EPI Newsletter

Expanded Program on Immunization in the Americas

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International Symposium on Measles Immunization

The Proceedings of the 1982 International Symposium on Measles Immunization are now available in the *Reviews of Infectious Diseases*, Vol. 5, No. 3 (May-June 1983). The Symposium was held in the headquarters of the Pan American Health Organization (PAHO) from 16 to 19 March 1982. Fogarty International Center of the U.S. National Institutes of Health, in conjunction with PAHO/WHO and other institutions, organized the 4-day symposium which included participants from 21 countries.

The symposium had five major objectives: (1) to assess the impact of measles in countries with and without special vaccination programs; (2) to discuss the characteristics of currently available measles vaccines; (3) to assess the results of attempts at measles control and to discuss the strategies needed to attain a high level of immunization in various parts of the world; (4) to evaluate the prospects for eventual eradication, and (5) to identify the need for further research on various aspects of the disease and its control.

The following summary from the Proceedings of the Symposium was written by Dr. Samuel L. Katz, Chief Rapporteur.

Summary of current status of measles and recommendations

"The passage of 20 years since the first International Conference on Measles Immunization in November 1961 has been accompanied by significant advances in our understanding of the impact of measles among different groups, in the development and utilization of measles vaccines, and in the control of the disease. Throughout all these considerations, there remains great variability, which is manifest in the surveillance data on morbidity and mortality, the extent of vaccine utilization, and the attitudes about measles as a serious public health problem. Because of these variations it is obvious that any recommendations must be evaluated carefully and adapted appropriately to meet the needs of a given nation, a population group, a geographic locale, or an environmental setting.

Among the developed nations, there is a great divergence of attitudes and programs. The United States has reduced the reported number of measles cases by more than 99 percent in the past 15 years. Canada has also made striking headway in reduction of the impact of measles. Mexico reports significant progress on a national scale. Costa Rica has mounted an initially successful program. In much of Western Europe, there has been only modest change, and measles transmisssion continues. Eastern Europe (especially Czechoslovakia, Albania, Yugoslavia, and the USSR), like North America, has made great strides in the reduction of numbers of cases of measles, as has Japan. China's programs have been targeted initially at selected provinces with large populations, where programs of intensive immunization have resulted in 90 percent reduction in incidence.

Among the Central and South American nations, Costa Rica, Cuba, Chile, and parts of Brazil have achieved similarly effective progress; the most serious impact of measles appears essentially unchanged in much of Central America and tropical South America. Africa continues to devote increasingly greater attention to measles and to programs aimed at its control. The Gambia has demonstrated the possibility of termination of transmission but has also shown clearly the need for longitudinal continuation of programs for maintenance of successful control. Increasing data on morbidity, mortality, and sequelae lend further credence to the justification for eliminating measles as a hazard of childhood.

Vaccines in use throughout the world have proved safe and immunogenic. Stabilization has improved the viability of vaccines in field use, but the cold chain remains a necessity for optimal efficacy, even of the freeze-dried material. Laboratory assessment of vaccine stability has been standardized and offers specific dimensions for the tolerable duration and degree of exposure to heat and

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light. Nearly all vaccines currently are prepared in chick embryo cell cultures, except for the Yugoslavian vaccine, which is prepared in human diploid cells; the Iranian AIK-C strain, prepared in MRC-5 human diploid cells; and the USSR Leningrad-16 vaccine, prepared in quail embryo cells.

Although all vaccines are currently administered parenterally by syringe and needle, or by jet inoculation, the proposal for reexamination of aerosol administration was greeted with interest and enthusiasm and merits further study. Representatives of the pharmaceutical industry, government, and national laboratories addressed the question of availability of production facilities sufficient to guarantee an adequate supply of vaccine.

It was apparent that motivational issues were at least as important as technologic ones. Especially in the developed nations, a more overt committment to measles control is needed by many key individuals. In contrast, the developing nations face major management problems, often related to the structure of primary health care delivery systems. Once a program for measles immunization has begun, it is essential that a maintenance program be put in place for a sustained, continuing effort to reach new susceptibles. Clinical surveillance is more practical than laboratory testing for assessing program success in most such areas. When laboratory surveillance is used, it appears that the HAI test is the most convenient and reproducible, but attention must be devoted to better antigens and more responsive erythrocytes. The drop in HAI antibody titers after the initial demonstration of an increase following vaccination should not be equated with waning immunity. The group for whom further study is needed are those infants receiving vaccine before their first birthday. These studies should determine the completeness of their initial response, their subsequent antibody response to a second dose of vaccine after their first birthday, and, most important, their enduring resistance to clinical infection. On the other hand, there seems to be no convincing evidence at present of a need for booster doses in children immunized successfully after one year of age.

Although it may initially be advisable to immunize infants younger than one year of age—at six to nine months—to reduce epidemic transmission and disease, eventual control by vaccination at or after the first birthday is a desirable goal. If the aerosol experiments should demonstrate the ability to overcome or bypass transplacental immunity, then this restriction could be removed, and immunization in very early infancy or even neonatal immunization could be considered.

For those vaccinated after the first birthday, second doses of vaccine should be regarded not as boosters but as "fill-ins" for that 5-10 percent of recipients who may have failed to respond to the initial exposure. Whether such "fill-ins" are given must be a decision based on the economics and logistics of a given program. In general it is more efficient to concentrate on extending initial vaccination to the greatest number of recipients rather than administering multiple doses to a more limited number The need and desirability of a second dose should be carefully assessed and followed with proper clinical, serologic, and epidemiologic surveillance.

Contraindications to vaccine, other than the defined, rare cases of infants with immunodeficiency, have not been a major consideration. Pregnant women have been empirically excluded, but there is no evidence for untoward effects of vaccine virus in the embryo or fetus. Inclusion or exclusion of infants and children with intercurrent febrile illness is a good example of the flexible variability to be utilized. Vaccination of a child with intercurrent febrile illness might be postponed in a private pediatric office but not in a field setting.

Agreement is incomplete on the current and future management of individuals who previously received inactivated measles vaccines. Used mainly in the middle and late 1960s, these vaccines were distributed in only a limited number of nations to a relatively small number of recipients. Probably Canada and Japan have the largest reservoir of such recipients. Local decisions will produce the recommendations for these selected groups.

All programs, of every type, must be preceded, accompanied by, and sustained with educational materials to motivate and to inform. Strategies for continued motivation are essential, since the initial anxieties that accompany a high incidence of disease can be expected to give way to complacency once disease patterns have been greatly reduced. An adequate, retrievable record system or some appropriate substitute is essential so that evidence of immunization can be documented and preserved, for the individual child and for the evaluation and surveillance of the program.

As various nations achieve measles control within their own boundaries, the problem of importations from countries where programs are less successful, or nonexistent, will become more apparent and increasingly troublesome. This problem will further emphasize the need for the favored, developed nations to provide assistance of many types to their brethren in the less-favored, developing nations. Unique strategies may be required to overcome disease patterns in certain areas.

Although an initial goal is to utilize immunization as a means of measles control, an eventual goal must be that of measles eradication. There is no known biologic reason why successful measles immunization cannot be extended to all the world's children. The challenge before us now is to exploit the available vaccines and to overcome the remaining economic, logistical, and attitudinal barriers. Each of us must return to his her own constituents and continue to expand the efforts already in motion or to initiate those that are lacking. Measles can be eliminated as a universal cause of childhood misery and of long-term disabilities."

Source: *Reviews of Infectious Diseases* 5:3, 1983.

1982 Vaccination Coverage in the Americas

Coverage in children under 1 year of age, by vaccine type and dose, including dropout rates. Region of the Americas, 1982.

Subregion and Country	Population under 1 year	Coverage (%) in children under 1 year of age							
		DPT-1	DPT-3	Dropout rate	Polio-1	Polio-3	Dropout rate	Measles	BCG
NORTH AMERICA									
Canada	390,000	...	...	...	...	...	...	...	...
United States	3,911,000	...	...	...	...	...	...	...	...
CARIBBEAN MIDDLE AMERICA									
Antigua and Barbuda	1,161	...	78.9	...	...	85.9	...	...	...
Bahamas	5,506	...	68.7	...	...	67.3	...	64.8	...
Barbados	4,346	...	62.2	...	...	62.6	...	53.1	...
Belize	5,867	...	49.7	...	...	52.3	...	42.8	75.2
Cuba	161,169	83.1	67.0	19.4	81.3	82.0	...	54.3	95.9
Dominica	1,648	...	100.0[a]	...	...	72.8	...	42.6	48.4
Dominican Republic	182,000	75.3	30.1	61.0	93.7	38.7	59.0	26.4	51.6
Grenada	2,400	...	56.0	...	...	61.1	...	5.2	...
Haiti	155,735	...	11.6	...	...	6.6	...	...	65.2
Jamaica	65,859	...	33.8	...	...	72.0	...	12.0	26.6
Saint Lucia	3,800	...	79.1	...	...	81.2	...	43.3	59.5
St. Vincent and the Grenadines	3,118	...	67.3	...	...	99.1	...	40.2	...
Trinidad and Tobago	26,300	...	53.8	...	...	58.5	...	...	...
CONTINENTAL MIDDLE AMERICA									
Costa Rica	64,000	100.0[a]	88.2	11.8	100.0[a]	100.0[a]		97.0	82.0
El Salvador	192,000	55.7	43.9[b]	...	56.7	43.9[b]	...	44.5	47.3
Guatemala	312,198	75.7	45.8	...	73.8	45.4	...	12.2	28.0
Honduras	160,000	94.8	53.0	44.0	95.0	54.1	43.0	55.7	57.4
Mexico	2,847,000	41.7	22.7	45.6	100.0[a]	73.2	26.8	8.3	25.4
Nicaragua	119,000	51.9	26.8	51.6	...	71.9	...	41.2	81.8
Panama	54,129	...	62.8	...	...	63.2	...	66.3	86.3
TROPICAL SOUTH AMERICA									
Bolivia	216,000	40.7	12.4	70.0	43.2	13.1	70.0	15.9	33.1
Brazil	3,811,116	...	53.4	...	100.0[a]	100.0[a,b]		64.0	60.8
Colombia	940,000	47.7	21.0	56.0	48.8	21.7	56.0	22.4	53.2
Ecuador	334,000	65.3	26.1	60.0	64.6	25.9	60.0	33.1	77.0
Guyana	20,500	...	53.3	...	...	73.1	...	67.5	77.5
Paraguay	122,000	...	39.0	...	...	43.0	...	34.0	47.0
Peru	661,000	46.5	21.6	54.0	46.6	21.5	54.0	29.3	59.5
Suriname	10,000	...	60.8	...	...	58.1	...	...	...
Venezuela	496,000	93.7	70.6	25.0	63.7	42.5	34.0	35.8	67.0
TEMPERATE SOUTH AMERICA									
Argentina	555,000	100.0[a]	66.1	34.0	100.0[a]	100.0[a]	...	11.2	82.6
Chile	274,000	98.1	93.7	5.0	97.8	82.5[b]	...	92.5	93.9
Uruguay	56,000	97.8	63.1	36.0	94.8	70.0[b]	26.2	56.8	30.9

[a] Estimated. Reported number of doses exceeded estimated target population.

[b] 2nd dose

... Information not available

New Cold-Chain Developments

Icepack freezing time

Recent tests performed at the cold-chain focal point at the University of Valle (Cali, Colombia) have shown that icepacks freeze more efficiently when placed laterally on their edges against the freezer evaporator plate, as shown in the drawing. The icepacks should be positioned about 1 cm apart to allow free air circulation.

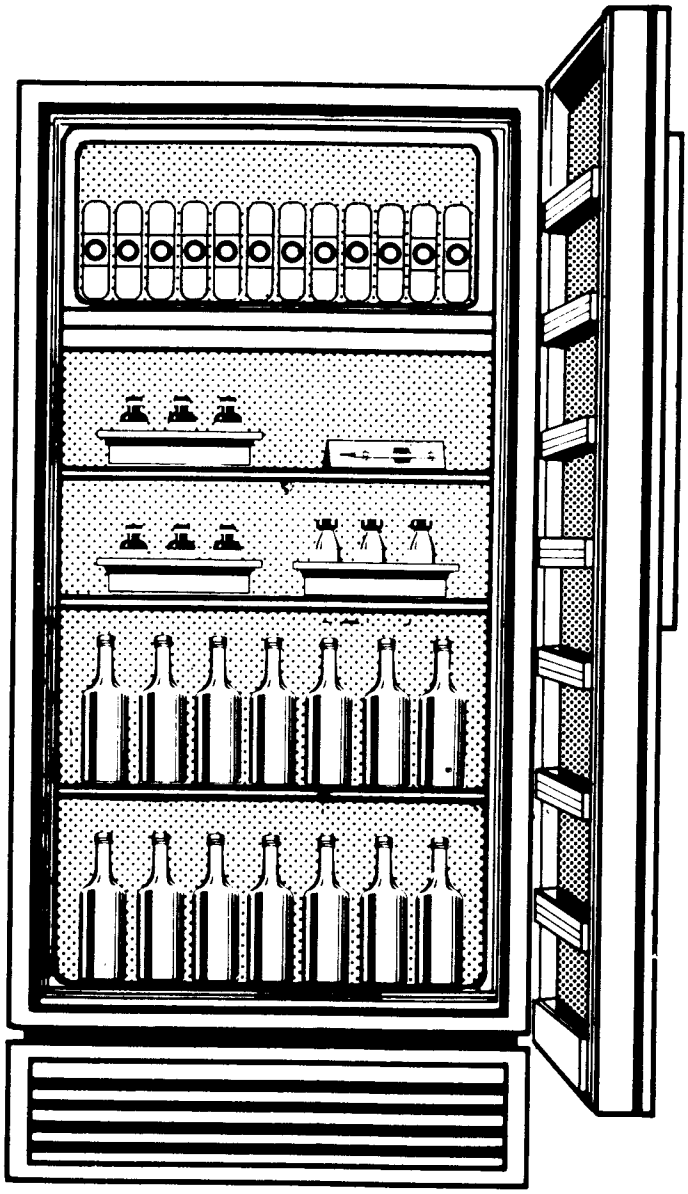
Tests results revealed that the same refrigerator froze eight icepacks (4.2 kg of water) in 38 hours when they were placed flat against the evaporator, as opposed to 13 icepacks (6.1 kg of water) in 18 hours when they were placed upright on their longer side.

The number of icepacks that can be frozen within a 24-hour period must be determined for each type of refrigerator, ensuring that the internal temperature of the refrigerator does not exceed +10°C at any point during the freezing time.

Stabilization of refrigerator temperatures

Tests have also confirmed that water-filled plastic bottles placed on the lower shelves of the refrigerator (see drawing) help stabilize the internal temperature more rapidly after the door has been opened. A refrigerator was tested with and without plastic water-filled bottles at +43°C to determine the amount of time necessary for the internal temperature to return to +10°C after the door had been left open for one minute. It was found that the refrigerator recuperation time was 120 minutes when no water bottles were used, but only 52 minutes when water bottles had been placed on the lower shelves.

Editorial note: The PAHO/WHO cold-chain testing program at Colombia's University del Valle periodically produces new information on how to handle vaccine and cold-chain equipment. This information will be published in the *EPI Newsletter* as soon as it is available. It is suggested that these new guidelines, such as those described above for freezing icepacks and using water-filled bottles, be disseminated to all health workers and eventually incorporated into cold-chain training materials.



Icepacks freeze more quickly when placed on their sides than when stacked one on top of another. Water-filled bottles on the lower refrigerator shelves help stabilize the internal temperature.

Second EPI Evaluation in Ecuador

In October 1982 the Expanded Program on Immunization in Ecuador was evaluated for the second time by the Ministry of Public Health of Ecuador and the Pan American Health Organization. Multidisciplinary teams reviewed all components of the Ministry's immunization activities and made site visits to ten national units within the Ministry of Public Health, five provincial health headquarters, and 33 local health facilities.

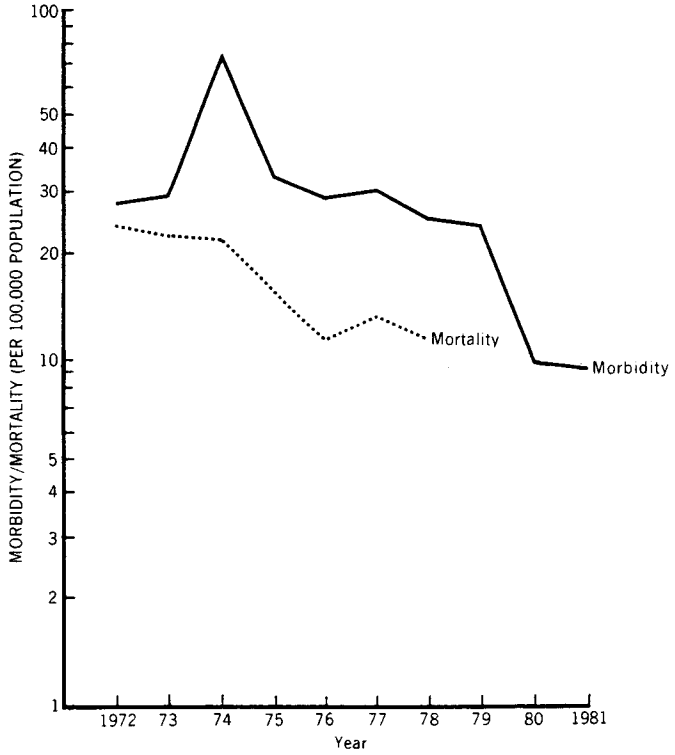
In 1977 Ecuador became the first country in the Americas to officially adopt the EPI. Prior to EPI implementation, immunizations in Ecuador were delivered sporadically by means of mass campaigns directed against single, specific target diseases (e.g. measles). Some vaccines were routinely administered in health centers, however spontaneous demand was small and no organized attempt was made to provide immunization services on a regular basis. With EPI implementation, immunizations became an active rather than a passive process. Vaccine "brigades" were created for house-to-house immunization and mobile

vaccination clinics were employed to promote access in larger urban areas.

From 1977 to 1981 vaccination coverage levels in children less than 1 year of age increased from 22 to 45 percent for the first dose of DPT, from 18 to 44 percent for the first dose of polio, from 6 to 22 percent for measles, and from 38 to 57 percent for BCG. However complete coverage with third doses of DPT and polio was only 18 percent by 1981, and coverage of pregnant women with tetanus toxoid was only 12 percent for one dose and 4 percent for the recommended two doses.

During this same period (1977-1981), a decline in incidence rates was observed for pertussis, diphtheria and polio (Figures 1-3). Measles incidence, however, continued to oscillate biannually (Figure 4). Mortality data and age-specific incidence rates were unavailable after 1978. Tuberculosis incidence increased slightly after 1977 (Figure 5), though it is not known whether this was due to improved surveillance or an actual increase in disease incidence. Neonatal tetanus incidence, after falling to a low in 1979, increased in 1980 and again in 1981 (Figure 6).

FIGURE 1. Pertussis morbidity and mortality (per 100,000 population). Ecuador, 1972-1981.



In 1982 the Ecuadorian Ministry of Health embarked on a national immunization strategy of trimesteral "intensive phases" of vaccination activities in an attempt to increase complete coverage levels with all EPI vaccines. Each intensive phase was designed to involve all Ministry-level personnel in immunization activities and was preceded by a national mass-media campaign to promote public

FIGURE 2. Diphtheria morbidity and mortality (per 100,000 population). Ecuador, 1972-1981.

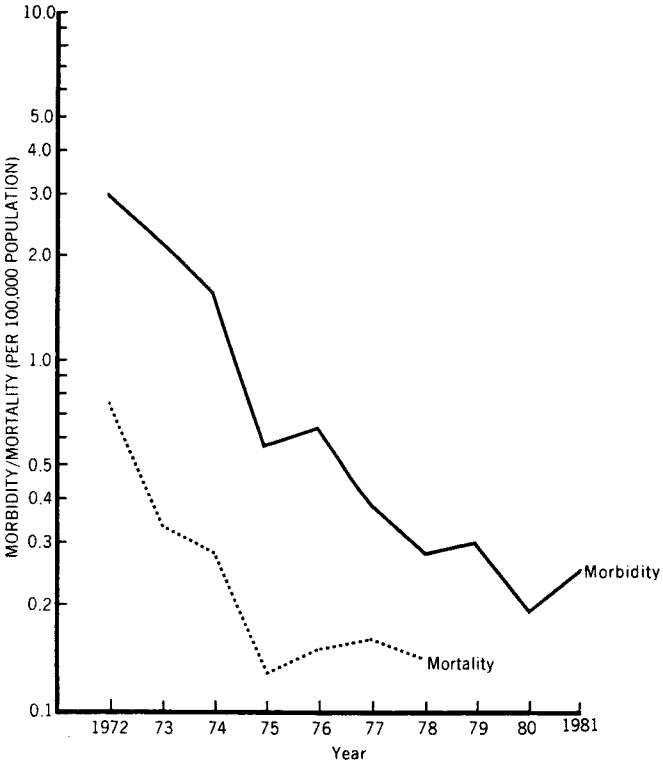


FIGURE 3. Poliomyelitis morbidity and mortality (per 100,000 population). Ecuador, 1972-1981.

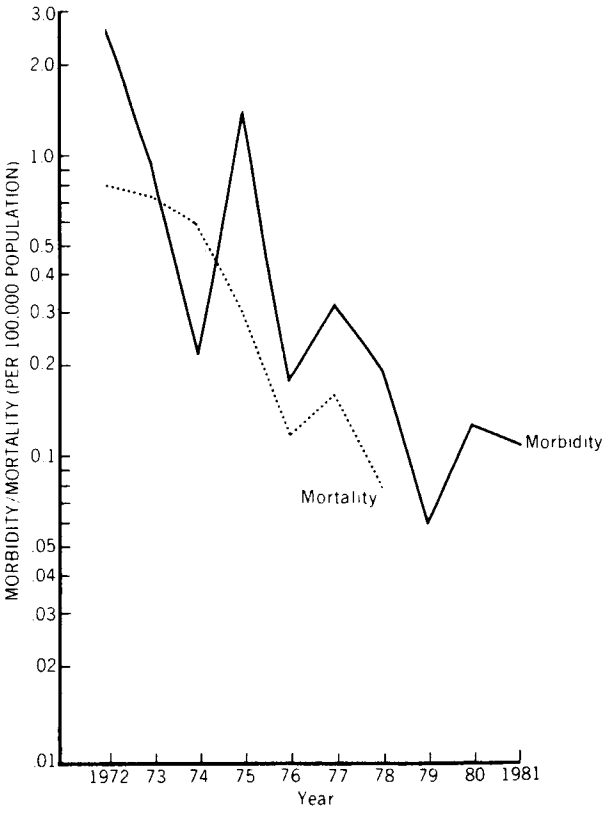


FIGURE 4. Measles morbidity and mortality (per 100,000 population). Ecuador, 1972-1981.

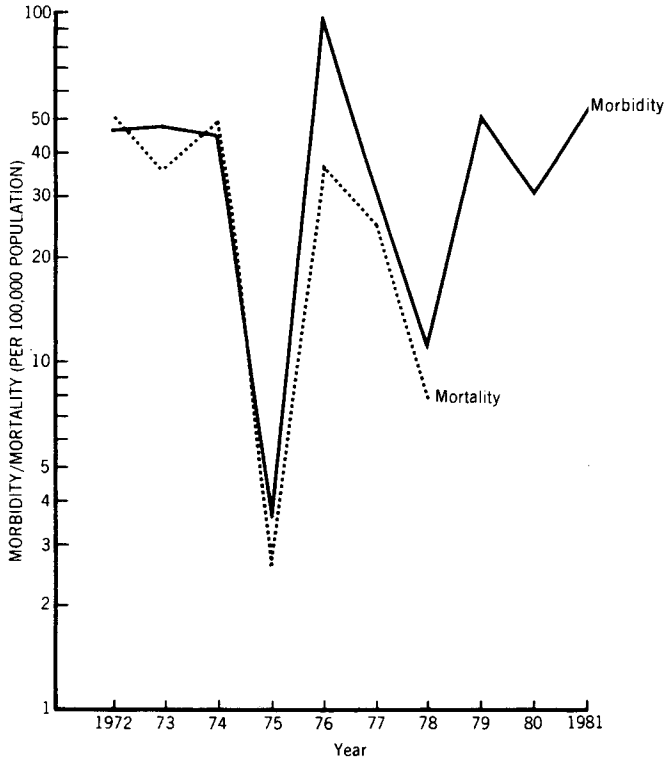
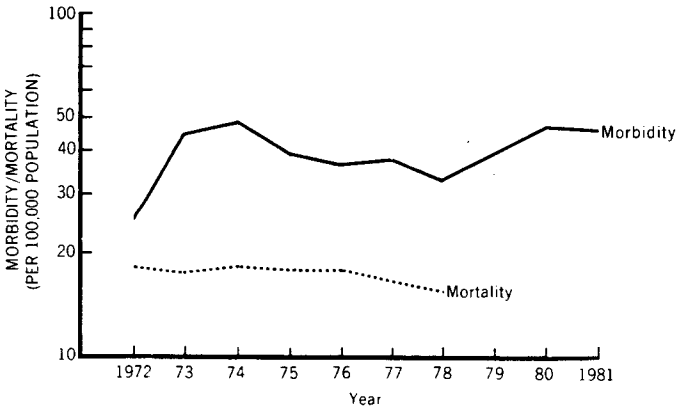


FIGURE 5. Tuberculosis morbidity and mortality (per 100,000 population). Ecuador, 1972-1981.



awareness. At the time of the evaluation (October), two of the three intensive phases scheduled for 1982 had been completed. Although year-end projections based on these data are tenuous, it seems clear that coverage had improved again in 1982 (Table 1). It should be pointed out that until data are available from the third intensive phase in 1982, it is difficult to assess improvement in the dropout rates between the first and third doses of DPT and polio vaccines.

The evaluation team concluded that Ecuador's commitment to the EPI has resulted in some improvement in

FIGURE 6. Neonatal tetanus morbidity and mortality (per 1,000 live births). Ecuador, 1972-1981.

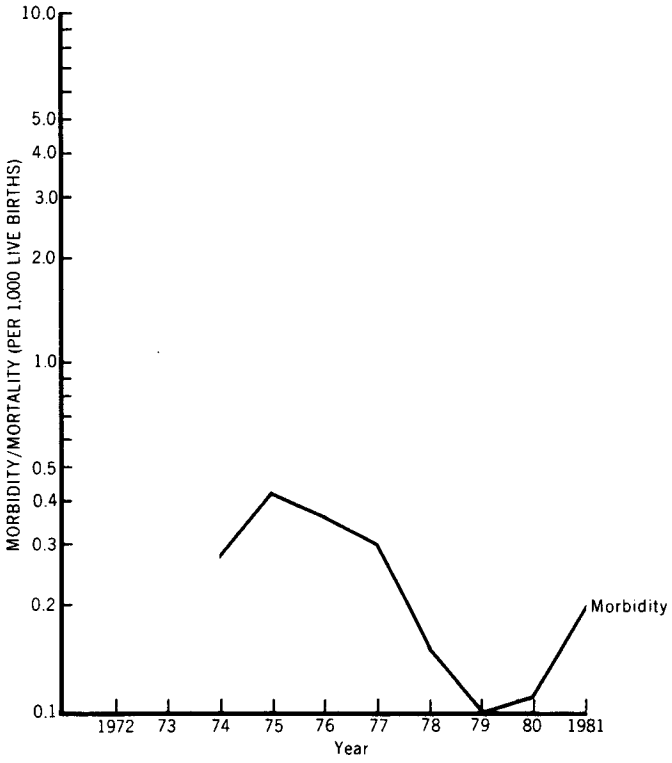


TABLE 1. Vaccination coverage in children less than 1 year of age. Ecuador, 1981-1982.

Vaccine	1981	1982 (projected)
DPT-1	45.1	60.6
DPT-3	18.0	21.8
Poliomyelitis-1	43.7	59.2
Poliomyelitis-3	18.6	22.0
Measles	21.9	28.4
BCG	57.3	70.8

vaccine coverage. Problems which still exist and which must receive further attention include the following:

- **Coverage of the less than 1-year-old population with measles vaccine remains low**, and at current levels is not having a discernable impact on measles morbidity. Measles mortality data is several years out of date and organizational problems impede the timely collection and analysis of up-to-date information.
- **Coverage of the less than 1-year-old population with third doses of DPT and polio vaccine remains low**, and a major effort needs to be made to correct this problem.
- **Coverage of pregnant women with tetanus toxoid has still not received the priority it deserves**, especially in

Reported Cases of EPI Diseases

Number of reported cases of measles, poliomyelitis, tetanus, diphtheria and whooping cough, from 1 January 1983 to date of last report, and for same epidemiological period in 1982, by country

Sub-Region and Country	Date of last report	Measles		Poliomyelitis		Tetanus				Diphtheria		Whooping Cough	
						Non-neonatorum		Neonatorum					
		1983	1982	1983	1982	1983	1982	1983	1982	1983	1982	1983	1982
NORTHERN AMERICA													
Canada	16 Apr.	287	395	—	—	—	4	...	...	7	2	603	737
United States	6 Aug.	1,149	1,124	2	3	44	44	...	...	—	1	1,202	748
CARIBBEAN													
Antigua and Barbuda	21 May	3	—	—	—	—	—	—	—	—	—	—	—
Bahamas	30 Jul.	2,803	20	—	—	—	2	—	—	—	—	7	5
Barbados	16 Jul.	3	3	—	—	5	3	—	—	—	1	—	9
Belize	2 Aug.	9	4	...	...	—	2	—	—	—	4	1	—
Cuba	4 Jun.	1,817	20,415	—	—	11	9	—	—	—	—	167	433
Dominica	25 Jun.	—	1	—	—	—	—	—	—	—	—	10	4
Dominican Republic	30 Apr.	890	1,191	6	32	34	28	6	2	40	55	87	112
Grenada	23 Jul.	268	320	—	—	—	3	—	—	—	—	—	—
Haiti	*	...	...	...	...	...	...	...	...	...	...	...	...
Jamaica	14 May	788	1,246	—	43	1	5	2	—	8	3	24	90
Saint Lucia	11 Jun.	51	80	—	—	1	1	...	...	—	—	—	3
St. Vincent & the Grenadines	4 Jun.	53	543	—	—	...	—	...	—	—	—	...	—
Trinidad and Tobago	4 Jun.	1,181	588	—	—	8	8	—	—	—	2	—	1
CONTINENTAL MIDDLE AMERICA													
Costa Rica	23 Jul.	10	76	—	—	2	11	1	1	—	—	20	20
El Salvador	4 Jun.	1,004	2,635	33	12	22	26	16	48	9	1	190	1,089
Guatemala	18 Jun.	1,813	2,673	68	13	43	31	...	...	8	8	573	567
Honduras	25 Jun.	786	1,757	3	8	18	16	—	—	—	—	291	841
Mexico	*	...	...	...	...	...	...	...	...	...	...	...	...
Nicaragua	*	...	...	...	...	...	...	...	...	...	...	...	...
Panama	2 Jul.	414	3,108	—	—	3	3	8	9	—	—	82	25
TROPICAL SOUTH AMERICA													
Bolivia	*	...	...	...	...	...	...	...	...	...	...	...	...
Brazil	30 Apr.	9,622	9,328	9	18	...	...	...	...	1,126	1,280	10,371	19,457
Colombia	3 Jun.	...	...	43	27	...	...	...	...	...	...	...	...
Ecuador	*	...	...	...	...	...	...	...	...	...	...	...	...
Guyana	30 Apr.	—	8	...	...	—	1	...	...	—	—	—	—
Paraguay	25 Jun.	272	140	8	46	25	31	63	56	2	9	100	212
Peru	26 Jun.	211	1,087	6	91	18	29	—	...	1	4	276	912
Suriname	24 Apr.	6	20	—	—	...	...	...	...	1	1	—	5
Venezuela	23 Apr.	3,520	4,791	—	—	—	—	—	—	—	1	890	528
TEMPERATE SOUTH AMERICA													
Argentina	7 May	422	1,477	11	—	58	26	...	...	13	10	696	3,104
Chile	25 Jun.	1,974	3,099	—	...	18	20	1	...	47	73	79	239
Uruguay	25 Jun.	1	69	—	—	—	11	—	1	—	—	180	345

* No 1983 reports received, therefore 1982 data not shown.

— No cases
... Data not available

view of the recent increase in neonatal tetanus incidence. The evaluation team recommended that a household survey be conducted to determine more accurately the incidence of this important and entirely preventable cause of infant mortality.

Editorial note: Ecuador, like all of Latin America, is facing severe economic hardships in the wake of the current global economic recession. Although these hardships have caused most nations to dramatically restrict expenditures across all sectors of their economies, money spent on preventative medicine such as immunizations makes more sense now than ever before in terms of cost effectiveness. Whether countries like Ecuador can stay on course and continue to achieve progress in EPI amidst this crisis may be one of the more severe tests of will that they will have to face.

Cold-Chain Training in Nicaragua

Refrigerator repair and maintenance course

The Nicaraguan Ministry of Health held its first national course on the maintenance and repair of vaccine refrigerators in Managua from 25 April to 17 May, in collaboration with PAHO/WHO and UNICEF. UNICEF provided tools and financial support for the course.

Sixteen persons attended the course, including one Mexican participant. Twenty 8-hour days of class time were devoted to the following topics: basic thermodynamic concepts of refrigeration, basic mechanics of absorption and compression refrigeration systems; refrigerator servicing and maintenance; procedures for detecting refrigeration failure, and repair and replacement of electrical and mechanical parts.

The training was more practical than theoretical, and included both laboratory and classroom work. Each student's progress was evaluated during the course to ensure that he/she understood the concepts and tasks related to each topic. A comparison of pre- and post-test scores revealed that only two of the 17 students failed to grasp the basic procedures involved in refrigerator repair.

Cold-chain logistics course

Managua was also the site of Nicaragua's first EPI cold-chain logistics course held from 9 to 13 May. This course was developed for cold-chain supervisors in order to improve their supervisory skills and thus promote more efficient cold-chain operations.

Eighteen Ministry of Health personnel participated in the course which covered receipt and distribution of vaccines, norms for the storage of vaccine in a refrigerator, operational planning and evaluation of the necessary cold chain equipment, administration and supervision, and the use of evaluation in improving supervision. Two days of the course were devoted to field visits in order to evaluate each student's progress.

The EPI cold-chain logistics course for supervisors was the first of its kind to be held in the Region. Evaluation of the course showed that health personnel became substantially more knowledgeable about cold-chain management. However, a review of the materials showed that the course could be streamlined, devoting more time to delineating the criteria used in cold-chain administration and supervision. Based on the results of this first course, EPI/PAHO will revise the methodology and materials for use in another course to be held in early 1984.

The *EPI Newsletter* is published bimonthly, in English and Spanish, by the Expanded Program on Immunization (EPI) of the Pan American Health Organization, Regional Office for the Americas of WHO. Its purpose is to facilitate the exchange of ideas and information concerning immunization programs in the Region in order to promote greater knowledge of the problems faced and their possible solutions.

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