EPI Newsletter

Expanded Program on Immunization in the Americas

Volume XIII Number 3 **IMMUNIZE AND PROTECT YOUR CHILDREN** *June 1991*

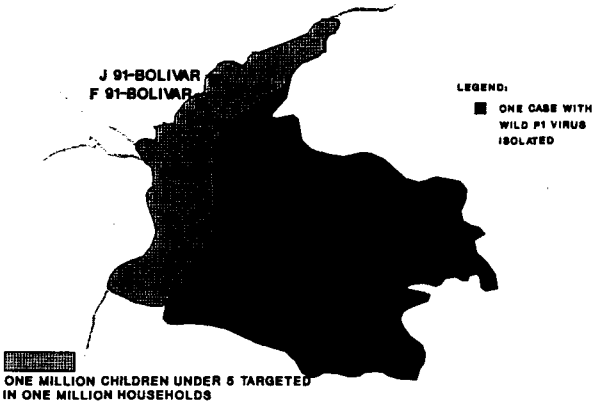
The Final Stages of Polio Eradication: Colombia Faces the Challenge

A state of emergency has been declared in Colombia. Through week 23 of this year, the only two confirmed cases of polio that have been reported in the Americas came from Colombia (Bolivar Department, see Figure 1). In the past, circulation of wild poliovirus in Colombia has been limited to Bolivar and other states located along the Atlantic and Pacific Coasts. In response to this critical situation, the Ministry of Health, with technical assistance from PAHO and support from ICC member agencies (UNICEF, Rotary, and AID), has planned a massive house-to-house vaccination campaign to immunize all children under five years of age living in the coastal areas of the country.

The campaign in Colombia will have three objectives. The most important, is the immediate goal to increase OPV coverage in order to interrupt abruptly the transmission of wild poliovirus. These house-to-house activities will also serve as an active search for new cases of acute flaccid paralysis. Finally, in view of the cholera epidemic, vaccinators will also conduct active surveillance of cholera and deliver health education to families regarding sanitary preventive measures to control the spread of the epidemic.

Nearly one million households will be visited and approximately one million children under five years of age living in 200 coastal counties have been targeted for immunization. Activities to immunize approximately 750,000 children living in urban areas and about 250,000 living in rural areas are planned for June 17-29 and July 1-26, respectively. These activities will be repeated in September with the purpose of assuring interruption of wild poliovirus transmission in Colombia.

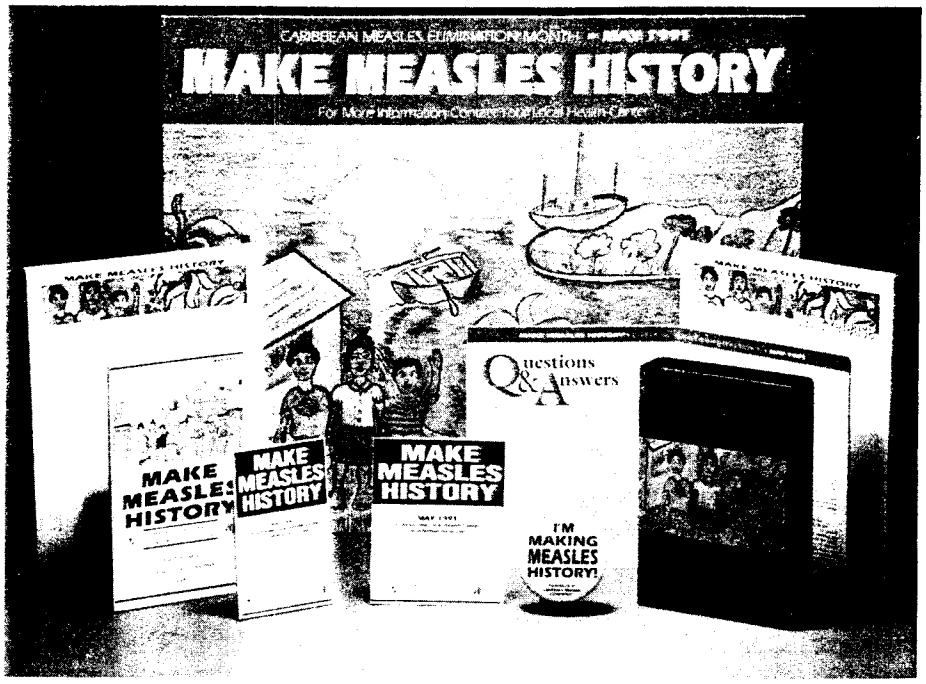
Figure 1. Site of Confirmed Polio Cases and Target Areas for Eradication Activities Colombia, 1991



Source: PAHO/WHO

In this issue:

Make Measles History



In 1988, the Caucus of CARICOM Ministers Responsible for Health made the commitment to "make measles history", when they unanimously resolved to eliminate the indigenous transmission of measles in the Caribbean by 1995, as one of the priority projects within the Caribbean Cooperation in Health initiative. The Ministers recognized that the Caribbean could become the first region in the world to achieve measles elimination.

The Pan American Health Organization was asked to develop a Plan of Action to achieve this target. As this drive gets underway, national efforts are being reinforced with support from PAHO in conjunction with the Canadian Public Health Association, UNICEF, Rotary International, the Academy for Educational Development, AID, the Caribbean Broadcasting Union, the Caribbean News Agency, and others.

The "Make Measles History" campaign, had as its primary strategy for interrupting measles transmission, the simultaneous immunization of all susceptible persons. To that end, May 1991 was declared "Measles Elimination Month" and a full scale attempt to simultaneously immunize all susceptible persons under 15 years of age--regardless of previous vaccination status or history of measles--was launched.

To ensure the success of the Measles Elimination Month, full participation from the community was needed. A large social mobilization effort was undertaken to inform everyone that they must vaccinate all children. This regional effort included a series of television and radio Public Service Announcements, Information Kits with brochures, fact sheets, and posters, buttons, and a half-hour television special, "Make Measles History," designed to entertain and inform. In general, the countries were very receptive toward the campaign and very pleased with the quality of products.

April 28th was chosen as the day to officially inaugurate the campaign, since it coincided with the International Children's Day and would lead right into Measles Elimination Month. In most countries, the television special was aired on the target date during prime time. Many countries even aired the special two and three times. The television special was hosted by a popular comedian and storyteller and featured the talent of contemporary calypso, reggae, and rap musicians. The fact that these stars have lent their talent to a worthy cause helped build credibility for the measles campaign.

The success of Measles Elimination Month also depended on the coordination of health agencies with community members. To this end, Health Ministries participated in the publicity and encouraged parents to be sure to have their children vaccinated. Health workers visited schools to make sure all the students knew they must be vaccinated. Teachers reinforced the message by reminding students and through such creative measures as holding contests to see which class achieved full immunization first. Health authorities set up multiple vaccination posts and clinics throughout the islands, with a variety of posts operating on different days and at different hours, to make immunization as accessible as possible. A huge logistics effort was undertaken to ensure that each clinic had all the vaccines and syringes necessary and that the "Cold Chain" was maintained.

Measles Elimination Month was a success and the campaign is off to a great start. Between now and 1995, the crucial steps necessary for the ultimate success of the effort are continued high levels of immunization coverage (90% or greater) and enhanced surveillance coupled with an aggressive response to any measles outbreak.

Missed Opportunities for Vaccination in the Americas: Diagnosis and Interventions, 1988-1990

Introduction

During 1990 the Region of the Americas had high coverage rates for all EPI vaccines: DPT 71%, Measles 75%, BCG 78%, and OPV 88%. With triple-dose vaccines such as OPV and DPT, levels of more than 90% have been attained for the first dose. It is now important to reduce the high drop-out rates, extend coverage even further and ensure that it is sustained, and promote follow-up of vaccinated children. This involves implementing a series of vaccination activities that will lead to greater supply and demand throughout the health services. It also implies a basic change in attitude toward vaccination.

Several countries in the world and in the Region of the Americas are currently undertaking studies to identify the technical, logistic, organizational, attitudinal, and cultural constraints involved in the acceptability of health services. These constraints are excluding many children and women of reproductive age from the Program. Even when they are appropriate candidates for vaccination and are in need of it, they often fail to be vaccinated when they consult a health facility, which constitutes a missed opportunity for vaccination.

Recent studies around the world have shown that in countries in other Regions, missed opportunities for vaccination range between 41% and 76%: Ethiopia 41%, Cameroon 44%, Turkey 49%, Pakistan 69%, India 57%, Nepal 54%, and Indonesia 76%. The relative weight of the causes identified has been determined in each of these:

- contraindications perceived by health personnel;
- lack of resources;
- deficient organization of the service;
- attitudes on the part of health personnel;
- response of the population to vaccination.

Specific solutions need to be proposed for bringing about a change that will have a positive impact on the community and help people to regain their confidence in the provision of these preventive services that are so important and necessary. Once the health services have dealt with their current constraints, vaccination coverage should increase substantially without the addition of new resources.

> ***Definition***
>
> *Missed opportunity for vaccination: refers to any circumstance in which a child under the age of five or a woman of reproductive age who is an appropriate candidate for vaccination and who needs to be vaccinated does not receive this service when they visit a health facility.*

Studies of Missed Opportunities for Vaccination in the Americas

All the studies listed in Tables 1 and 2 were conducted on the basis of a protocol prepared by WHO and amended by PAHO (Document EPI/GEN/84/4) in which women of reproductive age or persons accompanying children were intereviewed as they left the health establishments. The

Table 1. Missed Opportunities for Vaccinating Children: Summary of studies conducted in the Americas, 1988-1990

COUNTRY	AGE GROUP	NUMBER OF CHILDREN	% MISSED OPPORTUNITIES		% MISSED OPPORTUNITIES BY VACCINE				CAUSES				
			TOTAL %	CHILDREN <1 YEAR %	OPV %	DPT %	MEASLES %	BCG %	FALSE CONTRA-INDIC. %	HEALTH PERSONNEL %	LOGISTICS %	FAMILY %	OTHERS %
BOLIVIA	<4 years	572	32		25	28	52	35	33	61	6		
COLOMBIA													
Bogota	<2 years	553	52	73	47	53	59	89	24	50	12	10	4
Sucre	<2 years	428	77	76	70	75	88	83	14	40	26	14	
ECUADOR	<2 years	1 007	34		33	30	58	29	26	47	15	12	
EL SALVADOR	<5 years	1 211	45		NS	NS	NS	NS	93	1	1	5	4
EL SALVADOR*	<5 years	3 243	14		NS	NS	NS	NS	81	6	1	12	4
GUATEMALA	<2 years	1 326	51		47	48	20	NS	56	24	15	4	
HONDURAS	<2 years	507	45		31	36	49	68	57	37		6	
MEXICO	<5 years	812	40	55	63	71	84	83	22	35	43		
NICARAGUA	<3 years	3 276	66		54	69	74	65	19	31	37		13
PERU	<2 years	1 350	48	57	47	48	36	NS	42	32	20	6	
PARAGUAY	<5 years	1 290	51	55					61	38			1
VENEZUELA	<2 years	938	52		32	42	30	8	25	45	16	5	9
TOTAL		16 513	44										

N.S. Not studied
* Results obtained after the intervention

Table 2. Missed Vaccination Opportunities in Women of Childbearing Age and Pregnant Women: Summary of Studies Conducted in the Americas, 1988 - 1990

COUNTRY	OF CHILD-BEARING AGE/ PREGNANT	NUMBER OF PERSONS	PERCENT MISSED OPPORTUNITIES	CAUSES			
				FALSE CONTRAINDIC. %	HEALTH PERSONNEL %	LOGISTICS %	FAMILY %
ECUADOR	childbearing age	933	52	26	62		12
EL SALVADOR	childbearing age	556	71	94		1	5
	pregnant	494	50	89		4	7
EL SALVADOR*	childbearing age	712	61	98		1	1
	pregnant	454	28	68	3	4	15
GUATEMALA	childbearing age	2 797	80	10	74	10	12
VENEZUELA	childbearing age	1 259	72	N.E.	N.E.	N.E.	N.E.
TOTAL	childbearing age	6 257	71				
	pregnant	948	39				

N.S. Not studied
* Results obtained after the intervention

studies in El Salvador included data from clinical histories as well.

Principal Causes of Missed Opportunities for Vaccination

The rates of missed opportunities are highest in children under one year of age, who are the primary target of vaccination programs. In the studies of missed opportunities for vaccination against tetanus, the rates are consistently higher for women of reproductive age than for pregnant women.

Except in Guatemala, Peru, and Venezuela, the single-dose vaccines, namely BCG and measles, show a higher proportion of missed opportunities, probably because health services tend to offer the vaccine on specific days in order to reduce waste, since it has to be discarded 6 hours after it has been reconstituted.

The causes of missed opportunities for vaccination were divided into four categories:

a. False contraindications are the major cause of missed opportunities. These include: fever, diarrhea, vomiting, colds, and coughing.

Despite the fact that the standards of the national programs are clear on the definition of contraindications, health workers often fail to vaccinate because of false contraindications, alleging that to give the vaccination would produce and exacerbate adverse reactions, that such a procedure would be incorrect, or that the vaccine would not be absorbed.

This shows that it is important for health workers to understand the true contraindications and be encouraged to take advantage of all vaccination opportunities. Training should focus on the program's standards, and the standards need to be disseminated through explicit messages that are constantly reinforced.

b. The second most important cause is the attitude of the health workers, which is typified by not offering the vaccine, not thinking about vaccination during routine visits of patients to the health services, and not asking patients about their vaccination status while they are waiting. Another reason why health workers fail to offer vaccination is that they are economizing on biologicals and they are reluctant to open a multidose vial of vaccine in order to vaccinate a single child. The vaccine with which this happens most often is measles. But it is better to waste biologicals than to miss the opportunity to vaccinate a child or a woman of reproductive age.

c. The other causes are related to logistics and organization of the services. The supply and distribution of program inputs to the operational units is a genuine constraint that accounts to some extent for the levels of missed opportunities. It is important to get to the bottom of these problems and locate the bottleneck that prevents health establishments from receiving biologicals and materials on a timely basis and in sufficient quantities.

Other causes for failure to vaccinate have to do with the organization and availability of the services. Among the reasons invoked: it is not a vaccination day, vaccinations are not given because there have to be a certain number of children before vaccination can begin, and problems related to limited hours and the scheduling of vaccination days for the administration of multidose biologicals such as measles vaccine. Other reasons given are that the vaccination post is not well located in the health establishment, the patients are from another jurisdiction, or they did not bring in their vaccination cards.

d. The rejection of vaccination by the population, with the exception of some religious groups, is not a major cause of missed opportunities despite the fact that it is frequently cited by health workers.

Interventions

So far, documented information on interventions is available for three countries in the Americas: Colombia, El Salvador, and Venezuela.

In Colombia, based on the results of a study carried out in 1989, a strategy has been devised in which strong impetus is given to the regular program with a view to achieving the ideal situation in which supply and demand are manifested spontaneously. This intervention, implemented in the form of a workshop, attempts to deal with the problem of missed opportunities for vaccination, standardize the level of knowledge about vaccination among health workers, and involve them all in the commitment to guarantee the pro-

tection conferred by vaccines to all users of health facilities. The strategy calls for inviting the community to take advantage of all visits to health facilities as an opportunity to receive the necessary biologicals, and through Community Participation Committees (CPC), to participate in achieving efficient management of the EPI in every agency. This strategy succeeded in reducing missed opportunities by 70% within three months after it was implemented.

In El Salvador, the interventions consisted of disseminating the results of the study on missed opportunities to all those involved; providing in-service training with emphasis on false contraindications; and upgrading the expertise of student researchers, taking advantage of the fact that they would soon be serving as directors of the health centers. This intervention resulted in a 50% reduction of missed opportunities in children under five, a 45% reduction in pregnant women, and a 15% reduction in women of reproductive age. False contraindications continue to be the leading cause of missed opportunities.

In Venezuela, a study was carried out in nine health centers, six of which used interventions and three of which served as controls. Two types of intervention were employed. The first consisted of passive education of health workers and patients in the health center through letters sent to every center, coupled with posters and buttons worn by the workers to promote immunization. The second intervention included all of the foregoing plus reviewing every patient's vaccination history and stamping their cards to indicate which vaccines had been given and whether or not the patient was current in his or her vaccination status. These stamps reminded the physician to vaccinate eligible patients during this same visit. Unfortunately, many difficulties arose in carrying out the interventions and in keeping the control centers free from the influence of the interventions, a factor that made it impossible to obtain conclusive results. Only the second intervention resulted in a statistically significant reduction of missed opportunities--namely, 34%.

General Guidelines for Reducing Missed Opportunities for Vaccination

The point of departure for the formulation of guidelines is an analysis of the problems and their causes which are not being dealt with under the current standards and procedures. The general guidelines are aimed at enlisting more active and conscious participation by the services and personnel who are involved in vaccination.

Based on the problems identified, recommendations have been considered in the following areas:

a. Health Personnel

1. Develop an in-service training program for all professional and technical personnel in the health services that will disseminate the latest standards of the national vaccination program, make sure the personnel are up to date, and help to change their attitude about "false contraindications" and their own participation in the program.

2. Arrange for meetings and visit operations personnel on-site to discuss missed opportunities and examine alternatives with a view to taking advantage of every vaccination opportunity.

3. Motivate health workers so that through promotion and better communication with the community they will be able to ensure efficient demand for vaccines.

4. Motivate health workers so that they will provide satisfactory treatment to those who visit the vaccination services.

b. Health Services

1. Check the vaccination status of all those seeking services at health establishments. Any vaccination that is missing should be given immediately, and the patient should be encouraged to bring in the vaccination card every time he or she visits a health establishment. *No child or woman of reproductive age should leave a health establishment without having received the required vaccine doses.*

2. Carry out routine education and vaccination activities in waiting rooms, during hospitalization, in emergency rooms, and when patients are admitted to or discharged from the various services. Vaccination posts should be relocated in the health establishments.

3. Offer and administer all vaccines to all eligible individuals during working hours every day of the year, with a responsible person on duty to provide this service.

4. Disseminate current vaccination standards and correct false ideas about contraindications, as well as false ideas about wasting vaccines. The existing standard for the administration of tetanus toxoid to all women of reproductive age should be implemented.

5. Enlist the participation of all health workers in the ongoing promotion of the Immunization Program.

6. Establish comprehensive medical health care, promote immunization on the first consultation, and distribute the vaccination card.

c. Program Management

1. Arrange for biologicals, supplies, and parts for the cold chain to be permanently on hand in order to meet the demand of the health services.

2. Carefully study the distribution of vaccines and materials with a view to improving the logistics.

3. Decentralize National Immunization Program funds to the health units or areas, depending on the programming.

4. Ensure that during every supervisory visit to the local services an assessment is made of progress toward the elimination of missed opportunities for vaccination.

5. Promote interinstitutional coordination of the public and private sectors with a view to strengthening the Regular Immunization Program.

6. Include the control of diseases preventable by vaccination in the curricula of centers and institutions where health personnel are being trained.

7. Develop materials that will provide information for health personnel and the community and encourage them to take advantage of all vaccination opportunities.

8. Follow up and evaluate the activities being carried out to reduce missed opportunities through the Interagency Coordinating Committee (ICC).

d. Community

1. Encourage children and women of childbearing age to bring in their vaccination card every time they visit a health facility and to treat it as an important document and keep it in a safe place.

2. Create awareness and inform parents about the need for vaccination and the importance of completing the schedule in the first year of the child's life.

3. Get private physicians and personnel in other health sector institutions involved in promoting the program and implementing national standards.

4. Develop and execute a training program for leaders in the community that will encourage their participation in the activities of the immunization program and its various strategies.

5. Implement ongoing promotional activities with a view to increasing demand for the program.

6. Carry out joint activities with the mass media and enlist their participation in activities to promote the Immunization Program.

Conclusion

Through a series of studies in the countries of the Americas it has been possible to diagnose the causes of missed opportunities for vaccination. In the great majority of cases they reflect deficiencies on the part of the health services. The challenge ahead is to face the problem and develop and implement strategies that will reduce the missed opportunities for vaccination that have been identified so far. Taking advantage of all opportunities to vaccinate women and children when they visit health establishments is not a difficult task and does not imply additional costs or personnel. Intervention actions to reduce missed opportunities can be initiated immediately, without having to eliminate all the causes identified, essentially through the creation of awareness on the part of all health workers.

Source: *"Oportunidades perdidas de vacunación en las Américas: diagnóstico e intervenciones, 1988-1990,"* de Quadros C, Olivé J-M, Castle C. Document No. EPI/TAG9/91-5. Document presented at the Ninth Meeting of the Technical Advisory Group on Diseases Preventable by Vaccination, 12-15 March 1991.

Vaccine Potency Testing

Once in a while program managers are faced with a situation where a quantity of vaccine has expired or has suffered exposure to heat, i.e. breaks in the cold chain. The decision of whether to test the vaccine to confirm its potency, depends on a number of issues. Vaccine potency testing is a lengthy and costly procedure and therefore is justified only rarely. Only when large quantities of vaccine are affected, and when you see no ther alternative, should you attempt to retest vaccine. Table 1 shows the number of doses that justify vaccine potency testing and is meant to help program administrators make the decision.

Table 1. Minimum Quantities of Vaccine Justifying Vaccine Potency Testing.

Vaccine	Number of doses involved justifying a test	Number of doses needed for a test	Time when report is expected (in months)	Conditions of transport
Poliomyelitis (oral) Measles (freeze-dried) Yellow fever (freeze-dried)	20 000	20	one month	from 0°C, to +8°C
BCG (freeze-dried)	20 000		three months	
Diphtheria-pertussis-tetanus	200 000			
Tetanus Toxoid	50 000			
Hepatitis B	10 000			
Poliomyelitis (inactivated)	Until potency test is established Do not retest			

Source: PAHO/WHO

Reported Cases of EPI Diseases

Number of reported cases of measles, poliomyelitis, tetanus, diphtheria, and whooping cough, from 1 January 1991 to date of last report, and for same epidemiological period in 1990, by country.

Subregion and country	Date of last Report	Measles		Poliomyelitis #		Tetanus				Diphtheria		Whooping Cough	
						Non Neonatal		Neonatal					
		1991	1990	1991	1990	1991	1990	1991	1990	1991	1990	1991	1990
LATIN AMERICA													
Andean Region													
Bolivia	1 Jun.	32	136	0	0	1	7	13	11	1	0	13	83
Colombia	18 May	5 345	1 471	2	1	63	22	53	8	12	0	861	198
Ecuador	27 Apr.	429	625	0	1	20	33	14	16	...	2	148	193
Peru	23 Mar.	161	4	1	2	7	6	17	16	...	...	1	...
Venezuela	25 May	7 269	3407	0	0	41	25	10	11	0	0	327	447
Southern Cone													
Argentina**	*	...	...	0	0	...	...	...	...	...	...	...	...
Chile	25 May	418	443	0	0	4	11	1	0	8	21	18	43
Paraguay	20 Apr.	144	49	0	0	9	12	16	8	1	1	21	38
Uruguay	1 Jun.	194	...	0	0	3	...	...	...	...	...	28	...
Brazil	11 May	6 549	6 044	0	0	278	469	60	64	102	213	1 302	4 895
Central America													
Belize	8 Jun.	5	39	0	0	...	...	...	...	...	...	2	2
Costa Rica	*	...	...	0	0	...	...	...	...	...	...	...	...
El Salvador	27 Apr.	355	430	0	0	17	17	4	3	0	0	43	54
Guatemala	25 May	107	7 878	0	1	11	26	1	1	0	1	32	41
Honduras	18 May.	53	7 216	0	0	1	18	6	8	0	0	12	19
Nicaragua	1 Jun.	2 071	3 134	0	0	13	16	5	4	0	0	15	66
Panama	*	...	...	0	0	...	...	...	...	...	...	...	...
Mexico	11 May	1 208	47 929	0	2	76	74	21	22	0	0	34	465
Latin Caribbean													
Cuba	*	...	...	0	0	...	...	...	...	...	...	...	...
Haiti	*	...	...	0	0	...	...	...	...	...	...	...	...
Dominican Republic	1 Jun.	324	1 515	0	0	24	46	3	10	9	26	6	6
CARIBBEAN													
Antigua & Barbuda	30 Mar.	0	0	0	0	0	0	0	0	0	0	0	0
Bahamas	16 Mar.	0	10	0	0	1	0	0	0	0	0	0	0
Barbados	30 Mar.	0	0	0	0	2	0	0	0	0	0	0	0
Dominica	30 Mar.	1	3	0	0	1	0	0	0	0	0	0	0
Grenada	18 May	2	0	0	0	1	0	0	0	0	0	0	0
Guyana	1 Jun.	2	1	0	0	0	0	0	0	0	0	0	1
Jamaica	15 Jun.	206	7 398	0	0	4	6	0	0	1	3	13	3
St. Kitts/Nevis	30 Mar.	4	12	0	0	0	0	0	0	0	0	0	0
St. Vincent	18 May	2	1	0	0	1	0	0	0	0	0	0	0
Saint Lucia	30 Mar.	5	5	0	0	0	0	0	0	0	0	0	0
Suriname	23 Mar.	0	2	0	0	0	1	0	0	0	0	0	0
Trinidad & Tobago	4 May	47	350	0	0	5	4	0	0	1	0	4	0
NORTH AMERICA													
Canada	31 May	763	107	0	0	0	0	0	0	0	3	756	3 886
United States**	8 Jun.	5 843	11 044	0	0	11	25	0	0	1	0	902	1 349

** Country does not report neonatal tetanus data separately.
Data for polio includes only confirmed cases through week 26 (ending 29 June, 1991).
... Data not available.

Criteria for the differential diagnosis of poliomyelitis, Guillain-Barré Syndrome, Transverse Myelitis and Traumatic Neuritis

	POLIO	G.B.S.	TRAUMATIC NEURITIS	TRANVERSE MYELITIS
INSTALLATION OF PARALYSIS	24 to 48 hours	from hours to ten days	from hours to four days	from hours to four days
FEVER AT ONSET	high, always present at onset of flaccid paralysis, gone at following day	not common	commonly present before, during and after flaccid paralysis	rarely present
FLACCID PARALYSIS	acute, asymmetrical, principally proximal	generally acute, symmetrical and distal	asymmetrical, acute, and affecting only one limb	acute, lower limbs, symmetrical
MUSCLE TONE	reduced or absent in the affected limb	global hypotonia	reduced or absent in the affected limb	hypotonia in lower limbs
DEEP-TENDON REFLEXES	decreased to absent	globally absent	decreased to absent	absent in lower limbs
SENSATION	severe myalgia, backache	cramps, tingling, hypo-anesthesia of palms and soles	pain in gluteus, hypo-thermia	anesthesia of lower limbs with sensory perception
CRANIAL NERVE INVOLVEMENT	only when bulbar involvement is present	often present, low and high: Miller-Fisher Syndrome	absent	absent
RESPIRATORY INSUFFICIENCY	only when bulbar involvement is present	in severe cases, enhanced by bacterial pneumonia	absent	often thoracic, with sensory perception
AUTONOMIC SIGNS & SYMPTOMS	dysautonomia	rare	frequent blood pressure alterations, sweating, blushing and body temperature fluctuations	hypothermia in affected limb
CEREBRO-SPINAL FLUID	inflammatory	albumin-cytologic dissociation	normal	normal or mild in cells
BLADDER DYSFUNCTION	absent	sometimes	transient	never
NERVE CONDUCTION VELOCITY: THIRD WEEK	abnormal: anterior horn cell disease (normal during the first two weeks)	abnormal: demyelinization	abnormal: axonal damage	normal or abnormal, no diagnostic value
EMG AT THREE WEEKS	abnormal	normal	normal	normal
SEQUELAE AT THREE MONTHS AND UP TO A YEAR	severe, asymmetrical atrophy, skeletal deformities developing later	mild	symmetrical atrophy of peroneal muscles	moderate atrophy, only in affected lower limb

Source: " *The Diagnosis of Polio and Other Acute Flaccid Paralyses; A Neurological Approach*"; Alcalá, H; Olivé, J-M; de Quadros, C; No. EPI/TAG/91-10. Document presented at the Ninth Meeting of the Technical Advisory Group on Vaccine-Preventable Diseases, held in Guatemala City, Guatemala, from 12 to 15 March, 1991.

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