

*directing council*

PAN AMERICAN  
HEALTH  
ORGANIZATION

XX Meeting

*regional committee*

WORLD  
HEALTH  
ORGANIZATION

XXIII Meeting

Washington, D.C.  
September-October 1971



Provisional Agenda Item 27

CD20/12 (Eng.)  
30 August 1971  
ORIGINAL: SPANISH

AEDES AEGYPTI: COST-BENEFIT STUDY

At its 66th Meeting (July 1971), the Executive Committee took note of the Report of the Director on the steps taken to implement Resolution XLIII of the XVIII Pan American Sanitary Conference and approved Resolution V authorizing the Director to contract the necessary services for carrying out the cost-benefit study on the prevention of Aedes aegypti-borne diseases and to receive voluntary contributions from the countries for funding that study.

In selecting the best proposal for the study, the Bureau took into account the recommendations of Resolution XXIII of the XIX Meeting of the Directing Council (October 1969) and the comments, conclusions, and recommendations made by the PASB Study Group on the Prevention of Aedes aegypti (February 1970).

The proposal approved was that submitted by Arthur D. Little, Inc., of Boston, Massachusetts, a copy of which was sent to all Member Governments between May and June of this year.

The study, which will last for six months, will be carried out in two stages. The first will be devoted primarily to preparing the analytical instruments needed for cost-benefit studies, and the second to estimating the effect of various control measures on the incidence of Aedes aegypti-borne diseases.

The first phase will be devoted to:

- (a) Examination of the available information and the construction of quantitative models of the ecology of Aedes aegypti and the epidemiology of Aedes aegypti-borne diseases.
- (b) Determination of the relationship that should exist between infestation indices and efforts to control the vector.

- (c) Estimation of the impact of control measures (both traditional and experimental) on ecological relationships.
- (d) Development of the preliminary economic framework of inter-regional benefits that takes into account the importance of reducing uncertainty about future incidence and reducing average incidence.

The second phase will comprise:

- (a) Estimation of the economic impact of Aedes aegypti-borne diseases in a selected area with a well-developed system of case reporting.
- (b) Estimation of the impact of control measures on morbidity and mortality, using the methods developed in the first phase.

In short, Arthur D. Little, Inc., proposes to undertake a study based on quantitative models of the epidemiology of diseases and the ecology of the vector, to study in a selected area the social costs of the diseases and the impact and cost of different control measures and, finally, to use the data obtained in this way to estimate the economic impact of Aedes aegypti-borne diseases under existing or hypothetical control conditions.

With respect to the budget and the financing arrangements, the specific recommendations of the XVIII Pan American Sanitary Conference were followed, namely that the study should be undertaken as economically as possible without increasing the budget, and that appropriate voluntary contributions should be obtained. Together with the proposal, a summary of the budget totalling US\$92,000, presented by Arthur D. Little, Inc., for the complete study, was sent to the Member Governments. Since this cost estimate does not allow for contingencies, it was considered advisable to add US\$8,000 to the estimated US\$92,000 to increase the margin of budgetary safety.

The Bureau consulted the Member Governments about the possibility of their making voluntary contributions towards the funding of the study. A favorable reply was obtained from the United States of America, which led to the signing of Contract No. HEW-OS-71-164 on 24 June 1971, between the Bureau and the Secretary of Health, Education, and Welfare of the Government of the United States of America. It provided the amount of US\$100,000, which is considered sufficient to cover the cost of the study.

On 23 July 1971, the Bureau signed Contract No. 1-1349 with Arthur D. Little, Inc. At the present time, the technical staff of that firm are initiating phase a of the first stage of the study, which involves the examination of available information about the ecology of Aedes aegypti

and the epidemiology of Aedes aegypti-borne diseases, the purpose being to develop the necessary quantitative models which will play an important part in the preparation of the analytical instruments needed for cost-benefit studies.

The Bureau is awaiting the conclusions and results of the present cost-benefit study because of the contribution it may make to the limited experience of this method as applied to public health and preventive medicine activities, as well as the contribution it may make to future decisions about the strategy to be adopted for the prevention of communicable diseases and pertinent cost-benefit studies.

In the interim, the Bureau, in compliance with the recommendations of the XVIII Pan American Sanitary Conference, continues to urge the countries to intensify their activities to eradicate Aedes aegypti from their territories.

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CD20/12 (Eng.)  
ADDENDUM I  
3 September 1971  
ORIGINAL: SPANISH

STATUS OF AEDES AEGYPTI ERADICATION IN THE AMERICAS

The Directing Council of the Pan American Health Organization, at its first meeting held in Buenos Aires in 1947, called upon the Pan American Sanitary Bureau to solve the problem of urban yellow fever in the Western Hemisphere by eradicating Aedes aegypti.

At the time the Pan American Sanitary Bureau received those instructions, Aedes aegypti had already been eradicated from Bolivia and a large part of the territory of Brazil. With the exception of Canada, all the other countries and territories in the Americas were infested by the mosquito to a greater or lesser extent.

The countries and territories mentioned below have already eradicated Aedes aegypti, and are at present regarded as free of that vector: Argentina, British Honduras, Bermuda, Bolivia, Chile, Ecuador, Guatemala, Nicaragua, Paraguay, Peru, Uruguay, and the Panama Canal Zone.

Panama, which was reinfested in 1969, succeeded in eliminating the focus of reinfestation and has been negative for more than one year. Brazil is in the process of rendering the reinfested area in the north of the country negative; the same applies to Mexico where localities on the United States/Mexican border had been reinfested.

In Central America, mainly because of financial difficulties, campaign activities in El Salvador and Honduras were limited. In Costa Rica, the resumption of vector surveillance activities in March of this year led to the discovery of a focus of reinfestation in the port city of Puntarenas in April.

In addition to the above-mentioned reinfestations, the Aedes aegypti problem still persists in the northern part of South America, in the United States of America, and in the Caribbean area. The presence of the vector in those areas has been the cause of frequent reinfestations in the Hemisphere, and endangers the success of the continent-wide eradication program.

The frequency of foci or areas of reinfestation is clearly due to the absence or unsatisfactory nature of vector surveillance services in some of the countries which have already achieved eradication. Bearing in mind the importance of surveillance, the Bureau is actively aiding a number of countries to organize or intensify their surveillance activities. Assistance for this purpose has been given to the following countries and territories: Argentina, British Honduras, Bolivia, Brazil, Chile, Costa Rica, Ecuador, Guatemala, Nicaragua, Paraguay, Peru, and Uruguay. In the above-mentioned countries surveillance plans, standards and procedures were reviewed and in several of them assistance covered the training of professional personnel including the award of fellowships to enable them to visit similar programs in other countries, the training of local personnel, and the supply of printed entomological material and mounted specimens for the retraining of field personnel.

The status of the campaign in each one of the countries and territories still infested with Aedes aegypti is summarized below.

#### Barbados

The campaign has progressed very satisfactorily since the general reorganization and revision of the plan of operations in the first half of 1969. The house infestation index in the positive localities fell from 1.0% in 1969 to 0.5% in 1970. During the second half of the year, in which the eleventh verification was completed, only 39 houses were found to be infested with Aedes aegypti, the percentage of positive houses therefore being 0.05%.

The country is clearly in the process of rendering its entire territory negative, which obviously calls for a redoubling of efforts to ensure the success of the campaign.

#### Brazil

Campaign activities in the reinfested areas of Belem and its surroundings (State of Para), and São Luis, Ribamar and Rosario (State of Maranhão) are continuing satisfactorily. By May of this year, 39 of the total 50 reinfested localities had been rendered negative, and the house infestation index in the city of Belem, which was 5.6% at the end of 1969, fell to 0.4% at the end of 1970 and was reduced to 0.01% by mid 1971. During the verification of the city of São Luis, which ended in June, 46,870 of the 47,295 existing houses were inspected, and only one positive house was found (index 0.002%).

In view of the intensive efforts made and the results obtained, the Government of Brazil hopes shortly to render the entire reinfested area negative.

Vector surveillance operations are regularly undertaken in the vast area of its territory in which Aedes aegypti has already been eradicated.

### Colombia

Because of the reinfestations discovered at the end of 1969 in the cities of Barranquilla and Cartagena, the Government requested the assistance of the Organization in reviewing its eradication plan. The campaign was reorganized on the basis of the recommendations made during the second half of 1970, but there was little increase in the resources, which continued to be insufficient to undertake the activities planned.

The revised plan provided for the inspection of the extensive area of the country which had been rendered negative several years earlier, but which was not being regularly inspected. Inspection, which was begun at the end of last year, showed, up to May 1971, that many localities in the Departments of Atlantico, Bolivar, Cordoba, El Cesar, Magdalena and Sucre were also reinfested. A focus was found in Buenaventura, Department of the Valle.

Since the resources available in 1971 were not commensurate with the magnitude of the problem, the Government decided to limit attack activities and intensify total inspection of the country in order to delimit the infested area, and hopes to reorganize intensive vector control activities next year.

No substantial reductions were made in the operations in the Cucuta focus and in that of La Guajira, so that the level of infestation continues to be low.

### Costa Rica

The country eradicated Aedes aegypti in 1955 and was declared free of the vector in 1961.

The Organization assisted the Government towards the end of last year and the beginning of the present year in organizing an Aedes aegypti surveillance service.

The country had no regular surveillance service despite the fact that as early as 1960 it had been recommended that a work itinerary be established for the regular inspection of international ports, the international airport, and ports on the borders of neighboring countries that were still infested.

Surveillance activities were resumed at the end of March 1971, and in the first inspection of the port city of Puntarenas, Aedes aegypti was discovered. Puntarenas, on the Pacific Coast, is the main port of the country, and there is a very heavy movement of ships and small craft to various countries of the world, including some continental countries that are still infested with Aedes aegypti. It was undoubtedly the most vulnerable point for the introduction of the vector.

The Government immediately reorganized the campaign with the assistance of the Organization, providing it with the necessary resources for an intensive plan of attack in the area of the focus of reinfestation, inspection of the whole ecological area favorable to the vector, and the reestablishment of the surveillance system.

#### Cuba

The campaign, which has been incorporated into the general public health services, has suffered a sharp setback because of the time needed to shift from DDT to organophosphorus insecticides. This was necessary because of the discovery in 1969 of a DDT resistant strain of Aedes aegypti in La Habana.

After intensive training of the field staff in eradication techniques and the use of organophosphorus insecticides, treatment activities were begun at the beginning of this year in 12 regional nuclei, which will serve as a basis for the expansion and complete coverage of the La Habana area and the rest of the country.

#### El Salvador

The country eradicated Aedes aegypti in 1957 and was declared free of the vector in 1960. However, in June 1965 the city of San Salvador was found to be reinfested. Subsequent investigations showed that the reinfestation was spreading to the whole city and its surroundings, and that many other areas in the country had already been reinfested.

Because of financial limitations, the campaign, which was reorganized at that time, is only operative in the area of San Salvador and the International Airport at Ilopango. To date, the results obtained in San Salvador are not satisfactory.

#### United States of America

A campaign was begun in 1964 covering in part the areas infested by Aedes aegypti, which comprise part or all of the territory of the 10 states of the southeastern part of the country, Puerto Rico, and the American Virgin Islands.

Up until 1968, the results obtained by the campaign were limited and beginning in 1969 operations were suspended completely in the continental United States, in Puerto Rico, and in the Virgin Islands.

#### Guyana

After a complete reorganization, the campaign resumed operations in September 1969. The first phase of the program applies to the city of Georgetown, the east and west banks of the Demerara River, and the east coast districts of Demerara.

The results obtained up to the end of 1970 were very favorable and showed that 11 of the 51 localities initially positive had been rendered negative, and that the infestation index was under 1% in another 13 localities. During the first three months of 1971 the house infestation index, which at the end of 1970 was 2.5 for the east bank, and 0.2% for the west bank of the Demerara River, fell to 1.3 and 0.05% respectively. A substantial reduction was also achieved in the upper east coast, where the index fell from 0.1 in 1970 to 0.01% in mid 1971.

Up to the beginning of 1971, there was a sharp decline, to 0.7%, in the infestation index in the city of Georgetown. However, at mid year there was a reversal and the vector density began to rise, the index being 3.3%. In the lower east coast area progress was limited.

The Government is making every possible effort to solve the administrative problems which are hindering the progress of the campaign.

#### Haiti

The campaign, which was suspended in 1958, has not been resumed.

#### Honduras

Eradication was achieved in 1959, and in that year the country was declared free of the vector. In March 1968 the surveillance service found a reinfestation on the northern coast of the country in the cities of San Pedro Sula and also in Puerto Cortes, the main port.

The Government immediately resumed the campaign, but because of budgetary limitations work was only carried out in the city of San Pedro Sula and a few neighboring localities. Lack of resources made it impossible to properly treat the focus of reinfestation and to continue the investigation of the remainder of the country. So far, the vector is known to have spread to an area containing 34 localities.



The financial difficulties of the campaign increased in 1971 and made it necessary to curtail activities. The Government hopes to allot the campaign the necessary funds in 1972.

#### Jamaica

The campaign was begun in 1970 in a very small area serving as a basic nucleus for the training of personnel and the development of administrative and operating systems.

With the assistance of the Bureau, a complete plan for the eradication of the vector in the country was prepared in 1970, and in mid 1970 the Government submitted a request for assistance to the United Nations Development Program.

#### Mexico

The country completed eradication of Aedes aegypti in 1961 and was declared free of the mosquito in 1963 when a surveillance service was organized and made responsible for the periodical inspection of the localities most exposed to reinfestation. Since then the Aedes aegypti problem in Mexico has been limited to reinfestations along the US/Mexico border.

Between 1965 and 1971, 12 localities were found to be reinfested in the states of Coahuila and Tamaulipas, and 16 reinfestations were found in the United States/Mexico border area, some localities being reinfested more than once.

The country is making strenuous efforts to again eliminate the vector from the recently discovered foci of reinfestation, and is maintaining a regular Aedes aegypti surveillance service.

#### Panama

The country completed eradication in 1955 and was declared free of the vector in 1958. For financial reasons, the Government did not establish a regular surveillance system. In March 1969 an inspection carried out by health inspectors with the assistance of a PASB inspector, detected Aedes aegypti in the city of Colon and three neighboring localities.

Aware of the seriousness of the situation, the Government resumed the campaign immediately, and gave it full support and the necessary resources. Up to mid 1971, the reinfested area had already been negative for more than one year, as shown by various verifications, and the inspection of the ecological area favorable to the development of the mosquito in the remainder of the country is about to be completed.

A regular Aedes aegypti surveillance system was organized and began to operate in early 1971.

#### Dominican Republic

The campaign was suspended in 1962 and has not yet been resumed.

#### Trinidad and Tobago

The island of Trinidad is considered to be virtually negative, with the exception of small foci in the city of Port of Spain and certain other small areas in the interior of the country, which have been infested by Aedes aegypti introduced by small craft coming from certain Caribbean ports that are still infested.

The island of Tobago continues to be considered free of the mosquito.

#### Venezuela

The campaign continues to concentrate its activities in the western region of the country, primarily in the Venezuela/Colombia border area.

The results so far obtained in the restricted work area of the campaign are good. However, the Government has not yet decided to expand the campaign to achieve total coverage of the infested area of the country.

#### French Territories

Guadaloupe - The campaign, which was suspended in 1962, was resumed at the end of 1969.

French Guiana - The campaign was reorganized in 1969 because of the reinfestation of the city of Cayenne which was discovered in 1963. In 1964 an investigation showed that the reinfestation had spread to the whole city and its surroundings, and that several other localities in the interior were infested.

Results obtained up to May 1971 are still limited.

Martinique - Up to 1968, Aedes aegypti operations were limited to control measures. In 1969, the Government began an eradication program, but so far the results obtained have been limited.

St. Martin - The French part of this island continues to be considered free of Aedes aegypti, but no recent information is available about the situation there.

Territories of the Kingdom of The Netherlands

Aruba, Bonaire, Curacao, Saba, St. Eustatius, and St. Martin (part) - The attack phase was begun in Aruba in the third quarter of 1970 and at the end of the same year in Bonaire. Both islands showed a high infestation rate, there being areas in which the house infestation index ranged from 70 to 100%. At the end of the second quarter of this year, data obtained from the third verification in Bonaire showed that only one house was infested with Aedes aegypti, and in Aruba only 39 houses were found infested with the vector, so that the index was 0.3%.

The two islands are close to achieving eradication, but it is necessary for the Government to redouble its efforts in order to ensure its success.

Curacao, Saba, St. Eustatius, and St. Martin have just completed the preparatory phase and are about to begin the attack phase. Saba and St. Eustatius are undertaking an intensive operation for the elimination of breeding places, preliminary to insecticide sprayings.

Surinam - The campaign, which was reorganized during the second half of 1969, continues to face administrative (primarily personnel) problems. In Paramaribo (Division I) the situation worsened towards the end of 1970, the house infestation being 11.0%, but three treatment cycles in the first half of this year succeeded in reducing the index to 2.7%. Good results are being obtained with the use of granulated Abate in the gutters of the houses in this city which were also found positive for Aedes aegypti. Slow progress is being made in this activity because of the complexity of the operation.

In the other three divisions in which the campaign is active, the house infestation index fell from 1.45% in the first quarter of 1971 to 0.87% at the end of the second quarter.

Territories of the United Kingdom

Antigua - The preparatory phase was completed and the attack phase begun a little after the date planned because of the delay in the arrival of vehicles. At the end of the second quarter, the first treatment cycle was being completed.

Grenada - The first treatment cycle was begun at the beginning of 1971, but serious personnel problems have been encountered. By the end of the second quarter, new field personnel had been trained, and the total treatment cycle was being continued.

Cayman Islands - Grand Cayman, which had been confirmed to be negative in limited inspections in 1966 and 1968, was again found to be negative in the inspection carried out in the first six months of 1971. The campaign begun in February 1970 in Cayman Brac and Little Cayman has developed satisfactorily, and the house infestation indices, which were 33.0 and 22.0% respectively in the initial surveys, fell to 5.0 and 2.0% by the end of the past year, and to zero during the first half of 1971.

St. Lucia - The attack phase was begun in January 1970 and the campaign is obtaining very favorable results. The house infestation index, which was 16.7% in the initial survey, fell to 0.2% at the end of the second semester of 1971, only 59 houses being positive in the entire territory. Of the total of 27 localities initially positive, 16 have already been rendered negative.

Montserrat - Owing to the budgetary difficulties, it was necessary to prolong the preparatory phase and to postpone initiation of the first treatment cycle which had been planned to begin in the third quarter of this year.

Dominica and St. Vincent - Are in the preparatory phase.

Bahamas and the British Virgin Islands - Are endeavoring to organize their campaigns. The Bahamas, which maintain a vector control service, have already made a start on the preparatory phase.

The Turks and Caicos Islands, St. Kitts, Nevis and Anguilla continue to be infested and have no campaign.