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REPORT OF REVIEW TEAM EVALUATING
THE FOOD WASTE/SANITATION
COST-BENEFIT METHODOLOGY PROJECT

- Guatemala -

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REPORT OF REVIEW TEAM EVALUATING THE
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AUGUST, 1976

Submitted by: C. Frank Consolazio
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Introduction

The original contract for the project in question became effective in June, 1971, with the University of North Carolina (UNC) as prime contractor and the Institute of Nutrition of Central America and Panama (INCAP) as subcontractor. The purpose of evaluation at this time "is to determine what scientifically useful knowledge will have been acquired if the project is terminated at the end of November, 1976 as contrasted to the results which might be gained if the project is extended, as proposed, through December, 1978."

In particular the review team was asked to:

1. review background and results to date, and
2. review current forward policy.

The report begins with the statement and re-assessment of project objectives and hypotheses. This is followed by an appraisal of current institutional capabilities for pursuing these objectives. The third section is a more detailed review of methodology and progress to date. The final section contains a series of recommendations growing out of this review.

Objectives and Hypotheses

The project was originally designed to evaluate, in quantitative terms, improved environmental sanitation and improved nutrition on:

- O₁. the prevalence of gastro-intestinal diseases; and
- O₂. the extent of intestinal malabsorption associated with these conditions and the resultant amount and cost of food wastage due to malabsorption.

The current project focus remains on these objectives except that improved nutrition through supplementation has become infeasible. In line with these objectives, three hypotheses have been established for testing in the project.

H₁. A population living under unsanitary conditions will have an increased prevalence of diarrheal morbidity.

H₂. A population with a high chronic prevalence of diarrheal morbidity may have an increased degree of food wastage due to intestinal malabsorption.

H₃. The losses from intestinal malabsorption of food (in terms of nitrogen, fat, and calories) can be of significant economic importance and the results from the village populations can be extended to the population at the regional and national level.

In general, these hypotheses are significant and remain reasonable. From a planning perspective, however, it is unlikely that project results will be directly transferrable to the regional or national level. This is so because of unquestionable variation in dietary practices, sanitary conditions, and costs of improved sanitation. From a planning standpoint, therefore, the important consideration is methodology, rather than results.

Moreover, to be useful for planning the methodology must be sufficiently simplified to be routinely applicable. In the future of the project such simplification must be given substantially increased attention. Even the methodological potential is necessarily limited, however, in that: it will not include the basis for direct comparison with alternative forms of public investment; it will exclude non-health benefits of improved water supply and sanitation; and it will fail to include certain health benefits, e.g., the economic impact of improved productivity.

While the above limitations must be recognized, project results should be of considerable scientific and planning interest. In this regard, however, considerably more attention must be given to analysis at the household level than is suggested by the above hypotheses. The multiple sources of longitudinal information provide a rich opportunity for multivariate analyses of differential impacts within a community which has received only superficially uniform interventions.

Institutional Capabilities

Both UNC and INCAP are unquestionably competent institutionally in the areas of investigation. In general, the personnel at these institutions are highly qualified and dedicated. There is some question, however, whether responsibilities for field activities and for data processing and analysis are being delegated and coordinated for maximum effectiveness. Excessive centralization of control within a few key people appears to have caused past delays in the collection, verification, processing, and analysis of data. Evidence of improvement in this respect is noted, however.

Two specific areas of needed competence are a cause for concern to the reviewers, bearing in mind the increasing importance of complex analysis. First, the new availability of a powerful computer at INCAP has led to a centralization of data processing responsibilities there, and as a result it is not clear that the present project will receive the statistical and programming support it needs in competition with other INCAP project activities. It is the fear of the reviewers that the availability of improved computer capabilities at INCAP will lead to a reflexive attempt to utilize that facility without adequate consideration for the availability of personnel to utilize it effectively and without sufficient concern for the time required to gain familiarity and proficiency in the operation of a new installation.

The second cause for concern is the absence of a competent epidemiologist on the project. Such an individual could have been helpful from the beginning, but now that an impressive quantity of information has been collected, his input is critical in the appraisal of its relative value and in the assessment of complex inter-relationships.

The question of quality control is still a major factor (as reported by Dr. Roberto Schneider) and when instituted this should provide better information on the analytical data (Hb, serum protein, etc.). The use of a new planned protein method is not a standardization procedure. Quality control samples are available at many pharmaceutical houses. Comparisons made between INCAP and UNC show large discrepancies in the bomb calorimetry (K cal) stool data, anywhere from a -25 to -807 calories difference.

Dr. Schneider feels that these discrepancies could be resolved by purchase of a new bomb calorimeter. This funding should be deferred, since it is essential that all analytical procedures be the same throughout the study. Data from a new bomb calorimeter may make it more difficult to interpret the data.

The addition of Dr. O. Pineda, Chief of the Biochemical Section, will enhance the quality of the analytical data, and the analytical data processing.

Another strength which has accrued in the course of the project is a well-functioning field program of intervention and data gathering. The piped water system is in place and gaining increased acceptance in Guanagazapa; the health education program is likewise well-established and reaching increasing numbers of villagers; and the various survey instruments are now routinely operational.

The loss of Marilyn and Jacques Faigenblum does not now appear to be a major factor in the health education program, since Dr. Schneider feels that local (Guatemalan) personnel are sufficiently trained to continue this program.

In spite of the above encouraging assessment, a number of specific concerns about priorities and mechanisms for data collections did emerge and will be developed in the next section. The one major shortfall in program development has been the forced limitation of metabolic ward studies to adult males in the community. This raises questions about their value and complicates the analysis of their representativeness of family conditions.

Although the review team was generally satisfied with data gathering efforts, much remains to be done in the processing, analysis, and interpretation of the massive volume of data that have been collected. In the past, part of the problem has been the need to revise information collected in earlier surveys in order to make it compatible with information collected later according to revised survey instruments. Hopefully, this difficulty has now been overcome. Several additional things remain to be accomplished, however. First, more rapid editing of raw data is necessary. While one cannot dispute the need for "clean" data, one must also guard against delays resulting from excessive surveillance imposed by one or two persons. Secondly, duplicate tapes of cleaned data should be made available promptly to both INCAP and UNC. Third, master registers of information available by individual and household should be established for purposes of control and linkage of the various data sets. Fourth, detailed plans for analysis must be developed. Responsibilities for analysis at UNC and INCAP need to be specified clearly in order to avoid duplication and insure coordination of effort.

Review of Specific Methodology and Findings to Date

The rationale for the individual survey instruments is generally sound, and their inter-relationship is clear. Overall, however, the result appears to have been an over-burdening of field staff.

An important aspect of data analysis will be a determination of the usefulness of specific survey instruments and items of information collected. Such analysis will be essential for the preparation of a

manual of methodology for future use. In this connection, an appraisal should be made of the frequency with which each survey should be administered in this project.

Moreover, the team feels that the collection of monthly census data has been an unnecessarily time-consuming effort which has not been adequately coordinated with the morbidity information. At each household visit, for example, an explicit determination might be made of family members at risk of morbidity. This would lead to such code categories as: not present during the recall period; present but not sick; present and sick. In addition to improving the integration of morbidity and census information, the proposed procedure would serve as a check on the completeness of morbidity reporting. At the present time, absence of a morbidity record can be due either to the absence of reported morbidity or to the failure to process a record of reported morbidity.

The morbidity survey itself also needs to be streamlined. The present survey is comprehensive in that a wide range of conditions are sought with equal diligence and detail of attention. Yet the analysis is concerned largely with diarrhea. The data collection efforts should more nearly conform to the analytical interests. For example, point-prevalence rates for diarrhea should be obtained through a question such as: Did anyone in this household have diarrhea yesterday? This would yield a measure of person-days of diarrhea per 1,000 persons per year to be related to an economic measure of food wastage from diarrhea.

Finally, a careful assessment needs to be made of the need for a control area, given the virtual impossibility of selecting an area which

is truly comparable to the study area. To what extent and in what ways has Florida Acetuno served as a useful control in the present study?

Analysis to date has been conducted largely at the community level and has produced: (1) evidence of a reduction in diarrheal morbidity in pre-school children in Guanagazapa; (2) no clear-cut evidence of change in malabsorption among adult males; and (3) improvement in d-xylose results in adult males in Guanagazapa. These results are of limited value in view of the fact that metabolic ward data are not available on children, where morbidity change has taken place and the meaning of the d-xylose findings in relation to absorption of the normal diet is not clear. Future analysis must therefore concentrate at the household and individual levels where linkages can be made between morbidity experience, sanitation practices malabsorption results, etc. Analysis at this level may be sensitive to meaningful differences within communities. The analysis should also bridge the gaps between the different population groups mentioned above.

Since adult males tend to spend considerable time in the field away from home and the source of potable water, the impact of potable water on their drinking water habits is unclear. This consideration, along with the fact that metabolic ward data are available on adult males only, leads to the recommendation that water utilization of metabolic ward subjects relative to the rest of the population be a matter for special study.

The new D-xylose data appeared to be very interesting but may not be a true measure of intestinal dysfunction. In addition, the D-xylose data should be correlated with the incidence of diarrhea. This could also be another evaluation of morbidity.

Comparison of multiple results from the same 50 individuals, measured with D-xylose at frequent intervals showed the same trends as the total population that were studied. The question arises as to what the D-xylose data actually represents with respect to malabsorption of dietary protein, fat and carbohydrate.

The evaluation of diarrhea in this study is still puzzling since it is assumed that 12 bowel movements (BM) in 3 days is considered to be diarrhea. Clearly a high fiber diet is not producing more than 3 bowel movements a day, in this populations.

Evaluation of diarrhea must be standardized. In the recent review, the bowel movements were less than 2/day in 3 subjects. However, the 1976 reports 3 BM/day as being one criteria for diarrhea.

Since no new data were presented on nutrition surveys in the report (although presented orally by Dr. Roberto Schneider) it would have been very interesting to see the actual data, since it was reported that the dietary patterns have changed due to inflation (more corn - less beans). More information is required to estimate baseline food data in the villages.

It is very difficult to evaluate the status of data when they are not available (anthropometry, nutrition surveys, etc.).

Absorption - Malabsorption

In general, the overall study is technically sound but additional up-dated information is required to evaluate the plans for future work.

The major factor is that the reference population of soldiers is inadequate in numbers (13) to project important baseline information. The number of soldiers should have been increased, if at all possible. The UNC group should have determined the statistical number of subjects required.

Also, the use of Guatemalan soldiers may not be sufficient to represent the true goals of intervention since they already have some degree of acquired chronic intestinal disease. Dr. Schneider should make comparisons with his and Dr. Calloway's data on North Americans and Guatemalan City dwellers consuming the corn/bean diets.

The exclusion of "diarrhea" patients in the metabolic ward from the food waste calculation, because of excessive losses is a problem that must be rectified (more than 12 BM in 3 days). These data should provide several estimates of differing assumptions. The original design of the study was to investigate free living people, so isolation of diarrhea patients would complicate interpretation of data. Of course, one major problem is to predict the real cost of diarrhea.

Diarrhea morbidity can be used as a measure of intervention benefits. For example -- (a) Metabolic Ward diarrhea losses minus Metabolic Ward losses = an additional loss/day. (b) Diarrhea costs times the villager days/year = the cost of diarrhea in food/year.

One advantage of the approach is that diarrhea morbidity data are likely to and already show trends reflecting the impact of intervention. on the other hand, the disadvantages of multiplying soft numbers may be changed by shifting emphasis to harden those numbers.

The food wastage -- malabsorption of soldiers may be the best. population as a point of measurement. The savings year by year in the villages due to food wastage in a longitudinal sample can be compared to the best population in the world. Cost benefits should be based on

- (a) economic savings -- k calories versus wastage in rural and other populations,
- (b) savings between rural versus normal groups and
- (c) year by year evaluation based on sanitation.

The relationship of family intakes to malabsorption is essential, however, the dietary intakes were not completed in 1975 for comparisons.

The study to evaluate the digestibility of the rural diets of soldiers showed the importance of adaptation. The INCAP-UNC group must be certain that the selected data are fully representative of the fully adapted individual.

Recommendations

1. Detailed plans for analysis must be clearly specified as an urgent priority. These plans for analysis should be directed toward:
 - a. multivariate analysis at the household and individual levels (see page 3 and
 - b. development of simplified methodology for routine application (see page 3).
2. The "cleaning" of data and organization of files for the above analysis will require substantial and urgent effort (see page 6).
3. Coordination of analysis between INCAP and UNC must be established (see pages 3, 4 and 6).
4. An epidemiologist is essential to the analysis (see page 4).
5. Investigate the maximal influence of food preparation between families at Guanagazapa who have had a good water supply and some training in health education to those in Guanagazapa who had none (see last para. page 5 and page 8).
6. Consideration should be given to metabolic and other studies in children. This group is more prone to diarrhea (see page 8).
7. Major changes in diarrhea morbidity have been reported in children, however, details of the types of bowel movements (loose-solid) have not been detailed.
8. Investigate and determine the meaning of observed D-xylose trends (see page 8).
9. Standardization of diarrhea nomenclature (see page 9).
10. Data processing and analysis should attempt insofar as possible to estimate the cost of diarrhea and economic benefits of intervention (see page 10).

11. Field work should be completed by November 30, 1976. While the review team feels that further data collection can not be justified in terms of expected contribution to project objectives, the team does feel that further analysis of present data can substantially sharpen the findings in relation to these objectives and may well produce significant hypotheses to serve as the subject for a future research proposal. The team recommends, therefore, that an additional year at an adequate budget level be provided for project completion.

C. Frank Consolazio
C. Frank Consolazio

William A. Reinke
William A. Reinke

Though unable to participate in the second session of the evaluation, Dr. Rosenberg has reviewed the data presented and concurs in general with the narrative report. He concurs also with the thrust of the recommendations as they appear in the narrative, but differs somewhat from the recommendations at the end of the report-in particular recommendation #11. The reasons for these differences are stated in the annex, along with some suggested changes in emphasis of the general report.

Irwin H. Rosenberg
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September 27, 1976

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Joe Stockard
Tropical Medicine Advisor
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Department of State - AID
Washington, D.C.

Dear Joe:

Enclosed is a copy of some of the comments which I added to the project site visit report before sending it on to Reinke. I think the comments pretty much speak for themselves.

I did not want to let this whole matter pass by without taking the opportunity to express my appreciation for the way in which you handled this whole site visit and follow up report. We were as well briefed and prepared as was possible before we went there and your interaction with us subsequently was always supportive without being guiding and judgmental. Your mixture of sensitivity and critical review of the activities on this project have been a model, in my view, of the kind of interaction we should be having with programs overseas. With such staff activity, you can count on my help in the future.

Sincerely yours,



Irwin H. Rosenberg, M.D.
Professor of Medicine
Head, Section of Gastroenterology.

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ANNEX TO REPORT OF REVIEW TEAM EVALUATING FOOD WASTE/SANITATION COST -
BENEFIT METHODOLOGY PROJECT - submitted by Irwin H. Rosenberg, M.D.

As previously indicated this is a well conceived and well drafted report and I am happy to have been a participant in the first review. I would like to make a few comments on emphasis and still others on details, and I would like to address myself to the substance of some of the recommendations.

There is no question in my mind that the report of this research project, whatever it's outcome, will have policy implications far beyond those that were planned in the initial study design. This report is referred to in position papers within the World Bank, in task force statements within the National Academy of Sciences and I am convinced by discussions with individuals in various sectors in U.S.A.I.D. that the results of this report will have an impact far beyond those which are stated on page 2 of our review report. On page 2 it is stated that "it is unlikely that project results will be directly transferable to the regional or national level". "From a planning standpoint, therefore, the important consideration is methodology." I disagree with this perception. I believe that the results of a well designed study in rural Guatemala will have implications not only for other parts of Guatemala and Central America, but probably for other parts of the world as well. I don't think that the primary output of this report will be in the area of methodology. Certainly many different methodologies were employed here and much will be learned from this experience which may be applicable to similar studies elsewhere, but in fact the proximate output of this study will be to seriously influence thinking of planners and investigators much beyond the confines of coastal Guatemala. I would have preferred to have deleted the last six lines on page 2.

On the bottom of page 5 I agree with the attention to the short fall produced by the selection of adult males for the detailed metabolic and absorption studies. I think that decision was probably valid at the time that it was made, but we should now recognize that that probably was not the most sensitive population to study the impact of the water supply, rather it was the most accessible population. I don't believe we should let that short fall negate the other positive results of the study.

Annex

As stated on page 8, I disagree that the lack of absorption data on children seriously limits the value of the change in diarrheal morbidity which was observed in that population. I don't consider it necessary to have detailed absorption studies in children in order to make some estimations of the food waste in a population due to diarrheal disease or the food savings in a population due to prevention of diarrheal disease. The fact that diarrhea produces malabsorption in children as well as in adults is well documented and it would be entirely appropriate as an initial approximation to take the percent loss in nitrogen or calories documented in adults with diarrhea and apply that approximation across the population. I am particularly impressed with the improvement in diarrheal morbidity induced in relation to the water supply, since I believe that this is the population which must be addressed if the more permanent changes of tropical enteropathy are to be prevented. Indeed this is also the population where the morbidity and mortality from diarrheal disease is the greatest. In the same context it is of interest that some studies have noted a relationship between diarrheal disease and xylose malabsorption and indeed the improvement in xylose absorption referred to on page 8 and 9 of this report in adult males reflects, in my judgment, a combination of improved absorption and improved diarrheal morbidity.

A minor note refers to the bottom of page 10. Is this not meant to say that soldiers may not be the best population as a point of measurement?

Recommendations: Noted above, I feel that most of the recommendations are embodied in the report and may not have required enumeration. I hope that anyone reading the recommendations will clearly refer to the text as recommended by the references to text in the recommendations. I would take some issue with a few of the recommendations.

Recommendation #6: I doubt the feasibility of doing metabolic studies in children. As noted above I do not think that such studies are necessary but that it would be possible to make some predictions of food savings by extrapolating from studies in adults. Indeed I expect that such extrapolations would almost certainly be underestimations.

Recommendation #9: I agree with the recommendation to standardize and further define diarrheal nomenclature but I can't see how this can really be accomplished without permitting some period of continued surveillance and data-fathering in the field. This leads me to:

Annex

Recommendation #11. My major problem with the report has to do with this recommendation. The tone and substance of the narrative of the report did not prepare the reader or even me for this recommendation. After carefully reviewing the last series of data presented to the review team in August, I must conclude that the initial hopes that the impact of the intervention would be able to be visible within 2 or 3 years was simply too optimistic. In my view the investment in this project and the possibility for improvement as outlined in this report testifies enough continued fundings so that the early projections seen here and the improvement in diarrheal morbidity, in xylose absorption and in the specific impact of diarrhea on absorption should be further pursued. Rather than stop all field work on November 10, 1976, I would have preferred to recommend a cessation of the metabolic ward studies on adult males as it seems very unlikely that these studies are going to produce really helpful data within a finite time span. This may be the least sensitive population of all. If any metabolic studies were continued I would have preferred to see them addressed in a very defined way to the impact of diarrhea on malabsorption into a better definition of a "normal" base line. I do believe however that the data on diarrheal morbidity should continue to be collected for at least another 24 months. If this were done without continuing to collect an enormous amount of other morbidity data which is less relevant to the study, and the whole process were streamlined, I think that the project could be continued at a sharply decreased budget for field activities with attention to the most important kind of data outflow. I do however endorse the portion of the recommendation here that enough support be given to analyze the other data which has been collected, although I would once again choose the priorities of this kind of analysis on the basis of a review of some of the initial correlations.

Footnote: I continue to be greatly impressed by the kind of data presented in Table 4 of Set 3A. In particular I note sharp decrease in nitrogen absorption associated with diarrhea. If, as would appear to be the case here, the prevention of diarrhea for a single day would prevent the loss of one third of the absorptive capacity for nitrogen relative to the non-diarrheal population, then the implications of the changes in morbidity data for diarrhea become enormously important. Thus I feel it is very important that we continue to exploit the base of data with some continued collection of data on diarrheal morbidity.