Training Honduran Health Workers and Mothers in Infant Acute Respiratory Infection (ARI) Control

John Elder[1,4]
Peter Boddy[1]
Patricio Barriga[2]
Ana Lucila Aguilar[3] and
Hector Espinal[3]

1. San Diego State University
2. Academy for Educational Development
3. Honduras Ministry of Public Health
4. This research was supported by USAID contract DSPP-C-0023 and the Academy for Educational Development. The authors would especially like to thank Lic. Nora de Noren, Dr. Fidel Barahona, Dr. Mark Steinhoff, and Dr. Judy Graeff for their invaluable assistance.

Short Title: Training Honduran Workers and Mothers
Key Words : Acute Respiratory Infection, village health workers, health education/ promotion, behavior modification

Bulletin of the Pan American Health Organization, in press

Correspondence to:

John P. Elder
School of Public Health
San Diego State University
San Diego, CA 92182

1990

Abstract

The Honduras Ministry of Public Health, with consultation from the Academy for Educational Development's HEALTHCOM project, has conducted a countrywide study looking at patterns and correlates of, as well as interventions for, acute respiratory infections (ARI) in children in Honduras. Following, a population-wide ethnography, an intervention was designed to communicate to the mother how to detect ARI at early stages and what actions to take during mild, moderate, or severe episodes. Procedures included radio communication, behavioral training procedures, and incentives for both health workers and mothers for disseminating and learning the specifics of ARI control. Results showed that the improved effectiveness of the use of behavioral training procedures (including demonstrations and practice) by health workers contributed substantially to mothers' abilities to manage ARI in their children.

INTRODUCTION

Acute respiratory infections refer to diseases or pathologies of sudden onset in the respiratory tract caused by infectious agents. In many parts of the developing world, Acute Respiratory Infections (ARI) has become the principal cause of death in children under the age of five years, and particularly in those of less than one year of age (1,2). The great majority of these deaths due to ARI are preventable, a fact that is not widely recognized (3). The central problem is not specifically the incidence or occurrence of ARI in children, which appears to be comparable in both the developing world and developed areas (4-9) but instead the significantly greater mortality and severe morbidity requiring hospitalization resulting from ARI in children in the developing world as compared to the developed nations. Reducing mortality in children from ARI is a priority for all developing areas (10-13).

Acute respiratory infections were the leading cause of death of Honduran children under one year of age in 1987 and the third cause of death in children between the ages of 1-4 (14). Using a modification of the then current WHO classification scheme (15), the Honduran National Nutrition Survey of 1987 (9), found that 69.6% of a sample of 3,406 referred to an episode of ARI in children under the age of five during the 15 days preceding the survey interview.

No one single intervention is considered to be adequate to achieve a reduction in mortality from ARI (16). Current case management of ARI relies on the ability of the mother to detect signs of moderate or serious disease in the child, and to take the ill child to the health worker (17). The

health worker is likewise trained to detect signs of moderate and severe disease, and to provide treatment or referral as necessary (11,16,18). Two other components are essential to an ARI control program: 1) Community education in order to teach families about the importance of recognizing the signs of ARI (which this paper describes), and 2) research to identify local terms and beliefs regarding ARI which, in turn, informs the development of programs for training mothers and health workers (5,14,18).

This report presents the results of a study of behavioral approach to acute respiratory infections control in Honduras (16). Ultimately, the success of any ARI control or other child survival program can only be evaluated in terms of the reduction in morbidity and mortality among infants and young children in a targeted area. Mortality reduction involves the only detection and treatment of pneumonia and other severe lower respiratory infections. The specific, short-term purpose of the present program, however, was to improve both general community and specifically health worker ability to recognize and respond appropriately to childhood ARI. Therefore, our evaluation emphasized these specific targets.

METHODS

Research Setting and Subjects

Design. The multiple baseline design (19) consists of initiating baseline or preintervention observations at all sites at the same time, then implementing the intervention at different and successive times at each site, followed by post-intervention observations (see Figure 1). Potential temporal biases are addressed through this staggered intervention. Moreover, multiple baseline and other time-series data allow one to visually

observe whether a predicted effect actually occurred and what the stability of this effect was. It is particularly advantageous over significance-testing when the sample size is limited by the unit of analysis (in this study, four pairs of communities).

Subject and site selection. The study had two subgroups of subjects nested within groupings: health care workers (HWs) and mothers (with related and/or social support network persons). HWs participating in the study were those assigned to sites selected by the MOH on the basis of general representativeness. Mothers and other participants in the health education sessions presented by the HWs were essentially volunteers (i.e., they indicated an interest in attending such a class) or happened to be present at the health center when a presentation was made. Community survey subjects were obtained by visiting every second or third house or dwelling (depending on the size of the village), on streets or other areas of a data collection site, with a different street or area surveyed during each observation period. Participants in the knowledge demonstration contests ("sorteos") were all volunteers who responded to a general invitation to attend.

Target Populations

Two target populations were selected. The primary target was mothers with children under the age of five, and indirectly, those persons who formed part of their social support network. The secondary target was local health care workers (HWs), including physicians, registered nurses, nursing assistants, health technicians, social workers, midwives, and community

volunteers. In most cases, nursing assistants implemented health education activities.

Generally, the HWs worked at one of two local health care institutions in Honduras, both operated and staffed by the MOH. The first local health center is called a "CESAMO," and has at least one physician plus supporting staff. The second is a "CESAR," and is only staffed by nursing and auxiliary personnel. A CESAMO staff usually supervises several CESARs. In 1986, there were 115 CESAMOs and 519 CESARs located in rural villages and semi-rural and peri-urban areas in Honduras.

Data Collection Sites

The intervention was implemented at two sites each in four different areas of Honduras. A site consisted of a rural village with a health center, either a CESAMO or a CESAR. The first area was rural Tegucigalpa; the chosen sites were two small villages, Monte Redondo and Río Hondo, each with a CESAR, approximately 30 minutes by car from the metropolitan area of Tegucigalpa. The second zone was north of Tegucigalpa in the "departamento" (state) of La Paz, approximately one and a half hours from Tegucigalpa. The sites were the relatively large village of Villa San Antonio, with a CESAMO, and the medium sized village of Ajuterique, with a CESAR. The third zone was to the east of Tegucigalpa, in the "departamento" of Olancho, with one site about one and a half hours distant, and the other about two and a half hours distant. The former was Guiamaca, a large village with a CESAMO, and the latter was Concordia, a small village with a CESAR. These six sites were representative of the majority of rural Honduras.

The fourth zone was distinct from the others: La Mosquitia, the tropical Caribbean coast near the border with Nicaragua, is populated mostly by Miskito Indians many of whom speak little or no Spanish. The two sites selected were Puerto Lempira, a large village with a CESAMO, and the small village of Mocorón, with a CESAR.

The sites were numbered for identification purposes within the pilot study. The numbering had no other significance. The sites were numbered as follows: 1) Monte Redondo; 2) Río Hondo; 3) Villa San Antonio; 4) Ajuterique; 5) Guiamaca; 6) Concordia; 7) Puerto Lempira; and, 8) Mocorón.

Intervention

The intervention consisted of two basic parts: healthworker (HW) training and education of mothers with promotion of new behavioral responses.

Healthworker training. HW training had two emphases: the basic educational message and education/communication techniques. The object of the training was to enhance and utilize HWs as agents for immediate and long-term communication and initiation of behavior change in mothers, specifically, and in the community at large, in general, in regards to the recognition and management of childhood ARI.

The basic educational message emphasized that mild ARI, characterized by an irritated throat, light fever, pain in the ears, cough and/or runny nose, could be treated at home. Methods for this included giving a lot of fluids, continuation of regular (including breast-) feeding, looking for and lowering fever as appropriate, keeping airways clear, and humidifying the air. High fever, difficulty in breathing, a deep cough and/or greater pain

in the ears indicated a more severe level of ARI episode. In such cases, the message emphasized the need to seek immediate professional care from the nearest health post or center.

The message training reviewed the basic educational message, emphasizing the key concepts of ARI control and inculcating the idea that the message should be delivered as simply and clearly as possible. Traditionally, HW training focused on a topic area that HWs should present to their audience, such as "acute respiratory infections in children," and provided up-to-date, comprehensive information on that subject. HWs would then select those aspects of the information they considered important and present them, commonly trying to "cram" as much knowledge as possible into the small periods of time usually available for health promotion activities. The present training, in contrast, specifically emphasized the key concepts of the recognition and management of childhood ARI. A flip chart presenting these key concepts in pictorial form was prepared to assist in guaranteeing the integrity of the basic educational message and to facilitate HW presentations.

Education of mothers and others. The ultimate purpose of the intervention was to train health workers to, in turn, provide mothers of children under the age of five, and members of their social support networks, the capability of recognizing the signs of mild and moderate to severe ARI, and establish appropriate behavioral responses to both. The latter refers to home management of mild ARI and visiting a health center or a private physician for moderate to severe ARI. The elements used to achieve this purpose were the following:

1. An educational session presented by a health worker, which introduced, explained, and illustrated the basic educational message to mothers and other attendees. The effectiveness of the session was augmented by the communication and behavioral skills from the HW training and the use of the flip chart. The health worker was specifically instructed to use a skills training rather than health education approach, including having the mothers specifically practice their new skills and receive immediate feedback.

2. An illustrated booklet, "comic" book style, was prepared to present the basic educational message directly, clearly, and agreeably.

3. A contest/drawing or "sorteo," under the auspices of the health centers, was held at least once in each area, serving several purposes. It promoted and drew attention to the ARI control program, served as a stimulus to get involved in the program, and reinforced learning. Only mothers and women of childbearing age took part in the contest. On the contest day, people gathered together and one by one participants appeared before the whole group. They were each asked four questions about ARI recognition and management, which had to be answered orally in front of everyone.

If the participant answered the questions correctly, she was asked to demonstrate to the audience what she would do if her child had a runny, congested nose. Several items, such as clean cloths or toilet paper, were made available for her to use in her demonstration. If she was successful, her name was entered into a drawing for a small package of grocery items. After everyone who wanted to had answered questions and demonstrated behaviors, the drawing was held among those who had successfully performed,

and three persons won prizes. Everyone who attended received an ARI control program calendar and a new handkerchief with the program logo. As each mother listened to the questions she was asked to answer and gave answers, so too listened the entire gathering, such that all those present were exposed to multiple repetitions of the key concepts and appropriate responses.

Procedure

The intervention began with the health worker training. In accord with the multiple baseline design, the intervention was introduced in each of the four areas at different times (i.e., between different observation periods), with the two sites in each area beginning at the same time. There were five observation periods of two weeks each with one observation per site per period.

The HW training in Area One was held between the first and second observations; in Area Two, between the second and third observations; and in Areas Three and Four, between the third and fourth observations.

To provide an adequate comparison for BL and PI observations, regional supervisors were asked (by pilot study personnel) to instruct HWs to schedule talks on ARI, and that people might visit their health center at that time. No HW was asked to give a "spontaneous" or "surprise" talk on ARI. Thus, in effect, conventionally prepared ARI talks are compared to those inspired by the HW training. The presentations were made at a health center or other community locale. Volunteer attendees were recruited from persons who had arrived at the health center for a medical or health service or who had come specifically for the presentation.

The booklets were distributed by HWs through the health centers and to all those who attended the educational presentations, where they served as a reinforcement to the talks. People could also take booklets to distribute to their friends and neighbors.

The "sorteos" were announced one to two weeks in advance at the health center corresponding to the sorteo site. On the day of the event, cars and trucks with megaphones circulated throughout the village and surrounding area, promoting the sorteo and inviting people to attend. Health center personnel also walked throughout the village and personally invited people to attend. The sorteo was coordinated and presented by pilot study personnel with the assistance of health center staff. This allowed HWs to experience how the sorteos functioned so that they could direct them at their sites in the future. Calendars and handkerchiefs were distributed to all sorteo attendees.

Observations and Evaluation

Evaluation of intervention results was realized by observing HW performance in their educational presentations, assessing the effects of the presentations on mothers and other attendees and surveying residences in the communities surrounding health centers at observation sites for knowledge on ARI. Three instruments (described below) were used to make observations. Data from each completed instrument were codified and entered into computer files at the end of each observation period.

Using three different instruments, a team of two observers conducted an observation at each site once every two weeks. The first instrument was an assessment of the HW presentation, specifically concerning the message

content and education/communication techniques used by the HW. Both members of the observation team sat in the rear or behind the audience, and each completed an instrument during the presentation. Before the presentation, the observation team greeted the HW and informed her/him that they would be present and were evaluating the audience.

The second instrument was a pre/posttest of the attendees. Immediately prior to initiation of the HW presentation, the observation team interviewed those who were going to attend and completed the pretest (second instrument). At the termination of the presentation, the same attendees were interviewed again and the observers completed the posttest for each one.

The third instrument was termed the community survey questionnaire and was completed by the observers at the conclusion of the HW presentation. Observers left the health center and visited every third residence in the surrounding community, interviewing mothers or others. Interviewees were first asked if they had been interviewed previously. If they answered affirmatively, the interview was suspended and the observer proceeded to the next residence.

Observers. The observers were recruited by from MOH personnel. There were four regular observers: two nurses (RNs) and two social workers, all females. Point-to-point percentage agreements between pairs of observers was calculated for each site. Mean reliabilities ranged from 76% to 91%, with an overall mean of 83% agreement.

Instruments. The three instruments were questionnaires to be completed by the observers. The first instrument was based on an observer's

observations; the second and third instruments were interview questionnaires. The instruments were pretested on staff and field tested.

Instrument one (Q1) consisted of 57 items divided into four sections: identification, information about the HW presentation, personal data about the HW, and information about the presentation itself.

Each healthworker received two summary scores for each presentation. One summary score was concerned with the educational message content of the presentation, while the other related to the education/communication techniques employed by the HW in her/his presentation.

The message summary score indicated to what degree the key concepts of the basic educational message of the intervention were included in the HW presentation, and had no implications concerning the effectiveness of the presentation. A summary score of educational and communication techniques used by the HW in her/his ARI presentations was also devised. The technique summary score was only related to the manner of presenting the message and had no implications for the content of the message. The range of possible scores was 0 to 18.

Instrument two (Q2) was applied by interviewing attendees of the HW presentations. Interviews were conducted before and after the presentation, such that there should have been a pretest and posttest Q2 for each person interviewed. A summary score of responses related to the recognition of signs of childhood ARI and appropriate management was devised. This score facilitated comparisons of changes between pretests and posttests, as well as within and between series comparisons of pre/posttest changes. The pretest score was then subtracted from the posttest score to

determine what change occurred after the HW presentation. The change was reported as positive, negative, or no-change (zero).

Instrument three (Q3) was completed by interview of community members as described previously. Observers filled out one questionnaire for each person interviewed. A summary score was formed which joined together responses related to the recognition of the signs and appropriate management of childhood ARI. This score facilitated comparisons of within and between series community surveys in regard to knowledge of the key concepts in the basic message.

RESULTS

Instrument 1

The total number of the first instruments (Q1) completed during the five observation periods was 87, based on the presentations of 16 different healthworkers (HWs). All of the HWs except one were females. Professionally, 13 (81%) of the HWs were assistant nurses, 2 (12%) were physicians, and 1 (6%) was a volunteer health promoter. Five CESARs and three CESAMOs comprised the eight data collection sites. The most variation of HWs was at the CESAMOs, where sites 3 and 5, Villa San Antonio and Guaimaca, each had four different HWs make the ARI presentations. Two HWs made presentations at the third CESAMO, site 7, Puerto Lempira, and the two physicians and the volunteer health promoter gave presentations at the third site, Villa San Antonio.

Between two to four observations of each HW presentation were made, except at site 4, Ajuterique, during the third observation period, when only one HW observation was made. No HW presentations were made at site 6,

Concordia, during the second observation period, or at site 2, Río Hondo, during the fifth observation period for internal reasons of the health centers.

The message and technique summary scores are averaged by sites and areas and area average scores are reported. This form represents the effects of the intervention on organizational units of the MOH and may include the performance of more than one specific person. Consequently, the area scores are indirect indicators of the efficacy of the intervention, regarding specific effects of the intervention on the secondary targets (HWs). However, site or area summary score averages provide a more realistic indication of the efficacy of the intervention for the MSP.

Area Message Content Summary Scores

The summary scores for the message content of the HW educational presentations are graphed in Figure 1. The results for areas 1, 2, and 4 show clear and notable increases of the message content scores in the post-intervention periods compared to those in the baseline periods. Area 3 PI scores are higher on the average than BL scores, but there was not a clear-cut increase.

Area 1 increased from a BL score of 5 to two PI scores of 11, one of 10, and one of 13. This change was notable after the initiation of the intervention between periods 1 and 2 when scores increased from 5 to 11. The content increases were particularly marked regarding the management of mild ARI, and the recognition and management of worsening and moderate to severe ARI. Area 2 increased from BL scores of 2 and 4 to PI scores of 13, twice, and 12. The intervention was introduced between periods 2 and 3 and

scores increased from 4 to 13. The slight tendency to increase seen in the BL was not sufficient to explain the comparatively high PI increase. The message content particularly increased in the management of mild ARI and the recognition of worsening or moderate to severe ARI.

Area 4 increased from BL scores of 4, 6, and 7 to PI scores of 13 and 11. The intervention was introduced between periods 3 and 4. Scores after the intervention began increased from 7 to 13. Again, the slight tendency to increase seen in the BL was not enough to explain the higher increase seen in the PI period. Message content was notably augmented in the management of mild ARI.

Area 3 showed a PI increase in the message content scores, but the change was not as remarkable as in the other areas. There was a decrease in BL message scores from period 1 to 2. The score decreased from 7 to 5. Thereafter, from periods 2 to 5, the scores increased in a consistent fashion from 5 to 9 to 10 to 13. The intervention was introduced between periods 3 and 4, and the scores changed from 9 to 10.

The average of all BL message scores was 5.5, and the average of all PI scores was 11.8. While it is not appropriate to simply average all BL and PI scores, it does provide an overall indicator, particularly if there were no extreme scores to artificially increase or decrease the averages.

Area Technique Summary Scores

The summary scores of the educational and communication techniques used by the health workers in their ARI presentations are graphed in Figure 2. There were clear and impressive increases of the post-intervention scores compared to baseline scores in all of the four areas.

The BL score in Area 1 in the first observation period was 2. After the intervention, introduced between the first and second observation periods, the technique summary score rose to 10 in both the second and third observation periods, fell to 6 in the fourth period, and rose to 10 in the fifth period. The decrease in the summary score in the fourth period appeared to coincide with personnel problems at both sites of the area. Nevertheless, the PI scores are clearly superior to the BL.

Area 2 had two low BL scores (2 and 3) which rose moderately to 5 immediately after the HW training (initiation of the intervention), then increased to 10 and 12. Area 3 had stable BL scores of 4, 3, and 3. After beginning the intervention, PI scores were 8, then 11, again demonstrating an increasing trend.

Area 4 also had a relatively stable BL with scores of 1, 1, and 2. After the HW training, the first PI score was 9 but dropped to 4. This last score also reflects a personal change at one of the area's sites (site 7), coupled with the one HW (at site 8) who apparently was not affected by the HW training.

In-clinic Interviews of Mothers

The total number of persons interviewed by the observers immediately before the HW ARI presentation, and/or at the termination of the session, and for whom a pre- and/or posttest was completed at the eight sites during the five observation periods, was 519. Of this total, 46 only completed pretests or the interview just before the presentation. The great majority of these were persons who left early for some reason or who left while others were being interviewed. A further 21 of the 473 remaining only

completed posttests or interviews at the end of the presentation. The majority of these persons had arrived just as the HW began her/his presentation or within five to ten minutes of the beginning, depending on what had been said by the HW when a latecomer arrived. If a person arrived after the HW had mentioned more than one key concept, or later than ten minutes after the beginning of the talk, that person was not interviewed.

A total of 452 Q2s were paired pre/posttests of the persons who had attended the HW ARI presentation. Of those interviewed, 91% were females and 83% had children under the age of five. The average age of the respondents was 28 and the range was between 13 and 76. (The 13 year old had a child under the age of five.) Eight of the pre/posttest pairs were incomplete and had to be discarded as summary scores could not be determined.

Figure 3 presents the data from Q2. The pre/posttest difference was obtained by subtracting the pretest summary score from the posttest summary score. This served as an indicator of the net effect which might be attributable to attending the HW presentation. If the difference was positive, that represented a net increase compared to the pretest after the HW educational session. The average differences by area are graphed in Figure 3.

All four of the areas demonstrated significant increases in pre/ posttest differences after the initiation of the intervention (i.e., the HW training). This improvement was clearer in areas 2, 3, and 4. Area 2 had BL pre/posttest average differences of 1 and 2 and PI average differences of 8, 7, and 8. Area 3 had BL average differences of 3, 2, and

2 and PI average differences of 7 and 7. Area 4 had BL average differences of 1, 1, and 2 and PI average differences of 7 and 12. Area 1 results initially appeared ambiguous. The BL average pre/posttest difference was 2, and the following PI differences continued an increasing trend: 3, 4, 7, and 8. The fourth and fifth observation period differences were comparable to those in the other areas.

Community Interview

A general (and imprecise) indicator of the effects of the HW training on the ARI presentations is derived from a comparison of aggregate pre/posttest average differences for all baseline observations with all post-intervention observations. The average differences for all BL observations was 2, and the average differences for all PI observations was 7. Since the summary score had a total of 15 possible, this general average increase of 5 implies an overall increment of over 30% in PI pre/posttest improvement.

Area 1 showed a moderate increasing trend, with a BL average score of 3 and PI average scores of 4, 6, 6, and 8. It is unclear if the trend was the result of the intervention or had other causes. Area 4 showed clear summary score increases after the initiation of the intervention (i.e., the HW training). The BL average summary scores were 1, 1, and 2, while the PI scores increased to 6 and 5 (see Figure 4).

Areas 2 and 3 had similar ambiguous results. There was an initial decline in average summary scores, followed by several scores at the same level, then a slight increase. The overall average of all baseline summary score averages was 3 and of all post-intervention summary score observations

was 7. Though there was a clear summary score increase in only one area, a somewhat ambiguous increasing trend in another area, and equivocal results with possible delayed increasing trends in the other two areas, nevertheless the overall average implies a generalized increase after the intervention (HW training).

DISCUSSION

The purpose of the present study was to increase the ability of health workers and mothers to recognize and respond appropriately to childhood ARI. This integrated communication and behavior change approach to improve the detection and management of ARI generally proved highly successful. Unique features of this study included the training of health workers to function as change agents for mothers, a "sorteo" to supplement the effects of the intervention, and direct observation used as an evaluational methodology throughout the study.

The intervention proved effective in producing a change in health worker behavior in most of the targeted health centers. In addition, a major change in the level of knowledge of the signs and management of childhood ARI occurred in persons who attended the health worker educational presentations. More importantly, this change seems to have generalized to the community as a whole. Finally, it was demonstrated that this intervention could feasibly and effectively be implemented nationally in Honduras.

Health communication, education, and behavior change technologies can serve as important complements to improvements in diagnosis, case control, treatment, and other primary health care efforts. Communication efforts

have proven effective in enhancing child survival through improvement of abilities to respond to diarrhea and treat dehydration, the promotion of immunization, and through other health promotion campaigns. The present study represented an application of state-of-the-art health communication technology to the control of acute respiratory infections. Specifically, we had to determine which behaviors of mothers and health workers to target and, secondly, to enhance their behavior abilities to respond to ARI through a training program which focused on these abilities. This complex behavioral management approach to ARI control advocated in the present intervention would have been very difficult to describe through a mass communications campaign. Therefore, the health communication from health worker to mother was a very important feature of the ARI control program.

While the present study demonstrated the feasibility of enhancing behavioral skills and knowledge of health workers and mothers for ARI control, future research efforts should emphasize whether changes in mothers' practices subsequently occur, and whether actual reductions in morbidity and mortality can be achieved. We also hope to investigate whether it is feasible to implement this health worker intervention throughout the nation of Honduras and in other developing countries. Should this expanded intervention prove effective, we expect to apply similar procedures to the promotion of diarrhea control, vitamin A consumption, and other child survival programs typically addressed through other health education and communications technologies.

References

1. Denny, F. W., & Loda, F. A. Acute respiratory infections are the leading cause of death in children in the developing world. Am J Trop Med and Hyg, 35, 1-2, 1986.

2. Berman, S., & McIntosh, K. Acute respiratory infections. In J. A. Walsh & K. S. Warren (Eds.). Strategies for primary health care: Technologies appropriate for the control of disease in the developing world (pp. 29-46). University of Chicago Press, Chicago, 1986.

3. Chretien, J., Holland, W., Macklem, P., Murray, J., & Woolcock, A. Acute respiratory infections in children: A global public health problem. New Eng J Med, 310(15), 382-384, 1984.

4. Friej, L., & Wall, S. Exploring child health and its ecology: The Kirkos study in Addis Ababa: An evaluation of procedures in the measurement of acute morbidity and a search for causal structure. Acta Paed Scand, Supplement 267, 1977.

5. James, J. W. Longitudinal study of the morbidity of diarrheal and respiratory infections in malnourished children. Am J Clin Nut, 25, 690-694, 1972.

6. McConnochie, K. M., Hall, C. B., & Barker, W. H. Lower respiratory tract illness in the first two years of life: Epidemiologic patterns and costs in a suburban pediatric practice. Am J Pub Hlth, 78(1), 34-39, 1988.

7. Monto, A. S., & Ullman, B. M. Acute respiratory illness in an

American community: The Tecumseh study. JAMA, 227, 164-169, 1974.

8. Pan American Health Organization/World Health Organization. Guide for planning, implementing, and evaluating programs to control acute respiratory infections as part of primary health care. WHO/RSD 186.29. PAHO/WHO, Washington, D.C., 1986.

9. Unidad de Ciencias y Tecnologia. Encuesta nacional de nutrición, Honduras, 1987. (National nutrition survey, Honduras, 1987). Tegucigalpa: Direción General de Salud, Ministerio de Salud Pública, Republica de Honduras (in press).

10. Grant, J. P. The state of the world's children, 1987. Oxford University Press (UNICEF), Oxford, 1987.

11. Pio, A. Acute respiratory infections in children in developing countries: An international point of view. Ped Infect Dis, 5(2), 79-183, 1986.

12. WHO/UNICEF. Report of technical inter-agency meeting on acute respiratory infections, 18-19 March 1986. UNICEF, New York, 1986.

13. World Health Organization (WHO). Global medium-term programme, programme 13.7, acute respiratory infections. (TRI/ARI/MTP/83.1). WHO, Geneva, 1983.

14. Aguilar, A. L. Personal communication, February 8, 1988.

15. World Health Organization (WHO). Case management of acute respiratory infections in children in developing countries. (WHO/RSD/85.15). WHO, Geneva, 1985.

16. Stansfield, S. K. Acute respiratory infections in the developing world: Strategies for prevention, treatment and control. Ped Infect Dis, 6(7), 622-627, 1987.

17. Tupasi, T., Miguel, C., Bagasao, T., Natividad, J., Valencia, L., De Jesus, M., Lupisan, S., & Medalla, F. Child care practices of mothers: Implications for interventions in acute respiratory infections. Ann Trop Paed, 9, 82-88, 1989.

18. Monto, A. Acute respiratory infections in children of developing countries: Challenge of the 1990s. Rev Infect Dis, 11(3), 498-505, 1989.

19. Barlow, D. H., & Hersen, M. Single case experimental designs: Strategies for studying behavior change (2nd ed.). Pergamon Press, New York, 1984.

Figure Captions

Figure 1. Message content summary score (higher scores indicate inclusion of more elements of ARI message).

Figure 2. Technique summary scores (higher scores indicate more elements of behavioral training used by health workers).

Figure 3. Average pre-post knowledge improvement among mothers attending clinic educational sessions.

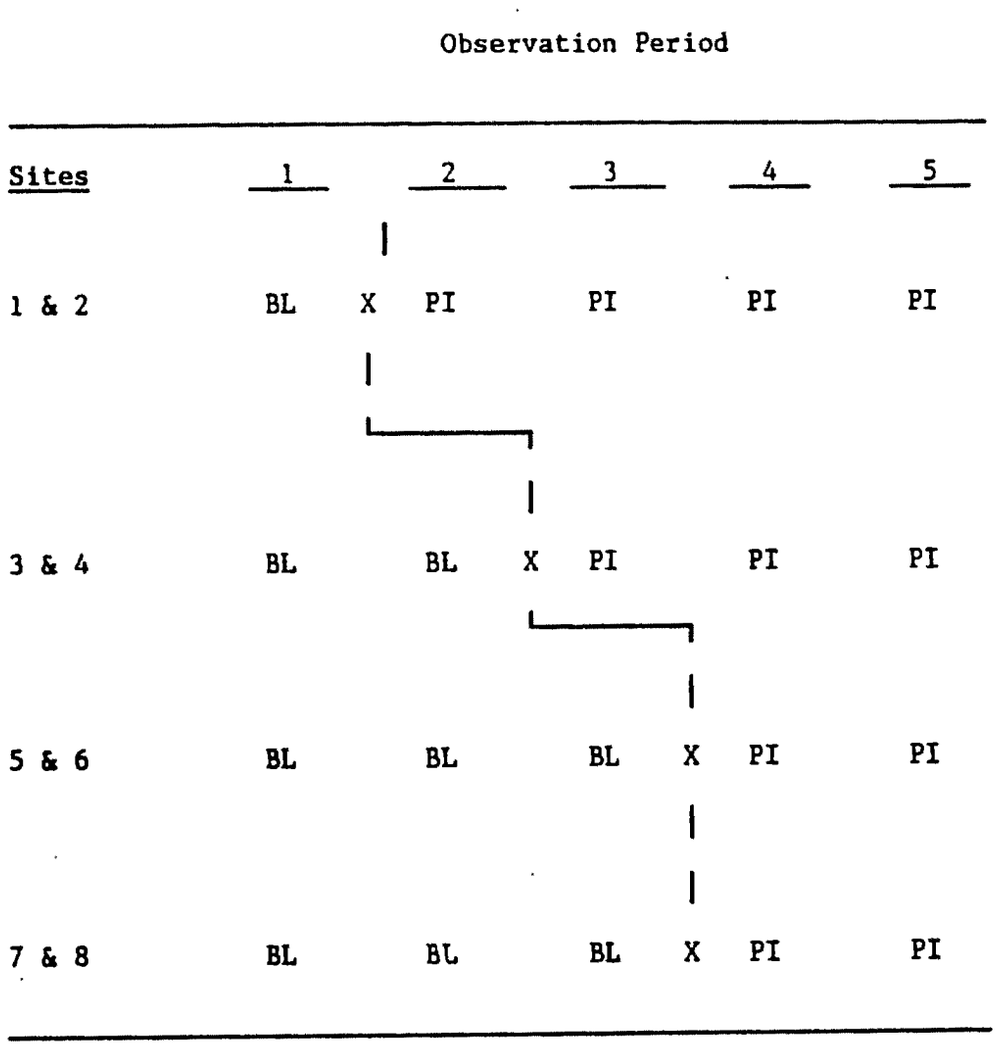
Figure 4. Average knowledge scores derived from community interviews.

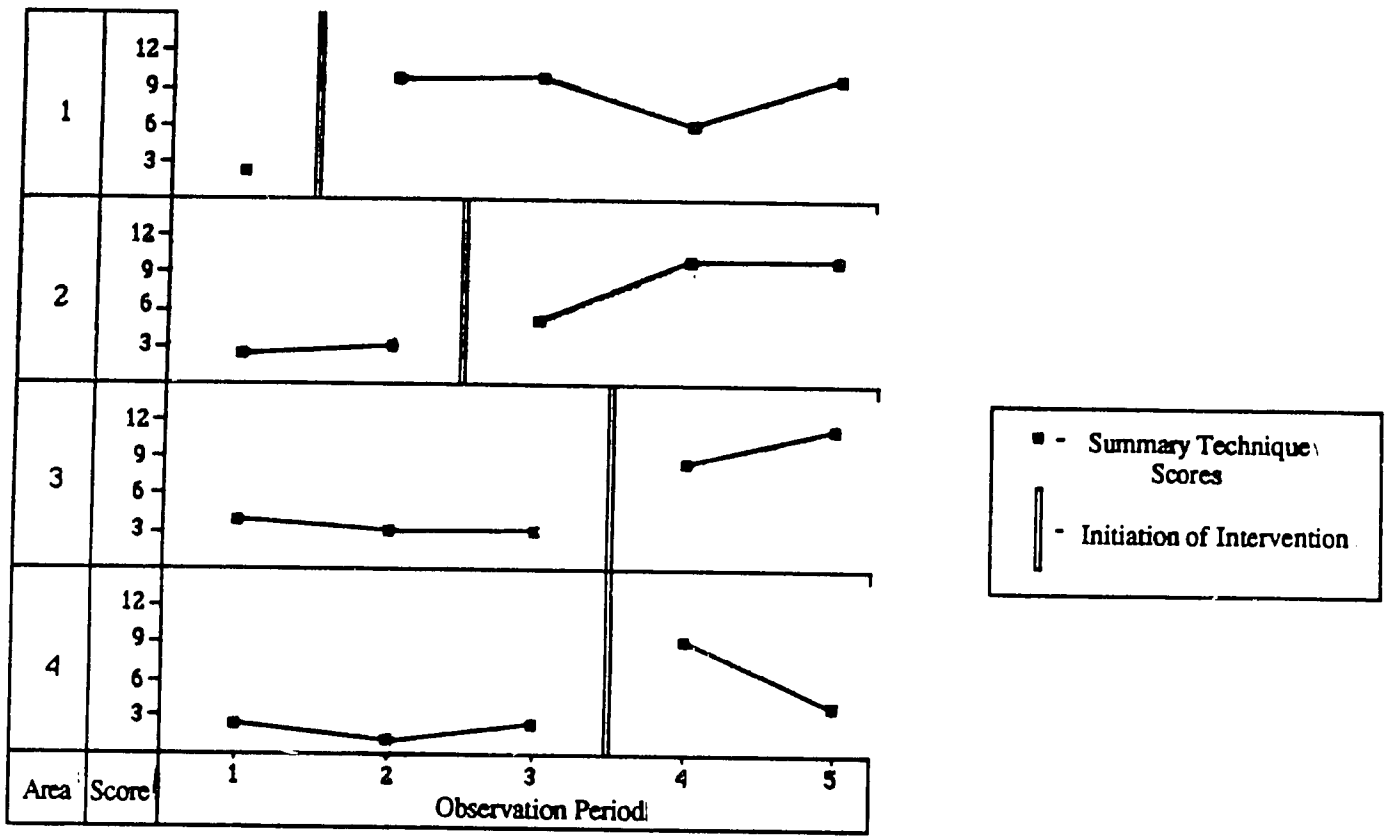
FIGURE 1. DIAGRAM OF MULTIPLE BASELINE DESIGN

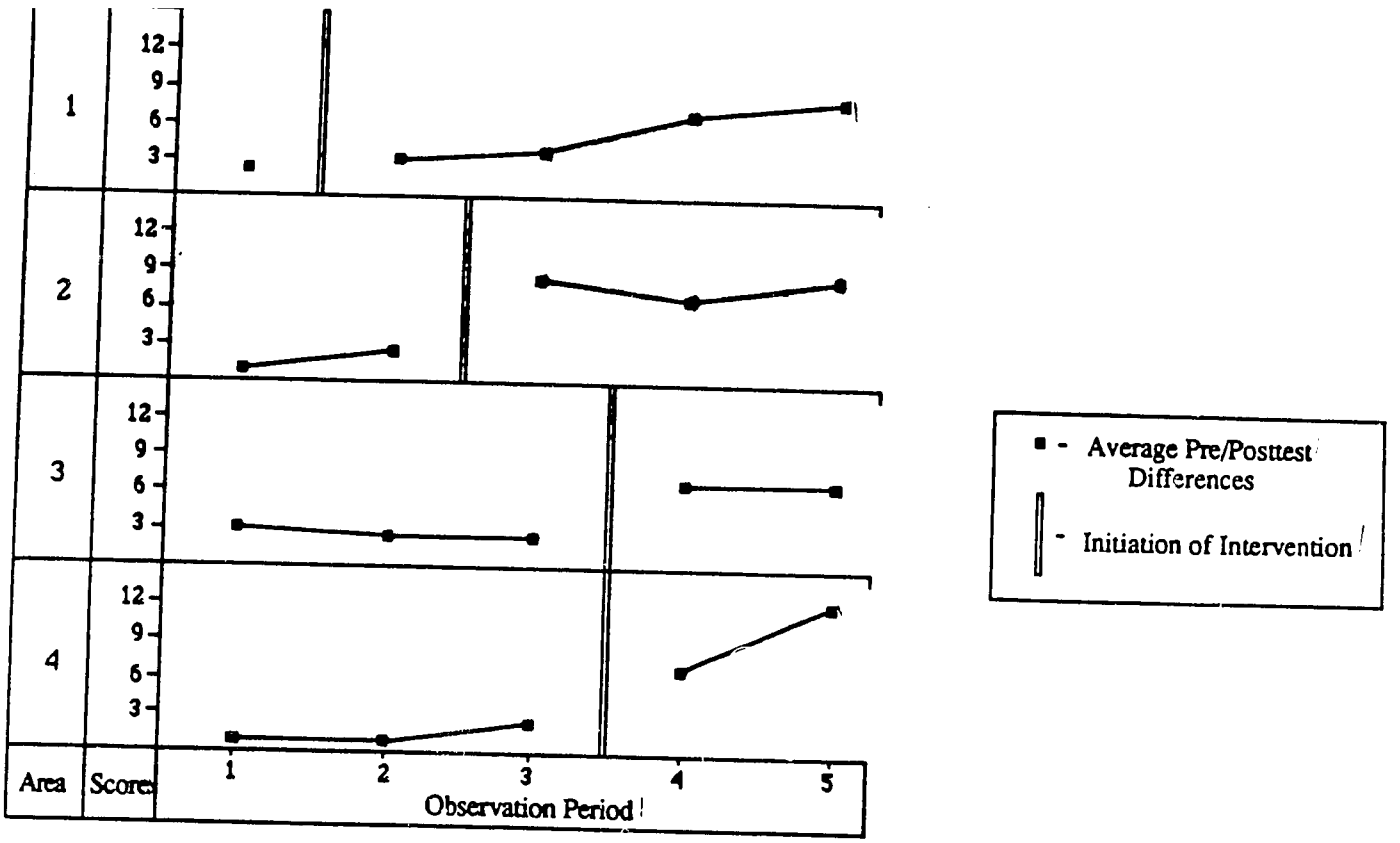
BL = Baseline observation

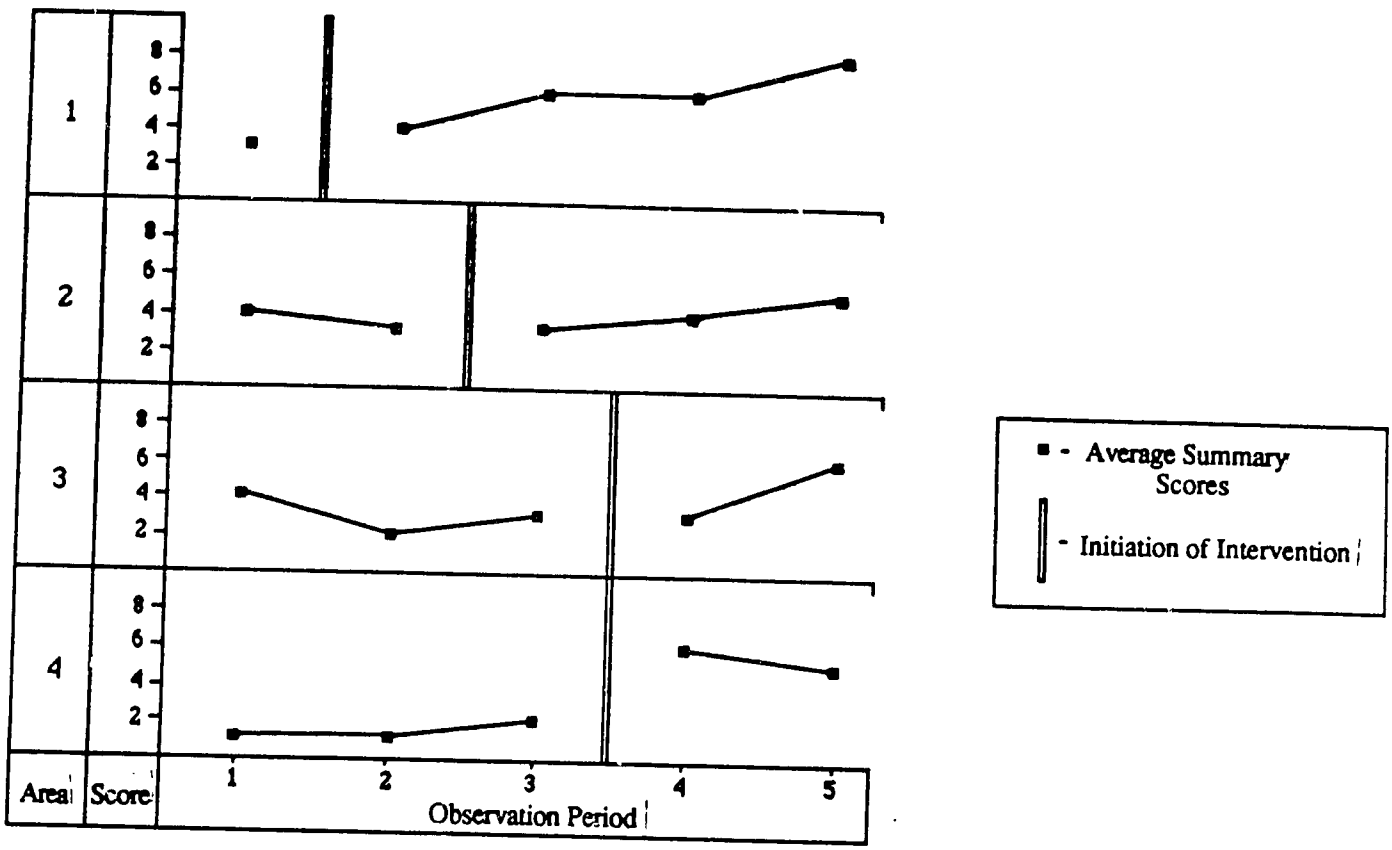
X = Intervention

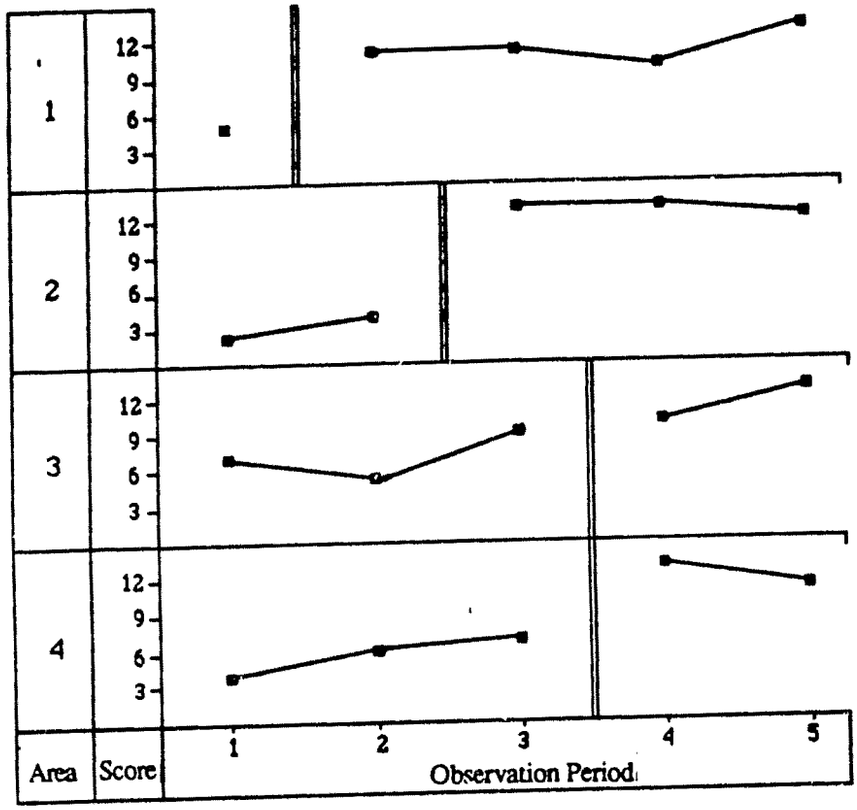
PI = Post-intervention observation




1
2
3
4
12
9
6
3
Area
Score
1
2
3
4
5
Observation Period
Summary Technique Scores
Initiation of Intervention


1
2
3
4
12
9
6
3
Area
Score
1
2
3
4
5
Observation Period
- Average Pre/Posttest Differences
- Initiation of Intervention


1
2
3
4
8
6
4
2
Area
Score
1
2
3
4
5
Observation Period
■ - Average Summary Scores
- Initiation of Intervention



■ - Summary Message Scores (Content)

‖ - Initiation of Intervention