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PARAGUAY

Report on a survey to determine the status of  
smallpox and levels of smallpox immunity



Introduction

In view of the favourable trend of smallpox incidence in the Americas and the virtual absence of cases since November 1970, the World Health Organization proposed to undertake a systematic search of various areas on the continent in an effort to determine if, in fact, transmission had been interrupted.

In March, 1971, technical staff from PAHO/WHO discussed the plan of work proposed with the Minister of Public Health and Social Welfare of Paraguay who supported the proposed survey.

The survey undertook to estimate present levels of smallpox immunity, to determine the quality and extent of the reporting system and to detect recent suspect cases of smallpox, if any. With Smallpox Eradication Programme personnel and technical and material assistance from PAHO/WHO, the survey was conducted between 22 March and 20 June 1971.

Method of approach

Information on smallpox vaccination activities was obtained.

Scar surveys were conducted in areas surrounding Asuncion and in towns at a distance of 20 to 50 km as well as in localities in the north-eastern part of the country.

Information regarding the notification system was obtained.

Possible suspect smallpox cases which might have occurred in recent months were sought through contact with schools, health centres and health posts. Personnel of the National Malaria Eradication Service (SENEPA) were asked to report any suspected cases of smallpox in dwellings visited for spraying purposes during a 30 day working cycle.

A special survey was conducted under the responsibility of the Chief of the National Smallpox Programme and a PAHO/WHO official in areas where there is a potential danger of smallpox introduction from infected areas in neighbouring countries.

Background information

Geography and population

Paraguay is a temperate zone country with an area of 407 000 km<sup>2</sup>, divided by the Paraguay River into two regions: the eastern region with an area of 160 000 km<sup>2</sup>, which is well irrigated and contains 96 per cent. of the population, and the western region, or Chaco, with an area of 247 000 km<sup>2</sup>, characterized by great plains in which the remainder of the population lives. The estimated population in 1970 was 2 379 000 inhabitants. The rural population represents about 64 per cent. of the total and apart from the Capital, Asuncion, there are no important centres of economic and socio-cultural activities.

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Paraguay is one of the least densely populated countries in Latin America with barely five inhabitants per square kilometre. In the Chaco, which constitutes about 60 per cent. of the land area, the population density is only 0.4 inhabitants per square kilometre.

The road system comprises 3260 km of highways, of which 800 km are paved; the railways system covers 1050 km. There is an international airport and many small landing fields in the interior. The telegraph system in the Republic covers 4000 km and the telephone network 2205 km.

#### Smallpox occurrence in recent years

By decree, telegraphic notification of certain diseases is compulsory - specifically, smallpox, yellow fever and plague. Stress is laid on the need to submit a weekly report regarding the presence or absence of smallpox cases by means of the communicable diseases notification form. All reports of suspected smallpox cases are checked by the office of the Chief of the Smallpox Programme.

Smallpox was endemic in Paraguay up to 1960 (Annex 1). From 1958 to 1960 a mass vaccination campaign was conducted throughout the country, reaching a coverage of 86.4 per cent. Between 1961 and 1963 no cases of the disease were reported. In 1964, smallpox reappeared with seven cases, and in 1965 there was an outbreak with 32 cases and two deaths, originating from a case imported from Brazil into the District of Union from whence it subsequently spread to the capital (Asuncion). In 1966 there were five cases.

#### Vaccination activities - 1968-1970

During the period 1968-1970 vaccinations were performed in all the health regions of the country; 136 707 primary vaccinations and 201 057 revaccinations were given (Annex 2). An additional unknown number of vaccinations were performed by religious, private and semi-official bodies.

#### Preparation for the survey

Planning meetings were participated in by PAHO/WHO representatives in Paraguay, the Chief of the WHO Smallpox Unit, Geneva, the PAHO Regional Adviser in Communicable Diseases, the Zone VI epidemiologist and the Technical Officer of the Peru Smallpox Eradication Project, who was seconded to the study. Provision for and co-ordination of the survey was arranged by the Minister of Public Health and Social Welfare, the Director-General of Health of the Ministry, the Director of the Department of Epidemiology and Zoonoses and the Chief of the Smallpox Eradication Programme. Others involved in planning, co-ordination and implementation included the Director of the National Malaria Eradication Service, the PAHO/WHO Vital Statistics Consultant, the PAHO/WHO Zone VI Epidemiologist, the Directors of Health Regions, epidemiologists, health centre doctors, staff of health posts, SENEPA and PAHO/WHO field staff.

Necessary forms were drawn up as well as manuals dealing with epidemiological surveillance and instructions for the differential diagnosis of smallpox and chickenpox. For the SENEPA spraying personnel, special instructions were drawn up in the local Guarani language.

#### Results of the Studies

##### Survey of high risk areas

Areas considered most likely to experience introductions of smallpox were surveyed by the Chief of the Smallpox Eradication Programme, Dr Luis Scura, and the PAHO/WHO Technical Officer Mr Alberto Uribe. The area surveyed (Annex 3) extended in the north from Bahia Negra to Concepcion, and in the north-east from Coronel Oviedo to Pedro Juan Caballero, including all the frontier with Brazil from Concepcion to Saltos del Guaira; in the east, from Asuncion to Capital Meza, on the frontier with Argentina.

In the course of this 5000 km tour, 88 localities in six health regions were visited. They included 42 per cent. of the health centres and health posts which normally provide more than 80 per cent. of the information on notifiable diseases from these regions.

Contacted during the survey were 39 doctors, 37 midwives, four health educators, 13 sanitary inspectors, 13 statisticians, 19 nurses, 63 heads of primary and secondary schools, 371 primary and secondary school teachers, 19 civil authorities and 68 schools with 9253 pupils (Annex 4).

During the course of the investigation, 15 cases of exanthematous disease were reported as having occurred during the last 12 months which conceivably could have been cases of smallpox. These cases were investigated and a total of 50 persons were examined. None were cases of smallpox.

| Health region | Cases reported | Other cases checked |
|---------------|----------------|---------------------|
| I             | 2              | 8                   |
| II            | 1              | 3                   |
| III           | 3              | 6                   |
| IV            | 4              | 22                  |
| V             | -              | -                   |
| VI            | 5              | 11                  |
| TOTAL         | 15             | 50                  |

#### National survey conducted through the health units and schools

A list of schools throughout the country was obtained from the Ministry of Education and Worship. The 3321 schools were classified as urban or rural, by department and district. Three hundred and thirty six of the schools, or 14.4 per cent. were selected by a random sampling system. This representative distribution among the 161 districts into which the country is divided gave an average of two rural schools per district to be surveyed by the health centres and health posts. Special care was taken to ensure that such schools were not close to one another.

Staff of the health centres and health posts were given specially prepared forms and asked to survey each of the selected schools to determine if any of the teachers or pupils knew of any suspected smallpox cases which had occurred between January and April. Health centre and health post staff were similarly asked to report any suspect cases of which they were aware. Responses were obtained from 48 health centres, 54 health posts and 206 schools (35 898 pupils) (Annex 5)

No suspect cases of smallpox were discovered.

#### National Malaria Eradication Service (SENEPA) survey

During a spraying cycle of 30 days in May, malaria service personnel directed and supervised by the team chiefs in the three large working areas enquired about smallpox cases occurring since January 1971. The staff visited 19 434 houses and 89 166 persons in 10 departments and 35 districts. This amounted to 3.9 per cent. of the estimated population of the country in 1970. No cases of smallpox were discovered (Annex 6).

## Evaluation of vaccination immunity levels

### Community surveys

Population samples were selected to determine levels of immunity by scar survey in various geographical areas. The areas surveyed were as follows:

Asuncion - Capital - Sector 5

Asuncion - Capital - Sector 6

Paraguari (62 km from Asuncion)

San Lorenzo (12 km from Asuncion)

Villa Hayes (48 km from Asuncion)

Overall, 78.5 per cent. of the population (range 62.8 per cent. to 82.4 per cent.) bore scars of vaccination (Annex 7). Less than half of the pre-school children had been vaccinated but among those five years of age and over, more than 80 per cent. bore scars of vaccination in three of the five districts. In the other two districts, the rates ranged from 65 per cent. to 80 per cent.

### Schools surveys

Children from the third, fourth, fifth and sixth primary school classes were examined in 10 representative schools in 10 departments.

|                  | Per cent. with vaccination scars |
|------------------|----------------------------------|
| Ypacarai         | 64.6                             |
| Col. 14 de Mayo  | 25.5                             |
| Colonia Hohenau  | 51.8                             |
| Cambyreta        | 78.0                             |
| San Miguel       | 66.0                             |
| Trinidad         | 91.6                             |
| Encarnacio       | 87.0                             |
| Encarnacion      | 89.0                             |
| San Ignacio      | 83.0                             |
| Salto del Guaira | 79.0                             |

In six out of the 10 schools, more than 70 per cent. of the children bore scars of vaccination but in the remaining four schools, the proportion of those with vaccination scars was less than 70 per cent. and in one school as low as 25 per cent.

### Summary

Taking all available data into account, it would seem highly unlikely that Paraguay is now endemic for smallpox and, except for importations, it is probable that endemic smallpox has not been present for some years.

REPORTED CASES OF SMALLPOX - PARAGUAY - 1954-1970

| Year  | Number of cases | Deaths |
|-------|-----------------|--------|
| 1954  | 207             | -      |
| 1955  | 57              | 1      |
| 1956  | 132             | 1      |
| 1957  | 103             | 2      |
| 1958* | 21              | -      |
| 1959* | -               | -      |
| 1960* | 35              | -      |
| 1961  | -               | -      |
| 1962  | -               | -      |
| 1963  | -               | -      |
| 1964  | 7               | -      |
| 1965* | 32              | 2      |
| 1966  | 5               | -      |
| 1967  | -               | -      |
| 1968  | -               | -      |
| 1969  | -               | -      |
| 1970  | -               | -      |

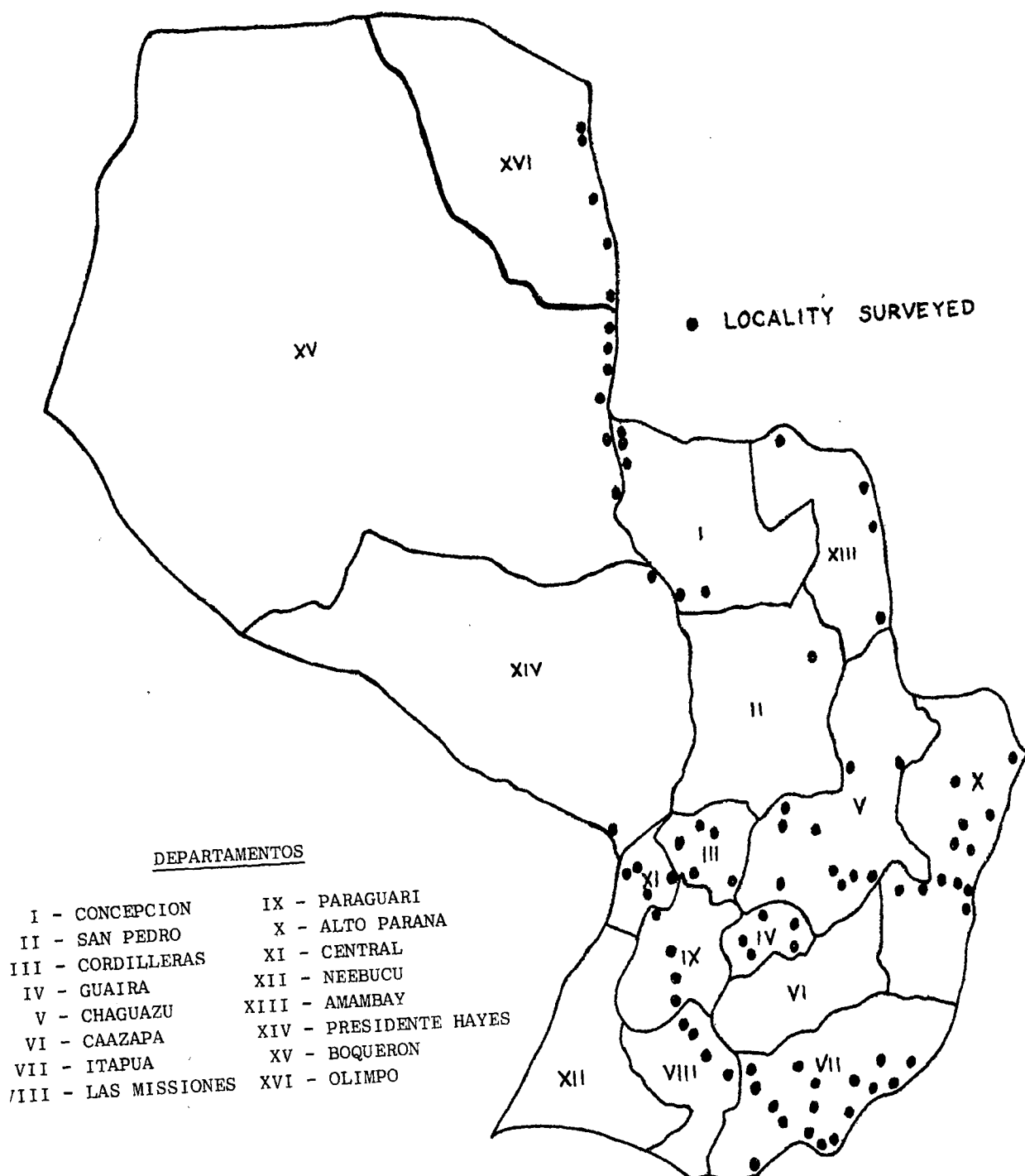
\* Mass vaccination campaigns.

SMALLPOX VACCINATIONS - PARAGUAY - 1968-1970

| Health regions | 1968    | 1969    | 1970    |
|----------------|---------|---------|---------|
| I              | 73 170  | 58 808  | 69 579  |
| II             | 18 641  | 4 980   | 4 045   |
| III            | 14 969  | 6 764   | 99 090  |
| IV             | 5 654   | 8 838   | 16 705  |
| V              | 11 571  | 127 434 | 130 194 |
| VI             | -       | -       | 18 151  |
| TOTAL          | 124 005 | 206 824 | 337 764 |

# LOCALITIES SURVEYED FOR POSSIBLE SMALLPOX - 1971

## PARAGUAY



SUMMARY OF PERSONS AND SCHOOLS CONTACTED REGARDING OCCURRENCE OF  
SMALLPOX DURING THE PAST 12 MONTHS - PARAGUAY (MAY

| Health region | Authorities contacted |               |                          |                  |                    |           |           |          |        |    | No. of schools | No. of students | No. of suspect cases reported | No. of cases investigated | No. which were smallpox |
|---------------|-----------------------|---------------|--------------------------|------------------|--------------------|-----------|-----------|----------|--------|----|----------------|-----------------|-------------------------------|---------------------------|-------------------------|
|               | Health                |               |                          |                  |                    | Education |           |          |        |    |                |                 |                               |                           |                         |
|               | Physi-<br>cians       | Mid-<br>wives | Health<br>Educa-<br>tors | Sani-<br>tarians | Statis-<br>ticians | Nurses    | Directors | Teachers | Others |    |                |                 |                               |                           |                         |
| I             | 8                     | 11            | 1                        | 1                | 3                  | 4         | 11        | 112      | -      | 15 | 1 367          | 2               | 8                             | 0                         |                         |
| II            | 1                     | 2             | -                        | 2                | 2                  | -         | 6         | 17       | -      | 5  | 408            | 1               | 3                             | 0                         |                         |
| III           | 12                    | 12            | 1                        | 2                | 1                  | 4         | 9         | 68       | 2      | 12 | 957            | 3               | 6                             | 0                         |                         |
| IV            | 11                    | 5             | 2                        | 4                | 5                  | 7         | 17        | 77       | 10     | 15 | 2 261          | 4               | 22                            | 0                         |                         |
| V             | 2                     | 1             | -                        | 1                | 2                  | 1         | 2         | 16       | -      | 3  | 362            | 0               | 0                             | 0                         |                         |
| VI            | 5                     | 6             | -                        | 3                | -                  | 3         | 18        | 81       | 5      | 18 | 3 898          | 5               | 11                            | 0                         |                         |
| TOTAL         | 39                    | 37            | 4                        | 13               | 13                 | 19        | 63        | 371      | 17     | 68 | 9 253          | 15              | 50                            | 0                         |                         |



ANNEX 5

HEALTH CENTRES AND HEALTH POSTS CONTACTED REGARDING  
SUSPECTED SMALLPOX CASES - PARAGUAY (MAY 1971)

| Health regions | Health centres or health posts | No. of rural schools | No. of students | No. of cases of smallpox |
|----------------|--------------------------------|----------------------|-----------------|--------------------------|
| I              | 21                             | 48                   | 8 599           | 0                        |
| II             | 20                             | 34                   | 7 157           | 0                        |
| III            | 28                             | 63                   | 8 497           | 0                        |
| IV             | 11                             | 24                   | 3 074           | 0                        |
| V              | 19                             | 33                   | 7 081           | 0                        |
| VI             | 3                              | 4                    | 1 490           | 0                        |
| TOTAL          | 102                            | 206                  | 35 898          | 0                        |

NATIONAL MALARIA ERADICATION PROGRAMME - SEARCH FOR SUSPECT CASES  
OF SMALLPOX 20 MARCH - 20 APRIL 1971

| Department   | No. of houses<br>visited | No. of persons<br>contacted | No. of cases of<br>smallpox |
|--------------|--------------------------|-----------------------------|-----------------------------|
| Cordillora   | 2 111                    | 8 183                       | 0                           |
| Paraguari    | 4 805                    | 20 135                      | 0                           |
| Guaira       | 3 813                    | 21 433                      | 0                           |
| Caazapa      | 2 841                    | 15 325                      | 0                           |
| Cnel. Oviedo | 1 526                    | 7 208                       | 0                           |
| Concepcion   | 1 762                    | 7 163                       | 0                           |
| San Pedro    | 1 009                    | 3 629                       | 0                           |
| Caaguazu     | 433                      | 1 539                       | 0                           |
| Amambay      | 666                      | 3 016                       | 0                           |
| Boqueron     | 20                       | 43                          | 0                           |
| Olimpo       | 448                      | 1 487                       | 0                           |
| TOTAL        | 19 434                   | 89 166                      | 0                           |

RESULTS OF SCAR SURVEYS - PARAGUAY - MAY-JUNE 1971

| Districts                       | Number of persons | Per cent. with vaccination scars |     |      |        |      |
|---------------------------------|-------------------|----------------------------------|-----|------|--------|------|
|                                 |                   | Total                            | 0-4 | 5-14 | 15+    |      |
|                                 |                   |                                  |     |      | Female | Male |
| Asuncion<br>Sector 5<br>(Urban) | 6 189             | 82                               | 48  | 90   | 87     | 90   |
| Asuncion<br>Sector 6<br>(Urban) | 8 844             | 82                               | 46  | 86   | 90     | 87   |
| Paraguari<br>(Urban)            | 774               | 84                               | 69  | 88   | 86     | 82   |
| San Lorenzo<br>(Urban)          | 1 550             | 71                               | 36  | 78   | 73     | 64   |
|                                 | 930               | 63                               | 33  | 67   | 72     | 65   |
| Villa<br>Hayes<br>(Urban)       | 1 183             | 65                               | 18  | 72   | 78     | 80   |
| TOTAL                           | 19 470            | 78                               | 43  | 82   | 86     | 84   |