have not been projected for the period 1989-1990, they will be used as a training method in 1991-1995. In addition, proficiency testing programmes will be increasingly developed during this period. Laboratory support costs will double, from approximately US$ 300 000 per year to approximately US$ 600 000 per year during 1991-1995. Support for research and development will increase from US$ 850 000 per year to US$ 1 000 000 per year during the period 1991-1995.
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Increased resources will be needed to support specific poliomyelitis eradication strategies forming part of national programmes during this period. These will mainly be covered by bilateral or multilateral support from organizations other than WHO, and are not included in these estimates.

The total costs for 1991-1995 will thus be US$ 60,000,000, (including programme support cost).

1996-2000

This is the period during which an increased need for WHO-managed resources can be envisaged, as specific intensive eradication strategies are implemented in countries which might otherwise not achieve the goal, relying in part on the help of short- and long-term international consultants. Realistic estimates of these needs will be developed during the period 1991-1995. It can be anticipated, however, that personnel costs will be at least two-thirds more than what has been projected for the period 1991-1995.

The total costs for 1996-2000 are estimated at US$ 78,000,000, (including programme support cost).
### TABLE 2. ESTIMATE OF ADDITIONAL EPI RESOURCE REQUIREMENTS* FOR ERADICATION OF POLIOMYELITIS, 1989-2000 (UNITED STATES DOLLARS AT 1988 RATE)

<table>
<thead>
<tr>
<th></th>
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<tr>
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<td>Staff/consultants</td>
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</tr>
<tr>
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<td>3 000 000</td>
</tr>
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<tr>
<td>Subtotal</td>
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<td>3 000 000</td>
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<tr>
<td><strong>TOTAL (without programme support costs)</strong></td>
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<td>53 000 000</td>
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<tr>
<td><strong>TOTAL with programme support costs</strong></td>
<td>17 000 000</td>
<td>60 000 000</td>
<td>78 000 000</td>
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</table>

* External resource requirements for routine EPI operations, estimated to range from US$ 300 million to US$ 600 million per year during the 1990s, are excluded from this table.