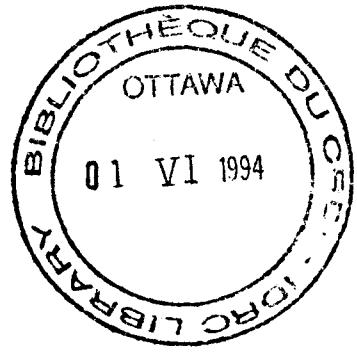
FINAL REPORT

EVALUATION OF THE CHAGAS DISEASE PREVENTION PROJECT

(PARAGUAY - IDRC)



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1.0 INTRODUCTION AND BACKGROUND

Chagas disease is a major public health problem in Paraguay, as it is in neighbouring countries of Latin America. In Paraguay, around 1 million people in the rural areas are believed at risk to the infection (25% of the total population), with an estimated incidence of over 14,000 new infections per year in the absence of control. In spite of this, research on Chagas disease in Paraguay has been extremely limited, and the current IDRC - supported project has had a major impact on awareness of the problem and its potential solutions - both amongst the Paraguayan research community and at the government level.

Chagas disease is caused by a protozoan parasite, *Trypanosoma cruzi*, transmitted to man in the faeces of blood-sucking triatomine bugs. The most important vector species in Paraguay, and in neighbouring countries, is *Triatoma infestans* - which primarily breeds in the cracks and crevices of poor quality rural houses, emerging at night to suck the blood of the sleeping occupants. Chagas disease cannot be controlled by drugs or vaccines, and so the IDRC-supported project was designed to test and compare two specific approaches to preventing insect-borne transmission - (a) by spraying infested houses with modern insecticides, (b) by using low cost techniques to improve houses to make them inappropriate for the triatomine bugs. The two approaches were evaluated separately, and in combination, in 3 rural communities in eastern Paraguay.

From the outset, the project called for an integrated approach involving specialists from several disciplines - particularly materials science and rural architecture, clinical medicine, sociology and medical entomology. This in itself was not a simple undertaking, and it is to the project's credit that it succeeded in bringing together specialists from such different disciplines to address together the complex issues of rural health and development. In 1986, an international meeting in Asuncion provided the forum to discuss and develop the initial project design which was

subsequently refined and approved for IDRC funding in 1988. Project implementation began in October 1988, and this report results from the evaluation mission carried out in March 1992.

1.1 Project Design and Objectives

The project objectives and design were exceptionally clear and elegantly structured, no doubt due in large measure to the success of the project development cycle initiated by Dr. Robert Rowe of the IDRC regional office.

In summary, the project sought to compare two types of Chagas vector control interventions, by use of modern pyrethroid insecticides and by use of low-cost house improvement techniques, alone and in combination. Direct evaluation of results was by physical examination of premises for Chagas vectors, community support in reporting the presence of vectors in houses, and serological examination of householders. The project thus provided much-needed comparative information both on the interventions methods themselves and on the evaluation techniques.

It is unfortunate, however, that the funds available and the timescale of the project (3 years) has restricted the level of field evaluation that could be achieved. For example, although insecticide applications were completed in about 1 week, the house improvement programmes took 18 months (a useful comparison in itself). But this, combined with the initial planning time, has left only about 1 year to elapse over which project results could be assessed. The total community size involved was around 1000 (in 3 communities of about 50 houses each). With a crude birth rate of about 30/1000, this implies no more than 30 newborns since the end of the intervention period, which, at an average infection prevalence of 20%, would give an expected incidence of infection of just 6 new infections over the year. This is just too low an expected level against which to evaluate the observed seroprevalence in children born since the interventions were completed. For this reason, we strongly recommend a further evaluation study in 1995 (see

recommendation 1) which will represent a 4 year period since completion of the intervention phase.

We believe that detailed longer term evaluation of this type is critical, and would also stress the importance of evaluating collateral benefits from the intervention such as control of other pests (e.g., cimicid bedbugs, cockroaches, fleas and flies) and other changes in health and social indicators that may have been associated with the project interventions.

2.0 EVALUATION PROCEDURE

During a field trip to Paraguay in early March of 1992 the study team (Black, Schofield and Yarzabal) interviewed members of the project team, visited the three rural communities, interviewed the Director of IICS, the head of the Appropriate Technology group at CTA, listened to a presentation of study results and reviewed background material at IICS and CTA (e.g., raw data, notes, papers, essays, student theses). In addition, the study team met with officials of the Paraguayan housing agency (CONAVI), the Ministry of Health (SENEPA), and the Pan-American Health Organization (PAHO).

The study team was guided by the evaluation framework which was prepared for this evaluation (attached as Appendix 3 of this report). It and the questions we sought to answer are attached to this report.

The realities of the field trip required some modifications to the evaluation design (e.g., it was not possible to interview households in the three communities and look for evidence of triatomine bugs at the same time) but these changes do not affect the conclusions of the study team or in any way leave us doubting the quality and value of the Chagas disease project.

2.1 Was the Chagas Program Successful?

The Chagas program had two "hard measures" of success: first has the incidence of infestation been reduced and secondly has seroconversion (from negative to positive) occurred? The incidence of bugs has been reduced to virtually zero which implies a lack of transmission and only an extremely low evidence of seroconversion 0.5% (negative to positive see Appendix 1). The two findings reinforce each other. If transmission did reoccur the delay is a benefit because delayed acquisition of infection reduces the likelihood of mortality in the acute phase. However, it is important that the duration of the intervention be assessed over a longer time scale (hence recommendation 3.1).

The project has also shown that low-cost housing improvement is feasible and has given a good estimate of the costs and time-scale over which this type of intervention can be done. The project has also provided the first direct comparison between the two most modern pyrethroid insecticides proposed for Chagas disease vector control and has provided valuable data on their initial impact and residual activity.

While these objective findings are important there are other ways in which the project was a success. First, the project carried out (under extremely difficult conditions) in Paraguay gives the authorities in Paraguay confidence that the proposed solutions will work in Paraguay. Second, the project team carried out an elaborate complex study on time and within the budget. This deserves some comment.

For someone who has not visited Paraguay and the study sites the research design for the project seems elegant, efficient and feasible. It is only when one visits all three study sites that one realizes the difficult operational conditions involved. These include long travel times, difficult road conditions, scattered houses, mobility of the study population and the difficulty of finding

suitable workers able to live in the communities while carrying out the requisite repairs and fumigation.

In addition, the project began under one government, and was carried out after a sudden change of government which required the study team to renegotiate the terms and conditions of the study with new authorities.

2.2 Were There Benefits From A Multidisciplinary Approach?

The multidisciplinary (biological, technological and sociological) and inter-institutional approach on which this project was based resulted in an enriching experience for the research team, officials from the institutions involved and the selected populations.

The main reason for this is because the project permitted and encouraged communication and understanding among professionals from quite different academic backgrounds (biologists, architects, sociologists (see first progress report, Appendix 2). Because the identified health program must be placed in its larger social context it also stimulated the participation of diverse groups of people (researchers, householders, members of the government and officials from the Ministry of Health and the Ministry of Housing).

The results obtained benefited the two research institutions involved. On the one hand the project helped augment their capacity to obtain support including funds for research, and enhanced the institutes capacity to participate and cooperate in international research projects (GTZ, JICA, TDR). On the other hand, the IDRC project enriched the intellectual atmosphere within the centres which in turn encouraged the dedication of researchers while offering a project of interest to young professionals and students.

2.3 Are There Benefits From An Integrated Approach?

In deciding whether or not there are benefits from an integrated approach one needs to look at the academic and practical benefits which flow from the project.

On the academic side one can see that the multi-disciplinary project proved to be particularly effective. Of particular importance was the community participation, the debates stimulated within the ministries of housing and health and the changes in the approach to eradication of the Chagas vector (i.e., the recognition that it is feasible - politically and financially).

The project led to the development of 19 papers and seminars at scientific meetings, the development of 3 audiovisual presentations and the production of 5 theses on the part of 9 architecture students.

At the same time the project produced new knowledge about the importance of housing quality in the control of Chagas. This productivity is a strong contribution to the creation of a scientific culture which translates into growing participation of researchers and their institutes in the national and international literature.

In summary this project augmented and enhanced the potential and actual research capacity of the institutions, creating within them the kernel of an applied research and development capacity for multidisciplinary studies. This involved (i) the objective evaluation of three methods for the control of Chagas; (ii) the creation of a multidisciplinary team; (iii) a quite remarkable participation in the research project by the local populations; (iv) the political and financial support of the local and national government; (v) the involvement of the research team and the involved communities in different Chagas control techniques and the renovation of rural houses; and (vi) the establishment of frequent and positive communication between those living in the

rural communities and government officials.

These types of results are not ordinarily obtained by single discipline research projects lasting three years. In these cases project success is usually limited to progress made in the growth of scientific knowledge or the specific research results of the study.

2.4 Institutional Benefits

The institutional benefits of this project have been substantial, especially in terms of enhanced reputation and improved contacts at national and international levels. Prior to project inception there was very little research on Chagas disease in Paraguay, and very few opportunities for Paraguayan research workers. In part this reflected the political aspects of the country since 1954, which have improved considerably since the 1989 change in government. There is no doubt however, that the IDRC-funded Chagas project has provided an excellent vehicle for undergraduate and post-graduate training, together with improved confidence and opportunities for greater Paraguayan participation in the international research efforts in health sciences and rural development. The success of the project has also had a major influence on Paraguayan government policy, and appears to have been a significant factor influencing other international agencies to support various projects in Paraguay.

The design of the project, and its implementation, had at its core the notion of a collaborative effort between Paraguayan institutions representing very different technical disciplines. This alone has influenced technical and administrative concepts. For example, investigators with established expertise in each discipline can now communicate with confidence about disciplines that would otherwise be alien and mysterious (e.g., biomedical and social scientists and health workers) forming an important basis for future cross-disciplinary projects. In addition, the nature of the project required administrative contact of a level not previously apparent, which

again lays important precedents for future collaborative studies.

In the course of project, a total of 49 scientists (29 in the health area, 9 in social sciences and 11 in the housing area) have been directly involved, together with 13 community workers contracted during the field work. In addition, through local discussion groups, publications, and participation in various congresses, the project work has been brought to the attention of a very wide range of scientists and others active in Chagas disease research and rural development in other parts of Latin America.

Irrespective of the specific project goals, there seem to have been three main institutional benefits in addition to the training opportunities:

2.4.1 Institutional Collaboration and Administrative Development

The IICS, as an institution dependent on the National University, has a staff of 82 professionals and around 40 support staff. It suffered from low budget and restrictive budgetary procedures. In parallel with project demands however, IICS has been able to set up a University Foundation to receive and administer funds in a more flexible way. This has brought immediate benefits and may be expected to improve future accounting for subsequent projects. It is clear from discussions during project evaluation that inexperience, plus internal administrative difficulties, were a source of problems for the project team, and yet these problems seem to have helped spur the development of improved administrative practice, both internally and in respect of administrative collaboration with other Paraguayan institutions.

2.4.2 Institutional Role At National Government Level

Since the government changed in 1988, there have been two significant developments in Paraguay in respect of Chagas disease control and rural development. The National Council for Housing (CONAVI) has embarked on an ambitious plan for low cost house construction in and around the metropolitan area. This policy was developed partly as a national response to improving housing stock, and partly as an attempt to cope with the increasing urban migration that characterizes most developing countries. However, from experience gained by CTA in the course of the IDRC-supported Chagas project, the project team has been able to participate in CONAVI activities and broaden its approach to encompass health aspects of housing as well. The project team has, in a sense, served as bridge between CONAVI and the Ministry of Health. CONAVI's appreciation of this input is illustrated by their proposal to offer up to US$ 3 million for housing projects in Chagasic areas, described by CONAVI Director Arq. Juan A. Cristalo as "an extended follow-up of the Chagas project experience".

In parallel to this, IICS has been able to offer its services to other institutions, and particularly to play a greater role in the activities of the MOH in relation to direct intervention against Chagas disease transmission. Paraguay, in conjunction with neighbouring countries, has developed in 1991 their first national plan for Chagas disease control based on a strategy of eliminating *Triatoma infestans* by insecticide application followed by community-based vigilance and progressive community-based improvements to rural housing and infrastructure. Examination of the plan shows that IICS experience gained through the IDRC project has played a key role in developing the adapted strategy.

2.4.3 Institutional Reputation and Scientific Development

At IICS, basic work on Chagas disease in Paraguay began in 1982 as part of a GTZ sponsored

institutional-strengthening initiative. This support continued for 10 years and is now under review for extension. Confidence in the outcome stems in large measure from the success of parallel projects like that supported by IDRC.

Institutional confidence and growing reputation is again shown by the 1987 agreement with JICA to support basic molecular biology (including Chagas disease) within IICS - which included substantial refurbishment and reequipping of laboratories. JICA personnel first visited IDRC project field sites in 1989 and from this, have been influenced to refocus part of their support on field work (mainly on reservoir hosts) in conjunction with the IDRC supported activities. IICS has also been successful in competing for TDR support in 1991 (for an overseas student fellowship on Chagas technology) and for OPS/Fondo Central support for work on AIDS. Moreover, this success is reflected by the 1992 core budget award for IICS which has been increased by 80% over the 1991 award, to US$ 1-5 million. In the words of IICS Director, Dr. Ricardo Moreno, "GTZ, IDRC and JICA are responsible for all our national tradition of research in the biomedical sciences." Since 1984, the institute has doubled its annual number of papers prepared for publication in international scientific journals, and, in 1991, was successfully awarded all 7 research projects prepared and submitted for funding from the National University Research Council (DDI).

2.4.4 Benefits To IDRC

The project on Chagas prevention required an integrated approach and is in some sense unique. However, this project is unlikely to be the only case where an integrated approach is the appropriate one. One can imagine many situations where problems of health, housing and education are intimately linked (e.g., in the control of intestinal parasites) not only in Paraguay but in many other countries.

The benefits of such a project to IDRC are at least twofold. The most important one is that an integrated approach, if the appropriate one, has a greater chance of being effective as was this case.

The second benefit or benefits are longer term. If these evaluation results are used wisely they should allow IDRC to 1) enhance its ability to see where integrated projects are required (or appropriate) and 2) foster situations where long term benefits are realized by the host country.

There may be a series of other benefits which have to do with administrative simplicity (i.e., in theory IDRC would carry out fewer projects but the projects carried out would be longer in duration and greater in size). These benefits which could accrue to IDRC are, however, not convincing reasons to undertake integrated projects. The reason for undertaking an integrated project should include an understanding of whether an integrated project is the appropriate approach for the study problem.

2.5 Other Impacts

During the course of its investigation the study team noted five impacts of the project which go well beyond the impacts expected from the project (as a research project) itself. These are impacts on the thinking of the government, community expectations, benefits to individuals, the transfer of knowledge among specialists and the recognition and correction of additional health problems. Each of these is discussed in turn below.

2.5.1 Impact on the Government

The value and usefulness of the study results have had a recognized impact on the government's approach to rural development. The most immediate manifestation of this is the expressed

intention of CONAVI to spend up to $3M on housing improvement in Chagasic areas as a follow-up to the Chagas project.

It is always difficult to ascribe causal impacts on government policy. Paraguay has recently undergone considerable government change and no doubt the new government is predisposed to consider new approaches to existing problems. Having said that, it seems obvious that this project has had a considerable impact on government thinking, in particular because the project has shown that it is feasible to prevent Chagas disease and to do so at a relatively low cost using a combination of housing improvement, education, community involvement and insecticide. Governments, no matter in what country, are always more willing to consider solutions to a problem if it can be shown that the solution works and can be carried out effectively with available resources.

2.5.2 Community Expectations

Because of the study process (baseline, intervention, follow-up) the three communities involved have acquired considerable knowledge about Chagas Disease and its prevention but they have also begun to think about other improvements which would be beneficial. As indicated in their response to the follow-up survey carried out as part of the project a large majority of the community would like to improve latrines and community health in general. Whether or not these expectations will be realized will depend on follow-up work by organizations in Paraguay, aid organizations and the communities themselves.

During the visit of the evaluation team it became obvious that knowledge about the Chagas project spread well beyond the three communities directly involved. When we visited houses outside the study community of Cañada the people knew about the project, knew we were looking for the Vinchuca (the local name for the vector in the area) and thought we were there

to fumigate the house.

2.5.3 Impacts on Individuals

The project had a number of impacts on the families and their children which were to some extent not intended. One impact mentioned by a number of households we visited was the elimination of not only the Vinchuca but also (as a result of the fumigation) bedbugs and other insects. The elimination of these other insects made life more pleasant.

In addition to this one had the feeling visiting the households that the families themselves were quite proud about their participation in the project and the elimination of the Vinchuca. Almost every household visited insisted on showing us the calendar which would indicate whether or not the Vinchuca was present. (The calendar is hung on the wall and may become streaked with distinctive bug faeces, thus revealing the presence of any bugs since the previous inspection. This technique was developed in Brasil where it has been used widely in monitoring the control of *Triatoma infestans*).

2.5.4 Transfer of Knowledge

One unintended and positive impact has been the transfer of knowledge between and among specialists. This transfer goes well beyond the knowledge gained and developed by the people who worked on the Chagas project itself. The design of the project, its funding and evaluation brought a number of different experts together from different countries and these meetings led to exchanges of information about work in other countries, findings applicable to Paraguay, and evaluation methods applicable to this and other projects.

2.5.5 Correction of Unrelated Health Problems

During the course of the project study team members identified (by observation) a child with a cleft palate and a child with meningitis. The child with the cleft palate was directed to the appropriate health professionals and operated on to correct the condition. Funds for hospital care were donated by a volunteer agency and the surgeon carried out the work at no charge. The second child was assisted with medical care and while still crippled is able to do more (e.g., sit-up) than before.

3.0 SUGGESTIONS AND RECOMMENDATIONS

For the Involved Institutes

In order to assure the continuity of the impacts on the development of multidisciplinary teams and capability we suggest the following measures: (i) supplementing salaries so that researchers can work full-time on projects; (ii) financing scholarships for the later development of researchers (e.g., for post-graduate work); (iii) simplification of administrative relations between the cooperating institutes and their respective universities.

3.1.1 Long Term Follow-up Evaluation

IDRC funding approval in 1988 was followed by base-line data studies during most of 1989. Thus, although the project kept very much to schedule, interventions were not completed until the end of 1990. Project design has allowed for initial evaluation which has been very encouraging. However, because of the time frame over which the interventions may act, the evaluation team recommends in the strongest-terms, that funds be allocated for a longer term assessment of the intervention impact.

As studies elsewhere in Latin America have shown-especially in Brazil - a key feature of triatomine bug populations is their ability to reinfest houses after treatment. This makes relevant the idea of a longer term comparative assessment of the three treated communities both in terms of entomological indicators, and in terms of serology of children born since the initial intervention. In addition, since a major component of the project was to assess low cost housing improvements, it is essential that the physical aspects of these improvements, and the sociological aspect of householder maintenance, be assessed over a longer term.

We therefore recommend that IDRC funds be earmarked for a mission in mid-1995 to visit each house in the 3 treated communities to carry out:

1. Visual and material inspection of house structure, paying particular attention to changes since 1990.
2. Interview of householders for their opinions on the structural changes, maintenance activities, demographic changes, and entomological indicators.
3. Thorough examination of house for triatominae bugs and other pests.
4. Serological study of all children aged 6 months - 4 years.

At the same time, the mission should discuss and reinforce health education aspects with community leaders, and liaise with SENEPA personnel concerning parallel sector, control activities.

Estimated duration 1 month.
Estimated budget (1992 terms) US$ 30,000.

3.1.2 Development and Protection of Human Resources

The IDRC project has greatly enhanced the national and international reputation of personnel involved - especially the team principals, who are now able to play a greatly enhanced role in national institutions both at university and government level. However, this substantial human resource development is represented only by the practical experience gained, and is not yet reflected sufficiently in the formal qualifications of those involved. There is a risk therefore that this valuable experience may be displaced by those with greater qualifications (e.g., gained through other opportunities for overseas study) but less relevant practical experience.

We therefore urge consideration of advanced study fellowships for team personnel designed to build upon their acquired experience and recognize their achievements through formal postgraduate awards [This implies fellowship awards tenable outside Paraguay because at present there is no postgraduate school within the National, or Catholic Universities. However, several institutions in other countries (e.g., U.K.) now offer schemes for external awards based on examination of project work carried out in a country such as Paraguay].

3.1.3 Project Development

In parallel with protecting the human resource development of this project, the evaluation team recommends consideration of protecting the project experience through design and implementation of a second phase.

Based on the project experience, it is clear that Chagas transmission is not an isolated phenomenon, but is intimately associated and dependent upon a number of social, community, structural, political and other health factors. Conversely, intervention against Chagas disease can influence a number of other components such as health education, community organization and

expectation. We would therefore recommend an amplified project designed to integrate other health and material interventions, to be evaluated in terms of their marginal costs and benefits as components of strategies designed either directly for Chagas control or for rural development in general. As an example, experience in house improvement could be extended to include concurrent improvements in water and sanitation facilities, and for specific drug treatments, to be evaluated in terms of contributions to child health and intestinal parasite burden, (as well as Chagas disease control). At the same time, community perceptions and collaboration with this broader type of intervention would be compared with previous experience of the more specific approaches directed only against Chagas disease.

Project development of this type would be more complex than the current Chagas project requiring the involvement of other disciplines (e.g., economics and legalistic studies related to land tenure). However, this would represent a closer approximation to the requirements of larger scale interventions at government level, and the results of the cross-disciplinary interactions would, in themselves, form a valuable area of study.

3.2 Suggestions and Recommendations for IDRC

3.2.1 Subsequent Evaluation Work

For reasons outlined previously in the report it is early to assess the longevity of the housing improvements carried out for this project. Accordingly we recommend that IDRC fund a follow-up evaluation visit to the three study communities in three years time. The purpose of the evaluation would be to see how well the repairs have lasted and to see if the households are maintaining the improvements.

3.2.2 Support Payments to the Project

One problem uncovered by the study team was the lengthy delay encountered in the receipt of project funds. These delays have, as far as we can determine, three components. First, the transfer of funds from the bank (used by IDRC) to Paraguay seems to have taken an unusual length of time (as much as six weeks). Second, the bureaucracy internal to the university added further delays. Third, the project reports to IDRC do not seem to be linked to reasonable expectations about the flow of funds needed to operate such a project.

These delays placed a considerable burden on the project team. The team had to take personal loans of up to $40,000 U.S. in order to maintain cash flow due to the 8 month delay in payments from IDRC during the middle of the project. This shows dedication (and bravery) and was necessary in order to maintain the schedule of work and the trust of those involved through subcontracts (e.g. , field workers).

IDRC, in the opinion of the study team should:

1) Establish an appropriate system of reports which should be linked to payments. The progress payments should not be tied to completion of large complex reports which, if delayed, can disrupt the entire project;

2) Ensure an appropriate payment mechanism and schedule of payments at the beginning of the project; and

3) Prepare a simple pro forma reporting system for the project which can be used under field conditions.

If a second phase is developed the institutions involved should work with IDRC to simplify and speed-up the payment of funds.

3.2.3 Long Term Benefits

Reaping the long-term benefits from a project like this one requires the development and establishment of research capability in the host country. While the benefits of an integrated project are evident in this case, deriving long-term benefits (i.e., in the development of research capacity) requires a longer term than the three years of this project.

In the view of the evaluation team IDRC should consider the possibility of second and third phases for successful projects. We feel this consideration should apply not only to this (Chagas) project but to other projects. For second and third phases IDRC would not have to be the sole source of funds but could ask the proponents to include partners (or funds) from other institutions either in the host country or other development agencies.

For example, one result of this project has been to encourage the interest of the national housing agency (CONAVI) in work in the country side. A second phase which could include work on materials technology (a research task) related to CONAVI's interest in funding $3M in housing improvements would be a good example of how benefits from the project can be increased in future work.

3.2.4 Some Additional Comments on the Evaluation of International Research Development Projects

The evaluation team includes two members with considerable experience in the evaluation of research projects funded by development agencies and foundations. In their view the approach

adopted for this evaluation could be usefully applied to other projects and should be considered as a prototype for such studies. In particular they thought it was useful to: 1) have evaluation issues and indicators agreed to ahead of time; 2) use appropriate methods for the evaluation; and, 3) have the study carried out by a small team composed of people with the range of skills appropriate to the evaluation.

IDRC may choose to work with other organizations in further developing and refining this approach.

The main benefits noticed by the study team are 1) the ability to assess a broad range of issues involving considerable technical complexity and, 2) the ability to carry out the evaluation relatively quickly while adhering to standards of objectivity and independence.

APPENDIX 1

SEROLOGY FOR *Trypamosoma cruzi*

PRE-INTERVENTION
(ELISA)

COMMUNITY	NEGATIVE (%)	POSITIVE (%)	TOTAL
ÑANDUA	228 (86.0)	37 (14.0)	265
YPA U	262 (80.6)	63 (19.4)	325
CAÑADA	123 (71.5)	49 (28.5)	172
TOTAL	613 (80.4)	149 (19.6)	762

SEROLOGY FOR *Trypamosoma cruzi*

POST-INTERVENTION
(ELISA)

COMMUNITY	NEGATIVE(%)	POSITIVE(%)	TOTAL
ÑANDUA	200 (87.3)	29 (12.7)	229
YPA U	216 (83.1)	44 (16.9)	260
CAÑADA	109 (86.2)	23 (17.4)	132
TOTAL	525 (84.5)	96 (15.5)	621

CASES OF SEROCONVERSION
(Negative to Positive)

ÑANDUA	3 (0.5 %)
YPA U	0 (0 %)
CAÑADA	0 (0 %)
TOTAL	3 (0.5 %)

APPENDIX 2

"Given the interdisciplinary and interinstitutional character of the project, a workshop was held on December 13 and 14, 1989, with the participation of the field workers and the coordinator. Several problems were discussed on that opportunity, especially those related to the methodology and the terminology to be used by the members of the different areas. Also, decisions were made on how to approach the communities, without losing sight of the emphasis on community participation. A system of weekly meetings was established to be held among all the participants of the project in order to keep them updated on the project progress and to make decisions on short-term activities. Once the communities had been selected, the first field work was decided to be a briefing to the community people on the objectives and the methodology of the project, in order to obtain their consent and active participation."

from

CHAGAS' DISEASE PREVENTION VIA IMPROVED HOUSING (PARAGUAY)

FIRST PROGRESS REPORT

APPENDIX 3

DRAFT REPORT

EVALUATION FRAMEWORK FOR IDRC

CHAGAS DISEASE PREVENTION

VIA IMPROVED HOUSING

(PARAGUAY)

Prepared by:

ARA Consulting Group Inc.

November 12, 1991

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1.0 INTRODUCTION

IDRC is contemplating an evaluation of the Chagas' Disease Prevention Program via Improved Housing (Paraguay). The Program is a multi-disciplinary effort involving two different institutions at the Catholic University of Paraguay and the University of Paraguay over the period 1988 - 1991 and is expected to cost approximately $.6M CAD.

The principal objective of this project is to develop effective strategies for the control of Chagas' disease. All current control programs are based on insecticide application. This project will provide information on the comparative effectiveness of shelter improvement interventions, either on their own or in conjunction with insecticide application (it is important to note that future work will concentrate on the prevention of transmission while gradually eliminating the use of insecticides). While research capacity building is an integral part of this effort, the main focus of endeavour is to produce useful knowledge concerning the effectiveness of other approaches to vector control for prevention of Chagas' disease in the long run. A brief description of Chagas' disease is given in Appendix 1.

2.0 EVALUATION ISSUES

A central question of interest to IDRC is whether or not integrated projects (multi-disciplinary projects taking place over several years) are effective and worth the resources required to make them work. IDRC is interested in other aspects of such projects as are the participating institutions. The following pages discuss how an evaluation could address the issues of interest to the institutions involved in the Chagas Disease Prevention via Improved Housing project in Paraguay.

2.1 What is to be Evaluated

A key evaluation issue is to examine the net-benefits (or costs) of an integrated program compared to a series of single projects within Paraguay and the research design requires three different studies before it can be completed. This issue is, however, of paramount interest only to IDRC.

There are several evaluation issues related to a multi-disciplinary research program, an integrated program or a comparison of integrated program costs with the costs of a single project. These are: 1) was the Chagas' program itself a successful one, 2) were there benefits from a multi-disciplinary approach, 3) did the involved institutes benefit and 4) is an integrated program more effective than a single project?

2.2 Methodology

This section is organized around the four key issues identified above. It is important to recognize that the issues are of interest to different institutions involved in the project. These interests vary. IDRC, for example, may be interested in all the issues while individual researchers in Paraguay may be primarily interested in the results of their work on Chagas' disease. The institutes, involved could be interested in both the results of the project, the value of a multi-disciplinary project and the efficacy of IDRC's initiatives (e.g., the benefits which accrue from multidisciplinary projects). The institutes could be interested in larger, longer term projects because such projects are thought to be more effective and may allow the institutes involved to manage their own resources more efficiently.

2.2.1 Was the Chagas' Program Successful?

From a preliminary review of the project it is possible to state that the project is a well designed one and the indicators chosen in the project design (attached as Appendix II) seem

entirely appropriate. Examining the success of the project is, because of its design, relatively straight forward. Two steps would be involved. First, the actual implementation of the project should be compared to the planned implementation to make sure the indicators are available. Secondly, assuming most or all of the project results are available, the easiest way to study the results would be to have several independent peers review the material and comment on it. Since the project is a multi-disciplinary one the peer review is slightly more complicated than when only one discipline is involved but this is not an insurmountable problem. A fuller discussion of integrated programs compared to single initiatives is given in Appendix III. Success of the project will of course be measured against the project objectives.

2.2.2 Were there Benefits from a Multidisciplinary Approach

One question of interest to those participating in the project and IDRC concerns the possible benefits from a multidisciplinary approach. Among questions of interest are: 1) did a multidisciplinary project produce research results which would not have ordinarily occurred; 2) did it allow a more effective use of resources; 3) did it enhance training opportunities for students and, 4) was it more effective than a simple discipline study?

Some of the questions (1 and 4) can be answered by the peer review and (2 and 3) as part of the work on the benefits of an integrated project.

2.2.3 Did the Institutes Benefit?

Along with possible benefits of the actual project (i.e., the social, health and housing benefits) there may be benefits to the involved institutions which go well beyond the specifics of this particular project. These benefits may include the more effective use of resources and cooperation in other areas (e.g., other research studies, a better training environment for students and a richer intellectual climate within the institutes).

The institutes involved in the Chagas project could benefit in a number of ways not directly related to their work on this particular project. Receipt of funds from IDRC could enhance the prestige of the institutes and make the institutes more attractive to other sponsors of research. The project could enhance the involved institutes knowledge about certain processes (e.g., educating people about disease prevention) and their ability to manage larger research projects. Both of these impacts should help the institutes attract students and other projects.

It is difficult to list all of the benefits the institutes might receive since the benefits in part depend on the socio-economic climate within which the institutes operate and the interests and capabilities of those working in the institutes. For these reasons it is difficult to separate the impact of the Chagas project from the general efforts of the institutes. Appropriate indicators are suggested for these issues in the next section of the report. However, it would take a larger study than the one described here to determine whether or not integrated projects like this one have additional benefits beyond those of a simple project for the involved institutes.

2.2.4 Are there Benefits from an Integrated Approach?

This issue is of primary interest to IDRC but it is also of interest to the institutions involved and the researchers. All of those involved may feel that, given the problems of dealing with Chagas' disease, an integrated approach (e.g., tying together education, health, housing and pest control) is particularly attractive.

3.0 ISSUES AND INDICATORS

The rationale for developing integrated projects is that they allow planners and their clients to design longer term, more comprehensive studies which, if well-designed, should be more effective than a single project. The issues for evaluation could include: impacts on the institution, research capability, training (students), utilization of research results, dissemination, impacts on beneficiaries. The following table divides the evaluation study into two parts. The first looks at the project and the second, the benefits of an integrated project. Questions about an integrated project are divided into six topics which probably apply to almost all integrated projects. The table lists the possible questions and the information and sources required to examine the issue. In all cases the assumed comparison is with a series of single projects in Paraguay if possible and South America if there are no comparable projects within Paraguay.

Comparable projects should be chosen in consultation with researchers involved in this Chagas project since they are likely to know about other projects which can be used as comparisons. The criteria for choosing projects should be specified ahead of time and the evaluators need to assure themselves that appropriate comparison projects are chosen. While independence and objectivity need to be built into the selection process, the researchers in the Chagas project are most likely to know about candidates for comparison projects.

All of the indicators proposed in the following table are objective rather than subjective. Most of the indicators are quantitative (e.g., comparing numbers of papers published or students trained and so on). Some indicators are qualitative (e.g., elements of the peer review) but this does not mean the indicators are subjective. Qualitative indicators (for example about research quality) are perfectly appropriate and for the evaluation of research and development projects are an important and a necessary ingredient.

ISSUES AND INDICATORS

SECTION A - WAS THE PROJECT SUCCESSFUL?

Indicator	Information	Data Elements	Source
Overall Project Success	Existing Data Peer Review	As described in the project proposal (see Appendix B)	Peer Review
Issue 1: Housing			
Improved housing	Comparison of housing conditions before and after	Counts of improvements - screens - smooth flat walls - use of repair materials	Householder appraiser
	analysis of expenditures on housing	hours of repairs for repairs	
Issue 2: Social Educational			
Awareness of causes/prevention for Chagas	Family and community knowledge of disease prevention factors	Scaled responses to interventions, surveys	Householder and family participants in project
	changes in relevant behaviour	observed/reported behaviour changes	

Indicator	Information	Data Elements	Source
Issue 3: Health			
Number of incidents of Chagas disease	serodiagnosis	Incidence of infections	Study results health officials
Vector density	Number of infected insects (triatomine infestation). Changes in vector.	analysis	pre and post data collection from the Chagas project
Lower incidence of Chagas Disease	Comparison of project population with 1) control population 2) another Chagas project	Number of observed incidents of Chagas disease	Project files Medical officers Comparison population(s)
SECTION B: - THE BENEFIT OF INTEGRATED PROJECTS			
Issue 4: Impacts on the Institution			
Enhanced institutional capability	comparison of capability before and after integrated project: increased ability to attract research grants and qualify researchers	$ value of research grants before and after integrated program # of qualified researchers before and after	interviews/surveys of officials and outside experts

Indicator	Information	Data Elements	Source
Enhanced institutional reputation	comparison of reputation in Chagas' expertise before and after	scaled responses to interviews/surveys	interviews of officials and outside experts
Possible negative impacts	increased administrative burden of integrated vs. single project cost of technical coordination	$ or person costs of administrative burden for single vs integrated projects	interviews/surveys of officials and senior researchers
Increased ability to plan and organize institution	evidence for use of integrated project enhancing the planning process	documents/plans indicating contribution of integrated project to planning process (ie. longer time lines)	interviews with officials responsible for developing the Institute's research efforts
Efficient resource allocation	comparison of use of resources and beneficial use between integrated and single projects	evidence for resource savings (lower $ costs or lower administrative burden - fewer person days)	officials, document review
Enhanced institutional cooperation	Cooperation among institutions and/or research institutes	- joint (planning for) new initiatives - exchanges among staff - resource transfers	officials, planning documents Interviews with researchers expert opinion, peer review

Indicator	Information	Data Elements	Source
Issue 5: Research Capability			
Greater research capability at the two universities	employment of and publications by researchers compared between integrated and single projects	# of additional employees incremental to integrated project # of publications incremental to integrated project	interviews, publications
Greater capacity to handle complex research tasks	use of multi-disciplinary project to train and develop researchers in their ability to conceive and manage larger, more complex projects	# of hours of training in multi-disciplinary projects # of hours of incremental exposure to complex projects # of additional projects to the universities	interviews/surveys with researchers students, key informants
Issue 6: Training Students			
Training and acquisition of research skills	evidence that students receive more/better training in development of research skills in an integrated project as compared to a single project	scaled responses to questions about quality # of hours of specialized training integrated vs single project	interviews/surveys with researchers, students, outside experts, former students

Indicator	Information	Data Elements	Source
	number of scientists that have acquired research and management skills which could not otherwise be obtained by working on a single project	incremental #s of scientists with additional experience training in management	interviews PCR's
	evidence that greater collaboration aids training of students	multiple lines of evidence from experts, students, teachers, administrators	interviews/surveys, students, researchers, outside experts
Issue 7: Dissemination			
Better planning of dissemination effort	evidence that integrated projects have better plans for dissemination of results	plans, documents scaled responses	expert opinion interviews - officials, researchers, beneficiaries
Optimal use of publication resources	evidence that integrated projects allow optimal use of publication resources	use of publishing resources before and after integrated project savings in $, hours	# of publications, focus of publications, utility of publications

Indicator	Information	Data Elements	Source
Issue 8: Utilization of Research Results			
Number of beneficiaries who apply results	number or incidence of applications weighted by research effort between types of projects	# of additional applications incremental to integrated projects	cost-effectiveness studies interviews/surveys with researchers and beneficiaries
Better planning for utilization of research results	evidence that integrated project allows for better planning for utilization of research results	plans, documents that show enhanced planning for utilization	document review interviews with university officials
Ability to carry out utilization plan	evidence that integrated project enhances utilization of research results	comparison of utilization between single and integrated projects	cost-effectiveness studies, interviews with researchers, beneficiaries
Utilization of research results	Use by other researchers	Citations	Bibliographic analysis Bibliometrics

Indicator	Information	Data Elements	Source
Issue 9: Impacts on Beneficiaries			
Clients and beneficiaries are better informed and more prepared to use research results (i.e., disease prevention)	comparison of contacts, information exchange and awareness of clients and beneficiaries about research results of integrated as compared to single projects	# of fruitful contacts scaled responses, plans, documents (oral comment) on increased ability to use results	interviews, clients and beneficiaries
Issue 10: Development Effects			
Better housing and health practices	changes in practices savings	# and type of changes $ value of savings	cost-effectiveness studies, Gov't officials, health and housing experts
Lower incidence of Chagas'	reported incidence before and after	- # of reported cases - health costs/lost work - longevity - return on investment	researchers recipients health officials
Improvements to health	Incidence	Number of reported/observed cases	Medical officers

Indicator	Information	Data Elements	Source
Issue 11: Impacts on IDRC			
Enhanced ability to manage projects	plans, documents on management of projects	$ and hours of savings	IDRC, POs, CTA
Increased project management burden	impact on project management	$ and hours for project management compared with single projects - incremental travel time - incremental visits	IDRC file, POs, CTA, researchers
IDRC more effective in meeting objectives	relative success of integrated projects	multiple lines of evidence	all indicators

4.0 AN ESTIMATE OF COSTS

As outlined above there are two components to the evaluation. One component would look at the performance of this particular project and the second would examine issues about the project as an integrated project (this would correspond to the division of indicators and issues between Component A and Component B as outlined in the previous table). For the evaluation of the project itself the easiest course would be to carry out a peer review of the research results from the project. This could, for example, include reviews of the research by experts in housing, social issues and public health. Ideally, one would like to have three experts for each area (e.g., three experts in the medical aspects of Chagas' disease would review the relevant published material from the project).

This part of the study would cost approximately $5,000. The actual amount would depend on how many peers are used for the review and how the peer review is organized.

The second component of the evaluation (examining the benefits of an integrated project) is more complex and as a result more expensive (Appendix III elaborates on some of the reasons for this complexity). Cooperation with the involved institutes in Paraguay would help make the study efficient and effective.

Ideally one would like to find a number of Chagas' projects in Paraguay or South America which could be used as comparison projects. Any evaluations or reviews of these projects should be acquired and looked at for information on costs and benefits. In addition, people associated with the projects (nurses, researchers, doctors, housing experts and so on) should be interviewed. This element of the study if carried out largely in South America should cost between $3,000 and $5,000 (i.e., 20-30 days at $125 Cad per day and expenses).

To complete the second component of the evaluation a certain amount of information needs to be gathered from officials within IDRC. This would include: 1) a file review of several integrated projects to select cases for study (i.e., Chagas' and perhaps four others), 2) an

estimate of time spent on various projects by perhaps 10 people and 3) interviews with program officers about the cases chosen. This element of the evaluation could cost about $7,500 if IDRC carries out some of the work (i.e., file review and some interviews internally).

Finally, the two elements of the evaluation need to be integrated into a single summary report. This could be done within IDRC or, if that is not feasible, jointly between IDRC and an external consultant. Preparation of a final report would cost approximately $5,000. The total estimate cost of the evaluation would be as follows:

Component A	
Peer Review and analysis	$5,000
Comparison of Chagas projects	$4,000
Component B	
Data Collection within IDRC	$7,500
Preparation of Integrated Report	$5,000
	$21,500

Out of pocket costs could be reduced if IDRC was able to carry out much of the work internally.

APPENDIX I

CHAGA'S DISEASE

APPENDIX I

Chagas disease. An acute, subacute or chronic condition caused by the pleomorphic *Trypanosoma cruzi*, transmitted by certain large bugs. The acute disease occurs mainly in children. It is characterized by fever; tumour at the point of infection; transient tissue oedema, especially of the face; local lymphadenitis, and various cardiac disturbances including myocardial insufficiency. Involvement of the cerebrospinal system is occasionally severe. The chronic disease appears in adolescents and young adults, some of whom may have a history of an acute attack in childhood, and is chiefly notable for myocardial involvement.

The disease is scattered irregularly in Central and South America, in a wide area stretching from Mexico in the north to the Argentina in the south. The distribution of the vectors and animal reservoirs is very much more extensive than that of the human disease, which is limited to certain areas within this wide belt. It is found in various parts of Venezuela, Brazil, west Argentine, Uruguay, northern Chile, Peru and Ecuador. It has been reported in Guatemala, Panama, and Mexico. Two cases have been reported from Texas. The disease has not otherwise been reported elsewhere in the U.S.A., although vectors and reservoir animals are common in some States, including southern California and Arizona.

It may be acquired by visitors to endemic areas, especially those who live rough and accept village living conditions.[1]

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[1] Adams & Maegraith, Clinical Tropical Diseases, Blackwell Scientific Publications, Eighth edition, p. 491-492.

APPENDIX II

PROJECT DESCRIPTION

This material is copied from the proposal as approved by IDRC.

GENERAL OBJECTIVE

13. To determine the effectiveness of different interventions for the control of Chagas' disease in rural areas.

SPECIFIC OBJECTIVES

14. To evaluate the effectiveness of three intervention programs: insecticide application; housing improvement and a combined insecticide/housing approach; vis-a-vis human T. cruzi infection and house triatomine infestation.

15. To document the degree and nature of community participation.

16. To evaluate the shelter improvement interventions both in terms of materials and technology performance and strategy.

17. To recommend appropriate strategies for the control of Chagas' disease.

18. To plan appropriate strategies for the utilization of project results.

GENERAL METHODOLOGY

19. The chronogram attached presents the Experimental Design underlying the proposal.

20. The project has been set up to facilitate a comparative analysis pre and post intervention in three communities. One can consider two dependent variables: 1) level of positive serology; and 2) level of house triatomine infestation. The independent variables are then:

1. The level of education/community participation achieved;

2. the house improvement;

3. the insecticide application action; and

4. the combined insecticide/house improvement action.

21. The project has been divided into 4 Phases of activity. Although there is some overlapping, each phase initiates a distinct set of activities described in general terms as follows:

22. Stage I will establish a pre intervention data base relating to health, social and shelter characterization. The analysis of the results of this phase will allow the researchers to familiarize themselves with the health, social and shelter variables associated with infection and infestation before any intervention occurs.

23. Stage II will initiate the intervention process by starting education/community participation activities in each community. In order to stimulate community interest in the interventions, demonstrations of them will occur. As well as setting up the education/community participation intervention method, this Phase will also initiate a triatomine monitoring program also in each community.

24. Stage III will be dedicated to carrying out a specific intervention in each of the three selected communities over an 18-month period.

25. Stage IV will focus on the post intervention evaluation of each community and resulting data analysis.

26. Stage V will focus on disseminating results and encouraging their utilization.

DETAILED METHODOLOGY

27. The Project Design outline serves as the reference here. See also the attached chronogram.

PROJECT DESIGN:

Stage I: Pre-Intervention Baseline Data

1. Serodiagnosis, Vector Density, Infection Level
2. Community and Environment Profile
3. Materials and Shelter Technology Characterization

Stage II: Community Participation

1. Education/Community Participation
2. Demonstration

Monitoring of triatomines

Stage III: Specific Interventions

1. I - Insecticide Application
2. H - Housing Improvement Program
3. IH - Housing Improvement Program including one-time insecticide application program

Stage IV: Post-Intervention Evaluation and Analysis

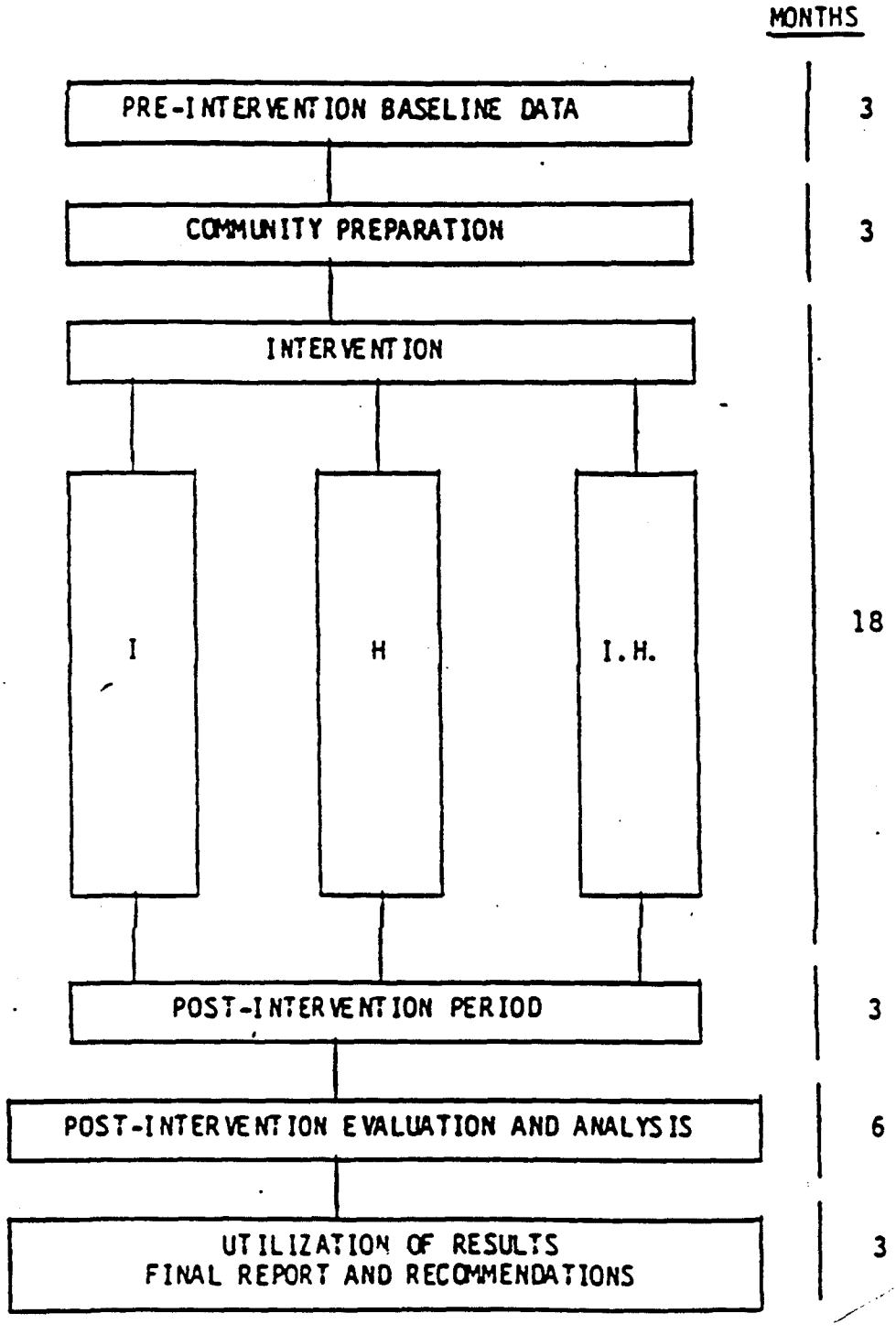
Post-Intervention Period

1. Serodiagnosis, Vector Density and Infection Level
2. Community and Environment Profile
3. Materials and Shelter Technology Characterization
4. Evaluation and Analysis

Stage V: Utilization of Results

Final Report and Recommendations

CHRONOGRAM


MONTHS
PRE-INTERVENTION BASELINE DATA
3
COMMUNITY PREPARATION
3
INTERVENTION
I
H
I.H.
18
POST-INTERVENTION PERIOD
3
POST-INTERVENTION EVALUATION AND ANALYSIS
6
UTILIZATION OF RESULTS
FINAL REPORT AND RECOMMENDATIONS
3

COMMUNITY SELECTION

28. Three communities will be selected prior to project initiation based on the following criteria:

Size - 40-50 houses with a total community population of about 200 inhabitants.
Infection - positive T. cruzi serology ranging from 20-30%.

Infestation - vector infestation levels ranging from 20-40%.

Accesibility - easy access (within 200 km. of Asuncion).

Materials - similar proportions of housing construction materials (wattle, wood, adobe, straw) representative of the endemic area.

Insecticide Application - no spraying activities of any kind in either the houses or the peri-domestic environment in the previous 5 years.

Population Stability - stable communities having low levels of spatial mobility.

Public Services - lack of existing public health facilities/services.

STAGE I PRE-INTERVENTION BASELINE DATA

1. SERODIAGNOSIS, VECTOR DENSITY AND INFECTION LEVEL

1.1 Serodiagnosis

29. Duplicate blood samples will be obtained from all individuals over six months of age in each of the three communities using capillary puncture on Whatman No. 3 filter paper. Each blood sample will be identified by the person's name, house and the date the sample was taken. The samples will be refrigerated according to the guidelines recommended by Marinkelle until they can be analysed. Analysis will take place within one month of taking the sample using the ELISA method to detect T. cruzi antibodies. The screening dilution will be 1:50 (equivalent to a 1:32 immunofluorescence (IFA) titre). This titre has been determined to be the minimum positive titre for T. cruzi infection in this area (IICS Revista (1984) Vol. 1,13-18). Confirmation of positive cases will be made using IFA and maximum positive titres recorded. In addition, IFA will be performed on a random 10% sample of all negative sera to confirm negativity and an external quality control on selected positive and negative sera will be performed by the Fundacion Oswaldo Cruz in Brazil. Individuals identified with a positive serology will be referred to national health centres for clinical evaluation.

1.2 Vector Density and Infection Level

1.2 Vector Density

30. A census of triatomine infestation will be carried out in all houses of each community. A team of two trained technicians equipped with tweezers, flashlights, plastic containers and a timer will collect triatomines for a standard period of 30 minutes in each house. Each plastic container will be identified by house and date of collection.

31. The collection will be repeated in the peri-domestic environment for a standard period of 15 minutes. Each container will be labelled peri-domestic and identified by house and date of collection. The peri-domestic environment includes an area of a maximum of 20 meters radius surrounding the house as well as other structures such as chicken coops at a greater distance but considered part of the household environment.

1.3 Infection Level

32. When the number of triatomines collected is 20 or less per house, all triatomines will be individually examined for the presence of T. cruzi. If the number of triatomines found is higher than 20, the first 20 will be individually examined as described above and 1 out of 3 of the remainder of the insects collected will be systematically examined.

(Examples: House X: 15 insects collected, all 15 examined.
House Y: 50 insects collected, 20 plus 10 = 30 examined.)

2. COMMUNITY AND ENVIRONMENT PROFILE

33. In the first three months of the project each of the selected communities will be described in cultural, demographic, economic, occupational and educational terms by means of a questionnaire covering the following information:

2.1 Community

Assessment of Demographic Characteristics

34. Demographic variables to be assessed are: age, sex, number of persons in the household, kinship, occupation, income (monetary and non-monetary), education level and technical skills. Certain variables refer to all members of the household while others refer only to adult members.

Assessment of Disease Knowledge

35. Questions will focus on the mother and father's knowledge of the disease, knowledge of the relationship of the triatomine vector with the disease and knowledge of vector distribution in the house and peri-domestic environment.

2.2 Assessment of Attitudes and Behaviour Towards the Vector

36. The mother and father will be asked if they have triatomines in the house, for how long, and if they use or have used some method to try to eliminate the insects and for how long.

Assessment of Time-Use Patterns

37. A typical daily timetable of activities of working persons in each household will be made, including work and work-related activities and recreation activities. Respondents' replies will be supplemented by observations made by the interview team.

2.3 Environment

Assessment of the Peri-domestic Environment

38. The physical and topographic characteristics of the peri-domestic environment will be assessed. This will include a hand-drawn sketch of all structures indicating approximate distance between structures.

Identification of Domestic Animals

39. All animals found in the house and the peri-domestic environment will be identified and counted.

Assessment of Sanitary Conditions

40. The following aspects of sanitary conditions in each household will be assessed: water facilities, human waste disposal and its proximity to the house and water facilities, garbage disposal, personal hygiene habits and habits used in the preparation and cooking of food.

3. MATERIALS AND SHELTER TECHNOLOGY CHARACTERIZATION

3.1 Materials

Mud

41. CTA will determine clay deposits, their location and extent. Samples will be tested for clay, silt and sand content, humidity, salt and mechanical properties.

42. Muds containing no additives will be tested for the effect of water content and pressure vis-a-vis density, compressive strength, shrinkage upon exposure to different humidities and temperatures. Lime-wood ash mixtures of various proportions with mud and water will be tested for compressive strength. The effect of adding to mud available proteinous materials such as banana and cactus oil and cow dung will also be analysed vis-a-vis physical-mechanical properties. Finally, the effects of available fibres on crack development and mechanical properties in mud/morter mixtures will be studied.

43. Additives to paints used in the communities will be studied to determine the adherence of lime based coatings to mud surfaces.

Wood

44. Timber engineering testing will not be required to determine the mechanical properties of common rural species as this work has already been done under an AFNS-Forestry Program project 3-P-82-0136. Some characterization work, however, will be required to determine the properties and performance of wood structural support components in combination with other materials eg. mud, straw and paint.

Straw

45. Straw-thatched roofing materials will be studied. The types of straw used will be characterized as well as the durability of existing straw roofing as a function of thickness and use. Mud/plaster coatings of straw will be tested.

3.2 Shelter Technology

46. The basis of this assessment will be the standard pre-tested questionnaire used by IICS for a national survey on Chagas' disease. Specifically, it will include elements of general house construction technology, design, ventilation, light, the materials used, and the number, size and locations of cracks. Respondents' answers will be supplemented by observations made by the CTA interview team.

STAGE II - COMMUNITY PARTICIPATION

1. EDUCATION/COMMUNITY PARTICIPATION

47. An education/community participation intervention will be prepared for each of the three communities.

48. The first set of education/community participation interventions will occur in the 3-6 month period following project commencement. Each intervention per community will present the following approach:

1. General Health Education
2. Chagas Disease Education - Knowledge
   - Attitude
   - Behaviour

49. The General Health Education component will offer information/ orientation on basic sanitary conditions which can be achieved in the community. This will be a minor but present component. The Chagas Disease Education component will be the major area of focus. It will impart knowledge of the disease and as a consequence try to change attitudes towards Chagas. The final aim will be to encourage behaviour conducive to participatory action in the triatomine monitoring and specific intervention programs.

50. Each education/community participation intervention will be similar except with respect to its behavioural aspects. This aspect will vary according to the intervention to be done in each community. Thus, in the community to receive the fumigation program the encouraged behaviour will be to collaborate with the insecticide application. The education/community participation intervention will take the form of a series of 10 day non formal education programs in each community. The first program will occur between months 3-6 from project commencement and will be repeated in each community close to the 6th, 12th and 18th and 24th month from project commencement. A three member team will carry out all the community based education/participation programs.

51. The programs will consist of discussion groups including all community members: young, old, men, women, students, workers, unemployed. Groups will be small to facilitate dialogue and will use appropriate communications methods: audiovisuals; brochures; dramatizations.

52. It is difficult to predetermine the approach and content of the education/community participation interventions in the 3 communities since the details will depend to a large extent on the analysis of the base line data. As well, modifications will be incorporated into the programs as they are implemented, in order to adapt and refine them to the community's needs. For example, the education/community participation intervention close to the 6 month mark will use the results of the demonstration activity, discussed below, to achieve their goals. As well, during the later education/community participation interventions the results of triatomine monitoring and specific fumigation/shelter improvement interventions will be used.

53. Monitoring of levels of community participation will also be important to observe and record. This will be carried out by preparing a scoring system for the social scientists, health professionals and engineers. During the education/community participation program scores will be based on community participation, attendance and participation in discussions and other events. The health scientists will base their scores on how the community members participate in the triatomine monitoring and fumigation programs, and the engineers on how the community members participate in the housing improvement programs.

2. DEMONSTRATION

54. An integral part of community preparation will be the demonstration of each activity performed in that community's intervention program. That is, in the community with the fumigation intervention, all aspects related to the application of the insecticide (including safety) will be demonstrated. Similarly, for the community with the housing improvement intervention, either a common community building or a house selected by the community, will be used to demonstrate all aspects relating to housing improvements. Accordingly, the community integrating both fumigation and housing improvements will be shown an integrated demonstration.

MONITORING OF TRIATOMINES

55. Triatomine infestation will be monitored every six months beginning after the first six months of the project's commencement in each house in all three communities using the following three procedures: i) white sheets of paper will be affixed to the interior walls of the house above each bed. These sheets, measuring 32 X 22 cm, will identify the house and the date of affixing. They will be removed and replaced every six months. Sheets removed will be examined using a code for identification of triatomine and other insect feces; ii) a team of 2 trained personnel, with the necessary materials, will make active searches for triatomines in all houses, following the same procedure as for the pre-intervention baseline data; iii) a plastic bag will be placed in each house and the family (children) encouraged to fill it with triatomines. This bag will be collected and replaced every 6 months and the insects counted.

STAGE III SPECIFIC INTERVENTIONS

1. INSECTICIDE APPLICATION PROGRAM (I.)

56. An insecticide application program will be the intervention in one of the three communities. In this community each house, that is: walls, floor, ceiling on the inside, eaves on the outside and the corresponding peri-domestic environment will be sprayed with insecticide. A synthetic pyrethroid of common commercial formulation will be the insecticide: WHO-1998 Deltametrine.

57. Following current Brazilian practice 40-50 ml/m^2 will be the recommended dose. The amounts of insecticide used and the time taken per house will be carefully recorded. Hudson spray pumps will be used and the fumigators will wear appropriate clothing and masks and will take all necessary safety precautions. Experienced fumigators from the Paraguayan Malaria Control Program (SENEPA) or the National Technical Training Institute (SNPP) will provide technical training and monitoring to ensure uniformity of intervention.

58. A check on the efficacy of the insecticide application will be performed 24 hours later in a random sample of three houses in the community. This will be done by placing 10 triatomines covered by a paper cone on the wall, roof and floor of each house. Cones will be removed 24 hours later and the number of viable insects recorded. In the event that one or more insects in any one of the three houses are alive, the strength of the insecticide will be increased and a re-application of the fumigation procedure will be needed. (Note: previous experience with the insecticide suggests that only a single application will be necessary.)

59. Checks for the residual effects of the insecticide will be repeated in the above manner in the same three houses at 1 month, 6 months, 12 months and 18 months post-spraying.

2. HOUSING IMPROVEMENT PROGRAM (H)

60. One of the three communities will participate in the housing improvement program intervention. The detailed study to determine human and material resources available, existing construction techniques and house plans will have been completed in the first three months of the project (i.e. concurrent with the gathering of other pre-intervention baseline data). With this information in hand and results of materials testing, construction techniques will be determined and the field work teams will be set up in the three months immediately prior to the start of the specific interventions (during community participation/demonstration phase).

61. The specific intervention phase will then take place between month 6-24 of the project. This will entail the improvement of each house in the community by using the existing structures and yet modifying them with improved materials in such a way as to ensure smooth, flat and crack-free wall and ceiling surfaces. Importantly, materials and techniques will also be developed to allow householders to maintain and repair cracks as they appear. As well design aspects will be improved to allow for more light and better ventilation.

62. The technically difficult components such as windows, doors and their frames will be prepared at CTA and assembled on site. The roof and other improvements will involve as much community participation as possible.

63. Partial and final technical evaluations will also be part of the housing improvement intervention. Partial evaluation of materials performance and the intervention strategy will take place twice, in month 12 and month 18. Throughout this intervention, as in all the others, detailed cost accounting will be required in order to facilitate accurate cost analysis towards the end of the project.

3. HOUSING IMPROVEMENT PROGRAM INCLUDING ONE-TIME INSECTICIDE APPLICATION (I.H.)

64. In one of the three communities a combined approach will be the intervention. A one-time insecticide application to the original structure and peri-domestic environment will be made immediately prior to the house improvement; that is: walls, floors, ceiling on the inside, eaves on the outside and the corresponding peri-domestic environment. Experienced fumigators from the Paraguayan Malaria Control Program (SENEPA) of the National Technical Training Institute (SNPP) will provide technical training. By one-time spraying it is not meant that the entire community is sprayed at one point in time. The problem with this approach is that since it takes longer to improve a house, by the time the last 10 houses are ready to be improved (12-18 months later) they may be reinfested. Thus one time insecticide application means one house at a time prior to improvement, not all houses at the same time.

65. A check on the efficacy of the spraying will be performed 24 hours later in the first three houses improved in the community. This will be done by placing 10 triatomines covered by a paper cone on the wall, roof and floor of each house. Cones will be removed 24 hours later and the number of viable insects recorded. In the event that one or more of the insects are alive, the strength of the insecticide will be increased and a re-application of the procedure will be needed. The efficacy of the strengthened insecticide will then be examined as described above in the next three houses improved. This procedure must be done to ensure the efficacy of the insecticide application procedure prior to house improvement. IICS will be responsible for verifying the efficacy of the spraying procedure. No continuing checks eg. 1, 6, 12, 18 months post spraying will be done since each house which is sprayed will be subsequently improved.

STAGE IV POST-INTERVENTION EVALUATION AND ANALYSIS

POST-INTERVENTION PERIOD

66. A period of three months will be allowed for during which time no intervention will occur. This time will be used to prepare for the subsequent evaluation and analysis work.

EVALUATION

1. SERODIAGNOSIS VECTOR DENSITY AND INFECTION LEVEL

67. Serodiagnosis will be performed in an identical manner as was done for the pre-intervention baseline data. In this way, pre and post intervention serologic results can be directly compared.

68. Both vector density and vector infection level measures will be estimated in the identical manner as was done for the pre-intervention baseline data. Again, pre and post results can be directly compared.

2. COMMUNITY AND ENVIRONMENT PROFILE

69. The questionnaires used for the pre-intervention baseline data will be used. This will be supplemented by additional questions designed to gather information about knowledge acquired and its translation into preventive action. Community members will also be queried on why or why not they participated in the various interventions/monitoring programs.

3. MATERIALS AND SHELTER TECHNOLOGY CHARACTERIZATION

70. The same questionnaire used for gathering pre-intervention data on cracks, house design, construction, and materials will be used, and complemented by the observations of the interview team.

ANALYSIS

Analytical Base: Data Requirements

71. The basis of the analysis is the comparison of pre and post intervention measures of: serodiagnosis, vector density and infection level; the community and environment profile; and materials and shelter technology. Measures for each are as follows:

72. 1. SERODIAGNOSIS VECTOR DENSITY AND INFECTION LEVEL

- Prevalence difference, based on percent positivity.
- Seroconversion rates (an incidence measure), based on the number of pre-intervention sero-negative persons who are sero-positive post-intervention.
- Quantitative assessment of the changes in titres pre and post-intervention to assess evidence of re-infection.
- Difference in the prevalence of houses infested with triatomines.
- Difference in the numbers of insects found per house.
- Difference in the prevalence of T. cruzi-infected insects.

2. COMMUNITY AND ENVIRONMENT PROFILE

73. Difference in scores constructed from responses to the questionnaires on disease knowledge, attitudes and behaviour toward the vector and time-use patterns.

- Construction of scores evaluating acquired knowledge pertaining to Chagas' control.

3. MATERIALS AND SHELTER TECHNOLOGY

74. Differences in materials used for walls, ceilings and rooves and their behaviour with special attention to cracks, crevices and other triatomine nesting environments. Differences in shelter technology using traditional materials and/or improved materials with special attention to light and ventilation.

Analysis

75. The effectiveness of the intervention programs will be determined through computer assisted data analysis. Both univariate and multivariate analyses, including path analysis to explore cause-effect relationships will be undertaken to understand the correlation and interaction of dependent variables with the three major outcome variables listed above in each intervention group (within-group comparisons). In addition, between group comparisons will be made to identify the intervention group having the largest effect on the outcome variables. Modifiable variables will be identified. Dr. T. Gyorkos will assist the ICCS health team both on-site in Paraguay and through data analysis facilities at the Université de Montreal.

76. In order to recommend participatory methodologies the evolution of the education/community participation programs will be analyzed vis-a-vis the pre and post community and environment profile information gathered. A crucial component here is to link why or why not people participated with the education/community participation methodologies used. The Social Science team will also analyse the costs of the various interventions. For this purpose, an economist will be contracted in Year I for 3 months to set up detailed cost accounting requirements and then in Year III for 9 months for final data analysis.

77. Analysis of materials performance, shelter technology adoption/adoption/strategies and intervention methodologies will allow the civil engineering/architecture team to make appropriate recommendations for shelter improvement intervention methodologies.

REPORT AND RECOMMENDATIONS

78. The results of the evaluation and data analysis will be presented in a series of final reports. An effort will be made to achieve a concise presentation of results in order to reach interested policy/decision makers in Ministries of Health and elsewhere. Publication of results in peer reviewed scientific journals will also be encouraged.

APPENDIX III

COMPARING SINGLE AND INTEGRATED PROJECTS

APPENDIX III

1.0 Integrated Programs Compared to Single Initiatives

Comparing an integrated program with single initiatives is not an easy task. Finding the right set of comparisons is difficult and in many cases may not be feasible. The following paragraphs describe the considerations which should be involved. Some or all of them may be of use when thinking about the issues in this evaluation or other evaluations.

IDRC would like to determine if the costs and benefits of an Integrated Program outweigh the additional costs associated with such projects. Answering this question is conceptually simple but practically difficult. In theory, one would establish the cost-effectiveness of several integrated programs and compare these with a series of single projects which are comparable (eg. took place over the same period of time and in total value are similar to the effort mounted in an integrated program).

Before discussing methodological issues of measuring cost-effectiveness it is worth examining the simple questions about what one needs in hand to address this evaluation issue. The evaluation issue is: are integrated programs worth the additional effort? There are two stages to answering the questions. First, the evaluator has to establish the cost-effectiveness of an integrated program as well as the cost-effectiveness of a 'bundle' of comparable single projects. Secondly, the evaluator needs to determine the additional costs associated with an integrated program and determine if the additional benefits are greater than the additional costs.

To assess net-benefits of the Integrated Chagas' Program compared to the costs of a series of single projects the evaluator will require:

1. A cost-effectiveness study for an integrated program and a cost-effectiveness study for each of a series of single projects;

2. an assessment of the research benefits and costs of a multi-disciplinary program compared to the similar aspects of a single (or series of single) research projects;

3. a net-benefit study of integrated programs compared to a similar study of single projects.

Study 1 (cost-effectiveness) is ordinarily completed for IDRC projects and thus should be available for the Chagas' Program and other projects funded by IDRC in South America. Cost-effectiveness studies require the evaluator to identify all costs of a program and then determine incremental benefits (usually measured in dollars) from the program. There are many problems associated with actually conducting a cost-effectiveness study but the logic of the exercise is simple enough (assuming that all benefits are incremental and costs are, for IDRC purposes, easily specified).

Study 2, a comparison of the benefits of a multi-disciplinary project with those of a single project requires some comment. IDRC funds at least four possible types of projects: a single research project, a single research project with supporting resources (eg. for dissemination), multi-disciplinary projects and multi-disciplinary projects with supporting resources (eg. training or dissemination). This last type of project is referred to as an integrated project and is the one of interest in this evaluation. The difficulty for the evaluator is to separate in the research design and in the minds of those being asked the question, the different types of projects. The benefits of a single or integrated project can accrue to the institutions, the researchers, students, beneficiaries, the country and to some sense the IDRC and Canada. The benefits can be measured in dollars or they can be more intangible (eg. enhanced research capability or a better reputation for the Catholic University and the University of Paraguay).

Study 3, a comparison of the net benefits of integrated projects compared to single projects would simply refine the work done in Study 1 and 2 by adding any extra costs

not already identified if they have not already been included, and in summary form make a statement about the net benefits of one type of project compared to other types. Since there are four types of projects the ideal comparison would be among the four types identified earlier but in the case of Chagas' the comparison will likely be made between two types of projects - single and integrated.

If all of the work has properly been done for Study 1 and 2, then Study 3 is a simple integration of the results of Study 1 and 2. Since Study 1 is customarily carried out by IDRC can Study 2 be done?

The methodology for a comparison of multi-disciplinary integrated projects with single project would ideally consist of a review of files and documentation in Paraguay, interviews with officials researchers, students and the beneficiaries or recipients of the research. Because the study is focused on The Catholic University and the University of Paraguay, the Study team should have a good understanding, or obtain one, of these institutions. To do so, he or she, should be able to answer questions about the history of the administration, its quality, outside involvements and any large changes in the fortunes of the institution. Any or all of these institutional factors can swamp the effects of any differences between types of projects.

1.1 The Problem of Specifying Additional Costs

Typical additional costs of an integrated program are easy to identify. Many of them are human resource costs for IDRC. One can assume as a working hypothesis that some costs (eg. more time spent consulting with colleagues in other areas to secure their agreement) are unique to an integrated program and therefore a genuine net increase in cost which can be attributed to running an integrated program.

One measurement problem is to separate perception from reality. Program officials may feel that an integrated project takes longer and involves more work than a single project simply because an integrated project has a longer life span (in this case 3 years) and seems to involve greater effort (eg. of coordination).

One question for the evaluator will be determining the extra administrative costs over a period of time. This is likely to be difficult since most officials will not know the exact allocation of their time, officials change, and the amount of effort required will vary over the life of the project. An integrated program may have been difficult to mount (at the beginning) and have required less effort once it was underway. Program records in IDRC are unlikely to be available to allow a precise enough answer to the question of how much effort is involved. Doing a survey of program officials after the fact is likely to produce unreliable information - people's idea of how much time was spent on a project a year ago is notoriously inaccurate. Asking for information for a period three to four years past will produce unreliable information.

A complex and long running project may seem more arduous to manage but it may be more useful to the recipients because of the long term nature of the support. Research and development take time, and stability of funding probably produces benefits which may not be captured in the estimates of cost-effectiveness. The success of the project may have helped the institutions involved to obtain other funds or projects unrelated to the Chagas' program allowing the institution itself to be more effective (eg. by training more students or mounting additional research programs). These benefits which may or may not accrue to single projects are hard to quantify and harder to evaluate (ie. to determine if they truly are incremental effects of the program).

IDRC may have enough information in program records to create proxy indicators of level of effort and thus be able to sum across a series of projects to determine if, indeed, there are additional costs to mounting and managing integrated projects. Typically,

project/program records are incomplete, missing and not easily comparable so care has to be taken if such an approach is chosen.

Most of the same points can be made about extra costs borne by the institution. Researchers and officials within the Chagas' Program may see the multi-disciplinary Program as more difficult or "more troublesome" without really examining the efforts they put into obtaining research support for a comparable level of effort (ie, $.6M CAD). An additional problem for researchers inside Paraguay is their perception of the research tasks they are working on and the source of the funds. If the institutes and people involved have been supported over a number of years in may different ways it may be difficult for officials or researchers to separate their opinions about one source of funds from their opinions about the general state of affairs at their institution.