

# Global eradication of poliomyelitis

Report of the Technical Consultation,  
29-30 April 1996



**GLOBAL PROGRAMME FOR VACCINES AND IMMUNIZATION**  
EXPANDED PROGRAMME ON IMMUNIZATION



*World Health Organization*  
Geneva  
1997

---

The Expanded Programme on Immunization  
of the Global Programme for Vaccines and Immunization  
offers its gratitude for the worldwide support of the  
Polio Eradication Initiative  
and thanks, in particular the donors listed below.

**Rotary International**  
**UNICEF**  
**U.S. Centers for Disease Control and Prevention**

*and the Governments of*

**Australia**  
**China**  
**Denmark**  
**Japan**  
**Netherlands**  
**Norway**

The success of this initiative to eradicate polio by the year 2000  
is made possible only through such support.

*Ordering code: WHO/EPI/GEN/96.04*

*Printed: January 1997*

**GPV Catalogue available on the Internet at:**

<http://www.who.ch/programmes/gpv/gEnglish/avail/gpvcatalog/catlog1.htm>

**Copies may be requested from:**

World Health Organization  
Global Programme for Vaccines and Immunization  
CH-1211 Geneva 27, Switzerland

• Fax: 022 791 4193/92 • E-mail: [gpv@who.ch](mailto:gpv@who.ch) •

© World Health Organization 1997

This document is not a formal publication of the World Health Organization (WHO), and all rights are reserved by the Organization. The document may, however, be freely reviewed, abstracted, reproduced and translated, in part or in whole, but not for sale nor for use in conjunction with commercial purposes.

The views expressed in documents by named authors are solely the responsibility of those authors.

---

# Contents

<b>1. Introduction .....</b>	<b>4</b>
<b>2. The global initiative to eradicate poliomyelitis by the year 2000.....</b>	<b>5</b>
2.1 Strategies for polio eradication .....	5
2.2 Progress in the implementation of the eradication strategies .....	5
2.3 Poliomyelitis incidence .....	7
<b>3. Supplementary immunization activities for polio eradication .....</b>	<b>8</b>
3.1 National immunization days .....	8
3.2 “Mopping-up” .....	9
<b>4. Acute flaccid paralysis surveillance for polio eradication .....</b>	<b>11</b>
4.1 Standardized core variables for surveillance of AFP .....	11
4.2 Age groups for AFP surveillance: .....	12
4.3 Classification of AFP cases .....	13
<b>5. Detection of wild polioviruses and the polio laboratory network .....</b>	<b>16</b>
5.1 Virological surveillance .....	16
5.2 Environmental sampling .....	18
<b>6. Certification of the eradication of poliomyelitis .....</b>	<b>19</b>
6.1 Non-human reservoirs for poliovirus .....	19
6.2 Countries that have been polio-free for many years .....	20
6.3 Immunization strategies beyond the year 2000 .....	21
<b>7. Polio eradication in “difficult areas” and cross-border issues .....</b>	<b>23</b>
7.1 Polio eradication in difficult areas .....	23
7.2 Cross-border coordination of polio eradication activities .....	24
<b>8. Revised plan of action for the eradication of poliomyelitis .....</b>	<b>25</b>
<b>Annex 1: List of participants .....</b>	<b>26</b>
Technical Panel .....	26
Technical Advisers/Presenters .....	26
Observers from collaborating organizations .....	27
<b>Annex 2: Working documents .....</b>	<b>29</b>
<b>Annex 3: Core variables .....</b>	<b>30</b>

---

# 1. Introduction

From 29-30 April 1996, a Technical Consultation on the Global Eradication of Poliomyelitis (hereinafter known as the Technical Consultative Group (TCG)) was convened by the World Health Organization to review the currently recommended strategies for achieving the global goal of eradication of wild polioviruses by the year 2000. Although informal consultations on poliomyelitis eradication were convened in 1988 and 1989, the TCG was first established in 1992 to periodically meet to revise the strategies on the basis of new scientific data, if and when appropriate (1).

The meeting was opened by Dr R. H. Henderson, Assistant Director-General, World Health Organization on behalf of Dr H. Nakajima, Director-General. Dr Henderson welcomed the participants, stating that the TCG was a vital component of WHO's commitment to providing technical leadership for the global polio eradication initiative. Dr Henderson thanked the TCG for taking on the responsibility of helping to guide the eradication programme and stressed the need for particular attention to the strategies for surveillance of polioviruses and certification of eradication as these activities become increasingly important. Dr J. W. Lee, Director of the Global Programme for Vaccines and Immunization, expressed optimism that with the consistent implementation of the proven strategies and the ongoing collaboration of the partner agencies, polio eradication would be achieved by the year 2000. Dr Lee reminded the TCG of the need to consider not only current technical problems, but also future issues such as how and when to stop immunization against polio.

Dr W. Orenstein of the Centers for Disease Control in the United States of America was elected to chair the meeting with Dr P. Figueroa of the Ministry of Health Jamaica, serving as rapporteur. This report presents a brief overview of the strategies for polio eradication and progress towards that goal, following which each of the technical deliberations of the TCG is outlined with the relevant conclusions and recommendations.

---

## 2. The global initiative to eradicate poliomyelitis by the year 2000

The target of polio eradication by the year 2000 was established by the World Health Assembly in 1988 (2). The initiative is supported by a coalition of partners which includes WHO, Rotary International, UNICEF, governmental agencies and non-governmental organizations.

### 2.1 Strategies for polio eradication

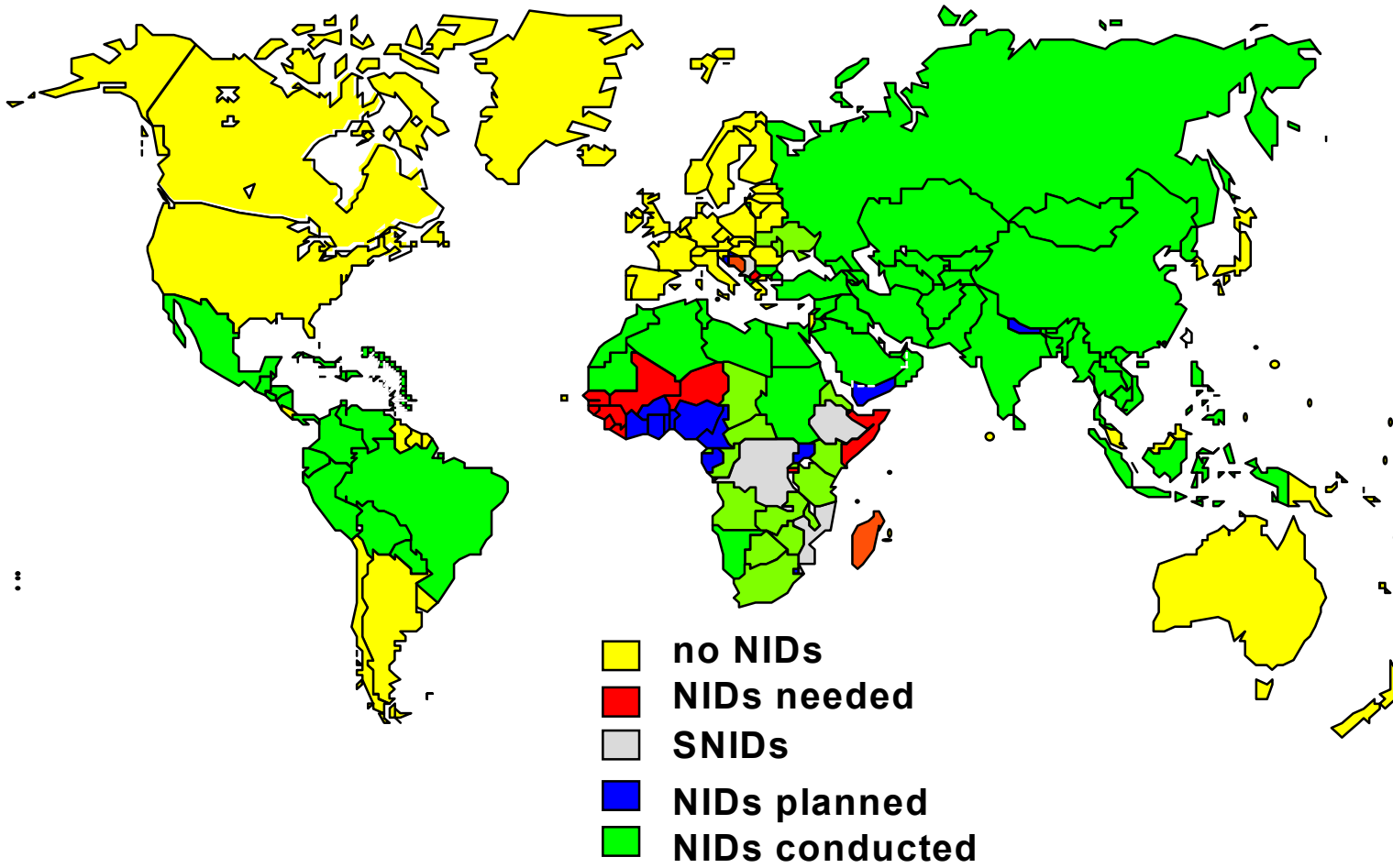
The four principal strategies for polio eradication have been clearly defined and have been proven effective in many countries: high routine immunization coverage; national immunization days (NIDs) with oral polio vaccine (OPV); surveillance and investigation of acute flaccid paralysis cases; and mopping-up immunization in areas or among populations where poliovirus transmission persists (3).

### 2.2 Progress in the implementation of the eradication strategies

Worldwide, routine immunization coverage with three doses of OPV has been over 80% since 1990 (in the African Region, however, coverage was 58% in 1995). Approximately 300 million children in 62 countries received OPV during NIDs in 1995, including 150 million children in China and India alone. In the European and Eastern Mediterranean Regions, 60 million children were immunized in 18 contiguous countries in the Middle East, Caucasus and Central Asian Republic countries (MECACAR) during coordinated NIDs on World Health Day (7 April 1995). By the end of 1996, all polio endemic countries in Europe and Asia and half of Africa will have conducted at least one round of NIDs. The few remaining countries are planning to begin NIDs in 1997.

AFP surveillance is now being implemented in 120 countries, 35 of which have achieved the key performance standard of at least one case of AFP reported per 100 000 children aged less than 15 years. The WHO Polio Laboratory Network includes six specialized reference laboratories, 12 regional reference laboratories, and 60 national laboratories. In February 1995 the criteria and process for certification of polio eradication was established during the first meeting of the Global Commission for the Certification of the Eradication Poliomyelitis.

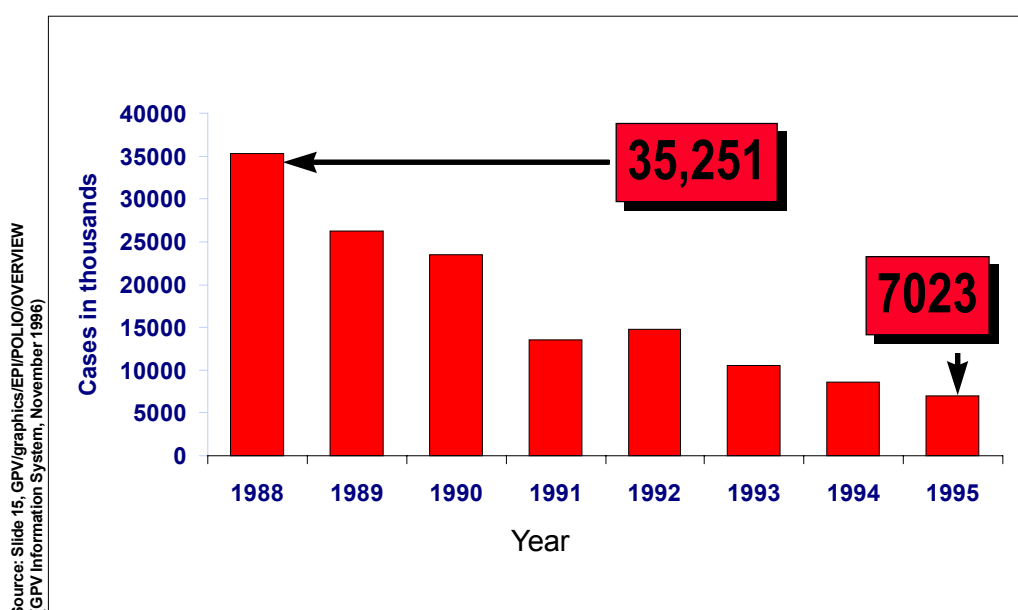
Figure 1: Global map showing the implementation of national immunization days, by country, as of November 1996



### 2.3 Poliomyelitis incidence

Since 1988, there has been an 82% decline in reported polio cases worldwide, with 6 179 cases reported in 1995. Zero cases were reported from 150 countries and only seven countries failed to file a report. In the Americas Region the last case of polio occurred in August 1991. The European Region reported 205 cases of polio from nine countries in 1995; 75% of the cases, however, occurred during a single outbreak centered in Chechnya, Russia. Only one confirmed case of polio was reported from a Caucasus or Central Asian Republic country after Operation MECACAR . Although 344 clinical polio cases were reported from the Western Pacific in 1995, there were no virologically confirmed indigenous cases in four of the six recently endemic countries of the region, including China.

Figure 2: Global annual reported numbers of poliomyelitis cases, 1988-1996



In the Eastern Mediterranean Region 738 cases were reported from nine countries in 1995; 86% of these occurred in Pakistan, Iran and Egypt, all of which have begun high quality NIDs. Seven of the ten countries of the South-East Asia Region reported a total of 3 398 cases of polio in that year, of which 3 142 occurred in India. In the African Region 1 512 polio cases were reported; 17 of the 49 countries in the region, primarily in southern Africa, reported zero cases.

---

# 3. Supplementary immunization activities for polio eradication

## 3.1 National immunization days

National immunization days (NIDs) are a time limited activity which aim to interrupt wild poliovirus circulation in endemic countries by delivering two supplemental doses of OPV, 4-6 weeks apart, to all children less than five years of age regardless of their immunization status. The TCG reviewed the experience to date with implementation of NIDs, focusing on the target age groups, the number of NIDs that should be conducted in a particular country, and the inclusion of other antigens.

In some countries, logistic and operational constraints have required changes to the WHO recommended strategy for NIDs, most notably in the target age group. In India, for example, the 1995/96 NIDs targeted all children aged less than three instead of five years of age. Although the decision to restrict the age group was motivated by limited resources for OPV procurement, it was supported by a careful review of the national epidemiology of polio and the experience with NIDs in China. In both countries over 90% of cases were less than four years of age and data from China demonstrated that virus transmission could be interrupted in such settings despite limiting the target age group.

While there is substantial evidence that polio endemic countries will usually require NIDs for a minimum of three consecutive years, the decision to stop NIDs depends on a number of factors. Regional experience showed that in many countries NIDs have been required beyond the initial three years primarily because of: ongoing widespread virus circulation, a weak health infrastructure that could not achieve routine OPV3 coverage of at least 80%, and/or insufficient AFP surveillance to evaluate accurately the impact of the NIDs.

The TCG also reviewed the experiences of countries that have included additional interventions during NIDs. It was widely acknowledged that the resources used to conduct NIDs should be exploited to deliver other health interventions. In some countries, however, multi-antigen campaigns had increased markedly the complexity and cost of NIDs while having little demonstrable impact on the epidemiology of the target diseases. It was also noted that although the inclusion of vitamin A in a round of NIDs is relatively easy logistically, in one country three children died due to its incorrect administration. Ensuring the safety of injectable vaccines is more difficult, requiring careful planning, adequate resources, trained personnel and proper targeting of high risk areas. Of critical importance to the success of multi-antigen campaigns was an early consensus during NIDs planning and coordination meetings with involvement of all partners.

---

### *Recommendations:*

- National immunization days in polio endemic countries must be conducted until wild poliovirus transmission is interrupted. Adequate AFP surveillance is essential in deciding how long to continue NIDs after wild poliovirus circulation has been interrupted. The decision to continue NIDs should be based on the level of routine immunization coverage, the performance of the AFP surveillance system and the perceived risk of introduction of wild poliovirus from endemic areas. The decision to continue NIDs should take into account the most efficient use of the resources available for polio eradication.
- The Technical Consultative Group endorses the concept of using the opportunity of national immunization days to deliver other health interventions where feasible and epidemiologically appropriate. Guiding principles include: (i) the primary objective of delivering oral polio vaccine is not compromised, (ii) if injections are used, injection safety is assured, (iii) other interventions (e.g. vitamin A) be administered in a safe manner, (iv) there is careful planning with targeting of high risk groups and (v) that additional resources are mobilized.
- The addition of other health interventions should be at the discretion of the individual country.
- The Joint UNICEF/WHO statement on the addition of other health interventions to NIDs should be completed and disseminated as quickly as possible.

### **3.2 “Mopping-up”**

During mopping-up activities OPV is taken door-to-door, with administration of two doses one month apart to all children aged under five years, regardless of prior immunization status. These localized campaigns are intended to interrupt the last remaining chains of wild poliovirus transmission in a country by delivering vaccine to the hardest to reach children. The TCG reviewed the experience and controversies surrounding the role of mopping-up campaigns in the eradication initiative.

Data from the Americas Region demonstrated the critical role of mopping-up in the last stages of the eradication effort in that region. The principle reason the campaigns were successful was because of the ready availability of high quality AFP surveillance data which identified accurately the areas where the last chains of wild poliovirus transmission existed. In that region, mopping-up was also conducted in other high risk areas, including those with low routine OPV3 coverage, borders with endemic areas, and insufficient AFP surveillance. It was noted particularly that surveillance for additional, unreported AFP cases was an important component of the mopping-up activities in the Americas as all volunteers had been trained to search for AFP cases.

Substantial discussion centred on the difference between mopping-up campaigns and sub-national immunization days (SNIDs). It was generally acknowledged that while SNIDs might be appropriate as an intermediate step after NIDs in some countries, the available evidence suggested that at least limited door-to-door mopping-up would still be required to ensure that the most difficult to reach children were immunized.

---

*Recommendations:*

- House-to-house mopping-up immunization campaigns covering large geographical areas surrounding high risk or infected areas should be considered an essential component of the polio eradication strategy in all regions unless high quality AFP surveillance demonstrates that such efforts are not required.
- The mopping-up activities are indicated after the major chains of transmission are interrupted but transmission persists in focal areas.
- In addition to delivering supplemental OPV doses, mopping-up activities can include an active search for AFP cases.
- Partner and donor agencies should recognize that these house-to-house mopping-up campaigns will require additional human and financial resources and are a high priority for eliminating the remaining chains of transmission in high risk areas.

---

# 4. Acute flaccid paralysis surveillance for polio eradication

Surveillance and investigation of acute flaccid paralysis (AFP) cases is the WHO-recommended strategy for both detecting wild polioviruses and demonstrating the sensitivity of national disease reporting systems. Consistency in the conducting of AFP surveillance has become increasingly important as more countries and regions report zero-polio incidence and prepare for certification of polio eradication. While the basic principles are well established, the TCG was asked to review three aspects of AFP surveillance that have varied between countries and regions.

## 4.1 Standardized core variables for surveillance of AFP

To achieve global consistency in AFP surveillance, it has been proposed that standard information (i.e. core variables) be collected from each AFP case and recorded. To ensure simplicity, it has been suggested that the data collected from each case be limited to the minimum amount needed to track circulation of wild poliovirus, guide supplemental strategies for eradication, and monitor surveillance performance. Regional experience indicated that in addition to the proposed “minimum core variables” presented to the TCG, three pieces of clinical information on each case should also be included:

- fever at onset of paralysis (*Yes/No*),
- complete paralysis within four days of onset (*Yes/No*),
- asymmetric paralysis (*Yes/No*).

This information would help focus polio eradication efforts on geographic areas with the highest risk of ongoing wild poliovirus circulation, and facilitate the review and classification of “polio-compatible” cases by national expert committees.

### *Recommendations:*

- A standard set of minimum core variables that are essential for managing national programmes, monitoring the performance of AFP surveillance systems, and documenting the presence or absence of wild poliovirus, should be adopted by the Global Polio Eradication Initiative and used in all countries (the recommended set of variables is attached in Annex 3).
- The Technical Consultative Group recognizes that some countries and regions may want to add other variables to the set of minimum core variables, but recommends that such countries and regions consider whether the additional work required to collect that information is justified.

---

## 4.2 Age groups for AFP surveillance:

Following the 1992 TCG meeting it was recommended that AFP surveillance be conducted among children aged less than five years. In February 1995 the Global Commission for the Certification of the Eradication of Poliomyelitis stated that AFP surveillance in children aged less than 15 years should be the standard for the purpose of certification. This decision was based on data which demonstrates a shift in polio incidence from younger to older children as countries move from polio-endemic to polio-free status. Some WHO Regions are now conducting AFP surveillance among children aged less than five years while others have retained a target of children aged less than 15 years.

The TCG reviewed data from the South-East Asia Region (SEAR) suggesting that in some countries it is more efficient initially to conduct AFP surveillance among children aged less than five years and then to expand to less than 15 years as each country nears eradication. In Thailand, a low endemicity country, AFP surveillance among children aged less than 15 years was appropriate as 41% (10/24) of the culture -- confirmed cases reported between 1992 and 1995 were more than five years of age. In the high endemicity setting of India, however, only 5% (447/9244) of the cases detected during the period 1992-1994 were more than five years of age. Only 2% of polio- infected districts would not have been identified if surveillance had been restricted to children less than five years (see below):

**Table 1: Age distribution of polio cases in India, 1992-94**

<b>Year</b>	<b>Number of reported cases with age data</b>	<b>Cases aged <math>\geq</math> five years (%)</b>	<b>Number of districts missed per total infected</b>
1992	4557	249 (6%)	7/279
1993	2013	80 (4%)	3/202
1994	2674	118 (5%)	4/171

### *Recommendations:*

- The global standard for AFP surveillance is children aged less than 15 years.
- In addition to AFP cases, all clinically suspected cases of polio should have full epidemiological, clinical and virological investigations regardless of age.
- In some highly polio endemic countries where the vast majority of cases occur in children aged less than five years, it is acceptable to initiate AFP surveillance in this age group. However, by the year 2000 all such countries should expand the age group targeted for surveillance to children aged less than 15 years. This will ensure that the target age group for AFP surveillance is adequate for a period of at least three years prior to Global Certification.

---

### 4.3 Classification of AFP cases

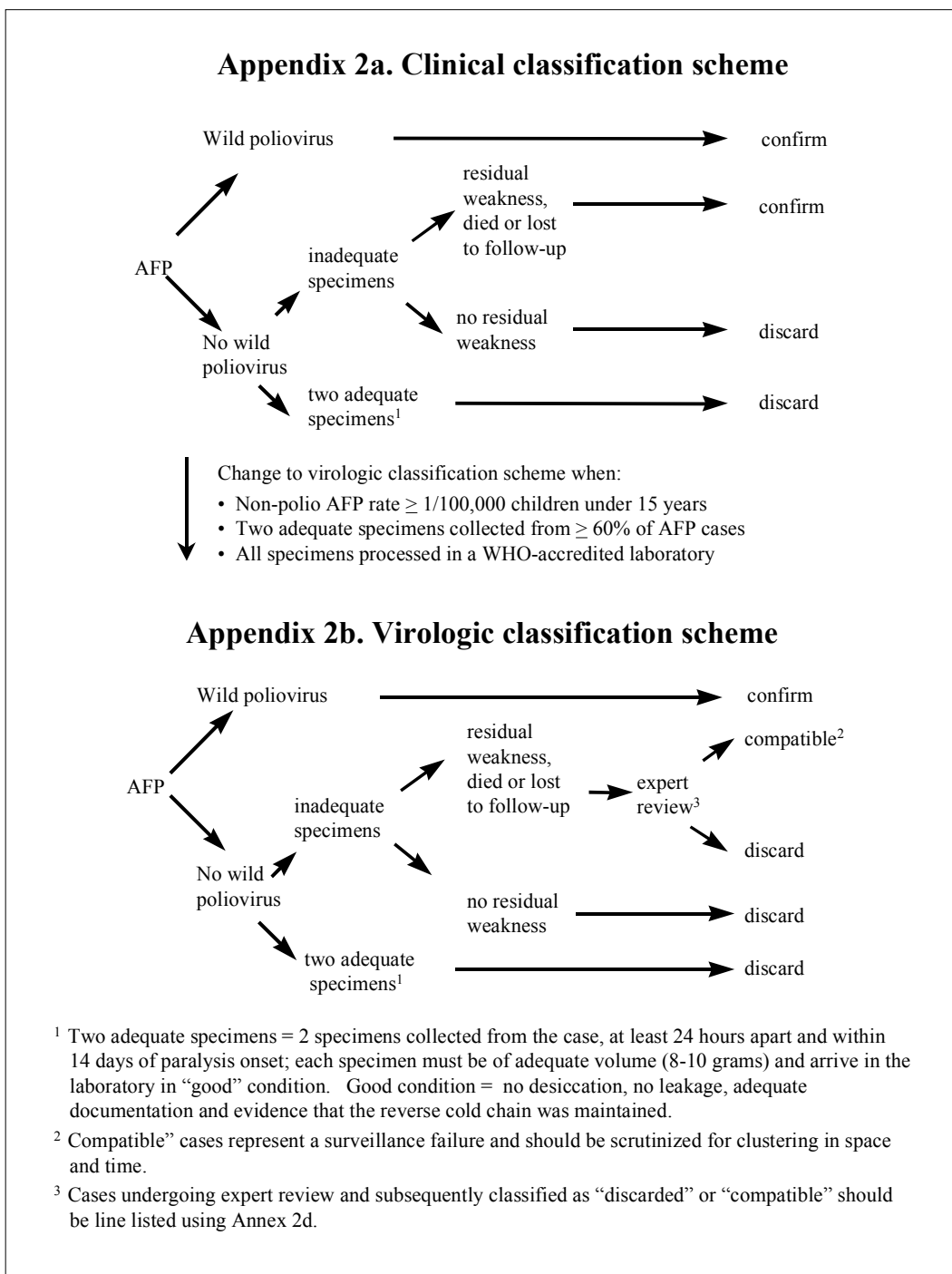
Ideally, all AFP cases should be classified as polio or non-polio on the basis of virological studies on stool specimens. In many countries which are introducing AFP surveillance, however, it is necessary to use a clinical classification system initially (figure 1), to ensure that the true incidence of polio is not grossly underestimated. The TCG discussed: the level of laboratory performance, AFP detection and stool sample collection that should be achieved prior to shifting from a clinical to a virological classification scheme; which AFP cases should be considered “polio-compatible” under a virological classification system; the role of the National Expert Committee in reviewing such cases; and the utility of retesting or supplementary testing of negative stool samples from AFP cases which have a high clinical suspicion of being polio (i.e. “hot” cases).

The TCG reviewed the operational and epidemiological considerations in changing from a clinical to a virological AFP classification system. Operationally, the need to meet certain performance criteria before moving from a clinical to a virological classification system provides a built-in incentive to improve surveillance. Epidemiologically, the combination of high AFP sensitivity (i.e. > one case/100,000 children aged less than 15 years) and low incidence of wild poliovirus results in a high predictive value negative for discarded cases (i.e. a high probability that a discarded case truly is not polio). While recommending standard criteria for changing from clinical to virological classification, the TCG recognized that individual regions might modify the criteria depending on the epidemiological, operational and political realities of the eradication initiative in that area.

Global consensus on the virological classification of AFP cases is needed to allow interpretation and comparison of surveillance results between countries and regions. Data were presented demonstrating that the final classification of AFP cases affects the sensitivity and specificity of AFP surveillance in identifying areas at highest risk of ongoing wild poliovirus circulation -- as polio incidence decreases, the capacity of AFP surveillance to detect wild polioviruses (i.e. population sensitivity) also decreases. The virological classification system adopted (Figure 2) emphasizes the detection of geographical areas with ongoing wild poliovirus transmission. In addition, weaknesses in a surveillance system are highlighted as polio-compatible cases (i.e. AFP cases which had either inadequate or no stool samples and had residual weakness, died or were lost to follow-up).

To minimize the potential for discarding true polio cases due to laboratory error, it has been proposed previously that negative stool samples from clinically “hot” cases be retested, even if the samples were adequate. Data presented from the Americas, however, demonstrated that such retesting, even in another laboratory, yielded little additional information on wild poliovirus circulation.

Figure 3: Clinical and virological AFP classification schemes



---

*Recommendations:*

- The ultimate goal is a classification system that is based on virological evaluation of all AFP cases. This requires a high quality AFP surveillance system. While there needs to be flexibility in moving from a clinical to a virological based case classification system, progress towards the following AFP surveillance targets should be considered:
  - a non-polio AFP rate of  $\geq 1/100,000$  in children aged less than 15 years,
  - collection of two adequate stool samples from  $\geq 60\%$  of AFP cases,
  - that specimens are processed in an accredited laboratory. Accreditation is reviewed annually based on: (i) use of WHO recommended methods, cell cultures and reagents, (ii) a proficiency test score of  $> 80\%$  and (iii) a non-polio enterovirus isolation rate of  $> 10\%$ .
- A compatible case should be considered a surveillance failure. All compatible cases should be scrutinized for clustering in space and time which might suggest ongoing wild poliovirus transmission and a need to further strengthen surveillance, undertake special investigations to rule out undetected wild poliovirus circulation and implement mopping-up activities as appropriate.
- An expert committee should review AFP cases which are clinically compatible with polio with residual paralysis at 60 days and from whom no stool specimens were available or from whom there were negative inadequate specimens.
- Routine supplementary laboratory testing of stool specimens from clinically compatible cases initially found to be virologically negative is not indicated. However, in specific cases such additional testing may be desirable.

---

# 5. Detection of wild polioviruses and the polio laboratory network

The TCG reconfirmed that AFP surveillance, with the collection and evaluation of stool specimens from all cases, should be the primary WHO-recommended strategy for determining whether or not wild poliovirus is circulating in a country or region. However, the utility of several aspects of the current strategy were reviewed by the TCG, including the collection of one versus two stool samples from each AFP case and the collection of stool samples from five contacts of each AFP case. The TCG also reviewed the current status of environmental sampling for wild polioviruses and its potential role in the eradication initiative.

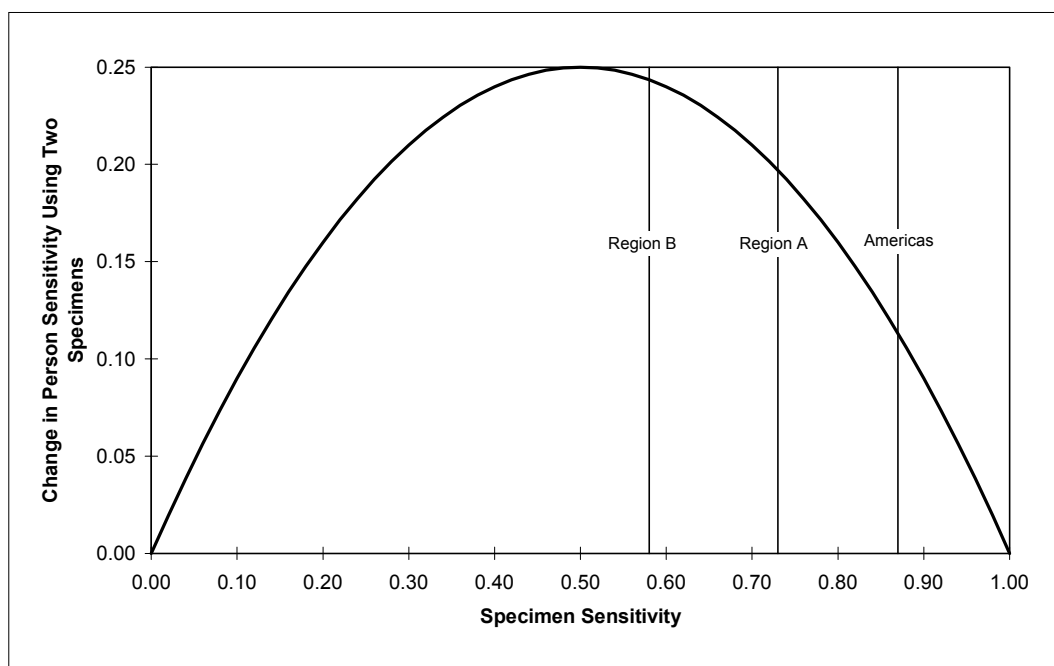
## 5.1 Virological surveillance

An analysis of the factors which affect the sensitivity of wild poliovirus surveillance was presented. The baseline strategy for wild poliovirus detection was the testing of one stool specimen from identified AFP cases. A mathematical model compared the contribution of (a) testing a second stool sample from each AFP case, (b) testing a single stool sample from five contacts from each AFP case, and (c) testing a single stool sample from aseptic meningitis cases (i.e. conducting aseptic meningitis surveillance).

The analysis demonstrated that in settings where there was an excellent laboratory, testing of a second stool sample resulted in a minimal increase in population sensitivity (i.e. the chance of detecting wild poliovirus in an infected population). However, the gain in sensitivity could be as high as 25% in areas with medium laboratory sensitivity. Similarly, testing of contact specimens contributes minimally to population sensitivity while resulting in a substantial increase in both case investigation and laboratory workload. Examination of a single stool sample from aseptic meningitis cases was the only proposal found to be a potentially efficient and sensitive supplemental surveillance strategy, particularly at lower prevalence of wild poliovirus. The analysis did suggest that random stool surveys could be useful if very carefully targeted.

Data from the Americas Region was then presented which demonstrated that the observed increase in poliovirus isolation between the first and second stool sample from each AFP case was 8% with an estimated 45% increase in workload. Testing of a second stool sample in that Region detected very few areas which had not been previously identified as polio-infected. Experience from the Americas also demonstrated that testing of contacts from only epidemiologically important AFP cases would have been more efficient than the routine testing of contacts.

**Figure 4: Increase in sensitivity to detect wild poliovirus with testing of a second specimen from AFP cases<sup>1</sup>**



The Technical Consultative Group was impressed with the data presented by PAHO showing that a second stool specimen offered little benefit over a single specimen in identifying wild poliovirus infected areas in the Americas. However, the group was concerned as to whether these findings apply to other regions; in particular it was noted that the PAHO laboratories are functioning at an extremely high level of competence that has not yet been reached in all of the laboratories of the other regions. It was therefore concluded that it is premature to change global policy at this time.

#### ***Recommendations:***

- It is essential that all regions build up a functioning network of accredited laboratories to ensure effective virological surveillance. Intensive AFP surveillance is required to obtain sufficient specimens for maintaining laboratory proficiency.
- Endemic countries and regions should continue to collect two stool samples from each AFP case within 14 days of the onset of paralysis.
- Each WHO Region should conduct a standard analysis of the additional sensitivity gained and programme costs of routine collection of the second stool specimen from each case. Such an analysis must include the number and proportion of “infected areas” which would have been missed with a single stool specimen but detected with the second specimen. These data should be presented at the next Technical Consultative Group meeting.

<sup>1</sup> Source: Gary Jr. HE, Sanders R, Pallansch MA. A theoretical framework for evaluating the sensitivity of surveillance for detecting wild poliovirus: I. Factors affecting detection sensitivity in an individual with acute flaccid paralysis. *JID*, in press.

- 
- The routine collection of five contact stool samples for every AFP case should be discontinued.
  - Targeted stool collection from contacts or healthy children may be required in special circumstances where there is a high suspicion of ongoing unrecognized wild poliovirus circulation such as areas where there are clusters of cases with inadequate or no stool specimens and recently endemic areas in which surveillance is poor.
  - The Technical Consultative Group recommends that the Global Commission for the Certification of Poliomyelitis Eradication review the previous recommendations on the routine collection of contact samples from every AFP case.

## 5.2 Environmental sampling

The use of environmental sampling was reviewed as a means of testing large populations for wild poliovirus circulation in the absence of clinical cases. Because a poliovirus-infected person will usually excrete relatively large amounts of poliovirus for several weeks and because the poliovirus may survive outside the human body for relatively long periods of time, monitoring the sewage of a population can potentially be used to demonstrate the circulation or absence of wild polioviruses.

Data was presented demonstrating that a single sewage sample collected at a plant serving a population of 200 000 people could show poliovirus excretion at a prevalence of one excretor/1-2 000 people. Experience with environmental sampling in Russia, Estonia, Kyrgyzstan and the Netherlands was described. In Estonia, wild polioviruses had been detected in the absence of reported polio cases and in the Netherlands a wild poliovirus had been detected in river water prior to the polio outbreak in 1992-3.

It was recognized that environmental sampling might only be feasible in countries and areas where well organized sewage systems exist. There remain, however, several technical aspects of environmental sampling that would need to be resolved to ensure standardization of results. Polio-specific mouse cell lines, monoclonal antibodies and/or RT-PCR were discussed as potential methods for increasing the specificity of wild poliovirus detection in environmental samples.

### *Recommendations:*

- An environmental surveillance working group should be established to prepare a working paper for the WHO Secretariat that reviews the current state of the art, defines the potential role of such techniques in the context of global certification, and outlines the work that would be required.

---

## 6. Certification of the eradication of poliomyelitis

In February 1995, WHO convened the first meeting of the Global Commission for the Certification of the Eradication of Poliomyelitis which established the basic principles and mechanism for the certification process. While criteria for certification of a Region as polio-free have been outlined by the Global Commission, the TCG was asked to review three issues related to the certification of poliomyelitis eradication.

### 6.1 Non-human reservoirs for poliovirus

The Technical Consultative Group reviewed the potential for persistence of wild polioviruses in humans, other animals and the environment. Wild polioviruses are transmitted by infected humans or their waste. For most persons, fecal excretion of the virus ceases within two months after infection. There are no data to suggest persistence of wild virus excretion among immunocompromised individuals. However, vaccine virus excretion has been reported to persist for long periods for some B and B/T cell deficient individuals. Vaccine virus excretion persisted for 684 days in one reported case. Because vaccine virus persistence in immunocompromised individuals may affect when and how to stop immunization against polio, further studies in this area are required.

Polioviruses may be found in high concentrations in shellfish, but the virus does not replicate and is rapidly purged in clean water. Antibodies to polioviruses in peridomestic animals such as horses and cattle may represent infection with related viruses; however, there is no evidence that these animals can be infected with polioviruses. Higher non-human primates such as chimpanzees have been infected in captivity, but infections among free-living non-human primates are exceedingly rare. Low population densities and the acute nature of wild poliovirus infection argue against persistence of polioviruses among primates in the wild. Although transgenic mice with polio receptors cannot be infected orally, WHO recommendations for their containment in the laboratory should be followed carefully.

There is no evidence of long-term wild poliovirus survival in the environment as indicated in the following table:

---

**Table 2: Survival of wild polioviruses in the environment**

<b>Environment</b>	<b>Time for virus infectivity to fall by 90%</b>	
1. Soil	Summer: Winter:	1.5 days 20 days
2. Sewage	At 2°C: At 23°C:	180 days 26 days
3. Surface water	Fresh: Sea:	5.5 days 2.5 days

The Technical Consultative Group reaffirmed the biological feasibility of polio eradication. Evidence that immunization interrupts poliovirus transmission comes from the decrease in polio cases globally and the disappearance of virus genotypes. Laboratory stocks represent the only non-human reservoir where wild poliovirus may survive indefinitely. Disposition of laboratory stocks should be resolved before immunization against poliomyelitis is stopped.

***Recommendations:***

- A plan for the disposition of laboratory stocks of wild poliovirus should be developed in consultation with other international bodies.

**6.2 Countries that have been polio-free for many years**

Although the Global Certification Commission has stressed the importance of AFP surveillance as the basis for certification, it also recognized the need for flexibility in countries which have eradicated polio for many years and where it is “impossible to establish satisfactory surveillance for AFP”. The TCG reviewed the recommendations of the European and Western Pacific Certification Commissions regarding such countries and evaluated a proposal for using sentinel aseptic meningitis surveillance as part of the certification process in some industrialized countries.

The Regional Certification Commissions of both EURO and WPRO stated that countries with a long history of being polio free could potentially be certified in the absence of routine surveillance for AFP. In both regions, it was recommended that there be an iterative process by which such countries would present their strategy for certification to the Regional Commission by 1998 to allow sufficient time for additional activities, if required. Minimum data requirements were explicitly outlined in the plan of action for each region, however, and included evidence of paralytic polio surveillance, poliovirus surveillance, high population immunity to polioviruses and other special studies for certification. In the Western Pacific, although routine surveillance for AFP cases may not be required in these countries, the special studies should include an evaluation of AFP cases in the country to show that paralytic poliomyelitis would not have been misdiagnosed.

---

A presentation was made on the potential use of sentinel surveillance for aseptic meningitis as a component of the documentation for certification of polio eradication in industrialized countries. In many industrialized countries sentinel aseptic meningitis surveillance would be less resource intensive than national AFP surveillance, but would maintain a high sensitivity for detecting wild poliovirus infection in those populations. Data on the clinical outcome of wild poliovirus infection showed that approximately 5% of cases result in aseptic meningitis while only 0.5% result in acute flaccid paralysis. Sentinel surveillance for aseptic meningitis could readily be established through pediatric hospitals and the analysis of one stool sample from each case could demonstrate the absence of wild poliovirus. In Olmstead County in the United States the rate of hospitalized cases of aseptic meningitis was fairly stable at 10/100,000 person years for the total population over the period 1950 to 1981 (though substantially higher in younger age groups) suggesting that it may also be possible to establish a performance indicator for the sensitivity of sentinel aseptic meningitis surveillance.

Although aseptic meningitis surveillance conducted in the United Kingdom to document adverse reaction to mumps vaccine found that many mild cases were not hospitalized, the Olmstead County data demonstrated that investigation of hospitalized cases alone would be at least as sensitive as AFP surveillance for detecting the ongoing circulation of wild polioviruses. The TCG encouraged the development of pilot projects in industrialized countries to further evaluate the programmatic and operational feasibility of using sentinel aseptic meningitis surveillance as a component of the certification data for industrialized countries.

#### ***Recommendations:***

- AFP surveillance is the standard for certification of all countries.
- As it may not be practical to establish AFP surveillance in some industrialized countries which have been polio-free for a prolonged period, these countries should develop a plan which details the information they will collect to establish that wild poliovirus is not circulating. This plan should be presented to their Regional Certification Commission to ensure that it will be acceptable and to allow sufficient time for revision should it be necessary. The information in such a plan must include, at a minimum, surveillance for cases of paralytic poliomyelitis, surveillance for polioviruses, data on population immunization coverage and immunity, and special studies.
- An evaluation of the effectiveness and programmatic implications of aseptic meningitis surveillance for certification of polio eradication should be undertaken in a limited number of industrialized countries.

### **6.3 Immunization strategies beyond the year 2000**

The TCG discussed the current understanding of the risks associated with a number of potential strategies for stopping immunization against polio once eradication has been achieved. The potential strategies that were discussed for polio immunization after certification of eradication were as follows:

- continue current immunization policy,
- allow individual countries/regions to decide,

- 
- replace OPV with IPV for a period of time,
  - eliminate poliovirus strains stepwise from the current formulation of OPV (example: eliminate type two poliovirus first),
  - stop all polio immunization upon global certification.

It was agreed readily that neither of the first two options were appropriate. Continued immunization with OPV in the absence of wild poliovirus would needlessly expose individuals to the risk of vaccine-associated paralysis while obviating the cost benefit of the eradication initiative. Although the continued use of OPV in some countries would probably not pose a threat to countries which had completely stopped immunizing against polio, leaving countries to decide would be inappropriate primarily for the reasons noted above. It was suggested that replacing OPV with IPV might prevent some cases of vaccine-associated paralytic poliomyelitis (VAPP) and provide individual protection for the very limited period during which OPV strains would continue to circulate. However, the use of IPV would not be feasible due to the costs, vaccine supply issues and operational issues at the field level and, in addition, there is no evidence to date that such a strategy would be necessary.

The sequential elimination of poliovirus strains from the trivalent formulation of OPV has the potential advantage that it would allow monitoring of the effect of stopping vaccination against one serotype (type 2) following its apparent eradication, while minimizing the risk of exposure to both vaccine and wild poliovirus strains. The advantages of this strategy, which in essence is a preliminary “trial” of stopping vaccination, is that it: (1) provides a test of the potential re-emergence of a wild poliovirus serotype using the one which has the least propensity to cause paralytic poliomyelitis, and (2) facilitates the search for that strain of wild poliovirus in a setting that is not needlessly impaired by ongoing vaccination with that vaccine virus strain. Such a strategy, however, could not be entertained unless the necessary vaccine regulatory and supply issues were adequately addressed and solved in advance.

The current plan to stop all OPV immunization upon global certification of wild poliovirus eradication continues to be the simplest, most cost-beneficial strategy, although it does not offer the advantage of providing a preliminary “test”.

***Recommendations:***

- A working group should be established to evaluate critical issues following the global eradication of circulating wild polioviruses, including: the strategy for stopping immunization against poliomyelitis, the potential need for interim immunization strategies, and the control and disposition of wild poliovirus stocks.
- All countries must continue immunization against poliomyelitis until such time as global eradication of wild poliovirus circulation has been certified and a global strategy for coordinated cessation of polio immunization has been implemented.

---

# 7. Polio eradication in “difficult areas” and cross-border issues

## 7.1 Polio eradication in difficult areas

The TCG reviewed the status of polio eradication activities in areas with particularly difficult circumstances due to civil unrest, war, lack of human and financial resources, weak health infrastructures and other extenuating circumstances such as economic sanctions. Given the global progress towards polio eradication, the TCG noted that assisting these “difficult areas” to implement the eradication strategies now ranks among the highest priorities for the initiative and should receive particular attention from partner and donor agencies. Despite the problems that have been encountered in these areas and countries, extensive experience was presented to the TCG demonstrating the success of national immunization days and AFP surveillance in countries such as Afghanistan, Cambodia, Iraq and Myanmar. Furthermore, data from Cambodia and Laos showed that routine immunization coverage had increased substantially in the period since polio eradication activities started in those countries.

It was consistently noted that the keys to progress in the “difficult” areas had been establishing political commitment, identifying and working through both formal and informal channels, realistically evaluating the financial resources required and aggressively ensuring the early availability of such resources. Despite the evidence that polio can be eradicated under virtually all circumstances, however, there remain “difficult” areas and countries where even the planning of eradication activities has not yet begun.

### *Recommendations:*

- Specific plans of action and budgets for polio eradication should be prepared for all “difficult areas” by mid-1997.
- In “difficult areas” the implementation of the initial NIDs must be kept as simple as possible to ensure very high OPV coverage and maintenance of strong political support.
- In the absence of an existing surveillance system, active surveillance for AFP must be established.
- In “difficult areas” the polio eradication initiative should be used as a means for improving the delivery of routine immunization services.

---

## 7.2 Cross-border coordination of polio eradication activities

While cross border coordination of polio eradication activities was not formally discussed by the TCG, reference to this issue was repeatedly made during the presentation and discussion of related topics. Recent importation of wild polioviruses into polio-free countries has demonstrated the need for improved coordination of eradication activities across both regional and national borders. Of particular importance is the need for rapid sharing of accurate surveillance data. Although cross border coordination does not raise specific technical issues at this point, the TCG recognized that it must be improved to eliminate reservoirs of wild polioviruses, particularly in areas where there is high risk of reintroducing the virus into polio-free areas.

### *Recommendations:*

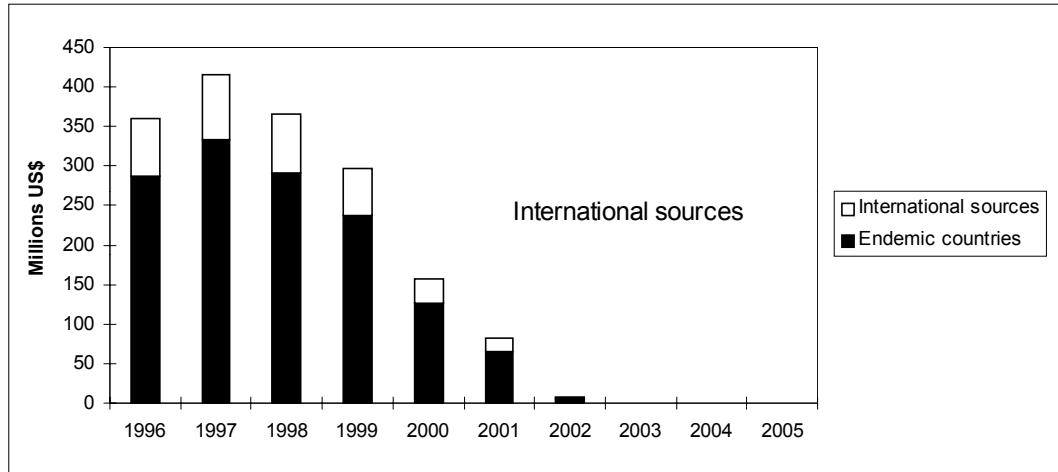
- The WHO secretariat should develop a mechanism to facilitate the cross border coordination required to eradicate polio and confirm that achievement.

---

## 8. Revised plan of action for the eradication of poliomyelitis

A proposed revision of the Global Plan of Action for the Eradication of Poliomyelitis was presented to the TCG. Substantial revisions had been made to the 1992 plan of action sections on staging, objectives and budget. Staging is now done on the basis of the current epidemiology of polio in a country rather than the status of implementation of the recommended polio eradication strategies. The timeline of objectives has been modified as a result of Regional progress and new priorities such as the predicted date by which immunization against poliomyelitis will stop worldwide. Further modifications were suggested primarily for the objectives and budget sections. The TCG endorsed the need to revise the 1992 version of the Global Plan of Action for the Eradication of Poliomyelitis and supported the stated objectives of the Plan with the modifications that were included during the discussion.

**Figure 5. Estimated global requirements for polio eradication by source of funding, 1996-2005**



### *Recommendations:*

- The Global Plan of Action should be finalized and disseminated as soon as possible.
- The budget in the Global Plan of Action should be reviewed to ensure that adequate financial resources are available for AFP and poliovirus surveillance. Annual estimates of resource requirements from international sources are essential.
- The Global Plan of Action should reflect the means by which the polio eradication initiative can be used to promote other disease control initiatives, particularly the eradication of measles.

---

# Annex 1:

## List of participants

### Technical Panel

Dr I. Arita, Agency for Cooperation in International Health, 4-11-1 Higashi-machi, Kumamoto City 862, Japan

Dr R. Nath Basu, A73 Yojna-Vihar, New Delhi 110092, India

Dr N. Begg, Public Health Laboratory Service, 61 Colindale Avenue, London NW9 5EQ, United Kingdom

Professor S. G. Drozdov, Director, Institute of Poliomyelitis and Viral Encephalitis, 142782 Moscow, Russia

Dr P. Figueroa, Department of Epidemiology, Ministry of Health, Kingston, Jamaica

Dr M. Suleiman Ali Jaffer, Ministry of Health, P.O. Box 393, Muscat, Sultanate of Oman

Professor Jan Kostrzewski, Department of Epidemiology, National Institute of Hygiene, 24 Chocimska Street, 00-791 Warsaw, Poland

Professor F.K. Nkrumah, Nogochi Memorial Institute for Medical Research (NMIMR), University of Ghana, P.O. Box 25, Legon, Ghana

Dr W. Orenstein, Centers for Disease Control and Prevention, National Immunization Program, 1600 Clifton Road, Atlanta, Georgia 30333, United States of America (Chairman)

### Technical Advisers/Presenters

Dr H. van der Avoort, Laboratory of Virology, RIVM, Antonie Van Leeuwenhoeklaan 9, Box 13720 Bilthoven, The Netherlands

Dr S. Cochi, Centers for Disease Control and Prevention, National Immunization Program, 1600 Clifton Road, Atlanta, Georgia 30333, United States of America

Dr R. Crainic, Institute Pasteur, 28 rue du Docteur Roux, F-75724 Paris, Cedex 15, France

Dr W. Dowdle, The Task Force for Child Survival and Development, The Carter Center, 750 Commerce Drive, Suite 400, Decatur, Georgia 30030, United States of America

Dr T. Hovi, National Public Health Institute, Mannerheimintie 166, SF-00300 Helsinki, Finland

---

Dr R. Linkins, Centers for Disease Control and Prevention, National Immunization Program, 1600 Clifton Road, Atlanta, Georgia 30333, United States of America

Dr M. Pallansch, Centers for Disease Control and Prevention, Center for Infectious Diseases, 1600 Clifton Road, Atlanta, Georgia 30333, United States of America

Dr R. Sutter, Centers for Disease Control and Prevention, National Immunization Program, 1600 Clifton Road, Atlanta, Georgia 30333, United States of America

### **Observers from collaborating organizations**

**International Pharmaceutical Manufacturers Associations (IFPMA)**, 30 Rue de St. Jean, P.O. Box 9, 1211 Geneva 18, Switzerland

Mr O. Raynaud, Pasteur Mérieux Sérums & Vaccins, 5 avenue Leclerc, B.P. 7046, 69348 Lyon, Cedex 07, France

**Rotary International**, One Rotary Center, 1560 Sherman Avenue, Evanston, Illinois 60201, USA

Dr M. Diamond

Dr T. Trainer

### **United Nations Children's Fund (UNICEF)**

Dr Jane Zucker, United Nations Children's Fund, UNICEF House, 3 United Nations Plaza, New York, N.Y. 10017, USA

### **US Agency for International Development (USAID)**

Dr P. S. Zeitz, Africa Bureau, Office of Health and Nutrition, Bureau for Global Programs, Field Support and Research, Agency for International Development (USAID), 1601 N. Kent Street, Room 1200, Arlington, VA 22209, USA

Dr Mary Harvey, Africa Bureau, Office of Health and Nutrition, Bureau for Global Programs, Field Support and Research, Agency for International Development (USAID), 1601 N. Kent Street, Room 1200, Arlington, VA 22209, USA

### **US Office of International Health**

Dr K. Bart, Associate Director for Child Health, Parklawn Building, Room 18-74, 560 Fishers Lane, Rockville, Maryland 208357, United States of America

### **CVI Secretariat**

Dr R. Widdus, Coordinator, CVI

### **WHO Secretariat (Headquarters)**

Dr R. H. Henderson, ADG

Dr J.W. Lee, Director, GPV

Mr P. Evans, Chief, VSQ

Dr B. Melgaard, Chief, EPI

Dr B. Aylward, EPI

Ms Amie Batson, VSQ

Dr Maureen Birmingham, EPI

Dr H. Doi, VSQ

Dr Barbara. Hull, EPI

Dr H. Hull, EPI

Mr G. Larsen, EPI

---

Dr Julie Milstien, VSQ  
Dr B. Nkowane, EPI  
Dr J-M. Olivé. EPI  
Dr Y. Pervikov, VRD

**Regional Offices**

Dr Okwo Bele, Regional Adviser, EPI, AFRO  
Dr A. Lobanov, Medical Officer, EPI, AFRO  
Dr O. Tomori, AFRO  
Dr C. de Quadros, Director, SVI, AMRO  
Dr Ana-Cristina Nogueira, EPI, AMRO  
Dr R. Aslanian, Medical Officer, EPI, EMRO  
Dr T. Gaafar, Regional Adviser, VPI, EMRO  
Dr G. Oblapenko, Medical Officer, EPI, EURO  
Dr Colette Roure, Regional Adviser, EPI, EURO  
Dr J. Andrus, Medical Officer, EPI, SEARO  
Dr I. Mochny, Regional Adviser, EPI, SEARO  
Dr D. Caussy, SEARO  
Dr J. Bilous, Regional Adviser, EPI, WPRO  
Dr R. Sanders, WPRO  
Dr R. Tangerman, Medical Officer, EPI, WPRO

---

# Annex 2:

## Working documents

	<b>Document title</b>	<b>Document number</b>	<b>Presented by:</b>
1.	Overview of global eradication of poliomyelitis	EPI/POLIO/TECH/96.01	H. Hull
2.	Surveillance for AFP cases	EPI/POLIO/TECH/96.02	M. Birmingham/ R. Linkins
3.	Overview of supplementary virological surveillance for poliomyelitis	EPI/POLIO/TECH/96.03	M. Pallansch
4.	Stool specimen collection from AFP cases	PI/POLIO/TECH/96.04	C. de Quadros
5.	Stool specimen collection from contacts of AFP cases	EPI/POLIO/TECH/96.05	B. Hull
6.	Virological surveillance of the environment and improved diagnostic techniques	EPI/POLIO/TECH/96.06	T. Hovi
7.	Case classification	EPI/POLIO/TECH/96.07	M. Birmingham
8.	Certification strategies in industrialized and polio-free countries	EPI/POLIO/TECH/96.08	R. Sutter
9.	Certification and vaccination strategies beyond the year 2000	EPI/POLIO/TECH/96.09	S. Cochi
10.	National immunization days	EPI/POLIO/TECH/96.10	B. Nkowane
11.	Multi-intervention campaigns	EPI/POLIO/TECH/96.11	J. Bilous/H. Hull
12.	Mopping up immunizations	EPI/POLIO/TECH/96.12	J.-M. Olivé
13.	Eradicating polio under difficult circumstances	EPI/POLIO/TECH/96.13	B. Aylward
14.	Revised Plan of Action for Global Eradication of Poliomyelitis	EPI/POLIO/TECH/96.14	B. Melgaard

# Annex 3: Core variables

**Code sheet for the AFP case data base and specimen data base to be linked together by an ID number (often called the EPID number)**

<b>AFP case variables</b>	<b>Name</b>	<b>Attributes</b>	<b>Codes</b>
EPID number	IDCODE	alpha, 12 characters	
District name	DISTRICT	alpha, 20 characters	
Province name	PROVINCE	alpha, 20 characters	
Date of birth	DOB	date (dd/mm/yy)	
Date of paralysis onset	DONSET	date (dd/mm/yy)	
Date of notification	DNOT	date (dd/mm/yy)	
Date of case investigation	DOI	date (dd/mm/yy)	
Total polio vaccine doses received	DOSES	numeric, 2 digits	99=unknown
Fever at onset of paralysis	FEVER	numeric, 1 digit	1=yes 2=no 9=unknown
Progression of paralysis within 4 days	PROGRESS	numeric, 1 digit	1=yes 2=no 9=unknown
Asymmetric paralysis	ASYM	numeric, 1 digit	1=yes 2=no 9=unknown
Date of follow-up	DFUP	date (dd/mm/yy)	
Findings at follow-up	FUP	numeric, 1 digit	1=residual weakness 2=no residual weakness 3=lost to follow-up 4=died before follow-up
Classification	CLASS	numeric, 1 digit	1=confirmed 2=compatible 3=discarded 4=vaccine associated

**Code sheet for the AFP case data base and specimen data base to be linked together by an ID number (often called the EPID number) (continued)**

<b>AFP specimen variables</b>	<b>Name</b>	<b>Attributes</b>	<b>Codes</b>
EPID number	IDCODE	alpha, 12 digits	
Specimen number	SPECNO	numeric, 1 digit	1=first specimen2=second specimen
Date of paralysis onset	DONSETL	date (dd/mm/yy)	
Date of last oral polio vaccine	DLOPV	date (dd/mm/yy)	
Date of stool collection	DSTCOLL	date (dd/mm/yy)	
Date stool sent to lab	DSTSENT	date (dd/mm/yy)	
Date stool received in lab	DSTLAB	date (dd/mm/yy)	
Condition of stool	STCOND	numeric, 1 digit	1=good 2=poor 9=unknown
Date final culture results sent from lab to EPI	DCRES	date (dd/mm/yy)	
Date intratypic differentiation results sent from lab to EPI	DIRES	date (dd/mm/yy)	
Polio type 1	P1	numeric, 1 digit	1=yes, wild 2=yes, vaccine 3=yes, unknown 4=yes, both (wild/vaccine) 5=no6=pending 7=no specimen processed
Polio type 2	P2	numeric, 1 digit	1=yes, wild 2=yes, vaccine 3=yes, unknown 4=yes, both (wild/vaccine) 5=no 6=pending 7=no specimen processed
Polio type 3	P3	numeric, 1 digit	1=yes, wild 2=yes, vaccine3 =yes, unknown 4=yes, both (wild/vaccine) 5=no 6=pending 7=no specimen processed
Non-polio enterovirus present	ENTERO	numeric, 1 digit	1=yes 2=no 3=pending 4=no specimen processed