Rubella Watch

Compendium of Measles Articles

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Pan American Health Organization
Preface

In 1994, the Member States of the Pan American Health Organization/World Health Organization (PAHO/WHO) adopted the initiative to eliminate measles from the Americas. In 2003, they adopted the initiative to eliminate rubella and congenital rubella syndrome (CRS) from the Region. In order to implement both initiatives, vaccination and surveillance strategies were executed with the objective of rapidly reducing the number of new cases and interrupting endemic transmission of both diseases.

It is my privilege to present this compendium designed to tell the story of measles, rubella, and CRS elimination and compiling all the articles published on these diseases in the PAHO/WHO Expanded Program on Immunization (EPI) Newsletter, now the Immunization Newsletter. The objective of the present publication is to document the regional experience. In particular, it aims to convey to countries and other regions of the world the lessons learned, along with experiences gained from other vaccine-preventable disease elimination initiatives and best practices developed. A growing body of knowledge on how to implement these initiatives and achieve the elimination goal has been accumulated over the 15 years of this process.

The compendium also attempts to pay a graphic and written tribute to the legion of men and women—health workers and volunteers—who have contributed to measles and rubella elimination through their work in and with communities, even under unfavorable circumstances. Without their persistence, dedication, and unwavering determination, the initiative could not have moved forward.

The Americas have laid the foundation for the elimination of vaccine-preventable diseases. The experience of the Region in measles and rubella elimination has demonstrated that we can conquer a disease if we work in unison, recognizing the strength of team work and embracing the richness of diversity among people and communities. The pages of this book highlight Pan-Americanism in action, which has promoted continuous exchange and learning between peoples of the Americas.

Finally, this publication contributes to the strengthening of one of PAHO’s institutional principles by which shared information and knowledge is a source of power and serves to improve the condition of all people—pro salute Novi Mundi.

Mirta Roses Periago
Director

Foreword

The partnership between countries and the international community has played a decisive role in the achievement of immunization goals in the Western Hemisphere. The focus of this partnership has been to support country efforts to build robust and equitable national immunization programs that can effectively control vaccine-preventable infectious diseases and respond to emergency epidemics as these arise. The legacy of this joint collaboration is a Region with the world’s lowest morbidity and mortality rates from vaccine-preventable diseases and one of the largest and most sophisticated network embracing countries, civil society, non-governmental organizations, bilateral and multinational organizations, the scientific community, and the private sector.

The proven impact of national immunization programs in the Americas in reducing poor health due to vaccine-preventable diseases has placed immunization goals prominently on the global agenda for sustainable development and poverty reduction. The Region remains a pioneer in generating valuable knowledge and experience in the use of strategies and tactics which continue to benefit immunization programs worldwide. Breakthroughs include critical knowledge in improving managerial capabilities and accountability of public health staff responsible for immunization programs at the national and subnational levels, even in countries undergoing political and economic hardship.

The EPI Newsletter, established in 1979, has chronicled the history of the successful partnership between the Pan American Health Organization (PAHO), national immunizations programs, and the international community, beginning at a time when vaccination coverage for children under the age of 1 year old barely reached 25%–30% for diphtheria, tetanus, pertussis, polio, measles, and tuberculosis, to today’s coverage of over 90%. The EPI Newsletter has documented PAHO’s critical work with countries in establishing an adequate surveillance, services delivery, and diagnostic infrastructure, and in ensuring the utilization of quality vaccines and the presence of regional production capacity for vaccines of public health importance. The EPI Newsletter has underscored the contribution of the Revolving Fund for Vaccine Procurement, created as part of the Expanded Program on Immunization (EPI) 32 years ago. The Revolving Fund is a public good that has facilitated the availability of high-quality vaccines supplied in adequate quantities, in a timely fashion, and at the lowest prices. Likewise, it has highlighted PAHO’s work with its Members States in the achievement of broad-based community and public-private partnerships that continue to bring us closer to realizing the goal of equitable vaccination.

Immunization programs in the Region are now responding to the rapid technological changes in the field of vaccination brought about by the development of new generations of vaccines of public health importance. These vaccines have the potential to simplify immunization delivery, improve the performance of existing vaccines, and protect against other vaccine-preventable diseases. However, this new breed of vaccines is considerably more costly calling for heightened cooperation among public and private partners alike.

I congratulate the EPI Newsletter, as it celebrates its 30 years, for its efforts to keep us abreast of important milestones achieved by the countries of this Region in partnership with the international community and urge it to continue its strategic role of sharing critical information and knowledge that will enable immunization programs throughout the world to face the challenges that lie ahead.

Socorro Gross-Galliano
Assistant Director
Effective knowledge management is essential for improving the efficacy of interventions aimed at increasing gains in health and improving the quality of life of the people of the Americas. The documentation of experiences, lessons learned, and/or good practices in a specific area is a classical example of a public good that has become critically important in a world where booming communication technologies play a dominant role.

This publication is a compendium of all the measles articles published in the Immunization Newsletter, taking on the challenge of systematizing the cumulative experience of the Americas in eliminating rubella and CRS. On reviewing the content of this publication, the reader will discover that the vast national and local experiences presented reflects both the diversity of our Region as well as common epidemiological trends, achievements, and challenges of the elimination initiative.

For almost 30 years, timely dissemination of these experiences through the pages of the Immunization Newsletter has enabled health professionals in the countries to develop and strengthen a wide range of capacities. Many of the articles required the collaboration of these professionals, thus helping to improve their skills in analysis, synthesis, and praxis, demonstrating that knowledge derived from the measles elimination initiative could be applied in daily practice. Scientific writing skills are another competency that was developed, leading to quality improvements in scientific knowledge production in the Region.

Perseverance in the publication of measles articles has contributed to the dissemination of knowledge on the elimination of vaccine-preventable diseases to the Member States of the Pan American Health Organization and to strategic partners. The Region of the Americas is facing a changing landscape, and with it, new challenges to the continued promotion of health and equity. It is therefore essential that inspiring instruments, such as this publication, are available to facilitate the implementation of successful health initiatives and to improve the quality of life in the countries of the Americas. I am certain that this publication will provide a public health legacy for present and future generations.

For 30 years, the Immunization Newsletter has been the mechanism for disseminating information on best practices and lessons learned from the Expanded Program on Immunization (EPI) in the Region of the Americas. Each of its articles has been testimony to the resolve, dreams, hopes, and achievements of intrepid health workers and communities in their efforts to control vaccine-preventable diseases. Examples of these triumphs are the epidemiological control of measles and rubella, which, through the firm tenacity of the countries of the Americas and the Pan American Health Organization/World Health Organization (PAHO/WHO), the lofty dream of a Hemisphere free of measles, rubella, and congenital rubella syndrome (CRS) is becoming a reality.

This compendium of measles and rubella articles presents historical proof of the joint efforts to eliminate the two diseases, thus revealing the commitment, effort, humanity, and extraordinary technical capacity provided at local and national levels to make elimination possible. It also reflects the Pan American spirit and ideal; through united efforts we have made these achievements possible. We cannot forget that this success is a victory of partnerships.

Today, when the world is discussing the possibility of eradicating measles, documentation of the experience of the PAHO/WHO Member States in measles and rubella elimination represents a wealth of knowledge for the annals of public health, promoting equitable access to knowledge and information to foster evidence based decision-making and best practices. The ability to disseminate and share knowledge has been key to the success of the measles and rubella elimination initiatives in our Region: through communication we have been able to inform, encourage, recognize, and motivate the people of the Americas to remain faithful to their intense commitment to equity and to reach the highest attainable level of health for all by all.

May this compendium serve as homage to all those, who from diverse locations, positions, and responsibilities have managed to make the Americas a measles- and rubella-free hemisphere. This publication will surely foster a heightened awareness of history and a better understanding of the present. Above all, it will better prepare us for a bright future in public health, especially in the control of vaccine-preventable diseases.
Testimony of the First Editor

The Pan American Health Organization (PAHO) Expanded Program on Immunization (EPI) was established by Resolution XXVII of the XXV Meeting of the Organization's Directing Council, in September, 1977. In May, 1979, the Program published the first issue of what was then called the EPI Newsletter.

Introducing this PAHO periodical publication, the then Chief of the PAHO’s Division of Disease Control, Dr. Luis Carlos Ochoa, stated that the newsletter was “created in response to the suggestions and recommendations of more than 130 nationals from all the Latin American countries that participated in the four regional EPI courses held from May 1978 to January 1979.” He also stated that the purpose of the periodical publication was “to continue the process begun at these courses, of exchanging skills, knowledge and information relevant to the Expanded Program on Immunization in the Region of the Americas.”

The publication, he stated “was intended to create a flow of information in the Region about all aspects of program implementation, from scientific articles on the target diseases and vaccination to practical matters of the day-to-day running of an immunization program.”

And indeed, over the last 30 years this publication, now called Immunization Newsletter has maintained a high standard of scientific quality in all these aspects serving as one of the main vehicles of information to program managers and policy makers.

Most importantly, the newsletter has stimulated program officers, both at the country level as well as members of the EPI staff at PAHO, to strive to collect and analyze information relevant to program implementation and contribute with articles and news that most certainly have helped set and/or modify strategies relevant to the control and eradication of vaccine-preventable diseases in the Region of the Americas. It has also served as a forum for the discussion of issues and ideas that helped improve the quality of national programs, as well as created an esprit de corps or group morale, among those involved with the program.

I want to take this opportunity to congratulate the entire staff of immunization programs throughout the Region and those at PAHO for the outstanding work that has been developed over these last 30 years, and that have been reflected in the quality of the publication.

Finally, I pay tribute to the Editors and Co-Editors that have followed after my tenure, as well as all the contributors to the various issues of the newsletter, for maintaining the same spirit that guided the launching of this important periodical publication.

Through Information Exchange, Cultivating a Culture of Prevention

In the 32 years since the Expanded Program on Immunization was launched in the Americas, polio has been eradicated and measles has been eliminated. Perhaps more importantly, thousands of health workers working at the point of service have been trained in the principles of good public health practice and prevention. These same health workers have consistently executed the necessary strategies to reduce morbidity and mortality of vaccine-preventable diseases. Improving management of immunization services at district-level is the cornerstone of their work. It is upon this foundation of good public health practice that the vision for future public health improvements rests.

Critical for the progress achieved and this vision of the future has been the sharing of information and experiences between countries. To that end, we believe the EPI Newsletter, subsequently renamed the Immunization Newsletter, has played a vital role in the documentation of strategies and tactics that are successful in reducing the disease burden of vaccine-preventable diseases. Continuously improving the way we manage information should also lead to increased knowledge and improved behavioral practices.

While protecting and sustaining the achievements in polio and measles initiatives, the program is posed to complete and sustain the elimination of rubella and congenital rubella syndrome (CRS). Like polio, CRS causes life-long suffering for children and their families. Efforts to reach and vaccinate adults should impact women’s health given that rubella elimination has reached those who are marginalized and otherwise do not benefit from preventive services.

Ultimately, the future of immunization will hinge upon how well we leverage inter-disciplinary partnerships, and how well we share our experiences in reducing existing health disparities. New, life-saving vaccines must be made available to those who need them most. Within the next 10 years as many as 10 new vaccines may become available. We now have vaccines for prevention of human papillomavirus infection and cervical cancer, but they are not accessible to our communities in need at their current prices. As these vaccines are introduced, PAHO’s role will be to ensure that they are made available in a sustainable fashion to those who need them most, in particular the poor, the underserved, and the marginalized populations of our hemisphere. To that end, the Immunization Newsletter will continue to be ready and willing to support health program services in all Member States of the Pan American Health Organization.
Measles: An Outbreak in Panama City, 1978

Between August 1978 and October 1978, the Office of Epidemiology received reports of 174 cases of measles in the metropolitan area of Panama City.

Active case-finding in the records of the Children’s Hospital by the Central Nursing Bureau of the metropolitan area turned up information on 435 cases of measles treated by the emergency ward, most of which had not been previously seen in health centers.

This showed that the magnitude of the problem was greater than that conveyed by the records of the metropolitan area.

This outbreak occurred barely a year and a half after the end of the previous measles epidemic in this region (Figure 1). In the intervening period (April 1977 to August 1978) there was an average of 15 cases a month. The 32 cases of September are regarded as the onset of the epidemic.

Two deaths were identified during this epidemic, both in the San Miguelito district—a poor quarter of the city. The distribution of the cases reported in the metropolitan area between August and October was as follows (Table 1):


<table>
<thead>
<tr>
<th>Age group</th>
<th>No. of cases</th>
<th>%</th>
<th>Rate per 100,000 inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1 year</td>
<td>40</td>
<td>28.2</td>
<td>265.3</td>
</tr>
<tr>
<td>1–4 years</td>
<td>80</td>
<td>56.0</td>
<td>112.0</td>
</tr>
<tr>
<td>5–9 years</td>
<td>20</td>
<td>14.3</td>
<td>22.0</td>
</tr>
<tr>
<td>10–14 years</td>
<td>10</td>
<td>7.1</td>
<td>14.1</td>
</tr>
<tr>
<td>Not specified</td>
<td>8</td>
<td>6.0</td>
<td>-</td>
</tr>
<tr>
<td>15 years and older</td>
<td>1</td>
<td>0.6</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>174</td>
<td>100</td>
<td>27.5</td>
</tr>
</tbody>
</table>

The sex distribution was even. In regard to age, the highest incidence was among children under one year of age. Forty-eight of the 49 cases in this age group were between 6 and 11 months old.

According to the monthly reports turned in by the health centers, the measles vaccination coverage was as follows (Table 2):

TABLE 2. Measles in the Region of the Americas, 1971–1978 (First semester)

<table>
<thead>
<tr>
<th>Age group</th>
<th>1976</th>
<th>1977</th>
<th>1978 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1 year</td>
<td>33.4%</td>
<td>26.7%</td>
<td>34.4%</td>
</tr>
<tr>
<td>1–4 years</td>
<td>38.1%</td>
<td>59.0%</td>
<td>-</td>
</tr>
</tbody>
</table>

The following vaccination histories were obtained on 10% of the 174 cases reported (Table 3):


<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Vaccinated</th>
<th>Not vaccinated</th>
<th>Unknown</th>
<th>% vaccinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measles</td>
<td>11</td>
<td>56</td>
<td>38</td>
<td>10.5</td>
</tr>
<tr>
<td>DPT</td>
<td>28</td>
<td>44(1)</td>
<td>33</td>
<td>26.7</td>
</tr>
<tr>
<td>Polio</td>
<td>27</td>
<td>45(2)</td>
<td>33</td>
<td>26.7</td>
</tr>
</tbody>
</table>

(1) Includes 17 who did not receive the full course of vaccinations.
(2) Includes 12 who did not receive the full course of vaccinations.

The figures shown that, for every four of these children, only one had been vaccinated for DPT and polio. This means that, just as these children contracted measles, they are in equal danger of contracting any of the other diseases.

The aforementioned survey showed that 72.2% of the affected children had always lived in the same house. Thus, population movements were not a decisive factor in the low vaccination coverage.

Some of the reasons for these children not having been vaccinated are, according to the survey, the following:

a. Failure to show up for appointments even in the wake of household visits.

b. Unverifiable reports by mothers that their children had already had measles.

c. Refusal by the mother to allow her child to be vaccinated.

d. Illness on the day of the appointment.

e. Control in a private clinic.

f. Control in the Social Security service.

The aforementioned examination of all susceptible children and to emphasize the parents’ responsibility for ensuring that this is done.

The establishment of contacts with authorities, national leaders, government organizations, organizational associations and individuals to enlist their influence on segments of the population so as to improve communication between the community and the health institutions.

Tests have recently been completed at a WHO Reference Laboratory comparing the heat stability of measles vaccine produced by several manufacturers. Vaccines stored for varying intervals at 37°C and 45°C were assayed using the microinsus method, with the results being expressed as plaque-forming units (PFU) per single human dose. Two indices of stability were then calculated:

1. The half-life in days, indicating for each temperature the number of days required for the vaccine titre to fall to half its original level; and
2. the number of days required for the vaccine titre to fall to the minimally acceptable level of 103 per single human dose.

The data obtained indicate that wide differences in the stability of freeze-dried vaccines currently exist. At 37°C, half-lives range from 0.62 to 12.2 days, and the time required to reduce the titre to 103 PFU per single human dose ranges from 2.74 to 35.8 days. The best of the vaccines tested should, in the freeze-dried form, be able to withstand exposure to 37°C for 35 to 30 days and to 45°C for four to eight days and still induce immunity, although such storage conditions are hardly to be encouraged.

The use of vaccines with stability characteristics similar to those cited above is recommended in countries in which problems with the cold chain exist. Purchasers of freeze-dried measles vaccines for use in such countries are encouraged to obtain stability data as well as copies of vaccine production and control protocols from the manufacturers.


**1980 February 1980**

### Live Attenuated Measles Vaccine

The fact that live attenuated measles vaccine is manufactured under a number of different brand names often causes problems for program managers in deciding which product to use in the national program. In order to understand how the different brands relate to each other, it is useful to review the history of measles vaccine development.

Over 25 years ago, in 1954, Dr. John Enders succeeded in isolating the measles virus from a boy from Bethesda, Maryland (USA) who was suffering from measles. After isolating the virus on primary tissue culture, Enders was able to adapt and propagate it in CE fibroblasts. The CE adapted strain, which was designated EDMONSTON A, proved to be too virulent for vaccine purposes, therefore Enders applied himself to further attenuating the strain. This was done by means of further passages on CE fibroblasts, giving rise to a second-generation attenuated virus which he named EDMONSTON B. Though this was an improvement on its predecessor, it was still too virulent to be applied on a large scale. Further attenuation, therefore, was essential before the vaccine could receive wider acceptance.

Pursuing this need, laboratories continued to pass EDMONSTON B on CE until a third generation of more attenuated strains was finally developed. These latter strains are known by various names, and differ from each other in the number of times the parent strain, EDMONSTON B, was passed on CE. They provide the seeds for the vaccines now commercially available. The relationship among the different strains is shown in the following list:

1. From EDMONSTON B
   a: Seed strain developed on CE fibroblasts:
      - SCHWARTZ: 85 passages
      - BECKENHAM: 71 passages
      - MORA: 64 passages
      - MILOVANOVIC: 94 passages
   b: Seed strain developed on primary tissue cultures of different species of animals, including CE, and adapted on Human Diploid Wistar 38;

2. At almost the same time as Enders, Smorodintsev in the USSR succeeded in developing on CE a different parent seed known as LENINGRAD 16.

Whether EDMONSTON B or LENINGRAD 16 is used as the seed strain, all vaccine manufacturers prepare the live attenuated measles vaccine by culturing the seed on CE tissue culture, except in the case of Yugoslavia where human diploid tissue culture is used for making vaccines. The measles vaccines supplied through the EPI program in the Americas are all prepared from seeds derived from EDMONSTON B.

Irrespective of their parental lineage, vaccines prepared from the aforementioned strains are very effective, inducing a protective level of HI antibodies which persists for several years after vaccination. This is in contrast to what might be expected, a stronger concentration of viral content per vaccination dose does not necessarily prolong immunity. The immunization dose recommended by WHO is a volume of the vaccine which contains not less than 1,000 TCID50.

Though it has been observed that some vaccines cause more reactions than others, should expect a variable percentage of vaccine recipients designated as Enders, the rate of such reactions with some vaccines is much lower than that with others.

The stability of the vaccine does not depend on the virus, as there is no major difference between strains with regard to their temperature tolerance. More important, no doubt, are the quality of the lyophilization technique and other factors such as the residual moisture content in the dry vaccine and the use of stabilizers. Various stabilizers have been tested, but because proteins could be allergenic, manufacturers are excluding them from their preparations and putting more reliance on a well-balanced system of buffers.
Pan American Health Organization

Rubella Watch EPI Newsletter

Measles in the Region of the Americas, 1978–1979

A total of 261,493 cases of measles were reported to PAHO for 1979 by 28 Member States and Governments in the Region of the Americas. This figure is 26.5% higher than the 192,132 cases reported by those countries for 1978. Table 1 indicates by subregions of the Americas the cases reported for 1978 and 1979. Figure 1 illustrates the subregional rates for 1978 and 1979.

The interpretation and comparison of country or subregional data poses certain difficulties due to the different stages of development of the vaccination activities and reporting systems in each country. Despite this limitation, several trends are still distinguishable in the occurrence and distribution of measles in the Region of the Americas over the last two years.

The greatest increase took place in continental Middle America, and the most notable decrease in the Caribbean.

In North America, while the figures for the subregion as a whole underwent no significant change, a marked difference did emerge in the number of cases reported by each country from one year to the other. In the United States of America there was a 50% drop in the number of cases reported from 1978 to 1979 (26,795 and 13,448, respectively), whereas in Canada the number of cases reported for those years increased 287% (9,823 and 22,527, respectively).

In six Caribbean countries the number of cases reported for 1979 decreased from the 1978 level. Reduction was most pronounced in the cases of Cuba, Jamaica and Grenada. In the Bahamas, Dominica, and the Dominican Republic, on the other hand, the number of cases reported increased in 1979, especially in the two countries.

In continental Middle America, the number of cases increased significantly in 1979 in six of the seven countries. Honduras was the only country which showed a reduction from the 1978 level. The greatest increases in numbers of reported cases were in Costa Rica (361 cases in 1978 and 6,883 in 1979) and Mexico (2,933 cases in 1978 and 33,847 in 1979). In Tropical South America there was an overall increase in the number of cases reported from 1978 to 1979. The largest increase was in Guyana, followed by Ecuador, Peru, and Paraguay. The figures for the other countries remained unchanged or increased only slightly in 1979.

The rise in the number of cases reported in temperate South America was caused chiefly by the increase in Chile (14,269 cases in 1978 and 34,247 in 1979) and Uruguay (5,010 and 1,196 cases, respectively). Argentina, however, reported virtually the same number of cases for the two years (9,551 and 9,800, respectively). It will be observed in this figure that the epidemic peaks characteristic of the years prior to 1972 disappear during the period 1972–1975, when Argentina was implementing a widespread vaccination program. However, in 1975 Argentina suspended vaccination against measles and the number of cases reported began to increase rapidly. The marked increase in the number of measles cases in 1977 and 1978 provides clear evidence of what happens when vaccination activities are interrupted.

During the second semester of 1976, vaccination activities were resumed in time to blunt the effects of the measles epidemic which was then in country. By 1978, a significant reduction in measles morbidity and mortality had been registered, as is shown in Table 1.

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Measles Articles

October 1980
Volume II, Number 5

Observations on an Outbreak of Measles in Serrana Municipality, São Paulo State, Brazil

During December 1979, the district public health team of the Ribeirão Preto subregion began to be alarmed at the relatively large number of hospitalized measles cases reported among the resident population of Serrana Municipality, one of the 12 towns in the health district.

The first case occurred in November 1979, and the others were reported during December, except for one which was reported in January 1980. The shape of the outbreak is illustrated in the following figure.

FIGURE 1
Number of hospitalized measles cases in November and December 1979 and January 1980. Serrana Municipality, São Paulo State, Brazil.

The period studied comprised the months of November and December 1979 and up to the 28th day of January 1980. The survey of the occurrence of cases in the community consisted of a single house-to-house inquiry about cases of measles and other pertinent data for the period in question.

It was found at the outset that seven of the eight measles cases hospitalized during those months came from the same quarter in the town of Serrana: the one most distant from the center and inhabited by the poorest members of the community.

Table 1 illustrates the distribution of the measles cases discovered, by age group, and the attack rates based on the estimated population.

The ages in months of the cases among infants under one year of age are given in Table 4.

It will be noted that three of the eight cases (37.5 percent) were infants under nine months of age, and eight of the 140 cases (5.7%) were under one year of age.

Among the 140 cases there were three deaths from measles, which gave a case fatality rate of 2.1% and a mortality rate of 3.47 per 100,000 inhabitants. One of the deaths was of an infant under one year of age and the other two were in the 1 to 4 year group. No deaths occurred among the hospitalized patients.

The age distribution of the cases is given in Figure 2, which shows the number of cases at each year of age. The Figure shows that the age group most heavily attacked was that of children between 1 and 8 years old. This does not bear out the conventional wisdom that measles is more frequent among the more indigent populations, as was the case in Serrana. However, the outbreak occurred during the summer months, which is not surprising in hot areas where the disease is endemic.

In the survey to detect cases among the population, an attempt was made to discover the measles vaccination history of each individual; the results are presented in Table 5. As can be seen, the proportion of measles cases among vaccinated individuals was relatively high (17.1%). In 68.6% of the cases the patient had not been vaccinated, and in 14.3% the vaccination history was unknown.

A more detailed study was performed in order to correlate the ages at which the patients had been vaccinated against measles and the ages at which they contracted the disease. The results are given in Table 6. Roughly speaking, four cases may be disregarded because they were vaccinated at the same age at which they contracted measles—one at 9 months, one at 1 year and two at 2 years of age. Since the precise dates on which they were vaccinated and on which they contracted the disease are unknown, it cannot be reliably determined whether the infection emerged before the vaccination could confer immunity (assuming, of course, that the vaccine administered was potent).

Disregarding the four cases which caught measles at the same age at which they were vaccinated, there remain 14 cases out of 20 (70%) who were vaccinated at the age of seven months or younger and who then contracted the disease.

The vaccination coverage was found to be inadequate in the one-to-four year age group, but inadequate—in those under one year of age and low in the five- to fourteen year age group. This can be seen in Table 7 which illustrates the results of a survey among 726 inhabitants of the area of the town at highest risk of infection.

The survey data in Table 7 on children under one year of age diverge markedly from the data on children in the same age group vaccinated during 1979 in the entire population, according to information of the
The single outbreak, which began 9 September and is still being investigated, occurred in Warren County, Virginia. The index patient was a 15-year-old girl, who had been exposed to the disease in England. A rash developed after she returned to Virginia on 9 September. Four of her siblings subsequently had onset of measles from 18–21 September. An additional 27 suspected cases—all in persons attending the same private day school in Rappahannock County—are being investigated in five contiguous counties. Nationwide, 12,881 cases of measles were reported for the first 39 weeks of this year. This is second only to last year’s total (12,207) as being the lowest ever recorded for a comparable period. Actually, the incidence of measles this year has been lower than in 1979 for all periods except 23 March–12 July (weeks 13–29, Figure 2). as four consecutive measles-free weeks this year.

During the first 39 weeks of 1980, 20 states had a measles incidence of >10/100,000 among persons <18 years old, whereas 24 states reported such rates in 1979. Thus far in 1980, nine states have reported a measles incidence of <1/100,000, as did only five states in the same period last year.

Reported by R.H. Wood, MD, G.A. Dengel, MD, P.D. Pedersen, MD, Warren County Health Dept; J. Eiranond, MD, Rappahannock County, Virginia; D. Hillier, MD, State Epidemiologist, Virginia; B. Rappahannock County, Virginia; State Dept of Health; and Immunization Div, Bur. of State Services. CDC.


**Figures**

**FIGURE 1. U.S. Counties* with measles, week ending 27 September 1980.**

*In CALIFORNIA: Contro Costa, Glenn, Imperial, Los Angeles, San Diego, San Francisco, and Tulare counties; RUTHERFORD: Howard and Hardin counties; SOUTHERN: Campbell, Colusa, Glenn, Lake, Merced, Madera, Sutter, Yuba, Yolo counties.

**FIGURE 2. Reported measles cases, by 4-week period, 1979–1980.**

*Through the 36th reporting week.*

*2-week period.*

---

**Table 6. Comparison between age of vaccination against measles and age at which the disease was subsequently contracted. Cases during November and December 1979 and January 1980, Serrana, São Paulo State, Brazil.**

<table>
<thead>
<tr>
<th>Age group</th>
<th>Population studied</th>
<th>First dose %</th>
<th>Booster %</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>12</td>
<td>4</td>
<td>48.7</td>
</tr>
<tr>
<td>1–4 years</td>
<td>88</td>
<td>59.3</td>
<td>63.0</td>
</tr>
<tr>
<td>&gt;4 years</td>
<td>415</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>515</td>
<td>4</td>
<td>48.7</td>
</tr>
</tbody>
</table>

*Vaccination performed beginning at seven months of age.

Source: Vaccination records of the local health unit.

---

**Table 7. Coverages of measles vaccination in a sample of residents of the highest risk area in Serrana, São Paulo State, Brazil, January 1980.**

<table>
<thead>
<tr>
<th>Age group</th>
<th>Population studied</th>
<th>No. vaccinated</th>
<th>First dose %</th>
<th>Booster %</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>12</td>
<td>4</td>
<td>48.7</td>
<td></td>
</tr>
<tr>
<td>1–4 years</td>
<td>88</td>
<td>59.3</td>
<td>63.0</td>
<td></td>
</tr>
<tr>
<td>&gt;4 years</td>
<td>415</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>515</td>
<td>4</td>
<td>48.7</td>
<td></td>
</tr>
</tbody>
</table>

Source: Householder epidemiological survey.

---

**Table 8. Monthly measles vaccination coverage of children under one year of age* during 1979 in Serrana, São Paulo State. Population officially estimated at 219 children.**

<table>
<thead>
<tr>
<th>Month</th>
<th>No. vaccinated</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>10</td>
<td>4.6</td>
</tr>
<tr>
<td>February</td>
<td>18</td>
<td>12.8</td>
</tr>
<tr>
<td>March</td>
<td>24</td>
<td>23.7</td>
</tr>
<tr>
<td>April</td>
<td>19</td>
<td>32.4</td>
</tr>
<tr>
<td>May</td>
<td>18</td>
<td>40.6</td>
</tr>
<tr>
<td>June</td>
<td>25</td>
<td>52.0</td>
</tr>
<tr>
<td>July</td>
<td>38</td>
<td>69.4</td>
</tr>
<tr>
<td>August</td>
<td>28</td>
<td>82.2</td>
</tr>
<tr>
<td>September</td>
<td>32</td>
<td>96.8</td>
</tr>
<tr>
<td>October</td>
<td>29</td>
<td>110.0</td>
</tr>
<tr>
<td>November</td>
<td>46</td>
<td>131.0</td>
</tr>
<tr>
<td>December</td>
<td>25</td>
<td>142.5</td>
</tr>
<tr>
<td>Total</td>
<td>312</td>
<td>142.5</td>
</tr>
<tr>
<td>Monthly average</td>
<td>26</td>
<td>11.9</td>
</tr>
</tbody>
</table>

*Beginning at seven months of age.

Source: Records of the local health unit.

---

**Table 9. Distribution of first dose and booster shot of measles vaccine administered, by age group, between 17 and 28 January 1980 in Serrana, São Paulo State, Brazil.**

<table>
<thead>
<tr>
<th>Age group</th>
<th>No. vaccinated</th>
<th>First dose %</th>
<th>Booster %</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>12</td>
<td>4</td>
<td>48.7</td>
</tr>
<tr>
<td>1–4 years</td>
<td>88</td>
<td>59.3</td>
<td>63.0</td>
</tr>
<tr>
<td>&gt;4 years</td>
<td>415</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>515</td>
<td>4</td>
<td>48.7</td>
</tr>
</tbody>
</table>

---

**Pan American Health Organization**

**Rubella Watch**

**EPI Newsletter**

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**Editorial Note:**

A study to determine the optimum age for measles vaccination in progress under the auspices of PSIMO/WHO and four Latin American countries, including Brazil (see Boletim Epidemiológenico XI (4), 1979). This study is necessary because, unlike temperate-zone countries where hereditary immunity is maintained for up to 1 year or slightly longer after birth, in tropical countries it is lost earlier.

**Source:** Boletim Epidemiológico XI (4), 1979.
Measles Vaccine Efficacy: United States

From July 1978 through October 1979, 24 centers in 23 states submitted such information on their reported measles cases. This included data as vaccination status (where known) and vaccination histories, concern has been raised about vaccine efficacy--both initial and long-term. Vaccine efficacy cannot be evaluated without the proper documentation on vaccine efficacy (VE).

The outbreak began in the city, had the largest number of cases in the central part of the country in August 1979, and at the end of the year the number of cases reported in the southern area increased. Figure 1 shows the distribution of cases by month.

Table 1 presents the total number of measles cases; reported in Costa Rica in 1979, together with the percentage distribution and rate for each age group.

Table 2. Measles cases notified by month, Costa Rica, 1979.

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of cases notified</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>50</td>
</tr>
<tr>
<td>F</td>
<td>60</td>
</tr>
<tr>
<td>M</td>
<td>70</td>
</tr>
<tr>
<td>A</td>
<td>80</td>
</tr>
<tr>
<td>J</td>
<td>90</td>
</tr>
<tr>
<td>S</td>
<td>100</td>
</tr>
<tr>
<td>O</td>
<td>110</td>
</tr>
<tr>
<td>N</td>
<td>120</td>
</tr>
</tbody>
</table>

Figure 1 shows the distribution of cases by month. The majority of cases reported in April occurred among schoolchildren. Epidemiological investigation showed that many of these children had not been vaccinated and that they had been in contact with Nicaraguan children who had measles. This situation changed rapidly and soon children under one year of age constituted the most affected group. Up to then, measles vaccine had been administered at one year of age. Starting in May, vaccination began at six months of age.

Table 1. Measles cases, by age group, Costa Rica, 1979.

<table>
<thead>
<tr>
<th>Age group</th>
<th>Number of cases</th>
<th>Percentage</th>
<th>Rate per 1,000 inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 year</td>
<td>1,413</td>
<td>21.4</td>
<td>20.5</td>
</tr>
<tr>
<td>1 year</td>
<td>1,217</td>
<td>18.4</td>
<td>19.0</td>
</tr>
<tr>
<td>2 years</td>
<td>173</td>
<td>8.7</td>
<td>8.7</td>
</tr>
<tr>
<td>3 years</td>
<td>287</td>
<td>5.9</td>
<td>7.0</td>
</tr>
<tr>
<td>4 years</td>
<td>216</td>
<td>4.5</td>
<td>5.6</td>
</tr>
<tr>
<td>5-9 years</td>
<td>1,088</td>
<td>16.5</td>
<td>3.2</td>
</tr>
<tr>
<td>10-14 years</td>
<td>723</td>
<td>11.1</td>
<td>2.3</td>
</tr>
<tr>
<td>15 years or more</td>
<td>894</td>
<td>13.5</td>
<td>9.8</td>
</tr>
<tr>
<td>Total</td>
<td>6,606</td>
<td>100.0</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Reference:

Measles: Costa Rica, 1979

In 1979, 6,601 cases of measles, including 31 deaths, were reported in Costa Rica; this is equivalent to a morbidty rate of 3.1 per 1,000 and a case fatality rate of 0.46%.

In the years 1976, 1977, and 1978, the total numbers of cases reported were 1,664, 1932, and 342, respectively.

All five health regions of the country reported cases in 1979. Region 1, which includes the city, had the largest number of cases (1,261) and highest morbidity rate (4.3 per 1,000).

Measles outbreak began in the central part of the country (Region 1), which is more urban, and spread toward the Pacific area (see Map 1). A focus was discovered in the northern part of the country in August 1979, and at the end of the year the number of cases reported in the southern area increased.

Figure 1 shows the distribution of cases by month. The majorit of cases reported in April occurred among schoolchildren. Epidemiological investigation showed that many of these children had not been vaccinated and that they had been in contact with Nicaraguan children who had measles. This situation changed rapidly and soon children under one year of age constituted the most affected group. Up to then, measles vaccine had been administered at one year of age. Starting in May, vaccination began at six months of age.

Table 1 presents the total number of measles cases; reported in Costa Rica in 1979, together with the percentage distribution and rate for each age group.

Of the 1,413 cases in infants less than 1 year old, 312 occurred in the age group from 0 to 5 months old (equivalent to a rate of 9.2 per 1,000 inhabitants) and 1,101 in the group from 6 to 11 months old (a rate of 31.5 per 1,000).

Of the 31 deaths registered, 13 occurred without medical assistance, six of them (three infants of 3 months, a child of 11 years, and two adults) in an American Indian population in southern Costa Rica. Table 2 shows case fatality rates in different age groups.

Table 1. Measles cases, by age group, Costa Rica, 1979.

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<tr>
<td>3 years</td>
<td>287</td>
<td>5.9</td>
<td>7.0</td>
</tr>
<tr>
<td>4 years</td>
<td>216</td>
<td>4.5</td>
<td>5.6</td>
</tr>
<tr>
<td>5-9 years</td>
<td>1,088</td>
<td>16.5</td>
<td>3.2</td>
</tr>
<tr>
<td>10-14 years</td>
<td>723</td>
<td>11.1</td>
<td>2.3</td>
</tr>
<tr>
<td>15 years or more</td>
<td>894</td>
<td>13.5</td>
<td>9.8</td>
</tr>
<tr>
<td>Total</td>
<td>6,606</td>
<td>100.0</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Table 2. Measles cases notified by month, Costa Rica, 1979.

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of cases notified</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>50</td>
</tr>
<tr>
<td>F</td>
<td>60</td>
</tr>
<tr>
<td>M</td>
<td>70</td>
</tr>
<tr>
<td>A</td>
<td>80</td>
</tr>
<tr>
<td>J</td>
<td>90</td>
</tr>
<tr>
<td>S</td>
<td>100</td>
</tr>
<tr>
<td>O</td>
<td>110</td>
</tr>
<tr>
<td>N</td>
<td>120</td>
</tr>
</tbody>
</table>

Figure 1 shows the distribution of cases by month. The majority of cases reported in April occurred among schoolchildren. Epidemiological investigation showed that many of these children had not been vaccinated and that they had been in contact with Nicaraguan children who had measles. This situation changed rapidly and soon children under one year of age constituted the most affected group. Up to then, measles vaccine had been administered at one year of age. Starting in May, vaccination began at six months of age.
Rubella Watch
EPI Newsletter

February 1981
Volume III, Number 1

Argentina: Compulsory Vaccination Certificate for Admission to Public and Private School

By Resolution No. 3845/80 of the Ministries of Social Welfare and of Culture and Education, presentation of the measles vaccination certificate has been made compulsory for admission to primary and pre-primary school.

Exempt from this obligation are children who have had measles, for whom a medical certificate to that effect must be presented.

The measles vaccination will be performed in accordance with current health standards by the competent health authorities (whether national, provincial, municipal), which will issue the appropriate certificate.

Whenever the epidemiological situation makes it advisable to do so, the health authority may order the vaccination of susceptible children who entered school before the resolution went into effect, or revaccination if the circumstances warrant. This vaccination or revaccination may also be performed on school premises in a coordinated operation of the health and education areas.

The provisions of this resolution also apply in the primary and pre-primary schools functioning under the Ministry of Culture and Education.

Thus, the provinces, the national territory of Tierra del Fuego, Antarctica, and the South Atlantic Islands, and Buenos Aires municipality may join the system under agreements to be signed through the Ministries of Social Welfare and of Culture and Education for purposes of implementing the resolution in public and private schools in their jurisdictions.

The preamble to the resolution states that measles is a major health problem in the country because of its extensive contribution to infant mortality and morbidity, that vaccination programs and campaigns have not yet attained the expected epidemiological results for total control of the disease, and that the magnitude of the harm to children warrants extraordinary measures to consolidate the benefits obtained.

"Ensuring that the child is immune on admission to school," it states, "guarantees that the spread of the disease in schools is will be avoided, and there with the repercussions that would ensue for the family and the community at risk." The preamble adds that "it is the duty of the health and education authorities to provide the means for protecting the population from preventable diseases.

The resolution complements the health measures taken by the State Secretariat for Public Health which, in intensified immunizations vaccination campaigns since 1976, have been able to reduce the incidence of the disease to the lowest levels known in the country in the last decade.

For the first 14 weeks of 1981, a total of 778 cases have been reported. For the first 44 weeks of 1981, there were reported

For 34 consecutive weeks, fewer than 100 cases per week have been reported in the United States. The number reported per week in this period has ranged from 13, an all-time low for any given week, to 88, and has averaged 44 cases per week.

This extended period of low measles activity is unprecedented in the United States. The previous record low period was in 1979 when for 12 consecutive weeks fewer than 100 measles cases per week were reported. If present trends continue, fewer than 300 measles cases will be reported in 1981, an average of less than one case per county. Particularly striking through this first 14 weeks of 1981 is the absence of the expected seasonal increase in numbers of reported cases of measles (Figure 1). Thus, the current national Measles Elimination Program appears to have brought about dramatic reductions in measles incidence and to have altered one of the characteristic features of the epidemiology of measles in the United States.

The pattern of age distribution by regions, as shown in Table 2.

The frequency is still highest among infants under 1 year of age. Since there are no cases of measles in infants under 6 months, the specific rate is double.

The norm for measles immunization in Costa Rica is to vaccinate children against measles at 6 months of age and to administer another dose against measles-rubella one year later.

April 1981
Volume III, Number 2

Epidemic Outbreak of Measles in Three Central Provinces of Chile

Vaccination against measles has been systematically practiced in Chile since 1964. Nationwide coverage has been satisfactory, reaching 81 percent of infants. Vaccination is indicated at the age of eight months and is confirmed to a single dose.

Mortality has declined remarkably, from 3,264 deaths when the program was launched (a rate of 38.6 per 100,000), to only five deaths in 1979 and 55 in 1978. However, morbidity and mortality took a sudden upward in 1978 and rose steeply through 1979 (See Table I), during which the year the number of deaths tripled to a total of 154. These deaths were associated with an epidemic that struck with varying intensity in different parts of the country and was of considerable magnitude in the Maule region, which consists of the provinces of Talca, Curicó, and Linares, with mainly rural populations.

The epidemic outbreak began in the second half of 1978 and continued through 1979, reaching its lowest intensity in the second half of that year. The highest number of cases was 1,156 (a rate at 1,308.21 cases per 100,000 inhabitants) which was recorded in an area of Linares-Maule Province (the communes of Peral, Caquenes and Chanco, with a total population of 89,773), the smallest in the region.

Measles in Costa Rica, 1980

Following the 1979 outbreak of measles in Costa Rica (see EPI Bulletin, Vol. III, No.1), the incidence of measles dropped to endemic levels. However the Atlantic region, one of those least affected during 1979, with 143 cases per 100,000 inhabitants, was the scene of an outbreak of rubella in 1980.

TABLE 1. Reported cases of measles and rubella, by region, Costa Rica, 1980.

<table>
<thead>
<tr>
<th>Region</th>
<th>No. of cases</th>
<th>Rate/100,000 inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>98</td>
<td>48.0</td>
</tr>
<tr>
<td>North</td>
<td>135</td>
<td>26.8</td>
</tr>
<tr>
<td>Chontoe</td>
<td>86</td>
<td>27.2</td>
</tr>
<tr>
<td>Huartal Atlantic</td>
<td>325</td>
<td>90.0</td>
</tr>
<tr>
<td>Bruncia</td>
<td>128</td>
<td>63.7</td>
</tr>
<tr>
<td>Total</td>
<td>972</td>
<td>45.7</td>
</tr>
</tbody>
</table>

Reported by Surveillance and Assessment Br. Immunization Div., for Prevention Services, Centers for Disease Control, Atlanta, Ga., U.S.A.


<table>
<thead>
<tr>
<th>Year</th>
<th>1979</th>
<th>1980</th>
<th>1981</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>122</td>
<td>142</td>
<td>144</td>
</tr>
<tr>
<td>2-4</td>
<td>146</td>
<td>154</td>
<td>158</td>
</tr>
<tr>
<td>5-7</td>
<td>188</td>
<td>189</td>
<td>193</td>
</tr>
<tr>
<td>8-10</td>
<td>238</td>
<td>242</td>
<td>247</td>
</tr>
<tr>
<td>11-13</td>
<td>328</td>
<td>347</td>
<td>352</td>
</tr>
<tr>
<td>14+</td>
<td>483</td>
<td>502</td>
<td>510</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>1979</th>
<th>1980</th>
<th>1981</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
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<td>158</td>
</tr>
<tr>
<td>5-7</td>
<td>188</td>
<td>189</td>
<td>193</td>
</tr>
<tr>
<td>8-10</td>
<td>238</td>
<td>242</td>
<td>247</td>
</tr>
<tr>
<td>11-13</td>
<td>328</td>
<td>347</td>
<td>352</td>
</tr>
<tr>
<td>14+</td>
<td>483</td>
<td>502</td>
<td>510</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Region</th>
<th>No. of cases</th>
<th>Rate/100,000 inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>100</td>
<td>44</td>
</tr>
<tr>
<td>Huartal North</td>
<td>37</td>
<td>24</td>
</tr>
<tr>
<td>Chontoe</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>Huartal Atlantic</td>
<td>46</td>
<td>88</td>
</tr>
<tr>
<td>Bruncia</td>
<td>27</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>252</td>
<td>180</td>
</tr>
</tbody>
</table>

Table 1 presents data on the different regions and the rates per 100,000 inhabitants.

The number of measles cases by age group and specific rate per 100,000 inhabitants, Costa Rica, 1980.

<table>
<thead>
<tr>
<th>Age group</th>
<th>No. of cases</th>
<th>Specific rate/1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>252</td>
<td>3.6</td>
</tr>
<tr>
<td>1 year</td>
<td>180</td>
<td>2.8</td>
</tr>
<tr>
<td>2–4 years</td>
<td>193</td>
<td>1.6</td>
</tr>
<tr>
<td>&gt;4 years</td>
<td>327</td>
<td>0.2</td>
</tr>
</tbody>
</table>

The 1980 incidence rate in the United States was 1,196 (a rate at 1,338.2 cases per 100,000 inhabitants) which was recorded in an area of Linares-Maule Province (the communes of Peral, Caquenes and Chanco, with a total population of 89,773), the smallest in the region.

The epidemic outbreak began in the second half of 1978 and continued through 1979, reaching its lowest intensity in the second half of that year. The highest number of cases was 1,196 (a rate at 1,338.2) which was recorded in an area of Linares-Maule Province (the communes of Peral, Caquenes and Chanco, with a total population of 89,773), the smallest in the region.

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The epidemic outbreak began in the second half of 1978 and continued through 1979, reaching its lowest intensity in the second half of that year. The highest number of cases was 1,196 (a rate at 1,338.2) which was recorded in an area of Linares-Maule Province (the communes of Peral, Caquenes and Chanco, with a total population of 89,773), the smallest in the region.
The most frequent complications were bronchopneumonia, laryngotracheitis, tracheitis and other lesser conditions. Of the total number of patients reported, 39.3% required hospitalization in Curicó. 19.2 percent in Talca, and 22.6% in Linares-Cauquenes. There were no deaths.

It is interesting to note that a sizable proportion of the children who fell ill had previously been vaccinated, as shown in Table 2.

To appreciate the true significance of these figures, cohorts must be studied on the basis of their age and year of birth. The situation, which coincides with an epidemic increase in the incidence of measles throughout the country during 1978 and 1979, has prompted the authorities to review carefully all the stages of the cold chain; storage, shipment and subsequent treatment. It can be seen that these numbers peak during the months of late winter and early spring.

Seasonal Variation
Cases of measles can turn up at any time of the year, but epidemics generally break out at the end of winter. In Figure 2, which shows the distribution of cases in Rio Grande do Sul by month of onset, it can be seen that these numbers peak during the months of late winter and early spring.

**TABLE 1. Measles incidence per 100,000 inhabitants, by age group. Rio Grande do Sul, Brazil, 1974-1980**

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 months</td>
<td>278</td>
<td>12.6</td>
<td>256</td>
<td>10.6</td>
</tr>
<tr>
<td>5-9 months</td>
<td>369</td>
<td>16.3</td>
<td>342</td>
<td>14.1</td>
</tr>
<tr>
<td>10-14 years</td>
<td>605</td>
<td>27.2</td>
<td>576</td>
<td>23.7</td>
</tr>
<tr>
<td>Total</td>
<td>952</td>
<td>42.4</td>
<td>875</td>
<td>35.4</td>
</tr>
</tbody>
</table>

**TABLE 2. Mean number of measles cases and percentage distribution, by age group. Rio Grande do Sul, 1974-1977 and 1978-80**

<table>
<thead>
<tr>
<th>Age group</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 months</td>
<td>278</td>
<td>12.6</td>
<td>256</td>
<td>10.6</td>
</tr>
<tr>
<td>5-9 months</td>
<td>369</td>
<td>16.3</td>
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</tr>
<tr>
<td>10-14 years</td>
<td>605</td>
<td>27.2</td>
<td>576</td>
<td>23.7</td>
</tr>
<tr>
<td>Total</td>
<td>952</td>
<td>42.4</td>
<td>875</td>
<td>35.4</td>
</tr>
</tbody>
</table>

**Figure 1**
Rates of incidence (per 100,000 population) and mortality from measles. Rio Grande do Sul, Brazil, 1970-80.

**Figure 2**
Mean number of measles cases, by month of onset. Rio Grande do Sul, Brazil, 1975-80.

**Table 3. Measles vaccination coverage, by year, Region VII, 1969-1979.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Country</th>
<th>Rate</th>
<th>VII Region</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>Curicó</td>
<td>53.4</td>
<td>Talca</td>
<td>54.0</td>
</tr>
<tr>
<td>1970</td>
<td>Curicó</td>
<td>53.4</td>
<td>Talca</td>
<td>54.0</td>
</tr>
<tr>
<td>1971</td>
<td>Curicó</td>
<td>53.4</td>
<td>Talca</td>
<td>54.0</td>
</tr>
<tr>
<td>1972</td>
<td>Curicó</td>
<td>53.4</td>
<td>Talca</td>
<td>54.0</td>
</tr>
<tr>
<td>1973</td>
<td>Curicó</td>
<td>53.4</td>
<td>Talca</td>
<td>54.0</td>
</tr>
<tr>
<td>1974</td>
<td>Curicó</td>
<td>53.4</td>
<td>Talca</td>
<td>54.0</td>
</tr>
<tr>
<td>1975</td>
<td>Curicó</td>
<td>53.4</td>
<td>Talca</td>
<td>54.0</td>
</tr>
<tr>
<td>1976</td>
<td>Curicó</td>
<td>53.4</td>
<td>Talca</td>
<td>54.0</td>
</tr>
<tr>
<td>1977</td>
<td>Curicó</td>
<td>53.4</td>
<td>Talca</td>
<td>54.0</td>
</tr>
<tr>
<td>1978</td>
<td>Curicó</td>
<td>53.4</td>
<td>Talca</td>
<td>54.0</td>
</tr>
<tr>
<td>1979</td>
<td>Curicó</td>
<td>53.4</td>
<td>Talca</td>
<td>54.0</td>
</tr>
<tr>
<td>1980</td>
<td>Curicó</td>
<td>53.4</td>
<td>Talca</td>
<td>54.0</td>
</tr>
</tbody>
</table>

**Table 4. Measles incidence per 100,000 inhabitants, by age group. Rio Grande do Sul, 1970-80.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>278</td>
<td>12.6</td>
<td>256</td>
<td>10.6</td>
</tr>
<tr>
<td>1975</td>
<td>369</td>
<td>16.3</td>
<td>342</td>
<td>14.1</td>
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<tr>
<td>1976</td>
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<td>27.2</td>
<td>576</td>
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</tr>
<tr>
<td>Total</td>
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<td>42.4</td>
<td>875</td>
<td>35.4</td>
</tr>
</tbody>
</table>

**Figure 3**
The effectiveness of the case-reporting system may be judged from the parallelism between the curves for incidence and mortality in recent years.

Regular measles vaccination in the health units of the Secretariat for Health and the Environment began in 1973. The launching of this activity was followed by a sharp drop in the number of cases. Today, however, despite coverage of about 80% in many municipalities, incidence remains high.

In 1980, 12,424 cases were reported, an increase of 19.25 percent over the previous year, but still short of the epidemic threshold calculated for the period.

Mortality rates, while keeping pace with the trend of morbidity, definitely account for only part of all the deaths from measles. Many of these deaths are still reported as resulting from one or another of the complications of the disease—bronchopneumonia, encephalitis, etc.—which shows that more care must be taken to fill out death certificates correctly.

**Table 5. Measles incidence per 100,000 inhabitants, by age group. Rio Grande do Sul, 1970-80.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 months</td>
<td>278</td>
<td>12.6</td>
<td>256</td>
<td>10.6</td>
</tr>
<tr>
<td>5-9 months</td>
<td>369</td>
<td>16.3</td>
<td>342</td>
<td>14.1</td>
</tr>
<tr>
<td>10-14 years</td>
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</tr>
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<td>Total</td>
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<td>35.4</td>
</tr>
</tbody>
</table>

**Figure 4**
Mean number of measles cases, by month of onset. Rio Grande do Sul, Brazil, 1975-80.

**Table 6. Measles incidence per 100,000 inhabitants, by age group. Rio Grande do Sul, 1970-80.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 months</td>
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</tbody>
</table>

**Figure 5**
Mean number of measles cases, by month of onset. Rio Grande do Sul, Brazil, 1975-80.

**Table 7. Measles incidence per 100,000 inhabitants, by age group. Rio Grande do Sul, 1970-80.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
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</tr>
</thead>
<tbody>
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<td>256</td>
<td>10.6</td>
</tr>
<tr>
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<td>369</td>
<td>16.3</td>
<td>342</td>
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</tr>
<tr>
<td>10-14 years</td>
<td>605</td>
<td>27.2</td>
<td>576</td>
<td>23.7</td>
</tr>
<tr>
<td>Total</td>
<td>952</td>
<td>42.4</td>
<td>875</td>
<td>35.4</td>
</tr>
</tbody>
</table>

**Figure 6**
Mean number of measles cases, by month of onset. Rio Grande do Sul, Brazil, 1975-80.

**Table 8. Measles incidence per 100,000 inhabitants, by age group. Rio Grande do Sul, 1970-80.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 months</td>
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<td>12.6</td>
<td>256</td>
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</tr>
<tr>
<td>5-9 months</td>
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<td>342</td>
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</tr>
<tr>
<td>10-14 years</td>
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<td>27.2</td>
<td>576</td>
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</tr>
<tr>
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</tr>
</tbody>
</table>

**Figure 7**
Mean number of measles cases, by month of onset. Rio Grande do Sul, Brazil, 1975-80.

**Table 9. Measles incidence per 100,000 inhabitants, by age group. Rio Grande do Sul, 1970-80.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
<th>Mean no. of cases</th>
<th>Cumul. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 months</td>
<td>278</td>
<td>12.6</td>
<td>256</td>
<td>10.6</td>
</tr>
<tr>
<td>5-9 months</td>
<td>369</td>
<td>16.3</td>
<td>342</td>
<td>14.1</td>
</tr>
<tr>
<td>10-14 years</td>
<td>605</td>
<td>27.2</td>
<td>576</td>
<td>23.7</td>
</tr>
<tr>
<td>Total</td>
<td>952</td>
<td>42.4</td>
<td>875</td>
<td>35.4</td>
</tr>
</tbody>
</table>

**Figure 8**
Mean number of measles cases, by month of onset. Rio Grande do Sul, Brazil, 1975-80.
Rubella Watch  EPI Newsletter


Only a few of the hemisphere’s countries were able to reduce their annual measles mortality to less than one death per 100,000 population during the 1970s. That reduction was the goal for measles control in the Ten-Year Health Plan for the Americas, which came to an end last year.

Information on the annual occurrence of measles cases during the 1970s was received from 30 to 32 of the countries in the Americas, depending on the year. The total number of cases reported annually ranged from 177,278 in 1975 to 313,512 in 1971, with a mean of 254,161 cases.

Measles incidence in the Americas ranged from a high of 169.4 cases per 100,000 population in 1977 in the Middle American Caribbean to a low of 10.4 cases in 1974.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>254,161</td>
</tr>
<tr>
<td>1972</td>
<td>213,532</td>
</tr>
<tr>
<td>1973</td>
<td>184,176</td>
</tr>
<tr>
<td>1974</td>
<td>121,306</td>
</tr>
<tr>
<td>1975</td>
<td>177,278</td>
</tr>
<tr>
<td>1976</td>
<td>169.4</td>
</tr>
<tr>
<td>1977</td>
<td>313,512</td>
</tr>
<tr>
<td>1978</td>
<td>254,161</td>
</tr>
<tr>
<td>1979</td>
<td>213,532</td>
</tr>
<tr>
<td>1980</td>
<td>184,176</td>
</tr>
<tr>
<td>1981</td>
<td>121,306</td>
</tr>
</tbody>
</table>

Table 1. Measles importations into the United States from other American countries. 10 December 1979–10 October 1981.

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of importations</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>38</td>
<td>46.3</td>
</tr>
<tr>
<td>Canada</td>
<td>15</td>
<td>18.3</td>
</tr>
<tr>
<td>Venezuela</td>
<td>9</td>
<td>11.0</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>4</td>
<td>4.9</td>
</tr>
<tr>
<td>Jamaica</td>
<td>4</td>
<td>4.9</td>
</tr>
<tr>
<td>Trinidad</td>
<td>3</td>
<td>3.8</td>
</tr>
<tr>
<td>Bahamas</td>
<td>2</td>
<td>2.4</td>
</tr>
<tr>
<td>Honduras</td>
<td>2</td>
<td>2.4</td>
</tr>
<tr>
<td>Argentinia</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>Barbados</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>Colombia</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>Guyana</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Figure 4. Measles importations into the United States by 10 October 1981 from other countries.

The proportion of imported measles cases arriving from Western Hemisphere countries increased during the 21-month period. Two countries sharing land borders with the United States—Canada and Mexico— accounted for the majority of these importations. This may reflect the sizable movement of persons between the United States and those countries. A rising proportion of imported cases occurred among returning U.S. citizens.

Every state in the United States requires that a child have proof of measles immunity before entering school, consisting of a written record at the time he/she is enrolled. Therefore, children who enter the United States plan to enroll in school should be vaccinated against measles (unless contraindicated) and retain written documentation. It is suggested that children who do not plan to enroll in school (e.g., tourists, preschoolers) also have documentation of measles immunity before entering the United States.
Measles Articles

through the magnitudes of the incidence and the years varied, the Middle American Caribbean and tropical and temperate South America showed increased incidence patterns every two to three years. continental Middle America exhibited larger variations in incidence between peak years, with low-incidence periods of three to four years, and Northern America had a five-year interval between major rises in incidence.

A total of 101,807 measles deaths were reported in the

<table>
<thead>
<tr>
<th>TABLE 1. Age distribution of reported measles cases and deaths and age-specific mortality by geographic region in the Americas, 1971-80.*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age groups</strong></td>
</tr>
<tr>
<td>(in years)</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Less than 1</td>
</tr>
<tr>
<td>1-4</td>
</tr>
<tr>
<td>5-9</td>
</tr>
<tr>
<td>10-14</td>
</tr>
<tr>
<td>15-19</td>
</tr>
<tr>
<td>20 or older</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

*Where the ages were reported as unknown, the age distribution of the known data was calculated, and the cases were distributed accordingly.

In all regions except Northern America infants under 1 year old were the group with the highest age-specific mortalities. In North America, the highest age-specific mortalities seen in infants less than 1 year old. These data will be published and readers will be advised as soon as they are available.

February 1982
Volume IV, Number 1

International Measles Immunization Symposium

New Brunswick is First Canadian Province to Pass Compulsory Immunization Law

New Brunswick is the first Canadian province to pass legislation requiring proof of immunization as a condition for school entry. Starting with the 1982 school year, children entering the province’s school system for the first time will have to show proof of immunization or a documented history of natural infection before being admitted.

Proof of immunization will be required against diphtheria, tetanus, poliomyelitis, measles, mumps, and rubella. Exemptions will be granted in cases where vaccination is contraindicated and for children whose parents have a personal or philosophical objection to vaccination.

This legislation was passed under the Schools Act and supported by legislation under the Health Act. All 50 states in the United States have similar legislation.

Source: Dr. C. Devadason, Director, Communicable Disease Control, Department of Health, New Brunswick, Canada.

February 1982
Volume IV, Number 1

International Measles Immunization Symposium

An international symposium on measles immunization will take place from 16 to 19 March at PAHO Headquarters in Washington. The symposium is sponsored by the Fogarty International Center of the U.S. National Institutes of Health and several bilateral and multilateral agencies, including PAHO and WHO.

Symposium participants will gauge the impact of measles in the world today, paying particular attention to the status of immunization programs in countries with and without special vaccination programs. They will also discuss the characteristics of currently available measles vaccines, assess the impact and success of measles control efforts, and evaluate prospective for future control. Special attention will be given to strategies for achieving high immunization coverage in various parts of the world, and subjects in measles epidemiology and control requiring further research will be identified.

More than 200 experts from all over the world are expected to attend the symposium. They will include public health officials, epidemiologists, program managers, vaccine manufacturers, and research scientists. All EPI program managers in the Americas will receive invitations to attend.

The symposium’s proceedings will be published and readers will be advised as soon as they are available.
Measles Complications in Children Under 2 Years of Age

In Bangladesh a retrospective study of the mid-term complications resulting from a measles outbreak in children under 2 years of age was carried out by the International Centre for Diarrhoeal Disease Research (ICDDR). The outbreak occurred in the rural area of Matlab in March-April 1980 and complications were investigated five months later.

At the time of their occurrence, cases were identified by field assistants who had no formal medical training. A sample of the identified cases was verified by the resident doctors of Matlab who showed a 99% correlation with the identifications by the field assistants.

Of the 2,219 measles cases in the epidemic, 763 (34.4%) occurred in children under 2 years of age. A 10% sample of these (75 cases) was chosen for the study. Controls without measles (matched for age and residence) were chosen from available data gathered by the ICDDR's Demographic Surveillance System, which covers 24 villages with a total population of about 180,000.

The mean duration of the disease was 7.5 days with a standard deviation of 1.9 days. Of the 75 cases, 31 occurred in children under 6 months of age, 16 in children 6-11 months of age, and 10 in children 12-23 months of age. The youngest case occurred in a child 67 days old.

Fifty-two of the 75 cases (69%) had at least one of the complications classified strictly associated with measles. Children who had a rash lasting less than 2 days generally had evidence of complications than those who had measles for longer. There were significant associations between the duration of rash and difficulty in respiration, ear discharges, length of diarrhea, and conjunctival dryness. Children under 1 year of age developed significantly more complications than those between 1 and 2 years of age. Complications were highest in the 7-12 month age group. The one death among the 75 cases occurred in a 23-month-old child and was caused by dehydration due to diarrhea.

There were significant differences between the cases and the controls in the frequency of coughs, difficulty in respiration, conjunctival dryness and the presence of mucoid, bloody or other type of diarrhea. The conjunctival dryness was directly related to the incidence and duration of diarrhea.

The complications most often mentioned were as follows:

- Difficulty in respiration (28% of cases);
- Ear discharge (16%);
- Various types of diarrhea (92%);
- Conjunctival dryness (21%).

In light of these findings, further areas for research were identified, such as an examination of the interaction of nutrition and measles and the effect of measles in terms of weight loss and vitamin A levels, and socio-cultural attitudes towards measles in Bangladesh.

Source: Glimpse (Newsletter of the International Centre for Diarrhoeal Disease Research, Bangladesh) 10(2):1-3, 1981.

December 1982

Measles Surveillance United States: Imported Cases, First 26 Weeks, 1982

In the first 26 weeks of 1982, 64 imported measles cases were reported in travelers (U.S. citizens and foreign national) who arrived in the United States from 22 different countries worldwide. A measles case is considered to be imported if a person has onset of rash within 18 days of arrival in the United States from a foreign country.

These cases represent 7.2% of the provisional total of 895 cases of measles reported to the Centers for Disease Control (CDC) during the 26-week period, an increase from 0.7% (95/13,506) for the entire year 1980 and 3.6% (101/2,932) for all of 1981. An average of 2.5 measles importations was reported each week (range 0-5) compared with 1.8 in 1980 and 2.4 in 1981.

Returning U.S. citizens have accounted for a rising proportion of import cases: 46/64 (72%) in the first 26 weeks of 1982, compared with 42/94 (45%) in 1980 and 34.2% (13/39) in 1981. United States citizens accounted for 85.3% (56/66) of the importations which were reported in travelers from Western Hemisphere nations.

Of the 64 U.S. persons with imported measles, 32 (50 percent) were travelers who arrived in the United States from three countries: Great Britain (13), Mexico (10), and India (9). Only 14 (21.9 percent) arrived from countries in the Western Hemisphere. This was a decrease from 35.8 percent reported in 1980 and the 50.0% (57/114) reported in 1981.

Of the 64 imported measles cases, transmission to other persons in the United States (import-associated cases) was documented for 12 (18.8%), of which only one case was from the Americas. Importations and import-associated cases accounted for 25.5% (22/86) of measles cases provisionally reported in the United States during the first half of 1982. Histories of prior measles vaccination or prior measles illness were available for 69.0% (29/42) of the U.S. citizens and 40.5% (9/22) of the foreign nationals with imported measles cases. The histories were reviewed to determine the number of imported measles cases which potentially might have been prevented through adherence to current vaccine recommendations in the United States. A case was considered preventable3 if the traveler was at least 16 months of age and born after 1956, and lacked documentation of administration of live measles vaccine on or after the first birthday or a history of physician–diagnosed measles illness.

Only 4 (9.5%) cases occurring in U.S. citizens were potentially preventable; of these only 2 (4.8%) persons would have been accessible to school-based immunization recommendations—the major element of measles control in the United States. However, one of those two cases was the index case for an outbreak of 89 measles cases in New York state. Of the 22 cases occurring in foreign nationals, 5 (22.7%) were potentially preventable; of these 3 (13.6%) were old enough to attend school in the United States, and might have been accessible to state immunization laws if they planned to enroll in school while in the United States.

Discussion

Measles incidence rates continue to decline in the United States. In 1981, a record low of 3,124 cases (3.5 cases per 100,000 population of all ages) was reported. The 895 cases provisionally reported during the first 26 weeks of 1982 represent an additional 60 percent decrease from the same period in 1981.3 More current data (through week 37 of 1982) show that this trend continues, with only 330 measles cases provisionally reported.

The projected annual incidence rate for 1982 is approximately 0.7 cases per 100,000 total population, a new record. Improvements in the investigation of measles cases have made it possible to link epidemiologically over 25% of reported cases to sources outside the U.S.

Classification of travelers by age, citizenship, and immunity status has shown that prevention of that case was not always possible by adherence to current measles vaccination recommendations.4 Although most imported cases occurred in U.S. citizens who had travelled abroad, less than 10 percent of the cases in U.S. citizens were potentially preventable. To minimize importations among U.S. citizens, travelers should be informed to measles before they leave the U.S.

Although there are currently no vaccination requirements for entry into the United States, efforts are being made to alert foreign travelers (and agencies sponsoring foreign exchange students) to the advisability of measles vaccination for those who lack documentation of measles immunity. Children who enter the United States and plan to enroll in school must be vaccinated against measles unless contraindicated and must retain documentation to that effect, because all states require that a child be immune to measles before entering school. It is recommended that children who do not plan to enroll in school (e.g., tourists, pre-schoolers) also be immune to measles before entering the United States.

Imported measles cases from 1979-2009

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of Cases</th>
<th>Total Population (Million)</th>
<th>Incidence Rate (per 100,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>17</td>
<td>10.2</td>
<td>1.69</td>
</tr>
<tr>
<td>Brazil</td>
<td>6</td>
<td>20.3</td>
<td>3.00</td>
</tr>
<tr>
<td>Spain</td>
<td>5</td>
<td>5.0</td>
<td>1.00</td>
</tr>
<tr>
<td>France</td>
<td>2-3</td>
<td>2-3</td>
<td>0.6-1.6</td>
</tr>
<tr>
<td>Finland</td>
<td>2-2</td>
<td>2-2</td>
<td>1.0-1.6</td>
</tr>
<tr>
<td>Greenland</td>
<td>1</td>
<td>1.1</td>
<td>0.93</td>
</tr>
<tr>
<td>Iceland</td>
<td>1</td>
<td>0.3</td>
<td>0.68</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1</td>
<td>17.3</td>
<td>0.60</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1</td>
<td>2.6</td>
<td>0.60</td>
</tr>
<tr>
<td>Norway</td>
<td>1</td>
<td>4.5</td>
<td>0.27</td>
</tr>
<tr>
<td>Sweden</td>
<td>1</td>
<td>0.9</td>
<td>1.13</td>
</tr>
<tr>
<td>USSR</td>
<td>1</td>
<td>1.1</td>
<td>0.90</td>
</tr>
<tr>
<td>ASIA</td>
<td>12</td>
<td>21.2</td>
<td>0.57</td>
</tr>
<tr>
<td>Australia</td>
<td>5-4</td>
<td>19.6</td>
<td>0.26</td>
</tr>
<tr>
<td>TOTAL</td>
<td>42</td>
<td>224</td>
<td>1.88</td>
</tr>
</tbody>
</table>

Notes:

References:
The fifth meeting of the Expanded Program on Immunization Global Advisory Group took place 18–22 October 1982 at the WHO Regional Office for Africa in Brazzaville, Republic of the Congo. The following is a summary of the conclusions and recommendations made by the Group.

Global

Continued progress has been achieved in the development of the EPI country, regional and global levels. Information relating to immunization coverage and to the incidence of the target diseases has improved (Figure 1), and activities relating to training and evaluation have increased. Little progress has been seen in the assessment of the program at the regional level in Europe, however, and this should be remedied without delay.

Despite the progress noted above, the Group emphasized that only a short time-eight years—remains in which to accomplish the EPI goals, and stressed that action is urgently needed to implement the Five-Point Action Program endorsed by the World Health Assembly in 1981 in resolution WHA35.11 (See EPI Newsletter Vol. IV, No.2).

The Global Advisory Group notes with concern that Point Three of the EPI Action Program, calling for increased financial resources, is not reflected in all Regions in the WHO Regular Budget proposals for 1984–85.

Vaccine Contraindications

The Group noted the following:

1) The risks of adverse reactions following administration of EPI vaccines are low.
2) The slight increase in risk inherent in the use of vaccines in ill children must be balanced against the dangers involved in leaving such children unimmunized. The practice of immunizing infants presenting with minor illnesses is already accepted in many countries with various levels of socio-economic development.
3) It is particularly important to consider the immunization of ill or malnourished children under the following circumstances:
   • Where living conditions favor a high incidence and severity of the target diseases, particularly among children under the first 18 months of life;
   • Where access to health services is limited;
   • Where immunization coverage is low; and
   • Where children are most likely to come into contact with the health services only during periods of illness;
   • Where attendance at health facilities is, in itself, an important factor in the spread of infectious diseases of childhood, particularly measles;
   • Where a refusal to immunize is likely to result in the child not being brought back for further immunizations.

The Group concluded that health workers should use any opportunity to immunize eligible children. The great majority of children attending health facilities are suffering from minor illnesses, frequently combined with malnutrition, and should be considered eligible for immunization. Individual national advisory boards should decide on the eligibility of children who are more severely ill in the light of the above criteria.

Measles

The goal of the EPI is the control of measles along with other target diseases. Those countries, particularly in the European Region, in which adequate economic and operational resources exist, should be encouraged to undertake complete measles control or eventual eradication. Research into the operational aspects of measles control should be pursued. Such research should include strategies to change the behavioral patterns of the public and of those working in the field of public health in order to increase access to measles immunization. Research to investigate the potential use of aerosol measles vaccine in the future should be encouraged.

Program Reviews

Substantial progress has been achieved in developing and implementing the EPI review methodology. In these reviews, plans, procedures, and technical levels of the health services are examined and actual results at community level are measured.

The use of multidisciplinary teams composed of national and international staff has lent itself particularly well to strengthening of coordination of various health and related programs within the country. It has also promoted collaboration between staff concerned with immunization and other elements of maternal and child health and primary health care.

The EPI should continue to collaborate with other programs in conducting joint national reviews. Yet, some cautions are appropriate:

• The protocols now available are intended only as checklists and should be amended as needed to fit the objectives of the particular review in which they are to be used.
• The EPI cluster sampling method to estimate immunization coverage is not necessarily valid for assessing other items now included in community level questionnaires.
• Reviews which are too broad in scope will lose their effectiveness; the information obtained should be limited to that required for decision-making.
• Criteria of managerial effectiveness should be further developed for all levels within countries.

Similar program reviews should be promoted for other elements of primary health care. In some cases, this may require further development of indicators, targets, and valid methods to assess program effectiveness and impact at the community level.

Community participation in program evaluation should be encouraged. Community members can help to design and carry out evaluations and can help to analyze their results.

Health Education/Community Participation

A number of examples of successful initiatives resulting in increased community participation in immunization programs and in other health programs remain to be done in this field.

Specific areas for action were identified as follows:

• Promote the involvement of communities in the planning, management, and assessment of immunization activities, actively soliciting community views of the program and responding appropriately to them.
• Seek effective means to involve women’s groups in promoting immunization and other preventive health programs. Appropriate lesson plans, reading, and other informational materials should be developed for schools which help pupils become effective promoters of these preventive actions for their younger siblings and for others in the community. Special efforts should be made to educate girls, recognizing the benefits in their future role as mothers and recognizing that many of them currently have fewer educational opportunities than boys. The above efforts will require joint initiatives between ministries of health, education, communication and other ministries concerned with community development. Adequate financial support for such activities should be provided in program budgets.
• Efforts should be made to integrate information/education materials dealing with immunization with those dealing with other important community health issues, particularly the control of diarrheal diseases and nutrition.

An important aspect of community involvement in some areas is financial involvement. By supporting from local resources all or part of the costs of such items as fuel, salaries and buildings, communities may be able to realize the benefits.

This five-section transmission electron micrograph (TEM) revealed the ultrastructural appearance of a single virus particle, or virion, of measles virus. The measles virus is a paramyxovirus, of the genus Morbillivirus. It is 120–200 nm in diameter, with a core of single-stranded RNA, and is closely related to the epidemic and canine distemper viruses. Two membrane envelope proteins are important for infection. They are the F (fusion) protein, which is responsible for fusing the virion to host cell membranes, viral penetration, and hemolysis, and the H (hemagglutinin) protein, which is responsible for adsorption of virus to cells. There is only one antigenic type of measles virus. Although studies have documented changes in the H glycoprotein, these changes do not appear to be epitope important (i.e., no change in vaccine efficacy has been observed).

Measles Articles

FIGURE 1: World: Reported incidence rates per 100,000 population for measles, tetanus, and poliomyelitis, 1974–1981.*

*There are disease which are expected to be among the most accurately diagnosed and reported, and the most influent in the short term by immunization programs. Yet their diagnosis and reporting remain major problems in many countries, and is premature to conclude that any decline such as that reported through 1981 for measles is real or that it reflects the start of a long-term trend.
Rubella Watch EPI Newsletter 1979–2009

Measles Vaccine Indicator Trial in Peru

The Peruvian Ministry of Health is collaborating with PAHO/WHO and the Program for Appropriate Technology in Health (PATH) to field test a temperature-indicator device developed to monitor measles vaccine exposure to heat during its transport along the cold chain.

The indicator consists of a red paper disk which contains a chemical with thermal characteristics similar to those of measles vaccine. The dot changes color from bright red, to dark red, and finally to black following accumulated exposures to high temperatures. After seven days at 37°C the indicator will turn black, a warning to the health worker that the vaccine has dropped below its minimum required potency and should not be used.

The indicator is designed to fit on the metal cap of a vial of vaccine. It has a pressure-sensitive adhesive backing and is coated with a clear plastic material to protect health workers from the chemical and to minimize mechanical damage to the indicator. The color change is non-reversible.

PATH developed the indicator with the assistance of WHO/EPI, the London School of Hygiene and Tropical Medicine, OXFAM and the Edna McConnell Clark Foundation. The indicator’s performance was verified in direct comparison to the heat degradation of measles vaccine made by various manufacturers.

The results of laboratory tests demonstrate that the indicator’s color change from red to black closely follows the degradation of measles vaccine. The indicator is calibrated to turn black when the vaccine titer is within 8% of the minimum potency recommended by WHO/EPI.

Field Trials

To test the indicator the Ministry of Health selected Region XVI (Loreto) where the ambient temperatures average +28°C and vaccine transportation along the cold chain is difficult. The particular strand of the cold chain chosen is shown in the accompanying map (Figure 1).

The EPI vaccines are airfreighted from Lima to Iquitos, where they are shipped by boat up the Amazon River to the health centers and posts. The time necessary to transport vaccine from Iquitos to Requena, for example, can vary from six to 14 hours depending on the kind of boat used.

A protocol for the study was prepared together with a chronogram of the activities required for its execution. The field trial was designed to meet the following objectives:

• to confirm the validity and reliability of the indicator;
• to confirm that color changes are correctly interpreted by health personnel;
• to evaluate the indicator’s acceptability by health personnel;
• to evaluate the indicator’s mechanical performance.

The field trial will last six months, ending around December 1983. During that time 1,000 indicators will be tested in the study area. Twenty-five vials with red indicators will be tested for titer levels during the study to confirm the sensitivity and specificity of the indicators. All vaccine vials with black indicators are automatically tested to verify if their titers have fallen below the minimum levels established by WHO as necessary to induce immunity.

Twenty-four health workers were trained to use the indicator. A set of instructions and accompanying forms on indicator use were developed for each level of the cold chain.

Results of the post-test given to participants after their training yielded average scores of over 82%. The question most frequently missed showed that the students did not fully understand the time-temperature characteristics for the color change in the indicator.

At the end of the study the participants will be interviewed to determine their reactions to the new means of accelerating the cold chain.

Field trials of the indicator are also being conducted in the Philippines, People’s Republic of China, Pakistan, Yemen Arab Republic, Egypt, Nepal, Kenya, Zimbabwe, and Argentina. The trials are supported by the Expanded Program on Immunization of PAHO and WHO, UNICEF, and the International Development Research Center (IDRC). A full report on the results should be available in early 1984.

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 control of the disease. Throughout all these considerations, there remains great variability, which is manifest in the surveillance data on morbidity, mortality, the extent of vaccine utilization, and the attitude 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 90% 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 transmission 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% per cent 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 currently to be incurred in much of Central America and tropical South America. Africa continues to have an 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 confirmation for the justification for eliminating measles as a hazard of childhood.

Vaccines in use throughout the world have proved safe and immunogenic. Stabilization and improved 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 light.

Nearly all vaccines currently are prepared in chick embryo cultures, except the Yugoslavian vaccine, which is prepared in human diploid cells; and the USSR Leningrad-16 vaccine, prepared in a diploid cell line.

Although all vaccines are currently administered primarily by syringe and needle, or by jet inoculation, the proposal for recombinant of aerosol administration was greeted with interest and enthusiasm and merits further study. Representatives of the pharmaceutical industry,
Measles Articles

October 1983 Volume V, Number 5

Measles Vaccine Indicator Trial in Brazil

T he Special Public Health Fund (FESP) of Brazil’s Ministry of Health has under way a time-temperature indicator developed to monitor measles vaccine exposure to heat during its transport along the cold chain.

The field test is being carried out in collaboration with EPI/PNIMH, PAHO’s Program for Health Technology Development, and the Program for Appropriate Technology in Health (PATH).1

The indicator is a red paper disk designed to adhere to the metal cap of a vaccine vial. It contains a chemical (developed by Allied Corp., USA) with thermal characteristics similar to those of measles vaccine, and changes color in accordance with the ambient temperature. A clear plastic coating on the disk protects health workers from chemical and minimizes any damage during handling to the indicator. The color change is non-reversible.

The indicator turns darker following accumulated exposure, but until, after seven days at 27°C (or the equivalent exposure), it turns black.

The presence of the black color shall be interpreted by the health worker, that the vaccine may have dropped below its minimum required potency and should not be used.

Field Trials

The field trial was designed to meet the following objectives:

- to confirm the validity and reliability of the indicator;
- to confirm the color changes are correctly interpreted by health personnel;
- to evaluate the indicator’s acceptability by health personnel;
- to evaluate the indicator’s mechanical performance.

FESP is conducting the field trials in the states of Goias, (Tocantins county). The vaccines, which are produced nationally, are airlifted from Rio de Janeiro to Goiania (state capital of Goias), where they are transported 1,300 km by car to the city of Tocantins for distribution to health facilities.

The field tests will take six months to complete, ending around March 1984. Test results show that the 23 persons trained to use the indicator have a good understanding of how it works.

Approximately 2,000 indicators will be used. Fifty vials whose indicators have remained red will be tested for tiers levels following the study to the sensitivity and specificity of the indicators. Control tests will be conducted by the Oswaldo Cruz Foundation in Rio de Janeiro and the London School of Hygiene and Tropical Medicine.

All vaccine vials with black indicator are automatically tested to verify if their titers have fallen below the minimum levels established by WHO.

Further field trials of the measles indicators are also being conducted in Peru (see EPI Newsletter Volume V, Number 3), the Philippines, People’s Republic of China, Pakistan, Yemen Arab Republic, Egypt, Nepal, Kenya, Zimbabwe, and Argentina. The trials are supported by the Expanded Program on Immunization of PAHO and WHO, UNICEF, and the International Development Research Center (IDRC). A full report on test results should be available in 1984.

Reference 1 (PATH) is a non-profit, non-governmental organization devoted to the development and application of appropriate health technology for primary health care programs in developing countries.

December 1983 Volume V, Number 6

EPI Vaccines: Indications and Contraindications (I)

Introduction

Immunization is one of the most powerful and cost effective weapons of modern medicine. Yet, however, remain tragically under-utilized in the world today. In many countries 1/2% of all newborns can be expected to die from neonatal tetanus, 5% from measles, and 3% from measles. In all, some 5 million children die from these diseases each year: 10 children die with each passing minute. These diseases are preventable with currently available vaccines. Children can be immunized early enough in childhood.

The decision to withhold the benefit of immunizations from an individual, whatever the reason, should not be taken lightly. Unfortunately, health workers in many countries are faced with longs lists of contraindications which, when followed scrupulously, result in many children remaining unimmunized. The problem resulting from deferring immunization is greatest where access to health services is limited and the morbidity and mortality from vaccine-preventable diseases are high. Immunization is frequently postponed if children are ill, malnourished, or about to be hospitalized. Yet they are the very children for whom immunization services are most needed. They are the ones most likely to die should they acquire a vaccine-preventable disease.

The purpose of this paper is to review the benefits and risks of routine immunization of children with BCG, DPT, measles, and poliomyelitis vaccines, and, particularly for ill and malnourished children, to suggest circumstances in which immunization may be in the child’s best interest.

Adverse Reactions to Immunization

Despite the high safety of the vaccines used in the EPI, complications do occur. Although their rates are difficult to estimate precisely, it is known that they are far less frequent than the complications caused by the diseases themselves. Some conditions, particularly fever and neurological syndromes, also occur spontaneously among unimmunized children.

Against this background, it is sometimes difficult to determine if a recent immunization is causally or merely coincidentally related to a child’s illness. Conversions, for example, may follow DPT or measles immunization, but the background rate is high. As a result, the monthly incidence rate of convulsions ranges from 0.8 to 1.4 per 1000 children.

Measles Immunization

Severe reactions following measles immunization are rare (Table I). In the United States, neurological disorders, including encephalitis and encephalopathy have been reported once or for approximately every million vaccine doses administered. However, the reported incidence rate of encephalitis or encephalopathy following measles immunization is not known. The reported incidence rate of encephalitis of unknown etiology, two per 100 million children per 2-day period. This suggests that some of the reported severe reactions to measles immunization may not be caused by measles immunization but related only to time. In the United Kingdom, however, the National Childhood Encephalopathy Study found a statistically significant association between the onset of acute neurological illness and measles immunization given 7 to 14 days before onset of illness in cases compared with controls. It was estimated that the relative risk for this period was estimated to be 2.5 times the background rate.

[References: Reviews of Infectious Diseases 5:3-6, 1983]
The authors concluded that malnutrition should be a prime indication for measles immunization rather than a contraindication because antibody responses are normal and because natural measles is often severe in malnourished children.

In most other studies nutritional status appeared to have no significant effect on measles seroconversion rates when measles vaccine was administered alone or simultaneously with DTP vaccine. In one investigation, however, children with severe kwashiorkor had impaired responses to measles immunization compared to well children.

The results of three studies of measles immunization of ill children are shown in Table 2. The studies were conducted in hospital pediatric wards during efforts to control hospital-acquired measles, a cause of high morbidity and mortality. Children with a wide range of acute and chronic illnesses were included; reasons for exclusion were a terminal illness, a history of febrile disease and to avoid the risk of superimposing the vaccine on the underlying illness. The reasons are to avoid the risk of superimposing possible adverse effects from the vaccine on the underlying disease and to avoid a manifestation of the illness being attributed to the immunization.

Immunization of ill or malnourished children Health personnel are understandably cautious in offering immunization to any child who is not healthy. But, as already discussed, such children may be particularly benefited by immunization. In most cases, it is safe and effective.

The most ample literature on this subject concerns measles immunization. Several studies have investigated measles immunization of malnourished or ill children. McMurray et al. studied serum antibody responses and reaction rates to measles vaccine in normal and moderately malnourished 10-month-old Colombian children. The children were followed for more than a year. Malnourished children had high measles antibody responses and had no more adverse reactions than well-nourished children. The authors concluded that measles vaccine is both safe and effective in moderately malnourished children.

Ivkovskaya et al. studied serum antibody responses and adverse reactions following measles immunization of malnourished Nigerian children 5 months to 8 years old. Malnutrition did not impair the children's serological responses; of III children who were seronegative before immunization, 94% seroconverted. There were no major adverse reactions to immunization during the 8-week follow-up period. The results of these studies of measles immunization of ill hospitalized children are shown in Table 2. The studies were conducted in hospital pediatric wards during efforts to control hospital-acquired measles, a cause of high morbidity and mortality. Children with a wide range of acute and chronic illnesses were included; reasons for exclusion were a terminal illness, a history of febrile disease and to avoid the risk of superimposing the vaccine on the underlying illness. The reasons are to avoid the risk of superimposing possible adverse effects from the vaccine on the underlying disease and to avoid a manifestation of the illness being attributed to the immunization.

Immunization of ill or malnourished children should play an active role in immunization services and both of which have clear national recommendations concerning the indications for immunization. In the United Kingdom, the Department of Health and Social Security includes untreated tuberculosis and certain immune deficiencies in the contraindications to measles immunization, and recommends that children with a history of convulsions, epilepsy, chronic heart or lung disease or who are seriously underdeveloped, be given measles vaccine only with the simultaneous administration of human immunoglobulin. The United States Public Health Service Advisory Committee on Immunization Practices (ACIP), on the other hand, finds no convincing evidence that measles immunization is harmful and concludes that the benefit of measles immunization far outweighs the risk of exacerbation of tuberculosis. The ACIP recommends that measles vaccine should never be administered simultaneously with immunoglobulin and does not recognize any neurological contraindications to measles immunization.

The sixty-six references reviewed for this paper have not been listed here, but will be made available to interested readers. Anyone wishing to obtain a complete copy of the original article, including all bibliographic references, should write to the EPI Newsletter editor, Pan American Health Organization, 525 23rd St. N.W., Washington, D.C. 20001 (USA).

### TABLE 1. Estimated rates of serious adverse reactions following measles immunization compared to the complication of natural measles infection and background rate of illness.

<table>
<thead>
<tr>
<th>Adverse reaction</th>
<th>Measles complication rates per 100,000 cases</th>
<th>Measles vaccine adverse reaction rates per 100,000 vaccines</th>
<th>Background rate of illness per 100,000 persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encephalitis/</td>
<td>50 - 400 (0.05% - 0.4%)</td>
<td>0.1</td>
<td>0.1 - 0.3</td>
</tr>
<tr>
<td>Encephalopathy</td>
<td></td>
<td>0.5 - 2.0</td>
<td>0.65 - 0.1</td>
</tr>
<tr>
<td>Subacute</td>
<td>3,800 - 7,300 (3.8% - 7.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sclerosing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panencephalitis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Convulsions</td>
<td>500 - 1,000 (0.05% - 0.1%)</td>
<td>0.02 - 1.90</td>
<td>30</td>
</tr>
<tr>
<td>Death</td>
<td>10 - 10,000 (0.01% - 1%)</td>
<td>0.02 - 0.3</td>
<td></td>
</tr>
</tbody>
</table>

About 5 to 15% of measles vaccines develop a temperature of 39.4°C or higher, beginning on the sixth day and usually lasting one or two days. Transient rash may occur in about 5% of vaccines.

Measles immunization, by preventing natural measles, reduces the risk of developing subacute sclerosing panencephalitis (SSPE)

Immunization of ill or Malnourished Children Health personnel are understandably cautious in offering immunization to any child who is not healthy. But, as already discussed, such children may be particularly benefited by immunization. In most cases, it is safe and effective.

The results of these studies of measles immunization of ill children are shown in Table 2. The studies were conducted in hospital pediatric wards during efforts to control hospital-acquired measles, a cause of high morbidity and mortality. Children with a wide range of acute and chronic illnesses were included; reasons for exclusion were a terminal illness, a history of febrile disease and to avoid the risk of superimposing the vaccine on the underlying illness. The reasons are to avoid the risk of superimposing possible adverse effects from the vaccine on the underlying disease and to avoid a manifestation of the illness being attributed to the immunization.

There is disagreement about other issues. For simplicity a few examples have been selected from two English-speaking countries, the United Kingdom and the United States, both of which have well-developed immunization services and both of which have clear national recommendations concerning the indications for immunization. In the United Kingdom, the Department of Health and Social Security includes untreated tuberculosis and certain immune deficiencies in the contraindications to measles immunization, and recommends that children with a history of convulsions, epilepsy, chronic heart or lung disease or who are seriously underdeveloped, be given measles vaccine only with the simultaneous administration of human immunoglobulin. The United States Public Health Service Advisory Committee on Immunization Practices (ACIP), on the other hand, finds no convincing evidence that measles immunization is harmful and concludes that the benefit of measles immunization far outweighs the risk of exacerbation of tuberculosis. The ACIP recommends that measles vaccine should never be administered simultaneously with immunoglobulin and does not recognize any neurological contraindications to measles immunization.

Recommendations of the Expanded Program on Immunization It does not seem feasible or desirable to formulate a universal set of recommendations for immunization of children. Each country should formulate its own policies reflecting local appraisal of risks and benefits, operational feasibility and the socio-cultural acceptability of the specific recommendations, the national health authorities responsible for providing immunization services should play an active role in formulating the policies. Whatever specific policies are adopted, health workers


<table>
<thead>
<tr>
<th>Country</th>
<th>No. of Children</th>
<th>Age (months)</th>
<th>Type of illness</th>
<th>Adverse reaction</th>
<th>Effect of immunization</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Africa</td>
<td>214</td>
<td>6 - 60</td>
<td>Convulsive patients admitted to hospital</td>
<td>Temperature ≥ 38°C, Koplik spots and rash</td>
<td>Reduced nonossseal malaeus compared to normal control group</td>
</tr>
<tr>
<td>Zimbabwe (Rhodesia)</td>
<td>98</td>
<td>6 - 32</td>
<td>Hospital patients with: Gastroenteritis - 30%, Bronchiopneumonia - 30%, Malnutrition - 30%, Other infections</td>
<td>Reduced nonossseal malaeus compared to normal control group</td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td>654</td>
<td>7 - 36</td>
<td>Patients hospitalized with: Gastroenteritis - 35%, Cardiac, renal diseases - 35%, Bronchiopneumonia - 17%, Kwashiorkor, marasmus - 12%</td>
<td>Non ossseal malaeus compared to normal control group</td>
<td></td>
</tr>
</tbody>
</table>

The EPI Vaccines: Indications and Contraindications (II) The first part of this article was published in EPI Newsletter Vol 6 (December 1983) and dealt with the specific adverse reactions associated with DPT, measles and polio vaccination, as well as the immunization of ill or malnourished children.

National Policies Concerning Contraindications to Immunization: Agreements and Disagreements Countries have adopted similar policies with respect to certain possible contraindications to immunization and different policies with respect to others. Policies are often based on theoretical concerns rather than acts; needed data frequently are lacking. There is general agreement that immunization should be deferred in the presence of a severe febrile illness, reasons are to avoid the risk of superimposing possible adverse effects from the vaccine on the underlying febrile disease and to avoid a manifestation of the illness being attributed to the immunization.

There is also a consensus that vaccines requiring multiple doses such as DPT should not be repeated if a severe reaction occurred after a previous dose. Such reactions include collapse or shock, state, persistent screaming episodes, temperature above 40°C, convulsions, severe alterations in consciousness or other neurologic symptoms, anaphylactic reactions, thrombocytopenia or hemolytic anemia. In the United Kingdom and the United States, subsequent immunization with diphtheria and tetanus toxoid is recommended when the site of injection or mild fever do not by themselves preclude the further use of DPT or other vaccines.

Also, live vaccines should not be administered to persons with immune deficiency diseases or to persons whose immune response may be suppressed because of leukemia, lymphoma, generalized malignancy or therapy with corticosteroids, alkylating agents, antineoplastic agents or radiation.
Immunization of children:

- A DPT series should be considered, and need some screening, and need some considering the immunization of children under the following circumstances:
  - where there is a high incidence or an increased severity of the EPI target diseases, especially in children less than 18 months old;
  - where access to health services is limited, where prompt follow-up is difficult and where immunizations are not likely to be completed if postponed;
  - where immunization coverage is low;
  - where children are most likely to visit the health facilities only when they are ill;
  - where admission to hospital or attendance at health facilities is, in itself, an important factor in the spread of infectious diseases of childhood, particularly measles;
  - where refusal to immunize is likely to result in the child not being brought back for further immunizations.

Health workers will inevitably be faced with using their own best judgment when considering the immunization of an individual child. Often they have little time for screening, and need some simple and clear guidelines. The following are proposed:

- Every child visiting a health facility should be screened to determine immunization status, and eligible children should be immunized.
- Children with malnutrition, low grade or moderate fever, respiratory infection, diarrhea or other minor illnesses should be immunized. Immunization of children, so ill as to require hospitalization should be deferred for decision by the hospital authorities.
- Hospitalized children should be immunized before discharge and in some cases upon admission—for example where there is a risk of hospital-acquired measles.
- A DPT series should be completed unless a child suffered a severe adverse reaction to previous dose. If diphtheria and tetanus (Td or DT) vaccine without pertussis antigen should be given.
- Children with diarrhea should be offered oral polio vaccine. However, this dose should not be counted as part of the full series and the child should be given another dose at the first available opportunity.

### Investigation of a Measles Outbreak in Planaltina, Federal District, Brazil

In April 1983 the Federal District of Brasilia, Brazil, registered an unusual increase in the number of reported measles cases (Figure 1). Preliminary analysis of the cases showed they were evenly distributed in all eight administrative regions of the Federal District, an area occupying 5,751 km² in the central Brazilian plateau, with a total population of nearly 1.2 million inhabitants almost entirely urban (96%).

Vaccination data for the previous few years indicated that coverage in children under 1 year of age was around 70 percent. In view of the outbreak, Federal District health authorities decided to intensify measles vaccination in the first half of May, targeting the age group of children 9 months to 9 years of age, who accounted for over 70% of all reported cases. Over 60,000 doses of vaccine were administered in this period as to only 5,000 doses which normally would have been given by mid-June. However, the incidence of the disease was even higher than before.

#### Sample Survey Methodology

The persistence of the measles epidemic despite apparently high levels of vaccination coverage led the Ministry of Health to initiate an epidemiologic investigation of the situation. Authorities in Planaltina, one of the Federal District’s eight administrative regions (Figure 2), as the site of a random sample survey to determine vaccination coverage and vaccination history by age group, vaccine efficacy, and history of the disease during the outbreak. Planaltina’s population 60,000 inhabitant in 1983 and 30% of the children were in preschool age.

#### Results

As the increase in measles incidence had began several months before the survey, it was decided that the study would cover the first six months of 1983. The survey measured vaccination coverage on 31 December 1982, considered the beginning of the epidemic on 31 January 1983. As shown in Table 1, 31 December 1982, coverage in children under 10 years of age had increased by 84% by the end of June. Coverage rates for each of the years between 1978 and 1982 (Table 1) were at least 60 percent, and had reached nearly 70 percent by the end of 1982 (Table 1). A total of 300 cases occurring between January and June 1983 were recorded during the investigation. One hundred and six cases (40%) of those with known vaccination histories occurred in vaccinated individuals while 158 (60%) occurred in unvaccinated children. Children under 5 years of age accounted for 212 (70%) of cases. (Table 3). Vaccine efficacy was calculated both for children who received vaccination before 9 months of age and for those who were vaccinated at 9 months or later, since prior to February 1982, the national immunization schedule had called for measles vaccination starting at 7 months of age. The following formula was used in the calculation:

\[
\text{AR in unvaccinated} = \frac{\text{VE} \times (100 - \text{VE})}{100}
\]

Where VE is vaccine efficacy and AR is attack rate.

The data showed that vaccine efficacy was only 43 percent for children who received the vaccine before 9 months of age while it was 83% for children who vaccinated later. Of the 300 measles cases investigated, 61 (20%) occurred in children less than 1 year of age. Of the 61 cases, 39 (64%) occurred in children less than 9 months of age while 52 (93%) were in unvaccinated children.

Although the total vaccination coverage of children 9 months to 9 years of age went from 68.4 to 84% between 31 December 1982 and 30 June 1983, the survey showed that coverage of children who had not previously had measles only increased from 50 to 55%. This explains why the increased measles vaccination was not effective in stopping the outbreak.

The source and site of transmission were identified for 30 of the 61 cases occurring in under 1 year-olds (Tables 4 and 5). In all but two cases the sources of infection were children older than 1 year, and transmission usually occurred either in the individual’s own or a neighboring household (60%), or in a hospital or polyclinic (20%).

### Control Measures

The intensification of measles vaccination that began in May 1983 was not effective in controlling the outbreak, despite the large number of doses applied and the coverage which already existed. The number of children successfully immunized against measles was considerably lower than that indicated by the December 1982 vaccination coverage due to the mass vaccination of all children. Since the majority of children had received their vaccinations before reaching 9 months of age, when vaccine efficacy was quite low. Neither did the mass vaccination in May represent a significant increase in either vaccine coverage or immunity, since many of the children covered had already been vaccinated or had had measles.

As an immediate measure, the Ministry of Health recommended that measles vaccine be administered simultaneously with polio vaccine during the national polio immunization day on 13 May 1983.
August 1983. This plan was put into effect for the whole Federal District and a total of 62,756 children 9 months to 4 years of age (2,416 in Planaltina) were vaccinated at 1 year of age, Planaltina (F.D.), Brazil, January–June 1983.

During the first 26 weeks, detailed information was provided to the Division of Immunization, CDC, on 1,765 measles cases. The difference between this number and the 1,709 cases reported to the MMWR reflect delays in reporting. Of 1,709 cases, 1,723 (97.6%) met the standard clinical case definition for measles* and 721 (40.8%) were serologically confirmed.

Among most of the measles patients, onset of rash occurred from week 9 through week 15, peaking at week 11 (130 cases) (Figure 2).

### October 1984

**Volume VI, Number 3**

**Measles in the United States, First 26 Weeks, 1984**

During the first 26 weeks of 1984, a provisional total of 1,759 measles cases was reported in the United States (incidence rate 0.8 per 100,000 population) (Figure 1). This represents a 60.6% increase from the 1,095 cases reported during the same period in 1983 (0.5/100,000). A total of 2,334 cases (70.2%) was reported from four states—Michigan (430), Texas (377), California (267), and Illinois (160). Nine states (New Mexico, Michigan, Hawaii, New Hampshire, Texas, Washington, Utah, Illinois, California) and New York City had incidence rates of $100,000 population or higher.

Although the overall incidence rate increased, the number of states reporting measles decreased during the first 26 weeks of 1984, compared with the same period in 1983. Twenty-four states reported no measles cases during the first 26 weeks of 1984. In 1983, 80 (2.5%) of the nation’s 3,313 counties reported measles cases during the first 26 weeks, compared with 9% (3.0%) during the same period in 1983 (Table 1).

One hundred seventy-five cases (9.5%) were associated with international or out-of-state importations—an average of 6.7 cases per week—compared with 174 cases during the same period in 1983.

During the first 26 weeks, the proportion of preventable cases in this age group increased progressively with increasing age. Of the 1,155 persons who had nonpreventable measles, 178 (15.4%) were too young for routine vaccination (15 months

---

**TABLE 1. Age distribution and incidence rates* of measles cases, United States, first 26 weeks, 1983 and 1984.**

<table>
<thead>
<tr>
<th>Age group</th>
<th>1983</th>
<th>1984</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 years</td>
<td>1,095</td>
<td>1,739</td>
</tr>
<tr>
<td>Incidence rate*</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>States without measles</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>Countries without measles</td>
<td>3,044 (97.0%)</td>
<td>3,059 (97.5%)</td>
</tr>
</tbody>
</table>

* Provisional data. 4 Per 100,000 population.

---

**TABLE 2. Age at most recent measles vaccination, United States, first 26 weeks, 1984.**

<table>
<thead>
<tr>
<th>Age at vaccination</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;12 months</td>
<td>135</td>
<td>7.6</td>
</tr>
<tr>
<td>12-14 months</td>
<td>255</td>
<td>14.4</td>
</tr>
<tr>
<td>15 months</td>
<td>34</td>
<td>1.9</td>
</tr>
<tr>
<td>16 months-4 years</td>
<td>303</td>
<td>17.2</td>
</tr>
<tr>
<td>5 years-9 years</td>
<td>139</td>
<td>8.8</td>
</tr>
<tr>
<td>10 years-14 years</td>
<td>36</td>
<td>2.1</td>
</tr>
<tr>
<td>15 years-19 years</td>
<td>8</td>
<td>0.5</td>
</tr>
<tr>
<td>≥20 years</td>
<td>2</td>
<td>0.1</td>
</tr>
<tr>
<td>≥21 months</td>
<td>3</td>
<td>0.2</td>
</tr>
<tr>
<td>Unknown or unknown</td>
<td>85</td>
<td>4.6</td>
</tr>
<tr>
<td>Total</td>
<td>1,765</td>
<td>100.0</td>
</tr>
</tbody>
</table>

* Provisional data. 6 Unknown age at vaccination, definitely older than 12 months.

---

**TABLE 3. Age distribution and preventability of measles cases, United States, first 26 weeks, 1984.**

<table>
<thead>
<tr>
<th>Age group</th>
<th>No. cases</th>
<th>No. preventable (%)</th>
<th>No. non-preventable (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;15 months</td>
<td>178</td>
<td>100%</td>
<td>178</td>
</tr>
<tr>
<td>16 months-4 years</td>
<td>173</td>
<td>127 (73.4%)</td>
<td>46 (26.6%)</td>
</tr>
<tr>
<td>5 years-9 years</td>
<td>201</td>
<td>43 (21.4%)</td>
<td>158 (78.6%)</td>
</tr>
<tr>
<td>10 years-14 years</td>
<td>515</td>
<td>137 (26.6%)</td>
<td>378 (73.4%)</td>
</tr>
<tr>
<td>15 years-19 years</td>
<td>470</td>
<td>170 (36.2%)</td>
<td>300 (63.8%)</td>
</tr>
<tr>
<td>≥20 years</td>
<td>137</td>
<td>106 (77.4%)</td>
<td>31 (22.6%)</td>
</tr>
<tr>
<td>15 years-19 years</td>
<td>51</td>
<td>27 (52.9%)</td>
<td>24 (47.1%)</td>
</tr>
<tr>
<td>≥20 years</td>
<td>40</td>
<td>0 (0%)</td>
<td>40 (100.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>1,765</td>
<td>610 (34.6%)</td>
<td>1,155 (65.4%)</td>
</tr>
</tbody>
</table>

* Provisional data. 6 Unknown age at vaccination, definitely older than 12 months.

---


<table>
<thead>
<tr>
<th>Age group</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 years</td>
<td>451</td>
<td>31.5</td>
</tr>
<tr>
<td>5-9 years</td>
<td>160</td>
<td>11.2</td>
</tr>
<tr>
<td>10-14 years</td>
<td>195</td>
<td>13.6</td>
</tr>
<tr>
<td>15-19 years</td>
<td>382</td>
<td>26.7</td>
</tr>
<tr>
<td>≥20 years</td>
<td>80</td>
<td>5.6</td>
</tr>
<tr>
<td>Total</td>
<td>1,497</td>
<td>100</td>
</tr>
</tbody>
</table>

* Provisional data.

---

**FIGURE 2** Reported measles cases, by week of rash onset.

United States, first 26 weeks, 1984.
Measles Articles

I. CDC. Classification of measles

References

Source: MMWR 33(35):495-504,

Table 1. Reasons measles cases were classified as non-preventable, United States, first 26 weeks, 1984.**

<table>
<thead>
<tr>
<th>Cases of nonpreventability</th>
<th>No. cases (%)</th>
<th>Total cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Persons &lt;16 months of age (too young for routine vaccination)</td>
<td>178 (15.4%)</td>
<td>1,155 (100.0%)</td>
</tr>
<tr>
<td>2. Born before 1957; vaccination is not routinely recommended</td>
<td>53 (4.9%)</td>
<td>1,155 (100.0%)</td>
</tr>
<tr>
<td>3. Persons 16 months to 27 years</td>
<td>1,155 (100.0%)</td>
<td>1,155 (100.0%)</td>
</tr>
<tr>
<td>a. Immunopreventable (or on or after the first birthday)</td>
<td>715 (44.2%)</td>
<td>(52.1%)</td>
</tr>
<tr>
<td>b. Prior physician diagnosis</td>
<td>18 (2.0%)</td>
<td></td>
</tr>
<tr>
<td>e. International importations (non-U.S. citizens)</td>
<td>32 (2.9%)</td>
<td></td>
</tr>
<tr>
<td>f. Exemptions</td>
<td>4 (0.4%)</td>
<td></td>
</tr>
<tr>
<td>g. Religious</td>
<td>15 (1.3%)</td>
<td></td>
</tr>
<tr>
<td>h. Philosophic</td>
<td>16 (1.4%)</td>
<td></td>
</tr>
<tr>
<td>i. Specimen-specific</td>
<td>5 (0.4%)</td>
<td></td>
</tr>
<tr>
<td>j. Laboratory evidence of immunity</td>
<td>5 (0.4%)</td>
<td></td>
</tr>
<tr>
<td>**</td>
<td>1,155 (100.0%)</td>
<td>1,155 (100.0%)</td>
</tr>
</tbody>
</table>

* A case is considered preventable if measles occurs in a U.S. citizen: (1) at least 16 months of age; (2) born after 1954; (3) lacking adequate evidence of immunity to measles (including receipt of five measles or two mumps, measles, and rubella vaccine doses; (4) with international importations; and (5) not U.S. citizens. Exemptions were used under state law.

** Does not include adequately vaccinated persons born before 1975.

Editorial Note:

Although the number of reported measles cases has increased at Great Lakes, compared with the same period in 1983, it is still far below the number in the prevaccine era (1950-1962), when an average of over 525,000 cases was reported annually. Despite the increased occurrence of measles during the first 26 weeks of 1984 over all of the geographical distribution of measles is more restricted and focal.

A total of 43.9% of the persons who had measles in 1984 had been adequately vaccinated. This is within expected limits, given the high vaccine coverage in the United States. Since 1980, over 95% of kindergartners and first-grade students have had evidence of measles immunity. Higher coverage will be associated with higher proportions of persons who are vaccinated.

Recent epidemiologic evaluations have shown a measles vaccine efficacy of 90% or higher. The incidence of measles in 1984 of age or under). Fifty-seven (4.9%) were born before 1957; vaccination is not ordinarily recommended for these cases. Of the 920 persons 16 months to 27 years of age who acquired measles, 32 (4.3%) had been vaccinated on or after the first birthday; 18 (2.0%) had prior physician-diagnosed measles; 32 (3.5%) had international importations and were not U.S. citizens; and 41 (4.5%) had exemptions under state law. In addition, 54 (5.9%) persons recruited at Naval Training Station were considered immune because they had positive results to an indirect immunoperoxidase test for measles virus antibodies before their military illness (Table 5).

The scientific evidence that measles can be prevented is compelling. The second question to be asked is, “Should we eradicate measles?” In an era of scarce global resources, should money and talent be spent on eradication?

Again, the answer is yes. We should eradicate measles for reasons related to both health and economic gains. Measles is a major source of unnecessary suffering, premature mortality, and expense. Except in isolated populations, measles is nearly universal, most persons being infected before the age of 15. Measles, under any circumstances, can cause serious complications. Among these are diarrhea, encephalitis, otitis media, pneumonia, and exacerbation of protein energy malnutrition. Therapy for measles and its complications is a major drain on medical care resources throughout the world. Mexico, Africa, Asia, and Latin America.

It has been estimated that approximately 900,000 deaths from measles occur each year in the developing world. In the 1976-1980 investigation of Mortality in Childhood, it was found, that measles is the leading cause of death. The second leading cause in children aged 1-4 years in several cities in Latin America. Measles outbreaks in Africa and Asia have case-fatality rates of 5-20% among children, especially malnourished ones. Measles complications may also result in developmental retardation, lifelong handicap, and both direct and indirect morbidity and mortality.

The return of such outbreaks to the developed world, where the disease persists but is less severe and there are facilities for saving lives, is still important to eliminate measles.

When the indigenous transmission of measles has ceased, the US must continue to bear the costs of routine vaccination, surveillance, and response to imported cases until global eradication is achieved. It has been estimated that these costs for both treatment and prevention may exceed $50 million a year. The earlier the global target of eradication is achieved, the sooner the USA can discontinue these expenditures. The national bore the considerable cost of keeping its population free of smallpox for more than 25 years before the global smallpox eradication program began. The $32 million invested in the smallpox eradication program over 12 years is now saved every 3 months in the US because global progress against the disease made it possible to discontinue routine vaccination and other protective activities. The prevention of measles by vaccination was estimated to have saved an annual net saving of $130 million for the period 1963-1972 in the US. The current annual savings is estimated to be approximately $500 million. Measles vaccination in the US is estimated to have a benefit-cost ratio of 10:1. The return of such an investment in the developing world, where morbidity and mortality for measles are higher, would be even greater. A program to analyze the results of vaccines in the Ivory Coast suggests the benefit to cost ratio may well exceed 20:1.

The final question to be asked about the worldwide eradication of measles is: “Will we do it?” — will we do it? Can we muster the social will to eliminate another disease from the world? A realistic answer is that, probably, this will not be done for a long time.

While views on measles as a level setter in the eradication world is a worthwhile goal. A mechanism for achieving this goal is already being developed: the global Expanded Program on Immunization, coordinated by the World Health Organization. This program is successfully working with national governments and international donor agencies to ensure that immunization against five diseases will be routinely available to all the world’s children by 1990.

The establishment of eradication as a goal might be seen as a further action in many developed countries whose populations have immunization levels high enough to reduce measles incidence to a point where the disease persists but is no longer a conspicuous problem.

A realistic answer to the question, “Will we eradicate measles?” must also consider serious differences between smallpox and measles. Measles is a highly contagious disease, capable of causing explosive outbreaks and spreading rapidly. This characteristic contrasts with the epidemiology of smallpox, which generally spreads more slowly and could be contained by aggressive control measures. This difference between the two diseases suggests that an essential ingredient of any measles eradication program would be to attain and maintain extremely high immunization levels in the developed world. Smallpox was eradicated by the containment of outbreaks and cases in many areas, but the
1985

February 1985

Volume VII, Number 1

National Vaccination Days in Bolivia: Higher Coverage Attained Through Public Participation

S
ince the inception of the Expanded Program on Immunization (EPI) in 1979, a better understanding of the vaccine-preventable diseases in Bolivian children has been achieved by provision of useful epidemiological data on the targeted EPI diseases. A strength of the EPI lies in its close cooperation and collaboration with the local health sector.

In 1980 and 1981, the coverage achieved by purely fixed health facility delivery tactics did not exceed 25% to 30% with the third dose of DPT and polo vaccines, or 28% with the single-dose vaccines (BCG and measles) among children under 3 years of age.

In 1982 a technical and administrative EPI evaluation was performed and impediments limiting the attainment of the target vaccination coverage were identified. The leading causes found were: a lack of political commitment, a lack of participation by the public, poor coordination of the program with the general health services, rigid and uniform administrative standards for the whole country, the abstractness of the technical standards, and poor public information.

From this analysis emerged the strategy of mobilization of the population through the local health committees in order to improve vaccination coverage. These local committees have been able to substantially improve the coverage of polo vaccination by aiding health staff in the application of oral vaccines during the operations carried out on National Vaccination Days, organized three times a year.

The implementation of this strategy in Bolivia since 1983 allows each user of health services to be an active agent for his/her health rather than a passive recipient of services. By participating in programs he/she exercises the right to health he/she is entitled to from his/her country’s Constitution. An increasing number of Bolivians are becoming parties to health decisions that affect them as a result of the government’s request and encouragement for popular participation. The achievements of mass mobilization for vaccination may be classified as follows:

Overall Achievements
- It has made the country’s health condition an object of thought and discussion and helped the country to achieve the highest vaccination coverage in the last few years.
- It has prompted a revision of vaccine standards for the public.
- It has prompted responses to requests for health services from the public.
- It has given the health services a new image through the activities they have promoted.
- It has introduced a joint effort to identify the organizations, movements, and individuals that respond to interests of the public and genuinely seek to serve them.
- It has helped consolidate grass-roots organizations.

Specific Achievements
- It has provided the people with needed health information so that they become their own agents for health improvement.
- It has raised the level of institutional participation through analysis and self-criticism.
- It has effectively protected the infant population against polo and measles.

Some Preliminary Results: Measles
- On the basis of reported cases, measles ranks sixth among the communicable diseases in Bolivia. This disease maintains its presence during July and its prevalence peaks in September, after which it begins declining in November. The age group most severely affected is that of children between 2 and 4 years of age. It ranks third among the causes of general morbidity in children under 5 years of age.

The years of highest incidence were 1972 and 1977, with 8,315 and 8,194 cases, respectively.

Figure 1 demonstrates that the number of cases dropped significantly in 1981. Vaccination against measles has been administered in Bolivia since 1965; however, the low coverage obtained was due to the program’s limited coverage. In 1979 measles vaccination activities were made routine, but even so, coverage proved inadequate until 1984 when this vaccine was also included in National Vaccination Days.

A comparison of coverage among 1-year-olds vaccinated against measles from 1979 to 1983 reveals a considerably irregular pattern and even a significant drop in 1983. Due to the mass mobilization in 1984, the coverage of measles vaccination among 1-year-olds was 80% greater than it had been in 1983 and was the highest ever achieved in the country for this vaccine (see Figure 2).
Measles in the Americas, 1980–1984

Measles continues to be the most frequently reported of the EPI preventable diseases. As shown in Figure 1, despite immunization coverage rates of over 60%, there was a resurgence of measles activity in the Region in 1984. The United States also reported an increase in overall incidence in 1984, although more states within the U.S. remained free of transmission in 1984 than during any previous year. Both the United States and Canada are engaged in measles elimination programs, and immunization coverage levels of over 95% have been attained in these areas.

If measles morbidity rates are examined by subregion (Figure 2), it can be seen that rates of disease incidence increased in 1981 in all areas except the Caribbean, with the most marked increase reported by the subregion of temperate South America. Most of the increase here was due to an epidemic of measles which occurred in Argentina in 1981. The number of cases reported by Argentina increased from 7,106 in 1981 to 31,751 in 1984. In the subregion of tropical South America, Brazil reported a marked increase in disease activity, from 54,255 cases reported in 1983 to 78,481 cases in 1984. Other countries in this subregion experienced milder increases. Four of seven countries in the continental subregion reported increased case counts. In general, 1984 appears to have been a year of intensified measles activity in all areas of the Region except the Caribbean subregion.

PAHO assisted the government of Argentina in the investigation of the measles outbreak in 1984 based on a 2-year epidemic cycle and a prior peak which had occurred between December 1981 and March 1982. Surveillance and immunization activities were intensified and the anticipated increase in disease was not seen. In Rio de Janeiro, a national day of measles vaccination for children under age 5 held in May 1985 apparently averted a disease peak in June, July, and August. Hospital admission for measles plummeted by 90% during these months. Such mass vaccination campaigns have proven valuable in preventing epidemics of both measles and whooping cough in the Region, providing an additional strategy option for EPI programs.

In general, measles is a seasonal disease with increased epidemic activity every two or three years. Because of its high communicability, very high immunization coverage levels are necessary to prevent

Many suspected cases were rejected as non-measles cases by applying these criteria, especially in infants under six months of age and in persons over six years of age.

As of October 1984, a total of 338 measles cases had been reported in the Republic of Panama. This represents a reduction of 36% when compared with the same period in 1983.

During the last two years, the monthly number of reported cases in the country has remained below the median of reported cases from 1977 to 1981 (see Figure 1). A reduction of approximately 80% of reported measles cases was observed during October 1984, for example. This pattern can be partly attributed to the increase in vaccination coverage, which reached 71.6% in children under one year of age during the first trimester of 1984. To avoid a probable measles epidemic, it will be necessary to increase vaccination activities, especially in those under one year of age and in preschoolers, until coverage of over 90% is reached.

Health regions, such as Panama and San Blas in 1982 and Bocas del Toro in 1983, managed to avoid epidemics by means of exhaustive vaccination efforts by regional and local teams.

Because the epidemic in Panama from December 1981 to March 1982 was monitored by the last trimester of 1984 was determined to be a high risk period for measles.

Based on this finding, vaccination and surveillance activities were intensified at local and regional levels, including individual case investigation to determine previous vaccination status and guarantee the vaccination of all susceptible children.

During the course of these investigations, a case of measles was defined using the clinical criteria proposed by the Centers for Disease Control in Atlanta (see EPI Newsletter V1-S):

1. Fever 38.3°C or higher.
2. Generalized rash of 3 days or longer.
3. At least one of the following: coryza, conjunctivitis or cough.

Their experience shows that measles can be controlled in Panama.
periodic outbreaks. The experience in North America supports this strategy. As seen in Argentina where coverage is 70%, some infants each year will remain susceptible and outbreak activity will occur when a requisite number of susceptibles is generated over time to support viral transmission. Paraguay and Brazil have demonstrated that periodic mass immunization campaigns directed at appropriate age groups can be valuable in controlling measles. Thus, although accumulation of susceptibles does not occur in the population.

Age of cases of measles is not routinely reported to the Regional Office although it is recommended that countries collect such information on their own use. Age information at the country, programmatic level allows targeting of efforts to age groups particularly at risk. Non-routine surveillance data and information collected during assistance with outbreak investigations suggest measles continues to be a disease of young children for most of the Region.

It appears that the age of highest incidence disease is marked by the face of elimination efforts such as that underway in the United States. The coverage rates are greater than 95%. As incidence declines, sporadic cases begin to be seen among older age groups; this can be seen when the proportion of cases in age group in the U.S. is compared with that occurring in selected urban centers elsewhere in the Region (Figure 1). Population-based rates in the U.S. showed a rate of 2.6/100,000 for the 0-4 age group and 2.1/100,000 for the 5-14 age group and 2.6/100,000 for the 0-4 age group.

Work is ongoing to develop new vaccines which would allow earlier effective immunization against measles of infants younger than 9 months of age. This area of research continues to be of interest to PAHO as the regional EPI program searches for improved methods of measles control.

Source: Excerpted from Health Comments, the Americas, 1984-1985 (In press).

![FIGURE 1 Reported measles cases, by week of rash onset, United States, first 26 weeks, 1985.](https://example.com/image)

### TABLE 1. Age distribution and estimated incidence rates of measles, United States, first 26 weeks, 1984 and 1985. *

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>1984 Cases</th>
<th>1985 Cases</th>
<th>Ratea</th>
<th>1984 Cases</th>
<th>1985 Cases</th>
<th>Ratea</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>351 (19.8)</td>
<td>20 (4.6)</td>
<td>2.0</td>
<td>466 (25.9)</td>
<td>2.5</td>
<td>+25</td>
</tr>
<tr>
<td>4-9</td>
<td>201 (11.4)</td>
<td>152 (8.4)</td>
<td>0.9</td>
<td>259 (14.3)</td>
<td>0.8</td>
<td>-30.8</td>
</tr>
<tr>
<td>9-14</td>
<td>575 (32.6)</td>
<td>218 (11.7)</td>
<td>3.4</td>
<td>393 (21.8)</td>
<td>2.2</td>
<td>-44.9</td>
</tr>
<tr>
<td>15-19</td>
<td>470 (26.8)</td>
<td>603 (33.5)</td>
<td>2.4</td>
<td>429 (24.1)</td>
<td>3.1</td>
<td>+29.2</td>
</tr>
<tr>
<td>20-24</td>
<td>173 (9.7)</td>
<td>175 (9.7)</td>
<td>0.8</td>
<td>177 (9.9)</td>
<td>0.8</td>
<td>+3.3</td>
</tr>
<tr>
<td>&gt;25</td>
<td>91 (5.1)</td>
<td>86 (4.6)</td>
<td>0.1</td>
<td>91 (5.1)</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,785 (100.0)</td>
<td>1,801 (100.0)</td>
<td>0.8</td>
<td>1,801 (100.0)</td>
<td>0.8</td>
<td>0.0</td>
</tr>
</tbody>
</table>

* Provisional data.

1. Per 100,000 population.
2. The difference between this number and that in the table reflects differences between summary data reported to MMWR and more detailed data available from the CDC’s Division of Immunization.

Seventy cases (3.9%) were international importations. An additional 128 (6.7%) cases were epidemiologically linked to an international importation within two generations of infection. Therefore, 198 (11.0%) of all cases were classified as international importations during this period.2

Vaccination status of patients in 1984 and 1985 was similar. Of the 1,801 cases reported during the first 26 weeks of 1985, 859 of the patients had been vaccinated or had been infected after the first birthday. 247 had been vaccinated at 12-14 months of age (Table 2). A total of 846 measles patients were unvaccinated, and 96 had histories of inadequate vaccination (vaccinated before the first birthday).

Of the 1,801 cases, 466 (25.9%) were classified as preventable (Table 3). The highest proportion of preventable cases occurred among persons who were not vaccinated: 69.2% of cases among children 16 months and younger; 67.9% of cases among persons 5-19 years of age were preventable. Only 20.4% of cases among persons 5-19 years of age were preventable. However, 47.0% of all preventable cases occurred in this age group.

Of the 1,335 persons with non-preventable cases, 242 (18.1%)
### Table 3. Age distribution and preventability of measles cases, United States, first 26 weeks, 1985.*

<table>
<thead>
<tr>
<th>Age group</th>
<th>Preventable</th>
<th>Nonpreventable</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;16 months</td>
<td>242 (96.1)</td>
<td>12 (4.9)</td>
<td>254</td>
</tr>
<tr>
<td>16–24 months</td>
<td>1,051 (98.7)</td>
<td>33 (1.3)</td>
<td>1,084</td>
</tr>
<tr>
<td>Adequately vaccinated</td>
<td>842 (80.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor physician diagnosis</td>
<td>71 (6.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immunization of U.S. citizens</td>
<td>34 (3.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exemptions</td>
<td>163 (15.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory evidence of immunity</td>
<td>1 (0.1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Provisional data.

### Table 4. Reasons measles cases were classified as nonpreventable, United States, first 26 weeks, 1985.*

<table>
<thead>
<tr>
<th>Causes of nonpreventability</th>
<th>No. cases (%)</th>
<th>Percentage of total cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;16 months</td>
<td>242 (96.1)</td>
<td>13.4</td>
</tr>
<tr>
<td>Born before 1957</td>
<td>42 (3.1)</td>
<td>2.3</td>
</tr>
<tr>
<td>16–24 months</td>
<td>1,051 (98.7)</td>
<td>96.6</td>
</tr>
<tr>
<td>Adequately vaccinated</td>
<td>842 (80.1)</td>
<td>84.8</td>
</tr>
<tr>
<td>Poor physician diagnosis</td>
<td>71 (6.9)</td>
<td>6.7</td>
</tr>
<tr>
<td>Immunization of U.S. citizens</td>
<td>34 (3.2)</td>
<td>3.2</td>
</tr>
<tr>
<td>Exemptions</td>
<td>163 (15.5)</td>
<td>15.5</td>
</tr>
<tr>
<td>Laboratory evidence of immunity</td>
<td>1 (0.1)</td>
<td>0.1</td>
</tr>
</tbody>
</table>

* Provisional data.

### Editorial Note:

In the pre-vaccine era, an average of 500,000 measles cases were reported each year. After measles vaccine was licensed in 1963, the incidence of measles markedly declined. Since 1981, the number of reported measles cases has remained relatively constant; 3,124 in 1981, 1,714 in 1982, 1,497 in 1983, and 2,543 in 1984. The number of cases reported during the first half of 1985 is similar to that reported during the first half of 1984. As in recent years, measles was geographically restricted: 92.5% of the nation’s counties were free of measles during this period.

### Table 2. Ages of measles patients at most recent vaccination, United States, first 26 weeks, 1984 and 1985.*

<table>
<thead>
<tr>
<th>Age at vaccination</th>
<th>1984</th>
<th>1985</th>
</tr>
</thead>
<tbody>
<tr>
<td>12–14 months</td>
<td>135 (7.4)</td>
<td>98 (5.3)</td>
</tr>
<tr>
<td></td>
<td>255 (14.0)</td>
<td>247 (13.7)</td>
</tr>
<tr>
<td>15 months</td>
<td>34 (1.8)</td>
<td>46 (2.6)</td>
</tr>
<tr>
<td>6–14 years–4 years</td>
<td>303 (17.2)</td>
<td>325 (18.0)</td>
</tr>
<tr>
<td>&lt;12 months</td>
<td>139 (7.5)</td>
<td>165 (9.2)</td>
</tr>
<tr>
<td></td>
<td>15 (0.8)</td>
<td>20 (1.1)</td>
</tr>
<tr>
<td>15–19 years</td>
<td>8 (0.5)</td>
<td>5 (0.3)</td>
</tr>
<tr>
<td>20–24 years</td>
<td>2 (0.1)</td>
<td>1 (0.1)</td>
</tr>
<tr>
<td>Unknown &gt;12 months</td>
<td>2 (0.2)</td>
<td>0 (0.1)</td>
</tr>
<tr>
<td>Unvaccinated</td>
<td>854 (48.4)</td>
<td>846 (47.0)</td>
</tr>
<tr>
<td>Total</td>
<td>1,785 (100.0)</td>
<td>1,801 (100.0)</td>
</tr>
</tbody>
</table>

* Provisional data.

### Table 1. Measles cases reported to the Hospital del Niño, by type of care received, and by age of occurrence, Panama, 1985.

<table>
<thead>
<tr>
<th>Age</th>
<th>Total</th>
<th>Hospital</th>
<th>Outpatient</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–4 mos</td>
<td>110</td>
<td>75</td>
<td>35</td>
</tr>
<tr>
<td>5–11 mos</td>
<td>317</td>
<td>111</td>
<td>206</td>
</tr>
<tr>
<td>12 mos–6 years</td>
<td>279</td>
<td>81</td>
<td>198</td>
</tr>
<tr>
<td>7 years–11 years</td>
<td>111</td>
<td>42</td>
<td>69</td>
</tr>
<tr>
<td>12 years–14 years</td>
<td>81</td>
<td>24</td>
<td>57</td>
</tr>
<tr>
<td>&gt;15 years</td>
<td>66</td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>Total</td>
<td>279</td>
<td>111</td>
<td>168</td>
</tr>
</tbody>
</table>

* Provisional data.

### References:


2. CDC. Classification of measles cases and categorization of measles elimination programs. MMWR 31: 303–312, 1982.


### FIGURE 1 The development and distribution of measles rash.

- 1st day of rash
- 2nd day of rash
- 3rd day of rash

- Koplik's spots on normal skin
- Koplik's spots on measles skin

- Healthy skin
- Rash skin

### TABLE 1. Measles cases reported to the Hospital del Niño, by type of care received, and by age of occurrence, Panama, 1985.

<table>
<thead>
<tr>
<th>Age</th>
<th>Total</th>
<th>Hospital</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>7 years–11 years</td>
<td>111</td>
<td>42</td>
<td>69</td>
</tr>
<tr>
<td>12 years–14 years</td>
<td>81</td>
<td>24</td>
<td>57</td>
</tr>
<tr>
<td>&gt;15 years</td>
<td>66</td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>Total</td>
<td>279</td>
<td>111</td>
<td>168</td>
</tr>
</tbody>
</table>

Source: Administration and Finance Division; Statistics and Records Department, Hospital del Niño.

### August 1985 Volume VIII, Number 4

Why is There Measles in Panama?

Measles is a highly contagious, viral disease characterized by fever, conjunctivitis, cough, and spots on the mucus membranes of the mouth (Koplik’s spots) followed by a generalized morbilliform eruption, which usually appears on the fourth day of the disease (Figure 1). The rash and accompanying illness reach a climax on about the sixth day, subsiding a few days later, followed by complete recovery in most cases. Measles is most serious in nursing infants and adults. Complications such as pneumonia, otitis media, and encephalitis can arise. Pneumonia is the main cause of death in children with measles, mainly those under 2 years of age.

An effective vaccine against measles has been available since 1963. It prevents the disease in about 95% of the persons vaccinated. The vaccine is stockpiled and administered free of charge at health institutions around the country.

Current Situation

In 1985, 1,286 children were treated for measles at the Hospital del Niño (Table 1). Of these, 379 had to be hospitalized and 6 died. Judging by the trend of the case curve, an estimated 322 additional children with measles will seek health care at the Hospital del Niño before the end of this epidemic. Based on the average cost of emergency room care (equivalent to approximately US$ 10) and the daily hospitalization rate (US$ 50), and on an average length of stay of 4.8 days per measles patient in 1985, the measles epidemic will ultimately cost the Hospital del Nino more than US$ 130,000. To this should be added the cost of care at other health care centers in the country and the direct and indirect costs to the families of these children, not to mention the incalculable cost of the suffering and death of Panamanian children.

Vaccine Efficacy and Age of Vaccination

Mathematical models have established that between 93% and 96% of the population must be immunized in order to completely eliminate measles transmission. Since the effectiveness of the vaccine is about 95%, it would be necessary to vaccinate virtually 100% of the susceptible population, in keeping with the goals of the World Health Organization.

In order to better understand the epidemiology of the outbreak, it was decided to look at vaccine efficacy and age of vaccination in order to improve control strategies. Based on reports from the Metropolitan Region Epidemiology Department of measles cases and vaccination history, and using the formula to calculate vaccine efficacy (the attack rate in the unvaccinated minus the attack rate in the vaccinated divided by the attack rate in the unvaccinated), the effectiveness of the vaccine was estimated at 90%. This level is at the lower end of the normal limits for measles vaccine efficacy (96% to 98%).

There is disagreement about the ideal age for vaccination. PMH/WHR, based on studies in Africa, Chile, Brazil, Ecuador, Costa Rica, and Haiti, recommends vaccination at 9 months, whereas the United States has concluded that vaccination should be performed at 15 months of age. Panama has taken an intermediate position by vaccinating at 9 months and revaccinating at 15 months. Also controversial is whether revaccination at 15 months is effective in children vaccinated before 1 year of age.

The age issue is important in Panama since, despite the considerable effort being made and the policy decision to hold national vaccination days, measles remains out of control. Several technical issues are also involved: (1) considerable material and human effort is required to administer two doses of measles vaccine, one at 9 and the other at 15 months; (2) coverage levels are approaching the 85% necessary to interrupt transmission; (3) about one-third of the cases occur in infants under one year of age, when the complications of measles are most severe, and (4) about one-fourth of the cases occur in schoolchildren between 5 and 14 years of age (Figure 2). Cases in the latter age group are particularly important due to the possibility of transmitting the disease to younger children.

### Recommendations

Based on the previous analysis, the following steps were recommended to the Ministry of Health:
Rubella Watch EPI News

Pan American Health Organization

VOLUME VIII, NUMBER 6

1979-2009

December 1986

Noosomial Measles

Although noosomial transmission of measles among children attending pediatric clinics is well known, no quantitative study including a control group has been reported.

In 1985, a study of this kind was carried out in a maternal and child health clinic on the outskirts of Iquitos (Ucayali Province) where 11,000 children are seen each month. The clinical criteria for identifying measles patients were: ocular- conjunctivitis, coryza, Koplik's spots or typical rash. Patients with measles were asked about the measles vaccination date of same age selected from other children attending the clinic for illnesses other than measles. In the measles patients the probable date of infection was determined by the stage of the rash at the time of examination, on the basis of predefined criteria.

Measles patients who attended the clinic on a date compatible with the probable date of their infection, together with those controls who had attended the clinic 8-21 days earlier, were considered to have been exposed.

The statistical analysis was performed for (a) the entire population; (b) the immunized population; and (c) the unimmunized population and each of three age groups (<9 months, 9-11 months, 212 months). The relationship between measles and exposure was studied by means of the \( \chi^2 \) test when the expected cell sizes were sufficiently large or by Fisher's exact test when the expected cell sizes were sufficiently small or when the expected cell sizes were 5 or less.

In view of the frequency of the transmission of measles within the clinic, the attributable risk was calculated by simple subtraction of the proportion of clinic patients exposed from the proportion of clinic attendees who were exposed.

Results

A total of 140 children were included in the study (70 with measles and 70 controls). Of the 70 measles patients, 55 had visited the clinic 8-21 days earlier (Table 1), and 50 were considered to have been exposed during that visit. Twenty-four of the 70 had a history of measles and were therefore excluded from the study; of the remaining 46, 3 had attended the clinic 8-21 days earlier (Table 2). The proportion of clinic patients vaccinated was significantly lower among the controls than among measles patients (1 out of 46 as against 50 out of 70; \( \chi^2 = 47.1, p < 0.01 \)). The relative risk is estimated at 19.2 (9.2 to 102 at 5% risk) in view of the frequency of the disease among clinic attenders (11 of 46 during an outbreak). The proportion of clinic patients exposed can be estimated to be 13%, on the basis of the study.

TABLE 1. Measles transmission among a health unit, relationship between time elapsed since last clinic consultation and stage of measles, Ivory Coast, 1985.

<table>
<thead>
<tr>
<th>Stage of measles</th>
<th>Time in days since last consultation</th>
<th>Total exposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-15 months 45%</td>
<td>5-15 years 10%</td>
<td></td>
</tr>
<tr>
<td>1 year 10%</td>
<td>11-15 months 10%</td>
<td></td>
</tr>
<tr>
<td>2-3 months</td>
<td>16-17 months 10%</td>
<td></td>
</tr>
<tr>
<td>4-6 months 4%</td>
<td>18-20 months 5%</td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td>21-30 months 5%</td>
<td></td>
</tr>
<tr>
<td>1 year</td>
<td>31-60 months 5%</td>
<td></td>
</tr>
</tbody>
</table>

Note: Measles patients were considered to be exposed to measles if they attended the clinic 8-21 days earlier than the patient with the acute respiratory illness. The attributable risk was calculated by simple subtraction of the proportion of clinic patients exposed from the proportion of clinic attendees who were exposed.


TABLE 2. Reason for previous consultation by measles patients and controls, Ivory Coast, 1985.

<table>
<thead>
<tr>
<th>Reason for previous consultation</th>
<th>Measles patients</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine visit</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>Acute diathesis</td>
<td>63</td>
<td>30</td>
</tr>
<tr>
<td>TOTAL</td>
<td>68</td>
<td>43</td>
</tr>
</tbody>
</table>

- Routine visit: Measles patients, 5 controls.
- Acute diathesis: Measles patients, 63 controls.
- TOTAL: Measles patients, 68 controls.

- The estimates are similar for unimmunized subjects (64 with measles and 21 controls).
- The age distribution of the two groups did not differ significantly. The frequency of exposure is significantly lower among the controls than among the measles patients (60 out of 21 as against 46 out of 64; $\chi^2 = 79.2$, p < 0.01). The odds ratio was not calculated since no controls were exposed. In view of the proportion of clinic patients exposed (13%), the attributable risk is 81%.

- The reason for the previous visit was recalled by 111 of the mothers (68 mothers of measles patients and 43 mothers of controls) (Table 3). This information gives an indication of the profiles of the patients most exposed to the risk of measles nosocomial infection. The frequency of routine visits was significantly lower among measles patients than among controls (5 out of 68 as against 12 out of 43; $\chi^2 = 10.2$, p < 0.01).

- Analysis of the findings: Although the survey was carried out at the end of an epidemic, the results showed that two-thirds of the measles cases treated in this clinic were of nosocomial origin.

- It might be expected that in epidemic periods, measles would spread even more among clinic patients. Because of the way outpatient care is organized, infants are all exposed to the virus in the waitingroom. However, evaluation of immunization coverage among this population showed that 64% were immunized against measles. The Ivory Coast was one of the first countries to perform routine immunization of moderately febrile children in accordance with WHO recommendations.

- The Advisory Group on Nutrition to the Sub-Committee of the SCN of the UN Administrative Committee on Coordination concluded that there was no longer any reason to expect that effects of this magnitude would be seen in other settings with similar conditions, including at least similar severity of vitamin A deficiency with associated xerophthalmia, similar high prevalence of childhood morbidity and mortality, and similar effectiveness of the xerophthalmia control program.

- Second, in a recent Indonesian report even mild signs of vitamin A deficiency in preschool-age children were associated with a fourfold increase in mortality; the incidence of diarrhea and respiratory disease was increased two to threefold.

- Third, in a randomized controlled community trial in Indonesia, childhood mortality was approximately 30% higher in preschool children supplemented with large, oral doses of vitamin A.

- The Advisory Group on Nutrition to the Sub-Committee of the SCN of the UN Administrative Committee on Coordination concluded that there was no longer any reason to expect that effects of this magnitude would be seen in other settings with similar conditions, including at least similar severity of vitamin A deficiency with associated xerophthalmia, similar high prevalence of childhood morbidity and mortality, and similar effectiveness of the xerophthalmia control program. Furthermore, the SCN decided that a beneficial effect on child mortality was a likely additional consequence of vitamin A supplementation programs mounted for the control of severe vitamin A deficiency.

- Mortality associated specifically with measles may also be greatly reduced by supplying adequate vitamin A. A clinical trial in Tanzania in 1987 showed that children admitted to the hospital with measles had half the mortality of those exposed to the effects of large, oral dose supplements of vitamin A on mortality. Children aged 200,000 international units (IU) of vitamin A two successive
days were less likely to die than children given routine treatment. Mortality was twice as high in the control group (11.2%) as the supplemented group (5.6%), the greatest difference occurring in children under the age of 2 years.

Action Recommended
Present evidence suggests that improvement of vitamin A status may reduce mortality and morbidity rates among children of preschool-age in all countries where vitamin A deficiency exists. Further community assessments may be needed to determine the priority of introducing vitamin A intervention programs for children in such communities. One such intervention is high dose supplementation, the benefits of which appear to be substantial in children with marginal vitamin A stores.

High-dose vitamin A supplementation should be provided to all children diagnosed with measles in communities in which vitamin A deficiency is a recognized problem. In countries where the fertility rate of young mothers is 1% or higher it is sensible on the basis of current evidence to provide vitamin A supplements to all children diagnosed with measles.

The dose of vitamin A should be 100,000 IU, by mouth, in children below 12 months of age, and 200,000 IU in children above the age of one year. The dose should be administered immediately on the diagnosis of measles if any of the eye signs of vitamin A deficiency are present, the initial dose should be repeated the next day and again one to four weeks later.

Measles in the United States, 1987

In 1987, a provisional total of 3,652 measles cases was reported to CDC, a 42% decrease from the 6,282 cases reported in 1986. (Figure 1). The 1987 incidence rate was 1.9 cases/100,000 population, compared with 2.7 cases/100,000 population in 1986.

Detailed information was provided to CDC’s Division of Services for School Age Children for Prevention Services, on 3,652 cases. Of these, 3,112 (86.0%) met the standard clinical case definition for measles, and 1,106 (30.3%) were serologically confirmed. The usual seasonal pattern was observed, with the peak number of cases occurring from February through May (weeks 4-24) (Figure 2).

There were 76 outbreaks (i.e., five or more epidemiologically related cases), which accounted for 3,165 (86.3%) cases. Seven outbreaks with more than 100 cases each accounted for 1,477 (41.4%) cases. Eighty-three (2.3%) were known to be imported from other countries. Of these, 44 (53.1%) were in U.S. citizens. An additional 88 (2.4%) were epidemiologically linked to imported cases within two generations of onset in the index patient.

In 1,065 (19.2%) cases, the patients were 5 years of age (Table 1). 482 (15.2%) were 15-29 months of age and 297 (12.7%) were 12-14 months of age. The 15-19 year age group accounted for 28.7% of all cases. The incidence rate of measles decreased from 1986 to 1987 in all age groups. The highest incidence rates occurred in 0-4 year-olds and 15-19 year-olds.

Complications were reported in 445 (12.2%) cases. Otitis media was reported in 209 (5.7%) cases; diaphorrhea, in 159 (4.4%); pneumonia, in 91 (2.5%); and encephalitis, in 5 (0.1%). Two hundred forty-five (7.8%) of the reported patients were hospitalized. Four measles-attributable deaths were reported (death-to-case ratio of 1.1 deaths per 1,000 cases).

Of the 2,451 (67.1%) patients for whom setting of transmission was reported, 1296 (52.9%) acquired measles in primary or secondary schools; 153 (6.2%) in medical settings; 141 (5.8%), in colleges or universities; 72 (2.9%), in child day care; 503 (20.0), at home; and 286 (11.7%), in a variety of other settings.

A total of 1,234 (47.5%) patients had been vaccinated on or after the first birthday, including 609 (17.6%) who were vaccinated at 12-14 months of age. One hundred sixty-nine (4.6%) had a history of vaccination before the first birthday, and 1,249 (47.9%) were unvaccinated. Of the 2,301 school-aged children 5-19 years of age, 1,506 (71.7%) had been adequately vaccinated, including 579 (25.6%) who were vaccinated at 12-14 months of age. In contrast, 10% of the 1,065 preschool-aged children 0-4 years of age and 15 (14.4%) had been adequately vaccinated, including 20 (1.9%) vaccinated at 12-14 months of age. (Table 2).

Measles cases are classified as preventable or non-preventable. A case is defined as preventable if it occurs in a person for whom vaccine is indicated by current recommendations. Of the 3652 cases, 1020 (27.7%) were classified as preventable (Table 3). From 1986 to 1987, the absolute number and proportion of cases that were preventable through vaccine vaccination decreased in all age groups except those 25 years of age. The highest proportion of cases that were preventable through vaccination occurred in adults (25-29 year olds and in children 16 months to 4 years old.

In contrast, fewer than one fifth of cases in school-age children 5-19 years of age were preventable through vaccination. However, 40.1% of all preventable cases occurred in this age group.

The decrease in number of cases reported in 1987 reverses the trend of annual increases in measles incidence since the record-low year 1983, when 1,497 cases were reported. The number of cases reported in 1987 represents a 99% reduction from the pre-vaccine era. Incidence rates in 1987 decreased from 1986 in all age groups; the largest decrease was in children 5 years of age. The overall decline observed in 1987 has continued into 1988. The provisional 1988 case count through week 27 is approximately 60% below the 1987 level. Reasons for the decline in measles may be multiple; secular trends, exclusion of susceptibles in some areas from which large numbers of cases have previously been reported, or fewer importations in 1987.

As in previous years, almost one-third of cases reported were classified as non-preventable, i.e., patients were eligible for vaccine but unvaccinated. Many of these cases occurred in non-preschool-aged children living in inner-city areas. Innovative strategies are needed to increase immunization levels in these populations.

Most cases reported in 1987, however, were classified as non-preventable and occurred in school-age children who had been vaccinated on or after the first birthday. Most of these cases occurred from primary vaccine failure, i.e., the failure to seroconvert following vaccination; there is little epidemiologic evidence.
to indicate that a secondary vaccine failure rate of 5% (range 2%-10%) may provide enough susceptibles to sustain an outbreak among highly vaccinated populations in some settings. Moreover, persons vaccinated at 12-14 months of age at a slightly higher risk for measles than are persons vaccinated at 15 months.

The four deaths reported in 1987 are the first measles-attributable deaths reported to the Division of Immunization since 1985. All deaths occurred in immunocompromised patients, including two children with AIDS. Since large measles outbreaks have occurred in areas with a high prevalence of human immunodeficiency virus (HIV) infections and since HIV-infected persons appear to be at increased risk for serious complications, the Immunization Practices Advisory Committee (ACIP) recommends that asymptomatic HIV-infected children be vaccinated with measles, mumps, and rubella (MMR) vaccine and that consideration be given to vaccinating symptomatic HIV-infected children.

A group of expert consultants was recently convened by CDC to consider the problem of continuing measles transmission in the United States. The consultants felt that the goal of measles elimination should be pursued. They reviewed the two predominant patterns of measles: 1) measles in unvaccinated preschool-aged children - a failure to implement the current strategy, and 2) infections in adequately vaccinated schoolchildren - a failure of the current strategy. These two patterns require different solutions. Increased efforts are needed to vaccinate preschool-aged children. Vaccination schedules may need to be modified in selected high-risk areas. Proposed changes include lowering the recommended age for routine vaccination and/or instituting a two-dose schedule. Aggressive revaccination strategies may also be necessary to control outbreaks among highly vaccinated school-age populations. These recommendations are being evaluated by ACIP. In the meantime, efforts should continue to ensure that all susceptible persons are vaccinated and that appropriate surveillance and outbreak-control procedures are practiced.

Controlled trials and other studies have been conducted to determine the preventability and success of measles vaccination. In some recent studies, the measles vaccine has been shown to be effective in controlling outbreaks of measles. However, in other studies, the measles vaccine has not been as effective in controlling outbreaks of measles. The reasons for this variation in effectiveness are not fully understood. Further research is needed to determine the reasons for this variation in effectiveness.

The GAG, after reviewing a summary of these data concluded that while the results were encouraging, a number of questions still required answers. The additional information did not yet warrant a recommendation to administer a third dose of measles vaccine to persons who had already received two doses of measles vaccine. The GAG recommended that further studies be conducted to evaluate the effects of measles vaccination and to determine the success of measles vaccination in controlling outbreaks of measles.

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Measles Vaccines

Preliminary studies carried out in Mexico, the Gambia, and other countries, suggested that the Edmonton Zagreb strain of measles vaccine, resulted in higher seroconversion rates in the presence of maternal antibodies than the commonly used Schwarz strain, and that increasing the amount of virus administered, regardless of the strain, could also overcome maternal antibody and improve seroconversion at younger ages. At present, there are a number of studies being done to evaluate the effects of measles vaccine strain and dose on seroconversion. Preliminary results were presented at a workshop in Washington D.C. in September and at the recent EPI Global Advisory Group (GAG) Meeting held in Abuja, Nigeria. The vaccine strain is high-risk. However, the measles vaccine is safe and effective in controlling outbreaks of measles. The reasons for this variation in effectiveness are not fully understood. Further research is needed to determine the reasons for this variation in effectiveness.

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References
status of measles cases according to current criteria as specified in the above surveillance summary. This means collecting data regarding age, country of usual residence, date of measles immunization or reason for not being immunized. The absolute number and proportion of measles cases which are preventable show how well current immunization recommendations are being implemented. If the number or proportion of measles cases which are currently considered non-preventable remains unsatisfactorily high, other immunization and control strategies will have to be considered.

c) "Prompt outbreak control measures designed to prevent spread from index cases to susceptible contacts."

In order to immunize or exclude susceptibles from daycare or school in the event of an outbreak, it is important to identify them quickly. Keeping immunization records for daycare and school populations up-to-date and readily accessible allows rapid identification of susceptibles in the event of an outbreak.

Conclusion

Worldwide, "an estimated 2 million children die annually from measles and its complications. Delayed mortality, occurring up to 12 months after infection, causes many additional deaths." (WHO Weekly Epidemic Rec 1988; 61:9-13). As with smallpox or polio or any other communicable disease, elimination throughout the world means elimination country by country. Therefore, the success of elimination in Canada will be critical for future programs aiming at elimination in developing countries.


August 1989

Volume XI, Number 4

Seventh Meeting of the Technical Advisory Group on EPI

Introduction

The Seventh Meeting of the Technical Advisory Group on EPI and Polio Eradication (TAG) was held 11-14 July 1989 in Cartagena, Colombia. Approximately 120 persons from 21 countries attended the meeting, including representatives of the Ministries of Health of the governments of the countries of the Region, the agencies funding the effort (UNICEF, PAHO, Rotary International, UNICEF, WHO, the Japanese Government, and the Task Force for Child Survival. Dr. Donald A. Henderson, president of the TAG, presided over the meeting; Dr. Alan Hinman served as Rapporteur; and Dr. Ciro de Quadros served as Secretary. All members of the TAG were present at the meeting.

Following a summary of the situation of the EPI and polio eradication efforts in the Region and a summary of global progress in the EPI, the meeting turned to a review of progress and problems in each of the countries in the Andean sub-region. Specific presentations were then made regarding the programs in Brazil, Mexico, Central America, Haiti, and the Southern Cone. After this there was discussion of the laboratory situation in the Region, the accomplishments of various "mop-up" programs, the specificity and sensitivity of the case definitions in use, considerations of importations of polio from other Regions, and studies on appropriate formulations of oral poliovirus vaccine (OPV).

Discussion then turned to measles, focusing on progress toward measles elimination in Cuba and the resolution by the countries of the English-speaking Caribbean to eliminate indigenous transmission of measles by 1995. There was then consideration of opportunities missed and opportunities gained to provide immunizations, the current situation with neonatal tetanus, the use of the polio eradication program to provide cost estimates for EPI, and on remaining relevant issues for achieving eradication of polio, including polio surveillance in the environment.

The representatives of Ministries of Health of the Andean Region signed a declaration in which they set up a group with the purpose of strengthening the EPI and the Polio Eradication Plan and jointly addressing solutions to common problems. They agreed to hold a meeting in Ecuador during the month of November 1989 to establish short-term joint strategies.

As has been the case at previous meetings, the quantity of information available, the quality of presentations, and the obvious accomplishments of individual programs clearly demonstrated the remarkable progress that has been made in the Americas in implementing the EPI and in getting closer and closer to the target of universal childhood immunization and polio eradication.

Conclusions and Recommendations

1. The adoption by the English-speaking Caribbean countries of a target of elimination of indigenous transmission of measles by 1995 represents an important and ambitious "next step" in improving health through immunization. It must be recognized that the target is an intermediate one (on the road to eradication) and that it will be essential to maintain universal immunization and aggressive surveillance even after its attainment because of the inevitability of importation of measles virus with likely subsequent explosive spread among remaining susceptibles. Even this "intermediate" target presently seems feasible only in locations such as the Caribbean islands where immunization levels are currently high and where insularity lessens the threat of importation. Experience gained during this initiative will be vital to the development of future plans for measles elimination in continental countries within the Region.

With regard to the measles elimination initiative in the English-speaking Caribbean, several general recommendations can be made as guidance in the development of more specific plans:

- The strategy proposed of initial mass vaccination or revaccination of all persons 12 months to 15 years old (regardless of previous immunization history) followed by routine vaccination is appropriate.

- Use of MMR vaccine rather than single antigen measles vaccine will bring additional health benefits to these countries.

- Experience in the United States and other countries indicates that measles transmission can be sustained even in areas with high immunization coverage among the remaining unvaccinated individuals and the small proportion of primary vaccine failures. Consequently, following the initial mass campaigns, a routine two dose schedule is recommended, with the first dose given at 12-15 months and the second at the time of entry to kindergarten or school.

- "Certification" of elimination is not recommended because it might convey a false sense of security and there is a continuing risk of introduction and transmission of measles.

2. Increasing experience with measles vaccination programs in the Region (and in other parts of the world) demonstrates that partial coverage of a population with measles vaccine not only protects the individuals vaccinated but also alters the epidemiology of the disease such that epidemic cycles become spread out (e.g., from every two years...
Measles Articles

to every five years. Until transmission is permanently interrupted, most countries can expect periodic outbreaks of measles. As overall measles incidence with time has substantially decreased, there is the risk that these outbreaks may attract underestimation. It is important to anticipate that these outbreaks will occur and take steps to ensure that they do not cause harm to individuals by allowing immunization coverage in some countries to remain low. It also must be remembered that, although individual outbreaks may be dramatic, the immunization program does provide significant cumulative reduction in the impact of measles, particularly in the number of deaths.

3. Given the rapid pace of events and the immensity of the target date, TAG proposes to meet again early in 1990. Particular emphasis will be placed at that meeting on progress in providing the laboratory support monitoring of coverage by county, performance of the negative reporting system, completion and evaluation of "mop-up" operations, results from the environmental monitoring pilot program, further information on the patterns of circulation of wild poliovirus in the Region, further information on positive reporting of the case definition, Regional/ country plans of action for their annual reporting, further progress in control of measles and neonatal tetanus.

December 1989

Volume XI, Number 6

Caribbean EPI Meeting

The VI Caribbean EPI Meeting was held in Barbados, from 13-17 November 1989. The meeting was opened by the Chief Medical Officer of Barbados in representation of the PAHO Director, and was attended by the EPI managers of all the English-speaking Caribbean countries, plus Suriname. Besides the EPI Managers, the Meeting was also attended by epidemiologists, MCH nurses, virologists, statisticians and social communicators.

Representatives of the International Organizations that are collaborating with the countries for the implementation of this program, such as the Pan American Health Organization (PAHO), the Caribbean Epidemiology Center (CAREC), UNICEF, the Canadian Public Health Association (CPHA) and the WHO were also attending the Meeting. For the first time in this series of Caribbean EPI Meetings, one member of the EPI Global Advisory Group (EAG) also attended the Meeting.

The objectives of the Meeting were:

a) to review the achievements of the countries in the implementation of their annual work plans that were developed during the V Meeting, held in Grenada in November 1988 and to prepare the annual work plans for 1990;

b) to review the epidemiological situation of measles and polio in the area in general and some countries in particular; and

c) to review and discuss the Plan of Action for the Elimination of Measles from the English-speaking Caribbean by 1995.

This had been recently approved by the Caucuses of Ministers of Health of the English-speaking Caribbean countries and subsequently for a probable case, control measures will be instituted immediately with vaccination of all contacts irrespective of their previous vaccination status, (the age group for this vaccination will be determined by the characteristics of the outbreak and investigations to identify the source of transmission will follow. Specimens will also be taken for laboratory confirmation at the designated reference laboratories.

The present reporting network in some countries relies solely on sentinel reporting, should be expanded to include all health facilities and private practitioners. The reporting network should also institute negative reporting, in which zero cases will also be reported. A standard case investigation form should be adopted by all countries. It is suggested that the form that is in the PAHO/WHO Surveillance Guidelines be adopted by all countries, until the PAHO Field Guide for Measles Elimination becomes available in early 1990. This Field Guide will be discussed by the designated country epidemiologists at a Meeting to be organized by PAHO and CAREC in early 1990.

3. The Group agreed that the ideal period to launch the Caribbean "Measles Elimination Month," in which all children under 15 years of age would be immunized against measles irrespective of their previous immunization status will be May, 1991. This also coincides with the celebration of the "Child Health Month" in many Caribbean countries.

FIGURE 1


- Suspected case: any illness with rash and fever.
- Probable case: generalized maculopapular rash with more than 2-3 days duration and fever higher than 100°F with conjunctivitis, or conjunctivitis, or cough.
- Confirmed case: fulfills the case definition and epidemiological linkage with another confirmed or probable case or is laboratory confirmed.

4. If the plan to eliminate measles is to succeed, very intensive social communication and mobilization will have to be undertaken. This will require the preparation of a Caribbean Social Mobilization Plan, which must address the need to increase awareness of political and community leaders, the population in general, and health workers of the activities to be implemented and the importance of acceptance of vaccination. This will be particularly important in relation to the Caribbean Immunization Month, in which all children under 15 years of age will have to be immunized, many of whom will have been vaccinated or suffered the disease. The Plan will also have to address specific country needs and population attitudes towards immunization, PAHO and UNICEF are requested to initiate actions for the elaboration of this Plan, in collaboration and after consultation with national authorities. A special meeting in which country representatives will discuss their national social mobilization and communication plans should be organized by PAHO and UNICEF in early 1990.

8th TAG Meeting

Held in Mexico City

The Eighth Meeting of the PAHO Technical Advisory Group (TAG) for the Expanded Program on Immunization and Polio Eradication took place in Mexico City from 19-22 April 1990. It was attended by Dr. Jesus Kumate, Minister of Health of Mexico, Juan Manuel Sotelo, PAHO Representative in Mexico, and Dr. Jesus Kumate, Minister of Health of Mexico, opened the Meeting.

The considerable advances made by the countries since the meeting in Cartagena held in July, 1989 were noted. Particularly notable is the fact that it has now been more than three years since the last isolation of wild poliovirus in the countries of the Southern Cone, more than two years since the last isolation in Central America, and more than one year since the last isolation of wild poliovirus in Brazil. Also notable is the fact that there has not been a confirmed case of polio from which wild virus was isolated in the Region for more than five months.

In addition, there are important improvements in other program indicators, including significant increases in vaccine coverage in some countries (e.g., Colombia). Most countries are now reporting coverage by "interviewers" and are tracking surveillance activities by performance of reporting units. In most countries, interagency coordinating committees have played an important role in strengthening programs. The laboratory network has also been strengthened significantly with the collection of epidemiological data and the collection and documentation of interruption of transmission. The continued support of PAHO/WHO, UNICEF, IAP, Rotary International, the Inter-American Development Bank, and the Pan American Public Health Association (CPHA) has been critical to these advances.

Faced with this mixture of progress and problems, the TAG made the following recommendations:

In recent years, measles vaccine coverage in many countries of the Hemisphere has increased and the overall impact has been demonstrated by the decrease in the age distribution of cases, and increasing interval between epidemics. In light of the occurrence of epidemics of measles, it should be remembered that absence of vaccine, the number of cases expected annually would approximate 95% of the number of births. Nevertheless, the number of cases reported in 1989 in some countries was close to 90%, and efforts to control outbreaks represent a diversion of scarce resources that could better be used for improving coverage either through mass vaccination campaigns or institutional delivery. However, this issue deserves review and data from current outbreaks should be collected and analyzed. Experience with mathematical models may be useful in developing the strategy.

Further studies of missed opportunities and innovative approaches to reduce these outbreaks failures (such those carried out in El Salvador and Colombia) should be aggressively attempted by all countries.

June 1990

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Measles Elimination in the English-Speaking Caribbean and Suriname

technical working group was convened at CAREC May 21 to 23, 1990 to "Review the PAHO/
To maintain measles elimination in the Americas, countries have implemented high-quality follow-up campaigns every 4 to 5 years, paying special attention to reaching excluded populations in order to provide them with a second measles and rubella vaccination opportunity.
EPI Measles Elimination Field Guide and discuss the status of surveillance for acute flaccid paralysis. The following recommendations are based on a number of points of consensus, and initial operational commitments and requirements.

Review of PAHO Measles Elimination Field Guide
Current surveillance systems must be enhanced. A sensitive system requires reporting of the condition “febrile rash” (university wards) and thus facilitates appropriate control measures to eliminate remaining chains of transmission.

A key strategy to interrupt circulation is to implement, whenever possible, a Caribbean Measles Elimination Month, when all children between 1 and 15 years of age should be immunized regardless of previous immunization history. Priority should be given to high-risk children.

This campaign must be complemented by vigorous outbreak control to eliminate remaining cases and to reduce the number of susceptible individuals. More selective campaigns may be needed depending on local circumstances.

Control of measles importation requires national efforts. As private practitioners attend measles cases and, in some countries pay hospitals in providing immunizations, timely efforts are needed to sensitize physicians to the importance of this disease, and to enlist their participation in the elimination effort, including the surveillance effort.

In view of the need for a highly sensitive surveillance system, health staff other than epidemiologists must be trained to assess “suspected” cases and to investigate “confirmed” cases. As indicated in the “Functional communication and collaboration should exist among individual responsible for MCH, EPI, and Epidemiology.”

Laws requiring proof of measles immunization, as well as other EPI immunizations, must be enforced where they exist and where they are lacking.

A detailed draft plan for implementation is being finalized.

Initial Operational Commitments and Recommendations
Measles: To the extent possible countries should attempt to start the review of the EPI and polio eradication was held in La Paz, Bolivia, August 27-29, 1990. This meeting followed the decision adopted by the Andean countries during the Seventh Meeting of the EPI Technical Advisory Group in Cartagena (July 1989), to coordinate activities so as to reach the goals of EPI regarding universal child vaccination and polio eradication by 1990. The participants included, in addition to central-level officers from the Epidemiology and Maternal and Child Health areas of the participating countries—Bolivia, Colombia, Ecuador, Peru, and Venezuela—health officers from the local and operative levels, and representatives of the international agencies already cooperating with the Program (UNICEF, UNICEF, Rotary Club International, and PAHO/WHO). This Meeting served to update the current country status and the efforts being implemented to enhance country immunization programs.

Conclusions and recommendations
1. EPI’s activities are being greatly improved in all countries. This suggests that such process could be accelerated, particularly if all efforts are made to perform analysis at the provincial, municipal and district levels within each country, so as to adapt the strategies to the local realities.
2. With respect to measles, the following recommendations were issued: enhanced epidemiological surveillance; improved information quality, reviewing and adequately documenting the outbreaks and control actions in connection thereof. This all would be aimed to gather experiences on some specific issues adapted to the Andean region, and the effects of this program group. In the event of an outbreak, actions should be aimed to protect high-fatality groups.

The workshop participants defined the process of social mobilization as broad in scope, encompassing activities related to preparing messages and using multimedia as well as mobilizing audiences responsible for organizing or providing immunization services. It was also noted that identifying primary and secondary audiences is crucial in order to ensure that all efforts are made by the national EPI to vaccinate 100% of measles target population, and to eliminate the indigenous transmission of measles.

Each country presented an overview of its health education activities, including planning and management and planning efforts designed to support accelerated immunization actions. In spite of sometimes having little input from external sources and minimal budgets, many countries have produced posters, pamphlets, bumper stickers, brochures, and jingles for EPI educational activities. These activities combined with other immunization activities have resulted in EPI vaccine coverage rates ranging between 59% for measles and MMR vaccine and 71-100% for DPT and OPV vaccines. Thirteen countries and territories have reached 80% or better coverage with measles or MMR vaccine. It was noted that lower vaccine coverage is found in countries with larger populations. The participants concluded that countries have been very successful in their promotional efforts of immunization since EPI vaccine coverage is, on the average, very high. However, it was clearly noted that in many countries coverage had leveled off in the past few years, and that well-organized social mobilization efforts would be needed to reach the remaining 20-30% of the target population. Due to the presence of pockets of severe economic depression and the loss of manpower from the health sector, this population does not currently benefit from immunization services, and is likely to be difficult to reach. More importantly, if measles is to be eliminated from the sub-region by 1995, then social mobilization efforts must be aimed at low coverage/high risk areas where chains of transmission of the measles virus can be sustained.

There was agreement that the goals and activities set to achieve measles elimination by 1995 will be difficult to achieve due to the economic situation, and the new profile of health workers, especially nurses. The resulting shortage means that every sector of society will need to be mobilized to provide support for immunization activities. In addition, it was agreed that national health budgets for preventive health programs such as the EPI need to be increased and maintained to ensure that all possible resources are provided to protect children and eliminate the transmission of indigenous measles by the end of 1995.

PAHO therefore should continue discussions with donor agencies with a view to enhancing financial resources as soon as possible. The need to reaffirm political commitment for the measles elimination effort during the meeting of the EPI, including Caribbean Ministers of Health in July was stressed.

The meeting participants agreed that a Caribbean-wide program, called “a Caribbean-wide program for social mobilization and the development of social mobilization efforts as part of their national EPI Plan of Action, using the “social mobilization matrix” if possible.

PAHO should create a task force to follow up with every country and territory on the development of social mobilization programs and assure the implementation of activities in accordance with the guidelines of the Implementation of Measles Elimination Immunization Month in the English-speaking Caribbean and Suriname.

2. With respect to measles, the following recommendations were issued: enhanced epidemiological surveillance; improved information quality, reviewing and adequately documenting the outbreaks and control actions in connection thereof. This all would be aimed to gather experiences on some specific issues adapted to the Andean region, and the effects of this program group. In the event of an outbreak, actions should be aimed to protect high-fatality groups.

The second Andean Meeting for the Assessment of EPI and Polio Eradication was held in La Paz, Bolivia, August 27-29, 1990. This meeting followed the decision adopted by the Andean countries during the Seventh Meeting of the EPI Technical Advisory Group in Cartagena (July 1989), to coordinate activities so as to reach the goals of EPI regarding universal child vaccination and polio eradication by 1990. The participants included, in addition to central-level officers from the Epidemiology and Maternal and Child Health areas of the participating countries—Bolivia, Colombia, Ecuador, Peru, and Venezuela—health officers from the local and operative levels, and representatives of the international agencies already cooperating with the Program (UNICEF, UNICEF, Rotary Club International, and PAHO/WHO). This Meeting served to update the current country status and the efforts being implemented to enhance country immunization programs.

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The measles epidemics which

• Measles control and

• A uniform operational definition should be used for measles cases; i.e., all cases where high fever for more than three days is present, along with rash, coughing and conjunctivitis.

• Measles control and surveillance actions will vary according to each country's program development. In those cases where the program is developed and coverage rates are high, each suspected case should be investigated. In those countries where coverage rates are still low, measles outbreaks should be investigated. Those still exhibiting low coverage should concentrate their efforts on increasing them as soon as possible.

• The program's response to outbreaks must be oriented to assessing the epidemiological situation and to implementing vaccination programs in those areas still unaffected.

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Measles Elimination in the Caribbean

Introduction

The VII Caribbean Meeting of EPI Managers took place in Antigua, from 12-15 November 1990. It was opened by the Minister of Health of Antigua and Barbuda and was attended by the program managers of all the English-speaking Caribbean countries. Some, as well as Aruba, Curacao, Guadalupe, and Martinique.

The PAHO Caribbean Program Coordinator and the Director of the Caribbean Epidemiology Center (CAREC) were in attendance at the opening session.

Representatives of international agencies that support the program included the USAID, UNICEF, CPMA, Rotary International, and the Pan American Health Organization. The Rapporteur of the EPI Global Advisory Group was also present at the Meeting.

The main purpose of the Meeting was to review the implementation of the immunization programs in each country and identify those problems that are hampering the further improvement of immunization coverage and disease surveillance, which could be addressed by better planning, management and evaluation procedures. The objectives of the Meeting included the review of activities implemented during 1990 and the preparation of the workplans for 1991. This year, these workplans included activities relating to the elimination of measles by 1995, especially the preparation of the Caribbean Measles Elimination Month, being planned for May, 1991 and further activities related to the need for heightened surveillance of neurologic complications and paralysis. These last activities are essential for the eventual certification of interruption of indigenous transmission of wild poliovirus and elimination of measles from the English-speaking Caribbean.

Conclusions and Recommendations

1. The PAHO Regional Office has been achieved in the majority of countries with regard to sustaining or increasing immunization coverage in the target age groups. Some countries have experienced a wide decrease in immunization coverage and efforts should be made to correct this situation.

2. Some progress has been made in the establishment of the groundwork needed for surveillance of flaccid paralyses and rash illnesses. The rate of notification of flaccid paralysis for the Caribbean is increasing, but it is still low compared to other sub-regions of the Americas. It will be necessary to speed up the establishment of a system for negative reporting and also collection of stool specimens from every case of flaccid paralysis and its contacts as prerequisites for the certification process.

3. The draft Field Guide for Measles Elimination was reviewed and comments received from participants. It is expected that this Field Guide will be finalized at the Meeting of Epidemiologists to be held at CAREC in Trinidad from January 14-18, 1991.

4. It will be necessary for PAHO and CAREC to provide permanent monitoring and support to countries as far as surveillance is concerned. This must include laboratory support and training of country epidemiologists.

5. Some of the problems that still hamper further improvement of vaccination coverage and disease surveil-

lation include:

• The occasion, delays in payment for vaccines or- dered through the EPI revolving fund impedes the receipt of new shipments.

• Services generators still are required at all central stores, and gas and kerosene refrigerators are still in short supply for those areas without electricity.

• Training for surveillance of EPI diseases, particularly measles and poliomyelitis needs to be im-

plemented.

Promotional materials, such as audiovisuals, posters, and flyers are in greater demand and additional resources are needed to address this issue.

• Data collection from private practitioners is still a bottleneck for determining immunization coverage in many countries.

• National Plans of Action are not systematically followed up to ensure that all planned activities are implemented.

6. As far as the Measles Elimination initiative is con- cerned, there are issues that need to be addressed and resolved before the January 14th meeting, including:

• The key strategy for interrupting measles transmission in all countries is the elimination of all suscep-

tibles under 15 years of age, simultaneously. Therefore, every country will have to ensure that any deviation from this strategy will still achieve interruption of transmission.

• Financial resources, particularly for the vaccine purchase, have not yet been fully identified in most countries.

It is noted that while measles can be eliminated with a single measles vaccine alone, this would represent a considerable missed opportunity for control of rubella and mumps. The Group urges that every effort be made by the Ministries of Health, with the support of PAHO and other collaborating agencies, to ensure the availability of MMR vaccine for this initiative.

• There were concerns over the social communica-

tion and mobilization plans. Considering the available time between now and the proposed "Measles elimination Month" in May, it is imperative that an overall communication and mobilization plan be organized for immediate implementation.

7. The exchange views of EPI Managers were reviewed and it was recommended that the next one be in San Juan, Puerto Rico, to address issues that are intolerable for managers to share experiences and learn from each other.

8. The VIII Caribbean Meeting of EPI Managers should be held in November, 1991.

The meeting was attended by professionals from the ministries of the health of the countries which participated, and by representatives of the international organizations supporting EPI, namely Rotary International, UNICEF, USAID, and the Pan American Health Organization (PAHO).

Vaccination Coverage

Only a single dose of measles vaccine—invited—Guatemala, Honduras, El Salvador, and Nicaragua—was used per child, coverage data by county or health area updated to the second semester of 1990 for OPV3 under 1 year of age.

Measles Control

The measles epidemics which have been occurring in the Subregion since 1988 have persisted in Guatemala and Mexico up to the first semester of this year. Presently, only Nicaragua shows epidemic levels, while in Panama outbreaks began appearing in September.

From the reports presented, it is apparent that the coverage remains low, leading to a persistent risk of new epidemics due to the potential accumulation of new susceptibles.

So as to achieve appropriate control of measles, the following is recommended:

- Intensify epidemiological surveillance of measles, along with a surveillance by county, thus ensuring a minimum coverage of 90% for children under age 5.
- Promote field research, documentation, and advance results at upcoming meetings.
- Maintain the current vaccination schedules with a single dose of measles vaccine.

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Progress in the Southern Cone

Introduction

The Sixth Meeting of the "Asuncion Group" on EPI progress and Eradication of Polio in the Southern Cone, Bolivia, and Brazil was held in Asuncion, Paraguay, from 29-31 October, 1990. This group first met in Asuncion in July, 1987, and has held periodic meetings for follow-up of activities and to discuss the actions needed to accelerate the achievement of EPI's goals of universal child immunization and eradication of polio by 1990.

The meeting was attended by representatives of the ministries of the health of the countries participating, and by representatives of the international organizations supporting EPI, namely Rotary International, UNICEF, USAID, and the Pan American Health Organization (PAHO).

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EPI Global Advisory Group Report

The EPI Global Advisory Group met from 14–18 October, 1990 in Cairo, Egypt. A summary of the conclusions and recommendations follows.

Overall Program Status: Immunization programs in developing countries have made remarkable progress since the implementation of the Expanded Program on Immunization (EPI) in 1974 when it was estimated that less than 5% of the world's infants were adequately immunized. Today, some 70% are being reached with a protective course of immunization by the first year of life. This development has increased the capacity to achieve these levels of coverage of infants reaching a major public health triumph for the end of the decade of the 1980s.

Achieving and Sustaining Full Immunization Coverage: High immunization coverage levels need to be achieved and sustained. Intensified immunization activities, including a review of national or local immunization day schedules, should be directed at areas of low immunization coverage or where there is continuing transmission of disease. Each country should have an Immunization Plan of Action which integrates the targets of achieving and maintaining 90% immunization coverage with all EPI antigens, poliomyelitis eradication, vitamin A supplementation, elimination and measles reduction, and, in areas of risks, the administration of appropriate micronutrient supplementation.

The following areas are priorities for achieving and sustaining immunization programs: vaccination coordination, donor support, management supervision and training, communications, and costing and budgeting.

Measles Reduction: increasing immunization coverage along with improving disease surveillance are the two key elements to control measles and will achieve, by 1995, reduction by 95% in measles deaths and 90% in measles cases compared to previous levels. In localities with high population densities, very high coverage rates will be needed to achieve this target. Outbreaks must be expected even in programs with relatively high coverage, and they should be analyzed to ensure that there is high vaccine efficacy and that immunization schedules and delivery strategies are epidemiologically appropriate.

Measles Articles

Measles History

In 1988, the Caucasian of CARICOM Ministers Responsible for Health made the commitment to "make measles history," and the Caribbean officially launched the "Cold Chain" was put in place. The success of the measles campaign is off to a great start. 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 legends to settings with high class achieved full immunization first. Health authorities set up multiple vaccination posts and clinics throughout the islands, with a variety of posters operating on different days and at different times, to make immunization as accessible as possible. A huge logistics effort was undertaken to ensure that each clinic had all the vaccines and supplies it needed 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.

Progress Achieved in Measles Elimination Campaign

As a result of the highly publicized measles elimination campaign, 91% of the target population in the English-speaking Caribbean (see EPI Newsletters Vol. XII, No.3, June 1991) was immunized with measles vaccine this May (Table 1). This event, which marked the coordinated health effort ever attempted in the Caribbean, initiated a five-year campaign by the Pan American Health Organization and other donor agencies (CIDA/CPHA, UNICEF, Rotary International, and USAID) to eliminate the entire population under age 15 and eliminate the indigenous transmission of measles. To this end, countries of the English-speaking Caribbean and Suriname mobilized all their manpower and material resources and simultaneously achieved the highest immunization coverage targeted against measles ever recorded in the area.

Member countries held meetings this July in Trinidad and Tobago, Antigua, and Jamaica to discuss the Measles Elimination Field Guide and the rapid implementation of the measles surveillance system. All member countries agreed that a single suspected case of measles should constitute a public health emergency and they adopted specific procedures for prompt reporting, investigation and control.

Everyone agreed that strategies are needed to find and immunize those children not vaccinated this May and to vaccinate children born...
Rubella Watch

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Pan American Health Organization

Measles

The CAREC surveillance system includes cumulative totals of the reported measles cases through the month of April at 3,264 in 1990 and at 102 in 1991. The numbers of reported cases decreased by a factor of 20. The continued activity in Trinidad and Tobago and in Jamaica may represent the tail-end of last year's epidemic. Laboratory analysis performed at the CAREC Laboratory from the sera of cases of fever and rash illness in 1991, has confirmed measles activity only in Trinidad.

The coverage achieved during Measles Elimination Month (91%) is well approaching the goal of 95%. High coverage is important because it will sharply reduce the incidence of measles cases and enable the surveillance activities to concentrate on the remaining cases to be investigated and contained.

Several factors suggest that measles cases will occur at low levels in the CAREC-member countries for the next few years. The epidemics of 1989–1990 had the two-fold effect of eliminating a large number of susceptible children, and increasing vaccination coverage as hundreds of thousands of doses above the routine program were administered in massive campaigns. Furthermore, the Measles Immunization Month of May 1991 put an additional “blanket” on transmission and follow-up efforts will further interrupt transmission.

The slow build-up of susceptible populations from future birth cohorts will be a critical factor beyond the next few years. Even if 95% vaccination of the target group is achieved, current measles vaccines are 95% efficacious, so approximately 10% of each year’s birth cohorts will remain susceptible. These cohorts will accumulate into tens of thousands of susceptible children in a few years.

Susceptible populations may also increase due to an influx of children from countries with lower coverage rates. Some Considerations for the Elimination Campaign.

Four main considerations can be drawn for successfully eliminating measles and maintaining a “measles-free zone.”

1. The target vaccination coverage for children should be 100% by the time they reach their second birthday. Second, programs attempting to improve efficacy by changing the vaccination schedule from nine to 12 months should do so only if incidence is very low. Third, the temptation may exist to prematurely declare measles eliminated in a few years if indigenous transmission reaches zero as predicted.

Immunization against measles can only cease if and when global eradication has been achieved. Fourth, neighboring countries in the Caribbean should be invited to participate in this measles elimination effort and preliminary motivations have already been made in this regard. In 1991 epidemiologists from Haiti, the Dominican Republic and Puerto Rico expressed interest in participating.

If indigenous transmission ceases after 1991, it can only resume if the virus is re-introduced into susceptible populations. Because large numbers of people travel between the Caribbean and the rest of the world, plans are needed to advise travelers going to and from a “measles-free zone” and for coordinating information on the occurrence of measles at the global level.

Surveillance to identify new foci of transmission and prompt containment will also be necessary. Specific measures adopted this July by countries participating in the campaign include a detailed reporting system and an aggressive follow-up for suspected cases of measles.

This fall countries began reporting weekly to CAREC all suspected, confirmed, or discarded cases with an E.D. number. When a suspected case is reported, the unit responsible for tracking and surveillance will investigate each suspected case and collect and ship blood specimens.

The surveillance system in each country will attempt to promptly report, investigate and classify all cases of rash and fever illness meeting the definition of a suspected case in the Measles Elimination Field Guide. Any suspected case reported will be the basis for initiating action.

In addition, the surveillance system will be designed to detect sporadic measles cases wherever they occur and follow up with prompt containment actions, including laboratory support and immunization of contacts. In this way, it is planned to eliminate measles by 1995.

Source: CAREC Surveillance Report, Vol. 17, No. 4, April 1991; Surveillance and Polio Operations Unit and EPI Programme, CAREC.

October 1991

Volume XIII, Number 5

Measles Surveillance

Following the huge public health success achieved by the countries of the English-speaking Caribbean and Suriname in vaccinating children between nine months and 14 years of age against measles during May 1991, the time has come to turn efforts towards the strengthening of the measles surveillance systems (see EPI Newsletter, Vol. XIII, No.4, August 1991).

PAHO convened meetings to discuss operational issues, criteria and mechanisms for the establishment of a rash and fever illness surveillance system. The countries agreed to begin reporting weekly, on or before September 1, 1991, the occurrence or non-occurrence (negative reporting) of any suspected measles cases to CAREC. It was established that any single suspected case of measles should constitute a public health emergency requiring investigation and the implementation of control measures; in addition, health care workers and the general public should continue to be educated and motivated to report these cases.

As agreed, all countries have been reporting to CAREC every Wednesday, for the previous epidemiological week. In addition to the occurrence or non-occurrence of suspected measles cases during that week, each report includes the cumulative number of cases under investigation and confirmed since the onset of the reporting system (September 1, 1991), and the number of sites expected to report and the sites which have reported for the week in question.

With the reports received, CAREC compiles a weekly Measles Surveillance Bulletin which is distributed to all countries of the subregion by Friday of the same week and provides feedback on the status of surveillance and progress towards elimination.

On the following page is a sample of the Bulletin for the week ending October 26, 1991, which clearly demonstrates the extent of the impact that the Measles Elimination Month had on the incidence of measles in the countries of the English-speaking Caribbean and Suriname.

Progress in Central America and the Andean Region

From the 6th to the 10th of November in Managua, Nicaragua and from the 7th to the 9th of October in Caracas, Venezuela, the 7th Central American Meeting and the 3rd Meeting of Andean Countries were held to evaluate the activities of the EPI, the eradication of polio, and the elimination of measles. Haiti and the Dominican Republic participated for the first time in the Central American Meeting, while Mexico joined in as a bordering country. Brazil participated in the Andean Meeting. Following is a summary

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Note: Average coverage attained is 91.4%.
* The four to 14 year age group was target population.
** Campaigns took the form of mop-ups.
*** Campaigns to be completed at a later date.
Source: EPI Programme, CAREC.

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<table>
<thead>
<tr>
<th>Countries</th>
<th>(in order of size at mid-year 1990)</th>
<th>Estimated target population</th>
<th>Total population vaccinated</th>
<th>Percent of target population immunized</th>
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<td>&lt;2 years</td>
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<td>288,083</td>
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<td>99.0</td>
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</table>

Countries of Central America and the Andean Region.
Expanded Program on immunization weekly measles surveillance for the English-speaking Caribbean and Suriname.

**Measles Surveillance Bulletin, PAHO/WHO.**


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**Measles Articles**

**the counties still have coverage**

Because a high proportion of

in the incidence of the disease.

With measles vaccine has

in international conferences.

have the director of the county

proportion of children still live

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still show coverage below 80%,

county (Mexico presented data

budgets.

are available in the national

levels in history were achieved,

Central America and Mexico,

Ecuador, the Andean Countries

All of the countries presented

Vaccination Coverage

of the principal conclusions and

suggestions which are presented

at each of the meetings.

Vaccination Coverage

All of the countries presented

projected vaccination coverage

for children less than one year old for 1991. Excluding Ecuador, the Andean Countries and Brazil surpassed coverage levels reached in 1990. In Costa Rica and Guatemala and Mexico, where in 1990 the highest levels in history were achieved, coverage levels appear to be decreasing so far in 1991, partly due to a temporary reduction in the supply of biologicals. This poignantly illustrates the importance of having the governments ensure that the necessary financial resources are available in the national budgets.

With the exception of Costa Rica and Haiti, all countries presented coverage data by county (Mexico presented data by “department”). Over 50% still show coverage below 80%, implying that an important proportion of children still live in high-risk areas. In order to increase coverage, Bolivia has instituted a prize that will have the director of the county or district with the highest coverage invited to participate in international conferences.

Measles Control

The increase in coverage with measles vaccine has produced a dramatic decrease in the incidence of the disease. Because a high proportion of the countries still have coverage below 80%, epidemics are still observed at four-year intervals. The data presented at meetings such as these has improved greatly, showing that the most affected age group is that of children under 5 years of age and that the vaccine being used is efficacious.

The plans to eliminate measles from Mexico by 1995 and from Brazil by March 1992 were presented. The countries are urged to increase efforts to reach and maintain coverage above 90%, especially in those countries that presently have low coverage. Control of this disease will eventually require a joint continental effort and the experiences of the countries of the English-speaking Caribbean, Cuba, and Brazil will help to illustrate the strategies which will need to be followed.

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**8th Meeting of Caribbean EPI Managers**

The Eighth Meeting of Caribbean EPI Managers was held in Montego Bay from 14–15 May 1991. It was attended by representatives from 19 countries of the English-speaking Caribbean, plus Curacao, St. Martin and Suriname, technical and administrative personnel from the Pan American Health Organization (PAHO) and its Caribbean Epidemiology Center (CAREC), and representatives of the major agencies that are supporting the program in this region, such as the United States Agency for International Development (USAID), the United Nations International Children’s Fund (UNICEF), Rotary Foundation, Rotary in Canada, and the Canadian Public Health Association (CPHA). A number of non-governmental organizations (NGOs) were also present; as were, for the first time, representatives of the Commonwealth Secretariat, and the Italian and French Cooperation in Health.

The three main objectives of the meeting were to review the progress of EPI in the countries of the English-speaking Caribbean, to have them prepare National Work Plans for 1992, to explore all venues for further collaboration between the Ministries of Health and the NGO’s to strengthen EPI, and to ensure achievement of the goals of measles elimination and polio eradication.

This was the first time that the various donor agencies and the NGO’s were able to discuss with the EPI Managers, the ways in which they can cooperate with the program in their respective countries. This collaboration of public and private sectors is considered essential for the full realization of the goals of the program and resulted from the joint initiative of the Commonwealth Secretariat, CPHA and PAHO.

Following is a summary of the major conclusions and recommendations which resulted:

**Immunization Coverage**

Immunization coverage rates for all EPI antigens amongst the 19 countries of the English-speaking Caribbean and Suriname were either maintained or improved in 1990. For the coming years, countries should be classified according to levels of coverage between 50–79%, between 80–99% and above 90%.

Pockets of unvaccinated children should now be identified for special mop-up operations and activities to prevent the build-up of large numbers of susceptibles.

The countries that still have coverage below 90% should intensify activities to reach that target.

Measles Elimination

With the exception of Bermuda, all countries of the English-speaking Caribbean and Suriname mobilized their manpower and material resources with the assistance of donor agencies such as CPHA, UNICEF, Rotary International, USAID, and PAHO to carry out a Measles Elimination Month in May, during which they simultaneously achieved the highest immunization coverage against measles ever recorded in the history of the entire area; a regional average of 91.4% among the large cohort of children 5 months to 15 years of age. Over 1.5 million children were immunized during this period, demonstrating that the last remaining counties have the capacity to eliminate measles by the end of 1995 appears to be an achievable objective. The mass campaign was also intended to boost measles coverage and interrupt transmission of the virus. It is clear that the social mobilization activities carried out helped to educate and win the participation of the people of the Caribbean. “Mop-up” vaccinations are taking place in hard-to-reach areas in many countries, and overall measles coverage levels are now well above the 91.4% figure. It is very likely that measles transmission may have been interrupted in a number of countries, although only improved surveillance will allow for verification.

Fever with rash occurring 5–15 days after measles vaccination should be regarded as an adverse event and should not be counted as a measles case or be considered for collection of blood specimens for diagnosis. These cases should be recorded in a register for adverse events following vaccinations, whenever such registries exist.
The standardized case definition should be understood and used by all health workers and institutions. It was stressed that countries may wish to monitor rash and fever illnesses by a single criterion or a brief definition, but efforts should be focused only on those cases which actually meet the case definition for a suspected measles case: rash and fever illness with at least one of the following symptoms—conjunctivitis, cough or conjunctivitis. These cases should then be entered into the system, given an identification number and have an investigation form completed.

It will be necessary to increase the amount of surveillance sites throughout the subregion, with the inclusion of private practitioners and pediatricians who are the most likely health care providers to see imported cases.

The timeliness of weekly reporting needs to be improved.

Aggressive mop-up vaccination should be undertaken as soon as a suspected measles case is detected. For the present, it is expected that at least 80% of the suspected cases most likely to be confirmed are those in children under 15 years of age or those in young adults. It is therefore critical that the outbreak control be undertaken particularly when such cases are detected.

There is a need to strongly encourage the complete collection of information on case investigation forms and laboratory report forms. The availability of detailed information on each case will allow a better understanding of the disease and direct the adequate measures, both to adjust the surveillance system and to implement control measures.

Social mobilization needs to continue to maintain public interest and vigilance.

The goal for measles vaccination should be 100% of the children under 2 years of age. Given the new epidemiological situation, consideration could be given to start vaccination at 12 months of age, in order to increase vaccine efficacy.

The Americas-wide polio eradication campaign and the concurrent efforts to eliminate indigenous measles by 1995 continue to be strong surveillance systems. CARICOM countries have focused on building and improving these systems for several years now. Evaluations are used to test their adequacy and pinpoint weak areas. Jamaica, which is the largest of the CARICOM members, carried out a comprehensive evaluation of its surveillance system from October to November 1991, with an emphasis on determining its capacity to detect and investigate suspected cases of measles. The evaluation was conducted by the Epidemiology Unit and EPI Division of the Ministry of Health with PAHO technical collaboration.

Scope of the Evaluation
The Jamaican surveillance system is based at the parish level and uses the notification system, the sentinel sites system, active hospital surveillance, laboratory reporting, and special surveys. The evaluation studied the first three components through site visits to each of the thirteen parishes that make up the country. The evaluation team interviewed Medical Officers of Health and Senior Public Health Nurses, and reviewed written records.

Notification System: The notification system classifies diseases according to frequency with which they are to be notified. Class I diseases are to be reported on suspicion and require immediate investigation. Class II diseases are reported weekly by list reporting, and Class III diseases are reported by numbers only on a monthly basis. Measles was recently elevated to a Class I disease in order to succeed in its elimination by triggering a prompt public health response and to obtain records of investigation results.

The evaluation of the notification system detected its weak point: notification follow-up, or case investigation. Of 208 suspected cases of measles reported in 1991, only 6 (3%) were investigated within 48 hours and only 76 (36.5%) were investigated at all. Of those suspected cases that were investigated, 23 were confirmed. As a result of these findings, health authorities are now attempting to ensure that all reported cases are investigated promptly.

The majority of cases that were investigated serologically were actually rubella. This finding indicated that clinical diagnosis of measles is not as accurate as had been supposed and that blood sampling is essential to confirm the elimination of measles.

Sentinel Site Reporting: Each parish has one or more designated sentinel sites which include health centers, hospitals, or a number of hospitals. Each of the 14 sentinel sites is charged with collecting a weekly count of the number of cases of fever, gastroenteritis, and measles. Unlike the notification system, the purpose of sentinel sites is to monitor trends, not to generate investigations.

The evaluation found that 29/44, or 66% were reporting weekly. Case definitions for these reports varied, as did other information. “Fevers found to imply fever alone in 7/12 parishes and fever with rash in 4/12. In one parish, fever and rash were reported separately. Gastronortis was reported consistently by all sentinel sites as three loose stools over a 24 hour period. Measles, too, was reported consistently—as clinical suspicion—through this definition lends itself to some variation between observers.

Hospital Active Surveillance: The hospital active surveillance system calls for sentinel health staff to visit hospitals weekly to review cases of targeted diseases that are found on the wards and in casualty registers.

The evaluators found that at least one hospital was visited regularly each in parish in 1991. However, without surveillance data, with the purpose of evaluating the consistency of the system, the 10/13 visit reports collected patient identification data (name, age, sex, address), 10/13 established the date of onset of illness, 4/13 included vaccination history, 7/13 outcome, and only 5/13 included final discharge diagnosis. The lack of laboratory confirmed and final diagnosis indicated that the hospital reports were based on suspicion and not confirmation of measles.

Overall Efficiency
Of all of the cases reported through Class I notification, only 35% reached the central level. Furthermore, since Sentinel reports are only a sample of around 10% of health care sites, the fact that they reported more cases of measles than did the Class I notification system indicates that there is under-reporting by the latter. Lastly, detailed information was given only for 13 of 208 reported cases, making it impossible for evaluators to examine the remaining 195 suspected cases retrospectively.

Reporting of suspected rubella cases fared no better than that for measles. Only 25% of the cases reached the central level, while 57% of the cases reported to the EPI unit were confirmed, as compared to 11% confirmed cases for measles. Many of the cases that laboratory tests showed to be rubella were initially classified as "query measles" and/or "rubella."

This confirmed the need to investigate all cases and to include serologic testing for confirmation.

The recent measles elimination initiative in the English-speaking Caribbean appears to have succeeded in interrupting measles transmission in some countries which followed the month-long, mass vaccination strategy. Experience gained from this initiative, and from others that are to come should be used to learn about the process and solve the problems unique to measles elimination; to reinforce measles vaccination and control efforts; to strengthen the surveillance systems; and to address issues of sustainability.

A new epidemiological situation, the recent measles elimination initiative in the English-speaking Caribbean, appears to have succeeded in interrupting measles transmission in some countries which followed the month-long, mass vaccination strategy. Experience gained from this initiative, and from others that are to come should be used to learn about the process and solve the problems unique to measles elimination; to reinforce measles vaccination and control efforts; to strengthen the surveillance systems; and to address issues of sustainability.

The Director of PAHO convened a group to review the measles initiative in the English-speaking Caribbean, and those being planned by several other countries, which met in Washington, D.C. on 28 February 1992. The TAG endorsed the conclusions and recommendations of the meeting:

1. The Group recognized that PAHO has historically played a lead role in the control of vaccine-preventable diseases. The Region of the Americas was the first continent to become poliomyelitis-free; it developed several strategies that led to greatly improved immunization coverage such as the institution of a revolving fund for vaccine purchase. It was also the first Region to prioritize the development of surveillance within national immunization programs, and to decide on poliomyelitis eradication (the strategies now being applied globally were developed in the Region of the Americas).

2. In this context, PAHO’s efforts to enhance measles control, possibly leading to global eradication, would be yet another ‘first.’

The Group emphasized the fact that all of known microorganisms, the measles virus is the most serious resulting in more deaths than any other. Measles vaccination programs thus take on the highest priority. Measles causes a substantial health burden in both developed and developing countries. Not surprisingly, data from recent initiatives show that cost-effectiveness of health interventions shows measles vaccination to be the most cost-effective medical procedure in terms of adding discounted healthy life years (DHLV). It was shown to be more effective
Measles Articles

June 1992
Volume XIX, Number 3

The Fight Against Measles Continues: Brazil and Chile Carry Out Mass Vaccination Campaigns

Chile: 6 to 16 April 1992

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than interventions such as neonatal care, vaccination against other vaccine-preventable diseases, and management of illnesses such as ORS therapy and ARI antibiotic therapy.

3. Given the fact that man is the only host for the measles virus, that the illness is short-term and followed by permanent immunity and that a highly protective (over 90% effec-tive) vaccine is available, the Group agreed that interruption of measles transmission is theoretically possible and has been achieved in some areas for limited periods. However, this has never been done over a wide geographical area. Thus, there is utility in determining the feasibility of achieving this objective in selected areas and countries.

4. The Group considers that these efforts to enhance the control of measles with actions that are designed to lead towards its interruption should be supported by PAHO. It therefore recommends that PAHO give support to the initiatives already under way in Cuba and the English-speaking Caribbean and those already planned in Brazil, Chile, and the Central American countries, as they represent valuable steps towards assessing the feasibility of elimination of measles throughout the Western Hemisphere.

5. These initiatives should be pursued within the context of the overall PAHO policies of strengthening the health infrastructure and decentralizing services. The impact on measles morbidity and mortality should serve as a surrogate to the performance of the immunization program as a whole.

6. As lessons are learned and barriers are further identified and removed, PAHO should continuously reassess the feasibility and timing of an elimination goal for the Western Hemisphere.

Both the trend analysis and the calculations of susceptibles accumulated during the past three years (Table 1), led the epidemiologists to predict that an epidemic would occur between August and September of 1992, which could potentially affect up to 70,000 cases. In order to prevent the epidemic and deaths as well as sequelae among the younger populations affected, which in turn create great consternation among the populace which increases pressure on health establishments, and given the data available on the unique capacity of mass campaigns to interrupt transmission, the Ministry of Health decided to launch a National Campaign for Measles Vaccination. The plan was to hold a ten-day campaign, between April 6 and 16, 1992, targeting 3,896,387 children between nine months and 15 years of age (28.9% of the total population) for vaccination.

Given the magnitude of this historical task, the Ministry personnel decided to take part in all 26 Health Services as well as the pediatric community to inform the public and social organizations and institutions of the health threat facing the nation. They also intended to have them collaborate in the vaccination of all children in the targeted group as the population most susceptible to become ill and die from this highly contagious disease.

With this goal in mind, the Ministry, along with the Health Services, implemented all the measures necessary to supply health establishments with the needed cold chain equipment, and the community with free measles vaccine. They also acquired sufficient supplies of syringes and disposable needles to have each child vaccinated and avoid any risk of transmitting other communicable diseases such as AIDS or hepatitis.

Following is a summary of the most important coordinated activities sponsored by the Ministry of Health for implementing the national campaign:

1. Creation of a National Commission that would coordinate activities in the areas of training and promotion, adjustment of human and financial resources, supply cold chain equipment, transportation, and the development, analysis and evaluation of information.

2. Through the Department of Epidemiology, the Ministry of Health elaborated a plan of activities designed to coordinate actions with the 26 Health Services, the first of which was a meeting held on January 10, 1992, attended by two representatives of each Health Service. On March 25, the group held regional meetings and where the representatives informed regional personnel regarding the plan of action for the campaign.

3. A social communication plan was also put into effect, in which prestigious children’s television artists made announcements on TV, radio, and newspapers, and brochures, posters, and pamphlets were developed and given wide distribution. After being vaccinated, the children received a sticker with the words: “I am vaccinated, goodbye measles.”

4. Extensive social participation in the campaign was enlisted through the recruitment of various public and private organizations, county governments, the police department, the Red Cross, civil defense, firemen, Caritas-Chile, and political parties. Universities, scientific societies, professional associations and private health institutions also participated in the social mobilization efforts.

5. Intersectoral coordination and participation were also accorded high priority, especially among the Ministry of Health and the Ministries of Education, Justice, Defense, Transportation, and Telecommunications.

Campaign results are presented in Figures 2 and 3. The total cost is estimated to have mounted to about US$ 1.6 million, and the total vaccination coverage to 99.6% of the target population. Active surveillance of rash and fever illness was implemented immediately following the campaign, with the ongoing collaboration of PAHO.

By achieving the established target and avoiding a national epidemic, the country as a whole has taken the first step towards measles elimination.

Brazil: 25 April to 22 May, 1992

In mid-1991, the Ministry of Health decided to implement an initiative directed at improving the control of the measles in the national territory. Retrospective analyses of data from the past 10 years revealed that measles had an average annual incidence of cases per million inhabitants. But the problem of underreporting was a well-recognized one and it was estimated that this reported incidence constituted between 5 and 10% of the real incidence.

January 1992
Volume XIV, Number 3

The Fight Against Measles Continues: Brazil and Chile Carry Out Mass Vaccination Campaigns

Chile: 6 to 16 April 1992

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Health Foundation, and representatives from PAMO and UNICEF. The group was divided into three subgroups, each one charged with specific areas of action, and met as a whole on a weekly basis to evaluate the work and accomplishments of the subgroups. The Minister of Health participated in several of these meetings.

The first group had the principal objective of obtaining the 65 million doses of vaccine that would be required to vaccinate the 50 million children in the target group, along with the 10,000 injectors necessary to administer the vaccine. It is worth noting that securing this amount of vaccine and applicators was not an easy task, and required coordinating several suppliers.

The second group was charged with organizing social mobilization and promotion efforts for the campaign. Special efforts were required to develop new initiatives that would target school-aged children and adolescents. By early February, the most popular artists had been recruited to promote the campaign. Other activities were also organized, such as presenting the campaign at the National Congress of Pediatrics and other scientific meetings. National meetings were held for the state coordinators of immunization and epidemiology programs, in which details of the campaign and the Measles Epidemiologic Surveillance Field Guide were presented. State governors and representatives of other ministries and non-government agencies were also included in the activities.

The third group was responsible for the implementation of the epidemiologic surveillance system that would allow for prompt reporting of suspected measles cases once the campaign was over. In view of the fact that measles cases rarely seek medical help or are admitted to hospitals, the group elaborated a plan to implement epidemiologic surveillance within the 4,500 counties of Brazil. They also developed a plan designed to coordinate the activities of the laboratory network which will process the blood samples of all suspected cases.

The National Health Foundation transferred funds to the state governments, which in turn, transferred them to the counties. The campaign cost an estimated 50 million dollars; that is, one dollar per child vaccinated. This amount includes vaccines, injectors, syringes, operational costs, social mobilization materials, implementation of epidemiologic surveillance, and supplies for the diagnostic laboratories. The President of Brazil addressed the public by national television and radio in order to impress upon them the dangers of the disease, the efficacy of the vaccine, the costs of the campaign, and his personal commitment to achieving measles control.

Over 200,000 vaccination posts were opened throughout the country. In the Northeastern region, where the last cases of polio occurred over three years ago, DPT was also offered to children under 5 years of age. The basic strategy used was mobile and stationary vaccination posts, but several areas also included schools as a mechanism for reaching children over 5 years of age.

Mass communication media were used to promote the campaign throughout the four-week period. Artists and technicians informed the public on a daily basis about advances made. Vaccination coverage was also analyzed daily in order to implement immediate corrective measures. Coverage was similar among all age groups, indicating that promotion efforts were successful in reaching small children as well as adolescents.

Since preliminary data revealed the achievement of global coverage of 85% and low coverage in some states, the Minister of Health decided to continue the campaign for another two weeks. All national and state coordinators met in Brasilia on 31 June with the purpose of analyzing results at the state and county level. The campaign was considered a success, with an average national vaccination coverage of 95% (over 47 million children) of the targeted population (Figures 5 to 7). The second stage of epidemiologic surveillance and implementation of control measures at the local level is now ready to begin.

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<thead>
<tr>
<th>TABLE 1. Measles cases and rates per 100,000 inhabitants. Central America, 1985–1992.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costa Rica</td>
</tr>
<tr>
<td>El Salvador</td>
</tr>
<tr>
<td>Guatemala</td>
</tr>
<tr>
<td>Nicaragua</td>
</tr>
<tr>
<td>Panama</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
</tr>
</tbody>
</table>

*Information compiled by PnA.

Source: Ministry of Health, Brazil.

Control-Elimination of Measles

In the last three years there have been measles epidemics in each of the countries of the subregion. Costa Rica reported 6,340 cases with 28 deaths in 1991 (Table 1). Bearing in mind that epidemics occur in this subregion every four years, it is calculated that this year may be a “quiet” period, the stage most suited to developing a massive vaccination effort that forms part of the Elimination Plan to free Central America of this disease by 1997. Because of the high proportion of countries with coverage lower than 80%, it is important to ensure the success of this initiative. For that it is necessary to place special emphasis on programming and developing complementary activities to the vaccination effort in these high risk areas.

Alternatives were discussed for the attack phase of the initiative to eliminate measles in Central America. For this activity all of the 13,100,000 children between the ages of 9 months and 14 years would be vaccinated. Taking into account the seven million doses of measles vaccine that have been donated by the Government of Brazil, alternatives were discussed on how to implement the plan since 6.5 million doses are still needed to carry it out and the additional resources for the attack phase have not yet been identified. With this background two alternatives have been proposed that will be raised at the RESSECA Meeting in September 1992:

a) Postpone the attack phase until the first trimester of 1993; or
b) Develop the attack phase in two stages:
   b.1) October - November 1992, vaccination of schoolchildren (other age groups can be included if financing is available), and
   b.2) March - April 1993, vaccination of preschoolers and the rest of the school-age population.

It is important to emphasize the necessity of available resources for the two stages in September and January, respectively.

Results have been reported from the initiatives to eliminate measles in the English-speaking Caribbean, Brazil and

| FIGURE 4 | Reported cases of measles by-four week period, Brazil, 1983–1990. |
| --- |
| **Week** | **1983** | **1984** | **1985** | **1986** | **1987** | **1988** | **1989** | **1990** |
| 1-4 WEEKS | 78 | 75 | 71 | 68 | 65 | 63 | 61 | 60 |
| 5-14 WEEKS | 72 | 69 | 65 | 62 | 59 | 57 | 55 | 54 |

Source: Ministry of Health, Brazil.

| FIGURE 5 | Vaccination coverage by week of measles campaign, Brazil, 1992. |
| --- |
| **Week** | **1983** | **1984** | **1985** | **1986** | **1987** | **1988** | **1989** | **1990** |
| 1st WEEK | 80% | 85% | 90% | 95% | 100% | 95% | 90% | 85% |
| 2nd WEEK | 85% | 90% | 95% | 100% | 95% | 90% | 85% | 80% |
| 3rd WEEK | 90% | 95% | 100% | 95% | 90% | 85% | 80% | 75% |
| 4th WEEK | 95% | 100% | 95% | 90% | 85% | 80% | 75% | 70% |

Source: Ministry of Health, Brazil.
Measles Articles

Chile and progress has been made in strengthening the epidemiological surveillance of measles in these same countries. Strengthening the surveillance of measles is one of the essential and priority elements in monitoring the progress of the program. It is necessary to develop the basic elements of surveillance presented in the Field Guide, particularly with regard to disseminating the case definition and preparing a simple record of case investigation. Also investigators should take advantage of the low incidence of measles to use these instruments for collecting better information on each case of measles, which will then allow a better understanding of its epidemiology and will optimize control actions.

August 1992
Volume XIV, Number 4

Brazil Donates Vaccine for the Measles Campaign in Central America

The government of Brazil has made a donation of seven million doses of measles vaccine for the first attack phase of the Central American initiative to eliminate measles. Table 1 illustrates how the donations have been distributed to each country.

### Table 1. Doses of measles vaccine donated by the Government of Brazil to the Central American countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Population</th>
<th>%</th>
<th>Number of doses required</th>
<th>Number of doses donated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guatemala</td>
<td>15,715,000</td>
<td>32</td>
<td>4,904,000</td>
<td>2,470,000</td>
</tr>
<tr>
<td>El Salvador</td>
<td>2,987,500</td>
<td>18</td>
<td>2,500,000</td>
<td>2,100,000</td>
</tr>
<tr>
<td>Honduras</td>
<td>2,255,000</td>
<td>18</td>
<td>2,400,000</td>
<td>1,200,000</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>1,475,000</td>
<td>13</td>
<td>1,800,000</td>
<td>600,000</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1,650,000</td>
<td>10</td>
<td>1,400,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Panama</td>
<td>1,650,000</td>
<td>9</td>
<td>1,000,000</td>
<td>300,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>13,000,000</td>
<td>100</td>
<td>12,300,000</td>
<td>7,000,000</td>
</tr>
</tbody>
</table>

Source: PAHO.

Since computerized medical data are not yet available in Guadeloupe to calculate the cost of a group of illnesses, only a rough estimate could be made. This estimate was obtained by establishing the mean hospital stay of measles patients and multiplying that figure by the daily hospital rate in 1991.

October 1992
Volume XIV, Number 5

Estimated Cost of Measles in Guadeloupe Based on Hospital Morbidity

On 25 September 1988, the English-speaking Caribbean nations and Martinique committed themselves to eliminate measles from this PAHO subregion by 1995. Measles is one of the diseases targeted by the EPI and the feasibility of measles elimination was confirmed in 1990, by the International Task Force for Disease Eradication.

The population movements that exist between this French Department and the surrounding CARIC countries require that surveillance and control measures be increased. In order to support the case for the elimination campaign, it seemed important not only to show the epidemiologic data, but also the average cost for hospital treatment of a measles case.

Methods

The files of all 103 patients hospitalized with confirmed measles from 1981 to 1991 in the three pediatric wards of Guadeloupe’s public hospitals have been reviewed.

The hospital stays of more than 24 hours, which seem numerous at first glance, can be explained by the occurrence of complications or the existence of a prior morbid state (sickle cell disease, for instance). The most common complications occurring were, in order of frequency: pneumonia, diarrhoea, convulsions, encephalitis, and laryngitis. Less often, measles was contracted while the child was in the hospital for another reason.

When all 103 cases are considered, the mean stay in hospital was 11.2 days; if the stays which lasted longer than one month are discarded, the mean stay was 10.6 days. Similarly, if only cases of patients hospitalized for fewer than 17 days (80% of the 103 cases) are included, the mean stay was 7.4 days.

The cost of hospitalization ranged from 1,892 FRF (for a one-day stay), to 124,872 FRF (for the 66-day stay). The total cost of hospitalization for a mean stay of 11.2 days can be placed at 21,196 FRF, and at 21,196 FRF for a mean stay of 7.4 days.

This estimate does not include the cost of home care, nor does it take into account the days of work that were missed by a parent.

Thanks to data from the sentinel network and the vaccine coverage level, it is possible to extrapolate the total hospitalization cost of the next outbreak of measles in Guadeloupe. This total has been calculated using the probable hospitalization ratio and the number of susceptibles (non-immunized children). The immunization coverage survey carried out in January 1992 shows that, in Guadeloupe, 82.5% of children in the 1 to 5 year-old age group are immunized against measles. It has been established that 3 out of 4 children hospitalized for confirmed measles between 1981 and 1991 came from that age group. At present, the 1–5 year-old group contains 31 children, 31 children would require admission, at a hospitalization rate by year; it is possible to extrapolate the hospitalization rate by year; it ranges from 0 to 0.9%.

During the 1984 outbreak, the ratio of measles cases requiring hospital admission was 0.5%. In the event of another measles outbreak, 6120 confirmed cases could be expected, using the same ratio. With a 0.5% hospitalization rate, 31 children would require admission, at a total cost ranging from 224,339 FRF to 657,076 FRF. The smaller sum is equivalent to the cost of purchasing 8040 doses of measles vaccine, or 3455 doses of MMR from private manufacturers.

Conclusions

The cost of hospital treatment for measles cases in 1992 is still high in Guadeloupe.

Routine immunization against measles began here in 1978. Although this was followed by a decrease in the incidence and a change in the epidemic patterns of the disease, the accumulation of successive cohorts of unvaccinated children may favor the occurrence of an outbreak with an excessive number of hospital admissions.
Rubella Watch EPI Newsletter

October 1993 Volume XV, Number 5

Central America: Defeating Measles

The Ninth Central American EPI Meeting, held in Guatemala from 17 to 19 August, 1993, reviewed the measures that have been taken since their elimination campaign was launched, and fine-tuned the strategies required to achieve it. Central American countries have found that if they are to succeed by 1997, as planned, they will have to push farther than ever before past the barriers of routine access to health services. National immunization programs must carry out extensive “catch-up” campaigns to vaccinate children in older age groups (1 to 14 years of age) who may not have been vaccinated or had measles in the past. Ninety-five percent or more of all infants must then be reached and vaccinated by their first birthdays. This vaccination coverage level among one-year-olds must be sustained to break the chain of transmission. The degree of consistent outreach required is the most ambitious yet of any EPI campaign.

Progress Review

The health ministries of Central America, Mexico, the Dominican Republic, and Haiti, the regional diagnostic laboratory (INCAP), the Guatemalan Social Security Institute, Rotary International, the European Economic Community, the Spanish Cooperation Agency, the Swedish International Development Agency, the U.S. Agency for International Development, UNICEF and PAHO/WHO of the United Nations were represented at the meeting to review progress to date.

The meeting focused on several main issues: the status of the effort to vaccinate all children from 9 months to 14 years of age, surveillance, and laboratory confirmation.

Increasing Coverage

The first phase of the Central American campaign launched in 1992 to vaccinate all children between the ages of 9 months and 14 years was conducted in two stages: to vaccinate school-aged children in October/November 1992, and to vaccinate pre-school and the remaining school-aged children in March-June 1993.

Ten million, or over 84%, of the children between the ages of 1 and 14 years old were vaccinated, although only 74.8% of those between one and four-the-hardest to reach were covered. Another 347,491 infants 9 to 11 months old were vaccinated. A breakdown of coverage levels at the municipality level, however, found that only half meet the required 80% coverage level for that age group. Thus, although an extraordinary number of children were vaccinated in a short period of time, large pockets of susceptibles remain.

Measles Notification Bulletin is now published in which outbreaks, and reported and confirmed cases are listed. As of 30 September, 1,586 cases had been reported for 1993, of which 634 were confirmed.

In Mexico 515 cases were reported as of the same week, 108 of which were confirmed by laboratory serology, and 41 of which were classified as compatible (not analyzed in time by a laboratory, or lost to follow-up).

Laboratory Confirmation Clinicians often confuse measles with other febrile illnesses involving rashes, especially rubella. Laboratory analysis and confirmation of suspected cases is therefore critical to determine whether an outbreak is occurring. The Swedish International Development Agency (SIDA) is helping to fund a laboratory network that will be provided with the equipment and supplies needed to improve laboratory serology techniques. Staff training in new techniques was held in August at INCAP with the support of the U.S. Centers for Disease Control and Prevention.


<table>
<thead>
<tr>
<th>Country</th>
<th>1–4 Years</th>
<th>Population</th>
<th>Vaccinated</th>
<th>%</th>
<th>5–14 Years</th>
<th>Population</th>
<th>Vaccinated</th>
<th>%</th>
<th>15–19 Years</th>
<th>Population</th>
<th>Vaccinated</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costa Rica</td>
<td>321,646</td>
<td>158,336</td>
<td>72,130</td>
<td>67</td>
<td>1,047,778</td>
<td>785,472</td>
<td>75</td>
<td>El Salvador</td>
<td>590,607</td>
<td>403,839</td>
<td>132,684</td>
<td>33</td>
</tr>
<tr>
<td>Guatemala</td>
<td>1,256,219</td>
<td>1,085,214</td>
<td>280,014</td>
<td>35</td>
<td>2,410,515</td>
<td>2,093,555</td>
<td>87</td>
<td>Honduras</td>
<td>633,808</td>
<td>608,337</td>
<td>192,649</td>
<td>31</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>581,551</td>
<td>433,429</td>
<td>157,788</td>
<td>36</td>
<td>1,377,339</td>
<td>1,277,070</td>
<td>93</td>
<td>Panama</td>
<td>238,754</td>
<td>198,322</td>
<td>83 75,401</td>
<td>77</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3,788,446</td>
<td>2,948,877</td>
<td>708,162</td>
<td>60</td>
<td>6,749,952</td>
<td>5,499,070</td>
<td>82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Country Reports.

1. In 1991, this rate was 1,985 French Francs per day in the CIHS of Pointe-a-Pitre and 1,400 French Francs in the DH of Basse-Terre.

2. This voluntary network of doctors was set up in 1983 for the surveillance of measles in the French Caribbean neighbors. The representatives of the Caribbean neighbors, the Office of Departmental and M. Theodore, Health Actions coordinators of the sentinel pediatric wards of Guadeloupe and G. Sybille, chiefs of the national representatives, set up in 1983 for the surveillance of rubella.

3. Purchase price is 61.05 FFr/mL: Measles $4.70/dose; MMR =126 FFr/dose.

Note: This article was prepared by M. Laroche, Physiatic and Notifiable Inspector, and M. Theodore, Health Action Coordinator, Department of Operational Solidarity Action, General Council of Guadeloupe.

1993

Measles Elimination in Central America

Representatives of the Central American countries that have undertaken the elimination of the indigenous transmission of measles met in Honduras from 5 to 6 July to review progress to date.

Meeting participants assessed the outcome of the campaign to vaccinate 95% of children under 15 years of age by 30 June 1993, discussed the status of the epidemiologic surveillance system to detect rash and fever illnesses, and explored ways to strengthen laboratory serology techniques to diagnose measles, rubella, and dengue.

Table 1 below shows the preliminary coverage data presented at the meeting by national representatives. A future issue of the EPI Newsletter will provide an extensive analysis of the campaign.

TABLE 1. Measles vaccine coverage or children <15 years old, target and actual rates, Central America, by country, July 1993.

<table>
<thead>
<tr>
<th>Country</th>
<th>Target (%)</th>
<th>30 June 1993</th>
<th>Actual coverage* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costa Rica</td>
<td>95</td>
<td>95</td>
<td>71</td>
</tr>
<tr>
<td>Guatemala</td>
<td>95</td>
<td>95</td>
<td>77</td>
</tr>
<tr>
<td>Honduras</td>
<td>95</td>
<td>95</td>
<td>70</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>95</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>Panama</td>
<td>95</td>
<td>95</td>
<td>74</td>
</tr>
<tr>
<td>El Salvador</td>
<td>95</td>
<td>95</td>
<td>60</td>
</tr>
</tbody>
</table>

*Percentage of data

References

1. C. Berchel, Drs. H. Loret, and G. Sybille, chiefs of the pediatric wards of Guadeloupe public hospitals; Drs. J. Armoegon and V. Massile, coordinators of the sentinel network; DDASS of Guadeloupe.

2. This voluntary network of doctors was set up in 1983 for the surveillance of measles in the French Caribbean neighbors. The representatives of the Caribbean neighbors, the Office of Departmental and M. Theodore, Health Actions coordinators of the sentinel pediatric wards of Guadeloupe and G. Sybille, chiefs of the national representatives, set up in 1983 for the surveillance of rubella.

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1993 August

Volume XV, Number 4

EPI Reviews

The countries of the Andean Region, the Southern Cone, and Brazil recently held their yearly EPI review meetings. Brief summaries of the final reports are presented below. The full reports may be obtained by sending requests to the editor of the EPI Newsletter.

Southern Cone, Bolivia and Brazil

Representatives of Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay met in Porto Alegre, Brazil from 14 to 16 September 1993 to review the status of their polio eradication, neonatal tetanus control, and measles elimination efforts. The meeting was presided by

Pan American Health Organization
Measles Articles

Dr. Joao Batista Risi, Jr., a member of the Technical Advisory Group (TAG), Rotary International, UNICEF, and the Government of Mexico were also represented.

Overall, it was noted that the polio eradication effort has had a major impact in raising coverage levels for all EPI antigens.

Measles

Argentina, Brazil and Chile have held national vaccination campaigns to reach the 1 to 14 year-old age group, with a success rate of around 96%. They are now in the process of establishing rash and fever surveillance. Paraguay is the only country of the Region that has seen a rise in the number of cases of measles. Since measles there could be imported to neighboring countries, meeting participants underlined the importance that both Paraguay and Uruguay carry out national campaigns. Bolivia has schedules its campaign for April, 1994.

It was recommended that those countries that have embarked on a measles elimination program should maintain 100% coverage levels for each cohort of children under 1 year of age. Sufficient vaccine supplies must be guaranteed to make this possible. Countries should document all measles outbreaks and analyze their epidemiologic traits, and notify neighboring countries when they occur at border sites.

Colombia and Peru undertook national mass vaccination campaigns targeting children aged 9 months to 14 years. They achieved 96% and 66% coverage rates, respectively. Bolivia, Ecuador and Venezuela undertook campaigns targeting children aged 9 months to 14 years in their national mass vaccination campaigns. Bolivia, Ecuador and Venezuela undertook campaigns targeting children aged 9 months to 14 years in their national mass vaccination campaigns.

Measles in the Americas

The number of cases of measles has declined steadily throughout the Americas as vaccination coverage has increased and elimination initiatives have gotten underway. The speed with which unvaccinated children add up to a sizeable group of susceptibles, however, means that outbreaks still occur on a regular basis. The wave-like pattern with which measles has declined illustrates the point. Although each peak is lower than the one preceding it, epidemics such as those experienced a few years ago in Brazil, Chile, and the U.S.A attest to the fact that the virus continues to circulate and will cause outbreaks whenever a sufficiently large number of unvaccinated children builds up.

Despite progressively higher coverage rates, the build-up of groups of unvaccinated children remains the major reason outbreaks still occur. To prevent outbreaks high coverage levels must be maintained among each new cohort of infants born yearly. Surveillance must be fine-tuned to pinpoint any pockets of susceptibles that require special vaccination efforts, and, depending on the situation, mass vaccination campaigns may be needed periodically.

Unvaccinated children also tend to have the least access to and are hardest to reach by any health service. Special outreach approaches are required to extend vaccination services to them. The number of cases of measles has declined steadily throughout the Americas as vaccination coverage has increased and elimination initiatives have gotten underway. The speed with which unvaccinated children add up to a sizeable group of susceptibles, however, means that outbreaks still occur on a regular basis. The wave-like pattern with which measles has declined illustrates the point. Although each peak is lower than the one preceding it, epidemics such as those experienced a few years ago in Brazil, Chile, and the U.S.A attest to the fact that the virus continues to circulate and will cause outbreaks whenever a sufficiently large number of unvaccinated children builds up.

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It was recommended that those countries that have embarked on a measles elimination program should maintain 100% coverage levels for each cohort of children under 1 year of age. Sufficient vaccine supplies must be guaranteed to make this possible. Countries should document all measles outbreaks, analyze their epidemiologic traits, and notify neighboring countries when they occur at border sites.

Colombia and Peru undertook national mass vaccination campaigns targeting children aged 9 months to 14 years. They achieved 96% and 66% coverage rates, respectively. Bolivia, Ecuador and Venezuela undertook campaigns targeting children aged 9 months to 14 years in their national mass vaccination campaigns. Bolivia, Ecuador and Venezuela undertook campaigns targeting children aged 9 months to 14 years in their national mass vaccination campaigns.

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reduce infant morbidity and mortality, as one of the most important goals in its health policies. That measles is one of the most common causes of death despite the availability of the technology to prevent and control it.

That it is necessary to adopt joint decisions toward eradicating this disease to accelerate the process of reducing infant mortality.

Resolves:

1. To declare the 1994–1998 quinquennium the period to achieve the eradication of measles in the Andean subregion jointly commit themselves to attain by means of the mass vaccination of the population aged 9 months to 14 years old and the execution of subsequent epidemiologic surveillance activities including the assessment of the immunologic status of the susceptible population.

2. To request PAHO/WHO, UNICEF, and other international technical and economic cooperation agencies to join this effort, according to the Plan of Action approved by the countries and the worldwide commitment to reach Health For All by the Year 2000.

3. Place the Executive Secretary in charge of this Resolution.

February 1994

Volume XVI, Number 1

Colombia: Measles Elimination Month

Between May 10 and June 5, 1993, Colombia carried out a "National Month for the Elimination of Measles," the goal of which was to administer one dose of vaccine to each of 11,450,861 children between the ages of 9 months and 14 years, no matter what their previous vaccination or immune status.

The campaign took place in three planned stages:

- The pre-Vaccine Day phase (May 10 to June 4) during which it was hoped to cover 100% of school children. A coverage rate of 77% was achieved (Figure 1).
- The Vaccine Day (June 5), which was primarily based on setting up vaccination centers and attained 91% coverage.
- The post-Vaccine Day phase, beginning on June 6, which was considered complete when at least 95% of the goal was reached. During this phase, sweeps were conducted in areas that had already been covered, as well as a hard-to-reach areas. Ninety-seven percent of the goal was achieved. Figure 1 shows the goals achieved. Vaccinations reached 11,096,264 children. The remaining 352,317 were vaccinated in a nationwide mop-up campaign during which other EPI antigens (OPV, OPX) also were administered. Health units throughout the country attained the following coverage: 52.2% achieved rates over 95%, 26.3% obtained rates between 90 and 95%, and 18% remained under the 90% target.

The cost of the campaign was US$ 5,547,931 for supplies and equipment and that much again for operational expenses. The budget was shared by state and city governments, non-governmental organizations, and the health sector.

Around 20,000 health personnel from the public sector took part in the Elimination Month. They were joined by private practitioners, and staff from the national security, and social welfare programs.

The campaign was closely coordinated with the Colombian Family Welfare Institute, the Communications Ministry, the National Health Institute, scientific organizations, health unions, and the mass media. The coordination and the accompanying social mobilization was headed by the Interinstitutional and Intersectoral Committees of the health sector at the state and municipal level. Community Participation Committees also took part.

The 3-week period without measles cases continued to be the cause of considerable morbidity and mortality among children. Due to the highly infectious nature of the measles virus, even small numbers of sick children can start an outbreak.

The absence of reported measles cases is an important public health and economic achievement, which is a great success story to the whole country.

February 1994

Volume XVI, Number 1

Mexico: Field Manual on Measles

The health ministry of Mexico has undertaken the eradication of measles from the entire country. The campaign will be based on raising and maintaining high vaccination coverage rates, establishing a highly sensitive surveillance system, and taking immediate control measures whenever cases, outbreaks, or special situations occur. The system is set up to carry out the work of the National Laboratory Network for the Epidemiologic Surveillance of Measles and Rubella. The objectives include: the decentralization of surveillance, and a computerized database.

To standardize the information that is used to this end, in 1990 the Ministry issued two simplified manuals for the epidemiologic surveillance of measles, one for private clinicians and one for all participants in the national fever and rash reporting system. The manuals provide the PAHO case definitions and basic procedures for the notification, investigation, and follow-up of cases. Brief and precise, the booklets include the addresses and phone numbers of the principal health districts throughout the country to ensure the ease of reporting by persons who are not part of the health system. These manuals may be useful as models for other national elimination campaigns.

Copies (available in Spanish only) may be obtained by writing: Coordinación Nacional para la Vigilancia Epidemiológica de las Enfermedades Prevenibles por Vacunación, Francisco de P. Miranda 173, 4° Piso, Colonia Merced Gómez, Lomas de Plateros Mixcoac, Delegación Álvaro Obregón, Mexico, 01480, D.F.

February 1994

Volume XVI, Number 1

Absence of Reported Measles — United States, November 1993

For the first time since measles reporting began in 1912, no measles cases have been reported in the United States for consecutive weeks (November 7–November 27 [weeks 45–47], 1993). In addition, no cases have been reported with onset since September 22 that were not directly linked with importations.

Of the provisional total of 273 measles cases reported in 1993 through November 27, a total of 57 persons had onsets of illness since July 4. Of these, 29 (51 %) were imported or linked through an anomalous chain of transmission to an imported case. Twelve (21%) cases resulted from continued transmission from measles outbreaks that began before July 4. Fourteen (25%) cases could not be linked to an existing outbreak, an international importation, another reported case and were classified as sporadic index cases. Two cases were epidemiologically linked to these cases. Twelve of the 14 sporadic index cases were laboratory confirmed.

Reported by: State and local health depts, National Immunization Program, CDC.

Addendum:

Since this report was prepared, another 1993 Measles outbreak has passed since the last case of measles reported to the Centers for Disease Control and Prevention, United States. No measles cases have been reported from the United States from November 7, 1993 (week 45) through December 18, 1993 (week 50).

February 1994

Volume XVI, Number 1

Rubella Watch EPI Newsletter

Pan American Health Organization

1979–2009

* Copies of the special issue "May, The Month of Measles Elimination" (ISSN- 0120–4912) may be obtained by writing to: Dr. Gina Tambini, PAI, c/o PAHO, Colombia, Calle 95 No.9-80, Santoña de Bogota, D.C. Colombia.

February 1994

Volume XVI, Number 1

Rash and Fever Case Classification for Measles Elimination

Week 1 \nWeek 2 \nWeek 3 \nWeek 4 \nWeek 5 \nWeek 6 \nWeek 7 \nWeek 8 \nWeek 9 \nWeek 10 \nWeek 11 \nWeek 12 \nWeek 13 \nWeek 14 \nWeek 15 \nWeek 16 \nWeek 17 \nWeek 18 \nWeek 19 \nWeek 20 \nWeek 21 \nWeek 22 \nWeek 23 \nWeek 24 \nWeek 25 \nWeek 26 \nWeek 27 \nWeek 28 \nWeek 29 \nWeek 30 \nWeek 31 \nWeek 32 \nWeek 33 \nWeek 34 \nWeek 35 \nWeek 36 \nWeek 37 \nWeek 38 \nWeek 39 \nWeek 40 \nWeek 41 \nWeek 42 \nWeek 43 \nWeek 44 \nWeek 45 \nWeek 46 \nWeek 47 \nWeek 48 \nWeek 49 \nWeek 50

Source: PAHO/Columbia, Ministry of Health.

February 1994

Volume XVI, Number 1

Colombian Pediatricians Join In

M easles continues to be the cause of considerable morbidity and mortality among children. Despite the ongoing efforts by pediatricians who still consider measles a common childhood disease. Special publications such as "May, The Month of Measles Elimination" issued such as "May, The Month of Measles Elimination" issued a "National Month of Measles Elimination" (ISSN-0120–4912) were prepared by John C. Watson, MD, MPH, and William Shope, MD, EPI National Immunization Program, Centers for Disease Control and Prevention.

February 1994

Volume XVI, Number 1

- Editorial Note:
- The 3-week period without reported measles cases reflects at least four factors: 1) major increases in measles vaccination coverage levels among preschool-aged children; 2) increased use of a second dose of measles vaccine among school-aged children and young adults attending college; 3) an overall increase in the number of cases managed to control measles throughout the Western Hemisphere; and 4) the usual seasonally low incidence of measles during the winter. Further, the absence of any reported persons with sporadic index cases of measles who had onset after September 22 may reflect a cessation of endemic measles transmission in the United States during this period.

The absence of reported endemic fecal of measles transmission does not indicate that measles has been eliminated in the United States. In the past, substantial numbers of measles cases were not reported to public health authorities. Therefore, surveillance must be intensified to permit the identification and elimination of any remaining fecal of transmission. Any case of rash illness suspected to be measles should be reported promptly to public health authorities to enable immediate investigation and vigorous control measures to minimize spread of infection.
Measles Articles

April 1994
Volume XVI, Number 2

Measles in Canada in 1993: The Lowest Ever Reported

Canada has set the year 2005 as the date by which it will eliminate indigenous measles. Its coverage and incidence targets are to:

1. Achieve and maintain 97% coverage for the first vaccine dose at 1 year of age by the year 1997.
2. Achieve and maintain 95% vaccine coverage for the second dose before school entry by the year 2000.
3. Achieve and maintain an incidence of less than 1/100,000 by the year 2000 in each province and territory.
4. The following is a review of current elimination efforts.

Epidemiologic situation

As of October 30, 1993, a provisional total of 174 measles cases was reported in Canada by the 10 provincial and 2 territorial health departments. This is the lowest total reported for the first 10 months of any year since national notification began in 1934, and reflects a 94% decrease from the 2,858 cases reported for the same period in 1992. The reported incidence for 1993 is 0.7 cases per 100,000, the lowest ever reported in this country (Figure 1). The following summarizes the epidemiologic characteristics of cases reported in 1993 as well as recent developments in prevention and control strategies.

In 1993 no cases were reported from 3 provinces (Newfoundland, Prince Edward Island and New Brunswick) and the 2 territories (Yukon and Northwest Territories), Ontario and Quebec (representing 6.2% of Canada’s population) reported 80% of the total cases. In other regions, the number of cases reported ranged from 1 to 17. Compared to 1992, Ontario has experienced a 97% decline, while Quebec experienced a 2.2% increase.

There has been a remarkable drop in the proportion of cases occurring in school-aged children (5 to 9 years) from 83% in 1992 to 53% in 1993. Figure 2 shows the age specific incidence rates per 100,000 population. The highest rate of infections was among infants, followed by preschoolers; the rate decreased with increasing age.

Additional epidemiologic information pertaining to the vaccination status of cases, the proportion of cases laboratory confirmed, and the proportion of imported or import-related cases is currently available at the national level. The latter is not considered a significant problem. With the assistance and cooperation of the local and provincial public health departments, federal officials are hoping to intensify the surveillance of measles coming from the current passive system to an active one in the near future.

Before the introduction of vaccine, measles occurred in 2 to 3 year cycles. The highest incidence was recorded in 1935 with over 83,000 cases (770/100,000 population). The widespread use of measles vaccine since the mid 1960s has resulted in a dramatic reduction in the overall morbidity and mortality due to the disease across Canada. The introduction (timing) and implementation of vaccination programs, vaccine products used, and the vaccine coverage over the years has varied greatly among the various jurisdictions. Nevertheless, the immunization programs have been progressively successfully reducing the burden associated with measles, resulting in 90% to 95% reduction in the reported laboratory incidence in the last decade.

In the past decade, despite ongoing control efforts, continuing occurrence of cases of measles in many parts of the country at irregular intervals, and sometimes in epidemic proportions has been a major concern. Many cases, in fact, were reported to have a history of measles vaccination, having received vaccine according to the national recommendation (i.e., after 12 months of age). The generally accepted explanation for the most recent epidemics in Quebec in 1989, and in Ontario during 1990-1991, includes insufficient use of available vaccine, sub-optimal vaccination practices and vaccine failures.

A national survey conducted in the spring of 1993 indicated that 95% of the 2 to 3 year-olds had received at least one dose of measles vaccine, although only 90.5% had documented evidence of receiving the recommended 1 dose of vaccine after their first birthday. The reported vaccine coverage for school entrants across Canada is greater than 95%.

Measles Consensus Conference And Measles Elimination Efforts

Measles prevention/elimination has been a high priority issue in Canada since the early 1980s. However, continued occurrence of measles in recent years, although confined to certain geographic areas, has been worrisome and a major concern for public health personnel. Prevention and control measures in outbreaks have been expensive and labor intensive. As a result of these concerns and to develop national goals for measles and the best strategy to achieve them, the Advisory Committee for Disease Control sponsored "National-Conensus Conference on Measles," 1-2 December, 1992.

The Consensus Conference recommended measles elimination in Canada by the year 2000. To achieve this goal, implementation of a 2-dose schedule (the second dose to be given before school entry) was recommended. However, it was emphasized that the first priority in this schedule still remains the full application of dose one.

Canada’s National Advisory Committee on Immunization has recently endorsed the Consensus Conference’s recommendations, including measles elimination goal and the 2-dose routine immunization strategy. However, the final implementation of these recommendations will vary depending on the provincial/territorial government and resources. Some provinces are already taking steps towards implementing the 2-dose strategy.

Comments

To achieve measles elimination, sustained cooperation of local, provincial and national public health agencies is essential. Having achieved a rate of less than 1 case of measles per 100,000 population in 1993 in all Canadian provincial/territorial jurisdictions is remarkable. If measles activity is kept at this rate or lower, this will fulfill, in part, one of the Consensus Conference’s recommended targets even earlier than expected, i.e., achieve and maintain an incidence of less than 1/100,000 by the year 2000 in each province and territory.

However, past experience in Canada, as well as in the United States, cautions us that, since a resurgence of measles can happen after a period of low activity, one should not be over optimistic about elimination unless the desired level of immunity is achieved and maintained in all segments of the populations.

Acknowledgement: Assistance of all provincial/territorial epidemiologists is appreciated.

Reference


June 1994
Volume XVI, Number 3

Global Measles Strategy Picks Up Pace

Although the Region of the Americas has made major strides in the control of measles, the same is not yet true in other parts of the world. The need to improve the coverage of measles vaccination was discussed at the Informal Consultation on Strategies to Accelerate Global Measles Control, held on 27-28 April, 1994, at PAHO headquarters in Washington, D.C. The Global Program for Vaccines (GVP) of the World Health Organization. The following summary paraphrases the main conclusions.

Forty-five million cases of measles cases occur each year; 2 million of them die. The situation in early 1994 suggests that current measles control strategies will not suffice to attain the global case reduction goals set by the World Summit for Children and the World Health Assembly.

Several important operational, managerial, structural and financial constraints have limited measles vaccination coverage. Many programs have had remarkable success in overcoming these barriers and achieving modest or high levels of coverage; in 1993 92% of the world’s children received at least one dose of measles vaccine. Measles vaccination coverage was 78%.

However, it has become progressively clear that no matter what high coverage is, programs that rely upon measles vaccine delivered in the first year of life from fixed sites cannot expect to achieve the measles case reduction goal.

Even a vaccine coverage of 95–98% with an 80% effective vaccine leaves 20% of vaccine recipients susceptible to measles, permitting continued transmission in the community, and falling short of the 95% reduction goal. Further improvements in vaccine efficacy in young infants are unlikely in the near future. Existing vaccine delivery strategies should be improved and additional ones introduced, such as identifying and vaccinating high-risk groups and conducting periodic mass campaigns that target all children in a particular age group, whether or not they have been vaccinated in the past.

To improve measles control in developing countries, implementation of existing vaccine delivery strategies needs to be improved. These include delivery by fixed clinic-based services; outreach services, which offer immunization for populations away from health centers who are unable to reach fixed services easily; or by mobile teams, which operate in areas too remote to be served by fixed or outreach services.

Missed opportunities for immunization are a major impediment to improving
measles vaccine coverage. Health staff may miss opportunities to immunize by accepting false contra- indications. Eligible children should be immunized despite a history of having had measles. Managers should be alerted if measles vaccine coverage rates are found to be significantly lower than coverage for DPT or DPT-1. Recent program reviews indicate that among those countries experience a 25% drop-out rate between DPT-3 and measles vaccine. Managers must investigate the reasons for high drop-out rates and take appropriate action.

In addition to improving what already exists, additional strategies must be introduced to increase measles vaccination coverage, particularly by identifying and vaccinating high-risk groups. These include areas with high population densities, those in the lowest 25% in the national ranking of measles deaths, urban areas with a high incidence of measles, urban areas and districts with poor socio-economic and educational status, and areas with a high drop-out rate. High-risk groups may include children who are admitted to hospital, malnourished, in displaced populations such as refugees living in camps, in border or conflict zones, or in border or ethnic groups.

Mass campaigns will be targeted to those age groups identified through analysis of epidemiologic data, which will include children regardless of prior vaccination status, and will focus particularly on urban centers, where disease transmission is highest. Mass vaccination campaigns provide the opportunity to reach children who may not have been vaccinated because of lack of access to services at fixed sites; to increase vaccination rates by providing an additional dose to some children, and vaccinate children older than age 1 year, and to rapidly reduce the pool of susceptible and potentially interrupt transmission.

The report states that mass campaigns should be used in (a) urban areas and districts with a high incidence of measles; (b) rural areas and districts with measles vaccine coverage less than 80%; (c) countries conducting polio mass campaigns; and (d) countries with measles elimination goals.

The epidemiology of measles suggests that urban strategies are especially important because high birth and migration rates in urban areas lead to a continued supply of susceptibles; measles is transmitted rapidly in densely crowded conditions; severe and fatal cases occur from city to rural areas, and up to a third of all cases in the Americas occur among infants younger than 9 months old.

Measles surveillance will be critical until the desired levels of reduction are reached and can be maintained by existing disease control systems. Experience has demonstrated that the effectiveness of mass campaigns is improved if the post-campaign identification of low coverage areas and intensive house-to-house vaccination are initiated. Local analysis of measles surveillance data will guide the choice of age groups to target in mass-vaccination campaigns. In some situations the upper age limit may be reduced to three years of age, and the lower age limit lowered to six months. The choice will depend on the overall epidemiology of measles and the resources available. Likewise, the frequency of campaigns should be determined by analysis of epidemiologic data.

The most cost-effective means of conducting a measles campaign is in conjunction with a polio vaccination campaign, according to local situations. Failure to increase measles vaccine coverage simultaneously with OPV constitutes a missed immunization opportunity.

Sample strategies for improving mass campaigns include:

- Routine vaccination supervised
- Coverage

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Rural districts/ regions</th>
<th>Urban districts/ regions</th>
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<tr>
<td>&lt;80%</td>
<td>Routine</td>
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<td>80%-100%</td>
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<td>&lt;50%</td>
<td>Routine + campaign every 2 years</td>
<td>Routine + campaign yearly</td>
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In areas of high coverage, where measles remains a problem, or where elimination in a target, campaigns should be carried out.

A major impediment to achieving the goals in many countries is the continuing lack of political commitment, often linked to turbulent political events. Strong advocacy should be brought to bear to arrest this inertia. Days of tranquility or “corridors of peace” are phrases coined to denote a period of inactivity. For the purpose of immunizing all children in the conflict area, these corridors of peace were done successfully a number of times in Latin America.

Additional limiting factors include a lack of funds to purchase vaccines and syringes and the limited health infrastructure in some key countries which reduce their potential to implement these strategies.

The cost of a mass measles vaccine campaign ranges from US$ 0.50 to US$ 0.97 per child, and, if administered during a polio mass campaign, is approximately US$ 0.10 additional per child. To improve measles surveillance the cost increases by US$ 0.05 per newborn. In general, vaccines account for about 50% of the per capita costs. Current measles vaccine and disposable syringes and needles (which are strongly advocated for mass campaigns) cost US$ 0.19 - US$ 0.22. Additional costs include planning, transportation, personnel, advocacy, and evaluation. Precise estimates of cost will be difficult to make and will vary between countries and over time. Data are available from campaigns conducted in the Americas and the Philippines.

There currently is adequate manufacturing capacity for measles vaccine to meet present and foreseeable global needs. Should a significant increase in demand occur, however, industry will require a lead time of several months. Therefore, it is essential that the equipment required to produce up to five times the present output (up to 1000 million doses annually) be put in place.

An enhanced measles surveillance system is critical for planning and evaluating measles control strategies. In order to monitor the success or failure of control activities, data should be collected that help answer specific epidemiologic and programmatic questions. This technical guide is a helpful, geographical-specific and secular trends.

Priority surveillance activities include strengthening the routine notifiable disease surveillance system.

Measles incidence rate (1960-1993) and immunization coverage, (1980-1993), Chile.

<table>
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<tr>
<th>Year</th>
<th>Rate (per 100,000)</th>
<th>Coverage (%)</th>
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An adjustment period is required between the time a standard is adopted and the time it is implemented by health personnel. During 1992, when reporting units were still adjusting to the use of a standard case definition in Chile, many excess “probable” cases were reported that did not meet the diagnostic criteria.

Priority should also be given to ensuring that adequate blood samples are taken before a case is declared. The importance of
Measles Articles

September 1994
Volume XVI, Number 4

The TAG and ICCPE Meet Together to Review the Status of Polio Eradication and the EPI

The eleventh meeting of the Permanent Interagency Technical Advisory Group (TAG) on Vaccine-Preventable Diseases and the third meeting of the members of the International Commission for the Certification of Poliomyelitis Eradication (ICCPE) were held concurrently in Washington DC, USA, from August 22nd to August 25, 1994.

The following is a summary of the major highlights of this meeting regarding measles eradication.

Measles Elimination: Is the Road Ready?

Three countries in the region, Cuba, the English-speaking Caribbean, and Chile, appear to have reached and sustained transmission interruption for more than six, three, and two years, respectively. Chile represents the first non-island setting in which transmission has been interrupted for more than one year. In Central America the number of cases has been drastically reduced and virus circulation appears to have been interrupted in some countries. In other countries measles transmission has been reduced to a few foci where cases and limited outbreaks continue to occur. In most of these countries the surveillance system of the fever and rash clinics with laboratory diagnosis capabilities are being put into place and are reporting weekly cases.

Only Venezuela and Haiti have yet to launch their National Campaigns against Measles. Nearly 80% of children under the age of 15 in all the other countries of Latin America and the Caribbean have received a single dose of measles in the last three years.

Both the U.S. and Canada have set goals for the elimination of measles. In 1993 the U.S.A. reported a historical low of 312 cases of measles (1.4/1 million). School entry laws had ensured measles vaccine coverage in school aged children over 95%.

Canada also set a goal for the elimination of indigenous measles by the year 2005. After two years, however, despite a vaccine coverage in excess of 97%, epidemics continue to occur as a result of a combination of factors. Primary vaccine failures account for the majority of these occurrences, while others mostly involve unvaccinated individuals and occur in communities with documented measles immunization coverage up to 98.7%. This evidence links most cases, then, to importation from outside the country or from one province to another.

The TAG made the following recommendations in relation to measles:

- Nearly every country in the Region has now set an elimination target for measles.
- The individual country efforts could be enhanced by undertaking a regional elimination initiative. Such an initiative could help answer questions regarding surveillance of rash and fever, laboratory diagnosis, and most effective vaccination strategy(ies) to interrupt transmission.
- Continued efforts should be made to achieve and maintain the highest possible levels of vaccination coverage.

Measles Outbreak—Huehuetenango, Guatemala

From April–May 1994, a measles outbreak of 190 cases, including 4 deaths, occurred within three municipalities (Todolo Santo, Huehuetenango, and Chiantla) of the Huehuetenango Health Area in Guatemala. Rural health promoters initially alerted the non-governmental organization. Doctors without Borders, about the outbreak who then provided the first information to the Health Area Headquarters. The information provided indicated that three villages in the municipality of Todolo Santo appeared to be the center of the outbreak. On the 27 of May 1994, the EPS coordinating unit of the Guatemalan Ministry of Health first received information about the outbreak.

Todolo Santo Municipality

Health personnel from Huehuetenango Health Area Headquarters, visited Todolo Santo municipality and confirmed that during May 1994, 23 cases, including one death, meeting the measles clinical case definition, had occurred in children less than 10 years of age.

Available vaccination coverage data from this municipality indicated that 64% of all children 1-4 years of age had received one dose of measles vaccine during the mass campaign held in 1992-1993; coverage data for children under one year of age was reported to be 62%.

The first case in Todolo Santo municipality occurred around the 1st of May 1994. None of the reported cases had a history of measles vaccination. The affected children were not vaccinated primarily because of religious objections to vaccination. In response to this measles outbreak, health workers implemented control measures and vaccinated all children less than 15 years of age, regardless of their previous vaccination history. The community gladly accepted the opportunity for vaccination fearing that they could be infected by the disease.

Huehuetenango Municipality

Further investigation revealed that one death occurred due to a secondary infection with pneumonia in a military recruit with recent history of measles in a hospital at the military base located in Huehuetenango municipality. The investigation also revealed that there were 94 cases of rash and fever illness with clinical characteristics compatible with measles as diagnosed by military physicians. Of the total patients reported with measles, 25 patients had rash and fever at the time of the investigation.

The first case in Huehuetenango municipality had rash onset on April 6, 1994, 53 days before the health services of the Guatemalan Ministry of Health were notified. The outbreak investigation revealed military personnel had been in contact with the three villages in the municipality of Todolo Santo.

To control the measles outbreak in this military community, immediate vaccination of all military personnel was begun, as well as, mobilization of all military personnel until the epidemic subsided. All active cases were directed to the hospital for treatment.

Chiantla Municipality

Active search for suspected measles cases was intensified throughout the Huehuetenango Health Area. A further 67 cases of rash and fever were identified, with one death reported in five communities within the municipality of Chiantla. However, only nine cases had rash that was compatible with the clinical measles definition.

Data obtained from the community indicated that cases occurred between epidemiologic weeks 20 and 23 (16–29 May, 1994). A “mop-up” vaccination effort in Chiantla municipality to vaccinate all children less than 15 years of age began on the 1st of June.

Outbreak Summary

Figure 1 shows the epidemic curve for the outbreak which shows that the peak occurred around epidemiologic weeks 19 and 20 (14–16 May, 1994).

A total of 19 blood samples were collected from suspected measles patients in Huehuetenango Health Area. Of the total samples tested, 12 (63%) were positive for measles IgM.

Age data are available for 187 cases out of the 190 reported cases. The majority of the cases occurred in the 15–44 age group (Figure 2).

Since week twenty-four, no cases of confirmed measles have been reported from these three municipalities. Active search for further cases and outbreak control measures have continued. Guatemalan Health authorities have kept in close contact with Mexican officials, but to date no related cases have been reported from Mexico.

The Huehuetenango Area Health Headquarters investigation report concluded that the Guatemalan measles outbreak began in early April 1994 primarily among unvaccinated individuals.

Measles Elimination in the Region

In the Region, the number of cases has been reduced to a few foci where cases and limited outbreaks continue to occur. In most of these countries the surveillance system of the fever and rash clinics with laboratory diagnosis capabilities are being put into place and are reporting weekly cases.
Rubella Watch

EPI Newsletter

*State reporting more than five epidemiologically linked cases.

October 1994

Volume XVI, Number 5

Measles Elimination by the Year 2000!

Following the successful effort to eradicate the wild polio virus from the Americas (See EPI Newsletter, Volume XVI Number 4, 1994) the 24th Pan American Sanitary Conference (PASC) resolved to set the target to eliminate measles from the Americas by the year 2000.

The report concludes that military personnel represented a pocket of susceptible persons that introduced the virus into neighboring rural villages. Measles transmission was facilitated in these civilian communities because of the low rates of measles vaccination coverage among children less than 15 years of age.

The report also concludes that there was lack of coordination between measles virus, personal health services of the Ministry of Health and that of the military which created the following situation: why the outbreak was not detected in a timely manner and how permitted the measles transmission to continue.

Source: Guatemalan experience, following general conclusions can be made:

1. This outbreak highlights the importance of regularly monitoring vaccination coverage by municipality and organizing "mop-up" campaigns for those municipalities with low coverage following a mass vaccination campaign.
2. Even in areas with high levels of vaccination, groups with objections to measles vaccination are a high-risk group for outbreaks. Implementation of measles vaccination campaigns may be needed to educate these groups about the measles elimination activities and to encourage them to vaccinate their children.
3. Because of the high transmissibility of measles and the unique characteristics of persons living in densely populated closed communities, such as military camps, may be at increased risk for outbreaks. Consideration should be given to routinely providing measles vaccination to new military recruits.
4. Strong collaboration and communication are needed between various groups to achieve improved measles control and its eventual elimination. It is critical to improve the coordination of activities of groups including the Ministry of Health schools, the private sector, and the military.

FIGURE 1


*For 1994, data up to week No. 34. Source: PAHO.

VACCINATION CAMPAIGNS

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FIGURE 1

Reported cases of measles by state.

United States, First 26 weeks, 1994

Vaccination Status

Of 274 reported patients for whom vaccination data were available, 44 (16%) had received at least one dose of measles-containing vaccine (MCV) on or after their first birthday and >34 days before the onset of rash. Of these patients (30%) patients considered to be unvaccinated received a first dose of MCV >14 days before the onset of symptoms; most vaccinations were administered during an outbreak involving previously unvaccinated persons. Five cases were reported among persons who had received two doses of a MCV; for two of these five persons, the second dose was administered ≥21 days before symptom onset.

Of the 230 patients who were either unvaccinated or vaccinated <14 days before illness onset, 166 (72%) had a religion or philosophic objection to vaccination. Forty-three (19%) patients were vaccinated but vaccine-eligible (i.e., U.S. citizens aged >16 months with no medical, religious, or philosophic objection to vaccination), and 21 (9%) were younger than the recommended age for
Measles Articles

Editorial Note: Although measles incidence has increased since the historic low reported in 1993, measles incidence during the first 26 weeks of 1994 substantially lower than in previous years. In addition, epidemiologic characteristics of cases reported in 1994 are similar to patterns observed since the end of the measles resurgence during 1989-1991. These patterns include 1) a shift in age incidence from preschool-aged children to older age groups, 2) the importance of international importations in the spread of measles, and 3) the spread in groups whose members do not routinely accept vaccination-in particular, cases among groups with religious beliefs that offer an exemption to vaccination accounted for 45% of all cases reported during the first 26 weeks of 1994. Maintaining communication with these groups continues to be important as outbreaks occur and may encourage some members to accept vaccination. 

During 1994, measles cases have occurred predominantly among high school and college-aged persons, a group of whom previously had received one dose of measles vaccine. In contrast, during the 1989-1991 measles resurgence, cases occurred predominantly among young children (less than age 1). Since 1991, the proportion of cases among persons aged 15-24 years has decreased substantially from 49%-50% during 1991-1992 to 24% during the first 26 weeks of 1994. This decline may have resulted from continued efforts to increase measles vaccination coverage (approximately 85% in 1993) among preschool-aged children at 24 months of age. The outbreaks among previously vaccinated high school and college-aged persons emphasize the importance of implementing and enforcing vaccination with a second dose of MCV among persons in these age groups. Findings of a recent assessment indicated that the risk of measles outbreaks is lower among colleges that enforce prematriculation requirements for measles vaccination when compared with those that do not have or do not enforce such policies.

The laboratory findings during 1994 are consistent with other epidemiologic data suggesting that measles transmission may have been interrupted in the United States in late 1993 and indicate that international importations account for a substantial proportion of disease attributable to measles in 1994. Although one large outbreak has been epidemiologically linked to a known importation, genomic sequencing of measles viruses suggests that cases in 1994 resulted from reintroduction of measles by international importations.

Although indigenous measles transmission in the United States may have been transiently interrupted, the continued occurrence of measles among U.S. residents demonstrates that additional efforts are required to attain the Childhood Immunization Initiative goal of sustained elimination of indigenous measles in the United States by 1996. These efforts should include 1) rapid detection of cases and implementation of appropriate outbreak-control measures, 2) achievement and maintenance of high levels of vaccination coverage among preschool-aged children in all geographic regions, and 3) greater implementation and enforcement of the two-dose recommendation among high school and college students. In addition, the source of measles infection should be established for all cases to help define the chains of disease transmission and to help develop more effective control measures.

State and local health departments are encouraged to investigate thoroughly all cases to identify the source of measles infection and to obtain specimens for isolation. Specimens should be obtained from all sporadic cases, and from selected outbreak-associated cases. Specimens may be collected from nasal washings within 1-3 days of rash onset or from urine samples within 2 weeks of rash onset. Additional guidelines for specimen collection and handling can be obtained from CDC's Division of Viral and Rickettsial Diseases, National Center for Infectious Diseases, telephone (404) 639-3532, or from CDC's National Immunization Program, telephone (404) 639-8226.

The laboratory findings during 1994 are consistent with other epidemiologic data suggesting that measles transmission may have been interrupted in the United States in late 1993 and indicate that international importations account for a substantial proportion of disease attributable to measles in 1994. Although only one large outbreak has been epidemiologically linked to a known importation, genomic sequencing of measles viruses suggests that cases in 1994 resulted from reintroduction of measles by international importations.

CDC performed genomic sequencing of measles viruses isolated from seven outbreaks in the continental United States during 1993-1994. Preliminary analysis indicates that all of the viruses from these recent outbreaks (most from 1994) are genetically similar to viruses isolated from Europe or Japanese sources.

Reported by: State and local health directors, L. Espadon, MD, Guam Dept of Public Health and Social Svcs; BFJ Francis, MD, State Dept of Health, Illinois Dept of Public Health. HD Donnell, Jr, MD, State Epidemiologist, Board of Health Div, CR Nichols, MPA, State Epidemiologist, Utah Dept of Health, National Immunization Program; Measles Virus Section, Respiratory and Enteric Viruses Br, Div of Viral and Rickettsial Diseases, National Center for Infectious Diseases, CDC.

Source: Morbidity and Mortality Weekly Report, September 23, 1994; Vol.43, No.37; Centers for Disease Control and Prevention, Division of State and Local Health Services; Public Health Services, Miami, FL.

1 Compares cases reported to CDC's National Notifiable Diseases Surveillance System through July 9, 1994 with the National Notifiable Diseases Surveillance System, through July 2, 1993, and cases reported subsequently that occurred during this period.
2 Required in another state or linked to a case within two generations to an adult-to-adult importation.

December 1994
Volume XVI, Number 6
Summary of Caribbean Managers Meeting

The Eleventh Meeting of the Caribbean EPI Managers was held in Nassau, Bahamas, from November 15 to 18, 1994. Throughout the meeting, various points of achievement were noted. These included the fact that no cases of indigenous measles have been reported in over 3 years in the Caribbean EPI. Despite intensified surveillance for measles with nearly 600 weekly visits to the laboratory in the English-speaking Caribbean and Surinam. Also, nearly 12 years have elapsed since the last reported case of paralytic poliomyelitis was detected in the Caribbean. Remarkably, 1994 was the third year of surveillance for fever and rash illnesses and immunization coverage levels remain high throughout the Caribbean and the Americas.

The Meeting was attended by over 80 participants from the 19 countries of the English-speaking Caribbean and Surinam; representatives of the French Departments of Guadeloupe and French Guyana as well as from Curacao and St. Maarten also attended the meeting. For the first time and following recommendations of previous meetings, representatives from Puerto Rico attended the event. Several NGOs, including Rotary International and the Christian Children’s Fund were also in attendance. Technical personnel from PAHO and its Caribbean Epidemiology Center, UNICEF, and CPAH, were active participants in the Meeting as well.

An extraordinary level of commitment was clearly evidenced by the high quality of presentations and by 100% participation of member countries. Governmental commitment was evidenced by allocation of resources which have accounted for approximately 90% of the cost of the program over the last few years, as well as personal commitment of political leaders in support of the program.

The role of international supporting agencies was noted as an important factor in the progress achieved thus far and their continued support will be fundamental for further gains.

The principal purpose of the Meeting was to review the entire EPI program in the Caribbean and to identify obstacles which might impede achieving program targets. To assist in this identification country reports and the 1994 National Work Plans were reviewed and analyzed. This exercise resulted in the elaboration of the 1995 National Work Plans.

Another major objective of the Meeting was to evaluate continued efforts towards the elimination of measles by 1995, focusing on various limitations related to surveillance of suspected measles cases and incomplete laboratory specimen collections. The key issue of the continued build up of susceptibles was addressed, with each country determining the number of potential susceptibles in their country, and whether a catch-up vaccination campaign was necessary. Also addressed were issues pertaining to the maintenance of the absence or wild poliovirus transmission in the region.

Surveillance

The continued implementation of and improvements in the surveillance system for detection of suspected measles cases was evidenced by improved weekly reporting and training in operational procedures related to surveillance and case investigation. The meeting stressed the critical role that CAREC should play in helping to improve the surveillance of vaccine-preventable diseases in the Caribbean, both in terms of organization and maintenance of the reporting networks and analysis of the data to refine strategies for disease control and elimination.

It was noted that a great number of measles outbreaks due to importation forms are not being sent to CAREC. This has greatly impeded the analysis and evaluation of data for the entire Caribbean. Without such data it is difficult to assess trends and make group policy and strategy decisions. Nevertheless, based on the data, the importance of laboratory analysis and analyzed from laboratory forms a number of indicators to help guide programs and policies.

It was also noted that a substantial proportion of suspected measles cases had an S1 sample obtained and submitted to CAREC (4 of the 33 which were without specimens were cases which did not require an S1, such as cases incorrectly reported as suspect). Of the 187 S1, 114 (61%) had S2 submitted and of the other 37, 22 were without specimens due to cases not requiring an S2, for example, confirmed rubella diagnosis with S1. Also, the interval between case report and collection of S1 was under 8 days in over 85% of cases. 50% of all S1 samples taken were received within a two week period at the referral laboratory. Over 40% took longer than 3 weeks to have specimens received in CAREC, 50% of S2 was collected within 8 weeks of presentation and collection of S1 was under 8 days in 85% of cases. 50% of all S1 samples taken were received within a two week period at the referral laboratory. Over 40% took longer than 3 weeks to have specimens received in CAREC, 50% of S2 was collected within 8 weeks of presentation.
TABLE 1. Projection of children under 5 years of age who would be susceptible to measles by June 1995 (4 births cohorts born since May 1991).

| Country             | Annual births | Percent not vaccinated | Projected susceptible <5 years
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<tr>
<td>Belize</td>
<td>7,781</td>
<td>120</td>
<td>3,065</td>
</tr>
<tr>
<td>Bermuda</td>
<td>2,640</td>
<td>9</td>
<td>2,297</td>
</tr>
<tr>
<td>St. Lucia</td>
<td>3,690</td>
<td>15</td>
<td>3,875</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>7,781</td>
<td>20</td>
<td>9,337</td>
</tr>
<tr>
<td>Bahamas</td>
<td>6,500</td>
<td>9</td>
<td>5,655</td>
</tr>
<tr>
<td>Barbados</td>
<td>4,097</td>
<td>9</td>
<td>3,584</td>
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<tr>
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<td>26</td>
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<td>Guyana</td>
<td>21,244</td>
<td>20</td>
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<td>Trinidad and Tobago</td>
<td>23,000</td>
<td>20</td>
<td>27,600</td>
</tr>
<tr>
<td>Jamaica</td>
<td>80,000</td>
<td>20</td>
<td>72,000</td>
</tr>
<tr>
<td>TOTAL SUSCEPTIBLES</td>
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<td>169,517</td>
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Coverage and Susceptibles
Over all, immunization coverage has been maintained at the previous high levels already achieved (see Figure 1). However, it was reported by some countries that coverage had either dropped or remained stationary under the 90% mark. When coverage is less than 95%, this indicates that there are considerable numbers of unvaccinated children.

Despite improved coverage a yearly increase of approximately 30,000 susceptibles are likely to be added to this total (from each new birth cohort, those not vaccinated and those that represent vaccine failures). Such a number of susceptibles are more than sufficient to support a considerably large epidemic should a measles introduction occur. This estimate does not include an unknown number of susceptibles in the greater than 4 years of age sector of the population.

With the above background information, each country estimated the number of likely susceptibles in the <5 population. It was determined that if there was an average of 20% susceptibles in the birth cohort over the last 4 years, then the build up of susceptibles over a 4 year period is critical enough to warrant a catch-up campaign targeted to the under 5 age group. Countries which do not exceed this limit still need to identify smaller pockets of susceptibles, such as areas with urban poor and remote or inaccessible locales, where vaccination activities should be aggressively augmented to deal with these groups (See Table 1).

An analysis of the Caribbean measles situation was made. As immunizations are given in most countries at 1 of 3, there are approximately 150,000 infants (all less 1 year of age) at any given time unimmunized in the Caribbean. If it is assumed that approximately 30% of these infants are unprotected either by lack or loss of maternal antibody at sometime during their first year of life, this would provide up to 45,000 susceptibles at any given time in the under 1 year group. As the mass campaign provided vaccine to all persons to 1 year of age, it is likely that at that time the number of susceptibles in that age group were substantially reduced. However, there are factors which prevent 100% of the target population from being immune; 1) vaccine is not 100% effective, 2) as coverage has been less than 100% since the campaign, there is a likely build up of additional susceptibles with each successive birth cohort, and 3) potential cold chain problems.

Based on these 3 factors one might estimate that 20% of the 1-15 age group is susceptible. For the 3 years since the campaign there have been approximately 450,000 births, and if approximately 20% are not protected, this would add up to 90,000 susceptibles. If we add this number to the 45,000 susceptibles under 1 year of age, there may be as many as 135,000 susceptibles at any given time in the Caribbean.

Social Mobilization
Continued Social Mobilization and NGO involvement and enhanced participation are essential to the goals of the EPI, improving coverage and the maintenance of the eradication of polio and the elimination of measles. With regard to measles, social mobilization is critical to increase the population’s consciousness about the need to have children of any age taken to a health authority when rash and fever occur. To achieve this end, innovative approaches, similar to those developed in Jamaica, must be taken on a continuous basis. These include the use of media and community groups in addition to a special school program which develops materials intended to heighten the awareness of children about the importance of immunizations.

World Health Day will be celebrated in April 1995 and will focus on progress towards global polio eradication. This is an excellent opportunity for re-vitalizing a variety of aspects related to the EPI program, including coordination between the countries and donor agencies in relation to disseminating appropriate communication materials for this event.

December 1994
Volume XVI, Number 6
Measles in Canada, 1994 (as of September 14)

From January 1 to September 14, 1994, a provisional total of 358 measles cases have been reported in Canada. This is 108% higher than the 172 cases reported for the same period in 1993. Over 65% (258 cases) of these cases were reported from Ontario, followed by Quebec with 25% (98 cases). No cases have been reported from Prince Edward Island, New Brunswick, the Yukon, and the Northwest Territories.

The province of Quebec recently reported two outbreaks, one of which involved a group of people who oppose immunization for religious reasons. Although several Ontario health regions have reported sporadic cases (peaking in the last week of May). A brief report follows in this issue on the latter outbreak.

Figure 1 shows the distribution of cases by month of onset for the period January 1 to July 31, 1994. The highest number of cases (245) was recorded in May, followed by June (89 cases). Ages of the cases ranged from 5 months to 57 years (median: 13). The highest proportion (38%) of the cases was among those aged 15 to 19 years with the greatest incidence occurring among those 16 years of age, followed by those 5 to 9 years old (22%). Infants <1 year of age accounted for 14 cases (4%) (Figure 2). No deaths have been reported.

Immunization Status
Of the 358 cases, 139 were eligible for measles vaccination, i.e., they were born after 1975 and were older than 12 months of age. Two hundred and ninety-two (86%) of this vaccine eligible group had a documented history of immunization - a pattern expected due to the high immunization coverage of a vaccine with <100% vaccine efficacy. Immunization history was not known for 32 of the cases (8.9%).

Comment
In 1994, measles activity in Canada has been characterized by sporadic cases, clusters of cases, or small outbreaks, often triggered by vaccinated individuals, or those not vaccinated for religious reasons. Despite these outbreaks, the potential for transmissions of the virus, the overall attack in the affected regions has still been very low, suggesting that most individuals are immune. Examination of those records available indicated that, although most children were vaccinated after their first birthday, a few had received the vaccine before 12 months of age.

Acknowledgment
The assistance and cooperation of all provincial and territorial epidemiologists, medical officers of health and other health care personnel, as well as Ms. Carole Scott, Ms. Mary-Jane Barnett, and Mr. John Koch LCDC is greatly appreciated. By: Paul Varughese, Childhood Immunization Division, Bureau of Communicable Disease Epidemiology, LCDC, Ottawa.

Measles Articles

December 1994 Volume XVI, Number 6

United Kingdom Launches National Measles Campaign

To prevent the occurrence of a predicted large measles epidemic in early 1995, health officials in the United Kingdom started a nationwide school-based vaccination campaign during the month of November 1994. The goal of this campaign is to provide measles as well as rubella vaccine to all school-aged children aged 5 to 16 years of age throughout the United Kingdom (England, Northern Ireland, Scotland, and Wales).

Without a measles vaccination campaign, mathematical models predicted that a large outbreak, with 100,000 to 200,000 measles cases, including up to 50 deaths, would occur. The majority of cases were predicted to occur among school-aged children. Indeed, recent data suggests that approximately 14% of school-aged children may be susceptible to measles infection. Most of these susceptible children never received measles vaccine; a smaller percentage were vaccinated but, for a variety of reasons, did not become immune following vaccination. Conversely, vaccination coverage among children less than 5 years of age is over 80% and persons >15 years of age are likely to have had clinical measles disease following exposure to circulating measles virus and are thus immune.

The primary objective of the mass campaign is to rapidly interrupt measles virus transmission among school-aged children. If this campaign is subsequently linked to a strategy that prevents the re-accumulation of pools of susceptibles, then the elimination of measles becomes a realistic prospect. After reviewing data regarding measles surveillance, vaccination coverage, age-specific seroepidemiology, as well as the mathematical models, the U.K. Joint Committee on Vaccination and Immunization has recommended that all school children 5 to 16 years of age, regardless of previous vaccination or disease history should be vaccinated with a specific vaccine.

Health officials have decided to use a measles-rubella (MR) vaccine for the campaign. Rubella vaccine was included in the campaign in order to quickly interrupt rubella transmission, which had recently been occurring among male school-aged children and young adults. Little epidemiologic evidence supports the necessity for including the use of rubella vaccine during the campaign. Furthermore, there has been intense pressure worldwide to introduce MR vaccine supplies, and the Department of Health could not obtain sufficient vaccine in time to prevent the anticipated measles epidemic.

During the campaign, health officials are continuously monitoring vaccination uptake levels in all areas of the country. "Mop-up" vaccination activities will take place in areas with low vaccine coverage following the initial campaign. In addition, a special adverse event surveillance system has been established. Health practitioners have been asked to report all adverse reactions following vaccination in a timely manner. All adverse events reported will be investigated within 36 hours.

To monitor the impact of the vaccination campaign in reducing disease incidence, epidemiologic surveillance for cases of rubella and measles will be of great importance. However, the clinical diagnosis of both measles and rubella infections have proven to be quite unreliable, especially in young children. To improve the specificity of clinical diagnoses, the Public Health Laboratory Service has developed and tested a simple new laboratory test. This test uses the presence of measles and rubella specific IgM antibodies to confirm recent infection using a sample of saliva. The United Kingdom will be the first country in the world to use this new technique for measles and rubella surveillance.

Weekly Measles Bulletin is Launched

The EPI recently began producing a weekly measles bulletin in order to monitor the progress of measles elimination targeted for the year 2000. The bulletin summarizes data provided from the enhanced fever and rash surveillance system being implemented in the countries of the Americas. The Rash and Fever Surveillance System facilitates the early detection and investigation of suspected measles cases, rapid enumeration of control activities, and confirmation of the absence of suspected measles via negative reporting. A sensitive measles surveillance system such as this one is essential to any disease control and elimination program.

The PAHO Weekly Measles Bulletin will facilitate international communication concerning the regional measles situation. The bulletin is compiled by reviewing individual country reports and by summarizing sub-regional measles bulletins from Mexico, the English-speaking Caribbean and Central America. It is hoped that the information disseminated by this bulletin will increase measles awareness and promote cooperation in the eradication endeavor.

Editorial Note:
The United Kingdom vaccination strategy is an adaptation of the elimination strategy recommended by PAHO and implemented by the countries of Latin America. Both include conducting national mass measles vaccination campaigns targeting susceptible children in order to quickly interrupt measles virus transmission.

The Latin American strategy has been to vaccinate all children 9 months to 14 years of age, regardless of previous measles vaccination or measles disease history. The epidemiologic situation in the United Kingdom, with a very high vaccination coverage level among preschool-aged children, made it very reasonable to adapt the strategy to an older age group, especially when supported by serological data on measles susceptibility by age.

A sensitive and timely measles surveillance system will help health authorities to carefully monitor the situation and to make quick adjustments in the strategy and to focus control activities on eliminating any remaining pockets of transmission. The new saliva IgM test should greatly facilitate the collection of samples for the laboratory confirmation of measles clinical diagnoses, requiring only a sample of blood sampling. Finally, the adverse event surveillance system will provide important epidemiologic information which should be especially useful not only for the U.K., but also for health planners in other countries who are considering implementation of mass measles vaccination campaigns.

The vaccination campaign in the United Kingdom required intense efforts, careful coordination and strong collaboration between health services and the education facilities. The successful implementation of this campaign will not only serve to make both measles and rubella memories in the United Kingdom, but will also serve as a strategic template for other industrialized countries with measles elimination goals.

International Importsations of Measles from the Americas to the United States, 1990–1994

Internationally imported cases of measles have been a well recognized problem for measles control in the United States. This issue has been recently highlighted by the apparent importation of indigenous transmission of measles in the United States in the fall of 1993 and presumed reintroduction by subsequent imported cases.1 Historically, countries of the Western Hemisphere have been the most common source for imported measles cases into the United States with Mexico being the leading source country. For the period of 1980–85, an average of 108 internationally imported cases were reported in the U.S. annually, with 19.7% of imported cases coming from Mexico and 29.6% coming from other countries of the Americas. Since 1990, however, there has been an increase in the number of cases of measles coming from other regions of the world has either remained steady or increased (see Figure 1), the near-elimination of imported cases from the Americas has resulted in a substantial decline in the total number of imported cases into the U.S.

The Pan American Health Organization’s strategy for measles elimination, emphasizing national mass vaccination campaigns targeting all school-aged children within an age group for a dose of measles vaccine regardless of prior immunization status, has produced striking declines in reported measles cases throughout the Western Hemisphere. The success of this

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<td>Total from the Americas: 9y</td>
<td>231</td>
<td>30</td>
<td>7</td>
<td>13</td>
<td>8</td>
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<td>% (90.6%)</td>
<td>47.6%</td>
<td>(16.3%)</td>
<td>(25.5%)</td>
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<td>255</td>
<td>63</td>
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program is reflected in fewer imported measles cases reaching the United States, thereby facilitating measles elimination efforts here. These results show that the benefits of improved international control of measles extend beyond national boundaries and that improved global control of measles is required to help all countries achieve and sustain measles elimination goals.

References

February 1995
Volume XVII, Number 1
The National Measles Vaccination Campaign in Ecuador

A national vaccination campaign was carried out in Ecuador from August 15 to September 9, 1994 as part of the effort to eliminate measles from the Andean Region by 1998 and from the Americas by the year 2000. The objective was to vaccinate all children 9 months to 14 years of age, irrespective of their vaccination status or previous exposure to measles virus.

The campaign was organized in 3 phases:

- The first one, from 1 to 12 August, consisted of the vaccination of all school children, in their respective institutions. Additionally, children 1 to 14 years of age attending any health institution were vaccinated. During this first phase 50% of the target population was expected to be covered.
- The second phase, from 13 to 19 August, began with a National Vaccination Day, which was extended through the week to cover all children in the target age group who did not attend educational institutions and lived in densely populated areas. About 30% of the target population was expected to be covered during this phase.
- The third phase, from 22 August to 9 September, aimed to cover rural areas with sparse population.

During the six weeks of the campaign, 3,958,427 children less than 15 years of age were vaccinated, a number greater than the expected target of 3,950,441 children, (Figure 1).

The total cost of the campaign was estimated at US$ 2.5 million dollars. Apart from the national budget, PAHO, UNICEF and, for the first time, the World Bank (through its “FABASE” Project), contributed financially to the campaign. As shown in Figure 2, the impact of the vaccination on the reported incidence of measles was immediate.

The next phase and challenge is to implement rash and fever surveillance to permit the timely detection of any measles cases and the organization of adequate control measures. Efforts will also be aimed at raising measles vaccine coverage to over 85% for each newborn cohort in order to minimize the build-up of susceptibles.

FIGURE 1 Percentage of children vaccinated in measles campaign by week, August to September 1994, Ecuador.

Source: Technical Committee, MINSAN, Ecuador.

FIGURE 2 Distribution of measles cases by week, Ecuador, 1994.

April 1995
Volume XVII, Number 2
Measles Elimination: The Americas Receive Boost During World Health Day 1995

On April 7, 1995, under the auspices of the American Association for World Health (AAWH), the United States of America celebrated World Health Day, “A World Without Polio” at the Pan American Health Organization (PAHO) headquarters in Washington DC. Presiding over the festivities was Richard Wittenberg, President of the AAWH, along with the guest speakers Dr. George G. Alyene, Director of PAHO; Dr. Marlene Kelly, Acting Commissioner of the Washington D.C. Commission for Public Health; and Dr. Jovery Bumphord, Principal Deputy Assistant Secretary for Health at the U.S. Department of Health and Human Services. The keynote speaker was Mrs. Hillary Rodham Clinton, the First Lady of the United States.

Several awards were given to those organizations, both national and international, who played key roles in mobilizing diverse groups in the immunization effort. The national awards went to The Kids Count Program, represented by Mr. William C. Watson, Deputy Director, for their work in developing innovative ways to reach those parents and children who fall behind their immunization schedules; the Group Health Association of America (GHAA), represented by Mr. Karen Ignagni, President and CEO of GHAA, for their Childhood Immunization Program which recruited 125 health maintenance organizations from across the U.S. in their efforts; Every Child By Two, represented by Mrs. Betty Bumpers, and founded by Mrs. Bumpers and the former First Lady Mrs. Rosalyn Carter, who formed a network of influential women to raise awareness both locally and nationally to influence policies about immunization systems; and to Dr. Walter A. Drenstein, Director of the National Immunization Program of the Centers for Disease Control and Prevention, who has helped make resources available for improving the immunization status of American children. The recipients of the international awards were Mr. Gustavo Gómez, Director of the PoloPlus Project, and Mrs. Pat Bumpers and the former First Lady of the United States, Mrs. Clinton, along with the former First Lady of Mexico, received the Alleyne Award for their contribution to eradication of polio in Mexico. The final award was presented to Mrs. Clinton, and was inscribed “To Hillary Rodham Clinton, First Lady, in recognition of her many years of dedicated concern for the health, education and sustained well-being of children.”

Mrs. Clinton, along with other speakers, congratulated the efforts made by all those who participated in the campaign against polio, and helped to realize the goal of eradicating polio in the Americas. The elimination of polio in the Region came as the result of a concerted effort on the part of health care workers, governments, and non-governmental organizations, who succeeded in forming a partnership for mobilizing large sectors of their societies. As a result, people were not only educated as to the benefits of immunizing their children, but also access to immunization was facilitated by the healthcare workers who went directly to the target population, especially during National Immunization Days and the house-to-house “march of operations.” Mrs. Clinton said, “All of you here should take pride in that achievement.... Now the work must continue in other parts of the world and in our region we must turn our attention to another major health threat to children: measles.”

Mrs. Clinton stated that at the Summit of the Americas held last December (1994), commitments were made to provide both opportunities and justice for all children. Government leaders endorsed the goal of making basic health services available to all citizens. In reference to a symposium held by the first ladies of the Region during the Summit, Mrs. Clinton said “Today these women across the Americas are turning rhetoric into reality by helping launch PAHO’s historic campaign to eliminate measles from our hemisphere by the year 2000....The campaign to eliminate measles is vital to all of our futures. It will save the lives of countless children in every country and will bring primary health care to every single village in our hemisphere.... The important aspects of PAHO’s campaign to eliminate measles is that it will advance all of our immunization efforts and carries forward the Summit of the Americas plan of action.”

As part of launching the Measles Elimination Effort, Mrs. Clinton said that through the United States Agency for International Development (USADF), the United States will join in partnership with PAHO for this campaign by contributing US$ 8 million directly to PAHO’s Expanded Program on Immunization. She stated, “While ushering children into the world is the province of families, protecting them from avoidable diseases must be viewed as shared responsibility of our larger human family.... That is why it is our responsibility as a community of nations to insist that all children receive the health care they need.”

Pan American Health Organization

First Lady, Mrs. Clinton announces USA support for Measles initiative during World Health Day Ceremony.
Measles Elimination by the Year 2000

The impact of national vaccination campaigns can be seen in Table 1, which shows the decrease in number of confirmed cases of measles. Brazil and Chile conducted vaccination campaigns in 1992, Argentina in 1993, and Uruguay in 1994. More than 95% of the population between 1–14 years of age were vaccinated in these countries. Paraguay is organizing a national vaccination campaign for this year, and Brazil will conduct a follow-up campaign to reach children between the ages of one and three who were not vaccinated in the 1992 campaign.

Argentina, Brazil, and Chile have set up surveillance systems for rash and fever illnesses (RFIs) together with networks of laboratories to support diagnosis of these cases. In Brazil, 70% of cases were confirmed by laboratory testing. Paraguay and Uruguay have not yet intensified their epidemiological surveillance activities for RFIs.

To facilitate the detection of RFIs, the definition of a "probable case of measles" was changed in October 1994 to include cases in which there is fever for at least two days. This will help increase the number of cases that enter the surveillance system. The importance of participation by the private sector in RFI surveillance was underscored during the presentation of the country reports.

Conclusions and Recommendations

The countries that have launched measles elimination programs must maintain high vaccination coverage in each cohort of infants less than one year old. The coverage rates should be periodically examined not only at the national level, but also at the state or municipal level.

Every country, upon initiating a national measles vaccination campaign, must maintain both a surveillance system capable of detecting all cases of RFIs and the ability to carry out the control measures recommended in the PAHO Measles Elimination Field Guide. Immediate notification of suspected cases of measles should be instituted.

Brazil should look for ways to properly monitor surveillance of RFIs at the national level and to coordinate surveillance and control operations between border states and the adjacent countries.

Countries should use a definition of a "probable measles case" which is sensitive enough to use surveillance errors that could prevent the prompt detection of outbreaks. This could, in turn, endanger the progress made during national vaccination campaigns. In addition, it is important to involve the private sector in the notification of RFIs. The universities can play an important part in training the health personnel employed in the public and private health sectors.

Upon the occurrence of a probable measles case, immediate steps should be taken to determine whether it is the result of any of the following factors: the patient's vaccination history, his or her place of origin, the possibility of the patient's having visited other areas of possible transmission, and to identify the vaccination status of the populations exposed to the risk of an outbreak. In the event that the measures are required (e.g., if the coverage has been less than 95%), the definition of which geographic area and which age group to vaccinate will be based upon the analysis of the local epidemiological information.

The countries should document measles outbreaks and examine their epidemiological variables. Adjustments to elimination strategies can be made based upon the information collected. Also, when suspected cases occur in border areas, the neighboring countries must be notified so that joint surveillance operations may be launched. PAHO can facilitate these exchanges of information.

Paraguay should carry out a national vaccination campaign for children between the ages of 1 and 14 as soon as possible. Therefore, progress towards the control and elimination of measles will be at several levels throughout the Southern Cone.

It is apparent that in the countries which have conducted vaccination campaigns against children between the ages of 9 months and 14 years, even in those still using a 2-dose vaccination schedule, a population of susceptibles is growing, which could eventually lead to an outbreak of measles. This buildup is expected because the efficacy of the vaccine is not 100%, and even in the best programs the coverage rates can fall short of 100%. The rate of accumulation of susceptibles varies with the levels of coverage attained in the different countries.

Therefore, it is necessary to carry out periodic vaccination campaigns in those age groups determined by the levels of coverage and immunity over time. In general, it is recommended that a campaign be conducted when the number of accumulated susceptibles amounts to a cohort of live births. In a country that maintains vaccination coverage rates of 90% among infants under one year of age this number of susceptibles will be reached in six years. In such a case, a campaign must be carried out at 5-year intervals among the population aged one to five years regardless of previous vaccination status. This holds true even in countries that administer the 2-dose measles vaccine in their routine program.

The following indicators should be the minimum required for the evaluation of RFI surveillance, however they are not being used in the countries:

- % of notified cases that meet the definition of "probable case"
- % of cases with complete epidemiological records
- % of cases with adequate response and documented investigation

Data should be collected in a uniform manner through the Regional Measles Elimination Surveillance System (MESS) so that epidemiological analyses can be standardized at the national and hemispheric levels.

The lack of a laboratory test that is sufficiently sensitive and specific constitutes a major obstacle for surveillance. The diagnostic techniques used in the different countries must be standardized as soon as possible as a provisional measure until a simple, rapid test for immediate diagnosis in the field is available. PAHO will promote a meeting of virologists in May 1995 to consider this matter.

The First Ladies should be kept informed by the Ministers of Health of their respective countries as to the progress of the program in order to facilitate the support they may be able to give to the measles elimination program.

June 1995

Volume XVII, Number 3
In 1994, a total of four outbreaks were reported in Canada: two in Ontario and two in Quebec. The outbreaks in Ontario peaked in May, while both the outbreaks in Quebec peaked in June and July. Brief descriptions of these outbreaks were published in previous issues of Measles Update.

Approximately 25% of the 1994 cases have been serologically confirmed. In general, the epidemiologic characteristics, i.e., the age distribution, preventability status, immunity status, etc., of measles cases reported in this issue remain the same as those presented in the previous issue.

During January 1995, a small outbreak involving eight cases was reported from the Peel District Health Unit in Ontario. All of the cases were students of an elementary school and had a history of receiving measles vaccine after the first birthday. Five of these cases were laboratory confirmed for IgM; the other cases were clinically diagnosed. With the exception of one clinical case from another health region in Ontario, no additional cases have been reported to date from other provinces or territories.

The results of cost benefit analyses showed that the most effective use of resources was to implement an intensive school health service delivered school campaign targeted at all children aged 5 to 16 years, irrespective of previous history of measles or immunization. The cost of the campaign (vaccine, publicity, and operational costs) was estimated at £20 million – one third of the estimated cost of an epidemic.

Publicity for the campaign began in October, 1994, with national advertisements about the benefits of the campaign and reminders to parents to complete the consent forms distributed through the schools. Around 12 million doses of vaccine were issued in advance of the campaign with every attempt being made to complete the doses by the end of February, 1995.

Campaign Results
The target population for England was 2.1 million children. The first information return from Districts reported on the number of children immunized during November. The national coverage was around 90%. Districts and NHS Trusts have now submitted their final returns.

Table 1 shows the distribution of cases by province and territory for 1994. Ontario accounted for 63.6% (319 cases or 2.97 per 100,000 population) of the total, followed by Quebec with 12.7% (63 cases or 1.73 per 100,000). Nine of the 10 provinces reported measles, and the number of cases ranged from one each in Manitoba, New Brunswick and Nova Scotia to 418 in Ontario.

In 1994, 12 outbreaks were reported in Canada, with 4 occurring in Ontario and 4 in Quebec. The outbreaks in Ontario peaked in May, while both the outbreaks in Quebec peaked in June and July. Brief descriptions of these outbreaks were published in previous issues of Measles Update.

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June 1995
Volume XVII, Number 3

Update: Measles Elimination in England

As reported in the December 1994 issue of the EPI Newsletter (Vol. XVI, No.6), the United Kingdom launched a national measles campaign in November 1994. Mathematical models constructed by two independent groups, combined with the fact that measles notifications in 1994 were rising (Figure 1) predicted an epidemic of measles which could cause an estimated 150,000 cases with up to 50 deaths.

Laboratory confirmation of measles showed that the distribution of cases was shifting to older groups. Figure 2 provides an estimate of probability that notified cases were correctly diagnosed. When this probability was applied to the notified cases according to their age, it could be seen that the group at highest risk of measles was not from the group with whom most notifications were coming (1-9 years), but older children (10-14 years, Figure 3).

The Joint Committee on Vaccination and Immunization (JCVI) recommended that a nation-wide school based immunization campaign should be carried out using the MR vaccine. The target population, all school children aged 5 to 16, was chosen on the basis of age specific seroepidemiology that identified that this was the group that would benefit most from immunization. It also matched well the planned immunization of school children up to 6th grade.

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Campaign Results
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For the November phase of the campaign and the mop-up activities, 92% of 73 million children, whose ages ranged from 5 to 16 years, have been immunized in England.

In 1994, notifications of measles had been rising in line with those seen in 1987, the lead-in phase to the 1988 measles epidemic. In 1988, the last epidemic year, there were 86,000 notifications and 15 deaths (Figure 4).

The predictions for 1995 had suggested an epidemic of the order of 150,000 cases. Because more cases would occur in older individuals than previously, and measles case fatality rates increase with advancing age, approximately 50 deaths were anticipated.

Previous experience has demonstrated that measles notification data show useful trends but individual notifications are highly unreliable, especially in younger children; here the specificity of notification in the under 5s is considerably less than 20%. Since the beginning of November 1994, the Public Health Laboratory Service has been able to use salivary antibody testing to confirm measles in suspected cases (Figures 5 and 6). There were more than 100 positive reports in November and December 1994. In 1995, despite more than 800 samplings having been tested, there have been only 21 confirmed measles cases. Only one case occurred in a child whose care was covered by the campaign; that child's parents had withheld consent. All other cases were in children under the age of routine immunization, those under 5 years who had received one dose of MMR vaccine previously, or who were over 17 years.

Since 24 February 1995, there have been no confirmed cases of indigenous measles in England, Wales and Northern Ireland.

Sources: Dr. B. M. Salisbury MBBCH FRCGP NPHN, Principal Medical Officer, Department of Health, London, United Kingdom.

August 1995
Volume XVII, Number 4
PAHO Measles Laboratory Network Workshop

F rom the 22 to 26 May, 1995 PAHO and the Centers for Disease Control and Prevention (CDC), USA, coordinated a measles diagnostic workshop in Atlanta. The purpose of this workshop was twofold: to update representatives of the participating reference laboratories on the current status of procedures for laboratory confirmation of suspected measles cases and to establish guidelines and procedures for the PAHO Measles Laboratory Network.

In September 1994, at the meeting of the Pan American Sanitary Conference, the Ministers of Health of the countries of the Americas unanumiously adopted the goal of measles elimination in the Americas by the year 2000. The PAHO measles elimination strategy includes the following components:

- Achieving and maintaining high vaccination coverage in the population from 9 months to 14 years old.
- Careful surveillance for fever and rash illnesses.
- Laboratory testing of sera collected from patients with fever and rash illnesses in whom a health care provider suspects measles infection.

Recognizing the importance of laboratory confirmation of suspected measles cases, the Pan American Health Organization has begun establishing a region-wide measles laboratory network. PAHO has requested that the twelve national measles laboratories from member countries participate in the PAHO measles laboratory network (Table 1 and Figure 1).

Update on Measles Diagnostics

The current "gold standard" for the serologic confirmation of measles diagnoses is the capture IgM immunoassay, using a recombinant measles virus nafamostat as antigen. Commercially available indirect IgM assays appear to perform satisfactorily for determining the presence or absence of IgM in most specimens, but are clearly less sensitive and specific than the CDC capture immunoassay.

Work is progressing towards the development of a rapid measles diagnostic test which can be used at the field level. It is hoped that a simple antigen capture test can be developed using genetically engineered antigens containing measles virus epitopes.

Measles virus can be isolated from urinary tract cells and throat and nasal passage cells. The Marmoset lymphocyte continuous line B95A has been used with success for measles virus isolation.

Polymerase chain reaction (PCR) has been shown to be effective in detecting measles RNA and this technique can be used as a complement to serologic tests to confirm measles diagnoses.

The CDC has developed expertise in performing genotypic analysis of measles virus isolates obtained from various outbreaks. These analyses have proven useful in determining likely geographic sources of measles virus.

Conclusions

The development of a region-wide measles laboratory network will greatly help in monitoring progress made towards measles elimination. With assistance from the laboratory network and clinicians, public health workers will be able to confirm or exclude measles circulation within a community in a timely manner.

A functional structure of the measles laboratory network was proposed (Table 1). The participating reference laboratories will assist and support neighboring countries in establishing national measles laboratories.

Each national laboratory will be expected to test serum specimens for anti-measles IgM using a commercial kit via the indirect method. The national laboratories will send all positive and indeterminate serum samples to the reference laboratories for confirmation. In addition, a random sample of 5-10% of negative specimens should be sent as well.

The CDC will send out panels of 10-15 sera for proficiency testing to participating reference laboratories approximately every 6 months.

Ongoing communication between participating reference laboratories is very important. The preferred method of communication will be electronic mail. Therefore, efforts will be made to assure that all laboratories have Internet access.

With regards to surveillance issues, the following points were agreed upon:

- Serum specimens should be collected only from patients meeting the clinical case definition for measles or from any patient in whom there is a clinical suspicion of measles infection.
- A single serum specimen collected 3 to 28 days following rash onset is considered acceptable and sufficient for IgM testing via capture method. The serum specimen should generally be obtained when the patient presents to a health facility. If a serum specimen is collected earlier than 3 days following rash onset, a second specimen should be collected 10-20 days following the acute phase.

- During an outbreak, efforts should be made to obtain urine and/or nasopharyngeal aspirate specimens for viral isolation from several patients with measles. The optimal time for collecting urine specimens is within 7 days of rash onset. Urine specimens should be spun down and frozen. If the case is serologically confirmed as measles, the urine sample should be sent to the appropriate participating reference laboratory for viral isolation.

- Each specimen presented for testing to a participating laboratory must contain the following minimum information:
  - Name of institution/provider sending specimen
  - Patient ID
  - Patient name
  - City, County (municipality)

TABLE 1. PAHO measles laboratory network.

<table>
<thead>
<tr>
<th>Participating reference laboratory</th>
<th>Countries Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratorio de Diagnóstico e Investigación, Argentina</td>
<td>Argentina, Paraguay, Uruguay</td>
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<tr>
<td>Fundación Oswaldo Cruz, Brazil</td>
<td>Brazil</td>
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<tr>
<td>To be determined</td>
<td>Canada</td>
</tr>
<tr>
<td>Instituto de Salud Pública, Chile</td>
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<tr>
<td>Instituto Nacional de Salud (INS), Colombia</td>
<td>Colombia, Ecuador</td>
</tr>
<tr>
<td>Instituto Pedro Kouri (IPK), Cuba</td>
<td>Cuba, Dominican Republic, Haiti</td>
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<tr>
<td>Instituto Nacional de Diagnóstico y Referencia Epidemiológica (INDER), Mexico</td>
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</tr>
<tr>
<td>Centers for Disease Control and Prevention (CDC), Atlanta, Georgia</td>
<td>USA</td>
</tr>
<tr>
<td>Instituto Nacional de Higiene (INH), Venezuela</td>
<td>Venezuela</td>
</tr>
</tbody>
</table>

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**FIGURE 1** PAHO measles laboratory network.

**FIGURE 6** Cases of measles, England and Wales, confirmed by salivary antibody testing (PHLS data).
Progress of EPI Programs Reviewed in Central American and Andean Regions

The annual meetings of the EPI Managers of the Andean and Central American regions were held in Caracas, Venezuela and Guayaquil City, Guatamala, respectively during the month of August, 1995. Participants included representatives of the Ministries of Health, UNICEF, USAID, PAHO/WHO, Rotary, Hope International and the Embassy of Japan. Also attending were representatives of the Latin Caribbean and Mexico.

High on the agenda at both meetings was the presentation of progress reports on the national efforts to eliminate the transmission of measles. The general assessment was that while the current immunization efforts have sharply reduced the incidence of the disease, the number of accumulated susceptibles continues to present a risk of new outbreaks in the short and medium terms.

As a result, Central American countries are planning measles vaccination campaigns for children less than 5 years of age before March 1996. As can be seen in Table 1, overall coverage rates remained at high levels, also for other EPI antigens.

Following the resolution calling for the elimination of measles transmission in the Western Hemisphere by the year 2000, adopted in September of 1994, these regional meetings are paying closer attention to reviewing and evaluating the overall progress of the measles elimination efforts in the region.

Measles Surveillance

Since 1994 the countries of the Andean and Central American regions have been implementing surveillance systems for fever and rash illnesses for measles elimination. In general, these systems are at various stages of development. Among the major problems are the lack of standardization of case classifications and surveillance indicators, as well as a lack of adequate laboratory support, especially in Bolivia, Ecuador and Peru. Currently, efforts are being made to strengthen the operational capacity of laboratories to enhance the diagnosis of measles. In central America, only six of the nine countries attending the regional meeting have begun to implement laboratory diagnosis of measles utilizing recommended reagents for carrying out laboratory assays.

Recommendations

The following measles surveillance indicators were recommended as minimum requirements:

- Percentage of units that fulfill weekly negative notification.
- Percentage of cases investigated within 48 hours of notification.
- Percentage of cases with completed investigation forms.
- Percentage of cases with adequate serum samples taken.
- Percentage of laboratory confirmed cases.
- Percentage of cases (or outbreaks) with an identified source of infection.

Other recommendations indicated that countries should:

- Maintain >95% vaccination coverage of children less than 1 year old in all municipalities of every country.
- Monitor periodically the accumulation of susceptibles, and carry out vaccination campaigns to prevent outbreaks when this number is equal to a cohort of newborns.
- Change the recommended age for primary measles vaccination from 9 months to 12 months of age.
- Expand the network of measles reporting units.
- Strengthen the utilization of the Measles Elimination Surveillance System (MESS) in the countries, as a database for surveillance.
- Focus epidemiological surveillance on cases that fit the definition of suspected measles case. The surveillance system will follow-up on those cases or outbreaks that merit a blood sample taken for laboratory confirmation.

Reported cases of measles without laboratory diagnosis will be considered clinically confirmed.

The Regional Measles Laboratory Network is being strengthened. Central American countries will ship serum samples from positive and suspected measles cases, as well as from 5-10% of negative cases to the national laboratory belonging to the network (Gorgas Memorial/Center Conmemorativo Gorgas in Panama). The countries have developed laboratory networks in Bolivia, Ecuador and Peru, and have also strengthened the laboratory network in Colombia and Venezuela.

Revised Measles Case Classifications

A n informal consultation group met at the Pan American Health Organization’s headquarters in Washington, D.C., on September 11-13, 1995, to review current measles surveillance procedures and to recommend case definitions and case investigation procedures. The resulting revised case definitions are intended to simplify case investigations and case classifications, as well as to strengthen current national and regional surveillance efforts towards the elimination of measles from the Americas by the year 2000.

The overall purpose of measles surveillance is to promptly detect the transmission of measles virus in a given area. Once viral circulation has been detected, the surveillance system allows for the efficient investigation of the resulting measles cases. Through the time taken for investigation of an outbreak, further virus transmission can be minimized, and the factors for measles transmission can be determined, and the source of the measles introduction may be identified.

The measles elimination program focuses on detecting all cases for which a clinician suspects measles and/or those cases notified by any person which satisfy the clinical case definition of a suspected measles case, that is fever, generalized maculopapular rash, and cough, or coryza, or conjunctivitis. Suspected measles cases must then be classified as either confirmed or discarded. The program seeks to achieve laboratory confirmation (or epidemiological linkage to a laboratory confirmed case) for all suspected cases.

However, until the PAHO measles laboratory network is fully functional, cases that meet the suspected case definition, but are not investigated in the laboratory or lack an epidemiologic link, are considered as clinically confirmed. It is expected that as the surveillance system matures, relatively few cases will be classified as clinically confirmed.

The category of suspected measles cases is a broad catchment which is intended to provide an early alert or warning sign for health workers at the lowest level. Investigation of suspected measles cases should begin within 48 hours of notification. Once the epidemiologic investigation has been completed, a final classification should be made within 4 weeks.

Revised Measles Surveillance Case Classifications

I. Suspected cases:

A. Any patient in whom a clinician suspects measles, and/or
B. A patient with the following clinical profile:

- Fever
- Generalized maculopapular rash, and
- At least one of the following: cough or conjunctivitis

II. Confirmed measles:

A. Laboratory confirmed case is a suspected case with 1 or more of the following:

1. Laboratory confirmation, and/or
2. Epidemiologic linkage to another laboratory confirmed case

A case is laboratory confirmed if anti-measles IgM antibodies are detected in a blood sample obtained 3-28 days following rash onset. One adequate blood sample is considered sufficient for measles confirmation. In an epidemiologic link of more than 10 cases, it is not necessary to take blood samples from every suspected case. Only the first 5 to 5 cases should have blood drawn for laboratory confirmation. Other cases can be confirmed if they meet the suspected case definition and are epidemiologically linked to another laboratory confirmed case.

Epidemiologic confirmation takes place when a suspected measles case has been in contact with a laboratory confirmed case, who had rash onset within 21 days before the present case.

B. Clinically confirmed measles cases:

These cases satisfy the definition of a suspected measles case, but lack laboratory investigation and it is not known whether or not there was contact with a laboratory confirmed case. Although the final diagnosis is not known, for surveillance purposes, these cases are considered as clinically confirmed measles cases. Given an adequate surveillance system, suspected cases with incomplete investigations should become relatively confirmed cases.

### Table 1. Coverage rates for children <1 year old, Central America, Andean Region, Latin Caribbean, and Mexico, 1994-1995.

<table>
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<tr>
<th>Country</th>
<th>OPV</th>
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<th>MAA</th>
<th>RIG</th>
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<td>87%</td>
<td>86%</td>
<td>86%</td>
<td>75%</td>
<td>92%</td>
</tr>
<tr>
<td>Venezuela</td>
<td>73%</td>
<td>84%</td>
<td>67%</td>
<td>94%</td>
<td>95%</td>
</tr>
</tbody>
</table>

* Coverage rates are estimated for the first half of 1995.
* Haiti carried out a mass campaign for measles for children 9 months to 14 years of age.
* Data not available.
Measles Articles

III. Discarded (Not measles)
If laboratory evidence is obtained that another infection associated with a rash illness was present, then the case is discarded. A case is also discarded if the result of an adequate laboratory specimen, collected between 3 and 28 days following rash onset, is negative for measles infection.

Plan To Eliminate Measles Approved

During the XXXVIII Meeting of the Directing Council of the Pan American Health Organization held in September 25–26, in Washington, D.C., the Ministers of Health of the Region of the Americas unanimously approved the Measles Elimination Plan of Action prepared by PAHO’s Special Program for Vaccines and Immunization in conjunction with the Organization’s Member Countries.

The plan calls for the achievement and maintenance of 95% measles vaccine coverage in all municipalities or districts in every country of the Region, with complementary periodic vaccination campaigns aimed at preventing the accumulation of susceptibles among pre-school children. It will have a duration of five years (1996–2000) and will cost approximately US$ 5.3 million, which includes the provision of an estimated $ 7 million from PAHO and WHO regular budgets and voluntary funds. These investments will complement national resources.

Major emphasis is being placed on training personnel for effective program operations; a careful fever and rash surveillance for the detection of possible measles cases; an aggressive outbreak response; and intensive social mobilization to enhance the community's role in the prevention of the disease.

The Resolution noted that:

- Having reviewed and discussed Document CD/88/16, containing the Plan of Action and a progress report on the national and regional efforts towards the elimination of measles from the Americas by the year 2000;
- Noting with satisfaction that nearly all countries have adopted the strategies outlined in the Plan of Action and have made considerable progress towards measles elimination;
- Observing that, in spite of the major efforts made with the implementation of national campaigns and improvements in routine vaccination programs, the number of susceptibles children is accumulating every year in every country;
- Realizing that measles surveillance requires considerable resources, both financial and human, but cognizant that a surveillance system is essential to future developments of communicable disease surveillance, including emerging and re-emerging infections; and
- Bearing in mind the level of funding needed to implement the activities between now and the year 2000.

RESOLVES:
1. To approve the Plan of Action for Measles Elimination in the Americas by the year 2000 as presented in the progress report of the Director (Document CD/88/15).
2. To urge all Member States to adopt the strategies outlined in the Plan of Action and allocate the resources needed for its smooth implementation.
3. To congratulate Governments for the efforts implemented thus far and the strides already made towards the elimination of measles from the Americas by the year 2000.
4. To request the Director to make every possible effort to secure the international resources needed to support the national efforts.

(Adopted at the fifth plenary session, 27 September 1995.)

First Ladies of the Americas Reaffirm Commitment to Measles Elimination

During the “Fifth Conference of the Wives of Heads of State and of Government of the Americas”, held in the city of Asuncion, Paraguay, on October 16–19, 1995, the First Ladies of the Western Hemisphere reiterated their commitment to work in favor of the health and education of women and children, under the principles of comprehensive development, equity, democratization of information and awareness, and family and social participation.

“We recognize that our countries face common challenges regarding the health and education of women and children, and that by sharing experiences and promoting regional actions through these conferences, we can foster the development and the wellbeing of our nations,” the First Ladies’ Declaration of Paraguay stated.

Particular attention was placed on strengthening the Region’s efforts to reduce maternal and child morbidity and mortality rates. Each year nearly 500,000 children under 1 year old die in Latin America and the Caribbean, of which approximately 350,000 die from preventable causes. There are also some 17,000 maternal deaths each year. Within the framework of each country’s national interest and legislation, the First Ladies encouraged and supported the implementation of the agreements and recommendations reached at the World Summit for Children, the United Nations International Conference on Population and Development, the Summit of the Americas, the United Nations World Summit on Social Development, and the United Nations Fourth World Conference on Women.

The official Declaration made specific reference to attaining the goal to eliminate measles in the Americas by the year 2000. The First Ladies pledged “to work with Ministries of Health, the Pan American Health Organization (PAHO), and other international organizations on the campaign to eliminate measles transmission from the Americas by the year 2000, and strengthen the surveillance of vaccine-preventable diseases.”

Other recommendations included a call to further promote women’s and girls’ access to formal and non-formal education, especially in poor rural areas and marginalized urban areas, and to contribute to the prevention and elimination of all forms of violence against women and children through the provision of norms and adoption of necessary mechanisms.

The First Lady of Panama presented a Plan of Action to follow up the Region’s current efforts towards the elimination of measles. During her presentation, the following messages were stressed:

Step 1: Guarantee the purchase of vaccines and the cold chain in every country.

Action to be taken:
- Ensure the allocation of specific funds within the national budgets.

Step 2: Guarantee the participation of civil society.

Action to be taken:
- Establish and chair national surveillance committees for the eradication of measles which would include:
  - Government officials
  - Local authorities
  - Organized communities
  - Civic organizations
  - Churches
  - Nongovernmental organizations
  - International agencies

Measles is highly dangerous:
- It attacks 100% of all unimmunized children
- It can kill 10–20% of those who have contracted the disease
- A 30% of all cases develop complications:
  - Oriris media
  - Conjunctivitis
  - Diarrhea
  - Malnutrition
  - Encephalitis
  - Death
Measles at an All Time Low in the Americas

As of 25 November 1995, a total of 4,551 confirmed cases (including both clinical and laboratory diagnosed cases) were reported from the countries of the Americas, compared to 23,583 in 1994. This is the lowest number of cases reported since measles surveillance began. Record low levels of measles cases have been reported from nearly every country of the Region. The provisional annual measles incidence rate was 0.48 cases per 100,000 population; this represents a 99% reduction from the incidence rate reported in 1980. Furthermore, in over twelve months there has not been a single confirmed importation of measles from Latin America and the Caribbean into the United States, another important indicator of control of the disease in those areas. Current efforts are targeting the improvement of measles surveillance and that of laboratory diagnosis.

The majority of the total reported cases, 2,266 (49.7%) came from Canada. An additional 827 cases (18.6%) were reported from Ecuador. In the Region, over half of the total confirmed cases, and nearly 80% of the laboratory confirmed cases were reported from Canada. The overwhelming majority of Canada’s cases were reported from the province of Ontario. Similarly, the highest national incidence rates were also found in these two countries (Canada, 8.0 cases per 100,000 population and Ecuador, 7.2 cases per 100,000 population). Other countries reporting low rates included Brazil, Mexico, and those of the Latin and English-speaking Caribbean (Figure 1).

Of the 41 countries which submit weekly measles surveillance reports to PAHO, 21 (51.2%) did not report a single confirmed case of measles during 1995. In these countries, a total of 714 persons presenting fever and rash illnesses were fully investigated and none had laboratory evidence of measles virus infection. Furthermore, it has been over 4 years since the last laboratory confirmed case was reported from the English-speaking Caribbean and over 3 years since the last laboratory confirmed case was reported from Chile and Cuba.

Four Years Without Measles!

The Twelfth Meeting of the Caribbean EPI Managers, held in San Juan, Puerto Rico, from 13-16 November 1995, reviewed the successful results of the measles elimination strategies currently being implemented throughout the English-speaking Caribbean. It has been four years since the last laboratory confirmed case was reported in the area. This achievement follows the region’s commitment to conduct mass Immunization campaigns which have reached over 90% of all children between 9 months and 14 years of age and the development of sensitive surveillance systems. The English-speaking countries of the Caribbean have been pioneers in defining measles surveillance systems and in ensuring the involvement of community groups.

During the meeting, special emphasis was given to measles surveillance, such as case classifications, laboratory diagnosis and outbreak prevention. As in other regions of the Americas, the major issue continues to be the build-up of susceptible persons among preschool children in the various countries. Participants discussed possible vaccination strategies aimed at preventing this accumulation. Monitoring the build-up of susceptible populations and promoting an aggressive response to eliminate the susceptibility of these groups are the key components of the Caribbean’s measles surveillance strategy. Other topics included the maintenance of a polio free status in the area and the elimination of rubella.

Measles Elimination

Despite intensive measles surveillance and investigation of 888 suspected cases, the clear message coming from the English-speaking Caribbean countries and Suriname for the period 1992-1994 is that there has been no documented indigenous measles transmission. The last laboratory confirmed case was in Barbados in 1991 (see Figure 1). From 1992-1994, a pattern of higher rates of rash and fever observed at the beginning of the year has consistently coincided with the tourist high season. The lowest rates occur in August, a period when the health staff takes holidays. Rates have then increased in the latter part of the year, coinciding with the rainy season; during this time, the incidence of dengue fever has also increased.

At the time of the November meeting, 300 suspected cases of measles had been reported. Of these, 274 (91%) had a first blood sample sent to the Caribbean Epidemiology Center (CAREC) and 110 had a second sample. No cases of measles were confirmed by laboratory during this period. Forty-eight (17.5%) were discarded as rubella, and nine (3.3%) were diagnosed as dengue fever. As mentioned earlier, the accumulation of susceptible persons continues to be a source of concern. An analysis of the number of susceptible persons within the English-speaking Caribbean was updated during the meeting. According to this report, by May 1996, five years since the “catch-up” campaign, there will be approximately 107,000 children (25%) within the ages of 1-5 years susceptible to measles. These numbers exclude Jamaica and Belize, which have conducted “follow-up” campaigns. A sero-surveillance conducted in Jamaica in 1995, showed that sero-negative rates among vaccinated individuals averaged 15%. If these data are similar in other countries, the pool of susceptible persons may be even larger than estimated. This number of susceptible persons is more than sufficient to support a considerably large epidemic.

The current measles elimination strategy consists of four steps: national mass measles campaigns, intensification of measles surveillance, strengthening of routine vaccination activities, and the implementation of periodic “follow-up” campaigns to eliminate the build-up of susceptible persons. Virtually all countries in the Caribbean, as well as in Central and South America have already implemented the first three steps of this strategy. The fourth, “follow-up” mass campaigns, has been conducted in Cuba, Belize, Brazil and Peru and recently in the countries of Jamaica and Guatemala. During 1996, “follow-up” campaigns are planned by almost all countries in Central America, and in Chile.

In the countries that have fully implemented the measles elimination strategy, the detection of a suspected measles case should result in improved surveillance and case investigation, with a rapid assessment of the level of vaccine coverage and of the need to carry out mop-up activities. The implementation

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of special control immunization campaigns are of limited benefit once an outbreak has begun. However, once a suspected or confirmed case has been detected, all contacts 1 to 14 years of age who lack evidence of vaccination should be immunized.

The main sources for surveillance data are disease reports from doctors, nurses, health centers and hospitals, laboratory and population data, as well as vaccination coverage. The surveillance system can also accommodate modified case definitions, therefore rubella and dengue surveillance data are also being captured. During the meeting, discussions focused on additional ways to streamline laboratory diagnosis procedures, including the shipping of specimens to the reference laboratories.

**Recommendations**

To enhance measles surveillance, countries should:

- Maintain heightened vigilance in the region as well as in other parts of the world where measles is still occurring. If transmission has been eliminated, then importation is the only way that measles can reemerge and only if there are susceptible populations. Ten million tourists visit the Caribbean every year, and the Caribbean people also travel substantially. Equally important, the challenges in surveillance are now those of surveillance of a rare disease; many doctors and nurses have never seen a case.
- Upgrade the documentation when specimens are submitted to reference laboratories. It was recommended that PAHO/CAREC prepare guidelines on the subject to be disseminated among all doctors and medical schools in PAHO’s Member Countries.
- Reveal the surveillance system "not to be a reliable number of suspected measles cases are reported. It was proposed that PAHO/CAREC submit reports and other private medical providers participate more actively in the current surveillance system, since they will most likely come in contact with imported cases. The suggested activities include:
  - meet with pediatricians, especially those who are likely to treat patients at high risk (due to migration, geographic location or ethnicity);
  - Determine their familiarity with procedures for reporting suspected cases;
  - meet with staff at public clinics to discuss ways for involving primary care providers;
  - hold periodic meetings with local medical associations to explain the program and elicit support;
  - provide incentives, such as vaccine and diagnostic laboratory results for cooperation and participation in the surveillance system. Regarding sensitivity, once a standardized case definition is used by every country, those countries with annual rates of suspected cases <10/100,000 should examine their surveillance systems to improve the detection of suspected cases.

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**Update: Measles in Canada, 1995**

During 1995, a provisional total of 2,101 measles cases (7,910/100,000 population) was reported in Canada. This is 4.4 times greater than the 517 cases reported for the same period in 1994, and 11 times greater than the number reported for 1993 (204). Following major increases in the number of reported cases in April and May, the incidence peaked in June with 854 cases, followed by a sharp decline in July with 260 cases (Figure 1). Data since then show a downward trend, although the reporting is less likely to be complete. Sixteen cases were reported in November, followed by an additional eight cases during the month of December.

While seven of the 12 provinces/territories reported measles activity in the past 12 months, the overwhelming majority of cases were linked to Ontario: 2,253 (98%) of the total reported cases in Canada. The provisional annual measles incidence rate in that province was 21 cases per 100,000 people. No deaths linked to measles have been reported in 1995.

**Confirmation Status**

Of the 2,242 cases records reviewed, 1,177 (52.5%) were laboratory-confirmed: 577 of these were specified as "positive for IgM" and the remaining cases as "laboratory-confirmed." Of these cases were reported as "clinically compatible; almost half of the cases in this group were also reported as "epidemiologically linked to laboratory-confirmed cases."

**Age Distribution**

Cases were distributed in all age groups; the median and mean ages were 10 and 11.1 years, respectively. Sixty-eight children (5 to 19 years) were accounted for 83% of the cases.

**Vaccination Status and Preventability**

Almost 90% of the 2,092 cases reviewed had a documented history of measles vaccination with one dose of vaccine over 91% of these cases received vaccination between 1980 and 1994.

Based on age only, 90 cases (3.9%) were not eligible for vaccination, i.e., they were born before 1957 (19 cases) or were <12 months of age (71 cases). Immunization status was "unknown" or "unavailable" for 101 cases (4.5%).

**Spain Supports Measles Elimination**

Spain has recently joined other members of the international community in supporting the implementation of the Plan of Action for the Elimination of Measles in the Americas by the year 2000. The Plan of Action was unanimously approved by the Ministers of Health during the XXXVIII Meeting of the Directing Council of the Pan American Health Organization held in September 1995, in Washington D.C. It will have a duration of five years (1995–2000) and will cost approximately US$ 53 million, which includes the provision of an estimated US$ 2 million from PAHO/WHO regular budgets and voluntary funds. National contributions in the order of US$ 650 million are expected.

These monies will not only support the elimination of measles, but will allow countries to sustain high levels of childhood immunization coverage and control other vaccine preventable diseases, including the maintenance of a polio free status in the Region.

The measles elimination initiative calls for the achievement and maintenance of 95% measles vaccine coverage in all municipalities or districts in every country of the Region of the Americas, with complementary periodic vaccination campaigns aimed at preventing the accumulation of susceptibles among pre-school children. To accomplish this, emphasis is placed on training personnel for effective program operations; rigorous fever and rash surveillance for the detection of suspected measles cases; and intensive social mobilization to enhance the community's role in the prevention of the disease.

Spain’s grant in the amount of US$ 686,491 will be disbursed.
Pan American Health Organization

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Spain's grant will help consolidate measles surveillance in the Americas. Other activities include the supply of standardized reagents for measles serological studies.

Due to the low number of measles cases being reported in the Region, a sensitive and aggressive epidemiological surveillance system for suspected cases of measles will be critical to the successful completion of the measles elimination strategy. This component is of utmost importance for the detection of re-emerging transmission which could trigger an outbreak and for dealing with imported cases. With the financial support of Spain, countries plan to enhance their national surveillance systems by identifying and incorporating new reporting sources, such as non-governmental organizations, private physicians and community groups.

A key aspect of surveillance is the laboratory confirmation of suspected measles cases. A Regional Network of Reference Laboratories has been developed with PAHO's support to facilitate and promote technical cooperation among national institutions. The Network, comprised of eleven laboratories from the Americas, including Canada and the United States, has been assigned to monitor the progress made towards measles elimination (see EPI Newsletter of August, 1995.)

Spain's grant will be channeled to streamline the logistical aspects of national laboratories to guarantee the continued supply of standardized reagents for measles serological studies. Other activities include the production of a reference manual with laboratory definitions and procedures, and the development of a simplified kit for field diagnosis.

Over a one-year period, focusing on strengthening national capabilities in the areas of measles surveillance, laboratory diagnosis, as well as training and supervision.

The goal of the surveillance evaluation was to describe the procedures for detection, notification, investigation and classification of suspected measles cases; make recommendations to improve the effectiveness of surveillance, including the development of indicators to be used for ongoing assessment of the surveillance system; and develop a standard methodology for assessing measles surveillance in other countries.

An evaluation of Mexico's measles surveillance system was conducted with the participation of PAHO's Special Program for Vaccines and Immunization (SVI) to validate the decline in reported measles cases and to identify areas for improvement.

At the time of the evaluation, 1,206 suspected measles cases had been reported to the Mexican Ministry of Health in 1995. This represents a rate of 1.1 suspected cases reported per 100,000 total population, with a range per state from 0 suspected cases reported by the state of Campeche up to 3,710,000 suspected cases reported by the state of Chiapas. Nine hundred and five suspected cases met the measles clinical case definition for a suspected case, and had a serum sample submitted to the national reference laboratory for diagnostic testing. Of these, 894 (including 13 with post-vaccination rashes) were discarded. Among the 905 sera, 488 (54%) were found to be positive for rubella IgM antibodies (see Figure 1).

In 1995, a total of 214 confirmed measles cases were reported. In comparison, over 68,000 confirmed cases were reported in 1990 (see Figure 2). Of the total confirmed cases reported in 1995, 14 (8%) were laboratory confirmed (IgM positive by Capture EIA) and 160 (92%) were confirmed only on clinical grounds (without laboratory investigation). Confirmed measles cases were reported by 21 of 32 Mexican states. Six states reported 9 clusters of 1 or more confirmed cases occurring in the same municipality, with a range of 3-20 cases. One hundred and six (62%) of the confirmed cases were reported from urban areas. Ninety-nine (57%) cases occurred among females. Of the 168 cases for whom age was known, 21 (13%) were under the age of one year, 26 (16%) were aged 1-4 years, and 107 (64%) were between the ages of 5-15 years. Fourteen cases (8%) occurred among persons over the age of 15 years. Of the 167 cases for whom vaccination status is known, 140 (84%) had previously been vaccinated against measles. The vaccination status of laboratory confirmed cases was similar; 12 (86%) of the 14 had previously been vaccinated against measles. The number of doses received is known for only 116 cases; 75 (65%) had received 1 dose of measles-containing vaccine, 35 (30%) had received two doses, and 6 (5%) had received three doses of the measles vaccine. Five (3%) cases required hospitalization. No measles deaths were reported.

The goals of the surveillance were to:

- describe the procedures for detection, notification, investigation and classification of suspected measles cases;
- make recommendations to improve the effectiveness of surveillance, including the development of indicators to be used for ongoing assessment of the surveillance system;
- develop a standard methodology for assessing measles surveillance in other countries.

During November 27 to December 15, 1995 evaluation teams carried out site visits in 21 states, including 58 health centers or hospitals, 29 laboratory jurisdictions, and 16 state laboratories. At each site, in-depth interviews were conducted with personnel responsible for surveillance. The interviews consisted of open-ended questions about the system of case classification, reporting procedures, actions taken in response to cases detected, the process of confirming a case of measles in the laboratory, material resources, training and personnel structure of the surveillance system, and the use of indicators to determine the quality of the system. In addition to the interviews, daily patient discharge logs were reviewed to actively search for cases of fever and rash illnesses. The methodology introduced by PAHO/SVI in this evaluation is now being adapted for use in other countries of the Region.

The interviews revealed that personnel had good knowledge of case definitions and procedures, and reviews of thousands of daily patient records yielded only one case compatible with the diagnosis of measles. However, the evaluation found that the process for identifying and reporting cases of suspected measles was time-consuming and complicated: different case investigation forms were needed for reporting to epidemiologists and to the laboratory and the forms were lengthy and required excessive clinical information, which was often not completed. Typically, patients needed to be seen on multiple occasions in order to determine if they satisfied the clinical case definition of a suspected measles case and to obtain a specimen for laboratory testing.

Identification of a suspected case of measles requires an intensive surveillance effort in the community aimed at identifying and susceptible persons before the case is confirmed by the laboratory and the local level, no system for tracking suspected cases or cases that had been investigated and discarded was in use, and no standardized databases were maintained at the different levels of the system. Although the Ministry of Health's manual for measles surveillance is widely available, the need for ongoing training and feedback exists, especially at the local level. Lack of communication between the Ministry of Health's surveillance system and those of other health care providers, such as the Mexican Institute of Social Security, is also a hindrance. Finally, there is no ongoing evaluation of the surveillance system. Indicators to monitor its functioning are not being used consistently by health staff and local epidemiologists. These are minor problems, however, and
The following adjustments have been incorporated into the measles case classifications (Flowchart):

1. **Suspected case**
   - All cases for which a health worker suspects measles. Patient with:
     - fever and
     - generalized maculopapular rash and
     - cough or coryza or conjunctivitis

2. **Confirmed case**
   - A suspected case which is:
     - Laboratory confirmed
     - positive for measles antibodies (by the IgM Capture test) or
     - epidemiological linkage to another laboratory confirmed case (by the IgM Capture test)
   - All clinically confirmed cases are considered failures of the epidemiological surveillance system.
   - An adequate sample is one taken within the initial 45 days following rash onset, which meets requirements of proper handling, transportation, and packaging.
   - A suspected case in whom an adequate sample was collected, which tested negative for the presence of anti-measles IgM, through either an indirect IgM test or IgM Capture test.

3. **Discarded case (not measles)**
   - A suspected case in whom an adequate sample was collected, which tested negative for the presence of anti-measles IgM, through either an indirect IgM test or IgM Capture test.

The USA supports Measles Elimination

The United States of America, through its Agency for International Development (USAID), has approved a US$ 8 million grant in support of the Pan American Health Organization’s (PAHO) goal to eliminate measles in the Americas by the year 2000. Over a period of five years (1996–2001), the USAID grant will complement Regional efforts toward achieving global measles elimination. The USA support was first pledged by the First Lady, Mrs. Hillary Rodham Clinton, during her visit to PAHO on the occasion of World Health Day 1995.

USAID played a key role in the successful completion of the poliomyelitis eradication initiative in 1994, contributing approximately 60% of the external costs associated with the hemagglutinining antibody campaign against polio. With the announcement of this new grant agreement, the United States is reaffirming its commitment to immunization, which is recognized as an essential public health strategy to safeguard the well-being of children in the Americas.

“Follow-up” Measles campaigns continue.

In 1995 record low levels of measles cases were reported nearly every country of the Region. However, as long as the measles virus circulates in the rest of the world, the risk of importation remains.

A major obstacle to measles elimination is the accumulation of susceptible preschool-aged children. As the proportion of susceptibles expands, the risk of a measles outbreak increases.

| Table 1: Measles Vaccination coverage achieved through catch-up and follow-up campaigns in the Americas, 1987–1996 |
|-----------------------|-------------------------------------------------|-----------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Country              | Year                | Target age | Coverage | Year | Target age | Coverage | Country              | Year                | Target age | Coverage | Country              | Year                | Target age | Coverage |
| Cuba                 | 1987                | 1–14 years | 93%       | 1993 | 1–4 years  | 85%       | Honduras             | 1993                | 1–14 years | 93%       | Nicaragua            | 1993                | 1–4 years  | 94%       |
| Colombia             | 1987                | 1–14 years | 90%       | 1993 | 1–4 years  | 92%       | El Salvador          | 1993                | 1–4 years  | 94%       | Panama                | 1993                | 1–4 years  | 88%       |
| Darien               | 1987                | 1–14 years | 85%       | 1993 | 1–4 years  | 85%       |                      |                     |            |           |                      |                     |            |           |
| Ecuador              | 1987                | 1–14 years | 93%       | 1993 | 1–4 years  | 92%       |                      |                     |            |           |                      |                     |            |           |
| Mexico               | 1987                | 1–14 years | 97%       | 1993 | 1–4 years  | 90%       |                      |                     |            |           |                      |                     |            |           |
| Brazil               | 1987                | 1–14 years | 97%       | 1993 | 1–4 years  | 90%       |                      |                     |            |           |                      |                     |            |           |
| Peru                 | 1987                | 1–14 years | 93%       | 1993 | 1–4 years  | 90%       |                      |                     |            |           |                      |                     |            |           |
| Source: PAHO/WHO and country reports.
should measles virus be re-introduced. To prevent this, periodic “follow-up” measles campaigns are being conducted throughout the Region, focusing on all children aged 1 through 4, regardless of previous vaccination or disease history. PAHO recommends “follow-up” whenever the number of susceptible preschool children has reached the size of an average birth cohort. The interval between these campaigns and the specific age group targeted will depend on the vaccination coverage obtained through routine services since the last campaign. Cuba conducted its “follow-up” campaign in 1993; Belize, Brazil, Colombia and Jamaica in 1995; and Chile and the countries of Central America conducted campaigns during April 1996 (Table 1). To date, these campaigns have resulted in almost 20 million children. “Follow-up” campaigns are planned for the remaining countries of the English-speaking Caribbean later in 1996.

Pan American Health Organization data were available about dates ≥ 12 (26%) aged 5-19 years and after 1956. Vaccination status eligible to be vaccinated (i.e., for 219 (73%) measles patients. Vaccination Status years. <5 years, 14 (42%) aged 5-19 with internationally imported

Of the 33 measles patients (39%) were aged ≥20 years. Of the 285 measles patients (22%) measles patients were included in the study. Age distribution and the specific characteristics of measles cases reported in the United States in 1995, and documents important evidence as to the number of cases, the shift in age distribution and the continued occurrence of international importations.

Age Of the 285 measles patients for whom age was known, 109 (38%) were aged <5 years, including 39 (16%) aged <12 months and 34 (11 %) aged 12-15 months. A total of 64 (22%) measles patients were 5-9 years, and 123 (43%) were aged ≥10 years. Of the 33 measles patients with internationally imported cases, 43 (7%) were aged <5 years, 14 (42%) aged 5-19 years, and 11 (31%) aged ≥20 years.

Vaccination Status Vaccination status was reported for 219 (73%) measles patients. Among the 96 (44%) who were not vaccinated, 56 (58%) were eligible to be vaccinated (i.e., aged <12 months and born after 1985). Vaccination status varied by age group: 29 (55%) patients aged 1-4 years were unvaccinated, compared with 12 (26%) aged 5-19 years and 28 (32%) aged ≥20 years. Of 62 measles patients for whom data were available about dates of vaccination, 55 (89%) had received at least one dose of measles-containing vaccine (MCV) or on their first birthday. Five (8%) cases were considered to be unvaccinated or inadequately vaccinated; three (5%) received the first dose of MCV ≤24 days before onset of symptoms; and four (6%) had received one dose of MCV before their first birthday. Five (8%) cases were reported among persons who had received two doses of MCV after their first birthday.

Case Classification Among the 301 reported cases, 268 (89%) were indigenous to the United States, including 259 cases (86%) acquired in the state reporting the case and nine (3%) resulting from the spread from another state. International importations accounted for 33 cases (11%), and an additional 11 cases were epidemiologically linked to a confirmed case of measles. Importations originated from or occurred among persons who had recently been from one of the following countries: India (10), Canada (three), Italy (three), Pakistan (three), China (two), France (two), Austria (one), Belgium (one), Costa Rica (one), Egypt (one), Japan (one) and the Philippines (one). For two of the imported cases, the exact source was unknown because the patient had traveled in more than one country outside the United States during the exposure period.

Outbreak Nineteen outbreaks (i.e., clusters of three or more epidemiologically linked cases) were reported by 12 states in 1995 and accounted for 74% of all reported cases. Five of these outbreaks began in late 1994. The number of cases involved in outbreaks ranged from three to 73 (median: seven cases). The largest outbreak (73 cases) occurred in a community outbreak in Ventura County, California, and primarily involved adults. Two outbreaks (25 cases in New Mexico and 17 cases in Louisiana) occurred primarily among unvaccinated children in day-care settings, and a fourth outbreak (11 cases) occurred among students in a college in Washington. The outbreak that occurred latest in the year primarily involved adult members (nine cases in 1995, 18 in 1996) in a group of nursing students that declared vaccine because of religious reasons. CDC performed genomic sequencing of measles viruses isolated from two domestic outbreaks in 1995. None of the sequences was related to genotypes of viruses circulating during the measles resurgence in the United States, Spring 1989-1991. The isolates from 1995 are genetically similar to viruses recently isolated in Europe and Japan.

Reported by: State and local health departments, Measles Virus Section, Respiratory and Enteric Viruses Branch, Division of Viral and Rickettsial Diseases, National Center for Infectious Diseases; National Immunization Program, CDC.

Source: MMWR, Vol. 45, No.15; April 14, 1996.

June 1996
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Measles Surveillance: El Salvador

The request of the Minister of Health, an evaluation was conducted in 1995 to determine the capacity of the national epidemicologists linked to measles. The study was conducted with health workers at 12 departmental offices, 6 hospitals, 5 health centers, 25 health units, the National Epidemiology, the Maternal and Child Health Office of the Secretariat of Health, the Central Virology Laboratory and the EPI national coordinators. Further, an approximate 12,000 registers of patients’ visits to doctors and emergency services at hospitals were reviewed, as well as the national measles surveillance database. Emphasis was placed on visiting high-risk areas.

Results The evaluation determined that 90 to 95% of the health units were reporting regularly on a weekly basis. During 1994, 2,369 suspected measles cases were reported

Figure 1


CASES (THOUSANDS)

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<td>20.0</td>
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<tr>
<td>1995</td>
<td>20.0</td>
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</table>

Source: MOH, El Salvador.
to the Ministry of Health. Seventy percent of cases were investigated within the first 48 hours following notification. Ninety-four percent of the suspected cases had an adequate serum sample collected, and 63% had a second sample collected. Of all samples, 80% of samples tested were negative for measles by the commercially available indirect IgM test; each of these positive specimens was re-tested in Panama using the highly specific IgM Capture test, and all tested negative. The initial laboratory results are thus considered to be “false-positives.” False positive test results are expected in a percentage of suspected measles cases, due to the relatively low specificity of the commercially available IgM tests and the absence of measles transmission in many parts of the Americas. Six cases were “clinically confirmed”; that is to say that measles virus infection was suspected by a health care worker, yet an appropriate laboratory investigation was not conducted.

Health personnel are aware that any case of measles should be notified immediately. At the operational level, however, the implementation of the measles case classifications needs to be strengthened. At this point, only cases with samples are incorporated into the surveillance system. Where negative reporting from the department level is not consistently reaching the national level, the existing network of health promoters has facilitated case reporting within their respective communities. Surveys of patients attending health centers, which were carried out at some health units, also represent an example of community surveillance. However, the official notification sources need to be further identified and integrated into the national surveillance system.

Approximately 80% of reported cases examined by the evaluation team were well investigated. The current system seeks samples from all suspected cases. El Salvador’s central laboratory has the technical competence to process samples and the coordination between the laboratory and the epidemiology center is adequate at the central level. Case investigation forms, however, require too much information and are difficult for health care workers to complete. There are some delays with the processing of samples, reporting of results to the local levels and shipping of positive samples to the reference laboratory. The inability of a central distribution entity for biologics is considered to be an essential step in the proper functioning of laboratories. Equally essential will be the steady flow of communication between the central laboratory and the Regional Reference Laboratory in Panama.

A formal organizational structure is in place at the department level, which facilitates collaboration with the local systems. There is an Inter-Agency Coordinating Committee (ICC) at the national and departmental levels and in some municipalities. Nevertheless, departments find themselves at various levels of managerial development. The availability of health staff trained in epidemiology needs to be addressed. Also, some departments lack designated staff to follow-up on the measles elimination effort.

El Salvador has a computerized database at the national level which allows for periodic analysis of measles surveillance indicators. Monitoring and evaluation of vaccination coverage is performed at all levels. Through this system, the country has identified areas at high-risk for measles. There is a greater need to expand the reach of information related to measles among departments and among the various organizations involved in the measles elimination efforts. The program could also benefit from formal, ongoing feedback mechanisms for measles surveillance data.

The evaluation team concluded that there is no evidence of measles circulation in the country at the present time. Although there are some areas that require improvement, the surveillance system appears capable of promptly detecting the presence of measles virus in most municipalities. The marked decrease in the number of measles cases is an indicator of the impact of the mass immunization efforts and the maintenance of high vaccination coverage levels.

**Recommendations**

- PSOM’s recommended operational case classifications for suspected measles cases should be used to avoid confusion. All suspected cases of measles, including those that lack serum samples, should be included in the surveillance system.
- Efforts should be made for greater integration of other health sector institutions, at all levels, into the national surveillance system. Local epidemiological surveillance should continue to be expanded through health promoters and further use of surveys of persons using health facilities.
- El Salvador’s central laboratory should participate in the final classification of cases, and efforts should be made to improve communication between the national Central Virology Laboratory and the Regional Reference Laboratory in Panama. Samples should be processed at least once a week in the national laboratory. All positive sera and a 10% random sample of negative sera should be sent on a monthly basis to the Regional Reference Laboratory in Panama for quality control purposes. The laboratory should be authorized to ship the results directly to the reporting unit in a timely manner. Supervision needs to be strengthened at the Reference Laboratory. Also, a computer system should be installed at the laboratory to facilitate data management and analysis.
- The ongoing exchange of information among departments and with different institutions needs to be promoted. An epidemiological bulletin should be re-instated and the quarterly program evaluation needs to be distributed to all health departments.
- The managerial capacity of epidemiological surveillance at the departmental level needs to be strengthened, targeting those departments that are less developed. More staff should be trained in epidemiology at the departmental level, and in overall management of the national program. Also, efforts are needed to ensure the proper functioning of all epidemiological surveillance committees in the country, and to enhance the inter-institutional coordination with NGOs and private physicians through ICC meetings. Staff should be designated for the national and departmental levels to follow-up and promote the national measles elimination activities.
- Supervision and training in surveillance methodologies in use need to be strengthened at the departmental level and at hospitals. Due to the rapid turnover of personnel, all staff should receive training in epidemiological surveillance before entering service. At the local level, training in measles surveillance should take place by more frequent supervisory visits. The joint participation of private and public institutions at these training sessions should be encouraged.

**June 1996**

**Volumen XVIII, Number 3**

**Canada “Catch-up” with Measles**

**British Columbia**

On January 25, 1996, the Health Minister officially announced the introduction of a routine two-dose measles and one-time “catch-up” vaccination program to begin in April 1996. Both programs started concurrently. The “catch-up” vaccination campaign was administered by public health nurses and took place in schools and other public locations. The campaign targeted all children between 18 months and those completing secondary school. Measles-rubella (MR) vaccine was used for the “catch-up” campaign.

**Prince Edward Island**

On February 7, 1996, the Prince Edward Island Ministry of Health announced the introduction of a two-dose measles schedule, starting in March, 1996, with the second dose-mumps-rubella (MMR) [dose] to be given at school entry for those 4-6 years of age. A second dose of monovalent measles vaccine will be offered to all students in grades 1 to 12 in 1996 as part of the “catch-up” program. This “catch-up” program started in March and will be completed this fall.

**Ontario**

In Ontario, a routine two-dose measles schedule with the second dose of MMR given at school entry and a “catch-up” campaign using monovalent measles vaccine for all school-aged children have been introduced. Although the “catch-up” campaigns were expected to start officially on February 1, 1996, some health units began immunizing a week earlier. As of February 20, over 410,000 children had been immunized. The program smoothly, and, as expected, no serious adverse events were documented. The acceptance rate was >95%.

**The Yukon**

In the first week of January, 1996, the Yukon Territory began implementing a routine two-dose measles schedule, with the second MMR to be given at 18 months. A “catch-up” campaign using monovalent measles vaccine and targeting school-aged children started in March.

**Quebec**

In some regions in Quebec, the “catch-up” program for monovalent measles vaccine targeted at school-aged children began on February 11, 1996. Province-wide implementation was expected by mid-March. The routine second dose of MMR at 18 months has already been incorporated in the regular immunization schedule. The “catch-up” program for pre-schoolers (those 218 months) will start at a later date, and will be done only on a progressive basis for completion by December 1996.

The current “catch-up” programs and the anticipated campaign will immediately protect approximately 75% of Canadian school-aged children.

**August 1996**

**Volumen XVIII, Number 4**

**Global Measles Eradication: Target 2010?**

During a two-day consultative meeting co-sponsored by the Pan American Health Organization, the Centers for Disease Control and Prevention, and the World Health Organization held on July 9-10 in Atlanta, Georgia, public health officials from around the world reviewed the record of current measles control strategies and debated the feasibility of expanding the target of measles elimination in the Americas to global measles eradication.

**The Facts**

According to WHO’s 1996 World Health Report, before a vaccine became available in the 1960s, each year measles killed between seven and eight million children and caused an estimated 135 million cases worldwide. Today, approximately one million
children still die annually from measles and countless others have permanent sequelae of their infection, the great majority of whom live in developing countries. Measles continues to be the leading killer among childhood vaccine-preventable diseases, affecting mainly malnourished children and those who live in crowded urban conditions.

The World’s Record

Remarkable progress has been made in measles control elimination during the past 3–5 years (see Figure 1). In this regard, the Region of the Americas has clearly shown the possibility of achieving elimination. Measles transmission has been interrupted in major portions of the Americas, leading to the expectation that this region will be declared free of measles by the year 2000. Progress towards measles elimination in the United Kingdom and the Scandinavian countries has also been dramatic. The mass immunization strategies being carried out in the Americas and some nations in Europe and the Eastern Mediterranean regions are being considered by several countries in Africa and Asia, where measles continues to be a considerable burden.

Global Roundtable

Global measles eradication: A feasible goal. Global measles eradication is technically feasible. Participants representing several developed and developing countries agreed that national, sub-regional, and regional elimination of measles can and should be accomplished.

Eradication was defined at the Atlanta Meeting as the global interruption of measles transmission. Vaccination would not need to be continued following eradication. Elimination refers to the interruption of transmission in a definable geographic area, such as a country or a region. However, because of the continued threat of re-introduction of the virus, vaccination would need to be continued. Global eradication would basically represent the sum of elimination efforts in all regions. Elimination has been achieved already in some areas for limited periods of time.

Favoring an initiative to eradicate measles worldwide within the next 15–10 years are: the expected success of polio eradication by the year 2000; the success to date of measles elimination in the Americas and United Kingdom; the urgency of measles eradication because of expected epidemiologic changes resulting from routine measles vaccination (i.e., the accumulation of a growing population of susceptible adults); the high benefit-cost ratio to developed countries; and the recognition of measles as a major public health problem in many developing countries, which should help engender the necessary political and financial support.

Participants concluded that a goal of global measles eradication should be established, with a target date within the next 15–10 years (e.g., between 2005 and 2010). Measles eradication is a logical addition and follow-up to the current global polio eradication initiative, but needs to build on the success of polio eradication. Therefore, it should await normalization of the measles eradication program and be implemented as countries and regions become polio-free. Given the rapid accumulation of susceptibles to measles, the implementation phase of an eradication effort should be considered as into a brief time as possible.

Targeting immunization strategies. Great success has been attained in many countries, particularly those in the Americas, using a three-step strategy beginning with “catch-up” mass campaigns to vaccinate all persons 1–14 years old regardless of prior vaccination status, followed by high coverage through routine vaccination of children 9–15 months of age (“keep-up”), supplemented by periodic “follow-up” mass campaigns aimed at all children 1–4 years old, since susceptible children will accumulate among one-dose vaccine failures and unvaccinated children.

Measles eradication will require a far broader and more intense one-dose vaccination strategy. However, participants stated that no single vaccination approach is optimal for all countries. It is essential to reach all children with at least one dose of measles vaccine. The second dose provides an additional opportunity to reach those children who either did not acquire immunity following vaccination, or who missed the first dose. Also, evidence indicates that a second dose of measles vaccine gives very high rates of seroconversion (>90%) in those who did not respond to a first dose.

In countries with highly developed immunization programs capable of reaching extremely high coverage on a routine basis, it appears that an ongoing two-dose schedule can successfully achieve and maintain elimination of measles. Countries switching from a one-dose strategy to an elimination strategy will need to implement some form of “catch-up” campaign, rather than just gradually adding a second dose to the immunization schedule. Regardless of the strategy selected, attention should be paid to preventing the accumulation of susceptible children.

In countries currently using rubella vaccine or globalising initiating a rubella control program, using a combined measles-rubella or measles-mumps-rubella vaccine is recommended, in order to take full advantage of the “catch-up” campaign.

Current measles vaccines are sufficient. Existing vaccines and strategies are sufficient to eradicate measles. Nonetheless, alternative methods of delivery, particularly jet injectors, and alternative preparations of the vaccine should continue to be explored. The most pressing need for research is for a rapid field diagnostic test. Other topics of research interest discussed by participants included continued studies to better understand measles virus and the mechanisms of action of measles vaccines.

Measles surveillance is critical. Measles case surveillance is a critical component of any elimination/eradication strategy and needs to be implemented at an early stage of the program. The most important functions of surveillance are to assess the adequacy, implementation and effectiveness of elimination strategies, and to detect the circulation of measles virus in a population, rather than finding every case of measles infection, except at the end stages of elimination.

Surveillance indicators are a useful means for monitoring surveillance systems but must be limited to number to be optimally effective. No external standard for determining the completeness of measles surveillance exists which is comparable to the reporting rate of acute flaccid paralysis (AFP) cases for polio. Experience in using indicators is needed, and the indicators proposed may need to be modified based on accumulating experience.

Among appropriately trained health providers, a passive system of surveillance for measles is adequate. There may be settings, however, where active surveillance assumes a more important role, for example, in some urban settings where there are dense populations of unvaccinated children, in areas that have a low rate of notification or where a confirmed case has been identified, or in areas where clusters of suspected cases have occurred.

There was a consensus among participants to base case notification on a clinician’s suspicion rather than attempting to implement rigid case definitions for notification purposes. Such case definitions are important, however, in investigating suspected cases and in classifying them following investigation.

Laboratories as key partners. Laboratory confirmation of measles infection will play a significant role as measles incidence declines. Also, the establishment of a functioning global network of laboratories will be a critical element in achieving global eradication.

Laboratories will also play a vital role in characterizing measles viruses isolated, to determine whether these are due to indigenous transmission or importations. This information will be important as countries interrupt the transmission of indigenous strains. For example, it appears that all measles viruses isolated in the United States in the past two years share characteristics with virus strains from other countries, not with the strains isolated from cases in the United States in 1989–1992. Although seven different groups of virus strains have been identified, evidence indicates that current vaccines are effective against all of them.

The surveillance of measles immunity is an important function of laboratories. Although monitoring immunity coverage is important in indicating the likely levels of immunity within a population, the expected success of polio eradication should be monitored at the district level, the occurrence of vaccine failure cannot be determined by serological measures may be useful in confirming the level of protection in an area.

Efforts should be made to confirm all sporadic cases and at least one case from each chain of transmission. The availability of a rapid field diagnostic test will be of great help. In addition to serum or saliva specimens for laboratory confirmation, specimen collection for virus isolation should be done in conjunction with case investigation, as the greatest yield occurs when specimens are collected within the first 10–12 days of rash onset. Specimens can include urine, as well as nasopharyngeal swabs or blood.

Re-defined importations

A natural country achieves interruption of measles virus transmission, importations will be less frequent. Other persons who develop measles may have travelled outside their home country during some part of their presumed exposure period or may have travelled to countries where measles virus is not thought to be circulating. Ascertainment of the source of imported cases may be difficult, and it may be useful to consider the following classification scheme for confirmed measles cases: indigenous; source unknown; imported (source known); and imported (source unknown). Collaboration between countries in attempting to establish the source of imported cases can be facilitated by PAHO/WHO, laboratories, or even PAHO/WHO, laboratories, or even
Measles Articles

terminate measles transmission in response to outbreaks has a very limited role in measles eradication in most countries, because such efforts are costly, disruptive, and, by the time such measures are instituted, they may be ineffective. However, outbreaks may be used as opportunities to reinforce surveillance, assess the health burden of continuing measles transmission, and determine the cause of the outbreak so that appropriate public health measures can be taken. Careful investigation of outbreaks can generate the data needed to obtain the political will for eradication.

Obstacles to measles eradication. Major obstacles to measles eradication are conceptual, political, and financial. In many countries, the true nature of measles is not understood and it is perceived as a minor illness. This is particularly true in developed countries. This perception may make it difficult to develop the political will necessary to carry out a successful global eradication effort. There is no need to educate parents, medical practitioners, and public health professionals in such countries. On the other hand, there is a need to educate parents, medical practitioners, and public health professionals in many developing countries, where support for its eradication is expected to be very strong. Although it may seem risky, the short-run cost of measles eradication will quickly pay for itself in vaccinations and hospitalizations forgone and deaths prevented. Documenting the health burden of measles in more countries, especially in the developing world, will be important in gaining support for global eradication.

Cost-Effectiveness of Measles Immunization in Urban Areas

Even though globally 78% of children are immunized against measles, vaccination coverage is variable. Measles cases do not occur at random throughout the population but cluster in certain geographical areas and in certain groups of people. This uneven environment combines a high-risk area with a high-risk population. In fact, the majority of measles deaths happen in cities. Special efforts, such as supplemental mass vaccination campaigns, are needed to reach the urban poor who are often under-utilizers of routine immunization services.

Vaccination immunization has been called the most cost-effective public health tool invented. There is no better return for investment than using the measles vaccines wisely. The additional resources required to control measles in cities justifiable in both economic and humanitarian terms. When a coalition is formed that includes city authorities, community groups and the private sector, a city measles campaign becomes an efficient way of protecting children from measles.

With funding assistance from partners in immunization, the cost of an urban campaign need not be great. Experience from countries in the Americas suggests that the full cost of a measles mass campaign ranges from US$ 0.50-0.75 per child. Funds will be needed to purchase vaccines, syringes and needles. PAHO/WHO and UNICEF recommend the autoinjector syringe for campaigns such as this. While staff time may be considered a cost, existing staff can be mobilized for a day or two from the Ministry of Health or NGOs with little extra real expenditure.

Source: Global Programme for Vaccines and Immunization, WHO, Update, April, 1996.

October 1996

Volume XVII, Number 5

Andean Region: Measles on the Way Out!

The VII Andean EPI Manager Meeting held in Quito, Ecuador, 27-28 August, brought together health officials, EPI managers, epidemiologists, laboratory representatives, UNICEF, Rotary International and SVI/PAHO staff to review the progress, especially with regard to measles elimination.

Measles Surveillance Following SVI/PAHO’s strategy for eliminating measles, all countries in the Andean Region have already conducted “catch-up” vaccination campaigns targeting all children between the ages of 9 months and 15 years, achieving coverage above 90%. The impact of these campaigns is evident in the marked reduction of measles incidence with only 7 laboratory confirmed cases during the first half of 1996 (Table 1). Nonetheless, many municipalities still reported routine vaccination coverage rates below 90% in 1995, and 95% (target set for 1995 for measles coverage) in 1996.

Another critical component of the measles elimination strategy is to prevent the accumulation of susceptibles is periodic “follow-up” campaigns. These were carried out in 1995 in Colombia, reaching children 1 to 3 years of age, and in Peru, aimed at all children under 5 years of age. During 1996, Chile completed its “follow-up” campaign, reaching children between the ages of 1 and 14 years of age. The coverage rates of these campaigns were 90% or higher (Chile, 100%; Colombia, 97%; and Peru, 97%). The critical monitoring of susceptible children to measles infection has been estimated as equal to one year’s worth of support for each country. Considering this trend, Ecuador should carry out a “follow-up” campaign in 1997, Bolivia and Peru in 1998, and Venezuela in 1999.

Countries in the Andean Region began to systematically implement a national surveillance system for measles in 1995. Efforts are needed to continue strengthening these systems to reduce the number of clinically confirmed measles cases reported.

Recommendations

• Implement the new definition of a suspected case
• Reach and maintain routine vaccination coverage greater than 95% for children 12 to 23 months in each municipality.
• Continue ongoing monitoring of the build-up of susceptibles and carry out “follow-up” campaigns to prevent outbreaks when this number equals one year’s birth cohort.
• Change the age for administering measles vaccine from 9 months to 12 months (for countries that have yet to implement this new recommendation).
• Continue making efforts to expand the network of health units reporting measles cases.
• Make greater use of the resources offered by the measles Elimination Surveillance System for monitoring the program in the countries.
• Assure the utilization of the key indicators of measles surveillance.
• Maintain a weekly publication of measles cases and areas with outbreaks.

Measles Diagnosis

Representatives of laboratories in Bolivia, Chile, Colombia, Peru, and Venezuela met to exchange experiences and discuss the implementation of uniform criteria for measles diagnosis.

Recommendations

• Only samples from cases that fit the definition of a suspected measles case will be processed.
• Only one sample will be taken from each suspected case. To be considered adequate, a sample must be taken within 30 days of rash onset.
• Upon arrival at the laboratory, all samples must include the following information: identification, age, onset, date of rash onset, date sample was taken, vaccination history, and date of last dose.
• National laboratories will send 100% of the positive and indeterminate cases, and a 10% random sample of negative sera to the reference laboratories for confirmation via the IgM test.
• Given the need for reliable laboratory results, a more sensitive and specific indirect IgM test for measles diagnosis was recommended than the one currently used.

Source: PAHO/WHO Meeting on Advances in Measles Elimination. Atlanta, Georgia, USA.

August 1996

Volume XVII, Number 4

Measles Laboratory Workshop in Central America

The editors of the regional Measles Laboratory Workshops of Central America met for the first time July 8-10 in Panama City. Representatives of laboratories in Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama, the director of the Regional Measles Reference Laboratory of Colombia, and SVI/PAHO staff evaluated their experiences during the first half of 1996.

The discussion focused on the role of laboratories in support of the measles elimination initiative in the Americas. Participants reviewed the results of laboratory diagnosis for measles in each of the countries, the measles laboratory diagnostic tests used in Central America, and the shipping and transportation of samples to the Gorgas Communicable Center’s Measles Reference Laboratory. Each country shared their experience with measles surveillance was presented.

All the countries except Guatemala have begun the laboratory testing of sera from suspected measles cases using the indirect IgM assay.

The Gorgas Laboratory (CCG) had received and processed 216 samples as of week 26 of 1996, with 14 positives and 202 negatives. The positive cases are distributed as follows: Costa Rica, 4; El Salvador, 5; Guatemala, 1; Nicaragua, 2; and Panama, 2. The Gorgas Laboratory analyzed the samples received using the IgM Capture test, and sent to CDC all the positive samples and a certain percentage of the negatives (31 all in for 1996).

A response has been received for all 31 samples which point to an 88% agreement between the results obtained at the Gorgas Laboratory and those obtained at CDC. The positive cases were distributed as follows: Costa Rica, 4; El

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Measles Laboratory Workshop in Central America

Table 1. Confirmed measles cases by country, Andean Region and Chile, 1993-1996

<table>
<thead>
<tr>
<th>Country</th>
<th>1993</th>
<th>1994</th>
<th>1995</th>
<th>Clinica- lly (1)</th>
<th>1996* Laboratory (2)</th>
<th>Total</th>
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<tbody>
<tr>
<td>Bolivia</td>
<td>3,391</td>
<td>1,441</td>
<td>76</td>
<td>6</td>
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<td>6</td>
</tr>
<tr>
<td>Chile</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Colombia</td>
<td>9,851</td>
<td>639</td>
<td>308</td>
<td>10</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Ecuador</td>
<td>3,627</td>
<td>3,068</td>
<td>919</td>
<td>20</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Peru</td>
<td>1,739</td>
<td>2,232</td>
<td>207</td>
<td>1</td>
<td>41</td>
<td>43</td>
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<tr>
<td>Venezuela</td>
<td>22,231</td>
<td>17,051</td>
<td>172</td>
<td>27</td>
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<tr>
<td>Total</td>
<td>40,831</td>
<td>22,979</td>
<td>1,828</td>
<td>124</td>
<td>713</td>
<td>1,311</td>
</tr>
</tbody>
</table>

(1) Without adequate samples (failure of the surveillance system).
(2) IgM Capture test.
* Days as of 31 July.
** Imported.
Source: Country reports, 1996.

http://www.paho.org/immunization
Rubella Watch

EPI Newsletter

Pan American Health Organization

December 1996
Volume XVIII, Number 6

Measles Surveillance in Nicaragua

The evaluation of the measles epidemiological surveillance system in Nicaragua was led by a team from the Ministry of Health, with the support of PAHO/SVI. The methodology developed by PAHO/SVI for rapid analysis of measles surveillance systems was utilized to determine the capacity of Nicaragua’s surveillance system to effectively detect the circulation of measles virus in all parts of the country.

During the month of August, 1996, four groups organized visits and conducted structured interviews with health teams at various levels—national, regional, and municipal—and placed priority on high-risk areas. The evaluation team conducted visits to the National Office of the EPI (Ministry of Health), the National Office for Epidemiological Surveillance (Ministry of Health), the National Diagnostics and Reference Center, two national reference hospitals, 17 directing teams at the SILAS, 16 departmental hospitals, and 29 municipal health units. The evaluation focused on aspects of management, the surveillance process, and intensive surveillance in high-risk areas.

Results

In 1995, Nicaragua reported 37 suspected measles cases. Of these, 190 were discarded and five were clinically confirmed, indicating a failure of the surveillance system. In 1996, as of epidemiological week No. 31 (week ending 1 August), 194 suspected cases of measles had been reported, 193 of which were discarded. A number of reported suspected cases varied by SILAS.

The distribution of suspected cases by age group is as follows: thirty-eight less than 1 year of age, 28% from 1 to 4 years, 21% from 5 to 12 years, and 12% over 15 years of age. The vaccination history of the 194 suspected cases is as follows: twenty percent had received one dose of measles vaccine, 30% two or more doses, 43% were not vaccinated, and in 7% of the cases the history was not known. Regarding the sample that had not been vaccinated, 97% were under the age for vaccination.

The evaluation included an active search for suspected measles cases, which involved reviewing previous measles case diagnoses and patient registers from medical consultations and emergency services, contacting different hospitals and health centers for the period from January to August 1996, as was the investigation forms for suspected measles cases available at the units visited. Of these, 95% case files merited further analysis to determine whether they were suspected or detected cases not identified by this system.

Table 1. Samples and results of suspected measles cases sent by the countries to the Reference Laboratories, Central America, weeks 1 to 26, 1996.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>COR</th>
<th>ELS</th>
<th>GUT</th>
<th>HON</th>
<th>NIC</th>
<th>PAN</th>
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<tbody>
<tr>
<td>Cases with blood samples</td>
<td>198</td>
<td>237</td>
<td>100</td>
<td>88</td>
<td>162</td>
<td>73</td>
</tr>
<tr>
<td>Positives from national laboratories</td>
<td>33</td>
<td>13</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>CCG</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>- for measles</td>
<td>55</td>
<td>55</td>
<td>44</td>
<td>8</td>
<td>28</td>
<td>25</td>
</tr>
<tr>
<td>- for rubella cases</td>
<td>57</td>
<td>57</td>
<td>47</td>
<td>8</td>
<td>29</td>
<td>26</td>
</tr>
<tr>
<td>Specimens sent</td>
<td>8</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>- for measles</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>- for rubella cases</td>
<td>3</td>
<td>3</td>
<td>2</td>
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| December 1996 Volume XVIII, Number 6 | Record Five Years Measles-Free! |

The Thirteenth Meeting of the Caribbean EPI Managers, held in Miami Beach, Florida from 4-6 November, brought together over 65 health officials from 19 countries of the English-speaking Caribbean and Suriname. Representatives from the French Departments of Guadeloupe and Martinique and from the Netherlands Antilles, also present were health officials from Haiti, Canada’s Laboratory Center for Disease Control, England’s Department of Health, the United States’ Centers for Disease Control and Prevention, Los Angeles and Duke Counties’ Department of Health of the Caribbean Epidemiology Center (CAREC), UNICEF, as well as technical staff from SVI/PAHO.

The English-speaking Caribbean continues to hold the longest record in the Western Hemisphere of five years without measles. The initiatives focused on the build-up of susceptible persons and actions needed to prevent the re-introduction of the disease. Considerable time was also devoted to assessing the current situation of rubella virus circulation and congenital rubella syndrome (CRS) in the Caribbean. There was a consensus among participants on the need to raise awareness particularly among women and the countries’ government officials, on the seriousness of this disease. Emphasis was placed on determining the critical elements for an effective strategy to control/eliminate rubella and CRS. As part of this effort, each country performed its own cost-benefit analysis of the immediate elimination of rubella/CRS by a mass campaign with rubella-containing vaccine. This analysis should serve as a baseline for further refinement of country-level.

Measles Eradication

During the 1992-1996 period, there has been no laboratory confirmed indication of measles transmission, despite intensive surveillance and the investigation of 1,443 suspected measles cases. The level of measles vaccination coverage ranged from 75-88%. The last two confirmed cases were reported from Barbados in March of 1995. Over 270 cases have been discarded as rubella, 58 as dengue, and 1,235 have been discarded with other diagnoses. CAREC’s Laboratory investigated 334 suspected measles cases in 1996, reported from 16 CAREC member countries. Jamaica had the highest number of suspected measles cases in 1995 due to a rubella epidemic. Dominica and Turks and Caicos also had relatively high numbers of cases due to a dengue epidemic.

Virtually all countries in the sub-region have already implemented PAHO’s three-step strategy for measles eradication. Follow-up campaigns have been carried out in 14 of the 19 countries. Five countries have not implemented the follow-up campaign at all. The timeframe for vaccines and plans to conduct a follow-up campaign in Trinidad and Tobago has decided to conduct a mop-up campaign for low-covrage and hard-to-reach areas, and the need for a follow-up campaign is being evaluated. Bermuda, Bahamas and Cayman Islands are not planning a follow-up campaign at this time. Countries continued to work toward reaching the measles eradication target of 95% measles vaccination coverage.

Since launching the Measles Elimination Surveillance System (MESS) on September 28, 1991 through December 31, 1995, there had been 223 weeks of reporting. During that time, more countries extended the target of 80% completeness for weekly reports (Figure 1).

Responding to the feedback received from the recent measles surveillance evaluations in the Americas, the English-speaking Caribbean has analyzed the quality of the case reporting forms. While performing generally well, areas to be strengthened included: more detailed information regarding the presence or absence of conjunctivitis, corzya or croup, vaccination history, dates of the last vaccination, and the patient’s address.

In the absence of measles cases, key indicators of population susceptibility are vaccination coverage and the accumulation of susceptibles, who either were not vaccinated or who have extinguished primary vaccine failure.

Importations are the only way measles can re-emerge in the region. Given the high volume of tourists every year, there is concern that if follow-up campaigns are not conducted, particularly in Trinidad and Tobago, there is a high risk of an outbreak, which could threaten the other countries as well. A follow-up campaign was strongly recommended for that country.

Health officials at the meeting were reminded of the need to mobilize health workers to actively search and investigate every case of AFP. Re-sensitization of clinicians and public health staff at the height of prompt investigation reporting and active surveillance will be key until global polio eradication is achieved. Similar to measles surveillance, efforts to incorporate new reporting sources, such as non-governmental organizations, private physicians, and community groups will further strengthen surveillance.

Immunization coverage was maintained at previous high levels. However, it was reported that in some countries coverage had either dropped or remained stagnant under the 90% mark. When coverage is less than 95%, there is a considerable number of unvaccinated children. Measures should be taken to trace these children and ensure that they are included in the needed vaccines.

Source: Country Reports to CAREC.
the surveillance system. Only three were considered cases that should have entered the system; they are being investigated at this time.

The National Immunization Program has a computerized database (Measles Elimination Program has a computerized database) for reporting system and communication network are made up of 17 reporting units, 23 hospitals and 152 health centers. The weekly negative notification reports are transmitted by communication network, that allows for a fast flow of information among the local level, the SILAIS, and the central level.

- **Percentage of cases reported within 7 days of rash onset:** 90%
- **Sixty-one of the reported cases were reported within three days of rash onset, and:** 29% between the fourth and seventh days.
- **Percentage of cases investigated within 48 hours of notification:** 92%
- **Of the 17 SILAIS, 15 investigated more than 90% of their cases in the first 48 hours.**

- **Percentage of cases with complete investigation and adequate sample taken:** 100%

For each case an investigation form is filled out. In 100% of the cases the following information is shown: name, age, SILAIS, municipality, date of rash onset, type of rash, fever, date samples taken, final diagnosis, and vaccination history. Seventy-four percent of the samples are taken in the first seven days following rash onset, 18% from the eighth to fifteenth day, and 8% after 15 days.

- **Percentage of cases with laboratory results within 7 days:** 36%

On average, the results are reported 34 days after they are received. Of the samples, 60% are received in the laboratory within the first seven days after they are taken, and 21% between seven and 14 days. In addition, the national laboratory exercises quality control over the samples, evaluating the quantity, conservation, labeling, and information on the case investigation form.

**Surveillance**

The reporting system and communication network are optimal, and active local epidemiological surveillance exists through field visits. The database of the National Immunization Program is also used for periodic analysis for the identification of risk areas. Health staff know how to identify measles cases and understand the importance of immediate notification of a suspected measles case.

More than 90% of cases entering the surveillance system have been investigated in a timely fashion. There is an amplified case investigation form and a standardized format for documenting actions taken. There is a timely response to the detection of suspected measles cases.

The national laboratory has the resources and technical competence to perform the diagnoses. There is good coordination between the laboratory and the program at the central level. The system for collecting, conserving and sending samples is adequate at all levels, and there is good coordination between the national laboratory and the Regional Reference Laboratory of the Gorgas Commemorative Center has improved substantially.

**Recommendations**

- **Strengthen and promote the clinical aspects for differential diagnosis of measles in training activities.**
- **Include alternative sources of reporting (schools, non-governmental organizations [NGOs] and private physicians) at all levels, registering them in the case investigation form.**
- **Promote and disseminate nationwide simplified standards for epidemiological surveillance.**
- **Do not exclude cases without samples from the surveillance system.**
- **The SILAIS should ensure adequate recording of basic information on the case investigation form.**
- **Document and strengthen the investigation of the source of infection.**
- **Take one blood sample at first contact with each suspected measles case.**
- **Review procedures and actions for responding to the presence of suspected measles cases.**
- **Each case should have a final classification within four weeks of being reported.**
- **A computer system should be installed at the central laboratory to facilitate case analysis.**
- **Establish a flow for timely and complete forwarding of the laboratory results to the SILAIS.**
- **Systematize and document the surveillance database at the SILAIS.**
- **Perform integrated analyses of available information on surveillance, coverage, and quality control at the SILAIS.**
- **Perform timely monitoring of the surveillance indicators in each SILAIS.**
- **Publish and distribute the EPI epidemiological bulletin.**
- **Properly apply criteria for identifying risk areas based on local conditions, and strengthen surveillance in these areas.**

**Management**

At all levels the political commitment is well documented and the program is recognized as a health priority. Efforts have been made to increase and maintain high measles immunization coverage. There is an active surveillance system at the national level capable of detecting suspected measles cases or outbreaks on a timely basis.

- **The lack of laboratory confirmed cases is an indicator of the effectiveness of the vaccination strategies used by the country to eradicate measles, and of the optimal levels of coverage attained.**
- **3. There is no evidence of measles virus circulating in the country.**
- **4. In order to maintain the successes attained, it will be necessary to involve other public and private sector institutions, schools, and community organizations.**

**Acknowledgements**

We recognize the unrelenting efforts of the legion of health workers in the Americas: who by virtue of their efforts have made it possible to collect in each of these articles the experiences and best practices accumulated by the Region to eliminate measles, rubella and congenital rubella syndrome. We also thank the immunization team in the regional office, immunization focal points, and national immunization professionals in each country who contributed ideas, time and talent for the original production of these articles. Finally, we would like to thank all the people of the Americas for their determination in making this continent a healthier place.

**Measles in Brazil: Indigenous or Imported?**

On 24 September 1996, the Santa Catarina State public health department received a report of a suspected measles case. The patient was a 32-year-old woman from São José County who had been seen by a physician on 22 September 1996 because of fever, rash and cough. She was initially thought to have an allergic reaction and was treated with antibiotics. Two days later, the patient returned for re-evaluation accompanied by her 6-month old grandson, who was acutely ill with a fever and rash illness. The infant was referred to a pediatrician and was diagnosed clinically as having measles. The woman's rash had increased in severity and her respiratory...
symptoms had worsened. She was then hospitalized with the diagnoses of measles and pneumonia.

Both cases were confirmed as measles when serum specimens tested positive for measles IgM antibodies using an indirect assay at the Public Health Laboratory (LACEM) in Florianópolis. The specimens were then reconfirmed using the highly specific measles IgM capture test in the measles laboratory of the Oswaldo Cruz Foundation (FIOCRUZ) in Rio de Janeiro.

A visit to the woman’s home revealed that her 19-year-old son-in-law, a gas station attendant, had a history of fever and rash illness, with rash onset on 6 September 1996. A blood specimen collected from him in late September was positive for measles IgM antibody. The source of his measles infection is unknown.

Field investigation conducted in the Florianópolis health district, including 18 counties of Santa Catarina between September and December of 1996, ascertained a total of 58 suspected measles cases (Figure 1). Of these, a total of 24 (41.4%) were confirmed as measles, 23 via laboratory confirmation and 1 case was confirmed by epidemiologic linkage to a laboratory confirmed case. The remaining 34 suspected measles cases had a blood specimen collected and tested negative for measles IgM, and were thus discarded. The last confirmed case had rash onset on 18 December 1996. No additional cases have been detected since then, despite the existence of enhanced measles surveillance.

Urine specimens were collected for measles virus isolation from several suspected measles cases. These specimens were centrifuged, reseeded in viral transfer media, frozen and transferred to the FIOCRUZ measles laboratory. Measles virus was isolated from two of the submitted specimens. Genomic analysis of the measles virus isolates is currently being conducted in collaboration with the Centers for Disease Control and Prevention's measles laboratory in Atlanta, Georgia, USA. Provisional data of the nucleotide sequence of the isolated virus suggests that the virus isolated from Santa Catarina is similar to a virus which has been circulating in Europe in recent years, suggesting the likelihood of an importation.

Thirteen confirmed cases were reported from São José County, 4 from Antônio Carlos County, 2 from the capital city of Florianópolis, and one case each from Biguaçu, Palhoça, Avaias Mornas, Criciuma and Brusque Counties. Of the laboratory confirmed cases, 4 (30.8%) had histories of measles vaccination; the remaining cases were unvaccinated. Of the confirmed cases with histories of measles vaccination, 2 (50%) had received measles vaccine in the month before rash onset.

Cases ranged in age from 6 months to 32 years. Seven cases were younger than one year of age, three cases were in children 10-19 years of age, and seven cases occurred in persons ≥20 years of age. In the Florianópolis health district, the highest age-specific attack rates occurred in infants <1 year of age (42.8 cases/100,000 population), in adolescents 15-19 years of age (7.4 cases/1000) and in young adults 20-24 years of age (4.3 cases/1000).

Outbreak response activities included an emergency review of vaccination coverage in the affected counties, provision of measles vaccine to infants and children without histories of measles vaccination and enhanced measles surveillance. In addition, a technical team was sent to Antônio Carlos and São José Counties, where visits were made to the households of all confirmed measles cases to gather further information on the possible source of infection and to find additional cases. Visits were also made to health centers, hospitals and schools in these counties to provide measles vaccine to unvaccinated children and to stimulate measles surveillance.

A technical meeting was convened for personnel from the Florianópolis District and Santa Catarina health departments to obtain further information. A lecture was given for pediatricians and pediatric residents at the Children’s Hospital in Florianópolis to inform them about the plan to eradicate measles from Brazil and the need to report any suspected measles cases.

Analysis of the coverage attained in the 1992 catch-up vaccination campaign aimed at children 1 to 14 years of age, and in the 1995 follow-up campaign among children from 1 to 3 years old, indicates that at the state level overall coverage was 94.2% in 1992, and 85.2% in 1995. In 1992, coverage of the group aged 10 to 14 years was 85.2%. Measles vaccination through routine health services between 1992 and 1995 reached 90% of the children under 1 year of age.

It can be estimated that the number of susceptible individuals born after 1992, between those not vaccinated (5% to 10%) and those vaccinated but not immunized (also 5% to 10%), comes to approximately 10 to 15% of all children born (105,000 a year), or 40,000 to 60,000 children aged 1 to 4 years in 1996, many of whom may actually have been revaccinated during the follow-up campaign of 1995. Given the coverage levels attained in the 1992 campaign among the group aged 10 to 14 years, it is also estimated that as many as 75,000 adolescents between 14 and 20 years old in the state, may also be susceptible to measles.

The confirmed cases in São José County were noted in a poor peri-urban area. This led to a selective vaccination effort, in which children from 9 months to 14 years of age living in the area were found to be unvaccinated. In the municipality of Antônio Carlos selective vaccination efforts were undertaken after each report of a confirmed measles case. This included a review of immunization of the

Presenting Evidence and Sharing Best Practices for Elimination Initiatives

The best way to understand how a disease can be eliminated is to observe the actions of those who worked to eliminate it and read what they wrote about it. This compendium of rubella and congenital rubella syndrome (CRS) articles is a collection of articles on evidence and best practices in measles, rubella and CRS elimination, written by the health workers themselves. Since 1979, the EPI Newsletters—today known as the Immunization Newsletter—has published lessons learned, critical evaluation of the results achieved by the interventions and of the data obtained, and investigation findings. An essential aspect of the Immunization Newsletter is that it has allowed the dissemination of experiences to other countries and future generations. This is of prime importance because without being written about and disseminated, these experiences would have been in vain.

Over the fifteen-year period of the measles and rubella elimination process, while recommended strategies were implemented in a time of rapid and dramatic changes, all the countries had to be tuned in on the same frequency. It was an ever growing challenge in light of the cultural, religious, and social diversity in the Region, but the daily and steady advances of the disease elimination initiatives were a means to counter it. In addition, countries worked hand-in-hand in a show of Pan-Americanism: a close bond and a tight solidarity between a brotherhood of countries. The book provides a response to questions regarding development and implementation of strategies, alternatives considered, challenges, and results.

The importation of measles and rubella cases will continue to pose a threat to elimination programs. Although extraordinary efforts are underway, much more needs to be done. The countries of the other regions of the world conduct similar efforts. Today, as we reach the end of the 21st century, the feasibility of global measles elimination will continue to be discussed. It will only become possible if appropriate strategies are implemented. With this in mind, this publication will represent a precious source of knowledge for other regions.

We cannot write about disease elimination without mentioning the impact these initiatives have on renovating and strengthening primary health care. The need to achieve universal coverage in order to attain measles and rubella elimination contributes to the
**Measles Articles**

**Editorial Note:**
The outbreak in Santa Catarina is the largest that Brazil has experienced in over 4 years. In 1995, only 13 laboratory confirmed cases of measles were reported in Brazil. In 1996, prior to this outbreak, only 3 laboratory confirmed cases had been reported, two of which are believed to have been imported from Japan and Italy, respectively. In contrast, in 1997, the year prior to the outbreak, over 12,000 measles cases were reported in Brazil.

The initial information from the outbreak investigation suggests that important changes have occurred in the epidemiology of measles in Brazil. Until very recently, measles was circulating freely in Brazil and thousands of cases were reported each year. However, in the country, evidence of major measles outbreaks in many areas, with tens of thousands of cases, when the number of susceptible children accumulated to high levels. Most cases occurred among unvaccinated infants and preschool-aged children.

As a result of the implementation of PAHO’s measles eradication strategy, measles virus circulation appears to have been interrupted throughout Brazil. Indeed, prior to this outbreak, the last confirmed case of measles in Santa Catarina was reported in 1993.

While measles surveillance cannot be expected to detect every case of measles virus infection in Santa Catarina, in historical comparison, measles transmission does not appear to be extensive. Most cases in this outbreak are occurring among unvaccinated infants, adolescents and young adults. Preschool-age and school-aged children have largely been unaffected by this outbreak. This demonstrates the ability of measles virus to seek out susceptible individuals, even in areas with high vaccination coverage in children.

The source of the outbreak remains unknown, but the genomic analysis of measles virus isolated from the outbreak investigation suggests that measles virus may have been imported into Santa Catarina from Europe. This finding underscores the ability of measles virus to readily travel between continents and to cause outbreaks in areas that had previously interrupted measles virus circulation. The recent report of an outbreak in the Philippines is a cogent example of the danger that measles poses.

Since early January 1997, 59 children have died from measles in the Philippines, with most cases and deaths occurring in the Manila metropolitan area. All deaths occurred in infants and children 5 years of age and younger. Furthermore, over 1,000 children were hospitalized in the Manila area and about 200 children in other parts of the country due to complications of measles infection.

As long as measles virus is circulating anywhere in the world, Brazil and the other countries of the Americas remain at risk for importations of measles virus. The only effective way to totally prevent importations into measles-free countries will be to achieve the elimination of measles in the Americas. As other regions of the world learn from PAHO’s measles eradication experience, global measles eradication will increasingly be seen as an attainable goal.

500 students attending the local school. Few previously unvaccinated students were found. Selective vaccination was also conducted among the contacts of the subsequently reported and confirmed cases.

By taking advantage of the impetus of disease elimination initiatives, we can accelerate the health system’s transformation to a more efficient and less dependent on external assistance, while drawing on the principles of universal access, equity, and social justice.

This compendium of lessons learned and best practices seeks to promote the sharing of experiences between countries. It can provide an example to follow in other countries. It can provide an example to follow in other countries. It can provide an example to follow in other countries. It can provide an example to follow in other countries. It can provide an example to follow in other countries.

With the exception of an outbreak of measles in Hawaii, which was linked both by case

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**Measles in the United States, 1996**

As of December 30, 1996, local and state health departments had reported a provisional total of 488 confirmed cases of measles to the Centers for Disease Control and Prevention (CDC) for 1996, and the Commonwealth of Puerto Rico had reported eight cases (Figure 1). In addition, indigenous transmission of measles in the United States was interrupted for a prolonged period beginning in late 1996. This report summarizes measles surveillance data for 1996, which indicate that a substantial proportion of cases were associated with continued international importations of measles and outbreaks among school-aged children who were not required to receive a second dose of measles-containing vaccine (MCV) to attend school.

Of the 488 provisional cases, 355 (73%) were indigenous to the United States. International importations accounted for 47 (10%) cases of measles, and an additional 86 (18%) cases were epidemiologically linked to imported cases.

Importations originated from 12 countries; all three individuals who had traveled in Germany (seven cases); Greece and Japan (five each); Austria, India, and Philippines (three each); China, Italy, and Russia (two each); and England, Kenya, Liberia, Nepal, Somalia, Tahiti, and Turkey (one each). For eight of the imported cases, the exact source was unknown, because the patient had traveled in more than one country outside the United States during the exposure period. None of the imported cases were acquired in countries in the Americas.

**Age and Vaccination Status**

Of the 465 measles patients for whom age was known, 177 (26%) were aged less than 5 years, including 37 (8%) aged less than 12 months and 25 (5%) aged 12-15 months. A total of 195 (42%) measles patients were aged 5-14 years, and 163 (33%) were aged greater than or equal to 20 years. Vaccination status was reported for 354 patients (Figure 1). Of the 226 (64%) of the total cases who were not vaccinated, 170 (75%) were eligible to be vaccinated (i.e., aged greater than 12 months and born after 1956). Vaccination status varied by age group; all 32 patients less than 1 year were unvaccinated, compared with 44 (21%) of 202 patients aged 1-4 years, 65 (44%) of 136 patients aged 5-19 years, and 85 (69%) of 124 patients aged greater than or equal to 20 years.

**Outbreaks**

Twenty-three outbreaks (i.e., clusters of three or more epidemiologically linked cases) were reported by 15 states, accounting for 76% of all cases. The number of cases associated with outbreaks ranged from three to 181 (mean: 62 cases). Transmission of measles occurred in school settings in 11 of these outbreaks, and 18 outbreaks accounted for 55% of all cases reported in 1996. In four outbreaks (Alaska, Texas, Utah, and Washington), cases among school-aged children occurred primarily in those who had received only one dose of MCV; in two other outbreaks (Massachusetts and Minnesota), cases occurred among school-aged children who had religious or philosophical exemptions to vaccination. In Hawaii, an outbreak occurred in a college without vaccination requirement.

The source case for six outbreaks (California, Hawaii, Massachusetts, New York, Pennsylvania, and Washington) was traced to an international importation. Genomic sequences from measles virus isolates from four outbreaks without an identified source case (Alaska, Massachusetts [different from the outbreak listed above in Massachusetts], Minnesota, and Washington) were similar to sequences from viruses that were identified as importations from Europe and Southeast Asia. This suggests that an additional 20% (44%) of the 488 provisional cases reported in 1996 were related to international importations.

**FIGURE 2**

Age distribution and vaccination status of reported measles cases, United States, 1996.*

* Percent unvaccinated among cases with known vaccination status.
The occurrence of measles in persons with histories of measles vaccination is not unexpected. Measles vaccine effectiveness is less than 100%, meaning that 5-10% of persons do not become immune to measles following vaccination. During a measles outbreak, susceptible, vaccinated persons may be exposed to the virus and develop measles. However, the risk of measles in a vaccinated person is clearly lower compared to that of the unvaccinated.

Analysis of data obtained from classic epidemiologic investigations, combined with information obtained from molecular epidemiology of isolated measles virus from reported measles cases suggest that importations may have been responsible for nearly 70% of the reported measles cases in the United States during 1996. The majority of imported cases appear to have originated from Europe and Asia.

None of the imported cases originated in the Region of the Americas. It has been over 2 years since the last measles case was imported from Latin America or the Caribbean into the United States. This provides further indirect confirmation of the remarkable progress the countries of the Americas are making towards achieving the goal of measles eradication by the year 2000.

To combat the occurrence of measles outbreaks among school-aged children in 1988, the United States adopted a routine two-dose measles vaccine vaccination schedule. During 1996, states which had not fully implemented this policy among all age cohorts of school-aged children were at greater risk for measles than those states which have assured that all school-aged children are vaccinated with two doses of measles-containing vaccine. The full implementation of this vaccination schedule is expected to greatly reduce the number of school-aged children with measles.

However, a two-dose measles policy is not an appropriate vaccination strategy for all countries. Unless nearly universal coverage can be obtained with the first dose of measles vaccine, the addition of a second dose will provide little benefit in preventing measles outbreaks. Indeed, most persons who receive a second dose of measles vaccine are already immune to measles, while the overwhelming majority of unvaccinated children are susceptible to measles and would be protected after receiving a single dose.

Nearly 40% of total reported measles cases occurred among school-aged children (5-19 years of age). Of these, 52% were unvaccinated, many due to philosophical or religious objections to vaccination. The remaining cases among school-aged children were among vaccinated persons.

Immunization and molecular epidemiology to international transmission of measles virus, indigenous transmission of measles in the United States appears to have been interrupted in late 1996. From October 16, 1996, to February 10, 1997 (16 weeks), only one case of measles (with rash onset on December 16) not linked to an international importation was reported in the United States. An indigenous case with rash onset in February is still under investigation.

Reported by: State and local health departments, Measles Virus Section, Respiratory and Enteric Virus Surveillance System, Div. of Viral and Rickettsial Diseases, National Center for Infectious Diseases; Child Viral Diseases Section, Measles, Mumps, and Rubella Branch, Div. of Viral and Rickettsial Diseases, National Immunization Program, CDC.

Source: MMWR 46(11); 242-246; March 21, 1997.

### Editorial Note:

Similar to other countries in the Region, in 1996 the United States experienced a low level of measles virus circulation, and reported the third lowest total number of measles cases in the history of measles surveillance. Indeed, the 488 provisional cases reported in 1996 represent a 98% reduction compared to the nearly 20,000 cases reported in 1995 during the last major outbreak of measles in the United States. However, measles outbreaks continue to occur.

Of the total cases reported with known vaccination status in the United States during 1996, 64% occurred in unvaccinated individuals. Seventy-five percent of the unvaccinated cases were in the target age-group for measles vaccination, and of the cases occurring in preschool-aged children (1-4 years of age), 71% were unvaccinated. These data reinforce the fact that unvaccinated persons are always at highest risk for contracting measles. The high infectivity of measles allows the virus to seek out susceptible hosts, even in populations with high vaccination coverage.

Nearly 40% of total reported measles cases occurred among school-aged children (5-19 years of age). Of these, 52% were unvaccinated, many due to philosophical or religious objections to vaccination. The remaining cases among school-aged children were among vaccinated persons.

Several outbreaks of measles have recently been reported in the Americas. On November 9, 1996, the Pan American Health Organization (PAHO) and the World Health Organization (WHO) recommended catch-up vaccination campaigns to assure high measles immunity among school-aged children. These vaccination activities have resulted in a substantial reduction in the circulation of measles virus in all countries of the Region, and a subsequent increase in the average age of infection. In the Americas, measles outbreaks now occur principally among older children, adolescents, and young adults who have not been targeted for measles vaccination, yet too late to have been exposed to circulating measles virus. Many of these outbreaks can be traced to importations.

The high transmissibility of measles virus allows it to infect susceptible persons, even in areas with high measles population immunity. Measles outbreaks suggest that there may be many adolescents and young adults in the Region who remain susceptible to measles. Increased efforts are needed to assure measles immunity in these groups, especially those working or residing in high-risk environments, including secondary schools, colleges and health care settings.

There have been no known cases among individuals immunized during last year’s second dose catch-up measles campaign. The source of the outbreak is unknown, and molecular analysis of isolated measles virus is pending.

### April 1997

**EPI Newsletter**

**Update: Recent Measles Outbreaks in the Americas**

Several outbreaks of measles have recently been reported in the Americas. The outbreaks provide further evidence on the changing epidemiology of measles in the Americas. In the pre-vaccine era, measles primarily affected infants and preschool-aged children. Measles outbreaks would occur every 2-3 years, when the number of accumulated susceptible children was sufficient to sustain measles transmission.

As recommended by PAHO, most countries in the Region have conducted catch-up vaccination campaigns to assure high measles immunity among school-aged children. These vaccination activities have resulted in a substantial reduction in the circulation of measles virus in all countries of the Region, and a subsequent increase in the average age of infection. In the Americas, measles outbreaks now occur principally among older children, adolescents, and young adults who have not been targeted for measles vaccination, yet too late to have been exposed to circulating measles virus. Many of these outbreaks can be traced to importations.

The high transmissibility of measles virus allows it to infect susceptible persons, even in areas with high measles population immunity. Measles outbreaks suggest that there may be many adolescents and young adults in the Region who remain susceptible to measles. Increased efforts are needed to assure measles immunity in these groups, especially those working or residing in high-risk environments, including secondary schools, colleges and health care settings.

The source of the outbreak is unknown, and molecular analysis of isolated measles virus is pending.
**Measles Articles**

The Pan American Health Organization reported 2,296 cases of Guillain-Barré Syndrome (GBS) among health care workers in January, during the first week of the university-wide campaign. Attempts are being made to vaccinate all people attending other post-secondary institutions in the state of São Paulo and to assure measles immunity among health care workers.

**Background.** Measles is caused by a paramyxovirus, which is highly contagious and can cause severe neurological complications, including GBS. GBS is a syndrome characterized by ascending paralysis and is thought to be an autoimmune reaction to the measles virus.

**Methods**

We analyzed data on 2,296 cases of GBS reported to the Pan American Health Organization as cases of suspected polyneuropathies. These cases occurred among 73 million immunized children aged 9 months to 15 years in Argentina, Brazil, Chile, and Colombia, between January, 1990, and December, 1994. These children were targeted for mass measles vaccination campaigns (each lasting 1 month) in 1992 and 1993. The frequency of GBS cases observed during the vaccination campaigns or the next 42 days (the latent period) was compared with that during the rest of the study period, with the assumption of a Poisson distribution.

**Findings**

The average annual incidence of GBS was 0.62 per 100,000 children aged 1-14 years. The number of cases that would be expected within any 2-day period would therefore be 92. The average observed number of cases during the latent periods after measles vaccination was 97. The probability that 97 or more cases would occur during a period with an expected number of 92 was 0.31.

**Interpretation**

The average annual rates of GBS by age-group for the 5 years analyzed were consistent with previous data; thus we believe that the surveillance system is sufficiently sensitive. There was no statistically significant association between measles vaccination and GBS. If there is any causal relationship, the number of GBS cases due to measles vaccination was so small that data from the vaccination of more than 70 million children were not sufficient to detect a rise in the number of observed GBS cases beyond the expected number.

**Sources:**

- Dr. Max Theodoul, DNDI, and Dr. Regis Goursaud, Institut Pasteur de Guadeloupe.
- Dr. Jean-Guillaume, Institut Pasteur de Guadeloupe.
- Division of Immunization, BID, RCDC, Canada.

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**Editorial Note:**

After a virtual absence of about 6 years, measles virus is again circulating in São Paulo. This is among the largest outbreaks in recent years in the Americas. Although difficult to predict, this outbreak may approach or surpass the 1988 measles outbreak, when nearly 2,000 cases were reported in São Paulo state.

**Commentary:**

Contributing factors for this outbreak include: insufficient population immunity in children 1-4 years of age due to an inappropriate vaccination schedule; the presence of large numbers of susceptible young adults, high population density and introduction of measles virus.

As discussed previously, a two-dose vaccination strategy is not sufficient to eradicate measles, especially when the vaccination coverage is less than 100% for both doses and population density is high. Moreover, the reported vaccination coverage data in São Paulo appear to have grossly overestimated true coverage, due to an underestimation of the population size.

There are approximately 400,000 measles susceptible children 1-4 years of age in Greater São Paulo. The group may be fueling measles transmission among infants <1 year of age and susceptible young adults.

According to the PDAM measles eradication strategy, a follow-up measles vaccination campaign should be conducted when the number of susceptible preschool-aged children approaches one birth cohort. Therefore, a follow-up campaign should have been conducted among children 9 months through 4 years of age in 1995. This was not done in São Paulo.

Such a campaign could have prevented this outbreak, or at the least, would have greatly reduced the number of susceptible preschool-aged children and would likely reduce the probability of experiencing so large an outbreak.

In addition to susceptible, preschool-aged children, there is apparently a large number of susceptible young adults living in São Paulo. These are persons who are both unvaccinated and have never experienced measles infection. Many of these persons are in the age-group which was targeted for vaccination during the 1987 mass vaccination campaign. A working hypothesis is that the outbreak is occurring primarily among unvaccinated young adults who have recently migrated to São Paulo from other parts of the country. This hypothesis is currently being investigated.

Outbreak prevention is always preferable to outbreak response. Measles outbreak control is very difficult, if not impossible, especially when measles virus is circulating widely. Measles virus spreads far faster than out-of-school vaccination activities. Therefore, the planned selective vaccination campaign is unlikely to have any major impact on measles virus circulation in São Paulo. A follow-up campaign targeting all children 6 months to 15 years of age would seem more appropriate under the present circumstances. Further updates of this important outbreak will be included in future issues of the EPI Newsletter.
Rubal Watch EPI Newsletter

Pan American Health Organization

Secretariat of Health. Of the reported cases, 383 (46.3%) cases have been laboratory confirmed, 127 (15.0%) have been discarded after laboratory testing, and 336 (47.7%) remain under investigation.

There has been a major increase in reported suspected measles cases during the months since March, 1997. In May, nearly 400 suspected measles cases were reported. The Greater São Paulo metropolitan area has been primarily affected by this outbreak. The highest measles incidence rates have been reported in the municipality of São Paulo and the surrounding areas of Greater São Paulo. Few cases have been reported from other parts of the state.

Confirmed measles cases have ranged in age from 2 months to 44 years of age. Over half of the reported cases have been among persons 20-29 years of age (born between the years 1966 and 1978) and 38% have been in children under 1 year of age. Highest age-specific attack rates are in infants <1 year of age, followed by adults 20-29 years of age and children 1-4 years of age. The majority of the young adults were born between the years of 1964 and 1978. Unvaccinated infants and young adults appear to be at highest risk for measles infection.

Transmission has been documented in medical settings. Several young adult health care workers have been confirmed with measles. Transmission has occurred from health care workers to patients and from patients to health care workers.

Measles virus has been isolated from clinical specimens collected from several measles cases by the Instituto Adolfo Lutz. Genetic analysis of these isolates will be performed at the measles laboratory of the Centers for Disease Control and Prevention in Atlanta, Georgia, USA. This information may provide important clues as to the source of the virus which is causing the São Paulo outbreak.

After reviewing available data, an advisory panel organized by the Secretariat of Health has recommended that a "selective" measles vaccination campaign be conducted among children 9 months through 4 years of age to stop the outbreak. This campaign was scheduled to begin on 21 June 1997.

Source: São Paulo State Secretariat of Health, Division of Epidemiology; Instituto Adolfo Lutz, Department of Virology.

June 1997

Volume XIX, Number 3

Natural Gas Company Supports Measles

In Haiti, as in the rest of the Hemisphere, the measles eradication initiative requires partnerships at all levels of society.

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Natural Gas Company Supports Measles

The decision to eradicate measles is the best example of the degree of political commitment achieved in the Americas by the polio eradication campaign. Based on the successful experiences in Cuba and the countries of the English-speaking Caribbean in interrupting measles virus circulation, the Ministers of Health of the Americas adopted a resolution during the XXIV Pan American Sanitary Conference in 1994, calling for the eradication of measles transmission from the Western Hemisphere by the year 2000.

Measles transmission has already been interrupted in major portions of the Americas. As recently as 1990, there were over 240,000 reported cases of measles in the Americas. By 1995, the number of confirmed cases had gone down to 6,489 and to 2,109 in 1996. The vaccination strategies recommended by PAHO in the Americas are being considered by several countries in Africa and Asia, where measles continues to be a considerable health burden.

The many health challenges today call for heightened collaboration. Increased international travel is bringing everybody closer to infectious diseases in distant places, and these diseases pay little attention to borders separating one country from another. In the years to come, PAHO will continue playing a catalytic and critical role in the Americas to ensure the sustainable and equitable delivery of national immunization programs. The breakthroughs obtained in the Americas in the field of vaccine-preventable diseases throughout the 20th century, particularly in the last two decades, have given the world a definitive clue of what it takes to make things happen, and what can be achieved in the 21st century.

PAHO’s intensified vaccination strategy is effectively protecting children in the 1-15 year age range. In the Americas, measles outbreaks now occur primarily among older children, adolescents and young adults. These persons were often born too early for routine measles vaccination, but too late to have been exposed to circulating measles virus.

Efforts are underway to further strengthen national information systems, and to provide support for the reporting of measles surveillance data that will allow for better targeting of measles vaccination in high-risk groups. PAHO has developed a comprehensive methodology for evaluating the capacity of national surveillance systems to detect measles cases. Measures have also been taken to improve laboratory testing of suspected cases. The Regional Measles Laboratory Network supported by PAHO is collaborating with national laboratories in conducting trials that will determine the most effective measles confirmation test.

What is Needed to Eradicate Measles?

Despite the progress achieved in the Americas toward the goal of measles eradication, the virus still circulates freely in other parts of the world and the risk of importations remains. This is a particularly dangerous situation since many children and young adults remain susceptible to measles in almost every country in the Americas. The latest measles outbreaks in the states of São Paulo and Santa Catarina, Brazil and in British Columbia, Canada are a reminder of the ability of measles virus to seek out susceptible individuals in areas which have achieved and maintained high levels of immunization and protection to these outbreaks. São Paulo had reported very few cases during the previous six years, and Santa Catarina had been free of measles for three years (in 1995, 1996, and April and June 1997 issues).

The current initiative to eradicate measles will require that countries in the Americas take a pro-active approach by maintaining high levels of immunity in preschool children, and by further enhancing the capacity of the surveillance system to detect all suspected measles cases. As recommended by PAHO’s measles eradication strategy, follow-up campaigns should be...
Measles Eradication

Substantial progress has been made towards achieving the goal of measles eradication in the Americas. Transmission has been interrupted in many countries of the Region. The PAHO vaccination strategy for measles contains ‘keep-up’ and ‘follow-up’, where fully implemented, has proven to be highly effective. However, TAG pointed out that low levels of incidence can lead to a false sense of security. In the absence of measles transmission, susceptibles accumulate in a community, as a result of failure to vaccinate all children and because primary vaccination does not protect 5 to 10% of those vaccinated. These susceptibles can sustain transmission. Vaccination efforts will require ongoing efforts to minimize susceptibility using the complete strategy.

The measles eradication effort is not a local or even a national campaign but a hemisphere-wide program which can only be as strong as its weakest component. This is true on a global scale as well because many cases in this Region have been linked either epidemiologically or virologically to importations from outside this hemisphere. Thus, better worldwide measles control is important to the continued success of measles eradication in the Americas.

Recommendations

General
• The occurrence of epidemic measles in a major urban area poses, by far, the most serious threat to the overall program because of the possibility of widespread disease dissemination. Accordingly, it is important that program success in all urban areas (population of ≥ >10,000) be monitored on an ongoing basis by national authorities and reported to PAHO.

Vaccination Strategies
• Routine vaccination of infants (keep-up vaccination) is a critical component of the PAHO measles eradication strategy.

• To maintain high population immunity among preschool-aged children, follow-up vaccination campaigns should be conducted whenever the estimated number of susceptible children 1-4 years of age approaches the number of children in one birth cohort.

Surveillance and Laboratory
• Each country should periodically evaluate the quality of its surveillance system. PAHO has developed a protocol for rapid evaluation of surveillance systems which should be disseminated to all countries of the Region. A plan should be made for these evaluations in all countries as soon as possible.

• Laboratory confirmation is an essential part of the regional measles surveillance system. A single serum specimen collected at first contact with the health care system is sufficient for confirming measles.

Virologic surveillance is important. Clinical specimens for viral isolation should be obtained from every case of transmission. Urine, the most practical specimen to collect, should be obtained within 7 days of rash onset and forwarded to a laboratory to be properly processed.

Outbreak Response
• Countries should not implement indiscriminate campaigns to vaccinate all adults against measles. Most adults are likely to be immune and achieving significantly higher levels of coverage among adults is extremely difficult. However, where surveillance has identified specific risk groups for measles among adults, such as university students, health care workers, or others, targeted vaccination efforts may be useful.

Management Indicators
The following indicators are essential for monitoring the performance of the program:

Notifications:
• 28% of reporting sites report on a weekly basis the presence or absence of suspected measles cases.
• 28% of reporting sites report at least one suspected measles case per year.

Investigation:
• 28% of suspected measles cases are investigated within 48 hours of report.
• 28% of suspected measles cases have a blood specimen collected if there is not an epidemiological link to a laboratory confirmed measles case.
• 28% of measles chains of transmission have an identified source of infection.

Laboratory:
• 28% of specimens with results within 7 days of receipt in laboratory.

The successful completion of the global polio initiative will facilitate further progress towards measles elimination. There was consensus that polio eradication and measles elimination activities can be mutually reinforcing and represent a natural joining of efforts. However, participants highlighted that while the global efforts to eradicate polio are progressing well, much remains to be done, particularly in the Indian sub-continent and Africa. While it is important to start planning for regional elimination of measles and ultimate eradication before the polio goal is completed, new measles activities should not jeopardize progress toward polio eradication. It will be important to initiate programs to interrupt transmission early in some of the most difficult countries in Africa, to determine the most effective strategies in these settings and demonstrate what can be done.

Sustaining interruption of measles transmission is difficult and expensive. As increasing areas of the world achieve elimination, participants agreed that the goal of global measles eradication be set and achieved in a short period of time. This will require close and effective partnerships between official agencies, private and voluntary sectors, and external donors as it was done in the Americas during the polio eradication years. A major hurdle to further improve control in areas that have not obtained the greatest case reductions.

FIGURE 1 Global annual reported vaccine coverage and measles cases, 1974-1996.

Source: WHO/HEPI Information System

NOTE: A decision to eradicate measles worldwide will have a tremendous impact on infant morbidity and mortality. Despite the availability of an effective vaccine, measles continues to cause 42 million cases, and nearly 1 million deaths per year worldwide. Global coverage with measles vaccine is estimated at 79%. Most measles deaths occur among children under five years of age living in developing countries, particularly in Africa. This is because many children remain unimmunized, particularly in poor urban areas where the case fatality is highest. The disease thrives in cities, in poor urban areas where crowding, poor sanitation and low measles vaccination coverage ensure ongoing circulation of the virus. Participants at the Atlanta meeting agreed it would be important to support urban immunization strategies to control measles in low income countries with high population density, with special emphasis on populations that have not yet been reached.

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such as the Americas and the United Kingdom, is the ongoing circulation of measles virus in other parts of the world. While the reported incidence rate in the Americas was only 0.7 cases per 100,000 population in 1995, the reported rates in other regions were much higher. For example, the rate in Taiwan was 83 times greater than the rate in the Americas, and the rate in Europe and the Western Pacific region was 13 to 10 times greater, respectively.

For sustainable impact, there was consensus that it would be important to continue strengthening the primary health care system and EPI in developing countries to achieve and maintain acceptable levels of measles control. Measles elimination is already underway in many areas but global eradication will most likely pose a number of additional challenges. Elimination activities must be integrated within primary health care to ensure the maintenance of progress and to pave the way for future eradication initiatives.

Next Steps
Programmatic and financial obstacles must be overcome if eradication is to be achieved and strategies will need to be adjusted based on accumulating experience. Competing priorities may create difficulties in raising political commitment to eradicate measles. Many of the poorest countries will require substantial external support. The amount of additional backing needed should be estimated soon to enable appropriate planning.

Key to rally political support for global measles eradication will be the availability of estimates of the overall cost of a global campaign. It will also be important to consider the marginal and opportunity costs of undertaking elimination or eradication. So far, different approaches have been taken to assess the economic costs, benefits and effectiveness of measles control/elimination and eradication efforts. They all show that measles control is highly cost-effective and that improvements in control are also highly cost-effective and may be cost-saving in some countries. Greater agreement on appropriate approaches to economic analysis would be useful, particularly with respect to eradication.

Measles eradication can convey two lasting benefits. The first, absence of measles disease (and the need for measles immunization), is obvious and indisputable. The second, permanent contribution to the development of health services, is a potential benefit which requires specific attention to maximize the benefits that can accrue to the overall health system from eradication efforts. Specific benchmarks should be developed to monitor interaction of eradication efforts and primary health care management.

Once countries progress from control to elimination goals, surveillance strategies need to be further developed and implemented to allow assessment at the most peripheral level. Based on the experience in the Americas, participants representing developed and developing countries stressed the need to implement the recommended vaccination strategies for measles eradication in full throughout a country or region. PMNs’ vaccination strategy for measles eradication, which has been adopted in most countries in the region, consists of a routine mass vaccination campaign of all children 1-14 years of age, high coverage through routine vaccination of 1 year olds and periodic follow-up vaccination to reduce the accumulation of susceptible infants and children 1-4 years of age.

October 1997
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Measles Update
As of week 40 (October 4, 1997), a total of 48,118 suspected measles cases have been reported to the Brazilian Ministry of Health. Of these, 39,929 were reported in the states of São Paulo, which with a population of approximately 34 million is the most densely populated state of the country. So far, 12,343 cases have been confirmed, most of them by laboratory testing, with a positive finding of IgM in blood samples.

Only two states (Acre and Roraima) have not reported confirmed cases of measles. The incidence rate by 100,000 population is highest in São Paulo (28.2), second and third are Brasília, the Federal Capital, and the state of Ceará (see Figure 3). Several municipalities with borders with Pará, Amapá, and Roraima have confirmed cases of measles virus and include P. Velho in the state of Rondônia (12 cases), three municipalities in the state of Pará (70 cases), four municipalities in the state of Santa Catarina (20 cases) and one municipality in the state of Rio Grande do Sul (1 case). The most notable international transmission can be observed between the border cities of Foz do Iguaçu in Brazil and Ciudad del Este, Paraguay, with more than 90 cases. This area attracts many tourists because of the Iguazu waterfalls and there is also high commercial activity between the two countries.

In the current outbreak, infants and persons between 20 and 29 years of age have been the most vulnerable. Their respective attack rates are 45.3 and 19.3 per 100,000 persons. The attack rate among the group of 1 to 4 years of age was 5.5 per 100,000 persons. The highest number of patients (5,451) are between the ages of 20 and 29 years of age. The above mentioned age group consists of those who were born too early for routine vaccination, but too late to have been exposed to circulating measles virus. The groups between 1 and 20 years old who have benefited from vaccination present the lowest attack rate in this outbreak.

In the state of São Paulo a campaign aimed at children under the age of 5 was organized in August. 100% of children in that age group, regardless of previous vaccination status, were vaccinated. A preliminary analysis has shown that the number of confirmed cases from São Paulo has dropped from approximately 700 cases per day in August before the campaign, to approximately 50 cases per day. At the national level, a campaign was held on October 25, during which most children under 5 years of age were vaccinated against poliomyelitis and measles.

October 1997
Volume XIX, Number 5
First Ladies United Against Measles
The First Ladies of the Americas and designated representatives held their Seventh Conference of the Americas with Human Rights First Ladies United in September. At the national and international level, major obstacles for the achievement of this goal are:

- Insufficient dissemination and promotion of the Plan of Action for Measles Eradication at the national/ municipal level.
- Insufficient resources to achieve the measles eradication goal.
- Insufficient vaccination coverage <90%.
- Inadequate logistical support for investigating all suspected measles cases.
- Limited participation of the private sector and non-governmental organizations in reporting suspected measles cases.

December 1997
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Measles in the Americas, 1997
Following an all-time record Regional low in the Americas of 2,109 confirmed measles cases in 1996, there has been a resurgence of the disease in 1997 in Brazil (Figure 1). Through 29 November 1997, a total of 75,236 suspected measles cases were reported from the countries of the Americas. Of these, 26,950 (35.8%) have been confirmed, 24,527 (32.6%) have been discarded, and 23,080 (30.6%) remain under investigation. Of the total confirmed cases, 26,508 (98.3%) have laboratory confirmation of measles infection or epidemiological linkage to a laboratory confirmed case, and 442 (1.6%) have been confirmed on clinical grounds alone. Together, Brazil (25,900 confirmed cases) and Canada (577 confirmed cases) accounted for 98.2% of the total confirmed cases in the Region.

Two municipalities in the state of Paraná (70 cases), Velho in the state of Rondonia (577 confirmed cases) accounted for 98.2% of the total confirmed cases in the Region.

The First Ladies recognized the valuable participation and contribution of international organizations and financial institutions stating that they have “supported our endeavors and are making possible the execution of projects and programs that serve the most needy and vulnerable sectors of our societies.”

The support of the First Ladies will be critical to provide greater dissemination of the measles eradication initiative at the national and international level.
Measles Articles

has had no cases for the last 18 weeks. Other countries reporting measles cases include: Guatemala (128 cases), the United States (127 cases), Paraguay (124 cases), Argentina (100 cases), and Costa Rica (14 cases).

The majority of cases from Brazil have been reported from São Paulo State, the only state in the country, which did not conduct a follow-up vaccination campaign in 1995. To date, over 20,000 cases have been confirmed in this outbreak, with most cases in the city of São Paulo. Over 50% of cases have occurred in young adults 20–29 years of age. The highest age-specific incidence rates are in infants, young adults 20 to 29 years of age, and children 1–4 years of age, respectively. To date, over twenty-five measles-related deaths have been reported, most in infants less than 1 year of age.

An investigation of measles cases in adults found that the majority were occurring among young adults who were members of certain risk-groups including men who recently returned to cities from rural areas in the Northeast of the country to work in construction projects and other manual labor, students, health care workers, persons working in the tourist industry, and military recruits.

Measles virus has been isolated from several patients from this outbreak at the measles laboratory of the Adulte Late Institute in São Paulo. Genomic sequencing of these isolates conducted at the Centers for Disease Control and Prevention (CDC) Atlanta, USA, revealed the virus circulating in São Paulo is virtually identical to virus currently circulating in Western Europe. Although an index imported measles case has not been identified, the molecular epidemiology data strongly suggest that the virus responsible for the São Paulo outbreak was imported from Europe.

The São Paulo outbreak is seen as an example of the importance of ongoing surveillance, which a follow-up campaign targeting all 1–4 years-old, selective mop-up vaccination in schools and vaccination of young-adult groups of high-risk for measles.

Measles virus has spread from São Paulo to nearby municipalities in the state of São Paulo. States most affected include: Rio de Janeiro, São Paulo, Minas Gerais, Bahia, Pernambuco, and Parana, Grande do Sul do, Matto Grosso do Sul, and the Federal District (Brasilia). Moreover, spread has been reported from several other countries in the Region, including Paraguay, Chile, Argentina, Peru, Costa Rica, and the United States.

A total of 577 confirmed measles cases were reported from Canada, a 1995 outbreak with over 300 cases occurred primarily among young adults affiliated with Simon Fraser University, near Vancouver. This outbreak came somewhat as a surprise since the province of British Columbia had just completed its school catch-up campaign in 1994. Genomic analysis of measles virus obtained from this outbreak performed at the Laboratory Centre for Disease Control suggests that measles virus was imported from Europe.

Measles virus from the British Columbia outbreak spread to school-aged children in Alberta, where 245 cases were reported. Other sporadic cases or small clusters have occurred in various Canadian provinces, mostly among adults due to importations. Since 1996, a total of 17 suspected measles cases were documented in Canada. No data from Europe and Asia. Since the end of July 1997, however, not a single measles case has been detected and transmission appears to have been interrupted in Canada.

To date, 127 confirmed measles cases have been reported during 1997 in the United States. This is the lowest number of cases every reported in the United States, and is well below the projected low incidence of 309 cases in 1996. In the absence of confirmed cases, imported cases are documented. Spread from importations has been limited and the largest outbreak has been in Canada. In 1995 and 1996, there were no measles importations from Latin America or the Caribbean. In 1997, however, there were 5 confirmed imported cases from Brazil.

Between October 1996 and May 1997, a large measles outbreak occurred in the French Leeward Islands. This island had not implemented PAHO’s recommended measles eradication strategy. A total of 28 confirmed measles cases were reported. The majority of cases occurred in unvaccinated persons 12 to 18 years of age. The source of the outbreak is thought to be an unvaccinated

Editorial Note:
While the resurgence of measles in the Americas during 1997 represents a major increase compared to cases reported in 1996, these cases represent only about 10% of cases reported in 1990. Nevertheless, important lessons can be learned from this experience which can be used to “fine-tune” the Region’s measles eradication strategy and to assure its full implementation in all countries. The outbreak in Brazil can be considered a wake-up call to the countries of this Hemisphere to demonstrate that the absence of measles virus circulation does not mean absence of risk from measles infection.

Several factors combined to create conditions which facilitated widespread measles transmission in Brazil. First, the lack of a timely follow-up vaccination campaign in 1995 for children aged 1 to 4, combined with low routine vaccination coverage [keep-up] among infants using a two- dose schedule allowed for a rapid and dangerous accumulation of susceptible children. Second, the presence of large numbers of young adults who, for a variety of reasons, escaped both natural measles infection and measles vaccination increased the risk of a measles outbreak. Third, measles virus was imported into São Paulo, probably from Europe, the high population density of the city facilitated contact between persons infected with measles and susceptible persons.

Measles case surveillance data, combined with molecular epidemiologic information provided by PAHO’s measles laboratory network, suggest that the countries of the Americas are constantly being challenged by imported measles virus from other regions of the world where measles remains endemic. During 1997, 23 separate importations of measles virus were detected from Europe, 17 from Asia and Africa (Figure 2) that resulted in measles transmission. These data, however, probably seriously underestimate the true number of measles importations since many import cases may not seek medical care and do not report their measles transmission.

In addition to the challenge of imported measles virus, the outbreaks in Brazil, Canada and other countries of the Region suggest that there may be a significant number of young adults who remain susceptible to the disease. While the measles experience of 1997, clearly demonstrated that certain institutional settings, such as military barracks, health care facilities, large factories and prisons can facilitate measles transmission, if measles virus is introduced to such populations. The close contact among persons in these settings increases the risk that an unvaccinated person can become infected with the measles virus. In fact, numerous measles outbreaks among adolescents and young adults have been documented in these settings, even in institutions with high measles vaccination coverage. In addition to persons living or working in these settings, adolescents and young adults who travel to countries with endemic measles transmission are at increased risk for being exposed to and contracting measles.

To prevent the occurrence of measles outbreaks among adolescents and young adults, efforts are needed to assure measles immunity in groups potentially at high risk for measles. These include college and university students and professors, health care workers, military personnel, young adults working in large factories, young adults residing in institutions such as prisons and long-term care facilities, and persons traveling to measles endemic countries.

Vaccination of adolescents and young adults entering such facilities should be routine and ongoing and should take place before persons begin working or living in these high risk settings. Measles catch-up vaccination activities may be considered for adolescents and young adults already in such settings who are planning to travel to parts of the world where measles virus continues to circulate should be advised to be vaccinated before departing. These measures will enhance immunity levels in such population groups and help prevent measles outbreaks in these settings, should the virus be introduced.

The measles experience of 1997 clearly demonstrates that there are two major challenges to the Region’s measles eradication goal by the year 2000. First, the countries of the Americas need to keep up their guard by maintaining the highest population immunity possible in children. Second, vaccination of adolescents and young adults who are at highest risk for being exposed to measles virus, and thus need to be assured measles immunity in all countries of the Americas. As long as measles virus circulates anywhere in the world, the Americas will remain at risk for measles outbreaks. Almost certainly, additional support for the eradication of the measles eradication program will require full implementation of PAHO’s recommended vaccination strategy in all countries of the Region and improved measles control/elimination in other regions of the world, especially in Africa and Asia. As a result, previously, the only way for the Americas to assure regional measles eradication will be through the ultimate global eradication of measles virus.
Measles Eradication

The English-speaking Caribbean still holds the longest record in the Western Hemisphere of six years without indigenous measles transmission. Two recent importations into the Bahamas and Trinidad and Tobago stressed the danger of importations and the need for adherence to PAHO's measles eradication strategy, particularly the maintenance of high levels of immunization coverage and prompt implementation of follow-up campaigns. A large outbreak in Guadeloupe in late 1996, illustrates the vulnerability of the countries to measles transmission if the strategy is not fully implemented.

The measles laboratory at the Caribbean Epidemiology Center (CAREC) provides confirmation for suspected measles cases (Figure 1). The laboratory is able to test for IgM antibodies for measles, rubella, and dengue infections. Through week 44 of 1997, a total of 847 specimens had been submitted for laboratory confirmation. Of these, 2 (0.2%) were positive for measles, 7 (0.8%) were positive for rubella and 11 (1.3%) were positive for dengue. All specimens were tested and reported back to countries within seven days of receipt.

Recommendations
• MR or MMR are the vaccines of choice for measles and rubella elimination.
• Countries that are instituting a two-dose schedule should be aware that even with such a regimen, susceptibles will accumulate because coverage with two doses will never achieve 100% and some children will remain unvaccinated. Follow-up campaigns are required to maintain interruption of transmission.
• To maintain the English-speaking Caribbean and Suriname free of measles, high vaccination coverage must be maintained. Efforts need to be made to ensure that at least 95% of each birth cohort is vaccinated with measles-containing vaccine at 12 months of age.
• The possibility of combining measles and rubella surveillance should be explored.
• To prevent the accumulation of susceptible preschool-aged children from reaching dangerous levels, follow-up campaigns should be conducted among children 1-4 years every 4 years. Countries should plan on conducting follow-up campaigns in the year 2000.
• The field experience suggests that certain young adults may be at risk for measles. Efforts are needed to assure measles vaccination in young adults in high-risk groups, which include students, migrant workers, health care workers and the military.
• As long as measles circulates anywhere in the world, the English-speaking Caribbean will be at risk for measles importations. Measles surveillance systems need to detect these importations in a timely manner and respond accordingly when they occur.

importation of Measles to Costa Rica

from July through October of 1997, Costa Rica experienced a measles outbreak with a total of 12 laboratory-confirmed cases of measles. Ten clinically-confirmed measles cases were reported for the entire year. The following article summarizes the findings of the team that investigated the outbreak.

The measles elimination initiative was launched in Costa Rica in 1993, but only 75% vaccination coverage was achieved in children under 15 years of age during the attack phase (catch-up campaign). Since 1995, selective vaccination campaigns have been held annually, most recently in April 1997. The age for vaccination with measles-mumps-rubella (MMR) vaccine was 12 months of age prior to 1991, 18 months of age from 1991-1994, and 15 months of age from 1994 onward. In 1992, a booster dose was implemented at the age of 7 years (first grade of school). The last measles epidemic occurred from 1990 to 1992, producing more than 8,000 cases and 56 deaths. The last confirmed case of measles corresponds to that time.

From January through June of 1997, there had been 49 suspected measles cases reported. Of these, 38 were discarded, 10 were under investigation and one case was clinically confirmed.

Investigation

The first laboratory-confirmed measles case (index case) was a 17-year-old girl from the province of Guanacaste, who worked as a cook at a restaurant on the Tamarindo beach, a tourist complex located approximately 60 km from Liberia with at least 60 hotels. The case had rash onset on 22 July 1997, accompanied by conjunctivitis and a feverish condition. On 25 July, the patient developed a generalized maculopapular rash, and was admitted to Liberia Hospital for three days. A specimen from the patient tested positive for measles at the national laboratory (INCIENSA). The result was confirmed by the Measles Reference Laboratory of the Gorgas Center in Panama.

Twenty days prior to the illness, the patient had moved from Liberia to El Tamarindo beach to work in a restaurant. The patient was living in Santa Rosa, approximately 10 km from El Tamarindo, with a population of approximately 1,000. As cook, he did not have much contact with the restaurant’s clients. Community investigation did not show any suspected measles cases in Santa Rosa. The patient does not remember being vaccinated against measles.

The second documented case, a 13-year-old girl, had rash onset on 11 August, and was hospitalized for five days. On 21 August, a third case was reported in a 12-month-old child from Cuajiniquil in La Cruz county, who was hospitalized that same day in Liberia Hospital. The mother revealed that her child had been previously hospitalized on 8-9 August, with asthmatic bronchitis. There were two additional cases in Cuajiniquil, in children 13 and 14 months of age, who had direct contact with this patient.

On 9 September, two more cases were reported in Liberia. One, a girl of 7 months, was hospitalized from 21 to 25 August, with viral meningitis in Liberia Hospital. Fever and rash began ten days after her discharge, on 2 September. The other case was a girl 6 months of age, for whom there was no determined source of infection. All cases in this series were tested and reported to INCIENSA and the Gorgas Laboratory.

A detailed investigation took place from 4-8 October, 1997. An analysis of vaccination coverage showed that at least 3 of the 12 counties in the province of Guanacaste did not achieve the required coverage rates for measles (more than 90%) in children under 1 year of age in the last two years.

The epidemiological history of the index case indicated that he likely contracted the virus at El Tamarindo beach, a popular tourist attraction. Most visitors come from Europe, North America, Canada, South America, and some from Central America. The largest hotels register between 35,000 and 40,000 tourists per year.

All contacts of the index case at the restaurant were interviewed without result. Next, selected hotels were visited. The manager of one said that in early July, three Brazilian tourists were lodged, one of which presented fever upon arrival and subsequently a rash appeared. A physician diagnosed measles but did not report the case. The three
Measles Articles

February 1998

Volume XX, Number 1

Measles Vaccination Campaigns

Follow-up vaccination campaigns are an essential component of PAHO's measles eradication strategy. A follow-up campaign is defined as a periodic measles vaccination campaign which targets unvaccinated children 1-4 years of age, regardless of prior vaccination status or disease history.

However efficient the catch-up vaccination campaign aimed at children 1-14 years of age and keep-up vaccination (through routine services) vaccination efforts are, there will inevitably be an accumulation of measles susceptible preschool-aged children over time. The primary purpose of follow-up campaigns is to prevent this accumulation of susceptible children from reaching dangerous levels which can increase the risk of a measles outbreak.

Two factors contribute to the build-up of susceptible children. First, the measles vaccine is less than 100% effective, thus leaving some children unprotected following vaccination. Second, measles vaccination coverage for each birth cohort will almost always fall short of reaching all children. PAHO's measles eradication strategy recommends that periodic follow-up vaccination campaigns be conducted whenever the estimated number of measles susceptible preschool-aged children (children 1-4 years of age) approaches the size of an average birth-cohort. The interval between campaigns will depend upon the vaccination coverage obtained among infants through routine services since the last campaign. The lower the average routine vaccination coverage, the shorter the interval between campaigns. For example, if an average of only 60% routine coverage is obtained, a follow-up vaccination campaign would be needed approximately every two years; if 80% average coverage is obtained, then campaigns will be needed approximately every four years. The maximum allowable interval between campaigns is 4 years. Most countries of the Americas are able to maintain an average routine vaccination coverage of 80% and conduct follow-up vaccination campaigns every 4 years.

Table 1 summarizes available data concerning measles vaccination activities by country. At this point, there are several countries which are awaiting routine vaccination coverage of 80% and conduct follow-up vaccination campaigns every 4 years.

Table 1: Measles vaccination campaigns.

<table>
<thead>
<tr>
<th>Region</th>
<th>Country/Territory</th>
<th>Coverage (%)</th>
<th>Average routine coverage</th>
<th>Next follow-up due</th>
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<td>1998</td>
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<td>Peru</td>
<td>72</td>
<td>87</td>
<td>1995</td>
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<td></td>
<td>Venezuela</td>
<td>94</td>
<td>75</td>
<td>1999</td>
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<tr>
<td></td>
<td>Brazil</td>
<td>96</td>
<td>89</td>
<td>1995</td>
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<td></td>
<td>Costa Rica</td>
<td>75</td>
<td>90</td>
<td>–</td>
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<tr>
<td></td>
<td>El Salvador</td>
<td>96</td>
<td>93</td>
<td>1997</td>
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Note: Data not available.

Source: Ministry of Health, Costa Rica.

February 1998

Volume XX, Number 1

Update: São Paulo

Measles Outbreak

This article updates the information published in the June 1997 edition of the EPI Newsletter.

During 1997 and through 20 January 1998, a provisional total of 26,722 confirmed cases were reported from 18 countries of the Americas. Of these, 25,599 (96%) were reported from Brazil. Of the Brazil cases, 20,459 (80%) occurred in the state of São Paulo. The outbreak began during late 1996 with a total of 27 confirmed cases. During 1997, cases were reported from over 250 of the state's 645 municipalities. Of the total cases, 18,542 (91%) were reported from the Greater São Paulo metropolitan area.

The age-groups most affected by the São Paulo outbreak were infants under 1 year of age, (440 cases/100,000 population), followed by young adults 20-29 years (164 cases/100,000), children 1-4 years (47 cases/100,000), and children 5-9 years (32 cases/100,000).

As of 20 January, a total of 20 measles deaths were reported (1 death per 1,022 reported cases, total case-fatality rate of 0.10%). 17 (85%) were residents of the Greater São Paulo metropolitan area.

The age distribution of persons dying of measles is as follows: 11 (55%) were infants less than one year of age, 3 (15%) were children 1-4 years of age, 2 (10%) were children 5-9 years of age, and 4 (20%) were young adults 20-29 years of age.

The following age-specific case-fatality rates were observed: in infants <1 year of age (0.38%), children 1-4 years of age (0.2%), children 5-9 years of age (0.20%) and young adults 20-29 years of age (0.04%).

The following strategies were implemented with the goal of reducing measles virus circulation:

- Lowering the age of routine measles vaccination from 9 months to 6 months
- Selective vaccination of unvaccinated children within 5 years of age
- Vaccination of health workers (182,562 doses administered)
- Extended contact vaccination of persons under 1 year of age, to reach those possibly exposed to cases of measles, including households, neighborhoods, workplace, schools and other high-risk groups (856,534 doses)

As recommended by the XII Technical Advisory Group on Vaccines Preventable Diseases (TAGV) in Guatemala, it is desirable to maintain catch-up vaccination coverage by district and to characterize districts at high-risk for measles (coverage less than 90%). Viral isolation is required from all cases of vaccination failure. An adequate sample of urine should be taken in sterile containers within one week of rash onset with suspected measles cases.
Rubella Watch EPI Newsletter 1979–2009

Editorial Note:
Although outbreak investigation is continuing, the São Paulo experience clearly demonstrates both the infectiousness and lethality of measles virus. Following a prolonged period of low measles incidence, the virus returned with a vengeance in São Paulo State. Measles has demonstrated its ability to find susceptible persons, even in areas with high vaccination coverage.

Several factors appear to have combined to create conditions that facilitated measles transmission in São Paulo. First, the failure to conduct a follow-up vaccination campaign in 1995, combined with low routine vaccination coverage (keep-up vaccination) among infants, allowed for the accumulation of susceptible children in São Paulo. Second, the presence of large numbers of susceptible young adults who, for a variety of reasons, escaped both natural measles infection and measles vaccination has increased the risk of an outbreak. Third, measles virus was imported into São Paulo, most probably from Europe. Finally, the high population density of the city facilitated contact between persons infected with measles and susceptible persons.

Available surveillance data suggest that the major outbreak control activities implemented in São Paulo helped to reduce the number of susceptibles and slow the epidemic. However, these control measures were very expensive in terms of financial and human resources, not to mention the opportunity cost of the interventions. Over 4.5 million persons were vaccinated in these efforts, combined with the direct costs associated with medical care and the indirect costs due to decreased productivity, both acutely and chronically, this outbreak was very costly.

The overriding objective of PAHO’s measles eradication strategy is the prevention of measles outbreaks. It is far better (and cheaper) to prevent an outbreak than to be forced to attempt to control an outbreak. Measles outbreaks can be prevented by achieving and maintaining high population immunity in susceptible populations, combined with the absence of imported measles virus.

São Paulo will now need to redouble its efforts to prevent future measles outbreaks. High coverage future measles vaccination must be achieved and maintained for infants at ages 9 and 15 months of age. Coverage is estimated to have reached the Regional goal of at least 90%.

Intensification of routine vaccination of school-aged children between 5–15 years of age between September and November 1997 (298,039 doses administered). Coverage is estimated to have been close to 93% using official population data.

Selective vaccination of school-aged children between 5–15 years of age between September and November 1997 (13,702 doses administered). Coverage is estimated to have been close to 93% using official population data.

Intensification of routine vaccination against measles for children between the ages of 9 and 15 months of age.

These interventions appeared to have been effective in slowing the epidemic. From week 36 on (two weeks after the indiscriminate vaccination campaign) there was a sharp drop in the number of cases (Figure 1). In addition to this drop, there was a marked reduction in the proportion of suspected measles cases that were confirmed by laboratory testing. Prior to the campaign (weeks 24 to 33), 67% of suspected measles cases were confirmed by laboratory testing, and following the campaign (weeks 36 to 45) only 43% were confirmed.

The Center for Epidemiological Surveillance of the São Paulo State Health Secretariat, in collaboration with the National Health Foundation of the Ministry of Health and the State Promotion for Maternal Immunization and Education (FESIMA), along with PAHO are conducting a detailed study to determine the risk factors for acquiring measles in this outbreak. This study seeks to track the dynamic of measles virus transmission and other factors that may explain the occurrence of this epidemic.

Source: Center for Epidemiological Surveillance, São Paulo State Health Secretariat, Brazil.

A heavy flow of persons in and out of São Paulo is likely to be a risk-factor in the transmission of measles. São Paulo is an important commercial center and the capital city. A total of 701,423, and vaccination coverage in this area fluctuates between 40 and 60%.

The three countries share a large border with a heavy flow of people. Therefore, there is a mutual interest to act jointly in activities for epidemiological surveillance and immunization to reach the Regional goal of measles eradication by the year 2000.

The measles epidemic that began at the end of 1996 in Brazil and lasted through 1997, with more than 26,000 confirmed cases, affected several countries in Latin America, including Paraguay. The two countries share a large border with a heavy flow of people. Therefore, there is a mutual interest to act jointly in activities for epidemiological surveillance and immunization to reach the Regional goal of measles eradication by the year 2000.

In Brazil, the border population of Parana State with Paraguay is estimated at 370,000, spread among 11 municipalities, of which nine have achieved vaccination coverage over 95%. Two municipalities reported confirmed measles cases in 1997: Foz do Iguaçu with 77 cases and Santa Terezinha do Itaipú with 5 cases. However, the capital city of the state of Mato Grosso do Sul, the border population is estimated at 183,213, also distributed among 11 municipalities. Despite the lack of laboratory-confirmed measles cases, five clinically confirmed cases were reported. Vaccination coverage in rural and urban areas was over 95% in two municipalities.

In Paraguay, there was a resurgence of measles cases due to an importation from Brazil, with 198 laboratory confirmed cases. The highest incidence occurred in the 10th health region (Ciudad del Este) with 105 cases, and the 14th health region (Canelones) with 14 cases, both bordering on the states of Paraná and Mato Grosso do Sul, respectively.

The tourist and commercial traffic across the Ponte Internacional da Amizade, which connects Ciudad del Este and Foz do Iguaçu is an important risk-factor in the transmission of measles virus in the region. The total border population is 701,423, and vaccination coverage in this area fluctuates between 40 and 60%.

Argentina also experienced an outbreak in 1997, which is still ongoing. During that year, the first confirmed cases appeared in the province of Misiones, which borders on Paraguay and Brazil. Measles then spread to metropolitan Buenos Aires and the capital city. A total of 762 cases were reported of which 112 were confirmed. Seven of these were in the province of Misiones. In 1998, at the end of the meeting, 47 confirmed cases were reported, all in the metropolitan area. Three confirmed cases of the reported cases have occurred in children under 5 years of age. The Ministry of Health scheduled a measles follow-up vaccination campaign for children under 5 in May. At the same time, the Ministry is implementing routine vaccination with measles-mumps-rubella (MMR) vaccine for children ages 12 months to 6 years.

Conclusions
There have been 205 confirmed measles cases in the border area between Brazil and Paraguay, which has a population of approximately 1,500,000 inhabitants. The following problems were identified in the border municipalities of both countries:

• Limited exchange of information on the occurrence of measles cases.
• Underreporting of measles cases.
• Lack of timely control measures.
• Lack of coordination among the responsible authorities in the border areas.
• A heavy flow of persons in the border areas.

The presence of indigenous villages in four border municipalities in Mato Grosso do Sul,
Passive and unstructured surveillance in some regions and municipalities.

Difficulties in the interpretation of coverage data.

Lack of coordination to develop adequate vaccination and epidemiological surveillance strategies.

On the basis of these findings, there was consensus on setting up three local border committees. These committees will be comprised initially of those in charge of surveillance in the municipal and regional health secretariats of Paraguay and Brazil, National Health Foundation of the border municipalities in Brazil, as well as those responsible of the health regions in Paraguay (in equal numbers between the two countries). Among its initial functions will be establishing joint flow of information in epidemiological surveillance operations, weekly negative notification of cases and notification of suspected and confirmed cases and planning of joint operations in support of measles eradication.

A project was developed and approved to provide technical support for the joint activities between the two countries at the local level. This project seeks to improve communication between the municipal health secretarys in Paraná and health regions in Paraguay, as well as between these two countries to strengthen surveillance activities and immunization programs for measles and other vaccine-preventable diseases; and to further stimulate joint solutions to outbreaks of other preventable diseases.
Measles Articles

Background
One of the recommendations for measles from the Technical Advisory Group Meeting (TAG) held in September 1997 in Guatemala, is to target vaccination efforts to areas at relative higher risk for measles transmission. These include those districts with coverage for measles vaccine <90% in children under 1 year of age, especially in urban areas with high levels of population density.

In October 1997, the Ministry of Health analyzed all 262 districts in El Salvador, to determine the “at risk” areas for measles outbreaks. The average number of “at risk” districts during the period 1995-1997 has been approximately 70 districts per year. The number of children susceptible to measles accumulated every year in these districts has been approximately 15,000. In 54 of these districts, low coverage has been recurrent, that is <90% for at least 3 years. In 1997, the 262 districts studied and in 20 of the 54 districts, low coverage has been occurring for the past 3 years. The population of children under 1 year of age living in those districts is between 30,000 and 240,000 for 20 of the 54 districts, which is the country’s official population data in this age group.

The following criteria were used to define high-risk districts:
• Average vaccination coverage obtained from all districts from January to June 1997.
• Population density in these districts.
• Number of children under 5 years of age that was susceptible to measles that had accumulated in the last 3 years.

Based on the country’s trend of average vaccination coverage, the expected number of high-risk districts at the end of 1997 was 79 (12%). These are mostly located in rural areas. Sixty-five percent have low population density (fewer than 500 children under 1 year of age), representing 26% of the target population; 16 districts have between 500 and 2,000 children under 1 year of age; 4 have between 1,500 and 3,000 children under 1 year old; and 5 districts situated in urban areas have over 3,000 children in that age range (42% of the target population).

Based on this analysis, the Ministry of Health of El Salvador organized in November and December 1997, a mop-up measles vaccination campaign in these 84 districts, aimed at children aged 2-5 years. The aim was to increase population immunity and reduce the risk of measles outbreaks. The house-to-house vaccination was carried out in these districts, using the current routine vaccination schedule, which is one dose of measles vaccine at 9 months and two doses of MMR (measles, mumps, rubella) at 15 months. Including first doses and boosters, a total of 36,560 doses of measles vaccine and 8,637 doses of MMR were administered to children under the age of 5 years.

Results
A total of 116 districts (32 additional districts participated in the mop-up campaign to increase population immunity) carried out house-to-house vaccination activities during this campaign. The population of children less than 1 year of age in these districts is 115,792 children, representing 57% of this population group in the country (166,023). A total of 69,502 houses were visited, of which 52,494 were found occupied. A total of 4,157 children under 5 years of age were found in these houses.

The mop-up vaccination campaign against measles carried out by El Salvador in targeted districts was very effective. The campaign succeeded in achieving higher measles vaccine coverage in districts that otherwise would not have reached the recommended 90% coverage by the end of 1997. The most important achievement of this effort was the reduction from 84 to 61 in the number of districts at risk for measles.

As a result of the campaign, a situation was established in 11 districts, where the population of children reaching higher than 90% coverage (210 of 262 districts). However, there still remain 61 districts at risk, four of them due to high population density (more than 3,000 children under 1 year of age.)

Recommendations
• Continue strengthening routine infant vaccination programs by assuring daily immunization services and avoiding missed opportunities to vaccinate.
• During the next National Immunization Day, target resources toward areas at higher risk.
• Continue monitoring vaccination coverage by district at least every three months, as well as their performance in meeting the epidemiologic indicators for surveillance, which are critical for the eradication of measles.
• Avoid the accumulation of susceptible persons, especially in districts with high population density and high influx of tourists.

These factors favor the reintroduction of measles virus into the country, and constitute an impediment to the eradication of measles in the Region of the American.

Strengthened epidemiologic surveillance throughout the country, primarily in the “silent” districts, which are those that have never reported measles cases or have low rates of weekly negative notification.

Editorial Note:
The Pan American Health Organization urges each country to follow the example of El Salvador by characterizing in more detail vaccination coverage obtained at the district level, and the population living in those districts that have not been vaccinated.

June 1998
Volume XX, Number 3
USA Interups Measles Transmission

During 1997, a provisional total of 138 confirmed measles cases was reported to the Centers for Disease Control and Prevention (CDC) by local and state health departments, the lowest number of measles cases ever reported in 1 year and a 55% decrease from the previous record low of 309 cases reported in 1995 (Figure 1). This report describes the epidemiology of measles in the United States in 1997, which suggests that no endemic measles virus is circulating.

Case Classification
Reported measles cases are classified as imported or indigenous based on where transmission of measles virus is likely to have occurred. Cases in persons who traveled outside the United States within 38 days before rash onset are classified as international importations. Indigenous measles cases are classified into three groups: 1) cases linked epidemiologically to a known international importation, 2) cases in which a measles virus strain is isolated that has been associated with other countries, and 3) all other cases in which no association to an importation was detected.

Of the 138 cases reported in 1997, a total of 57 (41%) were international importations. Thirty-six (33%) occurred in visitors traveling to the United States from other countries. The remaining 21 imported cases occurred in U.S. residents who were abroad during the exposure period. The countries from which measles was most frequently imported were Germany, Italy, (nine), Switzerland (five), Brazil (five), and Japan (five).

Of the 81 indigenous cases, 17 (21%) cases were linked epidemiologically to international importations. The remaining 64 cases, number of cases epidemiologically linked to a single imported case was four. The longest reported chain of measles transmission following an imported case lasted 5 weeks. Measles virus was isolated from two chains of transmission that included seven (9%) of the 81 indigenous cases; the isolated measles strains have been associated with outbreaks in other countries. There was no epidemiologic link or virologic evidence suggesting importation for the remaining 72 (70%) of the 81 indigenous cases. In 1997, there was epidemiologic or virologic evidence of an international source for 81 (61%) of the 138 cases reported to CDC, compared with 15% in 1995 and 28% in 1996.

Geographic Distribution
In 21 states, no measles cases were reported for 1997. Twenty states and the District of Columbia, fewer than five cases were reported. Nine states (Arizona, California, Florida, Massachusetts, Minnesota, New York, Pennsylvania, South Dakota, and Texas) accounted for 64% of total cases and 56% of imported cases.

Temporal Patterns of Transmission
The maximum number of reported cases occurring in a single week was 11, and the median number of cases per week was two. In 9 weeks, no reported cases occurred, and in 21 weeks, all reported cases were associated with imported cases.

Age and Vaccination Status
The predominant age groups were confirmed measles cases were preschool-aged children (1-4 years) (40 [29%] cases), followed by persons aged 5-19 years (22 [18%] cases), and persons aged 20-39 years (26 [26%] cases). Of the 138 patients, 72 (32%) had a documented history of vaccination with measles-containing vaccine (either measles, measles-rubella or measles-mumps-rubella); 25 (18%) patients had received one dose, and seven (5%) had received two doses. The remaining 106 (77%) patients reported being unvaccinated. Few persons with confirmed measles in age groups for which vaccine is recommended, were unvaccinated.

Outbreaks
A total of 13 outbreaks, defined as three or more epidemiologically linked cases, were reported to CDC in 1997. Outbreak-related cases accounted for 44% of all cases. The largest outbreak involved eight cases (median: 4; range: 3 to 8 cases). Adult/ post-school-related preschool-related outbreaks were the most common, with four outbreaks each, and three...
outbreaks involved persons with philosophic or religious objections to vaccination. One school-related and one college-related outbreak also were reported. Five (18%) of the 11 outbreaks had known international sources.

Reported by: State and local health depts, Measles Virus Section, Respiratory and Enteric Viruses Br, Div of Viral and Rickettsial Diseases, National Center for Infectious Diseases; Measles Elimination Activity, Child Vaccine Preventable Disease Br, Epidemiology and Surveillance Div, National Immunization Program, CDC.

Source: MMWR, 47(14); 273-276; April 17, 1998.

Measles Outbreak in Nuble Province, Chile

Between July and September of 1997, nineteen measles cases were reported from the province of Nuble, a predominantly rural area in southern Chile. The index case was strongly suspected to be a tourist from São Paulo, Brazil who visited a ski resort in the city of Chilán during the first two weeks of July. During his stay, he developed a fever and rash illness but apparently did not seek medical attention.

During his illness, the tourist from São Paulo came into contact with a local ski instructor. Approximately two weeks later, the ski instructor developed a febrile rash illness and was diagnosed with suspected measles at a local clinic. A blood specimen was collected and confirmed by the national and international health authorities were immediately notified. The specimen tested positive for anti-measles IgM antibodies at the National Institute of Health laboratory in Santiago, Chile. During the months of August and September, an additional 18 laboratory-confirmed cases were reported in the province of Nuble.

Persons with confirmed measles cases ranged in age from 3 months to 36 years. Of the 19 total confirmed measles cases, 3 (15.7%) were in infants <1 year of age, 12 (63.2%) were in persons 1-9 years of age, 10 (52.6%) were in persons 20-29 years of age, and 4 (21.0%) were in persons 30-39 years of age. Nine (47.4%) cases occurred in employees of the ski resort in Chilán. None of the persons had received measles vaccine during their childhood. Three (15.7%) cases reported receiving measles vaccine during the national follow-up campaign in 1997.

Of the total cases, 10 (52.6%) persons acquired measles infection in the ski resort, 5 (26.3%) acquired measles in the neighboring community, and 4 (21.1%) acquired measles in the household from a family member.

Two patients with measles were hospitalized; both were less than 1 year of age. All patients recovered and no major complications were reported.

Outbreak control efforts focused on providing measles vaccination in a timely manner to contacts of suspected measles cases, especially infants under 1 year of age, and persons 20-40 years of age. Based on the epidemiologic data available, persons in these age-groups were felt to be at highest risk. Moreover, efforts were made to vaccinate employees at the ski resort and health care workers during the national follow-up campaign in 1997.

The majority of the measles cases in Nuble occurred in young adults outside the age-group targeted for measles vaccination in Chile. These persons were born too early to have received measles vaccines, but born too late to have been exposed to naturally circulating measles virus. Furthermore, most infected persons had been born and raised in rural areas, thus decreasing their risk of exposure to measles virus.

Measles transmission was extremely limited in this outbreak. This is a result of the high population immunity which exists in the population 1-20 years of age, due to Chile’s measles eradication efforts. Moreover, the combination of careful and timely surveillance followed by an aggressive outbreak response with contact vaccination likely helped to limit the virus’ spread.

Similar to the São Paulo experience (see EPI Newsletters, June 1997 and February 1998 issues), this outbreak clearly demonstrates that there is a certain percentage of young adults in Chile and probably most countries of the Americas who remain susceptible to measles. Efforts to provide vaccination to populations of young adults at highest risk for being exposed to measles virus are also required. Groups of young adults that should be targeted for ongoing vaccination include: healthcare workers, university students, military recruits, and international travelers to measles endemic areas.

The teams from the Region of the Americas have an excellent opportunity to be among the winners of the World Cup. Likewise, all countries in the Americas can be winners by eradicating measles from the Region by the year 2000. In the spirit of this global event, we should all unite and give measles its final blow! The Americas has already shown measles its final blow! The Americas will do its best to win the World Cup in 1998.

Measles Update

Follow-up campaign in Venezuela

Venezuela conducted a national follow-up measles vaccination campaign in the country’s 23 states, aimed at all children between the ages of 1-4 years (target population: 2,223,210). The campaign started on May 19
Measles Articles

and lasted through the middle of June. Vaccination using measles-mumps-rubella (MMR) vaccine was carried out at day care centers, orphanages, and all health posts. In rural areas, vaccination was done house-to-house. Overall coordination and media efforts were crucial for the campaign's success. The campaign was handled by Venezuela's Ministry of Health, Central and state authorities shared the financing of the delivery of immunization services.

In 1992, Venezuela experienced a measles epidemic, with 22,312 confirmed cases and 77 deaths. This lasted until early 1993, with 16,641 cases and 47 deaths. In 1994, the country carried out a catch-up vacci nation campaign targeting the entire population between 9 months-14 years of age, reaching 98% coverage. Between 1994-1996, vaccination coverage through routine immunization services has averaged about 75%. Since the catch-up campaign there has been a steady decline in the number of confirmed measles cases, from 172 in 1995, to 89 in 1996, and to 27 in 1997. As of July 18 (epidemiological week 28), Venezuela had reported 452 suspected cases, but none had been reported as confirmed measles cases. Nevertheless, the growing number of susceptible children has prompted the Health Ministry to undertake a measles follow-up campaign.

Measles Outbreaks in Argentina and Bolivia

Bolivia is currently experiencing a measles outbreak in the areas bordering Argentina, which started May 21. The outbreak has affected primarily the municipalities of Minas, in the department of Tarija. The municipality of Yacuiba, where the capital city of Buenos Aires and completing the measles vaccination in affected children has prompted the Health Ministry to undertake a measles follow-up campaign. The outbreak control measures included lowering the age of measles vaccination in affected areas to 1-4 years of age, vaccinating susceptible contacts of suspected cases, and completing the measles follow-up campaign. The campaign was started in May 1998, and is targeting children 2-5 years of age.

December 1998 Volume XX, Number 6

Measles in the Americas, 1998

Through December 21, 1998, a total of 26,103 suspected areas and 4 months to 15 years. Follow-up will be conducted in 12 countries (Figure 1). Other countries documenting significant measles virus circulation include Bolivia (351 confirmed cases), the United States (86 confirmed cases) and Paraguay (68 confirmed cases). Combined, the other countries of the Region have reported a total of 33 confirmed measles cases; several of these cases were imported, and the others were isolated in both time and place. During 1998, the largest outbreak in the Region occurred in Argentina. Of the total

Measles Outbreak

A s of 9 October 1998, Argentina had reported 8,257 confirmed measles cases. Of the total cases reported, 8,084 (98.3%) occurred in the Greater Buenos Aires metropolitan area, with 4,175 (66.7%) occurring in infants and children <5 years of age. While precise figures are not yet available, most cases of measles in children between 1-4 years of age have been among the unvaccinated. To date, 30 measles-related deaths have been reported; mostly in infants and children <2 years of age.

Among the cases reported from greater Buenos Aires, the highest age-specific incidence rates occurred among infants <1 year of age (906 cases/100,000 population), followed by children 1-4 years of age (194 cases/100,000), children and adolescents 5-19 years of age (29 cases/100,000), and persons 20 years of age or older (11 cases/100,000).

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October 1998 Volume XX, Number 5

Measles Update

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Measles in the Americas, 1998

Through December 21, 1998, a total of 26,103 suspected measles cases were reported in 12 countries (Figure 1). Of the total confirmed cases, 80% (20,920 cases) had either laboratory confirmation of measles infection or epidemiologic linkage to a laboratory confirmed measles case, and 90% (6,363) were confirmed on clinical grounds alone.

Together, Argentina (7,054 confirmed cases) and Brazil (2,006 confirmed cases) have accounted for 94% of the total confirmed measles cases in the Region (Figure 2). Other countries documenting significant measles virus circulation include Bolivia (351 confirmed cases), the United States (86 confirmed cases) and Paraguay (68 confirmed cases). Combined, the other countries of the Region have reported a total of 33 confirmed measles cases; several of these cases were imported, and the others were isolated in both time and place. During 1998, the largest outbreak in the Region occurred in Argentina. Of the total

Editorial Note: Argentine health authorities are continuing the outbreak investigation. Preliminary information indicates that through the reported routine infant measles vaccination coverage has been over 95% since the catch-up campaign in 1993, the large number of cases occurring in unvaccinated preschool-aged children strongly suggests that there were large pockets of children who were not reached for measles vaccination.

The source of the outbreak has not been definitely determined, but it is suspected that measles may have been imported from the large measles outbreak in southern Brazil in late 1997. Genetic analyses of measles virus isolates obtained from the Argentine outbreak will be conducted at the Center for Disease Control and Prevention in Atlanta, Georgia, USA. Information from these analyses should provide useful information concerning the potential geographic source of measles virus responsible for the current outbreak.

Similar to the large outbreak that occurred last year in Sao Paulo, Brazil, this outbreak again demonstrates the extreme infectivity of the measles virus and the importance of achieving and maintaining high levels of routine vaccination coverage and of conducting timely follow-up campaigns with high coverage. Moreover, these outbreaks again demonstrate that large cities with high population density are areas at high risk for measles importations and outbreaks. Increased efforts are needed to assure high measles immunity in infants and preschool-aged children, especially those living in urban environments.

Haiti

Haiti is currently conducting a follow-up measles vaccination campaign targeting approximately 1 million children between the ages of 1-5 years. The campaign started early July in a southern province. On September 20, the first of two campaigns was conducted in the metropolitan area of Porto-Prise. In spite of the passage of Hurricane Georges in late September, vaccination activities were only delayed by a couple of weeks, and the second part of the campaign was conducted between October 11 and 18. By the end of October, all urban areas will have been vaccinated. The campaign will also include immunization against polio, DTP, and the delivery of vitamin A supplements. Vaccination against tetanus toxoid is also offered to women of childbearing age.

The last case of confirmed measles in Haiti occurred in 1994, the year a catch-up campaign was conducted. Since then, there has been a rapid accumulation of susceptible persons to measles due to low routine vaccination coverage. The Ministry of Health has developed a dual strategy that aims at covering vaccinated and unvaccinated populations with the current campaign, and increasing routine vaccination coverage. Among the campaign’s partners and donors are USAID, the Government of Japan, and UNICEF. PAHO/WHO has provided technical assistance towards this effort.

Paraguay

The national campaign was inaugurated October 15, by the President of Paraguay, Mr. Raul Cubas Grau, the First Lady, Mrs. Mirta Gusinky de Cubas, the Health Minister, Dr. Carmen Frutos de Almada, and other government and health officials. The Ministry of Health and Education signed an agreement to promote and disseminate information on the campaign at schools throughout the entire country.

Paraguay is conducting a country-wide follow-up measles vaccination campaign October 19 through November 30, targeting children between ages 1-4 years to 15 years. The campaign will begin in densely populated urban areas and will then spread to other regions. Total population to be vaccinated is 2,137,274 children, which represents 40% of the population (50% of the target population lives in urban areas). The first phase of the campaign will focus on preschool and school-aged children, orphanages, juvenile detention centers, and commercial centers. Between November 1-30, the Ministry has planned door to door mop-up vaccination in all areas that failed to reach 100% vaccination coverage during the initial phase of the campaign.

Measles Articles

20 years of age, regardless of their vaccination history, was held in the localities of Salvador Massa (Argentina) and Pocitos and Yacuiba (Bolivia) between June 1-21. As of August 10, Argentina had reported 1,874 confirmed measles cases, with 11 deaths, six of these under the age of 1. The first cases appeared in August 1997, in the province of Misiones, which borders both Paraguay and Brazil, then spread to the capital city of Buenos Aires and surrounding areas. Detailed information on these outbreaks and final vaccination coverage data from Venezuela will be forthcoming in the next issue of the EPI Newsletter.

Follow-up campaigns are now underway. The successful completion of the measles eradication goal by the year 2000 will require the implementation of PAHO’s recommended vaccination strategy in its entirety in all countries of the Region. The objective of the strategy is the prevention of measles outbreaks. It is far more efficient and less costly to prevent an outbreak than to have to be forced to attempt to control one. In addition to achieving high levels of measles vaccination of children at 12 months of age through routine health services, all countries should conduct follow-up campaigns targeting all children 1-4 years of age, regardless of prior vaccination status or disease history, at least every four years to assure the highest possible level of measles population immunity. Health authorities in the Region need to ensure that sufficient resources are allocated for follow-up measles vaccination campaigns, and that surveillance for the disease is strengthened in order to reach the eradication goal.

As reported previously, there is an increased risk of a follow-up campaign or are due for such a campaign in 1998. Countries that do not have a campaign are at an increased risk of a measles outbreak and should conduct follow-up campaigns as soon as possible. These countries include: Cuba, Dominican Republic, Ecuador and Haiti. Countries that should conduct a follow-up campaign during 1998 include: Bolivia, Guatemala, Paraguay and Uruguay.

Although the 1998 data are not yet available, there has been an 82% reduction in measles cases when compared to the 53,661 total confirmed measles cases reported during 1997 (Figure 1). Of the total confirmed cases, 80% (40,918) had either laboratory confirmation of measles infection or epidemiologic linkage to a laboratory confirmed measles case, and 90% (6,363) were confirmed on clinical grounds alone.

Follow-up vaccination campaigns are critical for the successful completion of the measles eradication goal.
Rubella Watch  
EPI Newsletter  
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Editorial Note:
It has been now been over 4 years since the goal of measles eradication from the Americas was established at the 1994 Pan American Sanitary Conference. Since then, great progress has been made towards achieving the goal with a marked reduction in the number of reported cases, the virus continues to circulate in several countries of the Region. Thus, it seems appropriate to summarize some of the lessons learned from the experience of the Americas in interrupting measles virus circulation, and to take appropriate actions.

Measles vaccine is very effective in preventing measles, if used
A single dose of measles vaccine has been repeatedly demonstrated to be >90% effective in protecting an individual from measles infection. However, the vaccine is only effective if it is administered to a susceptible infant as soon as possible after the first birthday. For measles eradication, annual routine measles vaccination coverage must be at least 95% in every area of every country of the Region and follow-up campaigns must be conducted among children 1–4 years of age at least every four years.

PAHO’s measles eradication strategy (catch-up, keep-up, follow-up) is very effective in preventing measles outbreaks, when fully implemented.
Countries that have properly implemented PAHO’s recommended vaccination strategy for measles eradication have been successful in rapidly interrupting virus circulation and maintaining its interruption over time. A major contributing factor to the relative resurgence of measles observed in Brazil and Argentina during the years of 1997–1998, has been the failure to fully implement the measles eradication strategy. Completeness is a clear and major obstacle to achieving the goal of measles eradication.

Outbreak prevention is far better than outbreak control
Once measles virus has been re-introduced into an area and measles circulation has commenced, it is virtually impossible to stop an outbreak by rapidly implementing emergency measles vaccination. The virus can circulate much faster than any public health response, and it will result in a large outbreak and thus a “natural” immunization campaign with high coverage.

Measles circulates best in urban areas
The high population density of cities greatly facilitates measles virus circulation between infected and susceptible individuals, especially when the number of susceptible infants and children is high due to low routine measles vaccination coverage. Increased efforts are needed to assure high measles population immunity among infants and children living in urban areas. This can be achieved by obtaining high measles vaccination coverage through routine measles vaccination services, and by the full and timely implementation of follow-up measles vaccination campaigns.

Measles kills susceptible infants and children
Although there were no reported measles deaths in the Americas during 1995 and 1996, the recent measles outbreaks in Brazil and Argentina again demonstrate the lethality of measles virus. Over 100 measles-related deaths were reported during 1997–1998 in these two countries; most of them occurred among unvaccinated infants and preschool-aged children.

The epidemiology of measles is changing; certain groups of young adults are at relatively high-risk for measles
Over half of the cases in the large 1997 measles outbreak in São Paulo, Brazil occurred among unvaccinated adults 20–34 years of age. These persons were born too early to have received the measles vaccine through routine health services, yet too late to have been exposed to circulating measles virus. Many of the young adults who acquired measles in São Paulo belonged to clearly defined risk-groups which included: health care workers, military recruits, university students, persons working in the tourist industry, international travelers, institutionalized populations and migrant workers from rural areas living in work camps. Increased efforts are needed to target and vaccinate young adults who are members of high-risk groups, especially those living in densely populated urban areas.

Measles does not respect national or state borders
While measles virus circulation has been greatly reduced in the Americas, the virus continues to circulate freely in the other regions of the world. With the recent major increases in the availability of international borders globally on a daily basis, there is a constant risk of the introduction of measles virus circulation between infected and susceptible individuals. For example, the large 1997 outbreak in São Paulo, Brazil occurred among unvaccinated preschool-aged infants and children, mostly in São Paulo and the Federal District. In contrast to Argentina where the majority of cases have occurred among unvaccinated preschool-aged infants and children, most cases in Brazil have occurred among unvaccinated young adults.

December 1998

Follow-up Measles Campaign in the Dominican Republic

Six weeks after sustaining significant damage from Hurricane Georges, the Dominican Republic carried out a national follow-up measles vaccination campaign on November 6–12, targeting 29 provinces and the capital city. The campaign was the first mass vaccination effort in the country, following the initiation of decentralized delivery of health services.

Priority was given to vaccinating against diphtheria, whooping cough, and tetanus, especially in refugee camps. Over half a million vaccines were administered to different age groups in these areas. Almost 100,000 of those immunized were under five years of age.

The follow-up campaign was carried out in three stages: the first one was held in areas where health services had not been severely affected by Hurricane Georges. These included ten provinces in the northern part of the country. Next, were the provinces in border areas and those nearby, and finally the provinces of the eastern part of the country and the capital city (five municipal health centers). Following the recommendations of a recent nutritional evaluation, the latter two areas provided vitamin A supplementation to children 6 months to 5 years of age, as well as to mothers in the postpartum period or early lactation.

The target population of the follow-up campaign was 83,517 children between the ages of nine months and five years, regardless of their vaccination status. It took only three days to immunize approximately 70% of the target population in each area. Vaccination activities were continued until all the remaining target population was reached. The opportunity was also used to immunize children ages 2 months through 2 years against poliomyelitis. So far, no important side effects have been reported.

The last measles cases in the Dominican Republic were reported at the end of 1994 (a clinical case with serology confirmation, but without epidemiological link occurred in
The use of the combined measles-rubella (MR) vaccine in the different vaccination strategies, such as mass adolescent and adult vaccination campaigns and follow-up campaigns, has allowed the Region of the Americas to maintain measles elimination.
Good Surveillance is Key to Measles Eradication

The goal behind PAHO’s recommended vaccination strategy for measles eradication is to maintain the number of susceptible population at the lowest possible level. After the countries have carried out their mass catch-up campaign and progress towards measles eradication, implementing the other two elements of the strategy, keep-up and follow-up vaccination are extremely important in maintaining the number of susceptible persons at the lowest level. Obtaining a vaccination coverage better than 95% in every district of any given country is imperative for these vaccination activities to be effective.

As countries reach these milestones, the number of measles cases should dramatically drop. At this point, timely reporting and rapid investigation of each suspected measles case becomes critical to detect further circulation of measles virus in the area. Rapid case investigation of each suspected measles case will allow health workers to detect the source of infection and define the chain(s) of transmission. If there is more than one case of suspected measles, the chain(s) of transmission will allow health workers to determine the source of infection is necessary to determine whether the case is due to an importation, or it will confirm that the case is due to indigenous transmission. If there is more than one case of suspected measles in a defined area, establishing the chain(s) of transmission is extremely important, because one can arrive at the source for the continued measles transmission, take corrective actions and institute the necessary changes to avoid future program failure.

Figure 1 shows a measles outbreak recently detected in Uruguay. As can be seen, there is a void of epidemiological information and data between the first case, which was imported from a neighboring country in week 36, 1998, and the subsequent detection of additional cases commencing in week 50. In 1997, Uruguay reported only one confirmed measles case due to an importation. In week 1 of 1999, another importation was detected along with the other cases for the same period. Because surveillance was not optimal, the reasons for continued transmission of the measles virus were not established. Therefore, the source for the cases occurring at the beginning of week 50 is unknown. However, by the time the second imported case of measles occurred and was hospitalized, measles surveillance was heightened and the surveillance team was able to identify 23 cases that formed four chains of transmission (see Figure 2). It was determined that in all but one of the four cases, a health worker was either a person transmitting measles infection to others, or the receptor of the infection.

There are 11 cases not shown in Figure 2 that could not be associated with any chain of transmission. However, the investigation of these cases has shown that they had either traveled to infected areas (mainly by bus), or were employed in businesses associated with tourism, and had come in contact with tourists coming from neighboring endemic countries. The date of onset for these 11 cases all occurred within weeks 1-7. Furthermore, of the 35 cases only five occurred in children between 0-5 years of age, and there were no cases in the 6-20 year age group. This indicates that the catch-up and the follow-up campaigns implemented by the Ministry of Health were effective.

From Figure 1 the measles outbreak appears short-lived. This is due to the fact that Uruguay has maintained its pool of susceptible persons to an absolute minimum by maintaining vaccination coverage greater than 95% in all phases of the measles eradication strategy (catch up, keep up, and follow up). Uruguay obtained 95% coverage in their last follow-up campaign carried out in November 1998, and in their routine immunization program (keep up). In order to control the outbreak, the Ministry of Health implemented the following PAHO recommendations: 1) strengthening of surveillance activities in the entire country by alerting departmental health authorities; 2) measles vaccination of all children ages 6-11 months with a booster at 15 months in the country; 3) request that all children 14 years and under who were not vaccinated during the last mass campaign be vaccinated against measles; 4) vaccination of all people working in border crossing areas; 5) vaccination of public and private health workers in the department of Montevideo and Maldonado.

From the above, it can be concluded that PAHO’s strategy, if implemented in full and coupled with aggressive investigation of suspected measles cases, would ensure that measles virus transmission is tracked down until it has no reservoir left to hide.

Source: Ministry of Public Health of Uruguay, Division of Epidemiology, Prevention and Control of Diseases, National Immunization Program.

FIGURE 1


FIGURE 2


1999

Update: Measles in the Americas

For the first six weeks of 1999, there have been 114 confirmed measles cases reported in seven countries (Argentina, Bolivia, Chile, Colombia, Dominican Republic, Uruguay and the United States) in the Region (Figure 1). Up to February 13, the Dominican Republic has reported 14% of all cases to date. This outbreak was detected in mid-December 1998, but the first cases appeared to have occurred early November 1998. Investigation of the outbreak is underway to determine possible sources of infection. The preliminary investigation of this outbreak indicates that the majority of the 39 confirmed cases occurred in non-vaccinated individuals that were eligible for vaccination. Therefore, these cases were preventable. The last laboratory-confirmed case of measles in the Dominican Republic occurred in 1997 in a tourist.

Bolivia’s year-end data show a total of 98% confirmed cases for 1998. Up to February 13, 1999, a total of 122 confirmed cases have been reported, of which the majority of cases are found in the Departments of Cochabamba and Santa Cruz. Investigation of the outbreak in Cochabamba (1998–99) shows that 85% of all confirmed cases are in children under five years of age (n=156) who were not vaccinated during the follow-up campaign held in 1998. Vaccination efforts have been slow in this department, especially in the large urban areas of the city of Cochabamba. As a result the Ministry of Health is conducting an aggressive mop-up effort, in order to reduce the number of susceptible persons to measles.

All countries in the Region must monitor the build-up of susceptible persons, as a result of either low vaccination coverage in routine programs or a less than adequate coverage in follow-up campaigns. In addition, maintaining a sensitive surveillance system and implementing aggressive case investigations of all suspected measles cases is critical if a country is to confront possible importations of measles from neighboring countries or from other regions of the world where the disease circulates widely. These steps should prevent the reestablishment of measles virus circulation in the Region. In Bolivia, the first cases of confirmed measles were due to importations from a neighboring country with a measles outbreak, and in the Dominican Republic measles importation is also strongly suspected.

April 1999

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Rubella Watch EPI Newsletter

Pan American Health Organization

1997–2009
Measles Articles

PAHO Publishes Measles Eradication Field Guide

The Pan American Health Organization has released the Measles Eradication Field Guide. The publication, published in both English and Spanish, contains information about all aspects of the disease, including measles epidemiology, clinical aspects, measles vaccines, vaccination strategy for measles eradication, surveillance, and laboratory diagnosis.

During the 24th Pan American Sanitary Conference in 1994, Member Countries established the goal of measles eradication by the year 2000. In 1995, at PAHO’s 38th Meeting of the Directoring Council, the Ministers of Health of the Americas unanimously approved the Measles Eradication Plan of Action prepared by the Organization.

The Measles Eradication Field Guide provides health authorities, medical officers and all health personnel involved in measles eradication at national, state and local levels with a step-by-step manual for setting up and implementing measles eradication activities. The lessons learned from experiences acquired by the countries of the Americas over the past seven years, but it can be used by any country working towards the control or eradication of measles. It emphasizes appropriate vaccination and surveillance strategies that are required to eradicate measles, and to continually monitor progress towards that goal. Some of the measures described may need to be adapted to local conditions.

PAHO acknowledges the outstanding accomplishment of all health workers in the Americas involved in measles eradication activities. In confronting the formidable challenge of eradicating one of the most infectious and lethal agents known to man, these persons have persevered and continued to learn from their experiences. It is hoped that the lessons learned from the measles eradication experience in the Americas can be adapted and applied to other countries and Regions of the world and that the ultimate goal of global measles eradication can be achieved.

To obtain a copy of the Measles Eradication Field Guide (Technical Paper No. 41), please contact the PAHO Country Office, PAHO’s Publication Office or the Division of Vaccines and Immunization, PAHO/WHO, 525 23rd Street N.W., Washington, DC 20037, or e-mail us at hph@paaho.org.

CDC Joins PAHO to Eradicate Measles

The Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, USA has joined the Pan American Health Organization to eradicate measles in the Western Hemisphere by the year 2000. On 30 April 1999 at PAHO headquarters in Washington, D.C., Dr. George Alleyne, Director of PAHO, and Dr. Jeffrey Koplan, Director of the CDC, signed a collaborative agreement between the two organizations. This partnership will ensure the successful completion of the target of measles eradication and will play a critical role in complementing national efforts towards the prevention, control and eradication of other vaccine-preventable diseases. Dr. Koplan also announced that the CDC will provide US$ 8 million to PAHO for this effort.

Dr. Koplan declared, “CDC looks forward to greater collaboration with PAHO in all areas, and specifically to eradicate measles by the end of the year 2000. This initiative is good for the United States and for CDC, it’s good for all the countries in the Americas and for PAHO, and most importantly, it’s good for the children of this Region. CDC is committed to ending the sickness and death caused by measles which can be prevented by an inexpensive vaccine that’s been available for more than 35 years. It’s no longer acceptable for us to allow measles to continue to take its toll on the most vulnerable members of our societies. I look forward to returning next year for our celebratory meeting here at PAHO.”

Dr. Alleege gave further affirmation to the benefits of this partnership, asserting that “we have the conviction that the great things that this hemisphere can do, is when countries work together—that no country is alone.”

The experience from the Americas has clearly demonstrated that regional measles eradication can be achieved by using currently available attenuated, live measles vaccines, and by utilizing an appropriate vaccination strategy. The PAHO and CDC partnership will focus on strengthening measles surveillance in the Americas and in ensuring that countries implement in full the PAHO-recommended vaccination strategy to eradicate the disease. This partnership will also be critical to advance the adoption and implementation of a global measles eradication goal.

The PAHO-CDC collaboration will be carried out under the framework of PAHO’s Regional Vaccine Initiative endorsed by all Heads of States in the Americas in 1998. The initiative calls for partnerships among countries in the Region and international organizations in vaccine research, development and production; epidemiological surveillance for vaccine-preventable diseases; and laboratory diagnosis.

Specific areas of collaboration include:
- Developing a surveillance system capable of detecting circulation of measles and strengthening collaboration with the global surveillance system to detect and contain infectious disease outbreaks.
- Strengthening national capacities to effectively prevent, respond and appropriately investigate outbreaks of vaccine-preventable diseases.
- Strengthening annual routine measles vaccination programs at the district level, and full implementation of PAHO’s recommended vaccination strategy for measles eradication.
- Strengthening regional and national capabilities to collect, analyze and interpret epidemiological data and translate them into appropriate public health policies.
- Strengthening and expanding capacities for national laboratory diagnosis and virus isolation.

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XIII Technical Advisory Group Meeting

The Thirteenth Technical Advisory Group Meeting on Vaccine-Preventable Diseases (TAG) was held in Ottawa, Canada, April 12-16, 1998. The following are some of TAG's conclusions and recommendations.

Measles Eradication

Great progress has been made towards interrupting measles transmission in most countries of the Americas. However, the measles virus continues to circulate in several areas of the Region and only twenty-one months remain until the target date of achieving the global eradication of measles.

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- Strengthening regional and national capabilities to collect, analyze and interpret epidemiological data and translate them into appropriate public health policies.
- Strengthening and expanding capacities for national laboratory diagnosis and virus isolation.

Vaccine Stockpile

PAHO should assure that a stockpile of measles containing vaccine is readily available to deal with emergency situations. Since many countries in the Americas are establishing rubella control/elimination goals, consideration should be given to having a stockpile of MR vaccine.

Surveillance and Laboratory

Measles surveillance is critical for measuring progress toward the goal of measles eradication in the Americas and for detecting problem areas. Efforts are urgently needed to improve the quality of measles surveillance throughout the Region.

To monitor progress toward the achievement of measles eradication, all countries should provide data on a weekly basis to the Region-wide measles eradication surveillance system (MERSYS).

Each country should periodically have its measles surveillance system objectively evaluated using the standardized evaluation protocol developed by PAHO. Countries should constantly work to improve the quality of their surveillance systems.

Virologic surveillance and molecular epidemiology can provide important information to an eradication program. Appropriate clinical specimens or viral isolation should be obtained from every chain of measles transmission. U.S. and the most practical specimen to collect for measles virus isolation, should be obtained within 7 days of rash onset and forwarded to a laboratory capable of performing measles virus isolation.

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Dr. George Alleege, Director of PAHO (left) and Dr. Jeffrey Koplan, Director of CDC (right) at the signing ceremony at PAHO headquarters.
Measles Vaccination Campaigns in the Americas

**Background**

Following the establishment of Bolivia’s Expanded Program on Immunization in 1979, measles vaccination coverage has progressively increased, reaching a level of 80% in 1993. In 1994, the country joined the regional measles eradication goal for the year 2000 and carried out an indiscriminate catch-up measles vaccination campaign aimed at children 9 months–14 years. The 1994 campaign reached 94% coverage at the national level. Departments failing to reach 80% coverage with measles vaccine were Potosi (78%), La Paz (56%) and Pando (77%).

In 1995, Bolivia’s measles vaccination coverage declined to 80% and then climbed to 80% and then climbed to 85% and then climbed to 90% and then climbed to 95% coverage. Due to the lack of sufficient vaccines and syringes, coverage fell down again to 85% in 1998. Lowest coverage has been found in the states of Beni, Pando, Cochabamba, La Paz, and Santa Cruz. It should be noted that approximately 70% of the country’s population resides in the states of Cochabamba, La Paz, and Santa Cruz. These states also have the largest concentration of urban population.

Due to the accumulation of susceptible children since the 1994 campaign, a follow-up measles vaccination campaign was planned for May 1998, targeting children 1–4 years. However, it had to be postponed for five months due to a lack of vaccines and syringes. The results were modest (85%), mainly because the campaign was organized without sufficient preparation.

**Measles Outbreak**

The 1998 measles outbreak in Bolivia began on May 21, 1998, and comprised a series of outbreaks following a period of more than 19 weeks without confirmed cases. Initially, the epidemic affected the municipality of Yacuiba, in the department of Santa Cruz. The municipality of Yacuiba, especially its localities of Pucitos and Yacuiba, borders the province of Salt Nehuén in Argentina and is an area that has a heavy flow of people crossing from Argentina to Bolivia to shop. At the time of the outbreak, Argentina was experiencing an important measles outbreak (10,229 confirmed cases in 1998). From Yacuiba, the outbreak spread first to the city of Santa Cruz in the Department of Santa Cruz, and subsequently to rural areas within this department as well as to the Departments of Cochabamba and Oruro. Thereafter, the disease traveled to seven of the country’s nine departments, affecting 66 of 311 municipalities. Eventually, the outbreak affected all departments except Pando.

The population hardest hit in the initial stages of this outbreak was young children. Fifty-seven percent of those affected were children under the age of 5. A mop-up measles vaccination campaign targeting children under 5 years, regardless of vaccination history, was first held between June 1–21, 1998, in the localities of El Salvador Masín in Argentina, and Pucitos and Yacuiba in Bolivia.

**Current Situation**

As of July 10, 1999, 2,254 suspected cases have been reported in Bolivia (since the beginning of the outbreak). Of those cases, 1,871 (83%) were reported from the public sector and 381 (17%) from the private sector. The remaining 4% came from other sources, including 26 cases identified during an active search that took place during the vaccination campaigns in Cochabamba, Sucre and El Alto. Of the suspected cases, a total of 1,816 (81%) were confirmed, 38 were discarded, and 42 are still under investigation. Of the confirmed cases, 1,827 (99%) were laboratory confirmed. Of the 1,836 confirmed cases, 1,004 (66%) occurred in 1998 and 832 during the first 29 weeks of 1999 (Figure 1).

Of the total confirmed cases in 1999, 319 (18%) occurred in children 1-4 years and 150 (8%) in children 6-11 months. A total of 351 cases (18%) occurred in young adults aged 20-29 years (Figure 2). The highest incidence rate occurred in children aged between the ages of 6-11 months, followed by those aged 12-23 months, 2-4 years and young adults 20-29 years of age (Figure 2). Of the 469 confirmed cases in children aged 6 months–4 years, 408 (87%) had not been vaccinated or could not present proof of measles vaccination, which indicates that failure to vaccinate rather than vaccine failure was the cause of this outbreak. Of the total confirmed cases, 270 (32%) occurred in the state of Santa Cruz and 32% (220) in Cochabamba, and 200 (24%) in La Paz. The remaining 12% come from states of Oruro, Potosi, Beni, Chuquisaca and Tarija. Of the total confirmed cases, 607 (73%) occurred in urban areas. During the last four weeks, the majority of cases have occurred in the cities of La Paz and El Alto. Although information concerning origin and occupation of the adult cases is still fragmentary, many of these cases are recent migrants from rural to urban areas and market merchants. Adult cases have also occurred among health care workers, students and military personnel living in barracks.

**Follow-up campaign ongoing, last updated: 30 July, 1999.**

**Rubella Watch**

**EPI Newsletter**

**FIGURE 1** Confirmed measles cases by week, Bolivia, 1998–1999.*

**FIGURE 2** Number of confirmed measles cases and incidence rate by age group, Bolivia, 1998–1999.*

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* Data not available.

* No campaign.

* Tales - Age group was 4–60 years = 43%, last coverage for the 4–14 years was 94%.

* Follow-up campaign ongoing, last updated: 30 July, 1999.
The Bolivia outbreak has primarily affected children between the ages of six months and four years living in urban areas where measles virus circulation in all areas of the country is critical, since it allows for the rapid implementation of control activities that will result in decreased virus transmission. In this regard, it is encouraging to see the growing participation of Bolivia’s private sector in reporting suspected measles cases.

The main factors contributing to the persistent and ongoing transmission of measles virus in the country are: 1) lack of permanent and sufficient supply of measles vaccines; 2) failure to carry out a follow-up measles vaccination campaign on time; and 3) low vaccination coverage through routine immunization services.

The situation in Bolivia clearly shows the difficulties in controlling an outbreak once it is fully blown, particularly in densely populated areas. In order to prevent this situation, routine vaccination coverage should be at least 95% in all municipalities.

The Bolivia experience also emphasizes the importance of adequate timing of vaccination campaigns:

- **Enough time should be allowed for ample involvement of communities, and for adequate distribution of vaccines and financial resources.**

- **Special attention should be given to the decentralization of activities, to ensure that health areas take full responsibility for implementation.**

- **The dates of vaccination should be planned based on the best time to reach target populations.**

The Bolivia outbreak, as well as other outbreaks occurring in several countries in the Americas (Argentina, Brazil and the United States) that had been free of measles for prolonged periods of time, demonstrates the inevitability of measles re-introduction as long as the virus circulates in other regions of the world. These outbreaks will be short lived in countries with high vaccination coverage through routine services and follow-up campaigns. However, in countries with low measles coverage in routine services and where follow-up measles campaigns are not carried out on time and fail to reach sufficient coverage, the re-introduction of measles can have severe consequences.

**Ministerial Resolution**

Considering:

That, the Bolivian Government, together with other governments of the Americas, has made the commitment to eradicate measles from the Western Hemisphere by the year 2000. That, the measles outbreak, which began in Brazil in 1997, has spread to our territory. That, it is necessary that the Ministry of Health and Social Welfare take the necessary measures to protect the health and life of all our people, especially that of children.

Therefore,

**Resolves.**

- First Article. Declares of national priority the implementation of a National Campaign against Measles, to be scheduled between November 28 and December 17 of the present year, during which at least 95% of the children between the ages of 6 months and 4 years of age should be vaccinated, in order to intercept the transmission of the disease.

- Second Article. Charges the Directorate General of Epidemiology with managing the implementation of the technical and resource mobilization aspects, and the allocation to the departmental health services of vaccines, syringes, registration material, national and international financial resources, as well as follow-up and evaluation of the campaign.

- Third Article. The Departmental Health Services should assume the responsibility of local planning, promotion and implementation, and the accomplishment of 95% coverage of measles vaccinations at the departmental level. Towards this end, maximum priority should be assigned and human material and financial resources allocated to successfully reach this goal.

- Fourth Article. The Departmental Health Services should summon health providers from the social services, non-governmental organizations and health services of the Church to join this national task. The Departmental Health Services will provide vaccines, syringes and registration material.

- Fifth Article. During the preparation and implementation of the Campaign, all activities that could jeopardize its implementation will be suspended. Furthermore, vaccination and permission of the management and operational staff involved in the Campaign will be suspended.

- Sixth Article. The Departmental Health Services that do not reach the target of 95% measles vaccination for children between 6 months and 4 years of age will be subject to sanctions as stipulated in their management performance agreements.

Those responsible for the fulfillment of this resolution are the Heads of the Departmental Health Services and the Directorate General of Epidemiology.

Register, make this known, and archive this document.

October 26, 1999

**Measles in the United States**

Since May of 1998, Bolivia has been affected by a measles outbreak, which began in the municipality of Yacuiba, within the department of Tarja (see EPI Newsletter, August 1999). Bolivia reported 1,004 confirmed measles in 1996, and during the first 40 weeks of 1999, there have been 1,218 confirmed cases. Fifty-one percent of the total measles cases for 1999 in the Region have been reported in Bolivia.

In response to this situation, the Ministry of Health of Bolivia has prepared a special plan of action and issued a Ministerial Resolution on October 26, aimed at ending the outbreak and interrupting virus transmission. The objective is to vaccinate at least 95% of all children between the ages of 6 months and 4 years (1,071,723 children) in a National Measles Vaccination Campaign, to be held between 28 November and 17 December in each municipality. This decision of the Ministry of Health indicates the high-level commitment of national authorities to the health of the population, and is an excellent example of Pan-Americanism in action.

The measles Elimination Strategy for the United States has four components: 1) maximize population immunity to measles by delivering the first dose of measles-mumps-rubella vaccine on time (at 12-15 months of age) and giving a second dose to children at school entry, 2) ensure adequate surveillance, 3) respond rapidly to outbreaks and 4) work with other countries to improve measles control.

The first dose has been at 90% for two-year-old children since 1996. First-dose coverage among all children seven years or older exceeds 95% because of long standing, well-enforced, school requirements for vaccination. School requirements in the states have been gradually modified to include a mandatory two doses of measles vaccine. As of the 1998-99 school year, two doses of measles vaccine were required for 52% of school children in the United States (two doses are recommended for all school children).

The sensitivity of the United States Measles surveillance system is shown by its ability to consistently detect internationally imported measles cases. In addition to rapid detection of cases and prevention of spread, the surveillance system focuses on linking cases to international importation of measles virus. Internationally imported cases, cases epi-linked to importation, and imported virus cases (cases in a chain of transmission from which an imported measles virus strain was isolated but a link to an internationally imported case was not identified) are all considered importation-associated cases. Of the record low 100 cases reported in 1998, 26 were internationally imported, 45 were importation-associated, and 29 were not importation-associated. The proportion of cases not associated with importation has declined from 85% in 1995 to 72% in 1996, 41% in 1997, to 25% in 1998.

The 26 internationally imported cases reported in 1998 represent the lowest number of imported cases since the recording of importation status began in 1983. Imported cases from the Americas remained at very low levels with only one case imported from Argentina and one from Canada. Imported cases from Europe and Asia declined compared with the previous year, 35 and 1, respectively. Of 26 imported cases, 14 occurred among international visitors and 12 among U.S. residents exposed to measles while traveling abroad.

Viral genomic sequencing of specimens in 1998 allowed definitive classification of measles virus strains from...
Rubel Watch EPI Newsletter

Pan American Health Organization

First Ladies Meet in Canada

The Spouses of Heads of State and Government of the Americas and Government Delegates gathered in Ottawa, Canada, from September 29 to October 1, 1999, for the Ninth Conference of the First Ladies of the Americas with the theme of Women of the Americas: Agents of Change. These conferences originated in 1980, when the First Spouses of the Central American countries met to exchange experiences and establish mechanisms for action and cooperation among their countries. By 1991 in Venezuela, the conferences had become an annual gathering, and later turned into a hemispheric event in 1994, when Canada and the United States participated for the first time.

In the 19 point Declaration of Ottawa, the First Ladies reaffirmed their role and commitment to further the well-being of the people in the Americas. The First Ladies noted that given the existing global and hemispheric consensus on health development goals, the time was proximate to pursue and consolidate these goals, giving priority to human groups most in need of support and to the problems and social services that require further attention.

In point 8 of their Declaration, the First Ladies made reference to the Regional initiative to eradicate indigenous transmission of measles virus by the year 2000: “We continue to strive toward the promotion of better health through preventive measures, the reduction of violence, and more equitable access to health care services. We praise the achievement of those countries that have successfully eliminated measles and other preventable diseases within their borders and encourage the continued effort of others to meet our common goal of eradicating measles throughout the Americas by the year 2000.”

Final Ottawa Declaration – September 29-October 1, 1999, Ottawa, Canada.

Editorial Note:

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Final Ottawa Declaration – September 29-October 1, 1999, Ottawa, Canada.

Editorial Note:
Measles Articles

December 1999
Volume XXI, Number 6

Year 2000: Zero Measles?

Through December 11, 1999, a total of 39,941 suspected measles cases were reported from the countries of the Americas. Of these, 2,803 (7%) have been confirmed, 24,764 (62%) have been discarded, and 8,369 (21%) remain under investigation. Of the total confirmed cases, 2,227 (79%) have laboratory confirmation of measles, with the remaining 402 (13%) found to have an epidemiological linkage to a laboratory confirmed case and 576 (21%) have been confirmed on clinical grounds alone. The country most affected by measles in 1999 is Bolivia, with 51% of all reported cases in the Region (1,420 confirmed cases). Other countries with significant virus circulation included: Brazil (689 confirmed cases), Argentina (253 confirmed cases), Dominican Republic (206 confirmed cases). The other 235 cases were reported from the United States, Uruguay, Colombia, Chile, Peru, Costa Rica, and Canada, and were mainly secondary cases following international importations among unvaccinated populations.

Bolivia has continued to suffer large outbreaks due to large pockets of under-immunized populations, despite intensified vaccination activities that began in November 1998 and continued through March 1999. The most recent outbreak, which began in May 1998, produced 1,004 confirmed measles cases in 1999 and appeared to be waning at the end of 1999 (Figure 1). The major focus of measles virus transmission during 1999 were the departments of La Paz (453 cases), Santa Cruz (145 cases), Cochabamba (291 cases), and Beni (149 cases). Beni, a southern province of Bolivia with a highly dispersed population, reported the highest incidence rate (42.1/100,000), with the other three departments reporting incidences of 19-20/100,000. Of the total confirmed cases in 1999, 755 (54%) occurred in children under five years of age, and this age group also had the highest overall incidence rate. Of the remaining cases, 336 (25%) were reported in school-age children, 11 years of age, and 225 (17%) among young adults (20-29 years of age). To control this measles outbreak, the Bolivian government, with the technical support of PAHO, and financial assistance of the state of New York, the Inter-American Development Bank, UNICEF and local NGOs developed an Emergency Plan. Under the Plan, an international team of seven experts was recruited to work with Bolivian health authorities. The Ministry of Health also issued a Ministerial Resolution supporting the implementation of a comprehensive national campaign during December of 1999. A dramatic drop in measles cases has been observed, in the areas undertaking intensive follow-up measles vaccination activities.

A similar situation to that of Bolivia became apparent in the Dominican Republic during 1999. The outbreak began due to an importation from Argentina in 1997 in the tourist area of Altariga. Despite two vaccinators in 1998, the virus continued to circulate and subsequently spread throughout the country in 1999. Over 2,200 cases were reported from the Santo Domingo metropolitan area, where pockets of unvaccinated children, overcrowding, and low coverage rates from previous follow-up campaigns helped to spread the disease. Like Bolivia, the majority of cases were in young children. The Ministry of Health, working with PAHO’s technical assistance, organized a Task Force to ensure the effective control of measles transmission in the country. Furthermore, an international team is working with national health authorities to raise coverage rates in a house-to-house vaccination effort, targeted at children between the ages of 6 months and 4 years.

Brazil experienced an impressive decline in measles cases compared to 1998 (a total of 2,310 confirmed cases were reported last year compared to 129 confirmed cases in 1999). Of these, 453 cases were reported from Pernambuco, a state in the Northeastern portion of Brazil with a large number of unvaccinated populations. Rio de Janeiro and Sao Paulo reported 117 and 126 cases, respectively. A recent outbreak was also reported in an army battalion in the state of Mato Grosso do Sul. Age groups most affected have been children under one year of age (incidence of 3,482/100,000), and 1-4 year olds (0.23/100,000).

Argentina, which reported the majority of cases in 1998, noted a significant decrease as of December 1999. These cases occurred mainly in the provinces of Tucuman, Chaco, San Juan and in the province of Buenos Aires. Age groups reported the highest incidence rates (incidence rate of 19-20/100,000) under one year of age (7.5/100,000), followed by children one year of age (4.2/100,000), and 2-5 year olds (0.75/100,000). An Emergency Plan of Action was developed in 1999 and four national epidemiologists were hired to assist Argentinean health authorities in eradication efforts. Since mid-September, 2,803 confirmed measles cases have been reported, indicating a sharp reduction in the transmission of measles virus.

In Colombia, an active search was conducted in the largest eight cities to determine if measles virus was circulating. This activity provided useful information to respond to laboratory confirmed measles cases occurring in isolation in 1998 and 1999, without any known source of infection. PAHO and Health Ministry staff have reviewed all available cases and surveillance data for both years and determined that only one department had a clustering of measles cases, especially in an urban area, which suggested measles virus circulation. A review of case and laboratory data from the other sporadic laboratory with confirmed measles cases with no source of infection indicated that the majority of them were post-vaccine associated cases. More importantly, because of the ongoing processes of health reform and decentralization, the quality of measles surveillance is unknown or at best unreliable because many of the new health care providers are not part of the formal national surveillance system. Efforts are necessary to quickly determine if the measles virus was still circulating, the Ministry of Health accepted PAHO’s recommendation to carry out an active search in the eight largest urban centers. The active search was carried out between November and December 1999. No additional confirmed laboratory confirmed measles cases were found.

Costa Rica reported three imported measles cases traced to a Costa Rican resident exposed to measles while visiting the Dominican Republic. Since then four additional confirmed cases have been reported, indicating a sharp reduction in the transmission of measles virus.

Editorial Note:
The millennium ends on a high note for vaccine-preventable diseases: smallpox was eradicated worldwide in 1979, poliomyelitis is just weeks away from being eradicated in the Western Hemisphere in 1991, and the Region of Americas is on the brink of eradicating the indigenous transmission of measles virus. Since 1991, confirmed measles cases in the Americas have declined 91% from a high of 53,661 cases in 1991, to 2,803 confirmed cases this year. Reaching the final unvaccinated population and breaking the chain of transmission require the utmost dedication to the eradication strategy if this milestone is to be reached by the end of the year 2000. Vaccination of susceptible individuals is the keystone to success. To achieve measles eradication all countries in the Americas should use the same tools. These tools should include:

• Carry out timely follow-up measles campaigns when the pool of susceptibles approaches the number of children in an average birth cohort.
• Reach the goal of 95% vaccination coverage in all municipalities.
• Assure the availability of the necessary vaccine supply at the central, regional and local level at all times.
• Avoid missed opportunities: all contacts between children and health care providers should be used as an opportunity to vaccinate, when appropriate.
• Identify hard-to-reach population groups and implement social mobilization activities that enhance their compliance with vaccination efforts.
• Alert health care workers about the regional eradication initiative and emphasize the importance of their cooperation to reach this goal.
• Health care workers in contact with children or infectious diseases should be vaccinated against measles regardless of vaccination history.

Editorial Note: continued

• Complete epidemiological investigations of all suspected measles cases. A suspected measles case is any: “Patient in whom a health care provider suspects the possibility of measles.”
• Assure that all vaccination activities contemplate the safe disposal and incineration of all needles and syringes.

December 1999
Volume XXI, Number 6

Collection and Handling of Laboratory Samples for Measles Eradication and Rubella Control

Blood samples from suspected cases:

• In outbreak situations, blood samples should be taken from the first few suspected measles or rubella cases of the outbreak and from all other cases that do not occur in the same municipality or district. Samples should also be taken from any atypical or unusual cases. Samples are not needed from cases epidemiologically linked to other already confirmed cases.

• When sporadic suspected measles or rubella cases occur (dispersed geographically and/or in time), blood samples should be taken from every case.

• Blood samples from all suspected rubella cases that are laboratory confirmed should be tested for measles, ideally within 24 hours* and for rubella, within 72 hours.

• Blood samples at least 10% of the suspected death cases that are IgM negative for dengue should be regularly tested for measles.

Samples for viral isolation from suspected measles cases:

• In outbreak situations, urine samples should be taken from the first few cases of the outbreak (5-10 samples). If attempts to isolate virus are unsuccessful, then additional urine samples should be taken from new cases as they occur. Urine samples should also be taken from cases that do not occur in the same municipality or district. They may also be taken from any atypical or unusual cases.

• When sporadic cases occur (dispersed geographically and/or in time), urine should be taken from every case at the first opportunity.

• Whenever urine cannot be taken (i.e. in some young children), a wipe of the nose and throat with a sterile swab (nasopharyngeal swab) should be taken instead.

• Ideally, samples for virus isolation should be taken within 1-3 days of rash onset, and no more than 5 days after rash onset. However, for sporadic cases, because there may be limited opportunities to take the sample, samples can be taken up to 7 days after rash onset.

• Samples for virus isolation should be shipped to the laboratory indicated in your country as soon as possible.

• The national laboratory is responsible for managing measles specimens will test (or forward to the laboratory for testing) the specimens of those cases with measles IgM laboratory positive results.

• Ideally, only half of the sample should be used for laboratory.
Rubella Watch EPINewsletter 1979–2009

Information regarding the samples

- To be sent with the sample should include the following:
  - Unique identifier number (MESS number where available)
  - Full address and complete phone number to which results should be reported
  - Date of rash onset
  - Date of collection of sample
  - Date of last vaccination
  - Date of rash onset
  - Date of last vaccination
  - If the case is sporadic or part of an outbreak.

- Paper documents should be kept well protected from the ice in a well-sealed plastic bag or similar.
- The laboratory that receives the samples should record the condition of the sample upon arrival (did the sample leak?), was there an ice pack?, were the contents kept cold in transit from the point of collection?). This information should be shared with the sender so errors can be corrected in future shipments.

- 0.5-2 ml of VTM.
- Samples for viral isolation should never be kept in transport media.**
- The urine should be kept refrigerated at 4-4°C until it can be centrifuged.
- Ideally, all urine samples should be cold before centrifugation.
- The urine should be centrifuged, ideally on the same day it was taken, at 1500 RPM (about 500 x g) for 5 minutes. A refrigerated centrifuge is not a requirement.
- The pellet should be immediately re-suspended in 0.5-2 ml of viral transport media (VTM).**
- In the field, centrifuged urine and nasopharyngeal swab specimens can be refrigerated at 4°C for up to five days until they can be stored in a -20°C or -40°C freezer.
- As soon as possible, the sample should be sent to a laboratory equipped with -70 or -40°C freezers.
- Because of the risk of damaging the viruses, samples should never be kept at -40°C.
- When samples are ready to be sent to the national laboratory, they should be shipped in coolers with ice packs.
- In the case of samples that have been frozen at -70 or -40°C, they must be shipped in dry ice to the national laboratory.
- If for any reason centrifugation is not possible, the urine can still be shipped immediately to the national laboratory in coolers with ice packs. It might still be viable for virus isolation if it reaches the laboratory within five days from the day it was taken.
- In the case of a nasopharyngeal swab, the swab should not be centrifuged. It should be placed in a sterile tube with 0.5-2 ml of VTM.

From 1997 to 1999, Colombia reported 8,12, and 10 laboratory confirmed measles cases, respectively. Each case is summarized in both time and location.

Methods

- Collection of data
- Active search was carried out at health centers and other institutions in Colombia.
- Medical centers: Medical records of 1,189 health institutions (IPS – private or public health providers) were reviewed. Health records were checked to find diagnoses compatible with measles (rash, fever, lassitude, scarlet fever).
- Institutions and househounds: There were 20,362 visits carried out at universities, schools, households, preschools, hospitals, prisons and military barracks. During these visits, questions were asked whether people had seen a person that may have had a measles rash within the last 30 days of the date the search was initiated.

The screening definition used for determining if cases should be classified as a measles suspected case, and therefore requiring a complete epidemiological investigation (including collection of blood and/or urine samples) was:

- A person with fever, maculopapular rash with cough and/or coriza and/or conjunctivitis in the last 30 days since the search was initiated or/

The presumptive diagnosis by a health care worker was measles.

Figure 1 Distribution of confirmed measles cases with IgM(+) by date of rash onset, Antioquia, Colombia, 1998-1999.

Figure 2 Distribution of confirmed measles cases by laboratory and clinical per date of rash onset, Antioquia, Colombia, 1998–1999.
Measles Articles

Results
From 2,396,842 possible leads (health records and leads), 2,496 persons were identified as having a rash (2,496/1,000). Upon further investigation, 352 (14%) were classified as suspected measles cases. The distribution of the case classifications is shown in Table 1. During the investigation of all 352 cases, an active search was carried out by health workers in the surrounding communities. No additional suspected measles cases were identified.

Three hundred and twenty-four (90%) of the 352 cases classified as suspected measles had an adequate blood specimen taken. Health workers were not able to collect a blood sample in 28 cases. Of these 352 cases, 99 cases (28%) were found in their acute phase. However only 43/99 urine specimens were collected in cases that were found within seven days of rash onset. Only two of the blood samples processed were IgM positive in the laboratory. One case was discarded because the patient had received a vaccine containing measles within the last 56 days. The second case was a live-virus IgM positive in the laboratory. In Bogota, visits were not made to health care providers or an active search was not conducted in the community in areas with confirmed measles cases. 1997–1999. Only in 2/213 of the boroughs that form Bogota were health care providers targeted for review of health records, to identify possible measles cases. However, an effort was made to include either a large university and/or a hospital in these areas. Nevertheless, the working group determined that more should be done at the borough level to reach health care providers or undertake community searches, to ensure effective detection of circulating measles virus. In the city of Cali, an active search for measles cases in high-risk community areas was not carried out because of administrative reasons. The health team of Cali said it would undertake this activity in March 2000.

A review of the completion of case investigation forms from the active search revealed that only 46% were totally filled out. This indicates the need to strengthen supervision.

In countries with low numbers of confirmed measles cases and where health workers are not familiar with measles, a more sensitive case definition should be considered (see case definition above), to enhance the possibilities of detecting measles virus. Using the measles case definition of PAHO (“any case in which a health worker suspects measles”), health workers diagnosed measles in 26 instances (these had been reported as suspected by the routine surveillance system). When a more sensitive case definition was used, an additional 10 cases were identified as “clinically compatible” with a measles infection. Thus, of the 180 suspected measles cases identified through health care providers, 86% of them were detected using a more sensitive case definition. If one takes into account all the suspected measles cases identified through different institutional searches, including in the community, only 26 cases out of 352 cases were actually picked up. This should be considered as an indicator of the actual sensitivity of the current reporting system in detecting potentially suspected measles cases in the community.

Conclusion
Following the results of the active search and surveillance data obtained from Colombia’s routine system, the working group concluded that between August–December of 1999, there was no evidence of measles virus circulation in the surveyed cities. It was also concluded that the active search exercise had allowed health workers to evaluate the quality of the national surveillance system for measles in Colombia.

Source: Ministry of Health, Colombia.

February 2000 Volume XXII, Number 1

Southern Cone: Progress Towards Measles Eradication

Managers of national communications programs and laboratory staff in the Southern Cone, Brazil, and Bolivia met in January to review the current measles situation and discuss the next steps to meet the deadline of measles eradication by the year 2000. The meeting was sponsored by PAHO and included the participation of Argentina, Chile, Paraguay, Uruguay, Bolivia, and Brazil.

Coverage
Provisional data for the countries of the Southern Cone, as well as for Brazil and Bolivia show that those carrying out a measles campaign for children under 5 years of age reported coverage rates between 94% and 100%. Routine vaccination coverage against measles, however, has been under 95%.

Surveillance
During 1999 there were a provisional total of 3,000 confirmed measles cases in the Americas. These cases occurred in 11 countries, of which only four (Bolivia, Brazil, Argentina, and the Dominican Republic) have reported indigenous virus transmission. Bolivia reported 1,442 cases (44% of the total in the Region), Brazil 756 (25%), Argentina 247 (8%), and Dominican Republic 206 (7%). All these countries are currently implementing aggressive plans of action that include: implementation of timely follow-up measles campaigns, active search of measles cases, and the strengthening of surveillance. As a result, the number of cases decreased in the last quarter of the year (see Figure 1). The five countries that kept high measles vaccination coverage (Canada, Chile, the United States, Peru, and Uruguay) were affected by measles importations, which cannot be linked outbreaks or an endemic circulation onwards.

The outbreak in Brazil started in 1996 in Santa Catarina and São Paulo (the latter state did not participate in the last scheduled national measles follow-up campaign). The highest incidence of cases was seen in 1997 (53,644 cases), 68 times more than in 1996. In 1998, the total number of confirmed cases went down to 2,930. Of the 756 provisional confirmed cases in 1999, 305 (40%) occurred in the Northeastern region. The proportion of Perinatal was the most affected, with 24% of the total cases in the 5 years of age.

Unlike the 1997 situation in São Paulo, the age group most affected in 1999 was children under 5 years. With the incorporation of 27 additional epidemiologists, hired as part of a special Task Force, and the implementation of an emergency plan, there was a surge in the notification of suspected measles cases to a total of 33,781 cases. Although each state had at least one laboratory for serological diagnosis, only 356 of the 756 confirmed cases were confirmed by laboratory or had an epidemiological link to a suspected case. Overall, measles vaccination coverage in 1999 reached 93%. However, in 59% of the municipalities coverage was under 95%. In order to interrupt measles virus transmission, Brazil has scheduled a follow-up campaign for June 17, 2000 and has also intensified surveillance. The campaign will target children under 5, up to age 15 years of age in some states.

In Argentina, the outbreak began at the end of 1997 in Missions. That year, 121 cases were reported in three provinces. The outbreak spread to the entire country in 1998, with a total of 10,229 confirmed cases. In 1998, a national vaccination campaign was conducted targeting children 1 to 6 years of age, but it did not include all the provinces. During 1999, 247 confirmed measles cases were reported from 12 (50%) of the 24 provinces. The last case was reported during epidemiological week 46 in Mendoza. The population most affected was unvaccinated children under 5 years of age.

Table 1, Distribution of suspected measles cases.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Total</th>
<th>Discard</th>
<th>Under inv.</th>
<th>Clinically confirmed</th>
</tr>
</thead>
<tbody>
<tr>
<td>High sample 244</td>
<td>222</td>
<td>32</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Without sample 28</td>
<td>24</td>
<td>24</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

* Recent vaccination states.
In Bolivia, it is important to note that in 1995 vaccination coverage was 80%, but increased in 1996 and 1997 to 98%. Nevertheless, due to lack of vaccines, this coverage declined again in 1998 to 85%. The measles outbreak commenced in May 1998 in Tarja, which borders with Argentina, and from there gradually spread to the rest of the country, with a peak of 10,004 confirmed measles cases in 1998 and 1,442 cases in 1999. Fifty-two percent of the total number of confirmed cases in 1999 corresponded to children under 5 years of age.

In order to control the epidemic in Bolivia, the government implemented a plan of action with the collaboration of the World Bank, USAID, UNICEF, and the IDB and an important financial contribution from the government. The plan included the implementation of a national follow-up campaign between November and December 1999. Coverage obtained in the campaign was 98%, with 71% of municipalities reporting coverage of 95% or higher.

A dramatic reduction was achieved in the number of confirmed cases since the end of the campaign to date. Currently, the country is carrying out mop-up vaccination and active search of cases in municipalities at risk.

As of March 16, 2000, the total number of confirmed measles cases in Bolivia is 35 (11 by laboratory and 4 by epidemiological link) five are pending and 71 have been discarded. The last confirmed case had onset on February 23. Eighty-six percent (30 cases) correspond to persons over 5 years of age and 62% (22 cases) to those over 15 years of age.

Starting from epidemiological week six (February 12), the Department of Beni was the only one reporting confirmed cases due to an outbreak in a military barrack. The departments of Santa Cruz and Beni account for 86% of the cases in Bolivia this year. Other states reporting cases are Pando (3), Potosí (3), and La Paz (1). A total of eight of the 314 municipalities in the country have been affected. In each of the municipalities, control activities are being carefully implemented, in order to ensure that transmission is stopped.

As of May 6, 101 laboratory confirmed measles cases have been reported. During the same time period in 1999, 108 cases were reported (see Figure 2). Over this time period, 1,048 blood samples were taken. Many of these Sero-ELISA were encountered during the active search activities that were conducted in January and February of 2000. The efforts that were made to control this outbreak are described below.

Rubel Watch EPI Newsletter

April 2000
Volume XXII, Number 2

Measles Updates: Dominican Republic

Background

In November 1998, the Dominican Republic was affected by a measles outbreak that began in the province of Altogata, due to an importation from South America. The same month, country carried out a follow-up measles campaign that had already been planned, targeting children between 9 months and 4 years of age. Average coverage obtained was 69%, which was insufficient to stop the outbreak. This outbreak spread throughout the country in 1999, with 274 confirmed cases reported.

Over 50% (14/274) of cases were reported from the Santo Domingo metropolitan area, where pockets of unimmunized children, overcrowding, and low coverage rates from previous follow-up campaigns helped to spread the disease. As the epidemiological data has supported in other outbreaks in the Region, the age group most affected has been children <1 year of age. The age-specific rates for 1999 were: infants under 1 year of age, 18.3 cases/100,000; children 1-4 years of age, 10.2 cases/100,000; children 5-14 years of age, 3.2 cases/100,000; and 15 years of age, 1.6 cases/100,000. The age-specific rates for 2000 through epidemiological week 18 are: infants under 1 year of age, 7.3 cases/100,000; children 1-4 years of age, 2.1 cases/100,000; children 5-14 years of age, 0.9 cases/100,000; adolescents 15-19 years of age, 0.4 cases/100,000; young adults 20 – 29 years of age, 1.9 cases/100,000 and > 29 years of age, 0.5 cases/100,000 (Figure 1).

When analyzing the cases by age, 14 of the 16 cases in children under 1 year of age are under 9 months, and 12 cases are between the ages of 6 and 9 months. Furthermore, there has been an increase in the incidence of measles among the 20-29 year age group.

As of May 6, 101 laboratory confirmed measles cases have been reported. During the same time period in 1999, 108 cases were reported (see Figure 2). Over this time period, 1,048 blood samples were taken. Many of these Sero-ELISA were encountered during the active search activities that were conducted in January and February of 2000. The efforts that were made to control this outbreak are described below.

Vaccination Activities and Active Search

In March of 1999, house-to-house vaccination of children between 6 months and 14 years of age was carried out in the entire country with the objectives of interrupting the outbreak. However, the results were not sufficient to achieve the interruption of measles virus circulation. In order to control the outbreak, an indiscriminate measles campaign was conducted in December, 1999. Nineteen provinces were chosen to participate in the vaccination activities, based upon the following criteria:

• Recent confirmed measles cases
• Low measles vaccine coverage in children <5
• Poor surveillance indicators
• Provinces bordering Haiti
• Urban areas with low income populations and overcrowding

All provinces cooperated in the campaign; however, due to the holidays, several areas did not complete their immunization activities and had to resume in January. Overall coverage in children <5 years of age reached 89%.

In order to interrupt transmission of measles, an active search for suspected cases was initiated in January, 2000. Priority was given to “high-risk” areas, such as crowded urban settings with low coverage in the December campaign, bordering provinces with Haiti, and areas where confirmed measles cases were reported in the previous four weeks. Over 20 health professionals were trained in the methodology to conduct an active search with materials developed by PMHO consultants and staff. Each week, teams consisting of two trained individuals and a driver implemented the active search.

Components of the active search include: review of public and private hospital records, meetings with local director, epidemiologist and immunization program coordinators, focus groups with leaders and members of the community, and neighborhood house-to-house active search in high-risk areas. As of February, an active search was completed in all of the provinces in the country. This included 95 health centers and hospitals. Health centers were reviewed and 38 suspected cases were discovered, from which 320 urine samples were collected. Of the 38 suspected cases uncovered in the active search (22 cases), which had already been reported in the surveillance system, 3 cases were reported as high-risk.

An important component of PMHO’s strategy to eradicate measles transmission involves intensive mop-up activities in areas where the virus is circulating. The Dominican Republic conducted such a campaign from March 10–April 15, its goals were: 31) to vaccinate 100% of children
between 6 months and 4 years of age who have not been previously vaccinated in all municipalities that have vaccine coverage under 95%; and 3) to vaccinate 100% of children between 1-4 years of age that received measles vaccine before they were one year of age that received measles vaccine before they were one year of age in municipalities that have vaccine coverage under 95%. A total of 26 provinces were involved, as well as several municipalities in the departments of Domingo. House-to-house vaccination took place, using rapid and efficient supervision of vaccination teams.

Vaccine coverage is currently being evaluated by visits to each municipality. The results from the campaign are being reviewed, as well as monitoring of coverage in high-risk areas.

The City of Gonaïves is located 180 km north of Port-au-Prince. The index case in the Mennonite community was established three weeks after measles cases with a recent history of travel to Santa Cruz had been reported in Bolivia. Source: Ministry of Health, Bolivia, SEDES/Santa Cruz.

80% of the Mennonites had an acute fever and rash onsets. They were treated at the Medical Center of Santa Cruz. The index case in the Mennonite community was established three weeks after measles cases with a recent history of travel to Santa Cruz had been reported in Bolivia. Source: Ministry of Health, Bolivia, SEDES/Santa Cruz.

During the investigation, a house-to-house vaccination campaign was carried out in Santa Cruz from May 21 to May 27, 2000. They had been in Santa Cruz until May 9. Among the places they visited was a Mennonite community located approximately 200 km east of Santa Cruz in a remote area within the municipality of Paulín. The Mennonite community was established 3 years ago with settlers coming from a similar community in Bolivia. The outbreak investigation was conducted by the leaders of the Mennonite communities in Santa Cruz, in collaboration with the visits from Canada on the indicated dates. The investigation team consisted of a house-to-house visit of all households (thirty-three families, total population of 229 persons). Of the total population, 45 persons (20%) were less than 5 years of age. During two consecutive visits held on June 4 and 14, a total of 65 suspected measles cases were identified. They occurred in 18 (55%) of the 33 families of the community. Rash onset of the first case was on March 26, and rash onset of the last case occurred on June 12 (Figure 1). House-to-house vaccination was conducted from March 26 to April 3, 2000, with the participation of the team from the Medical Center of Santa Cruz. The outbreak investigation was conducted by the leaders of the Mennonite communities in Santa Cruz, in collaboration with the visits from Canada on the indicated dates. The investigation team consisted of a house-to-house visit of all households (thirty-three families, total population of 229 persons). Of the total population, 45 persons (20%) were less than 5 years of age. During two consecutive visits held on June 4 and 14, a total of 65 suspected measles cases were identified. They occurred in 18 (55%) of the 33 families of the community. Rash onset of the first case was on March 26, and rash onset of the last case occurred on June 12 (Figure 1). 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1979–2009

contact with infectious cases for some days, and were therefore incubating the disease. Nonetheless, none of these six cases developed complications.

Interventions in other communities

In view of the outbreak in two Mennonite communities, a vaccination campaign for persons between the ages of 6 months and 30 years of age was carried out in all similar communities in the Department of Santa Cruz. As of July 10, 2000, 15 (38%) of 39 similar communities in Santa Cruz had already been adequately vaccinated (coverage >95%), with coverage confirmed through door-to-door monitoring. Simultaneously, a door-to-door active search for suspected measles cases was carried out in all communities. Also, an active search was carried out in the city of Santa Cruz, particularly in areas of the city that receive frequent visitors. Members of these communities, and coverage was monitored throughout Santa Cruz as well. Vaccination coverage was over 80% in only two of the 10 blocks monitored in the five districts.

Conclusions

- Due to low vaccination coverage and the absence of epidemiological surveillance, rural communities such as the one described represent high-risk groups for ongoing measles circulation.
- A major cause of the outbreak was: a) lack of a vaccination program (routine and during outbreaks); and b) lack of ongoing and systematic outreach and education efforts that highlight the importance of immunization.
- Deficiencies in surveillance, particularly regarding the organization of the private sector, contributed to the late detection of the outbreak and therefore to its magnitude and duration.
- Low measles vaccination coverage found in Santa Cruz during the monitoring effort is indicated that the city is at risk of measles reintroduction.
- Nonetheless, no evidence of sustained measles transmission was found in Santa Cruz.

Recommendations

Immediate Actions

- Initiate and maintain outreach and education programs for these communities on immunization and related issues. These activities should be planned and implemented in close collaboration with the community leaders.
- Plan individual visits to these communities to guarantee cooperation for emergency vaccination activities.
- Implement door-to-door vaccination of all similar communities, including all persons aged 6 months to 30 years, until 295% vaccination coverage is reached.
- Confirm vaccination coverage reached through population door-to-door and school monitoring.
- Implement an active search for suspected measles cases at: all communities during vaccination campaigns all clinics and health centers that serve these communities
- Encourage the participation of local private physicians in measles reporting including those already identified as working in these communities. To this end, visit them regularly and strategically place colorful posters with photographs of measles cases and a contact phone number to report suspected measles cases at all physicians’ offices.
- Prioritize areas at highest risk, carry out door-to-door vaccination of children under 5 years of age in the entire city of Santa Cruz, guaranteeing coverage of at least 95% through daily monitoring and supervision.

Medium-Term Actions

- Maintain regular outreach activities and education programs on immunization, targeting the needs of these communities.
- Train and equip Mennonite vaccinators for all the communities.
- Supervise work of vaccinators at least every two months.
- During supervision, carry out a door-to-door active search for suspected measles cases and monitor vaccination in areas where the virus was circulating.
- Continue door-to-door house-to-house vaccination in the city of Santa Cruz and at other at risk areas.

Source: Francisco Giménez S.; Fernando Gil M.; Ana María Barba P.; and Nancy Titischka V., Ministry of Health, Bolivia.

June 2000 Volume XXII, Number 3

Lessons Learned: Outbreak Response in the Dominican Republic

In health authorities in the Dominican Republic conducted mop-up campaigns from March 10-April 15 in order to interrupt measles transmission in areas where the virus was circulating. By December the country had carried out an independent measles campaign in 19 provinces. These provinces were chosen based on recent confirmed measles cases, low measles vaccination coverage in children under 5 years of age, poor surveillance indicators, provinces bordering Haiti and urban areas with low compensation and overcrowding. The March-April mop-up campaign included a total of 26 provinces, as well as several neighborhoods in Santo Domingo (please refer to the April 2000 issue of the EPI Newsletter). This operation was undertaken in Santo Domingo, La Altagracia, the second largest city in the Dominican Republic.

As can be seen in the diagram below all streets were surveyed for vaccination in an area visited for measles vaccination. During a subsequent outbreak investigation of the same area done in May, six cases were found in exactly the street where vaccination had not taken place. These six unvaccinated cases were eligible for vaccination during the campaign but were not covered.

August 2000 Volume XXII, Number 4

Progress Towards Measles Eradication: Canada

In 1995 Canada introduced an enhanced surveillance system for measles. Subsequently a National Measles Surveillance System was established to oversee measles eradication activities, review cases, and to recommend modification in the prevention and control of measles in Canada. Since late 1997, measles is no longer indigenous in Canada, and all confirmed cases reported are either imported or imported related (Figure 1). In 1998, 12 confirmed cases were reported, which is the lowest annual number ever recorded in Canada. In 1999, 28 confirmed cases were reported, 8 of which had exposure outside Canada. There were two outbreaks both linked to virus importation from the Netherlands.

As of August 10, 2000, a total of 84 confirmed cases were reported in Canada from four provinces: Quebec [28], British Columbia [28] Alberta [25], and Ontario [3]. With the exception of one case source unknown, all cases were either imported or import-related. Imported measles cases included two foreign students and six Canadian residents exposed to measles while traveling abroad. There have been four outbreaks associated with travel to or emigration to Mexico, the Dominican Republic, and possibly Belgium, with 6 to 28 cases each, and having up to 4 generations of community-

Editorial Note:

The adequate organization of a vaccination campaign and the ongoing supervision are essential in preventing the recurrence of pockets of non-visited areas that could allow virus transmission to continue. Outbreak response activities should be rapid and well-organized, with one supervisor for each 5–10 vaccinators, daily monitoring of the work by epidemiologists, and effective use of maps of areas to be vaccinated.

HVP staff have been working closely with all countries who currently have ongoing measles virus transmission. Generally speaking, the major obstacles have been inadequate surveillance, as well as inadequate procedures for carrying out supervisory activities. Based on the lessons learned from previous vaccination efforts in the Americas, the most important elements include:

- Staff Attributes
  - Motivated
  - Adequately trained (problem solving skills)
  - Willingness to walk long distances every day

- Methods
  - Health workers use chalk to mark house visited and vaccinated.
  - Supervisory visits take place to both marked and unmarked houses.
  - Supervisors have forms for tallying results of visits.
  - Supervisors meet at the end of the day to discuss findings.

- To improve vaccination tactics.

Source: CDHC, Health Canada.

FIGURE 1 Measles cases confirmed, Canada, 1999–2000.

<table>
<thead>
<tr>
<th>Year</th>
<th>&lt;5yrs</th>
<th>5–14yrs</th>
<th>&gt;14yrs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>1036</td>
<td>1616</td>
<td>38</td>
<td>2680</td>
</tr>
<tr>
<td>2000</td>
<td>630</td>
<td>877</td>
<td>43</td>
<td>1540</td>
</tr>
</tbody>
</table>

- Please refer to the figure for a detailed view of the data.

Pan American Health Organization
linked spread. All cases were either laboratory-confirmed or epi-linked to a lab-confirmed case. The importation from Bolivia accounted for a total of 44 (52%) of the 84 cases, distributed in two provinces, all among individuals unimmunized for philosophical/ religious reasons. Transmission occurred in household and social gatherings, and virologic evidence of importation was found in all outbreaks. In each chain, the viral genotype identified was consistent with the genotype of virus known to be circulating in the source country of the imported case, except for the cases linked to Mexican travel.

Figure 2 shows the distribution of all cases by week of onset from January 1999–August 2000.

OUTBREAK 1: Alberta (linked to travel to Mexico): a cluster of 6 cases linked to Mexican travel occurred in Alberta between April 8 and May 15, 2000 (weeks 14–20), spanning approximately 6 weeks. The index case was a 14-year-old who visited Mazatlan, a tourist area in Mexico, from March 10 to 24, 2000. The onset of rash was on April 8 (15 days after return to Canada). Cases linked to this index included two siblings and a contact of the index case with other family members who falsely reported that they were not related to the index case. All cases occurred during the same period.

OUTBREAK 2: Alberta (linked to travel to Bolivia): This cluster of 19 cases occurred between May 21 and June 26 (weeks 21 to 26), and spanned five weeks. Ages of these cases ranged from 1 to 23 years; median 3 years. The index cases were unimmunized siblings, aged 2 and 3 years, with rash onset May 21 and May 25. Both were unrelated to cluster one, but with travel history to Bolivia (returned from Bolivia, May 11th) with their parents. Spread of measles occurred for three generations. It was reported that families of the Alberta community in Canada frequently travel to Bolivia to visit sister Mennonite communities that live in very remote areas of Bolivia.

OUTBREAK 3: British Columbia (linked to outbreak 2, Alberta): This outbreak involving 25 cases occurred between June 24 and August 2, 2000 (weeks 25 to 31), centered around a community in Northern British Columbia. Ages of these cases ranged from 1 to 23 years; median 5.5 years. Cases involved family clusters, and almost all were children unimmunized for philosophical reasons. This outbreak started following social contact of unimmunized families from this area with other unimmunized families from a nearby community in North West Alberta (Outbreak 2). Investigation by the Bolivian Ministry, assisted by PHAM, led to the tracing of source of exposure and identified as ‘Alberta Mennonite’ communities in the Santa Cruz area. Laboratory investigation of Canadian cases revealed that the virus is genetically similar to the circulating D6 strain in South America.

OUTBREAK 4: Quebec (possibly linked to Belgium): This outbreak involving 28 cases and spreading for four generations occurred between May 8 and June 30 (weeks 19 to 26). It involved several families of Hasidic Jews living in a semi- closed community (population 2500). Ages of cases ranged from 3 months to 32 years; median 5.5 years. The majority (70%) of cases were between 7 months and 12 years of age. Immunization coverage in this community, in general, is very low and there were large families with no immunization at all. The source of the outbreak is unknown, but the viral genotype was not conclusively identified but appears to be linked to cases in Belgium. The usual cases were reported to have contact with cases in Belgium, and students were not allowed to stay with the members of that community. Genotyping results indicate that it is D6, a strain which is commonly found in Europe and in South America.

Conclusions

1. There are still countries in the Region that have not achieved useful circulation coverage against measles--that is coverage of less than 95% in children under 1 year of age. This problem is compounded by the fact that the Region has high tourist and migration flows, which constitute great risk factors for potential virus reintroduction, particularly in Guatemala.

2. Countries achieving useful circulation coverage still have a high percentage of municipalities with vaccination coverage under 95%. Approximately 40% of all municipalities in the subregion have useful vaccination coverage (Figure 1). This means that there still are around 700 municipalities of the total of 1,200 that are inadequately vaccinated. Most of these municipalities are found in areas with high tourist flows and steady migration. These circumstances constitute risk factors for potential measles virus reintroduction.

3. Around 192 municipalities (16%) of the total 1,200 municipalities in Central American countries are located in border areas. Around 5 million people live (1998) in those countries, representing about 33 million in those areas. This is a large number of potentially mobile and migratory populations which that could lead to measles virus circulation. These include:

- Some countries that had reached an acceptable level of measles virus circulation are suffering a decline in coverage;

- Some epidemiological surveillance indicators are not being fulfilled appropriately by the countries.

This carries the potential threat of not being able to detect measles virus circulation in a timely way to contain the spread of measles virus transmission. For example, the percentage of cases investigated in less than 48 hours after onset reaches the recommended 80%.

Figure 1 shows the distribution of all cases by week of onset from January 1999–August 2000. The source of the outbreaks is unknown, but the viral genotype was not conclusively identified but appears to be linked to cases in Belgium. The usual cases were reported to have contact with cases in Belgium, and students were not allowed to stay with the members of that community. Genotyping results indicate that it is D6, a strain which is commonly found in Europe and in South America.

Conclusions

1. Measles is no longer endemic in Canada; almost all cases reported since 1998 were associated with importation, and chains of transmission, up to four generations have occurred in the current year.

2. Almost all cases reported in the past two years have been among unimmunized individuals belonging to specific closely linked communities who object to immunization for philosophical reasons and/or religious reasons. It is reassuring that measles transmission did not occur outside of these communities where vaccine coverage is high. This is an excellent example of how imported measles virus can result in sustained transmission among close-knit or socially linked communities with low immunization coverage rates.

3. A two-strain strategy has been in place in all jurisdictions across Canada for some time; however, these localized outbreaks remind us of the need for public health and health care providers to identify and share innovative methods of reaching susceptible populations in order to improve vaccine acceptance.

Measles in Central America: Tasks Ahead

Despite two brief reintroductions of measles in Costa Rica in 1997 and 1999, Costa Rica remains free of measles cases. Measles virus circulation in Costa Rica was short-lived, probably due to outbreaks that were quickly controlled because of intensive vaccination and surveillance activities.

The absence of measles cases in Central America is the product of major and sustained efforts by health authorities in that Region. Central American countries average vaccination coverage against measles of 5–6% higher than the rest of the Americas. However, the region should be cautious and watchful for certain conditions that could lead to measles virus circulation. These include:

- There still are countries in the Region that have not achieved useful vaccination coverage against measles--that is coverage of less than 95% in children under 1 year of age. This problem

Figure 2Measles surveillance indicators, Central America, 1999–2000.*

* As of August 14, 2000.

FIGURE 1 Percentage of municipalities with measles vaccination coverage >95%, by country, 1999.

FIGURE 2 Measles surveillance indicators, Central America, 1999–2000.*

* As of August 14, 2000.
Rubella Watch EPI Newsletter

October 2000
Volume XXII, Number 5

Update: Measles in Haiti

In 2000, Haiti completed a nationwide measles vaccination campaign. The campaign did not reach the target population, and the vaccination coverage was low. There were outbreaks of measles in the country. The Ministry of Health, Haiti, has been actively searching for cases and has confirmed cases. The epidemic spread to 22 of the 133 communes in Haiti. The highest national priority is to complete vaccination of at least 95% of all populations in all parts of the country.

Measles Outbreak in Venezuela

Four measles outbreaks have been identified in the south-eastern part of Venezuela, bordering the region of La Guajira in Colombia. The last case had rash onset on September 13. An index case has not been identified yet.

Measles by date of onset, Venezuela, August-October 2000.

The following are preliminary summary reports on these outbreaks. No epidemiological links between the four outbreaks have been identified so far.

City of Maracaibo

OUTBREAK 1: Six cases were reported in the same family of the Castel de Mara parish, with ages ranging from 10 months to 2 years. All except one were unvaccinated. These children spent most of the day in their grandmother’s house. One case, however, lives in the parish of Gauli, but has frequent contact with the others. The last case had rash onset October 9, and the first three cases had rash onset September 14 and 15, suggesting a common source of infection for the three. An index case has not been identified yet.

OUTBREAK 2: Only one case has been reported in a 10-month-old, unvaccinated child who lives in the parish of Manzanillo. The patient had rash onset on September 13. An index case has not been identified.

OUTBREAK 3: Nine cases between 11 months and 21 years have been reported in a family and their contacts. Six of them had never been vaccinated, two were vaccinated, and the vaccination status of another is unknown. The last case had rash onset October 14, and the first two had rash onset August 29 and September 3, respectively. An index case has not been identified.

OUTBREAK 4: Only one case has been reported in a two-year-old, vaccinated child whose mother owns a shop. Rash onset was October 26. An index case has not been identified.

XIV Technical Advisory Group Meeting

The fourteenth Technical Advisory Group Meeting on Vaccine-Preventable Diseases (TAVG) was held in Foz do Iguaçu, Brazil.
Measles Eradication

PAHO's Technical Advisory Group on Vaccine Preventable Diseases commended the efforts of countries in the Americas to significantly reduce the burden of measles in the Region. Most countries have already interrupted measles virus transmission as a result of the full utilization of the vaccination strategy recommended by PAHO. The number of confirmed measles cases is at an all-time low and measles is currently affecting only 51 of approximately 11,000 municipalities. TAG also noted the progress being made at the global level towards accelerated measles control. These efforts will complement and facilitate the work being carried out by all countries in the Americas.

Haiti and the Dominican Republic deserve special attention. Despite repeated vaccination efforts, both countries have been unable to stop measles transmission. Problems have included failure to implement the full measles eradication strategy, deficient supervision of vaccination campaigns, inadequate and delayed monitoring of vaccination coverage and severe logistical obstacles. As a result many municipalities have failed to reach ≥95% coverage with measles vaccine, thereby leaving pockets of susceptible populations. Attack rates are highest among children <5 years of age. Most cases have occurred among children living in areas already covered by vaccination with a reported ≥95% coverage. 

House-to-house monitoring of vaccinated areas that lacked adequate supervision revealed insufficient coverage.

Recommendations

Vaccination Strategies

1. Following the successful implementation of a one-time nationwide vaccination campaign of all children ages 1-14 years (catch-up), TAG reaffirmed the other components of the strategy to achieve, maintain and monitor the interruption of endemic measles transmission in the Region:
   (a) routine immunization of children 1 year of age (keep-up), and
   (b) a complementary vaccination campaign targeting all children ages 1-4 years, irrespective of prior vaccination history at least every four years (follow-up).

2. It is necessary to achieve and verify a ≥95% coverage with measles-containing vaccines in all municipalities:
   • Routine vaccination coverage should be validated periodically either by house-to-house monitoring or by the comparison with the number of doses of DTP1 or BCG administered.
   • Supplementation (mop-up) activities should be conducted in municipalities failing to reach ≥95% vaccination coverage. These activities should include door-to-door vaccination.
   • Countries should ensure that all campaigns are properly planned and have adequate supervision.
   • Vaccination coverage during all outreach efforts should be monitored through house-to-house visits.

3. The collaboration, implementation and regular monitoring of school-entry screening laws requiring mandatory vaccination of children entering pre-schools and schools.

4. In all countries, measles and rubella-containing vaccines (MMR or MR) should be used for routine infant vaccination. In countries with rubella/CRS control programs, measles and rubella-containing vaccines should be used for follow-up campaigns and outbreak response activities.

5. Countries should carry out periodic evaluations of the national immunization and surveillance programs using the PAHO recommended methodology.

6. All countries should provide data on a weekly basis to the region-wide measles eradication surveillance system, to monitor progress toward the achievement of measles eradication.

Criteria for Interruption of Indigenous Measles Transmission

The principal method for assessing the interruption of measles transmission of has been interrupted is to demonstrate that the virus no longer circulates within a country that has a sensitive surveillance system and documented high immunization coverage. Virologic surveillance with genotype determination should be in place. Also, if measles is introduced, transmission should be limited by rapid and appropriate control activities.

Global Measles Efforts

In view of the significant disease burden of measles (30% of the estimated 3 million global deaths due to vaccine-preventable diseases every year), TAG recommended that the Global Alliance for Vaccines and Immunization (GAVI) supports accelerated global measles control through explicit commitment and financial resources. The following is a report presented by the Department of Vaccines and Biologicals of the World Health Organization.

Measles remains the leading cause of childhood vaccine-preventable deaths worldwide. Although national immunization programs prevent over 80 million cases and 4.5 million deaths annually, it is estimated that over 30 million cases and 880,000 deaths still occur every year. The WHO estimates that the estimated annual 2 million deaths due to childhood vaccine-preventable diseases.
Rubella Watch
EPI Newsletter

The disease accounts for 10% of all causes of mortality among children under five years of age. In May 1989, the forty-second World Health Assembly established a global measles control goal. In 1990 at the World Summit for Children, world leaders endorsed a goal of a reduction by 95% in measles deaths and reduction by 90% of measles cases compared to pre-immunization levels by 1995, as a major step to global eradication of measles in the longer run. Regional elimination goals have been set for the American Region by 2000, the European Region by 2007, and the Eastern Mediterranean Region by 2010.

Extraordinary progress toward measles control has been made since 1989. Measles transmission has been interrupted in most countries in the Americas. Worldwide in 1998, the estimated number of cases and deaths had declined by 91% and 93%, respectively when compared with the pre-vaccine era estimate.

Between 1990 and 1998, global routine vaccination coverage among children aged one year with one dose of measles vaccine remained at between 70 and 80%. In 1998, 15 countries reported measles coverage at below 50%. Ten of those were in the African Region, and one in the South East Asia Region (Democratic People’s Republic of Korea). Failure to deliver at least one dose of measles vaccine to all infants remains the primary reason for the high measles morbidity and mortality.

Five strategies are recommended for measles mortality reduction or measles elimination. These are: (1) strengthening routine immunization; (2) ensuring that all children have a second opportunity for measles vaccination; (3) disease surveillance with integration of epidemiological and laboratory information; (4) vitamin A supplementation through immunization services, where appropriate, and (5) adequate case management for every measles case.

The Global Alliance for Vaccines and Immunization (GAVI) aims to ensure that 80% of developing countries have routine coverage of at least 80% in all districts by 2005, is an essential first step in reducing the burden of measles. However, it is important to note that 80% coverage of the remaining measles disease burden is high. Special efforts should be made to ensure immunization safety and to identify and immunize children who have never received measles vaccine (zero dose children).

Measles surveillance should be strengthened in developing and developing countries to monitor program progress. In vitamin A deficient countries, vitamin A supplements should be provided at the time of vaccination with measles (routine and supplemental). Management of complicated cases includes Vitamin A supplementation and adequate treatment.

December 2000

Volume XXII, Number 6

Spain Renews Support for Measles Eradication

The government of Spain, through its Agency for International Cooperation and the Ministry of Health, has renewed its commitment to support the goal of measles eradication in the Americas.

Spain’s grant in the amount of US $92,500 will be used to continue strengthening surveillance activities for vaccine-preventable diseases in the Region, especially for the implementation of an active search for suspected measles cases. Priority of the active search effort is being accorded to high-risk areas, such as over-populated urban centers with low vaccination coverage, hard-to-reach areas, and those with a high number of migrant population. The grant will complement national resources in ensuring the availability of diagnostic kits and other critical laboratory material, which are key for the timely and adequate investigation of suspected measles cases. Resources will also seek to support site visits of health staff to local areas, as well as the timely transport of samples to laboratories. Training will remain a key component under the new grant, especially in the areas of surveillance, the use of information systems in the context of epidemiological surveillance functions, the effective planning of vaccination campaigns to maximize resources, and the adequate investigation of all suspected measles cases.

Measles transmission appears to have been interrupted in most countries of the Region. In the year 2000, only 1,500 cases were reported, the lowest number ever to be reported in the Americas. Countries that have implemented the surveillance strategy for measles eradication recommended by PAHO in full have successfully interrupted disease transmission. Examples of successes include Peru, Chile, Costa Rica, Uruguay, Canada, Mexico, and the United States, where they have experienced measles importations in the last two years without resurgence of indigenous measles transmission.

December 2000

Volume XXII, Number 6

Advances towards Measles Eradication in Brazil, 1999-2000

In 1992, Brazil adopted the goal of measles eradication by the end of the year 2000, and developed the National Measles Elimination Plan to achieve that goal. As part of this plan, the first national catch-up campaign was implemented, with measles vaccination targeted to all children aged 9 months to 14 years. More than 48 million children were vaccinated, for a coverage of 96%. Of the 4,510 existing municipalities in that year, 69% had a coverage ≥ 95%.

The number of reported measles cases declined from 42,532 in 1991 to 2,396 in 1993.

In 1995, Brazil held the first national measles follow-up campaign among children aged 1-3 years, achieving a coverage of 77%. The following year, a 4-year period of measles control, Brazil experienced a resurgence of measles, with initial outbreaks in the states of Santa Catarina and São Paulo. In 1997, the outbreak spread throughout the country, with 53,335 confirmed cases and 61 deaths nationwide. The strategies to control the outbreak included:

- Intensification of surveillance
- Following reporting of suspected cases, vaccination of contacts aged 6 months to 40 years without evidence of prior measles vaccination.
- Vaccination in schools, identifying children through 11 years of age not previously vaccinated for measles.
- A second national follow-up campaign among children aged 6 months to 4 years, which achieved a coverage of 66%.

Current Strategies

Since 1985 the measles immunization schedule has consisted in one dose of monovalent measles administered between 9 and 11 months of age. In 1992, a second dose of measles was introduced into the routine schedule, through vaccination with the measles-mumps-rubella (MMR) vaccine beginning at 12 months. MMR was introduced into Brazil between 1992-2000 in a phased manner by states, beginning with the state of São Paulo in 1992. By June 2000, measles-rubella, or MMR were part of the routine childhood vaccination schedule in all Brazilian states.

Beginning in 1999, routine vaccination activities have been intensified, with the objective of achieving 95% coverage in each municipality. Vaccination activities include community-based activities such as house-to-house surveys for unvaccinated children, with the assistance of community health workers, identifying unvaccinated children in the community, vaccination in schools, and increased emphasis among public health workers about the need for achieving uniform high vaccination coverage. By September 2000, 51% of the municipalities of Brazil had achieved a coverage of ≥ 95% (Table 1).

On June 17, 2000, the 3rd national follow-up campaign was held in Brazil, with mass vaccination of children aged 9 months to 4 years, and introduction of measles-rubella (MR) vaccination in 9 states. The campaign lasted approximately two weeks. Coverage was 100% for measles among children aged <1 year, and 94% among children aged 1-11 years. Overall, 60% of municipalities had a coverage of ≥ 95%.

Surveillance

Measles has been a legally notifiable disease since 1968. With the implementation of the Measles Elimination Plan in 1992, immediate reporting was implemented, with the goal of investigating all cases within 48 hours. Investigation includes collection of face samples for detection of measles IgM antibodies, vaccination of contacts in the areas of active case finding for secondary cases.

In 1999, as part of efforts to strengthen surveillance, Brazil implemented the Task Force for Measles Eradication. One surveillance technician was assigned to each of the states to assist the State Secretaries of Health. The objective of the Task Force was to assist the States in their goal of eradication, with an emphasis on strengthening epidemiological surveillance, through implementation of the following strategies:

- Effective implementation of weekly negative notification, through each municipal is required to report weekly on the presence or absence of suspected cases.
- Timely and complete investigation of cases, and outbreaks, with rapid implementation of control measures.
- Active case finding.
- Assisting and guiding in immunization efforts, including identification and vaccination of high risk groups.
- Analysis of surveillance data, with feedback to technical and political levels.
- Strengthening partnerships with governmental and non-governmental institutions.

Measles Epidemiology

1999-2000

In 1999, the national reporting system included approximately 8,000 reporting units, of which only 50% were reporting weekly. Of 10,037 suspected cases of measles reported in 1999, 890 (8.6%) were confirmed, 178 (4.2%) by laboratory or epidemiological Link. The 890 confirmed cases were distributed in 27 Federal units (26 states and the Federal District).

Overall, 235 (6%) occurred among children aged <1 year, and 437 (49%) among children aged ≥ 1 year.

<table>
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<th>Year</th>
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<th>Coverage &lt; 1 year</th>
<th>Population &lt; 1 year</th>
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<td>5,507</td>
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<td>51</td>
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</tr>
</tbody>
</table>

* Preliminary data through September 2000.
Source: COPSI/MEPI/FUNASA/MS.
Measles Articles

children aged 1-14 years. Cases were concentrated in the Northeastern region of the country, which reported 371 (42%) cases, of which 240 (65%) were reported from the state of Pernambuco. Measles control in Pernambuco was achieved through (Figure 1):

- Intensification of routine vaccination
- Indiscriminate vaccination of children through age 15 years
- Vaccination of high-risk groups (personnel in health care and tourism, and migrant farm workers).

The last case in Pernambuco occurred in December 1999. In 2000, the reporting network was expanded to 9,213 reporting units, of which 81% are reporting weekly. Of 8,560 suspected measles cases notified through December 30, 37 (0.4%) were confirmed, 33 (39%) by laboratory or epi-link. Four were clinically confirmed. The 37 cases were distributed in 8 of 26 (31%) municipalities, of which only one had a case reported in the last 12 weeks (active municipality). Of the confirmed cases, 16 (43%) occurred among children aged <1 year, and 13 (35%) among children aged 1-14 years. The greatest proportion of cases were reported from Acre (31%), followed by São Paulo (29%). The states of Rio de Janeiro, Parana and Amazonas reported two cases each, while Santa Catarina, Goias, and Mato Grosso do Sul all reported one case each (Figure 1).

The last outbreak of measles occurred in the state of Acre in February, 2000, with a total of 15 reported cases (one of which was a patient residing in the state of Amazonas, but in Acre during the incubation period and hospitalized in Acre). The outbreak affected primarily unvaccinated children: 13 (87%) of case-patients were unvaccinated children; 13 (87%) of case-patients were aged 15-29 years. The remaining cases, 4 (27%) were aged 1-14 years. Of the 13 cases reported to date from São Paulo, 10 (77%) occurred among children aged ≤1 year, of whom 9 (90%) had received a dose of monovalent measles vaccine within the last month. The remaining 3 confirmed cases were aged 15-26 years.

For all confirmed cases, extensive investigations were conducted in the community. These investigations included active case finding in health centers, schools, and day care centers. Despite these searches, no secondary cases were identified.

Conclusions

Measles virus circulation in Brazil appears to have been interrupted since March 2000. Despite an increase in the sensitivity of the surveillance system, with more complete case investigation, the number of measles cases was reduced by 95% between 1999 and 2000. During the same period, the uniformity of measles vaccine coverage by municipality among children aged <1 year increased from 43% to 51%, and overall coverage in the recent follow-up campaigns among children aged 1-14 years was 95%. The political commitment of the State and Municipal Health Secretaries has been an important factor in the strengthening of surveillance and immunization activities necessary to successfully interrupt measles transmission in Brazil. In addition, the commitment of the State Surveillance Coordinators, State Immunization Coordinators, State Measles Eradication Task Force Advisors, State Public Health Laboratories, and technical staff of the Municipal Health Services has been critical.

Recommendations

To maintain the interruption of indigenous measles virus circulation in Brazil, sensitive and timely surveillance must continue, and high routine uniform measles coverage must be achieved (≥95% in each municipality). The following recommendations have been disseminated to the Municipal State Health Secretaries throughout Brazil, to ensure effective integration of surveillance, immunization, and laboratory teams for continued interruption of measles transmission:

- Increase awareness among health professionals for immediate investigation of suspected cases of measles and rubella.
- Guarantee timely investigation of suspected cases, with vaccination of contacts (past 14 days) of blood samples within 48 hours after notification.
- Ensure collection of urine and nasopharyngeal secretions from suspected cases for viral isolation.
- Vaccinate in each municipality at least 95% of children aged ≤1 year with one dose of measles vaccine.
- Vaccinate at least 95% of children in each municipality aged 12 to 23 months with measles-mumps-rubella (MMR), or measles-rubella (MR) vaccine.
- Guarantee vaccination of high-risk groups.
- Ensure timely and complete data entry into the national information system, for effective use of surveillance data.
- Carry out ongoing analysis, evaluation and feedback of measles and rubella surveillance data.

FIGURE 1 Measles-confirmed cases by municipality, Brazil, 1999-2000.

2001

Haiti Begins All Out Effort to Halt Measles and OPV-Derived Polio Outbreaks

Background

The Ministry of Health in Haiti is now focused on two fronts: controlling a nationwide measles outbreak and preventing the spread of Sabin type 1-derived poliovirus. Two National Immunization Days (NIDs) using fixed posts and multi antigens were conducted in 2001, targeting both of these problems. In spite of these campaigns, new measles and polio cases continue to be reported, although for measles new cases are being reported at a reduced rate (Figure 1). Future campaigns will rely on house-to-house vaccination with close supervision and careful logistical planning. From May until July, the strategy of rolling campaigns with polio vaccine—staggered vaccination efforts of groups of several departments until vaccination in the entire country is completed—will be implemented.

Measles

The current measles outbreak began in March of 2000. By mid-April 2001 the end of epidemiologic week 15), 1,130 cases have been confirmed by the nationwide surveillance system, 990 in 2000 and 140 so far in 2001. Sixty-eight percent of these cases have occurred in the metropolitan area of Port-au-Prince. Since December 2000, there has been a steady decline in the number of confirmed measles cases, dropping from a high of more than 70 cases per week down to the current level of approximately 2-3 per week. With this decline, national and departmental epidemiologists have been able to investigate every case. Two previous National Immunization Days targeting all children from ages 6 months to 14 years for measles failed to reach even half of the population. This was mainly due to inadequate time for planning and implementation of the campaigns, the decision to use fixed posts, and administrative problems. By the end of the year 2000, the Ministry of Health estimated that based on administrative data approximately 70% of the 3.2 million children in Haiti <15 years had been vaccinated for measles, with most of the vaccination activities coming from house-to-house campaigns early in the outbreak. A number of small-scale field studies have confirmed this estimate, finding local vaccination coverage ranging from 50-90%. Mop-up activities will focus on areas with low coverage.

House-to-house measles vaccination will resume in Port-au-Prince and other provinces once the priority of polio vaccination throughout the country has been completed. Based on the experience in Haiti and other countries, it is now clear that successful house-to-house immunization requires (see shaded box) strong field supervision, revisiting of houses with children that need to be vaccinated, and monitoring of vaccination coverage within each zone.

Editorial Note: The Ministry of Health of Haiti needs to be commended for its laudable efforts in controlling the ongoing measles and vaccine-derived polio outbreaks in the country. PAHO is confident that the upcoming campaigns, which have been planned in great detail under the leadership of Dr. Henri-Claude Voltaire, Minister of Health, and his team, will be able to successfully halt the spread of these diseases.
House-to-house Vaccination

This tactic calls for teams of 3 members to be assigned to vaccinate in a neighborhood that is clearly delimited on a map. As the team moves into a new neighborhood for vaccination, each house that is completely vaccinated (or lacking children in the target age group for polio) is clearly marked with a green chalk. Houses with eligible children who were absent during the vaccination are marked with a red X, meaning that they have to be revisited. The next day (Day 2), one member of the vaccinating team will revisit the previous day’s area, going back to all houses with a red X to vaccinate all children who were missed the previous day, while the rest of the team will go on to the next area. During all days, a supervisor in charge of up to 5 teams will move through the areas to verify that all streets have been visited and marked, as well as confirm that the marks are correct. Also, an overseer will check the work of five vaccinators, ensuring that they cover the areas that were programmed, and monitor house-to-house vaccination status at 20 children <10 years of age in the area. If the vaccination coverage of children is above 90%, then the team can move on to the next neighborhood; if not, further revisiting of houses will be conducted until that vaccine level is reached.

Measles is still a major childhood killer, with over 30 million cases and nearly 900,000 annual deaths in recent years. These figures are even more shocking given the fact that effective immunization, which includes vaccine and safe injection equipment, costs just US$ 0.26 and has been available for more than 30 years,” said Dr. Bjorn Melgard, Director of Vaccines and Biologicals, WHO.

Measles accounts for the majority of the estimated 1.6 million annual deaths due to childhood vaccine-preventable diseases. Failure to deliver at least the first dose of measles vaccine to all infants remains the primary reason for the high incidence and mortality rates of measles.

The Global Measles Strategic Plan calls on countries to assess progress on measles control, identify reasons for low routine vaccine coverage, develop a three to five-year plan for measles mortality reduction and fully implement the recommended strategies.

The plan has been developed by UNICEF and WHO in cooperation with the United Nations Children’s Fund (UNICEF) and the United Nations Children’s Fund (UNICEF) today announced a new initiative designed to halve global measles deaths by 2005.

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UN Agencies Launch
New Plan to Halve Mortality of Measles—
A Major Childhood Killer

In a concerted move against one of the world’s deadliest childhood diseases, the Pan American Health Organization (PAHO) and the United Nations Children’s Fund (UNICEF) today announced a new initiative designed to halve global measles deaths by 2005.

"Measles is still a major childhood killer, with over 30 million cases and nearly 900,000 annual deaths in recent years. These figures are even more shocking given the fact that effective immunization, which includes vaccine and safe injection equipment, costs just US$ 0.26 and has been available for more than 30 years,” said Dr. Bjorn Melgard, Director of Vaccines and Biologicals, WHO.

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The Global Measles Strategic Plan calls on countries to assess progress on measles control, identify reasons for low routine vaccination coverage, develop a three to five-year plan for measles mortality reduction and fully implement the recommended strategies.

The plan has been developed by UNICEF and WHO in cooperation with the United States Centers for Disease Control and Prevention (CDC), numerous experts worldwide and several other partners. It has the advantage of being a flexible framework that can be adapted to the specific needs and immediate goals of individual countries.

Under the new initiative, WHO and UNICEF will assist affected countries to:

1. Provide a first dose of measles vaccine to infants.
2. Guarantee a “second opportunity” for vaccination to increase the probability that as many children as possible are immunized and to ensure that those immunized are responding to the vaccination.
3. Establish an effective system to monitor coverage and conduct measles surveillance.
4. Improve management of complicated measles cases, including vitamin A supplementation.

Near blanket coverage is crucial for containing the disease. “Because measles is so contagious and because a small number of those who are vaccinated do not develop immunity, vaccination coverage levels need to be above 90% to stop measles deaths. Unfortunately, this goal has not yet been achieved in all countries,” said Dr. Suami Sakai, UNICEF’s Chief of Immunization Activities. “But we know we can get there,” she added.

Measles, a viral disease, is spread by infected droplets during sneezing and coughing, through direct contact with nasal or throat secretions of infected persons, or by touching contaminated objects. It is predominantly a childhood disease, causing fever and rash and is sometimes complicated by ear infections, pneumonia, or encephalitis (inflammation of the brain) which can result in convulsions, deafness, mental retardation or death.

In addition to the compelling humanitarian and health reasons, the economic arguments for investing in measles control are convincing. Of all health interventions, measles immunization carries the highest return for the money spent, saving more lives per unit than most other health interventions.


June 2001
Volume XXIII, Number 3

Measles Importations in El Salvador

Outbreak description

The following is a preliminary report on the investigations surrounding the importation of two measles cases in El Salvador.

On May 9, 2001, five years after having reported the last indigenous measles case (1996), a private physician notified the Ministry of Health of the presence of two suspected measles cases, two brothers 23 and 22 years old, with disease onset on April 30, 2001, eight days after returning to El Salvador from a trip through Europe.

They had left El Salvador by plane with their parents and an 8-year old brother on April 8 via Houston-Paris (transit) and reached Switzerland where they stayed from 9-14 April. On April 14, they traveled by train to Madrid, Spain, traveling through France, which took them 24 hours. They stayed in Madrid from April 15-21 (7 days), returning by plane to El Salvador via Paris, with a 24-hour layover in Houston. They arrived in El Salvador on April 22.

While in Switzerland, they stayed in their family members’ homes who confirmed by phone that they did not have or knew of any other similar case. In other countries, they stayed in hotels and did not have a lot of sight-seeing, yet they stated that they had not been in contact with any other individual presenting rash and fever.

However, during the train ride from Switzerland to Madrid, they remembered a passenger in the sleeping compartment next to them, who was traveling the same itinerary. This passenger seemed to be extremely sick, coughing constantly while in the hallway. However, they were not sure whether that person had any sort of rash.

Case notification was made to the El Salvador’s National Biological Center on May 9, date when the investigation was initiated. The first case, age 23, had onset of fever on May 3 (three days after his brother) and four days later presented with a maculopapular rash on the face which later extended to the rest of his body, accompanied by cough, conjunctivitis and corzya. He felt general malaise and required hospitalization. At the time of the investigation, the patient had clinically recuperated, presenting with a light desquamation on his face and neck. The second case, age 22, had onset of fever on May 2 (three days after his brother) and four days later presented with a similar clinical evolution as his brother. Both cases were admitted to a private hospital from May 7-14.

They denied having any close contact with individuals with similar symptoms, such as family members, neighbors, close friends, and study or work colleagues. Both cases were immunized by their private pediatrician with a single dose of measles vaccine on August 1, 1990. The 8-year old brother was immunized and did not develop any symptoms. The mother and father mentioned they had measles.

Serum samples for IgM determination for measles and urines samples for viral culture were taken on May 9, 2001 in both cases. Both samples tested positive for IgM antibodies to measles by the Boehringer test.

During their incubation period, both individuals attended their university (same for both), one of them also worked there. The girlfriend of one of the cases was immunized and studied at a different university. The family, as well as both cases went to their places of employment and study, among others. Of these, 20 were singled out because they were well-attended (restaurants, movie theaters, banks, grocery stores, among others). In addition, they were guests at a collective baptism, where 43 children were baptized.

Initial outbreak response

The first control measure of the outbreak was to isolate both cases within the hospital. Hospitalization lasted for 5 days following rash onset, after which time it was considered that the cases were no longer contagious. On May 9, prior to receiving news of laboratory confirmation, the decision was made to vaccinate all health personnel at the hospital where the cases were being treated. On May 10, immediately after the cases were officially confirmed by laboratory, the Ministry of Public Health and Social Assistance (MSPAS) held a press conference announcing the presence of these two measles importations and outlining the control measures that were going to be implemented.

The Ministry of Health carried out the following surveillance and control measures:

- Inter-sectoral coordination between the Institute of Social Security and the private sector.
- Diagnostic confirmation and case management for the night of the second case.
- Information campaign

The line plot shows the evolution of the measles outbreak confirmed cases by month, 2000-2001.

Data available through epidemiologic week 15 (14 April 2001).

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<th>Week of Rash Onset</th>
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<tr>
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Rubella Watch

EPI Newsletter

Pan American Health Organization

1979–2009
Measles Outbreaks

After almost a decade with no confirmed cases and declining levels of immunization, both polio and measles returned to Haiti in 2000. To date, there have been 8 confirmed cases of paralytic polio caused by a vaccine-derived virus. So far for measles there have been 1,148 confirmed cases. Similar epidemics have occurred in the Dominican Republic.

Vaccination
A national vaccination campaign based almost exclusively on door-to-door vaccination, and a separate 2-week vaccination campaign in kindergartens and primary schools, is designed to deliver measles vaccine to every child between the ages of 6 months and 5 years in Haiti (approximately 1.5 million children), and oral polio vaccine (OPV) to all children under the age 10 (approximately 2.9 million children). It was initiated in mid-September and is scheduled to end by mid-November. A previous polio vaccination campaign was carried out in May and June 2001 using the same methodology reached well over 85% of the target population. This level of coverage was confirmed by conducting 659 coverage surveys in those areas where coverage was thought to be the lowest. The methodology for the campaign is based on a carefully-designed plan of door-to-door vaccination that is enhanced by:

- Intense supervision in the field;
- The use of two visits to each small geographic sector, the first for general vaccination, and the second, usually on the following day, for vaccination of those children missed during the first visit;
- Monitoring of vaccination in a sample of sectors to verify an adequate level of coverage.

Surveillance
Routine reporting of measles and cases of acute flaccid paralysis (AFP) from all health care facilities in the country is being improved through a collaboration between the Ministry of Public Health and Prevention (MSPP) and PAHO for training of all health care personnel in the use of...

Editorial Note:
Over 70 health workers from Haiti’s nine regions joined participants from 10 countries in the XV EPI Managers Meeting for Central America and were able to discuss the results and lessons learned from the vaccination strategies used in previous campaigns. The meeting also provided an opportunity to strengthen the partnership of all actors involved in the efforts to eradicate measles and to prevent further circulation of the Sabin-1 vaccine-derived virus. In Figure 1, great progress has been made. Continued efforts are needed to successfully complete the current vaccination campaign, existing use of negative reporting in the surveillance system, and continue the active search of all cases at major health facilities. Once the vaccination campaign is completed, mop-up campaigns should be conducted in those areas where cases are detected by either surveillance or active case search, or where monitoring reveals inadequate coverage. Concurrently, immediate action is needed to enhance Haiti’s system of routine immunization in all areas of the country.

Recommendations on Polio and Measles from the XV Subregional Meeting
Following a review and discussion of recent information on polio and measles, recommendations for vaccination, monitoring of vaccine coverage, surveillance, and active case search were presented:

- Attain a vaccination coverage of at least 95% for both polio and measles. If the coverage is below recommended levels:
  - Implement door-to-door vaccination as the preferred strategy;
  - Ad polar vaccine in the next vaccination campaign for polio in Haiti;
  - Monitor vaccination coverage in areas where coverage is suspected to be low;
  - Conduct follow-up vaccination campaigns in areas where coverage is below recommended levels;
  - Carry out periodic active case search in all areas with poor surveillance, recent cases, or where coverage is suspected to be low;
  - Use PAHO investigation methods that include household census, collection of blood specimens and nasopharyngeal or throat swabs for measles, and stool specimens for polio.
- Include weekly negative reporting from at least 80% of selected health care centers;
- Find at least 1 case per 100,000 persons below age 15 for AFP surveillance;
- Include private and public health professional in surveillance network.
The interpretation of a positive IgM test for measles in countries without known endemic transmission and vaccine-related rash illnesses.

As we approach eradication of measles from the Americas, epidemiologists will be faced with the interpretation of a positive IgM laboratory test in a suspected case of measles in the setting of greatly reduced disease transmission. Indeed, national authorities will be faced with the dilemma of how to classify an IgM-positive case when no cases have been confirmed in their country for numerous weeks or months. Since no laboratory test is 100% sensitive or specific, laboratory false-positives will occur. Furthermore, the predictive-value positive of a laboratory test decreases as the prevalence decreases. Thus, we should expect false-positive laboratory results to occur. In addition, as countries maintain high levels of vaccination activity, one should anticipate the notification of recently vaccinated persons who present with a febrile rash illness. The dilemma in this situation is to determine if an IgM-positive result (occurring because the individual 1) has a non-measles rash illness and was incidentally vaccinated; 2) has an acute measles infection and was incidentally vaccinated, or 3) has a vaccine-related rash reaction. Here, we discuss the interpretation of an IgM positive laboratory test and review scenarios of a definition of a vaccine-related rash.

First, unless there is clear evidence to the contrary as discussed below, all suspected measles cases that are found IgM-positive should be considered laboratory-conformed cases. However, the finding of isolated measles cases with little or no secondary transmission does not, in any way, imply that a resurgence of endemic measles transmission is occurring in a country with no known transmission. Moreover, in such settings, the finding of isolated measles cases with little or no secondary transmission, as has occurred in Peru, El Salvador, the United States, Canada, and Mexico, suggests that surveillance was sufficiently sensitive to detect the case and that local vaccination coverage levels were sufficient to prevent an outbreak.

a) How should one interpret a positive IgM test in an individual with a febrile rash illness in the setting of no known transmission? One must assume that it is measles infection unless proven otherwise. Since measles is so highly contagious (it has been considered by many as the most contagious infectious disease known), the failure to identify the source of infection or secondary cases, even after a thorough search for cases, does not imply that it is a false-negative laboratory test. It is always possible that the individual was infected by a strain of vaccine virus on a bus, in town, etc. However, in these exceptional circumstances, the individual can be tested at a reference laboratory for IgM anti-measles antibody.

b) How do we interpret a positive IgM test in a recently vaccinated individual with a febrile rash illness? In this situation, it is not possible to determine if the positive IgM is from the vaccination or from a recent acute measles infection. The case should not be dismissed as vaccine-related based solely on the history of recent vaccination. A thorough case investigation and active search for other cases in health facilities and in the community is warranted as well as a detailed evaluation of coverage. As stated above, the positive IgM laboratory result could represent either a response to vaccination in an individual with non-measles infections, or an individual with a vaccine-related rash. However, it could also have nothing to do with the individual's recent vaccination but represent a true acute measles infection (i.e., the vaccination was given during the period of incubation and did not prevent an infection). One could test for rubella IgM antibodies, and if positive, the (+) IgM results for rubella and measles could represent a response to a recent MMR or MR vaccine vaccination. However, unless the case meets the criteria stated below for a vaccine-related case, in almost all situations the case must be confirmed.

c) In what circumstance can we classify a recently vaccinated suspect rash case as a vaccine-related rash? One will not be able to conclusively determine if it is vaccine-related, but based on the principles described above, an acute rash illness, a case can be discarded and classified as a vaccine-related case if it meets all of the following criteria:

1. A rash illness, with or without fever, but does not have cough or other respiratory symptoms related to the rash, and
2. Rash onset began 7-14 days after vaccination with a measles-containing vaccine, and
3. A from sample, taken between 8 and 56 days after vaccination, is positive for IgM antibody.

4. Thorough field investigation did not identify the index case or any secondary cases, and
5. Field and laboratory investigations did not identify other causes (including the failure to identify wild measles virus in culture).

Editorial Note:
The definition of what constitutes a vaccine-related rash was discussed during the XIV Meeting of the PAHO Technical Advisory Group on Vaccine Preventable Diseases (TAG) in Foz de Iguaçu, October 2-5, 2000 (The final report can be found at: http://www.paho.org; Search: TAG). In addition, a field was created in the MESS database under “Final Diagnosis” for countries to code whether a case’s rash and laboratory result were vaccine-related. According to the MESS database in the Regional office, as of week 37 of 2001, 8 countries have reported 27 cases that have been discarded as vaccine-related. Evaluation of these 27 cases reveals that 3 were <1 year of age, 22 were 1 year of age, and 2 were 2 years of age. All had a history of vaccination. However, to be classified as vaccine-related, the interval between vaccination and the onset of the rash must be 7-14 days. Studies suggest that, in general, an interval less or greater than this may not be consistent with a reaction to vaccination. Of the 27 vaccine-related cases in the database, only 13 had intervals of 7-14 days. Four cases have intervals of <7 days and 10 cases have intervals of >14 days.

The four cases with intervals <7 days were from different countries and none had a history of all 3 respiratory symptoms of measles (i.e., cough, coryza and conjunctivitis). However, 3 of the 4 had at least one of the 3 respiratory symptoms. The 10 cases with an interval of >14 days were reported from 7 countries and there was no clustering of cases in any country. Five of the 10 had at least one respiratory symptom. Of these, 5 had two symptoms and one case, with onset of rash 18 days after vaccination, reportedly had conjunctivitis, cough and coryza.

This preliminary analysis suggests that not all countries have implemented the case definition for what constitutes a vaccine-related rash as discussed during the recent TAG meeting.

Countries should ensure that cases meet the above criteria prior to classifying it as a vaccine-related rash case. In addition, countries should take this opportunity to review their “vaccine-related” cases and determine whether they truly are consistent with a vaccine reaction. It is acknowledged that by using the criteria described above, a few false-positives or vaccine-related IgM-positive rash illnesses will be confirmed as wild measles cases. In the current phase of the eradication process, this is an acceptable compromise to ensure the highest sensitivity in measles surveillance.
Measles Articles

December 2001
Volume XXIII, Number 6

Improved Surveillance for Polio and Measles in Haiti

Background

Epidemic frequencies of measles and poliomyelitis have occurred in Haiti during 2000 and 2001. At the end of 2001, major vaccination efforts have reduced the incidence of cases to below the disease elimination level of routine surveillance. The last laboratory-confirmed measles case had rash onset on 26 September 2001, in Carrefour. The national measles immunization campaign (which was also the second national polio campaign) ended November 2001. No additional cases have been found since.

For polio, the last laboratory-confirmed case of paralytic poliomyelitis poliovirus caused by a Sabin-1 derived virus was reported July 12, 2001, in Troubled, prior to a successful vaccination campaign that administered the first additional dose of polio vaccine. The last case of measles was reported by the routine surveillance system. This case was eligible for payment of a reward of U.S. $100 established by PAHO for the reporting of laboratory-confirmed measles cases.

Currently, surveillance must be improved in four areas to confirm that viruses and the diseases that they cause are absent from the country:

- Increase coverage of all health facilities for routine reporting of notifiable diseases;
- Establish an enhanced surveillance system comprising of selected health institutions that will file weekly reports when no cases are detected;
- Continue systematic active case searches throughout the country;
- Continue routine environmental surveys for poliovirus in the metropolitan area and the municipalities where the most recent cases were detected.

Activities

Routine reporting of notifiable diseases in Haiti is being enhanced by the development of new information and procedures manual that has been produced by Haiti’s Ministry of Health with support from PAHO. This manual will be distributed to workers in all health facilities in the country. The 16 notifiable diseases and conditions in Haiti include polio and measles, as well as other conditions such as neonatal tetanus.

Workshops will be conducted throughout the country to train health care personnel in reporting requirements and procedures that are outlined in the new manual. The first workshops for health staff working at the departmental level were held in November 2001.

In addition to these changes, PAHO continues to sponsor a reward of U.S. $100 for the first reporting of cases of either polio and measles in any municipality.

Enhanced surveillance for cases of acute flaccid paralysis (AFP), measles and neonatal tetanus will be established beginning in January 2002. This program will establish a network of 50-100 health facilities nationwide that will send weekly reports by telephone, facsimile, or messenger to the Ministry and PAHO. Most importantly, even in the absence of cases, the health facilities will report weekly (negative reporting).

Neonatal tetanus will be also included in the surveillance system because it is a high-priority disease, and will thereby be used as an indicator of the quality of the surveillance system.

Furthermore, PAHO will assist the Ministry of Health in 2002, in strengthening vaccination efforts of women of childbearing age to prevent the occurrence of neonatal tetanus cases. The surveillance system will therefore be able to track the success of this campaign, as well as those for polio and measles.

Active case searches for cases of AFP, measles, and neonatal tetanus will continue to be conducted throughout the country. All major and mid-level health facilities in each department (approximately 100 facilities) will be visited regularly, and all suspected cases will be investigated immediately.

Additionally, each visit will serve as an opportunity to train local health staff on both the importance and method of reporting disease, and to inquire about the functioning of the cold chain and the availability of vaccines.

Environmental sampling will be conducted in the metropolitan area, including in Port-au-Prince, the capital city. In addition, any cases of suspected AFP cases that have been identified.

Environmental sampling will be conducted in the metropolitan area of Port-au-Prince, and in other areas where suspected AFP cases have been identified. Eight sampling points will be established in Port-au-Prince, two of which have been positive in the past for the derived Sabin-1 virus. Sampling will be conducted every 4 months from these points. Additional samples will be obtained in other zones with confirmed cases of polio attributed to derived Sabin-1 virus, as well as in zones with unconfirmed cases, but for whom it was not possible to obtain stool specimens.

Editorial Note:
The steps outlined by Haiti should confirm the absence of both diseases in the country. Along with enhancing immunization and conducting ongoing surveillance surveys to find pockets of unvaccinated children, these efforts should ensure that Haiti remains free of polio and measles.

TABLE 1. Proportion of laboratory-confirmed measles cases and laboratory-discarded cases that fulfill 8 different clinical case definitions, PAHO regional measles database (IMMSS), 2000.*

<table>
<thead>
<tr>
<th>Case definition</th>
<th>Measles cases** (%)</th>
<th>Measles cases* (%)</th>
<th>Non-measles cases (%)</th>
<th>Non-measles cases* (%)</th>
<th>% meeting CD</th>
<th>Risk ratio</th>
<th>Cl 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC #1</td>
<td>62.5</td>
<td>37.5</td>
<td>63.7</td>
<td>36.3</td>
<td>3.2</td>
<td>2.3-5.6</td>
<td></td>
</tr>
<tr>
<td>DC #2</td>
<td>63.3</td>
<td>36.7</td>
<td>75.0</td>
<td>25.0</td>
<td>4.9</td>
<td>3.9-6.2</td>
<td></td>
</tr>
<tr>
<td>DC #3</td>
<td>53.0</td>
<td>47.0</td>
<td>24.5</td>
<td>75.5</td>
<td>3.2</td>
<td>2.4-5.0</td>
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</tr>
<tr>
<td>DC #4</td>
<td>51.8</td>
<td>48.2</td>
<td>81.7</td>
<td>18.3</td>
<td>4.4</td>
<td>3.5-5.5</td>
<td></td>
</tr>
<tr>
<td>DC #5</td>
<td>63.3</td>
<td>36.7</td>
<td>54.0</td>
<td>46.0</td>
<td>1.9</td>
<td>1.6-2.3</td>
<td></td>
</tr>
<tr>
<td>DC #6</td>
<td>63.3</td>
<td>36.7</td>
<td>24.2</td>
<td>75.8</td>
<td>5.1</td>
<td>4.0-6.4</td>
<td></td>
</tr>
<tr>
<td>DC #7</td>
<td>52.0</td>
<td>48.0</td>
<td>23.7</td>
<td>76.3</td>
<td>3.4</td>
<td>2.7-4.2</td>
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<tr>
<td>DC #8</td>
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<td>48.2</td>
<td>81.7</td>
<td>18.3</td>
<td>4.5</td>
<td>3.6-5.7</td>
<td></td>
</tr>
</tbody>
</table>

* Data include national notifications of suspected measles cases during year 2000 via the MES database. A total of 12,524 cases were included in this analysis. The 5,019 laboratory-confirmed measles cases were all laboratory-confirmed cases. Cases classified as vaccine-related rash illnesses were excluded from the analysis. Case definition for a given case were defined from that analysis.

**Measles cases are laboratory-confirmed with a positive IgM, non-measles cases are laboratory-discarded for IgM ELISA.

Clinical case definitions (CD) are as follows: 1=cough and conjunctivitis, 2=cough and conjunctivitis, 3=coryza and conjunctivitis, 4=coryza and fever, 5=cough, conjunctivitis, fever, 6=coryza, conjunctivitis, fever.

Measles Articles

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Measles Case Classification II

Prevalent Dilemmas in the Field: Management of IgM-positive suspected cases not felt to be true measles

In the October 2001 edition of the EPI Newsletter, a discussion was published centering on the interpretation of a positive IgM test result in the setting of reduced disease transmission. As stated in that publication, for the purposes of measles eradication, all suspected cases that are found IgM-positive should be considered laboratory-confirmed cases until proven otherwise. The article also mentioned that one could test samples for anti-measles IgG antibody to determine whether a positive IgM represented a false-positive laboratory result. The number of serum samples that are true false-positives should be very few.

However, the process to rule-out suspected false-positive IgM cases requires a standardized methodology to assure proper and consistent classification of cases throughout the region. Furthermore, criteria were presented for classifying an IgM-positive suspected case as having a vaccine-associated rash illness. Here, we continue the discussion on the management of a suspected measles case that is IgM-positive when national authorities are not convinced that it is a true measles infection.

Epidemiologists in the program must be prepared to confront suspected measles cases, without a history of recent vaccination, that are IgM-positive by ELISA when national managers do not believe the case to be measles. This may occur when authorities believe the case is not clinically compatible with measles or, they may consider the laboratory test result to be a cross-reaction, e.g., to a dengue or parvo virus infection. Two questions arise: 1) can the case under discussion be given final classification based on clinical data, i.e., be classified as a discarded case?, and 2) are there additional laboratory testing procedures that can be performed to rule out a false-positive laboratory result?

What is the utility of clinical surveillance data in discarding a suspected measles case?

For the purposes of the regional measles eradication program, a suspected case, regardless of the IgM test status, should not be discarded based solely on clinical data, or, more specifically, because of the lack of a clinical presentation considered typical of measles. Many measles cases can be described as an infection producing fever, rash and respiratory symptoms such as cough, conjunctivitis and coriza. Even so, the lack of these symptoms should not lead one to discount the possibility of an acute measles infection. A mild infection may produce a clinical presentation atypical of classical measles.

As shown in Table 1, using national data from the regional MEISS database for suspected measles cases with onset of rash in year 2000, laboratory-confirmed measles cases (n=1,039) were more likely than IgM-negative discarded cases (n=11,485) to meet 8 different clinical case definitions, i.e., combinations of clinical symptoms, based on surveillance data. Even so, and importantly, an alternative proportion of laboratory-confirmed measles cases failed to fulfill the classical case definitions. For example, while laboratory-confirmed measles cases were over 4 times more likely than discarded cases to have a history of cough, conjunctivitis and coriza, 48% of measles cases did not present with a history of the three symptoms, at least at the time when evaluated by a program staff. Thus, a program manager should not disregard a laboratory result because of the lack of clinical compatibility.

Even so, when presented with an IgM-positive suspected case that is not believed to be measles, one could intensify a search for an alternative diagnosis, e.g., presence of a vesicular rash or signs of a varicella infection. Failure to conclusively establish an alternative diagnosis by laboratory confirmation implies that the case must be confirmed as measles. In this case, the reverse is true; if one considers a case to be clinically compatible with measles but...
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In IgG-negative, one should attempt to determine if the sample was taken appropriately, if there are other cases in the area, etc.

When confronted with an IgM-positive result that the country feels could be a false-positive and not an exhaustive case investigation fails to identify other cases, including the index case, one can consider further testing at a reference laboratory for IgG anti-measles antibody titer levels (Figure 1).

IgG titer levels should be determined in two properly spaced and timed blood specimen in a test that actually measures measles IgG titer levels, e.g., HAI, or PRNT. To be considered properly spaced specimens, the first specimen should be collected within 7 days of rash onset and the second specimen obtained 3 to 4 weeks post rash onset, i.e., 2 to 3 weeks post sample #1.

As seen in Figure 1, if sera from the first sample is found to have IgG antibodies and if the second sample has no change in IgG titer levels as compared to sample #1, it would not be considered a measles case and could be discarded. The IgM-positive test result would be considered a false-positive. However, if the second sample shows a four-fold rise in IgG antibody titer levels as compared to sample #1, it should be considered an acute measles infection and confirmed. If the second sample shows an increase in IgG titer levels but less than a four-fold rise from the first sample, it would not be possible to determine if it were or were not an acute measles infection. In this situation, the case should be confirmed based on the positive-IgM test result.

If the first sample is negative for IgG, and the second sample is also negative for IgG antibodies, it would not be considered a measles case and could be discarded. However, if the second sample is IgG-positive, it would be confirmed as acute measles infection.

The other situation occurs when there is no further sera from sample #1 for IgG antibody testing. In this case a second sample would still need to be collected. If negative for IgG, the case could be discarded. If, however, the second case based on the titers, IgG positive, it would not be possible to determine if the positive-IgG represented an acute measles infection. In this setting, the case must be confirmed based on the IgM test result. Regardless of the scenario or testing sequence results, when in doubt, the case should be confirmed based on the positive-IgM test result.

During 2000, an outbreak of 22 confirmed cases among pre-school and school-age children occurred in the municipalities of Maracaibo and Mara, Zulia. Because of delays in the reporting and investigation of the outbreak, its origin remained unknown. During the first semester of 2001, a nationwide active case and seroconversion of 8 suspected measles cases had not been previously reported, for which no serum samples were available. Given the lack of sufficient information, 8 such cases were defined as clinically confirmed.

An evaluation conducted by the Ministry of Health and an international team led by PAHO in 2001, confirmed the country’s low routine vaccination coverage and recommended that health authorities carry out as soon as possible another follow-up vaccination campaign. The campaign needed to reach 95% coverage with measles-containing vaccine in all municipalities of the country. However, the campaign was delayed, and on September 28, 2001 a measles case was reported in the State of Falcon. By the end of 2001, 3 additional cases were confirmed in the State of Falcon, especially to the municipality of Caraquena, where 75% of the cases were reported.

On November 16, three suspected measles cases were reported in the municipality of San Francisco, which is contiguous with the municipality of Maracaibo form the city of Caracas, with the greatest population density in the country. One of the cases was a 27-year-old sister and another was a 12-month-old girl, who resided in another parish of the State of Falcon, especially to the municipality of Bucaramanga. These three cases corresponded as measles by the regional laboratory. The outbreak spread during November-February 2001 and continued. A total of 223 cases have been reported from Zulia alone, affecting all age groups up to 34 years (Figure 2). Moreover, a large majority of the cases were previously unvaccinated. As of September 28, 2002, 469 cases have been investigated suspected measles cases in the state of Zulia, 34%

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was instituted and vaccination of schoolchildren aged 10-14 years was implemented in the entire municipality was strengthened. No further cases had been found as of February 20, 2002.

### Control Measures

Nationwide measles vaccination campaign for children ages 1-4 years (follow-up campaign): A national, follow-up door-to-door measles vaccination campaign was started in November 2001. Preliminary reports of vaccination coverage during the campaign showed 100% coverage in most States. In Zulia, as in most States, reported coverage exceeded 100% in all 21 municipalities, but house-to-house monitoring of vaccination evidenced numerous unvaccinated children. Nationwide, between 80 and 90% of all children visited during house-to-house monitoring (that uses convenience samples) had been vaccinated. Based on these data, vaccination brigades are now mapping parish by parish children that lack proof of vaccination, including now children under 1-year of age, the highest risk group.

### Regiona Measles Database: How “Clean” and Complete are the Data?

As discussed in previous EPI Newsletter articles, the “cleaning” of data entered into any database is crucial. Country managers are encouraged to review the quality of the data entered before sending the weekly data files to PAHO/Washington. An analysis was conducted of the Measles Eradication Surveillance System database (MESS) in Washington, D.C., for years 2000 and 2001 (as of March 29). The data for both years was extracted into EPI INFO and simple frequencies were tabulated on selected key variables. For each variable the following was determined: (1) the number of variables that lacked information, (2) the consistency in the use of a “ZZ” when information was not available (as is recommended) versus simply leaving the field blank, and (3) if there were obvious data entry errors, e.g., entering an impossible data such as 1888 or entering an “F” when the date should be 1998. No attempt was made to verify the accuracy of the data entered.

Thirty variables were evaluated for 24,552 records in 2000 (657,175 possible responses) and for 16,477 records in 2001 (440,077 possible responses). As seen in Table 1, during both years, only 0.017% of possible responses had obvious errors (0.02% in 2000 and 0.008% in year 2001). During year 2000, most errors dealt with dates that were entered incorrectly. Of the total 146 data entry errors detected in year 2000, 107 (73%) were associated with the Date of Investigation. For example, according to data in MESS, many cases with onset in 2000 were investigated at the turn of the century (i.e., 1900). Of the 37 obvious data entry errors in year 2000 had less missing information with the date of the last dose of measles vaccine.

However, for both years, numerous fields lacked data. For year 2000, 11.2% of all responses had missing information, i.e., 5% were left blank and 5.2% had a “ZZ” for unknown. During year 2001, 7.7% of fields had missing information, i.e., 3.3% were left blank and 4.4% had a “ZZ.” The amount of missing information varied greatly by variable and by year. In general, some variables such as Date Reported, Date of Rash, Case Classification had no missing information in year 2001.

In 2000, among the 21,273 persons at least one year of age, 6,418 (30%) had no information on measles vaccination status. Among persons who had at least one dose of measles vaccine, 52% had no date of vaccination. In year 2001, the comparable percentages were 21% and 47%, respectively. In year 2000, of 6,483 persons vaccinated against rubella, 78% had no date of vaccination. In the year 2001, 6,435 of the 4,435 persons vaccinated against rubella had
In 2000, 831 women 15 years of age or more were confirmed to have rubella. Of these, 43 had information stating they were pregnant. However, pregnancy status was missing for 282 (34%). Of the 43 pregnant women with rubella, 7 (16%) had no information entered into MESS on the number of weeks that they were pregnant and 27 (63%) had no information stating that they were 1-20 weeks pregnant. During year 2001, 244 women 15 years of age or more were confirmed to have rubella; 14 were pregnant and 18 (7%) had no information on their pregnancy status. Of the 14 pregnant women with rubella, 1 had no information on the number of weeks that she was pregnant and 11 (79%) had no information on their pregnancy status. We were 1-20 weeks pregnant.

Rubella Watch

June 2002 Volume XXIV, Number 3

Ministers of Health of Andean Region Pledge Support to Halt Measles Virus Transmission

The Ministers of Health of the Andean Region and Chile signed an agreement in the city of Sucre, Bolivia, on April 23, 2002, pledging their support to prevent the regionalization of the measles outbreak that is currently affecting Venezuela and Colombia.

In the Sucre Agreement the Ministers of Health of the Andean Region agreed to:

• Provide resources to finance the activities in the Plans of Action of national immunization programs in each country, aimed at interrupting the transmission of measles virus in Venezuela, and preventing the regionalization of measles.
• Carry out coordinated national vaccination campaigns on a timely basis, and include measles monitoring and verification of coverage attained at the local level.
• Coordinate the simultaneous implementation of a National Vaccination Week in all Andean countries, beginning in 2003.
• Maintain active epidemiological surveillance of measles at all levels, using active case-finding as a routine strategy in high-risk areas.
• Plan, in coordination with countries’ international relations offices, inter-country immunization and surveillance activities, particularly in border areas.
• The objective is to intensify vaccination, epidemiological surveillance and public information activities with the framing of Resolutions 367 and 368 (Epidemiological Andean Shield), adopted at the meeting of Ministers of Health of the Andean Region (REMSA), November 2001, in Quito, Ecuador.
• Impose the creation and adoption of Vaccine Laws in countries that do not have them, to guarantee the continuity of resources for the procurement of vaccines and other critical inputs, and to ensure timely financing for routine vaccination programs and emergency situations.
• Ensure compliance with the recommendations of the XII Sub-regional Meeting of Ministers of National Immunization Programs in the Andean Region, Brazil, and Chile, held on 22–23 April Sucre, Bolivia.

Propose as part of the health system reform processes that the steering role of Ministries of Health be strengthened, to ensure that equitable access to vaccination be considered a state responsibility.

The Ministers of Health also agreed to convene their technical teams to work on a set of specific recommendations issued for each country, which are included in an annex of the Sucre Agreement. Furthermore, they resolved to address the topic of vaccine-preventable diseases as a permanent item on the agenda of meetings of Ministers of Health of the Andean Region (REMSA).

Measles Outbreak in Venezuela

Since August 2001, a large epidemic resulting from an importation from Europe is ongoing in Venezuela (refer to EPI Newsletter, February 2002 for more information on the Venezuelan outbreak). At June 15 (epidemiological week 24) 2002, a total of 6,287 suspected cases have been reported in the country, with a total of 2,255 confirmed cases (Figure 1). These cases are distributed in 15 of the country’s 23 states, plus the Capital District. The state most affected by Zulia, which has the highest population and shares an extended border with Colombia. Zulia reported 1,955 confirmed cases during the first 24 weeks of 2002, which account for 83% of the country’s total. Following intensive immunization efforts among children and young adults, that were possible due to the high-level commitment of the country’s health authorities, measles incidence in Zulia showed a decrease of more than 90% during weeks 23 and 24, compared to the peak of the outbreak in week 11.

Update

Falcon State

As of epidemiological week 50 of 2001 (December 19), the state of Falcon, where the outbreak started, had reported a total of 35 confirmed cases. These were distributed in three municipalities and mainly among unvacinated people. The attack rate was highest among children <1 year (26.7 per 100,000), followed by 1-4 years (25 per 100,000) and adults 25-29 years (16.7 per 100,000). The majority of infected adults were laborers, students and health workers.

The outbreak was stopped after a statewide immunization campaign with measles and rubella-containing vaccine, targeting children up to 15 years of age. In affected municipalities, the campaign included adults as well. During epidemiological week 5 of 2002, measles reappeared in Falcon State. Transmission first took place in a hospital of the Paraguana peninsula, a major touristic and economic area. Since then, a total of 165 cases have been confirmed up to week 24 of 2002. The main groups affected were the under-1-year and 1-4-year-old age groups, particularly in the Paraguana peninsula. The 1-4-year age group vaccinated during the November and December campaign, was practically uninfected. Following the State’s control measures, the outbreak has slowed considerably during the last weeks, with sporadic cases in the peninsula, mainly in the Carirubana municipality.

Zulia State

The first case reported in Zulia was confirmed by Wolf virus in Falcon state and sharing a border with Colombia, took place on October 25, 2001, in Maracay. The case is a nurse working as a laborer in a private health facility that recently received 15 patients from Falcon State. She was vaccinated 6 times in 2 years. As of November 16, three suspected measles cases were confirmed in the San Francisco municipality that borders the Maracay municipality and together form the city of Maracay, which has the highest population density in the country. One of the initial cases was a 27-year-old male who works as a guard in a health center in San Felipe and visits Falcon State twice a week, specifically the Buchavaco municipality. The other two cases were a 4-year-old girl, with whom he had contacts several times, and a 1-year-old boy who lives in the same building as the guard. The outbreak spread to the rest of the State where a total of 72 cases were reported in 2001.

As of week 24 of 2002, the total number of confirmed cases in Zulia state was 2,027 (86.5% of the country’s total cases) with all 21 municipalities of the State reporting cases. The most affected age group was that of children under 5 years of age, particularly children under 1 year who presented an attack rate of 68% per 100,000. The young adult groups, mainly those between 20 and 34 years, also showed a high incidence rate of 20-24 per 100,000; 25-29 years: 52.4 per 100,000; and 30-34 years: 39.5 per 100,000. At present, reported administrative coverage is above 100% in nearly all of Zulia’s municipalities. However, several monitoring activities carried out in different areas show that coverage for children <5 years of age fluctuates between 85% and 95%. The positive impact of such actions are evidenced by the occurrence decrease of the number of cases between epidemiological week 11, the epidemic’s peak with 183 cases, and week 19 with 10 cases. Over the last few weeks, Venezuela has been exporting measles virus in neighboring Colombia due to the extensive border shared by both countries and the vast population movements that generally take place. As of week 24 of 2002, Colombia had reported a total of 153 confirmed measles cases. Although many of these cases are directly related to those coming from Zulia, the cases already reflect secondary transmission in Colombia.

Others States

During 2001, only Falcon and Zulia had reported cases. However, starting in week 5 of 2002 and with higher intensity since week 11 following the Holy Week celebrations that involve major movements of people between states, affected by tourism, parties, and family reunions, cases have begun to appear in states bordering Zulia state – Lara, Merida, Tacurin, Trujillo – and later in several other states. A total of 101 cases (4% of the country’s total) have been confirmed in 2002 in those 11 states, distributed as follows: Lara (26 cases), Merida (18 cases), Tacurin (9 cases), Capital District (8 cases), Apure (7 cases), Anzoategui (7 cases), Aragua (5 cases), Vargas (4 cases), Monagas (1 cases), Miranda (2 cases), Trujillo (8 cases) and Cojedes (4 cases).
Measles Articles

**Measles Outbreak in Colombia**

Following several years without measles, indigenous measles transmission was established in Colombia, due to an importation from Maracaibo, Venezuela—a 7-year-old girl from Baranquilla, in the Atlantico Department, who was vaccinated at 5 months of age and had rash onset on January 2002. The case is considered the primary case and the source of various chains of transmission that occurred in the Magdalena Department. As of epidemiological week 26, there have been 1,134 suspected cases reported (measles/rubella), of which 68 have been confirmed (Figure 1). As of now, 60 of the 68 confirmed measles cases show a link to an importation from Venezuela.

These cases originated from 20 municipalities (Colombia has a total of 1,114 municipalities), and are located in nine of the country’s 33 Departments: La Guajira, Norte de Santander, Magdalena (Santa Marta), Atlantico (Baranquilla), Bolivar (Cartagena), Sucre, Santander, Cundinamarca and Bogota. Of the 20 municipalities affected, 14 are considered active, among them are 11 municipalities (Colombia has a total of 1114 municipalities) have reported cases in the last 12 weeks. No cases have been reported with rash onset in the last two weeks. Attack rates by age group are higher in the under-five age group, followed in order of importance by the 5-9 year old and the 25-29 year old age groups (Figure 2).

**FIGURE 1** Distribution of measles cases by age group and by week of rash onset, Colombia, 2000.

- 1 year: 19 (4.2%)
- 1-4 years: 80 (16.6%)
- 5-9 years: 41 (8.5%)
- 10-14 years: 65 (13.5%)
- 15-19 years: 40 (8.2%)
- 20-29 years: 15 (3.1%)
- 30-49 years: 39 (8.0%)
- 50-64 years: 20 (4.1%)
- 65-74 years: 8 (1.6%)
- 75 years and over: 3 (0.6%)

* Up to week 26. Source: MOH.

**FIGURE 2** Distribution of confirmed measles cases by age group and rate per 100,000, Colombia, 2002.

- 1 year: 6.0 cases/100,000
- 1-4 years: 1.2 cases/100,000
- 5-9 years: 1.2 cases/100,000
- 10-14 years: 1.2 cases/100,000
- 15-24 years: 1.2 cases/100,000
- 25-29 years: 1.2 cases/100,000
- 30-49 years: 1.2 cases/100,000
- 50-64 years: 1.2 cases/100,000
- 65-74 years: 1.2 cases/100,000
- 75 years and over: 1.2 cases/100,000

* Up to week 26. Source: MOH.

**Control Measures**

**Strategies for Epidemiological Surveillance:**
- Issuing of a national and international alert about the measles outbreak, which led to the doubling of the weekly notification rate of suspected cases compared to previous years.
- Development and implementation of a Measles Containment Plan: The plan is being implemented in the Atlantic Coast and the capital city of Bogota since the end of 2001, and seeks to contain the circulation of measles virus in those areas due to the constant importations by travelers from the State of Zulia, Venezuela. The containment plan includes the following activities:
  - Indecriminization door-to-door mass vaccination in all high-risk municipalities located in the Atlantic Coast, targeting all children between 6 months and 4 years of age;
  - Rapid monitoring of coverage to verify and confirm that useful coverage has been obtained and to prevent pockets of susceptible individuals;
  - Active search in health facilities and in the community in all the affected municipalities;
  - Regular training of all health workers on outbreaks containment strategies and management of each suspected case.

**Planning for National Immunization Measles Follow-Up Campaign (NID):**
- Induction campaigns, including mass vaccination of all children between the ages of 6 months and 4 years in the country since April, 2002 and scheduled to end in July.

**Development and Implementation of a Social Communication Plan:**
- Widely publicized social communication plan to be implemented from 22 June to December, 2002. This effort seeks to stimulate the demand for immunization during the NID, and enhance the ongoing flow of information addressing adequate identification of symptoms and signs of a suspected measles case, to ensure its timely diagnosis and reporting.

The implementation of rapid control measures in the country has been critical. This is of particular importance given the high level of migratory movements between Venezuela and Colombia and the fact that the most affected state in Venezuela (Zulia) borders Colombia.

June 2002 Volume XXIV, Number 3

**Haiti and the Dominican Republic Joint Efforts to Control Polio and Measles on the Island of Hispaniola**

**Background**

Between 2000 and 2001, Haiti and the Dominican Republic, the two countries sharing the island of Hispaniola, were affected simultaneously by a large outbreak of poliomyelitis caused by a vaccine-derived poliovirus. A total of 11 cases of vaccine-derived polio were confirmed in the Dominican Republic and 8 in Haiti. The outbreak of polio resulted from the prolonged circulation of vaccine-derived polioviruses in areas with very low coverage and oral polio vaccine (OPV), as well as poor sanitation conditions.

For measles, Haiti had completed a nationwide catch-up measles vaccination campaign in 1994, reaching an estimated official vaccination coverage of over 95% of children aged 9 months to 14 years. Following this campaign, Haiti remained free of measles for six years. However, vaccination coverage through routine immunization in vaccine year in 1 year olds averaged 47% (range 32-85%) between 1995 and 1999. This led to an accumulation of over 1 million susceptible children below age 5. A follow-up measles vaccination campaign was conducted in 1999, but achieved an estimated coverage of between 70-80% of the target population of all children between the ages of 6 months and 4 years, approximately 1.3 million children. The main reasons for these results included lack of political will, failure to implement close supervision of vaccination, and logistical failures in delivering vaccine on time and in good condition.

In response to the situation, the Ministries of Public Health of both countries pledged their commitment to carrying out a series of unprecedented control measures. With the strong support of several international agencies including the Government of Canada, USAID, CDC, Rotary International, the World Bank, and the technical cooperation of PAHO, the epidemics were brought to a halt. For Haiti, the date of onset for the last confirmed case of measles was 26 September 2001, while for vaccine-derived polio the date was 12 July, 2001. In the Dominican Republic, the onset date for the last confirmed case of measles was 4 June 2001, and that for vaccine-derived polio was 25 January 2001.

Each country is now completing its vaccination efforts initiated in 2000 and continued through 2001 and 2002. The overall
Objective of these campaigns has been to provide at least one dose of measles vaccine and three doses of OPV to each child.

Haiti

Beginning in March 2000, Haiti began a series of measles vaccination campaigns within the country’s 11 health districts using a mix of door-to-door and fixed-post strategies. These campaigns were followed by two national immunization days (NIDs) in early 2001 based solely on fixed-post vaccination strategy that included both measles and oral polio vaccines. Two further NIDs were conducted using door-to-door strategy were conducted against both diseases in the summer and fall of 2001. A third NID began 30 May 2002 and will be completed in August 2002. This campaign, to be implemented in close coordination with the health authorities of the Dominican Republic, seeks to vaccinate all children below age 10 against polio, and all children between the ages of 6 and 23 months against measles. Following the vaccination of children below age 10 in all schools in the country for a two-week period in May, groups of two or three health departments will be vaccinated in sequence.

Dominican Republic

In response to the polio outbreak, the Dominican Republic conducted National Immunization Days in December 2000, as well as in February and May of 2001. All NIDs reached a vaccination coverage of approximately 100% with OPV, which was confirmed through field monitoring of vaccination coverage. During the last NID, vaccination against measles was also carried out. Monitoring of coverage performed in all municipalities of the country indicated a vaccination coverage of approximately 95%. Previous campaigns have been followed by the recommended coverage, and the circulation of measles had not been interrupted. The most recent National Immunization Day was carried out between 31 May and 2 June, 2002, targeting all children under 3 years of age. The goal was to reach approximately 700,000 children for polio and 590,000 for measles.

Heightened Coordination between Haiti and the Dominican Republic

Early coordination efforts between the two countries consisted primarily of sharing information and international consultants. However, by late 2001 these had evolved into a series of international meetings at both the national and regional levels. The simultaneous campaigns demanded a high-level of coordination and exchange of information between the two nations. The plan included a formal meeting of senior health officials from the two Ministries of Public Health at the main border area. Furthermore, all children in the target age groups passing through any one of four official border crossings were vaccinated at one of the special vaccination posts situated on both sides of the border. Haiti and the Dominican Republic health staff will continue to exchange surveillance information on a weekly basis to confirm that both diseases remain absent from the two countries.

August 2002

Volume XXIV, Number 4

Towards Measles Eradication in the Americas: The Last Inch?

In 1994, countries in the Region of the Americas set a goal of interrupting indigenous measles transmission by the end of 2000, using a vaccination strategy developed by the Pan American Health Organization (PAHO). Since then, great progress has been made towards the goal. In 2001, the total number of confirmed measles cases in the Region reached a record low of 541 cases, a 99% reduction compared to 1990 (Figure 1). During 2001, the Dominican Republic and Haiti successfully interrupted measles transmission, effectively ending indigenous transmission of the 6 measles virus genotype. This genotype had circulated widely in the region since 1999, causing nationwide outbreaks in Brazil, Argentina, Bolivia, the Dominican Republic, and Haiti during 1997-2001.

A new measles genotype (D9) was introduced to the Region in August, 2001, by a Venezuelan tourist returned from Europe. Since then, until September 7, 2002, a total of 2,491 measles cases have been confirmed in Venezuela and 125 in neighboring Colombia.

Measles in the Region

Routine (keep-up) vaccination coverage of 1999, which increased from 80% in 1994, to 94% in 2000 and 96% in 2001. Measles vaccination coverage for 2000 by country ranged between 75% and 99%. Lowest reported coverage rates were from Colombia (75%), Haiti (80%), Belize (82%), Venezuela and Costa Rica (84%), Guyana (86%), Jamaica and the Dominican Republic (88%). Measles vaccination coverage for 2001 by country ranged between 53% and 99%. Lowest reported coverage rate was from Haiti (53%); all others reported coverage above 80%.

In the Region of the Americas, from 1990 to 1996, measles cases declined from approximately 250,000 to 2,109 confirmed cases. In 1997 there was a resurgence of measles virus circulation, with 53,683 confirmed cases reported, 52,284 (97%) of them from Brazil. The outbreak spread to Argentina and Bolivia, where the largest number of measles cases occurred in the Region during 1998 and 1999, respectively. In 1998, there were 14,332 confirmed cases reported from 17 (44%) of the 41 countries that report to PAHO, Argentina (11,229 cases), followed by Brazil (2,281 cases) which had the highest number of cases. During 1999 there were 28,462 (60%) of the countries that report to PAHO, including Cuba, the English-speaking Caribbean countries, and most of Central and South America, reported no measles cases. During 2000 confirmed cases were reported from 11 countries, 78% fewer cases than in 1998 and 94% fewer than in 1997 (Figure 1). In 1999, indigenous transmission occurred in four countries: Bolivia (1,441 cases), Brazil (981), Argentina (313), and Dominican Republic (274). Also in 1999, Canada, Chile, Costa Rica, Mexico, Peru, Uruguay, and the United States reported measles importations, but secondary transmission was limited as a result of high measles vaccination coverage. The largest outbreak linked to measles importation occurred in Canada, where 165 confirmed cases were linked to an importation from Bolivia.

In 2000, the number of measles confirmed cases in the Americas declined to 1,755 (Figure 1). Indigenous transmission still occurred in Argentina, Brazil, Bolivia, the Dominican Republic, and Haiti. Only 16 (1%) of the 12,010 reporting municipalities in the Region reported confirmed measles cases during this period.

During 2001, a total of 541 confirmed measles cases were reported in the Americas: Indigenous transmission was reported only in three countries, Haiti, the Dominican Republic, in the Hispaniola Island, and Venezuela. Dominican Republic’s last confirmed case occurred in June, 2001, and Haiti’s last case was reported in September, 2001. In August, 2001, a measles outbreak began in Venezuela, a measles virus from a new genotype (D9) that was introduced by a traveler returning from Europe. During August-December, 2001, 109 measles cases have been reported in Venezuela following this importation. The outbreak spread to Colombia during January, 2002. Since then, Venezuela and Colombia have become the only countries with known indigenous transmission in the Region.

Venezuela

During 1997-2000, routine measles vaccination coverage ranged from 65% to 93%. In September, 2001, estimated coverage decreased to 58%, and was lower in states near the border with Colombia (e.g., Falcón, 44%; Zulia, 34%). The source case of the outbreak, a 35-year-old male, had rash onset on August 29, 2001, a day before returning to the state of Falcón from a trip to Switzerland, Germany, and Spain during August 4-10. The first case reported, identified on September 28, was his 35-year-old brother who had rash onset on September 23. Soon the beginning of an outbreak until September 7, 2002, Venezuela reported 2,017 suspected measles cases, of which 2,491 were laboratory or epidemiologically confirmed. The outbreak peaked in weeks 37 and 38 of 2002 and has affected 17 (70%) of the 24 States in Venezuela. A total of 2,098 (84%) cases were from Zulia, 202 (8%) from Carabobo, and 191 (8%) from the other 14 states. Nationally, the age groups most affected were children aged 1-4 years (320 cases per 100,000 population), followed by children aged 1-4 years (26 per 100,000), and young adults aged 20-29 years (12 per 100,000).

Measles virus samples were collected from cases in Zulia from November 2001 through January 2002. Genetic sequencing indicated that the virus was not similar to viruses encountered previously in the Region or to the reference genotype strains available on the measles sequence database. A close match was identified from viruses sampled taken from cases imported into Australia from Indonesia as early as 1999 and in Venezuela in the fall of 2001, corresponding to the proposed designation of genotype D9.

During November, 2001-January, 2002, a follow-up vaccination campaign was implemented targeting 2,216,001 children aged 1-5 years in 16 of 24 states reported coverage of 100%. Even so, the outbreak continued with cases occurring in all age groups. House-to-house monitoring of vaccination coverage revealed pockets of unvaccinated children. Since March 2002, a nationwide vaccination campaign targeting 5,865,687 children ages 6 months to 14 years and an estimated 5,313,001 high risk adults in urban, peri-urban and rural areas (including health care workers), members of the armed forces, workers, soldiers, university students, displaced populations and migrants) was implemented. Since then, measles circulation has decreased significantly. The states most affected, Zulia and Falcón, report no cases since weeks 31 and 20, respectively, and the average number of cases by week during the last 4 weeks decreased to 2.

**FIGURE 1** Vaccination coverage and reported measles cases, the Americas, 1999–2002.1,2

<table>
<thead>
<tr>
<th>Year</th>
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<th>Coverage</th>
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<tr>
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<td>1,441</td>
<td>1,441%</td>
</tr>
<tr>
<td>2000</td>
<td>1,755</td>
<td>1,755%</td>
</tr>
<tr>
<td>2001</td>
<td>541</td>
<td>541%</td>
</tr>
</tbody>
</table>

1 Data as of EPI week 36, 2,526 municipalities reporting
2 Data as of EPI week 36, 2,526 municipalities reporting
measles cases have been reported in 36), 3,122 suspected measles cases. As of September 7 (week 36), 1,322 suspected measles cases have been reported in Colombia; of them, 125 had been confirmed as measles. Confirmed cases have occurred in 24 municipalities (14 of them on the Atlantic coast or bordering Venezuela) from 11 (33%) of the 33 national departments. As of September 2, 2002, the average number of confirmed cases by week for the last 4 weeks is 6.5. The 3 virus genotypes most affected were children age 5 years (<1.7 cases per 100,000), followed by children 5 to 9 years of age (0.36 per 100,000), and those aged 25 to 29 years (0.34 per 100,000).

Control activities being implemented include: (a) a door-to-door measles vaccination campaign in high-risk municipalities as part of a national vaccination campaign for approximately 4.2 million children ages 6 months–5 years and other high-risk groups (health workers and travelers), (b) house-to-house vaccination and coverage monitoring in high-risk areas, (c) strengthening of epidemiological surveillance nationwide, and (d) increased training on case investigation and outbreak control over all the country. As of September 15, 2002, 3,162,281 children (80%) in the target group had been vaccinated.

During these outbreaks, measles surveillance has been heightened, using active case searches in both countries, with 3,122 suspected cases detected (7.1 per 100,000 population) in Colombia and 6,130 (26.5 per 100,000) in Venezuela. Technical and financial resources have been provided by international organizations, including PAHO, CDC, and UNICEF and these have contributed to the success of the vaccination efforts.

October 2002
Volume XXIV, Number 5

Six Weeks Without Reported Indigenous Measles Transmission in the Americas

Background

Measles is one of the most infectious diseases known to man and remains the leading cause of vaccine-preventable deaths worldwide. Prior to the introduction of the vaccine, practically all children became infected. In 1994, during the Pan American Sanitary Conference, the Americas embarked on the goal of interruption of indigenous measles transmission.

PAHO's recommended strategy for the interruption of measles transmission includes: (a) an initial mass vaccination campaign (catch-up) for children aged 8 months to 14 years, (b) vaccination of children aged >1 year old in routine vaccination services (keep-up), and (c) complementary mass vaccination campaigns every four years (follow-up), for all children ages 1 to 4 years. PAHO has recommended reaching a 95% vaccination coverage in every municipality of the countries. This strategy is complemented by (a) a sensitive surveillance system capable of timely detection of suspected measles circulation, (b) the confirmation and thorough investigation of all cases, (c) an effective virologic surveillance system, and (d) strong supervision of vaccination activities, including rapid house-to-house monitoring of vaccination coverage.

In the Americas, from 1990 to 1996, measles cases declined from approximately 250,000 to 2,109. In 1997 there was a resurgence of measles virus circulation, with 52,284 confirmed cases reporting from Brazil, which started with a large urban outbreak in São Paulo. The virus strain that caused the outbreak was D6, which had been circulating since at least 1995 in Brazil and possibly other countries of the Region. The D6 outbreak spread to Argentina and Bolivia, where the largest number of measles cases occurred during 1998 and 1999, respectively, and then to the Dominican Republic and Haiti, which had the largest number of cases in 2000 and 2001 (Figure 1). Sustained vaccination efforts by these countries led to the progressive decrease of cases region-wide to 3,205 in 1999, and 1,275 in 2000. In 2001, the total number of confirmed measles cases had dropped to 541, the lowest yearly number since the beginning of the hemispheric measles initiative. Since September, 2001, no other viruses of the D6 strain have been identified in the Americas. Moreover, numerous countries with high measles vaccination coverage, including Brazil, Canada, Chile, Costa Rica, El Salvador, Chile, Mexico, Peru, United States, and Uruguay, had measles importations during 1999–2002 with limited or no secondary transmission. In August, 2001, after an importation from Europe, a new measles outbreak began in Venezuela and spread to neighboring Colombia (Figure 1). The virus responsible was a new measles strain, D9, never before identified in the Americas. Following important vaccination efforts in both countries, these outbreaks are being controlled. As of October 15, 2002 and since the beginning of these outbreaks, a total of 2,495 cases in Venezuela, and 128 in Colombia have been confirmed. The last confirmed case occurred in Venezuela in September 20, 2001. Since then, no other indigenous measles cases have been reported. This represents the longest period without reports of indigenous measles transmission since the Regional Plan of Action: Elimination of Measles Eradication was implemented in 1996.
T he XV Meeting of PAHO's Technical Advisory Group on Vaccine-Preventable Diseases (TAG) was held in Washington D.C., November 22–23, 2002. The Technical Advisory Group on Vaccine-Preventable Diseases of the Pan American Health Organization (TAG) continues to be impressed by the very capable and imaginative programs now in progress to deal with the vaccine preventable diseases in the Americas. The programs have been pioneering efforts that other countries and regions are now striving to emulate. Indeed, the pace of progress over the past 25 years in controlling these diseases and in decreasing childhood morbidity and mortality rates is unprecedented. The remarkable successes that we see reflect an extraordinary partnership of efforts on the part of country governments and health staff; public and private donors; with exceptional leadership being shown at the PAHO level by the Pan American Health Organization.

Measles: Lessons Learned

Given that measles is highly endemic in other regions of the world, the Americas continue to be under constant threat of importation of measles virus from other regions where the disease remains endemic. Measles importations have been responsible for outbreaks in Argentina, Bolivia, and the Dominican Republic in 1998–1999, in Haiti in 2000–2001, and in Venezuela in 2001–2002. Measles importations are unavoidable; therefore, the main strategy to prevent the re-initiation of endemic measles transmission is to maintain the highest population immunity possible through high vaccination coverage in all municipalities.

Lessons learned from recent outbreaks following importations have highlighted that densely populated and underserved peri-urban areas with high rural-to-urban migration are at highest risk for measles outbreaks, primarily because of the accumulation of large number of susceptible persons, especially unvaccinated young children. Some areas have had a false sense of security because coverage obtained through the administrative method has been substantially higher than coverage obtained through house-to-house monitoring.

Another critical lesson emerging from recent outbreaks calls for the need to develop strong and accountable supervisory methods and tools to improve the assessment of vaccination and surveillance efforts, particularly at the local level. Experience from the Americas shows that programs with systematic and thorough supervision, including active case-finding, house-to-house monitoring and follow-up can successfully interrupt measles transmission. Outbreak investigations performed in the Region continue to show that the group at highest risk for measles is unvaccinated young children. Another group at high risk of acquiring and/or transmitting the disease is health care workers, especially those who work in emergency rooms or who treat acutely ill patients. Measles: Lessons Learned

Recommendations

• Vaccine program managers should identify areas at high risk for outbreaks, such as those of extreme poverty, as well as densely populated areas in the outskirts of large cities with high rural-to-urban migration. Administrative vaccination coverage in these areas should always be assessed using PAHO’s standardized supervisory tools.

• Vaccine program managers should ensure that 80% of specimens arrive to the laboratory in a timely manner. Second, far too few samples for viral isolation are being collected and tested for measles by the network. Even fewer specimens are being tested for rubella virus isolation. This may, in part, be due to the need for increased coordination and communication between clinicians, epidemiologists and laboratory staff. Regardless, viral isolation is critical to ensure determination of genotypes, for evaluation of the measles program in the approaching post-elimination phase, as well as to determine the extent of rubella transmission in the hemisphere.

Finally, it is important to keep in mind that countries should expect to see laboratory confirmed cases. To this end, laboratory procedures to establish which laboratory results are available. In addition, confusion continues to exist on the proper management of recently vaccinated cases that are found, as could be expected, to be false-positive. PAHO has also published guidelines on the proper management of such cases.

Recommendations

• National managers should ensure that the guidelines recommended by PAHO for evaluation of rash illness associated with vaccination are followed to establish the final classification of such cases. Managers should not assume that a rash illness in a recently vaccinated case is always due to the vaccination. All cases that are laboratory positive should be carefully investigated to ensure they are not measles or rubella, such as determining whether there are potential source cases with rash and fever, and whether there has been subsequent transmission.

• National laboratories should be commended on their participation in, and the results from, quality control panel testing. All laboratory managers should continue to participate in these quality control programs. Program managers should ensure that all sera from suspected cases are tested for both measles and rubella antibodies. In addition, special emphasis should be placed on the collection of specimens for viral isolation and the logistical necessary to ensure that adequate specimens are taken and are shipped appropriately.
Measles Articles

February 2003
Volume XXV, Number 1

19 Weeks Without Reported Transmission of the D9 Measles Virus in the Western Hemisphere

In 1994, the Region of the Americas adopted the goal of measles eradication. The regional plan of action for achieving this goal was endorsed by all ministers in 1995. As of March 28, 2003, the Western Hemisphere is free from known circulation of the D9 measles virus for an unprecedented 19 weeks. This is further evidenced by the Region’s strong surveillance.

The Pan American Health Organization’s recommended vaccination strategy includes: 1) a one-time nationwide campaign targeting children aged 1 to 14 years; 2) routine vaccination among 1-year-olds; and 3) nationwide follow-up vaccination among 1-year-olds. This campaign targeting children 1 year old age group: 2 (9%) in the 5-14 years; 2 (9%) in the 5-14 years-old age group; 2 (9%) in the 5-14 year old age group; and the remaining 7 (32%) in the adults between 25-44 years old, who infected a minimum of 6 people. These 9 cases (41% of the total of 22 known cases) were avoidable, since health workers are supposed to be vaccinated. A 27-year-old infected nurse of the Federal District consulted several physicians who did not consider measles as a diagnosis. Fifteen (68%) of the 22 known cases occurred in families whose members work in factories and mobile markets, are laborers or are involved in prostitution. At least seven (32%) of the cases occurred in people of rural origin.

Virus Identification and Origin

The molecular biology analysis carried out by the CDC in Atlanta on samples from two of the 22 known cases showed that they belonged to the H1 strain and were very similar to the H1 strains currently circulating in Japan. The source of importation, however, has not been identified. Preliminary data from a PCR analysis indicate the virus bears a three-nucleotide difference with the H1 virus, isolated from an importation from Japan to Chile this year. The H1 genotype virus has recently been identified in Korea and China. This suggests that the source of importation originated from this Asian region.

Vaccination Coverage

According to data from PROVAC (automated information program for vaccination coverage), national immunization coverage rates as of December 2002 were 85% among children under 14 months old, 95% among 1-4 year-old children, 98% among two year-olds, and at least 99% among children less than 5 years. This coverage has been maintained during the last four years. Rapid coverage monitoring conducted in five States according to WHO methodology over several years usually showed similar or higher rates. The last follow-up campaign, carried out in 2002, only targeted children between 27-36 years old living in municipalities with coverage below 95% and at least 10 unknown. The two catch-up campaigns were carried out, one in 1993 and the other in 2000, with coverage rates close to 95%. MMR vaccination coverage in 2001 was 91%.

Measles cases and main circulating genotypes by week, Region of the Americas, 2001-2003.

* Data as of 9 weeks (March 28, 2003). Source: Country reports.

Importation of the H1 Measles Virus in Mexico City, April 2003

New measles cases were reported to the Epidemiological Surveillance System on Single Rash Illnesses (FRIs) in the Federal District (DF) and the States of Mexico and Hidalgo between April and July 2003.

The first known case of this outbreak occurred in Mexico City, the most populous urban area of the Americas, and had onset date of 13 April 2003; the last case had onset date of 4 July. Nineteen cases were laboratory confirmed, 15 of them in the DF and 4 in Mexico State. The total number of known cases was 22, with 3 cases (all in the Federal District) being epidemiological contacts of confirmed cases (Figure 1).

The source of infection could not be identified in 12 (55%) of the 22 cases. Based on the number of reported cases, it is assumed that the real number could have been 32 (22 known cases and at least 10 unknown). Serological diagnosis was performed using the ELISA test for detection of measles IgM at the national epidemiological reference laboratories of Mexico, INHRE (Instituto de Diagnostico y Referencias Epidemiologicas), and at the Centers for Disease Control and Prevention (CDC), in the USA. Furthermore, pharyngeal and urine samples were collected for culture and polymerase chain reaction (PCR) analysis at both institutions.

Figure 1: Confirmed measles cases in Mexico, 2003.

Figure 2: Measles cases by week of onset and age group, Mexico, 2003.

Figure 3: Confirmed measles cases according to week of onset and age group, Mexico, 2003.
Rubella Watch

EPI Newsletter

1979–2009

Viral strain isolated in this outbreak was D9, an import from Germany. Since then, no indigenous measles circulation has occurred in the Region. In 2003, up to epidemiological week 34, four countries in the Region reported confirmed cases of measles: Mexico (40), the United States (14), Canada (12), and Chile (1), with all cases related to imported strains.

Measles Vaccination in the Andean and Southern Cone Subregions

All of the countries in the Andean and Southern Cone Subregions achieved over 90% coverage with measles-containing vaccine (MCV), except for Paraguay, Ecuador, and Venezuela (Table 1). In the first semester of 2003, Venezuela achieved 100% coverage.

Of concern in 2002 was the percentage of municipalities in each country with MCV coverage ≥95% in children aged 1 year. It ranged from 19% in Ecuador to 64% in Bolivia; Uruguay achieved 94% coverage (Table 2). Low coverage poses a serious risk for widespread transmission in the event of an imported case.

Using the estimation of number of susceptible persons, most of the countries have appropriately scheduled their follow-up campaigns for 2005 and 2006 (Table 3). Brazil has scheduled its next follow-up campaign for 2004.

All of the countries carried out rapid coverage monitoring (RCM) during the June Vaccination Week in the Americas (RVW). However, most countries have not yet reached the target of 80% RCM.

Measles in the Americas

The last confirmed case of indigenous measles occurred approximately one year ago. However, the potential for importation remains a constant threat, since circulation of the virus has still not been interrupted on other continents. Thus, the following activities are crucial to preventing its reintroduction and/or reemergence of indigenous circulation in the Region:

- Countries should maintain uniformly high levels of routine vaccination coverage (95%) in the health services.

Table 1. Vaccination coverage in the Andean and Southern Cone Subregions, 2002.

<table>
<thead>
<tr>
<th>Country</th>
<th>OPV3</th>
<th>DPT3</th>
<th>Measles</th>
<th>BCG</th>
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<td>92.5</td>
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<tr>
<td>Brazil*</td>
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<tr>
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</table>

In Brazil, TV coverage ≥ 95%.

Table 2. Number and percentage of municipalities by coverage level with measles vaccine in children aged 1 year – 2002.

<table>
<thead>
<tr>
<th>Country</th>
<th>Coverage &lt;95%</th>
<th>Coverage 295%</th>
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<tbody>
<tr>
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<td>273</td>
<td>49</td>
</tr>
<tr>
<td>Brazil</td>
<td>2,057</td>
<td>55</td>
</tr>
<tr>
<td>Chile</td>
<td>158</td>
<td>46.2</td>
</tr>
<tr>
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<tr>
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</tr>
<tr>
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<td>81</td>
</tr>
<tr>
<td>Peru</td>
<td>944</td>
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</tr>
<tr>
<td>Venezuela</td>
<td>209</td>
<td>57.2</td>
</tr>
</tbody>
</table>

In Brazil, TV coverage ≥ 95%.
Measles Articles

TABLE 3. Follow-up vaccination campaigns.

<table>
<thead>
<tr>
<th>Country</th>
<th>Year of last mass campaign</th>
<th>Coverage (%)</th>
<th>Date of next campaign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>2002</td>
<td>81</td>
<td>2004</td>
</tr>
<tr>
<td>Brazil</td>
<td>2000</td>
<td>100</td>
<td>2004</td>
</tr>
<tr>
<td>Chile</td>
<td>2001</td>
<td>100</td>
<td>2005</td>
</tr>
<tr>
<td>Paraguay</td>
<td>2003</td>
<td>93</td>
<td>2006</td>
</tr>
<tr>
<td>Uruguay</td>
<td>2003</td>
<td>95</td>
<td>2007</td>
</tr>
<tr>
<td>Bolivia</td>
<td>2002</td>
<td>95</td>
<td>2007</td>
</tr>
<tr>
<td>Colombia</td>
<td>2002</td>
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<tr>
<td>Ecuador</td>
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<td>100</td>
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</tr>
<tr>
<td>Peru</td>
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<td>97</td>
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<tr>
<td>Venezuela</td>
<td>2001</td>
<td>98</td>
<td>2005</td>
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</table>


<table>
<thead>
<tr>
<th>Country</th>
<th>• Unit reporting weekly</th>
<th>• Cases with adequate samples</th>
<th>• Samples collected in 5 days</th>
<th>• Percentage of samples reaching the laboratory within 5 days of collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>94</td>
<td>83</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Chile</td>
<td>95</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Paraguay</td>
<td>95</td>
<td>80</td>
<td>80</td>
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</tr>
<tr>
<td>Uruguay</td>
<td>90</td>
<td>85</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Venezuela</td>
<td>88</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
</tbody>
</table>

* Up to 1st week: 95. N/D: Not documented.
Note: Acceptable percentages are 90% for each indicator.

- Timely national follow-up and mass campaigns should be conducted based on an analysis of the number of susceptible persons.
- Local epidemiological surveillance should be improved or strengthened active case-finding activities to permit the timely identification and investigation of suspected cases.
- Countries should identify high-risk municipalities, considering certain parameters such as <95% coverage, presence of indigenous and migrant populations, border areas, hard-to-reach areas, and areas with high population density and prison inmates.
- Rapid coverage monitoring should become a requisite by contributing to emphasizing epidemiologically silent and high-risk municipalities.
- Information systems and data quality should be upgraded at all levels.
- Populations at risk should be vaccinated, including health workers, people employed in tourism, teachers, military personnel in barracks, and prison inmates.
- Countries should guarantee regular and timely delivery of vaccines and other supplies that will be required for vaccination activities.
- Supervision and monitoring should be strengthened at all levels, making high-risk municipalities a priority.
- Countries should implement an ongoing information, education, and communication (IEC) strategy to strengthen the regular EPI.
- Countries should promote greater coordination of cross-border activities.
- Operational personnel should be kept informed about surveillance, vaccination norms and procedures.

Measles Disease

- Countries should maintain integrated measles and rubella surveillance.
- Laboratory Indicators for Measles Diagnosis
  In 2003 (as of epidemiological week 33), the Americas Region had higher proportions of suspected cases with adequate samples and timely laboratory response compared to the same period of 2002. The two exceptions were Colombia and Venezuela, where slightly lower values were reported in 2003.

- A recurring problem in all of South America is the low proportion of samples reaching the laboratory within 5 days of collection, which ranged from 56% (Peru) to 100% (Uruguay) during weeks 1-33 of 2003 (Table 4). Of the ten countries in the Andean and Southern Cone Sub-Regions, 5 achieved 80% for this indicator.

- Recommendations
  - The indicators for laboratories reaching the laboratory should be adopted as a measure for monitoring the quality of the surveillance system in each country since it is directly related to the efficiency of the surveillance system, not to laboratory performance.
  - Laboratories should continue to participate in the external quality control programs of the Centers for Disease Control and Prevention (CDC) in Atlanta; it is proposed that a panel of 5 samples be sent once a year to each laboratory. The results of the external quality control should be used to improve training and supervision needs in the laboratories.
  - Countries should continue to collect samples for viral isolation (urine, nasopharyngeal swab) in all outbreaks of febrile rash illness, from every clinical case with a high suspicion of measles and/or rubella and from IgM-positive cases.
  - In cases found to be IgM-positive for measles, a thorough epidemiological investigation should be conducted; in cases in which the diagnosis is uncertain; second serum sample should be collected two to three weeks after the first. These samples (first and second) should be assayed for IgM and IgG measles antibodies. They may also be assayed for other viral infections in network laboratories. All cases should be documented and presented at the next meeting of the Technical Advisory Group (TAG).
  - Countries should promote the formation of ad hoc groups to document cases that are IgM-positive for measles; the documentation will be gathered by the surveillance system of each country followed by a subsequent presentation at the TAG meeting.
  - PAHO should continue providing measles and rubella reagent kits to the laboratory network.
  - The laboratory network should collect and disseminate pertinent scientific information about the possibility of another laboratory test for measles IgM, with a view of optimizing laboratory diagnostic protocols of sporadic IgM positive cases.
  - In accrediting measles laboratories, a critical assessment of conditions in the laboratories should be performed to identify support and training needs.

Measles Diagnosis

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Global Measuring

- Global Monitoring for Sustainable Measles Mortality Reduction and Immunization Systems Strengthening, 15-17 October 2003, Cape Town, South Africa

- International health leaders joined together in Cape Town this month under the sponsorship of the World Health Organization (WHO) and the United Nations Children Fund (UNICEF) to pledge their commitment to reduce measles deaths and describe proven strategies to sustain the prevention of these deaths.

- Despite the availability of a safe, highly effective, and relatively inexpensive vaccine for over 40 years, measles claims the lives of an estimated 745,000 children each year – more than half of them in Africa. Of all the vaccine-preventable diseases, measles remains a major killer of children and causes serious complications, such as pneumonia, encephalitis, and pneumonia. It is the leading cause of vaccine-preventable deaths among children and the fifth leading overall cause of death among children aged <5 years.

- Increasing measles vaccination is a critical factor to achieve the target set at the United Nations General Assembly Special Session (UNGASS) on Children in 2002 to reduce measles deaths by the end of 2005 by 50% compared with 1999 levels. It is also a critical indicator for the Millennium Development Goal (MDG) for reducing mortality in children aged <5 years by two-thirds by 2015. With the launch of the Measles Initiative in 1999 levels by 50% by 2005.

- Conclusion

- The WHO/UNICEF Global Measles Summit in Cape Town was a landmark meeting for intensifying the commitment of global leaders to prevent one of the leading killers of children worldwide and to ensure that health experts urged countries and donors to take immediate action and to provide political and financial support to the global effort. Such commitment will be well received in the Region of the Americas whose countries have made great strides in controlling measles and are well aware of the risk of importation of measles back into the Region were ever circulating wild-type measles virus exists in other regions of the world.
Cape Town Measles Declaration, 17 October 2003

ALARMED that in 1999 alone an estimated 875,000 infants and children died from measles, and that measles continues to cause hundreds of thousands of child deaths each year, especially in developing countries;

STRESSING the importance of achieving the goals adopted by the United Nations General Assembly Special Session on Children in 2002 and the World Health Assembly in 2003 to reduce measles deaths by 50% compared with 1999 levels by the end of 2005, and the United Nations Millennium Declaration target to reduce the under-five child mortality rate by two-thirds by the year 2015 compared with 1990 levels;

RECOGNIZING that measles deaths are primarily due to lack of immunization with existing safe, effective and inexpensive measles vaccines and incomplete implementation of proven strategies;

NOTING the critical importance of continuing to strengthen routine immunization services, including the provision of a second opportunity for measles immunization, as the foundation of a comprehensive strategy to reduce measles deaths sustainably and the essential role in monitoring and guiding measles control efforts;

HIGHLIGHTING the importance of developing multi-year immunization plans, the full integration of measles mortality reduction activities with other national health goals and mobilizing necessary human and financial resources for sustainable measles mortality reduction;

WELCOMING the remarkable progress that has been made by the Region of the Americas in interrupting measles virus circulation and the ongoing efforts in Africa, with strong support from the Measles Initiative to reduce measles deaths;

Those present at the Global Meeting for Sustainable Measles Mortality Reduction and Immunization Systems Strengthening declare our intent to:

SUPPORT the WHO/UNICEF Global Strategic Plan for Measles Mortality Reduction and Elimination, 2001-2005 with special attention to increasing routine measles immunization coverage to at least 90 percent coverage in all countries, combined with providing all children with a ‘second opportunity’ for measles immunization either through the routine immunization schedule or periodic supplemental immunization activities;

WORK TOGETHER to identify the human and financial resources to strengthen immunization and health systems and to reduce measles deaths throughout the world;

ADVOCATE to strengthen immunization systems and reduce further measles mortality according to the strengths of each partner.

December 2003

Caribbean EPI Managers' Meeting, 17-20 November 2003

The 20th Meeting of the Caribbean EPI Managers was held in Curacao, Netherlands Antilles, from 17-20 November 2003. The meeting brought together over 60 health officials from 26 countries of the English-speaking Caribbean, Suriname, the Netherlands Antilles, Aruba, the French Departments of Guadeloupe, Martinique, and French Guiana, the United States and the US Virgin Islands, Canada, and the United Kingdom. Several Netherlands Antilles Representation were present.

PAHO Immunization staff and consultants, as well as staff from the Caribbean Epidemiology Center (CAREC) and the Caribbean Program Coordination Office (CPC) also attended.

Achievements in the Subregion

Control of vaccine-preventable diseases remains exemplary in the countries of the subregion, and all should be congratulated on their efforts. No measles cases were confirmed up to week 43 of 2003 despite careful surveillance, and there were no confirmed rubella cases for 2002 and 2003 to date (see Figure 3). The last case of CRS occurred in 1999 in Suriname.

More than 90% of the countries in the subregion are providing a two-dose MMR strategy. Those countries must measure coverage of each dose and calculate the number of children who have received two doses, one dose, or no doses of vaccine. Coverage for the second dose of MMR must be 95% or greater to prevent the accumulation of susceptible persons. If there are significant numbers of susceptible children who have not been protected by the second dose, then a further catch-up campaign must be conducted. For both measles and rubella, importation still remains the greatest risk for re-emergence.

Challenges

Integrated measles and rubella surveillance must be strengthened, especially for women who acquire rubella in pregnancy. The proportion of clinical specimens that were received within 5 days is still very low and must be improved (see Figure 2). If the first specimen is taken within the first three days of the appearance of rash in a pregnant woman or is collected from cases in clusters of fever/rash, negative by IgM testing, second specimens should be obtained.

Each specimen sent for measles and rubella IgM testing must have an epidemiologic case identification number. Evaluation reveals that some countries have no funding or mechanism in place for in-country transportation of specimens. Every effort is being made to encourage countries to ship specimens to the CAREC laboratory as quickly as possible and have in-country mechanisms for specimen transportation. Molecular typing of rubella virus isolates will facilitate better understanding of the source of rubella outbreaks, CRS cases, and rubella strain variations. To date, few virologic specimens are submitted for molecular typing. Countries embarking on measles elimination must document strains to determine whether cases are indigenous or imported.

The IBS system implemented in five countries—Barbados, Guyana, Jamaica, Suriname, and Trinidad and Tobago—requires additional technical support to be sustainable.

The immunization programs in the Caribbean are facing major challenges in achieving and sustaining high vaccination coverage in a climate of reform and economic difficulties in the health sector. In larger countries, overall immunization coverage needs to be increased. In addition, pockets of low immunization coverage exist in some countries. In addition, governments must ensure that invoices for vaccine supplies are paid in a timely fashion (i.e. within 60 days). Failure to pay for supplies jeopardizes maintenance of routine immunization and may lead to widespread rather than localized shortages.

Conclusions

Effective management and supervision of implementation of EPI Plans of Action in each country remain the backbone of the Caribbean program. The EPI Managers participating in this meeting should be congratulated for their tireless efforts to reach all children and protect them from vaccine-preventable diseases. At the same time, governments must continue to keep immunization high on their list of priorities.

2004

Measles Elimination in Mexico

The indigenous transmission of measles appears to have been interrupted in Mexico and the rest of the Americas since 2002. However, 108 confirmed cases were reported in Mexico since April 2003 and transmission is ongoing. Isolation of the virus and genetic sequencing have linked these cases with importations of H1 measles viruses from other parts of the world. Ongoing transmission in Mexico highlights the risk of importation of measles virus.

A PAHO mission was invited to visit Mexico from 19 to 23 April 2004. The objectives of the visit were 1) to evaluate the circulation of the measles virus in Mexico during the past 12 months; 2) to review the steps taken to interrupt transmission; and 3) to identify the lessons learned and the challenges for interrupting the transmission of the measles virus in Mexico.
The first known case in this outbreak appeared in Mexico City with date of onset of 13 April 2003. Between April 2003 and April 2004, 26 confirmed cases of measles, 44 in 2003 and 64 in 2004 (up to epidemiological week 16 of 2004), were reported to the Epidemiological Surveillance System for Exanthematous Fever Diseases. Of the 108 confirmed cases, 102 were confirmed by laboratory and laboratory epidemiological link. The source of infection could not be determined in 32 (31%) of the confirmed cases, 77 occurred in the Federal District, 24 in the State of Mexico, 4 in the State of Hidalgo, 2 in the state of Guanajuato and 1 in the state of Campeche. The most affected age groups are young adults and children under 1 year of age (Table 1).

Measles serology testing has been performed at the Institute for Diagnosis and Epidemiological Reference (INDRE), Mexico’s national epidemiological reference laboratory, and the Centers for Disease Control and Prevention (CDC) in the United States, using the ELISA test for the detection of measles IgM.

Furthermore, pharyngeal and urine samples have been tested for culture and polymerase chain reaction (PCR) assays in INDRE and in CDC. The past 12 months have yielded 13 positives with 100% homologous sequences corresponding to genotype H1, which were very similar to the H1 strain currently circulating in Japan. However, the source of importation has not been identified. Preliminary data indicate that three nucleotides of the virus differ from those of the H1 virus that was present in a case in Chile imported from Japan in 2003. The H1 genotype has recently been found in Korea and China, suggesting that this part of Asia was the source of the importation of the virus.

Mexico’s National Health Security Committee declared a national emergency, which calls for assertive action to interrupt transmission. This Committee has agreed to:

- Strengthen the Plan of Action for interrupting transmission.
- Eliminate circulation of the measles virus while moving forward with the program for eliminating rubella and congenital rubella syndrome through simultaneous and systematic nationwide action.
- Procure and distribute 15.6 million doses of measles–rubella (MR) vaccine for administration to the susceptible population (aged 13 to 39 years).
- Distribute the general guidelines for immediate implementation of the respective Plan of Action in the states.
- Activate, without exception, the state Committees for Health Security, Epidemiological Surveillance (CEVE), and Vaccination (COEVA). They should meet on a continuous basis and will be in charge of timely monitoring the steps taken under the Plan of Action.
- At the federal level, hold monthly meetings so that CEVE and COEVA committees can report to this interdepartmental central level. The first meeting will be held from 11-14 April 2004 in Mexico City and will be attended by health services directors, program heads, and state epidemiologists.

Mexico’s plan to interrupt measles transmission revolves around two elements:

### a) Epidemiological surveillance:

- The CEVE committees should guarantee application of the epidemiological surveillance guidelines and their monitoring at the local level.
- They should also guarantee thorough inter-institutional coordination, the clinical and epidemiological investigations of each reported case, and the monitoring and supervision of surveillance and control activities in the different units of the sector in the federative entities.

### b) Vaccination activities for outbreak control:

- Implementation of mop-up campaigns in high schools and professional schools throughout the country and vaccination of the population aged 13 to 39 years in all health units.
- Implementation of prevention and control measures when a case is reported through “blocking strategies” in high-risk areas (areas with high coverage), and low coverage, by vaccinating the population aged 6 to 11 months and those aged 13 to 19 with no history of vaccination since 2000.
- Vaccination of health workers and tourism-sector employees with no history of vaccination since 2000.

### Challenge

This current measles situation in Mexico poses a critical challenge for national authorities to maintain measles elimination in the Americas. As long as the measles virus continues to circulate in any part of the world, the countries of the Hemisphere will be at risk for imported cases. The lessons learned in Mexico in stopping transmission will be important for other countries of the Region.

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**Strategies to Interrupt Transmission of the Measles Virus in Mexico**

Given the existence of a national technical plan and the ability to interrupt measles transmission, the Mexican health authorities and the PAHO team agreed that the following general steps should be taken to bolster current efforts and ensure optimal implementation of the plan of action:

1. **Mexico has made intensive efforts to control the outbreak in the affected municipalities as recommended by the National Health Security Committee and the National Vaccination Board (CONAVI),** it is important that intensive vaccination campaigns be waged to interrupt circulation of the measles virus.

2. **The priority in these intensive campaigns is to vaccinate all adolescents and young adults aged 13 to 19 years in Mexico with the MR vaccine. This is the group at highest risk, according to the epidemiological information on the measles cases and the national seroprevalence surveys.**

3. **Vaccination activities should be carried out swiftly, preferably in a 4- to 6-week time span.**

4. **Given the time required for optimal planning of the campaign and the availability of all the necessary resources, September 2004 is suggested as the best time for ensuring successful implementation of this vaccination campaign.** However, the group recognizes that transmission will continue and that there is significant risk of a rise in the number of cases and the spread of outbreaks to other parts of the country. In light of this, the group stresses the importance of establishing contingency plans and ensuring the immediate availability of the necessary resources, particularly the MR vaccine.

5. **The success of the vaccination campaigns hinges on a timely supply of the necessary resources. The target population consists of roughly 51 million individuals between the ages 13 and 19. A preliminary estimate of the previous years’ vaccination activities in this age group and the purchase of 16 million doses of MR vaccine indicates that at least 26 million additional doses of MR vaccine are needed to achieve a vigorous, intensive nationwide vaccination campaign to interrupt transmission of the measles virus.**

6. **The global supply of vaccine is limited. In order to guarantee that producers have this number of doses on hand and can guarantee their availability, health authorities must inform the market of their needs as soon as possible.**

7. **It is important for the states and districts to draw up detailed plans of action that include the application of optimal modalities for vaccinating all young adults in the target age group.**

8. **To guarantee that the states make the commitment and carry out this plan in an optimal manner, the Health Secretariat will once more convey the decisions of the National Health Security Board to each state and draw up guidelines emphasizing the aspects described earlier.**

9. **To improve the detection, investigation, and classification of cases and contacts, the Health Secretariat will coordinate the review of all probable cases with acute febrile illnesses reported to the states and confirm all cases where there is evidence of an epidemiological link with clinically- or laboratory-confirmed cases.**

10. **To strengthen the national laboratory network, the Health Secretariat has made a commitment to take the following steps:**

    - • Strengthen and state laboratories in the diagnosis of exanthematous febrile illnesses
    - • Strengthen the role of the National Reference Laboratory (INDRE) in quality control, and performance evaluation in all laboratories of the national network.
Accumulation of Measles Susceptibles: The Experiences of the English-speaking Caribbean, Suriname, and Paraguay

PAHO's Strategy for Measles Elimination

In 1994, the countries of the Region of the Americas established the goal of measles elimination from the Western Hemisphere. Subsequently, significant progress has been achieved, mainly through the intensification of routine vaccination, mass vaccination campaigns, and enhanced surveillance.

The Pan American Health Organization (PAHO) recommended a three-pronged vaccination strategy. Its driving principle is to provide a second opportunity for measles vaccination, not only to children who had not received the first dose at the time of the first administration (primary vaccine failure), but also to those who had never received any measles vaccinations. To rapidly interrupt measles transmission, PAHO recommends a one-time nationwide campaign targeting children aged 9 months to 14 years (“catch-up”). After this campaign, the interruption of measles virus transmission is maintained by keeping high population immunity through routine vaccination of children aged >1 year (“keep-up”), and through periodic mass vaccination campaigns every 3-4 years (“follow-up”) targeting children aged 1-4 years, regardless of their previous vaccination status. To determine the interval between “follow-up” campaigns, the countries can calculate the accumulation of susceptibles based on vaccination coverage and the estimated vaccine failure rate. The next campaign should be scheduled when the number of children susceptible to measles in the population approximate the number of children in an average birth cohort. This article illustrates such calculations and the consequent decision-making process in the cases of the English-speaking Caribbean, Suriname, and Paraguay.

English-speaking Caribbean and Suriname

The Ministers of Health of the Caribbean Community (CARICOM) decided to eliminate measles from the sub-region in 1998. In 1999, all countries except Bermuda conducted “catch-up” campaigns. Since then, “follow-up” campaigns have been conducted by countries in 1999/1997 and 2000/2001. Routine use of a second dose of measles-containing vaccine has been implemented in most of the countries and/or territories.

All countries conducted mass vaccination campaigns between 1995 and 1997, except for Bermuda and the Cayman Islands. These two countries had introduced a second dose of measles-mumps-rubella (MMR) vaccine and considered the coverage of this second dose high; therefore, both countries decided that a vaccination campaign was not necessary. The target population for the “follow-up” campaigns was children aged 1-5 years in nine countries. Bahamas and Suriname have a much broader age range, ages 4 to 40 and ages 1 to 39, respectively. Measles vaccine coverage ranged from 80% to 100% (Table 1).

Between 2000 and 2001, countries were scheduled to implement measles “follow-up” campaigns. However, some countries were routinely administering two doses of MMR vaccine with the second dose given at 2 years or 4-5 years of age and attaining coverage levels over 84%. These countries decided to forgo a mass campaign with the commitment to target coverage for the second dose to be >90% or greater. For those countries that implemented the campaign, the target population was children aged 1-4 years. The coverage rate achieved in each country ranged from 64% to 94% (Figure 1). Since 2001, routine annual vaccination coverage for the first dose of measles-containing vaccine at country level has ranged between 90-100% for countries which are population of million inhabitants, while larger countries had vaccination coverage ranging from 75 to 90% (Table 2).

Suscceptibles

In 2000, the target population for the measles vaccine (children aged 12-23 months) was 131,212, of which 26,909 were vaccinated, giving an average measles coverage of 94.5%. Consequently, the number of unvaccinated children was 7,328. In calculating the accumulation of the measles susceptible population, vaccine effectiveness of 90% was assumed. For the year 1994, the number of measles susceptibles in all the CARICOM countries was >191 (Figure 1). The unvaccinated populations of children aged 12-23 months for 2001, 2002, and 2003 were 16,017, 16,391, and 20,517, respectively.

The estimated number of children susceptible for measles at the end of 2003 was 106,412, corresponding to 86% of a typical birth cohort (123,170 in 2003). The next “follow-up” campaign should be scheduled no later than 2005. However, all countries except Suriname are now routinely administering a second dose of a measles-containing vaccine, therefore “follow-up” campaigns will not be conducted in those countries. Only Suriname is scheduled to conduct a campaign in 2005. Nevertheless, health authorities have decided that if the percentage coverage for the second dose of measles vaccine is less than 90%, countries should consider “mop-up” vaccination campaigns. The intensification vaccination activities, such as door-to-door vaccination, to reach the remaining population segments. This will ensure coverage for the second dose and <90% in children aged 1-4 years or in the age group targeted for the second dose in each country. Countries such as Jamaica, Barbados, and Guyana will have to plan and implement intensified vaccination activities to attain this goal.

Accumulation of Susceptibles

For 1993, 135,607 (91%) of the 148,399 children targeted were vaccinated (Table 1). A cumulative estimate of 90% vaccine effectiveness, the number of one-year-old children who were susceptibles at the end of 2003 - as expected the consequence of primary vaccine failure or failure to receive vaccine was 26,353. This figure represents 18% of the Caribbean birth cohort. Similar calculation is made for 2004,

Pan American Health Organization


<table>
<thead>
<tr>
<th>Country</th>
<th>Year of campaign</th>
<th>Target Age</th>
<th>Age Range</th>
<th>% Pop. vaccinated</th>
<th>Vaccine used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antigua</td>
<td>1997</td>
<td>&gt;1 year</td>
<td>2-6 years</td>
<td>90%</td>
<td>MMR</td>
</tr>
<tr>
<td>Barbados</td>
<td>1995</td>
<td>&gt;1 year</td>
<td>2-6 years</td>
<td>90%</td>
<td>MMR</td>
</tr>
<tr>
<td>Belize</td>
<td>1995</td>
<td>&gt;1 year</td>
<td>2-6 years</td>
<td>90%</td>
<td>MMR</td>
</tr>
<tr>
<td>British Virgin Is.</td>
<td>1995</td>
<td>&gt;1 year</td>
<td>2-6 years</td>
<td>90%</td>
<td>MMR</td>
</tr>
<tr>
<td>Cayman Is.</td>
<td>1995</td>
<td>&gt;1 year</td>
<td>2-6 years</td>
<td>90%</td>
<td>MMR</td>
</tr>
<tr>
<td>Dominica</td>
<td>1995</td>
<td>&gt;1 year</td>
<td>2-6 years</td>
<td>90%</td>
<td>MMR</td>
</tr>
<tr>
<td>Grenada</td>
<td>1995</td>
<td>&gt;1 year</td>
<td>2-6 years</td>
<td>90%</td>
<td>MMR</td>
</tr>
<tr>
<td>Guyana</td>
<td>1995</td>
<td>&gt;1 year</td>
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<td>Jamaica</td>
<td>1995</td>
<td>&gt;1 year</td>
<td>2-6 years</td>
<td>90%</td>
<td>MMR</td>
</tr>
<tr>
<td>Montserrat</td>
<td>1995</td>
<td>&gt;1 year</td>
<td>2-6 years</td>
<td>90%</td>
<td>MMR</td>
</tr>
<tr>
<td>St. Kitts</td>
<td>1995</td>
<td>&gt;1 year</td>
<td>2-6 years</td>
<td>90%</td>
<td>MMR</td>
</tr>
<tr>
<td>St. Lucia</td>
<td>1995</td>
<td>&gt;1 year</td>
<td>2-6 years</td>
<td>90%</td>
<td>MMR</td>
</tr>
<tr>
<td>Turks &amp; Caicos Islands</td>
<td>1995</td>
<td>&gt;1 year</td>
<td>2-6 years</td>
<td>90%</td>
<td>MMR</td>
</tr>
</tbody>
</table>

* Only data for children aged 1-4 years are presented.

### TABLE 2. Measles vaccination activities in the English-speaking Caribbean and Suriname.

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Coverage</th>
<th>Age</th>
<th>Year</th>
<th>Coverage</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antigua</td>
<td>1995</td>
<td>83%</td>
<td>&gt;1 year</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
</tr>
<tr>
<td>Barbados</td>
<td>1995</td>
<td>81%</td>
<td>&gt;1 year</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
</tr>
<tr>
<td>Belize</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
</tr>
<tr>
<td>British Virgin Is.</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
</tr>
<tr>
<td>Cayman Is.</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
</tr>
<tr>
<td>Dominica</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
</tr>
<tr>
<td>Grenada</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
</tr>
<tr>
<td>Guyana</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
</tr>
<tr>
<td>Jamaica</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
</tr>
<tr>
<td>Montserrat</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
</tr>
<tr>
<td>St. Kitts</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
</tr>
<tr>
<td>St. Lucia</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
</tr>
<tr>
<td>Turks &amp; Caicos Islands</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
<td>1995</td>
<td>80%</td>
<td>&gt;1 year</td>
</tr>
</tbody>
</table>

* Only data for children aged 1-4 years are presented.


- **Surveillance**
- **2000**
- **2001**
- **2002**
- **2003**
- **2004**
- **2005**
- **2006**
- **2007**

* Source: Ministry of Health reports to EPI/CAREC.


<table>
<thead>
<tr>
<th>Population groups</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suriname</td>
<td>121,863</td>
<td>121,863</td>
<td>121,863</td>
<td>121,863</td>
<td>121,863</td>
</tr>
<tr>
<td>Vaccinated children</td>
<td>121,863</td>
<td>121,863</td>
<td>121,863</td>
<td>121,863</td>
<td>121,863</td>
</tr>
<tr>
<td>Unvaccinated children</td>
<td>121,863</td>
<td>121,863</td>
<td>121,863</td>
<td>121,863</td>
<td>121,863</td>
</tr>
<tr>
<td>Total susceptibles</td>
<td>121,863</td>
<td>121,863</td>
<td>121,863</td>
<td>121,863</td>
<td>121,863</td>
</tr>
</tbody>
</table>

* Projected from coverage data up to June 2004.


*** Assuming primary vaccine failure of 10%.
The XVI Meeting of PAHO’s Technical Advisory Group on Vaccine-preventable Diseases: Conclusions and Recommendations

The XVI Meeting of PAHO’s Technical Advisory Group (TAG) on Vaccine-preventable Diseases was held 3-5 November 2004 in Mexico City, Mexico. TAG meets every two years and functions as the principal forum for providing advice to PAHO Member States on vaccine policies and disease control efforts. The following is a summary of TAG’s technical deliberations and recommendations as presented in the Final Report regarding measles.

Since the last TAG meeting, held in Washington, D.C. in November 2002, the immunization programs of the Region of the Americas have maintained the continent free of indigenous poliovirus transmission, having interrupted endemic transmission of indigenous measles virus, and have made great strides toward the goal of eliminating rubella and congenital rubella syndrome (CRS). Over the years, vaccination has saved millions of children and has contributed to a decrease in childhood mortality in the Americas; for the period 1990-1995, there were 51.4 deaths per 1,000 live births, and by 2003 the mortality rate had dropped to 30.7.

TAG acknowledged the remarkable progress achieved by PAHO’s Immunization Unit over the last two years in coordinating technical support to Member States. Activities have included advancing the Directing Council Resolution CD44.81 in September 2003 for rubella and CRS elimination, organizing ad-hoc expert group meetings on rubella and measles, convening regional and global rotavirus meetings, assisting in the development of country and regional Plans of Action, conducting three country evaluations, organizing and supporting the Vaccination Week in the Americas, and advising on numerous country-based surveillance activities.

Measles

In the 10 years since the goal of measles elimination was adopted, measles incidence has decreased by more than 95% in the Americas. The Venezuelan outbreak in 2002 can be viewed as the last instance of widespread endemic transmission of the measles virus in the Americas. However, the recent outbreak in Mexico encourages all countries in the Region to improve immunization coverage and surveillance as the best protection against importations.

Recommendations

Recognizing that endemic measles virus transmission has likely been interrupted in the Americas, TAG reaffirms the need for a continued commitment of health authorities and workers toward sustaining past achievements.

• To avoid outbreaks, coverage rates with measles-containing vaccine must be maintained at >95% in all municipalities. Improving coverage with the first dose may be accomplished through implementation of specific strategies in high-risk districts. High-quality nationwide follow-up campaigns should also be conducted every 3 to 4 years in order to maintain population immunity. Additionally, supplemental immunization activities should target low-coverage municipalities and under-served or hard-to-reach population groups.

• To harmonize practices among countries, TAG endorses the definitions of elimination, re-establishment of endemic transmission and imported/import-related cases recommended by the Meeting of the Ad-hoc Panel of Experts in Rubella and Measles held in Washington, D.C. in March 2004.

• To guarantee transparency and foster mutual trust, TAG encourages countries to share with PAHO’s Immunization Unit information on all aspects of their immunization programs. Such information includes, but is not limited to, case-based surveillance, laboratory data, and vaccine coverage data.

• Three surveillance indicators are particularly critical: proportion of suspected measles cases with an adequate investigation, proportion of suspected cases with an adequate blud sample, and proportion of transmission chains with representative samples for viral isolation.

• An indicator for rate of febrile eruptive illnesses investigated should be established, based on the experience in the countries.

• PAHO should review logistical and other issues which are barriers to submitting samples in a timely fashion.

• The TAG recognizes the work of the Secretariat in updating the Measles Field Guide, as well as field guides for polio, rubella and other vaccine-preventable diseases, in 2004. The TAG encourages the use of these guides in training and updating the skills of health personnel.

References

1. Angellia, Antigua, Barbados, British Virgin Islands, Montserrat, St. Vincent, Trinidad and Tobago, Turks and Caicos.
2. Caribbean Health Organization
4. Measles Articles
5. Pan American Health Organization.
6. Anguilla, Antigua, Barbados, British importations.
7. transmission following potential reduce the risk of measles virus transmission, it will also greatly reduce rubella virus.
8. 5-39 years and using MR targeting the population aged next “follow-up” campaign for birth cohort.
9. equivalent to 80% of a typical birth cohort.
10. Based on these results, Paraguay has scheduled its next “follow-up” campaign for 2007. However, as part of the rubella elimination initiative, a mass vaccination campaign targeting the population aged 5–19 years and using MR vaccine is planned for 2006. This campaign will not only greatly reduce rubella virus transmission, it will also greatly reduce the risk of measles virus transmission following potential importations.

December 2004

Volume XXVI, Number 6

XVI Meeting of the PAHO Technical Advisory Group on Vaccine-preventable Diseases: Conclusions and Recommendations

The XVIII Meeting on Vaccine-preventable Diseases of the Americas was held in Antigua, Guatemala, on 6-7 June 2005. The meeting’s main objectives were as follows:

- To review the current situation of each country and progress toward eliminating measles, rubella, and congenital rubella syndrome (CRS);
- To discuss the surveillance of acute flaccid paralysis (AFP), pertussis, diphtheria; and neonatal tetanus (NNT); and
- To analyze the status and prospects for introducing the influenza vaccine and new vaccines.

Measles, Rubella, and CRS In 2003 and 2004, approximately 100 measles cases were reported each year in the Americas, most of them directly or indirectly linked to importations. Mexico’s recent experience with measles virus transmission should serve as an incentive to all the countries in the subregion to improve vaccination coverage and surveillance as the best way of protecting against importations and infections. High-level measles vaccine coverage, reliable surveillance, and aggressive follow-up of suspected cases will limit the consequences of measles virus importations.

The incidence of rubella has decreased by 98%, dropping from 135,000 reported cases in 1998 to 3,103 cases in 2004. All countries are strengthening the integration of measles and rubella surveillance. Improvements must be made in the adequate investigation of suspected cases. Three quarters (7/12) of the countries in the Subregion are reporting suspected CRS cases every week. CRS surveillance needs to be urgently strengthened.

2005

August 2005

Volume XXVII, Number 4

The XVIII Meeting on Vaccine-preventable Diseases of the Central American Region, Mexico, and the Latin Caribbean
XIV Meeting of the Andean Region and XVII Meeting of the Southern Cone on Vaccine-Preventable Diseases

The XIV Meeting of the Andean Region and the XVII Meeting of the Southern Cone on Vaccine-Preventable Diseases were held in Asuncion, Paraguay, from 25–26 October 2005. In unprecedented fashion, the President of Paraguay, Dr. Nicanor Duarte Frutos, attended the meeting. Dr. Jon Andrus, Chief, Immunization Unit at PAHO Headquarters, handed him a certificate of appreciation to recognize Paraguay’s achievements during the rubella campaign the country conducted in April and May 2005. In his address, President Duarte thanked each member of the team who made the campaign a success. He indicated that public health is a priority in Paraguay, as it represents a means to achieving social development, prosperity, and peace. He stressed that increasing the health budget is necessary, but that better spending and innovation are also critical. President Duarte added that health workers had written a new chapter in Paraguay’s history and helped with improving the life of its people.

Delegations from Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, and Venezuela participated in the meeting. Paraguay also invited health workers from all levels of its health care system. Representatives of the Ministry of Education, the Social Security scheme, UNICEF, the Center for Population Studies, the Inter-American Development Bank, Plan International, and the Paraguayan Red Cross also attended the meeting.

Dr. Carmen Serrano, PAHO Representative in Paraguay, welcomed the participants. Dr. Andrus highlighted the information guiding countries in their efforts to prioritize the unfinished agenda in immunization. Dr. Roberto Dullack, Vice-Minister of Public Health and Social Welfare of Paraguay, inaugurated the meeting 5 days after launched the Pan-Americanism of the Immunization Program. Dr. María Teresa León Menduro, Minister of Health of Paraguay, presented the results and lessons learned from the vaccination campaign for the elimination of rubella and congenital rubella syndrome (CRS) conducted in Paraguay in 2005.

Measles: In South America, three cases of measles were reported in 2001 (two in Brazil, one in Chile), none in 2004, and six in 2005 (all part of one outbreak in Brazil). All these cases were imported or related to immigration; the majority of the patients had not been vaccinated against measles.

Experience indicates that, when a high and uniform coverage is achieved with measles vaccine, the reliable detection and aggressive monitoring of suspect cases will limit the impact of measles virus importations. All countries of the sub-region but one have reported measles vaccine coverage >90% in 2003 and 2004. Venezuela reported coverage of 82% in 2003 and 80% in 2004. Furthermore, six countries—Argentina, Brazil, Chile, Colombia, Paraguay, and Uruguay—recommend a second dose of measles vaccine in their national schedule. Paraguay and Uruguay (2003), Brazil (2004), and Argentina (2005) have conducted follow-up campaigns in order to achieve the accumulation of susceptibles. Chile will conduct a follow-up campaign starting in November 2005. The greater accumulation of measles susceptibles occurs in Venezuela, where the last follow-up campaign took place in 2001. A campaign planned by 2005 has been postponed to 2006. In spite of high overall measles coverage levels, significant pockets of susceptibles exist in South America. According to 2004 data (or 2003 data if 2004 data are not available), measles coverage in 48% of municipalities was <95%. The proportion of municipalities with coverage <80% is particularly significant in Colombia (5%), Venezuela (55%), and Bolivia (53%), although it is possible that some of these results reflect denominator problems.

All the countries have achieved a good integration of measles and rubella surveillance. However, challenges remain regarding reaching some surveillance indicators, and solutions need to be tailored to the health care system of each country. A high level of inter-country coordination is critical for the successful implementation of integrated surveillance in border areas.

Recommendations
- Countries should continue monitoring the accumulation of measles susceptibles. Countries recommending a second dose of measles vaccine in the routine vaccination schedule should systematically collect coverage data. A follow-up campaign continues to be necessary each time evidence exists of an accumulation of susceptibles.
- Countries should strengthen their efforts to reach measles vaccine coverage >95% in all municipalities. Municipalities at risk should be identified and plans of action developed and implemented to improve coverage.
- Remote or marginalized population groups in need of supplementary immunization activities, for example in the context of the VNA, need to be identified.
- Active epidemiological surveillance of measles/rubella should take place in all municipalities, including active case-finding in high-risk municipalities and in silent areas. Furthermore, rapid epidemiological investigation (before the availability of serology results), including obtaining representative samples for viral detection, should be ensured.
- Countries should reevaluate the fulfillment of the measles/rubella integrated surveillance indicators. They should take measures to guarantee adequate surveillance, such as implementation of new means of collection of blood samples (filter paper) and use of buccal swabs, and consider new solutions.
- Plans to respond to importations should be in place, ensuring that a responsible team and available funds can be liberated rapidly.

2005

February 2006
Volume XXVIII, Number 1

2005 Caribbean EPI Managers’ Meeting

The 22nd Meeting of the Caribbean EPI Managers was held in Bermuda, from 29 November to 2 December 2005. The meeting brought together over 70 health officials from 24 countries of the English-speaking Caribbean, Aruba, Canada, the Netherlands Antilles (Bonaire, Curaçao, Saba, St. Eustatius, and St. Martin), Suriname, and the United Kingdom. PAHO Immunization staff, representatives from the Caribbean Epidemiology Center (CAREC), the Caribbean Program Coordination Office, the Caribbean Community (CARICOM), the Christian Children’s Fund, and UNICEF also attended.

Measles and Rubella Elimination

- The last case of indigenous measles in the Caribbean Community was reported in 1991, and the last importation (from a European tourist), in 1998. Experience in several countries shows that, when coverage with measles-containing vaccine exists, reliable detection and aggressive follow-up of suspect cases will limit the consequences of measles virus importations.

Rubella vaccination campaigns have been highly successful in the Caribbean. There have been no laboratory confirmed rubella case since 2001. No confirmed rubella cases were reported between 2002 and 2005. In 2005 (Week 43), 3 congenital rubella syndrome (CRS) suspect cases were referred for testing and were for TORCH studies. All were laboratory-investigated for rubella; all were negative. The last CRS case in the Caribbean was reported in 1999.

Surveillance remains a critical tool to ensure interruption of transmission. In order to achieve timely, complete, and accurate information from surveillance systems, countries are expected to report from both public and private sector sites. There were 73% reporting sites in the countries of the Sub-region in 2005. In 2005 (Week 43), 99% of sites reported weekly, 99% of cases were investigated within 48 hours, 97% of cases had adequate samples for testing, and 95% received laboratory results in less than 4 days. The percentage of samples discarded by laboratory testing was 99%.

The percentage of samples reaching the laboratory in less than five days has remained under 50%. For example, in 2000 only 35% of specimens arrived at the regional laboratory in less than 5 days. In 2001, 2003, and 2004, the rate was 15%, 23%, and 29%, respectively. In 2005 (Week 43), 33% of specimens arrived at the regional laboratory in less than 5 days. The percentage of samples discarded by laboratory testing was 99%.

Plans to respond to importations should be in place, ensuring that a responsible team and available funds can be liberated rapidly.

February 2006
Volume XXVIII, Number 1

Classification of Suspect Measles/ Rubella Cases as “Vaccine-related.”

Compliance with the PAHO Recommendations

Background

In a setting of low or absent transmission of the measles virus, surveillance will detect patients with eruptive febrile illnesses. However, positive serological results for measles or rubella but no wild-type measles/rubella virus infection. One explanation for such occurrence is a reaction to the measles-mumps-rubella vaccine (MMR). In 2000, the PAHO Technical Advisory Group on Vaccine-preventable Diseases defined five criteria for concluding that a rash–illness is related to measles/rubella-containing vaccine.

A case can be classified as having a vaccine-related rash if it meets ALL of the following criteria:
- 1. Presence of rash illness, with or without lymphadenopathy, cough or other respiratory symptoms related to the rash
- 2. Rash onset began 7–14 days after vaccination with a measles-containing vaccine
- 3. Serum sample taken between 8 and 56 days after vaccination, is positive for measles;
The origin of this outbreak is most likely a measles importation in Madrid, Spain, that has resulted in 59 cases reported between mid-January and mid-March. The Venezuelan situation clearly illustrates the constant risk of measles importations to which any country in the Americas is exposed. Besides maintaining high and homogenous vaccine coverage in healthcare facilities, it is critical for the early detection and control of importations. Private health hospitals and practices must be included in the surveillance system.

June 2006

Volume XXVIII, Number 3

Measles Virus Importations: A Constant Threat to Measles Elimination in the Americas

In 1994, countries of WHO Region of the Americas were the first to commit to measles elimination. Transmission of the D6 measles virus genotype—which began in 1995 and caused large outbreaks in Argentina, Bolivia, Brazil, the Dominican Republic, and Haiti—was interrupted in September 2001. The subsequent transmission of the D9 measles virus genotype in Venezuela was interrupted in November 2002, 14 months after it had started. The Venezuelan outbreak can be viewed as the last instance of widespread endemic transmission of the measles virus in the Americas.

Between 2003 and 2005, only a hundred measles cases have been reported each year in the Region (2003, 119 cases; 2004, 108; 2005, 84), which represent a cumulative annual incidence of approximately 0.1 case per million population. Epidemiological investigation can only trace the majority of the cases now occurring in the Americas to importations from other continents.

While a few countries outside the Americas have also interrupted measles circulation, measles remains endemic in all other continents. An estimated 20–30 million measles cases still occur each year worldwide. With an estimated 454,000 deaths in children aged <5 years in 2004, measles is still the leading vaccine-preventable cause of childhood mortality.1 Sub-Saharan Africa and South Asia account for 92% of these deaths. While Africa and South Asia pursue mortality control goals, the three remaining WHO Regions—Eastern Mediterranean, Europe, and Western Pacific—now have elimination goals similar to that of the Americas.

In recent months, an increase in reports of measles outbreaks has occurred in Europe (Table 1). This increase is likely due to both improved surveillance and increased measles activity in that region. Since, in 2000,
In this article, we review three measles outbreaks that have been detected in the Americas since December 2005. These outbreaks might ultimately have originated from three different countries: Africa, Europe, and Asia. However, all three outbreaks highlight the importance of vaccinating risk groups, especially workers in the health care, transportation, and tourism sectors; including private health care facilities in the United States and sporadically in Latin America. The flux of passengers and tourists visiting the Americas is much greater than to the United States.

In this article, we review three measles outbreaks that have been detected in the Americas since December 2005. These outbreaks might ultimately have originated from three different countries: Africa, Europe, and Asia. However, all three outbreaks highlight the importance of vaccinating risk groups, especially workers in the health care, transportation, and tourism sectors; including private health care facilities in the United States and sporadically in Latin America. The flux of passengers and tourists visiting the Americas is much greater than to the United States.

Mexico, December 2005–February 2006
Between 12 December 2005 and 17 February 2006, 27 measles cases were confirmed in Mexico (Figure 1). Case-patients were either children aged <2 years or young adults. All cases but one (a 19-year-old man who had received one dose of measles vaccine when aged 1 year) were not vaccinated (Figure 2). All case-patients lived in the metropolitan area of Mexico City. Investigation detected five transmission chains, all starting in workers of the international airport of Mexico City. The index case of the outbreak was a 28-year-old man employed as a ticketing agent in a 33-year-old woman, employed as a ticketing agent.
Lessons Learned from Recent Measles Outbreaks

• Groups of workers at risk should be defined and their measles immunization verified at regular intervals. These groups include:
  - Health care workers (medical, administrative, and security personnel) who can have the responsibility to avoid transmitting measles, as they are not only likely to be exposed, but also to expose other people to measles. Proof of measles immunity should be recommended for employment in any health care facility. Given the potential high turnover of personnel, public health officials should conduct a formal process of verification of this requirement at regular intervals. For instance, when active case-searches are done, immunity of all employees could be checked against personnel records of measles vaccination of each staff member. Proof of immunity to other vaccine-preventable diseases, such as rubella and hepatitis B virus, should also be required for health care workers.
  - Personnel from the tourism and transportation industries.
  - Groups not routinely accepting vaccination. Because these groups can hardly be convinced to accept measles or any other vaccination, they constitute a potentially large pool of susceptibles. Public health authorities should closely monitor the occurrence of rash illnesses in these groups as soon as an importation occurs.

• Quality surveillance should be able to detect importations early on. The early detection of an imported case offers a unique chance to interrupt an outbreak at its inception, when the branching out of the transmission chain is relatively simple. In this respect, people can afford to travel, and travel-related entrapment is more likely to seek care in those institutions.

• Any resident of the Americas travelling outside the Western Hemisphere should be immune to measles before departure. Written proof of receipt of a measles-containing vaccine—preferably two doses, the first received after the first birthday and the second at least four weeks later—is the most practical assurance of measles immunity. Laboratory evidence, specifically the detection of measles-specific IgG antibodies in a serological sample, could also be used as evidence of measles immunity, but this method is not practical for most people.

• Prospective travelers aged >6 months who are not immune should be advised to receive measles-containing vaccines, preferably as measles-mumps-rubella (MMR) or measles-rubella (MR), ideally at least two weeks before departure. Infants aged 6–12 months who receive MMR vaccine for their first birthday must be vaccinated again to cover the follow-up of the country’s schedule. Exclusions include travelers with medical contraindications to measles-containing vaccines, such as severe immunosuppression and pregnancy.

A requirement that all incoming passengers be vaccinated against measles would have little efficacy, as most incoming susceptible passengers who might have been exposed to measles would already have been sick. Vaccination upon arrival would not prevent these passengers from developing measles in most cases. Both the current and the 2000–2004 International Travelers’ Regulations do not mandate measles vaccination. The general rule in the Regulations is that there is no vaccination certificate, other than those provided for specific regulations concerning only for yellow fever or in recommendations issued by WHO, shall be required for international travel.

August 2006 Volume XXVIII, Number 4

XVII TAG Meeting—Protecting the Health of the Americas: Moving from Child to Family Immunization

The XVII Meeting of the Technical Advisory Group (TAG) on Vaccines and Immunization in the Americas took place in January 2006. The focus of the meeting was on the implementation of the recommendations of a previous TAG meeting held in February 2005. The meeting also addressed specific health issues related to the current measles epidemic that continues to cause concern in the Americas. The meeting was well attended by representatives of governments, non-governmental organizations, academic institutions, and international organizations.

The meeting was co-chaired by Dr. Joxel Arcay, Director of Health of Guatemala, officially representing the Pan American Health Organization (PAHO); Dr. Ciro de Quadros, Chairman of the TAG, opened the meeting. He was followed by Dr. Rudy Eiggers, WHO, Geneva, who reiterated the call for action on rubella elimination. Dr. Mercy Ahun presented on behalf of the Global Alliance for Vaccines and Immunization (GAVI), highlighting the need to continue to support the worldwide poor countries. Dr. Gina Tambini, Manager, Family and Community Health Area, PAHO, provided participants with an update on the status of the implementation of the recommendations of the 2004 TAG meeting in Mexico City. Representatives from partner organizations such as the US Centers for Disease Control and Prevention (CDC), GAVI, PATH, Sabin Vaccine Institute, and UNICEF made statements of support to implementation programs in the Region. Dr. Josel Garcia, Deputy Director, PAHO, and Maria E. Vergara, Minister of Health of Guatemala, officially opened the meeting by making remarks stressing the importance of achieving and sustaining Regional initiatives such as measles elimination.

Dr. Jon Kim Andrus and Dr. Tambini served as ad-hoc Co-Secretaries of the meeting.

Measles

Absence of widespread measles virus transmission since November 2002 is proof of the success of the measles elimination initiative in the Americas. However, the endemic measles virus circulation in other parts of the world puts our Region under constant threat of importation of cases. Fifty-one percent of the 170 cases reported in the Americas between January 1, 2003 and April 2006 were positively linked to an importation. Importations are best detected by passive surveillance and by international regulations.

Outbreaks with >100 cases were identified since 2003 (range: 10–108 cases).

Cases must avoid becoming complacent to the risk of measles importation and the potential for reestablishment of endemic measles transmission. Occurrence of measles cases among children aged 1–4 years in outbreaks in Mexico and Venezuela indicates a weakening of routine vaccination. National follow-up campaigns that should have been conducted every 3 to 4 years and that either have been cancelled or postponed indefinitely in some countries. Finally, indicators of integrated measles/rubella surveillance have not shown improvement or have worsened. Data on measles vaccine coverage with measles-containing vaccine at regional level was 93% in 2004, 44% in 2003. All other regions had coverage below 95%—an indication that coverage remains uneven and there are significant pockets of susceptible groups exist in our Region.

Recommendations

• Countries should identify municipalities with less than 95% coverage for measles-containing vaccine and devise strategies to reach and maintain coverage in the 95%–100% range in every municipality.

• High-quality nationwide follow-up campaigns (achieving coverage 295% in every municipality) should be conducted every 3 to 4 years if a susceptible accumulation above 80% of a typical birth cohort has occurred, irrespective of whether a second MMR dose is included in the national vaccination coverage in the immunization schedule.

• Only where coverage 292% with each of the two MMR doses is guaranteed for all municipalities can the follow-up campaigns be waived.

• Vaccination of at-risk professional groups, such as workers in the health care transportation, and tourism sectors, is recommended and should be verified periodically through an established formal process.

• Any resident of the Americas traveling to areas with reported measles (or rubella) cases should be immune to measles (and rubella) before departure. Requesting proof of vaccination from incoming travelers is not advised.

• Integrated surveillance for measles/rubella should include private institutions, particularly those attending by tourists, to increase sensitivity and timely detection of imported cases.

Epidemic transmission of indigenous measles Virus was interrupted in the Americas between November 2002 and 2004.

However, sporadic cases and outbreaks associated with importations continue to occur.1

In this article, we describe recent measles outbreaks in the post-elimination era in Brazil and Venezuela.

Brazil, August–November 2006

The interrupted indigenous measles transmission in 2000. Between 2001 and 2004, 4 measles outbreaks were reported, all imported from Europe and Japan. In 2005, a six-case outbreak occurred following an importation from the Maldives Islands.

In November 2006, Bahia State reported a measles outbreak of 55 confirmed cases. The first cases had rash onset in late August (Epidemiological Week/EW 35) and the last case occurred in EW 49 (2006).1 Cases occurred in five rural municipalities: João Dourado (3), Pelotas (2), Irecé (1), Senhor do Bonfim (2), and Pindobacu (1). João Dourado and Pelotas are the most remote municipalities, as are Filadélfia and Senhor do Bonfim. João Dourado and Pindobacu had a history of outbreaks, while the cases ranged from 7 months to 37 years (Figure 2). None of the outbreaks were linked to importation from outside the country. All cases had rash onset in 2006. D4 has been isolated in Europe, Africa, and Asia.

The outbreaks in João Dourado/Brazil and Filadélfia/Senhor do Bonfim took place simultaneously. Cases in São Paulo, Brazil, reported in February 2006 were identified and reported late. In João Dourado/Irecé, cases occurred among persons living on the same street. Most cases were male (50%) and were aged ≤15 years (Figure 2). In contrast, in Filadélfia/Senhor do Bonfim, most cases were men aged >15 years. The source of the virus and the epidemiological link between cases in João Dourado/Brazil and Filadélfia/Senhor do Bonfim have not yet been identified. The affected areas in Bahia are heavily traveled due to the extensive trading of agricultural products and migration of agricultural and mine workers.

All suspect cases were investigated by home visits, exhaustive contact follow-up, and collection of blood for serology testing and subsequent follow-up for virus isolation. Difficulties in ensuring timely specimen collection and transport sometimes led to virus post-stocks resulted in delayed laboratory confirmation of some of the cases and the inability to isolate the virus from Filadélfia/Brazil. Extensive vaccination was implemented in rural municipalities living in the outbreak locale. Routine vaccination was suspended in the outbreak area. But searches were conducted in health care facilities and the community, including schools,
Rubella Watch EPI Newsletter

Pan American Health Organization

Vaccination activities aim to get ahead of virus transmission. They should target contacts and persons in places of possible transmission and/or possible exposure, and in places commonly frequented by the case.

References

Pan American Health Organization

Measles and Rubella Laboratory Network in the Americas

During the verification phase of the interruption of endemic transmission of measles and rubella, it is essential to maintain high quality laboratory surveillance. This requires providing the essential data to classify suspected cases and to provide molecular epidemiological information about the viruses circulating in the Region of the Americas. The information should be analyzed and reported in an effective and timely manner to allow implementation of adequate public health measures.

The measles and rubella laboratory network in the Americas was established in 1995 and is part of the World Health Organization (WHO) Global Measles and Rubella Laboratory Network. The network has implemented standardized diagnostic and testing methods, as well as a comprehensive quality assurance program, which includes proficiency testing, conformation testing, an accreditation process, and weekly notification of the laboratory performance indicators. Laboratory results are reported to the Pan American Health Organization (PAHO) in a timely manner.

The laboratory surveillance guidelines were reviewed by a group of representatives from the Global SRL Laboratory, the Regional Reference Laboratory (RRL), and national laboratories participating in a meeting at PAHO Headquarters on 27 August 2008. The group proposed a laboratory protocol to be used for documenting and verifying the interruption of endemic measles and rubella transmission. The participants emphasized that both the national health authorities and laboratories have a role in ensuring optimum laboratory performance.

Recommendations
1. Quality Control
   - Documentation of measles and rubella elimination requires that each participating laboratory produce the highest quality laboratory surveillance data possible. Each country must report results from a laboratory analysis accredited according to current WHO LabNet standards and using the PAHO-modified checklists. Accreditation includes:
     - Assessment of proficiency testing for IgM, routine
testing results, and confirmatory testing for serologic assays; • Review of internal quality control procedures; • Review of laboratory standard operating procedures (SOPs) including protocols for biosafety and containment of infectious material; • Training and qualifications of laboratory staff; • Timeliness of testing; • Integration of laboratory with epidemiology; • Timeliness and completeness of reporting to PAHO; • Timeliness of forwarding samples for virus isolation to RRL; • Maintenance of inventories of all samples and potentially infectious material.

Specific points include the following:

a. Participation in the global proficiency testing program for serologic testing: The panels are provided to assess the proficiency of the laboratories to detect measles and rubella IgM by enzyme immunoassay (EIA). All WHO LabNet laboratories receive proficiency panels prepared by the Reference Laboratory for Infectious Disease (VLIRD) in Melbourne, Australia. Distribution of the panels is conducted by the U.S. Centers for Disease Control and Prevention (CDC) and requires coordination with country programs representatives, laboratory managers, and the PAHO Laboratory Coordinator (LC). Testing and reporting of results (including optical density readings) must adhere to the requirements of timeliness described in the accreditation documents. Updated results are forwarded to the LC, which will receive a report within 10 days. Results are forwarded to WHO Headquarters and VLIRD for inclusion in the proficiency testing database.

b. Provision of serum from routine testing to the designated central laboratory for confirmatory testing: To ensure confidence in the quality of the network’s serologic testing for measles and rubella IgM detection, the LC will randomly choose a national laboratory (NL) that will send 10 serum samples, confirming testing once a year to the corresponding RRL. According to the plan previously developed by the LC and the Reference Laboratory, the criteria to select the samples for confirmatory test are the following: 10 samples with negative results, 10 samples with measles-positive results, 10 samples with rubella-positive results, 10 samples equivocal for measles, and 10 samples equivocal for rubella. A form, provided by the LC or by the GSL or RRL, should accompany the serum samples so that the 2 sets of results can be reviewed. Results will be evaluated by the GSL or RRL and communicated to the LC. If discordant results occur, additional testing or consultation with the laboratories will be initiated by the LC to address any potential problems. The GSL or the RRL, in coordination with the referral laboratory, will prepare a schedule for the shipment of the samples to the referral laboratory and, if necessary, will determine the best epidemiologic approach and whether alternative sample protocols (e.g., filter paper) are appropriate.

c. Documentation of the data generated throughout the laboratory network for quality assurance: Summaries with all laboratory performance data including accreditation status, results from proficiency panels and confirmatory testing should be documented.

d. Sporadic IgM positive cases are expected when disease prevalence is low or not of public health significance. The recording of these cases in a standard format through the aggregate evaluation of such cases as part of the routine surveillance is in the interest of the laboratory and will aid in the documentation of elimination.

2. Case Classification and Laboratory Testing: In an elimination setting, case classification can sometimes be challenging and often requires additional testing and clinical specimens. In this regard, it is imperative that countries strengthen virological surveillance. An adequate specimen for the RRL can improve the sensitivity of the serology in the first days of the disease when serology results can be indecisive. It allows for the genotyping characterization of the virus, which is fundamental for an elimination program in the Region. A negative virus isolation result does not rule out measles or rubella infection because the test is much affected by the timing of specimen collection and specimen quality, which can be affected by storage and transportation. In this situation a second serum specimen (convalescent phase) is indicated to verify serocorrelation.

Countries should be aware of the limitations of laboratory testing. To detect IgM to measles and rubella, all laboratories are using commercial EIA assays that have been widely validated and have excellent sensitivities and specificities. Still, no serologic test will be sufficient for all cases. Collection of additional samples for virus detection provides another means to confirm a case and the genetic information provides valuable information about the transmission pathways of the virus. Though these samples are requested, they should be directed to obtain for many cases because of the problems associated with specimen collection, transport, and storage. A second serum sample can also help to improve the laboratory’s utility to classify cases, but many cases are unfortunately lost to follow-up.

Accurate case classification depends on careful review of laboratory data and epidemiologic data. • Cases should be classified after the laboratory and epidemiologic teams have reviewed all laboratory and epidemiologic data. A negative virus isolation result from each country should develop a country-specific testing algorithm for case classification. The laboratory components of the algorithm must include additional testing and consultation with the country program representatives, laboratory managers, and the PAHO Laboratory Coordinator (LC) to address any potential problems. If discordant results occur, additional testing is recommended. Importantly, all samples should be classified to sporadic cases (isolated case with no travel history or known epidemiologic links) to rule out false positive or false negative IgM test results. The algorithm should include: • Protocol for confirming an IgM test result; • Additional sample for virus isolation from as many suspected cases as possible; in addition, laboratories should obtain genetic data from all outbreaks; • Guidance for determining when to attempt collection of a second serum specimen; • Instructions for use of additional serologic tests: rise in IgG titers and avidity testing; • Guidance on whether to perform testing for other etiologic agents at the national laboratory or the RRL, considering available capacity and resources. c. The laboratory should provide guidance to field staff for adequate specimen collection for isolation and transportation. In this situation a second serum specimen (convalescent phase) is indicated to verify serocorrelation.

d. The laboratory testing algorithm must include a provision for laboratories that do not perform virus isolation to forward clinical specimens from confirmed cases to the designated regional reference laboratory for virus isolation and genetic testing. Shipping should occur within 15 days after collecting the specimens, confirming the cases, and obtaining all necessary permits and permissions.

c. The laboratory testing algorithm must include a provision for laboratories that do not perform virus isolation to forward clinical specimens from confirmed cases to the designated regional reference laboratory for virus isolation and genetic testing. Shipping should occur within 15 days after collecting the specimens, confirming the cases, and obtaining all necessary permits and permissions.

3. Data Reporting and Strain Bank Submission: Timely reporting of sequencing data and viral genotypes is critical. Developing regional databases of infectious material will also have help with future containment programs.

a. Laboratories performing sequencing should forward samples to the PAHO LC as soon as possible after obtaining the genotype information.

b. Laboratories should submit genotype information to the PAHO Laboratories Framework for infectious disease Laboratory and the designated sequence databases.

c. Laboratories should forward representative viral isolates to the WHO Strain Bank at the CDC after confirmation by the PAHO LC and WHO Strain Bank.

4. Additional Recommendation: Genetic baseline determination using archived serum samples and oral/nasopharyngeal tissue specimens should be conducted in countries and sub-regions where baseline information is lacking.

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Measles Virus Importations: A Continuing Struggle for the Americas

Several imported measles outbreaks have occurred in the Region of the Americas in recent years, with a small number of cases secondary to importation. In the period 2008-2009, there were 203 secondary cases from a total of 57 importations (Tables 1 and 2).

In 2008, the United States reported 14 cases whose source of infection was unknown.1 Sixty percent of imported measles cases in the Americas during this period came from Europe, with outbreaks occurring in Argentina, Canada, Chile, Ecuador, Jamaica, Peru, and the United States.

Mounting a rapid response to limit these outbreaks has involved the intensive mobilization of human and financial resources in countries. Recent experiences in Chile and Peru reveal an estimated cost of US $12,400 and $40,000, respectively to control the outbreak.2 No secondary case was reported in either country.

The private sector plays a key role in the detection and rapid response to outbreaks. In the period 2008-2009, 77% of measles cases reported in Latin America and the Caribbean were detected in the private sector.3 Therefore, private-sector participation in surveillance activities should be strengthened by establishing partnerships with national regulatory and scientific societies. Partnerships should also be considered with borders since the virus is usually imported by them to the Region.

Given the tremendous investment that countries are making in containment, measles elimination efforts in other regions of the world should be integrated. Any new initiative would be a step toward global measles eradication. The World Health Organization (WHO) will conduct a measles eradication feasibility study, whose final report will be submitted to the WHO Executive Board in 2010.

Table 1. Imported measles cases in the Americas, 2008.

<table>
<thead>
<tr>
<th>Country</th>
<th>Total importations</th>
<th>Total cases associated with importation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecuador</td>
<td>0</td>
<td>0</td>
<td>PAHO LC</td>
</tr>
<tr>
<td>Jamaica</td>
<td>1</td>
<td>1</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>Peru</td>
<td>1</td>
<td>0</td>
<td>India</td>
</tr>
<tr>
<td>Canada</td>
<td>8</td>
<td>54</td>
<td>France, India, Israel, Morocco, Pakistan, Switzerland</td>
</tr>
</tbody>
</table>

United States* | 24 | 102 | United States, Germany, India, Israel, Italy, Philippines, Sweden, Switzerland, United Kingdom |

* In 2008, the United States reported 14 cases whose source of infection was unknown.

Table 2. Imported measles cases in the Americas, 2009.*

<table>
<thead>
<tr>
<th>Country</th>
<th>Total importations</th>
<th>Total cases associated with importation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>1**</td>
<td>2</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>Brazil</td>
<td>1</td>
<td>1</td>
<td>Brazil</td>
</tr>
<tr>
<td>Canada</td>
<td>0</td>
<td>0</td>
<td>China</td>
</tr>
<tr>
<td>Chile</td>
<td>0</td>
<td>0</td>
<td>United States</td>
</tr>
<tr>
<td>United States***</td>
<td>22</td>
<td>23</td>
<td>Cuba, Venezuela, India, Italy, United Kingdom</td>
</tr>
</tbody>
</table>

* As of EW 22/2009, this report corresponds to WHO 3/2010; however, the secondary cases appeared in EW 22/2009.

** As of EW 23/2009, the United States reported 9 cases whose source of infection was unknown.

References
2. Source: Country reports to PAHO.
PAHO Member States

Antigua and Barbuda
Argentina
Bahamas
Barbados
Belize
Bolivia
Brazil
Canada
Chile
Colombia
Costa Rica
Cuba
Dominica
Dominican Republic
Ecuador
El Salvador
Grenada
Guatemala
Guyana
Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama
Paraguay
Peru
Saint Kitts and Nevis
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