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Radio Education Project Evaluation

Submitted to USAID Bolivia

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Acronyms

A.I.D.	- Agency for International Development
BS	- Bolivianos (Bolivian currency US\$ = 2.5 BS)
CBIAE	- Centro Boliviano de Investigacion y Accion Educativas
EDC	- Education Development Center
GOB	- Government of Bolivia
INE	- Instituto Nacional de Estadisticas
MOE	- Ministry of Education
OPG	- Operational Program Grant
PIOT	- Project Implementation Order - Technical
PVO	- Private Voluntary Organization
UNESCO	- United Nations Educational, Social and Cultural Organization
UNICEF	- United Nations International Children's Emergency Fund

Executive Summary

This is the report of a two-week external evaluation of a four-year Interactive Radio Education Project in mathematics which began operational activities in Bolivia in January 1988, a 1987 pilot project in mathematics which preceded it and a health pilot which was added in January 1989. The purpose of the evaluation was to summarize the results of existing evaluations: assess the methodology, including design and analysis, of the evaluation studies; and assess the sustainability, expandability and the impact of reducing or cutting A.I.D. funding to the Project.

The Project is broadcasting on a daily basis to an estimated 360 second-grade and 236 third-grade classes with an enrollment of approximately 20,000 in the Departments of Cochabamba, Santa Cruz the Beni, Sucre and Tarija. Children in Grades 4 and 5 receive lessons in the health pilot. The implementing organization is Fe y Alegria, a Jesuit-run, registered private voluntary organization (PVO) which administers public schools under contract with the Ministry of Education (MOE). The schools receiving the broadcasts are a mix of public schools administered by Fe y Alegria and schools administered directly by the MOE.

Fe y Alegria has an Operational Program Grant (OPG) for a four-year project from A.I.D. in the amount of \$822,537. Education Development Center (EDC) has a Mission buy-in to a centrally-funded contract for \$886,041 to provide intensive technical assistance to the Project. Funding for the 1987 mathematics pilot project was provided by AID/Bolivia with technical assistance provided by EDC through the AID/S&T/ED funded Radio Learning Project.

Each year from 1988 through 1991, the plan is to produce lessons and conduct intensive monitoring and evaluation for one grade level until 1991 when it is expected that lessons will be developed and validated for Grades 2-5. Thus far, only second-graders have been tested in both experimental and control groups.

Effect size was used as a measure of the comparative achievement between control and experimental groups. For the first year of the Project, an effect size of .909 was obtained in the second-grade, year-end evaluation which indicates a gain significantly higher than in studies reviewed in other countries of the effect of radio, textbook provision and teacher training. For example, the effect size for second-grade mathematics in a similar project in Nicaragua, from which the Bolivian lessons were adapted, was only .55. An effect size of .909 would mean that where the average control-group student would rank at the 50th percentile, the average radio student would rank at about the 81st percentile, a gain of 31 percentile points.

The 10 lessons which have been developed in the health pilot concentrate on diarrhea and dehydration, the largest cause of infant death in Bolivia, in addition to hygiene, clean water and

nutrition. Although the post-test results are not yet available, based upon field observations, a substantial gain in health knowledge is expected.

Both the Project and the evaluations conducted within the project have been well designed and carried out. Throughout the Project, problems have been addressed as they occurred, and there has been very little slippage in the production schedule. The intensive technical assistance from EDC, with their extensive experience with similar projects in other countries, appears basic to the development of quality lessons.

The active transfer of technology, essential for sustainability, is apparent in talking with staff from the implementing organization. Many Fe y Alegria staff members are thoroughly familiar with the Project and evaluation design and are learning day-to-day operations, such as the SYSTAT Program used for data analysis. There are also many mechanisms for cost recovery which could be explored to increase sustainability of the Project.

Fe y Alegria staff have taken the lead in expanding the Project, although they could probably do more to expand outside of Fe y Alegria administered schools. Still, they are well on their way toward the significant, A.I.D.-established goal of 25 percent coverage of enrolled children and appear to be strong enough to eventually administer the Project on their own after technical assistance has been phased out.

As post-production implementation costs are only a small fraction of the production costs, a reduction or cut in A.I.D. funding to the Project should not impact significantly upon the continued implementation of the Project at Grades 2 or 3 or the student achievement currently being realized at these grade levels. It would impact, however, upon expansion and the production of lessons for Grades 4 and 5.

A weak point, which may need to be addressed with further technical assistance of a more specific nature, is financial management of the Project.

The Recommendations Section addresses specific mechanisms for cost recovery, expansion efforts and opportunities for collaboration with other projects.

Radio Education Project Evaluation, June 1989

1. Introduction

This is the report of a two-week external evaluation of a four-year Interactive Radio Education Project in mathematics which began operational activities in Bolivia in January 1988, a 1987 pilot project in mathematics which preceded it and a health pilot which was added in January 1989.

Interactive radio instruction is currently being delivered by the Project in mathematics to school children in Grades 2 and 3 and to children in Grades 4 and 5 in a health pilot. The implementing organization is Fe y Alegria, a Jesuit-run, registered private voluntary organization (PVO) which administers public schools under contract with the Ministry of Education (MOE). Fe y Alegria has an Operational Program Grant (OPG) for a four-year project from A.I.D. in the amount of \$822,537. Education Development Center (EDC) has a Mission buy-in to a centrally-funded contract for \$886,041 to provide intensive technical assistance to the Project. Funding for the 1987 mathematics pilot project was provided by AID/Bolivia with technical assistance provided by EDC through the AID/S&T/ED funded Radio Learning Project.

1.1 Purpose of the Evaluation

The purpose of the evaluation, as approved by USAID/Bolivia, was to:

- briefly describe the state of education in Bolivia;
- summarize the results of existing evaluation studies on the effectiveness of the Radio Education Project in Bolivia;
- assess the methodology, including design and analysis, of existing evaluation studies on the Radio Education Project;
- assess the sustainability of the project;
- assess the feasibility of expanding the project;
- ascertain the perceived effect of cutting the program among program participants;
- assess the possible impact of cutting or reducing the program.

1.2 Evaluation Methodology

The evaluation was based upon:

- document review;
- site visits to four implementing schools in Cochabamba on May 30-31;
- discussions with staff from AID/Washington, USAID/Bolivia, EDC and Fe y Alegria as well as with school officials, departmental coordinators (classroom observers), principals, teachers, students and a radio station manager (see Appendix A).

The evaluator spent much of her time discussing project progress and ideas with implementing and technical assistance staff, both of whom openly shared available information, and the evaluation was contracted by EDC. However, the final report was delivered to USAID/Bolivia without censorship by either. The Chief of Party for EDC on many occasions made an effort to absent herself from interviews with teachers, departmental coordinators and others so as not to bias the results.

Site visits were made only in Cochabamba; therefore, information concerning operations in other sites could not be independently verified. Time also did not allow for independent verification of test construction (including a review of the MOE curriculum) or research data reported; major statistics, however, were recalculated on a sample basis. When results of the Bolivian Radio Education Project were compared to those in other countries in Project documents, results of the other studies were verified using published reports.

2. The State of Education in Bolivia

Demographic and educational statistics in Bolivia are not reliable or consistent. Statistics on the proportion of children 6-10 years of age enrolled in Basic School, the level for which the Radio Education Project is designed, vary from 94 to more than 100 percent for boys and from 81 to more than 100 percent for girls. The probability that a boy will finish Basic School is reported to be only 50 percent while the probability that a girl will finish is 40 percent. There are great differences, however, between dropouts in public vs. private schools and urban vs. rural schools. For 1984, according to statistics reported by the MOE, only 29 percent of children enrolled in rural public schools finished Basic School. There is also a substantial problem with repeaters in some areas with up to 33 percent of children in rural areas of some provinces in Santa Cruz repeating in 1988.

There is no quantitative teacher shortage at the Basic School level; however, many teachers are minimally trained, especially in rural areas. All teachers must complete one year

Language and was therefore not directly relevant to the Bolivian project, an independent review of the Kenya project demonstrates that many of the lessons learned in terms of production and evaluation design were applied in Bolivia.

There are interactive radio education projects ongoing or in the design phase in Honduras, Lesotho, Costa Rica, Ecuador, Nepal and New Guinea, in addition to Bolivia.

A comparative study conducted by Lockheed and Hanushek of the effect of radio, textbooks and teacher training on student achievement in developing countries (not including Bolivia) found that learning increases were substantially higher with radio; however, cost-effectiveness was often greater with textbook provision.

5. Interactive Radio Education in Mathematics in Bolivia

5.1 Program Description

5.1.1 Pilot Project

From April to July 1987, Fe y Alegria conducted a pilot study to assess the feasibility of using interactive radio instruction in mathematics to improve Basic School education in Bolivia. Fe y Alegria received intensive technical assistance from EDC throughout the pilot.

Before the pilot began, site visits were made to all schools participating, and basic information was collected about each of the communities.

During the four-month pilot, 20 radio mathematics lessons were adapted, produced and implemented in 11 second-grade classrooms in Cochabamba and Santa Cruz. Only recreational activities not a part of the core instructional package were adapted for the pilot. The core package used in Nicaragua was maintained. The lessons concentrated on the concepts of ones and tens, writing three-digit number and the zero.

A total of 35 teachers and principals were trained for one day in the classroom use of the interactive-radio lessons which children received over a period of only one month. Studio time was rented for the pilot.

5.1.2 Four-year Project

After funding was received, the Project established a central office in La Paz with a recording studio. A total of 650 teachers and 180 principals participating in the program have been trained to date for one day. Fe y Alegria has developed contracts with 11 radio stations in the Project areas.

The Project is currently broadcasting to an estimated 360 second-grade and 236 third-grade classes with an enrollment of approximately 20,000 in the Departments of Cochabamba, Santa Cruz the Beni, Sucre and Tarija. The schools receiving the broadcasts are a mix of public schools administered by Fe y Alegria and schools administered directly by the MOE. At least 182 of the classes participating are in schools administered directly by the MOE, more than one third of which are in the Beni.

Lessons are adapted and recorded in the central office and then Teacher's Guides and taped lessons are distributed to participating schools and radio stations, usually the week before a broadcast as they are being adapted, revised and recorded only a few lessons ahead. The Teacher's Guides are provided to Fe y Alegria departmental offices by the Project, and Fe y Alegria is then responsible for distributing materials to individual schools with some assistance from a half-time departmental coordinator (classroom observer). There have been some problems with distributing materials to schools in the Beni before the broadcasts. However, next year it is expected that complete second- and third-grade Teacher's Guides will be delivered for the entire course at the beginning of the school year. (The problem will then shift to providing fourth-grade materials as they will be developed just in time for distribution before the broadcast.)

Instruction in mathematics is being delivered to second- and third-grade classes on a daily basis throughout the school year, although lessons are frequently interrupted by strikes. (In 1987, for example, public schools in Kami, one of the Project areas, completed only 53 of 200 designated school days.) Lessons continue to be broadcast during strikes, although strikes have been taken into account in the design of the lessons. Material is reviewed for several lessons. Thus, if a few lessons are missed, the student will be able to continue without missing essential concepts. In some cases, teachers have continued to come to classes only for the radio lessons during strikes with a small financial incentive paid to them by the parents of participating children (\$.25 per student per month). In other cases, parents have come to the school to supervise the radio lessons themselves. There have also been reports of children listening in their homes during strikes.

In the Departments of Cochabamba and Santa Cruz, the departmental coordinators work intensively with parents of the children receiving instruction by radio. In Cochabamba, the classroom observer initially met with parents to discuss the concept of radio mathematics. He continues to meet with interested parents on a weekly basis largely to organize them to provide support to the program in case of strikes. In addition to their work in observing classrooms and distributing materials, observers are responsible for liaison with participating radio stations, teachers, school directors and parents.

Lessons are generally 25-30 minutes long and are truly interactive with children responding several times a minute. The lessons include music and physical exercise to hold the students' attention. Teachers are encouraged to conduct post-broadcast activities which are outlined in the Teacher's Guides distributed by the Project. Students have notebooks, purchased individually, in which they copy lessons from the blackboard in Grade 2 and take dictation from the radio broadcasts in Grade 3. The Program includes 130 lessons at each grade level.

5.1.2.1 Changes in Program Design

The Project was originally designed to develop an Interactive Radio Education Project in mathematics for Grades 1-3 and in Spanish language for Grade 1. From the beginning, however, teachers and Fe y Alegria officials felt that the mathematics program was not appropriate for children in Grade 1 because their language skills are not developed enough to be able to follow the lessons by radio. Thus, the Project began with Grade 2. It was found that one year of regular education prepared students sufficiently in both language and mathematics skills for their participation in Grade 2 mathematics.

In November 1988, evaluation meetings were held with teachers and with Fe y Alegria officials. The teachers were nearly unanimous (according to reports) in their desire to continue radio mathematics through Grade 5. Many also were interested in radio Spanish but still ranked mathematics through Grade 5 as a higher priority.

In June 1989, therefore, a request was officially made to the USAID/Bolivia Project Coordinator, Sandra Wilcox, to change the Scope of Work to four years of mathematics (Grades 2-5) rather than three years of mathematics (Grades 1-3) and one year of language. A decision has not yet been made by USAID/Bolivia. As the Project is working only in Grades 2 and 3 now, they are still within their original Scope of Work. (See Recommendations, Section 13.)

5.1.2.2 Program Target

It is impossible to accurately estimate the percentage of the Bolivian population enrolled in Basic School who are being served under the program without good enrollment data by grade level. However, using available statistics and assuming that dropouts will occur evenly through the five years of Basic School (a conservative assumption), the Project is presently serving at least six percent of the children enrolled in Grades 2 and 3. (Since the number of dropouts is greatest for the younger grades, they are undoubtedly serving somewhat more than six percent.) Their contract states that they are to reach 25 percent of the children enrolled in Grades 1-3 by the end of the Project. If the Project expands at the current rate throughout its life, it can realistically reach 25 percent of the children in the grade levels for which materials are being developed.

[It should be pointed out that there is an inconsistency between the targets set in the PIOT (Project Implementation Order - Technical) for technical assistance and the OPG to Fe y Alegria. The PIOT specifies a target of 25 percent of the enrolled children whereas the OPG specifies 10 percent.]

5.2 Analysis of Evaluation Previously Conducted Within Mathematics Pilot Project

5.2.1 Evaluation Objectives

The objectives of the pilot were to:

- verify that Bolivian children can learn mathematics using the radio instruction method;
- evaluate whether lessons developed in Nicaragua could be successfully adapted for use in Bolivia;
- assess whether the approach would be accepted by Bolivian teachers and whether they could use it with a minimum of training;
- assess whether Fe y Alegria was capable of successfully implementing the Project as an institution.

5.2.2 Formative Evaluation

Formative evaluation refers to general monitoring activities conducted during implementation of the Project to collect information which is used to modify future activities.

Classroom observations were conducted in an average of two schools per day during the pilot. Teachers also filed out written questionnaires and participated in focus group interviews. (See Section 5.3.1 for a full discussion of the formative evaluation process.)

5.2.3 Summative Evaluation

Summative evaluation in the Radio Education Project refers to an evaluation at the end of a designated period (usually a year, but one month in the case of the pilot) to measure student achievement during the period.

5.2.3.1 Design

The Pilot Project was conducted in Cochabamba and Santa Cruz. Pretests and post-tests were conducted in all 11 schools participating in the pilot project. A control group was not used.

5.2.3.2 Results

The results of the pre- and post-tests are summarized in the following table:

Percent of Correct Answers on Mathematics Test,
Second-Grade Pilot Project, Bolivia, June 1987

No. Schools	Region	First Language		Test Results	
		Spanish	Quechua	Pretest	Post-test
6	Cochabamba	49%	51%	59%	90%
5	Santa Cruz	100%		69%	89%
			Mean	64%	90%

As can be seen from the summary table, children correctly answered an average of 26 percent more items correctly after one month of instruction.

According to Project documents, teachers noted that the lessons seemed to heighten the ability of students to think critically and contributed to the development of language skills. Teachers also commented that they planned to incorporate interactive methods into their style of teaching other subjects.

Technical assistance providers felt that teachers with one day of training were competent in their support of instructional radio instruction. They also felt that Fe y Alegria was strong enough as an institution to implement and expand the program.

5.2.3.3 Discussion

Throughout the pretesting of children participating in the pilot, a review of Ms. Fryer's trip report demonstrates that consistently high standards of field control were maintained.

A strong weakness of the survey design, however, was that no control group was used. Children are expected to learn with a month of instruction. The real question is whether children in radio classes learned more than those in regular classes. Without a control group, the results are not very meaningful. It would probably have been more appropriate as an objective to assess not whether children could learn by radio but whether they could learn more by radio than by having the same material presented using traditional methods.

The same test was used for the pretest and the post-test. With very little time between testing and few test items, it is quite possible that children would remember a number of the items, discuss them with their friends and be particularly sensitive to information presented in class which might answer one of the questions.

5.3 Analysis of Evaluations Previously Conducted within the Four-Year Mathematics Project

5.3.1 Formative Evaluation

5.3.1.1 Design

Each year from 1988 through 1991, the plan is to develop lessons and conduct intensive formative evaluation for one grade level until 1991 when it is expected that lessons will be developed and validated for the four grade levels. Selected classrooms are regularly visited by an observer employed half time in each Department where formative evaluation is ongoing. Observers are supervised and housed by Fe y Alegria. Observers are given an observation sheet for each lesson by the central office in La Paz. They note student response to each exercise, including apparent confusion, misunderstanding of directions, boredom, etc. They are especially trained to note when the student response time is too long or too short for interactive segments of exercises. Teacher behavior is noted, including interference with radio lessons and compliance with post-broadcast activities. Radio emission quality is also noted.

Information collected during observations is forwarded to the central office in La Paz on a weekly basis. There, the sheets are reviewed to determine if changes should be made in the tapes. Problems with types of exercises are taken into account in the development of future exercises. Should all observers note a particular difficulty in completing a specific learning objectives, for example, additional reinforcement is given in successive lessons before introducing new concepts. If students consistently have difficulty in responding to a particular kind of drill, the drill is modified in future lessons.

Throughout formative evaluation, EDC and Fe y Alegria staff provide intensive field supervision. The EDC Chief of Party, Project Director and Implementation Director each make two trips per month for 3-4 days. The three supervisors rotate so that each site is visited at least once per month, and each supervisor visits each site at least once every three months.

5.3.1.2 Results

Tapes which have already been broadcast are not changed until the end of the school year. According to project documents, although observation sheets had been reviewed weekly, from October 1988 until January 1989, the central office team reviewed all observation sheets again to decide which tapes should be changed. Based upon this review, 80 percent of the tapes were edited, and 15 percent were rerecorded. Changes noted in Project documents included:

- adding exercises where students appeared to need more practice;

- deleting review activities where children seemed bored;
- replacing hard to learn songs;
- reinforcing topics not taught well by radio with postbroadcast activities;
- revising the Teacher's Guide;
- changing two radio personalities.

5.3.1.3 Discussion

Once a set of lessons has been revised at the end of the year, systematic classroom observations are discontinued. Lessons are not observed to note whether the changes have had the desired effect.

This could initially appear to be a problem, although the evaluator did not find it to be so. The process of formative evaluation is such that lessons learned through observation are applied and tested in future lessons. Thus, even though the results of corrections may not be observed in the particular lesson in which the problem was observed, the same corrections are applied to future lessons which are observed.

In addition, lessons are observed on a sporadic basis after their final revision. A few observations are still made both by departmental coordinators and by Fe y Alegria and technical assistance staff, and teachers are encouraged to report any problems which they or their students are having with the lessons.

5.3.2 Summative Evaluation

Each year, EDC plans to test a sample of children at one grade level to determine what they have learned in mathematics during the year compared to a control group. Thus far, only second-graders have been tested in both experimental and control groups. Although the study results have not yet been completely analyzed, a draft report was reviewed for this evaluation.

5.3.2.1 Lapped Year Design

During the Radio Education Project in Nicaragua, a conventional pretest, post-test with a control group design was used with control groups selected within the same areas as the experimental group. However, by 1978, near the end of the project, this design was found to be unworkable as there were no longer sufficient classes to be used as controls which had not been exposed to radio.

In Kenya, a lapped-year design was used from the beginning. The lapped-year design avoids the problem of contamination. In each case, students in the control group are tested before

broadcasts begin in their area. Therefore, there are no possibilities that the children in the control classes have also been listening to the programs by radio.

In Bolivia, the project used a lapped-year design for their summative evaluation. This is a design whereby the same classes are used as experimental and control groups but at different points in time. In November 1987, classes in selected Project areas were tested at the end of their second-grade term before broadcasts began. The following year, these second-grade classes became experimental groups receiving interactive instruction by radio in Grade 3. In November 1988, second-grade classes which had received a year of lessons by radio in the same selected project areas were tested, and the test results were compared to tests conducted with second graders in the same schools in November 1987. Each year, children for the control group will be tested from a new geographic area before broadcasts begin in their area.

The following chart, showing the experimental and control groups planned for the project by year, should make the lapped year design clear.

Summative Lapped Year Evaluation Design

Year	Experimental Group	Control Group
1987	—	Second-graders tested in Cochabamba, Kami, Trinidad
1988	Second-graders tested after year of instruction, 1987-88, in Cochabamba, Kami, Trinidad	Second-graders tested in 1987 in Cochabamba, Kami, Trinidad
1989	Third-graders tested after year of instruction, 1988-89, Sucre and Tarija	Third-graders tested in 1988 in Sucre and Tarija
	Third-graders tested after two years of instruction in Cochabamba	
1990	Fourth-graders tested after year of instruction, 1989-90, La Paz and Pando	Fourth-graders tested in 1989 in La Paz and Pando
	Fourth-graders tested after three years of instruction in Cochabamba	
1991	Fifth-graders tested after year of instruction, 1990-91, Potosi and Oruro	Fifth-graders tested in 1990 in Potosi and Oruro

5.3.2.2 Test Development and Testing

In developing the test for second grade, Michelle Fryer, EDC, and Fe y Alegria staff reviewed the Bolivian curriculum along with existing testing instruments used for the collection of baseline data in previous radio mathematics projects and selected a pool of questions appropriate for adaptation in Bolivia. A test was developed which consisted of 25 questions, including mathematical expressions in numeration, addition, subtraction, multiplication, division and measurement as well as word problems.

Although time did not allow the evaluator to compare the test with the official curriculum, items were reportedly chosen to follow the official Bolivian curriculum, and topics received the same representation as in the official curriculum.

A

In addition to the 25 test questions, for each child, information was collected on:

Region
Group (control vs. experimental)
Classroom
Urban Status
Student Name, Sex, Attendance (4 point scale), Repetition
Language Spoken at Home
Number of School Days (allowing for strikes)

Test instructions were recorded so that they would be standardized and teacher interference would be minimized. A pretest of the test with recorded instructions was conducted with students from La Paz. As indicated on the chart, second graders were pretested in Cochabamba, Kami and Trinidad in 1987, and other second-grade classes from the same schools were post-tested after one year of instruction.

5.3.2.3 Sample

Three regions were chosen for the summative evaluation within two of the three Departments where second-grade instruction began. One urban (Trinidad), one rural (Kami) and one suburban (Cochabamba) area was chosen. (There were no control group data for Santa Cruz as the schools closed early in 1987. Thus, Santa Cruz schools could not be included.) Classrooms with limited accessibility (more than one hour from the city) were eliminated for selection in Trinidad and Cochabamba. After eliminating schools with limited accessibility, within each area, 50 classrooms were randomly selected by computer for study. The resulting sample was 1,554 students.

None of the schools which were observed during formative evaluation were included in the sample to control for any possible "Hawthorne Effect" which may result from increased supervision. (The Hawthorne Effect refers to the probability that children who are observed intensively may achieve more than children who are not observed simply because of the observation.) Children who participated in the 1987 pilot program were included only in the formative evaluation group.

5.3.2.4 Results

Effect size is a measure of the comparative achievement between control and experimental groups. It is computed by taking the mean number of correct answers by the radio group, subtracting the mean for the control group and dividing the total by the standard deviation of the control group, as in the following formula:

$$\frac{\bar{X} \text{ radio} - \bar{X} \text{ control}}{\text{s.d. control}} = \text{effect size}$$

Effect size was computed separately for each of the regions in the summative evaluation and for all regions together. The effect sizes obtained were:

Effect Size for all Test Items by Region, 1988

Region	Effect Size
Cochabamba	.785
Trinidad	1.435
Kami	1.071
Total	.909

This means, for example, that the average radio student obtained a score .909 standard deviations above the average student in the control group (statistic independently calculated). Results were reported to be highly significant using a T Test.

Results were also reported in terms of percentiles using statistical tables. An effect size of .909 would mean that where the average control-group student would rank at the 50th percentile, the average radio student would rank at about the 81st percentile, a gain of 31 percentile points.

These effect sizes are extremely high. Perhaps the best method to demonstrate this is to compare them to effect sizes obtained in other radio education projects and with other types of interventions. The following table summarizes data presented by Lockheed in a World Bank report:

Intervention	Country	Effect Size
Radio Education	Kenya	.53
	Nicaragua	.55
	Thailand	.58
Textbooks	Brazil	.34
	Nicaragua	.36
	Philippines	.40
	Thailand	.06
Teacher Education	Brazil	.21
	Brazil	.09
	Brazil	.16
	Thailand	<.01
Peer Tutoring	United States	.73

The Radio Education Project in Bolivia obtained effect sizes clearly surpassing those obtained in the studies reviewed by Lockheed, including in the Radio Education Project in Nicaragua, from which both the recordings and tests were adapted. In Nicaragua, an effect size of .55 was found for second grade. Children in the radio group in Bolivia answered 19.3 percent more items correctly than the experimental group compared to a net gain of only 7.7 percent in Nicaragua.

Analysis of test results by urban status, sex, language, etc. has not yet been done. It is interesting to note from preliminary tables, however, that in addition to achieving consistently higher scores in the radio group, the rural-urban gap has diminished somewhat. Comparing rural schools in Kami with suburban-urban schools in Cochabamba, in the control group, children in suburban-urban schools answered 24 percent more items correctly compared with rural classes. The experimental group, after receiving the radio lessons, answered 22 percent more items correctly in suburban-urban schools.

Urban status in Cochabamba seemed to be a much stronger predictor of results than language. In one variation on data collection for the control group, students in one classroom in Kami were divided into two subgroups with one taking the test in Spanish and the other in Quechua. Both subgroups scored the lowest in the sample; however, there was almost no difference between the two. Schools in the general sample with a higher percentage of bilingual students did not score consistently lower than students from schools with relative few bilingual students. As testing methods should be completely standardized in the summative evaluation, the results obtained from students taking the test in Quechua were excluded from analysis.

5.3.2.5 Discussion of Methodology Employed

I consider the lapped-year design to be an excellent way to control for contamination in the project areas. There were many reports of teachers and parents from outside the Project schools contacting teachers, school principals, the Fe y Alegria departmental office, etc. for copies of the Teacher's Guide. The Cochabamba departmental coordinator told the evaluator that he had five such requests; even the local San Rafael Radio Station, one of 11 which broadcasts the lessons, reported requests for materials from parents.

It is impossible to know how many parents and children listen to the broadcasts without contacting anyone on the Project and how many teachers use the broadcasts to instruct their students without the Teacher's Guides. Many teachers interviewed at site visits stated that they knew of parents who listened to the broadcasts both to help their children and to increase their own knowledge of mathematics. A strongpoint of the approach is that the Teacher's Guides are not essential. There are clear instructions to teachers and students within the broadcast itself.

The lapped-year design insures not only that the control group has not been contaminated but also that there is a close match between control and experimental groups. The two groups come from the same neighborhoods, sometimes the same families, and are sure to have similar backgrounds and language histories. (There are a substantial number of native Quechua, Aymara and other Indian language speakers in many of the schools.) This design also builds upon the lessons learned in other radio education projects throughout the world.

The sample was in many ways a judgment sample, although individual classes meeting the chosen criteria were randomized. The clusters (or regions) for study were definitely not random. However, the regions appear to be well chosen to represent a cross-section of the project schools in order to gain the greatest amount of useful information for the least cost. There appears to be no attempt to choose clusters in such a way as to bias results in favor of greater achievement scores. Three very different regions with different problems were represented. Kami was specifically selected because of the preponderance of bilingual children who were expected to have problems understanding the broadcasts in Spanish.

There is some question as to whether the control group children do less well because they have not been previously exposed to radio or recorded instructions, and the testing instructions were recorded to control for teacher interference with the testing process. This has been found to be a problem in at least one other country and has not been systematically investigated in Bolivia. However, test observers have not noted this to be a problem. The recorded instructions ask each student to point to each question as it is being addressed. Therefore, if control-group children are having trouble following the instructions, the problem would probably be readily apparent to an observer.

Teachers who wanted to participate in the summative evaluation from Guayaramerin, Santa Cruz and Riberalta were given the option of doing so. Their corrected tests have been forwarded to the central office in La Paz, but compilation and analysis have not yet begun. As this is a very selective sample composed only of teachers who wanted their children to be tested, their scores will be analyzed separately and not included in the summative evaluation.

The PIOT states that regression should be used for data analysis. This has not been done - at least not yet. (Analysis is not finished.) However, "effect size" appears to be an appropriate substitute and intuitively easier to understand in presenting results to school administrators during Project expansion efforts.

5.4 Other Possible Summative Studies

EDC is interested in doing a study of school dropouts who have attended the radio lessons. Such a study could be useful to determine retention of information.

6. Interactive Radio Education in Health

6.1 Program Description

In September 1988, the Scope of Work for the Radio Education Project was expanded to include the development and field testing of radio health modules at the primary-school level. Health indicators show that Bolivia has the highest infant and child mortality in Latin America, and health is a USAID/Bolivia Mission priority. (See Appendix C for a complete discussion of the state of health in Bolivia.)

Before work in developing the radio health module began, a baseline survey of ongoing health education activities in Bolivia was conducted in which profiles of major PVOs working in child survival were developed. Health education materials used locally were also collected.

The health pilot builds upon the operational infrastructure already established within the Project. Ten lessons were produced using the same interactive approach used in teaching mathematics. Teachers received training in using the modules and in follow-on activities to take place after each lesson.

The lessons which have been developed concentrate on diarrhea and dehydration, the largest cause of infant death in Bolivia, as well as hygiene, clean water and nutrition. The lessons generally concentrate on actions directly under the control of children which they can apply in their homes. Although there are not many fourth and fifth graders dying of dehydration, many are caretakers of younger siblings and can apply lessons learned with them. In addition, many fifth graders will be parents themselves in five years.

The lessons are currently being delivered on a weekly basis, by cassette tape, to fourth and fifth grade students in 10 classrooms in the Cochabamba area.

6.2 Formative Evaluation Previously Conducted within Project

Formative evaluation is being conducted within the health classes as in the mathematics classes. Classes are being observed weekly. Whenever children appear to be confused by a topic or an approach, future lessons are changed accordingly.

6.3 Summative Evaluation to Be Conducted within Project

Children in 10 classrooms in urban schools within the Cochabamba area were pretested in health in March. The children will be retested again in mid-June to see what they have learned from the 10 lessons which they have received.

No control group was used. However, reportedly, there is no instruction in health in urban public schools in Bolivia. Therefore, had a control group been used, little change would have been expected in pretest vs. post-test results.

The evaluator has not seen the test used for health and does not know whether it follows the official health curriculum for rural schools. However, the lessons are following USAID child survival priorities. If the official curriculum does not, there is real reason in this case to use a test which follows the radio curriculum which addresses issues felt by USAID to be most important for saving lives instead of the official curriculum.

Although the post-test has not yet been done, based upon field observations, a substantial gain in health knowledge is expected.

6.4 Discussion

The evaluator observed two health classes. In both, the children were very interested and animated. Children sang with the cassette tapes. (Songs were health related.) Students demonstrated a good grasp of the topics presented. Children voluntarily stayed one-half hour after school in one class to finish the follow-on activity of constructing nutrition posters. Children in first and second grade had ended their lessons before those in fourth and fifth grade. Several dozen were lined up at the windows trying to hear the health lesson.

In a discussion with some students after class, the evaluator learned that children were indeed applying the lessons in their homes. Many had constructed a water filter which was taught to them in one of the lessons. (The children in this school had to obtain water from a particularly dirty stream with industrial pollutants; hence, there was a great deal of interest in this activity.) There was a report that soldiers from a nearby Air Force base had asked a teacher to show them how to construct a filter.

In one school visited, a teacher not officially participating in the program had used the tapes for her class also.

The evaluator, a specialist in child survival, considers the materials being used to be some of the best ever developed for teaching health to school-aged children.

The pilot health modules will be complete by July 1989. If the results of the summative evaluation demonstrate that the Project is successful, a follow-on program to develop lessons in areas which could not be addressed in the initial module should be considered.

In addition, there are many opportunities to work with PVOs to expand this project. This could be done in a number of ways. Fe y Alegria could train trainers from interested PVOs with projects in their areas to supplement the lessons with follow-on activities in the schools. Since many PVOs work in areas where the Project is not yet operating and in some areas which do not even have schools, a more direct method of expanding the program would be to make the pilot module (and any future modules) available on cassette tape to a local network of PVOs which operates under a OPG grant from USAID/Bolivia and to train a limited number of trainers from organizations participating in the network. The network could take responsibility for insuring that the tapes are used correctly. Many local PVOs have ongoing child survival projects and could rapidly incorporate the tapes within their Projects. Some PVOs have also expressed interest in doing so.

7. Sustainability

Sustainability has been a central concern of Fe y Alegria since the conception of the Project. An integral part of their proposal was to develop a cadre of trained Fe y Alegria staff who could continue to implement and possibly further the Project after technical assistance is phased out. Transfer of technology and phase-out have been carefully built into the Project design.

EDC plans to begin phasing out regular technical assistance to the Project in fiscal year 1991 and to turn the Project over to Fe y Alegria completely in fiscal year 1992 after all materials have been developed.

No costing study has yet been done on post-development implementation of the project in Bolivia, although one is planned for late 1989 or early 1990 after the lessons and evaluation for Grade 2 have been completely finished. Experience in other countries has shown, however, that the post-development costs of operating the program is about \$.45 per student per year. For the 20,000 students presently participating, therefore, the cost should be in the neighborhood of \$9,000 to continue operating the program without further development of materials for other grade levels. In short, the operational costs of the program appear to be quite modest after initial development.

The operational costs may be sustainable by a community participation scheme or by implementing mechanisms within the Project for cost recovery. The parents of many of the participating children could afford to contribute BS 1 per year (\$.40) for their child's participation. Parents now contribute

money and/or labor for school maintenance, batteries for use in the radios, school notebooks and, in some cases, incentives for teachers to continue with the Radio Education Project during periods of strike (\$.25 per student per month).

Possible mechanisms for cost recovery within the Project, which could begin during Project development, could include renting the recording studio to other organizations when not in use by the Project and an increase in the prices charged for radios and Teacher s Guides.

Due to problems in gaining sufficient access to a recording studio with quality equipment, a studio was constructed within the Project Office at a reported cost of \$35,000. The recording studio is apparently one of the most advanced in Bolivia. Even though the studio is now used a part of each day for recording, there is considerable downtime. Other organizations have contacted the Project concerning its availability. The feasibility of renting the studio, with a supervisor from the Project to insure that equipment is being properly used, should be explored.

Radios and Teacher's Guides are sold to schools in Cochabamba not administered by Fe y Alegria at cost (BS 100 for radios and BS 5 for Teacher's Guides. These prices could be raised.

8. Feasibility of Expanding Program

The Project is easily expandable to other schools within the Departments in which it is presently operating as well as to other Departments. Fe y Alegria currently administers 195 educational centers in Bolivia, some with two or more schools. A total of 3,128 teachers are supervised by Fe y Alegria, and the centers enroll more than 78,000 students. Approximately 549 classes (360 second grade and 236 third grade) are participating in the Project. All Fe y Alegria schools in the Department of Cochabamba are now participating in radio mathematics, and work is progressing to phase in more Fe y Alegria schools in other Departments. Schools in Sucre and Tarija were added this year. In 1990, there are plans to reach La Paz and Pando, and in 1991 Potosi and Oruro. In general, the Project plans to reach all Fe y Alegria schools in each Department which can successfully and cost-effectively receive radio transmissions. (That is, the Project will not contract with a new radio station if it will reach only a few students in a very remote area.)

Efforts to expand to schools directly administered by the MOE rather than by Fe y Alegria could be intensified in some Departments, but expansion to these schools is nonetheless progressing well. The Fe y Alegria Grant Agreement states that within their Scope of Work they should develop:

". . . an Agreement of Cooperation with other private organizations administering schools and the Ministry of Education to work jointly on promoting effective utilization of the interactive radio broadcasts by primary school teachers."

Many more MOE schools are participating this school year than last year in Departments where the Project is in its second year of operation. This suggests that efforts to expand into MOE schools are ongoing. Efforts have reportedly been made on Regional, Departmental and District levels to involve MOE schools.

In the Department of Cochabamba, where all site visits and interviews with Fe y Alegria personnel took place (with the exception of interviews with central office personnel), a total of 47 MOE administered schools are participating in the project. The participating schools were generally approached individually. The departmental coordinator (classroom observer) in Cochabamba Department, told the evaluator that he had spoken to the Superintendent of Educational Zone A which covers nearly all parts of the Department where the broadcasts can be heard. However, he said that the Superintendent was not interested in the program. He did not know why. Apparently the superintendent had not expressed his reasons, and the coordinator did not ask. Approaching the Superintendent showed good initiative on the coordinator's part. However, efforts to approach the Superintendent of the Zone should be made at a higher level, perhaps by the Director of Fe y Alegria for the Cochabamba Department. A serious effort should be made to invite Zone-level MOE employees to visit the classes where the lessons are being held and to disseminate the results of the summative evaluation to them. (Note: Ms. Fryer reported to the evaluator that after her evaluation visit, the departmental Director for Cochabamba did indeed visit the Zone Superintendent and invite him to observe the classes.)

In other Departments, the evaluator did not have an opportunity to talk with personnel regarding their experiences in trying to expand. However, according to central office staff, expansion efforts are generally made by departmental coordinators in other Departments, occasionally with their efforts reinforced by central office and technical assistance personnel. Thus, the level of personnel spearheading expansion efforts may be limiting the effectiveness of expansion efforts.

Efforts have not been made to deal with the MOE at the central level to expand the program. This is consistent with the recommendations of Carole Millikan, USAID/Bolivia, Office of Health, former Radio Learning Project Manager, and other USAID/Bolivia staff, such as Bambi Arellano, according to Project documents. The EDC Chief of Party feels that the present Minister of Education would not be able to successfully work with Fe y Alegria as they are very supportive of the teachers' union and the Minister does not support it.

There are reports of Project expansion at an informal level, as has been mentioned previously. Some parents and teachers who are not participating formally have requested Teacher's Guides from Fe y Alegria. A Cochabamba radio station which broadcasts the program has also had requests, including from radio station staff who want to use the tapes to teach their children. Some adults, both parents of participating children and others, have reported that they listen to the broadcasts from their homes. Some teachers outside areas where the broadcasts can be heard have reportedly copied the Teacher's Guide to use on its own.

9. Perceived Effect of Cutting or Reducing the Program

In all schools visited, teachers and students expressed the view that they wanted the program to continue. Teachers and school principals expressed the following possible effects of cutting the program:

- inferior gains in math scores;
- retarded language skills. (Teachers felt that students improved in their Spanish-speaking ability from listening to the broadcasts);
- a feeling that they were not receiving support from Fe y Alegria.

10. Possible Impact of Cutting or Reducing the Program

Since the costs of continuing the lessons for Grades 2 and 3 are minimal compared to the development of new lessons for Grades 4 and 5, perhaps the impact of continuing to deliver the lessons already developed but without developing new ones should be considered. It is interesting to note that in Keyna where an interactive radio instructional methodology was used to teach English as a Second Language for three years, the greatest gains were experienced during the first year of the program. Comparing the average percentage of correct answers for the experimental and control groups, gains were nearly twice as great for the first year as for each of the following two years. This was true both in comparing average scores for all students and for the subset of students who had completed all three years of the program on a continuous basis, that is excluding repeaters, dropouts and transients. Thus, the impact upon student achievement of lessons for Grades 4 and 5 could be expected to be less than for Grades 2 and 3.

Michelle Fryer has pointed out that a major problem with not developing lessons for Grades 4 and 5 is that students tend to learn more and go further in the radio group than in regular classes. Thus, they would become bored quickly graduating from a third-grade radio class to a fourth-grade regular class. This

problem may be minimized, however, by keeping radio students together in Grade 4 and beginning their regular instruction at a more advanced level. As the current plan is to continue to develop lessons for Grades 4 and 5, however, administrative arrangements to reduce the shock of radio students returning to a regular classroom environment have not been explored with Fe y Alegria. There is apparently a leap in subject material from Grades 5 to 6. Therefore, the transition from radio to regular classes at this point should pose less of a problem.

11. Expenditures

From the inception of the Radio Education Project in mathematics through April 1989, expenditures were reported as follows:

Materials & Services	US\$ 26,118.70
Equipment	36,678.51
Salaries & Wages	49,317.61
Fringe Benefits	11,296.58
Travel	15,921.51
Consultants	2,707.50
Subcontracts	39,700.64
Indirect Costs	38,861.69
<hr/> Total	<hr/> 220,602.74

(Some expenditures were erroneously charged to the mathematics project rather than to the health pilot and vice versa. These expenditures are currently being revised.) Line items reported by the Project and those suggested in the PIOT budget are not directly comparable. That is, the budget has been broken down differently. Those items which can be compared are within the suggested budget, however.

Technical Assistance costs are expected to be higher during the second year of the Project as the adaption of Nicaraguan materials for Grades 4 and 5 will require more changes than for Grades 2 and 3.

Expenditures by Fe y Alegria for the OPG are very difficult to determine. A total of US\$ 200,000 was obtained from PL 480 when the Project was initiated. Records for the PL 480 funds and those later received under the OPG were mixed. Earlier this year, the accountant was replaced. The new accountant is currently working with the USAID/Bolivia Project Coordinator and with the Financial Analysis and Review Office to revise all Project financial records. The next external evaluation should review expenditures under the OPG after the records have been revised as well as assessing whether financial reporting procedures and controls established by the new accountant are adequate.

12. Conclusions

Both the Project and the evaluations conducted within the project have been well designed and carried out, and substantial gains in knowledge of math have been reported in the radio group compared to the control group at Grade 2. Throughout the Project, problems have been addressed as they occurred, and there has been very little slippage in the production schedule. The intensive technical assistance from EDC, with their extensive experience in other countries, appears basic to the development of quality lessons.

The active transfer of technology, essential for sustainability, is apparent in talking with staff from the implementing organization. Many Fe y Alegria staff members are thoroughly familiar with the Project and evaluation design and are learning day-to-day operations, such as the SYSTAT Program used for data analysis. There are also mechanisms for cost recovery which could be used to increase the sustainability of the Project.

Fe y Alegria staff have taken the lead in expanding the Project, although they could probably do more to expand outside of Fe y Alegria administered schools. Still, they are well on their way toward their significant, A.I.D.-established goal of 25 percent coverage of enrolled children and appear to be administratively strong enough to eventually administer the Project on their own after technical assistance has been phased out.

As post-production implementation costs are only a small fraction of the production costs, a reduction or cut in A.I.D. funding to the Project should not impact significantly upon the continued implementation of the Project at Grades 2 or 3 or the student achievement currently being realized at these grade levels. It would impact, however, upon expansion and the production of lessons for Grades 4 and 5.

A weak point, which may need to be addressed with further technical assistance of a more specific nature, is financial management of the Project.

13. Recommendations

Based upon the evaluation results, the following recommendations can be made:

1. USAID/Bolivia should accept the requested change in Scope of Work from mathematics Grades 1-3 and language Grade 1 to mathematics Grades 2-5. Mathematics for Grade 1 does not appear to be feasible given language problems at this level. There is also no support for it among teachers or Fe y Alegria administrative staff. There does appear to be sufficient support and reason

to consider either an increase in budget and contract extension to continue the project for a fifth year or a follow-on project in order to develop a Grade 1 Spanish program.

2. Mechanisms for cost recovery should be explored now rather than waiting until after the development phase of the Project. These mechanisms could include:
 - increasing prices charged for radios provided to non-Fe y Alegria schools rather than selling them at Project cost;
 - increasing prices for Teacher's Guides rather than selling them at Project cost;
 - renting recording studio time to other organizations, with proper supervision;
 - nominal donations requested from parents of participating students sufficient to cover recurring costs once the lessons have been developed and technical assistance has been phased out (approximately \$.45 per year per student).
3. Although expansion efforts are proceeding reasonably well and the Project is well on its way to meeting targets; zonal, regional, departmental and district MOE offices should be approached, at least initially, by higher level personnel, perhaps by Departmental Fe y Alegria Directors, rather than by departmental coordinators (classroom observers).
4. If the results of the summative evaluation demonstrate that the Health Project is successful, a follow-on Project to develop lessons in areas which could not be addressed in the initial module should be considered under the USAID/Bolivia child survival initiative.
5. Mechanisms for working with private voluntary organizations (PVOs) to expand coverage of the health pilot should be explored. This could include training trainers from PVOs to work with children participating in the radio program or sharing materials developed within the Project.
6. The next external review should assess whether financial reporting, controls and other accounting procedures within Fe y Alegria have become adequate.

Appendix A: Interviews, Document Review and Site Visits

1. List of Persons Interviewed (Alphabetically)

Betsy Baron de Luna, Implementation Director, Radio Education Project, Fe y Alegria

Grover Barrientos, Classroom Observer, Cochabamba Department

John Cloutier, Project Officer, Project Design and Implementation, USAID/Bolivia

José Diaz, Financial Analysis and Review, USAID/Bolivia

Sister Gloria Esposito, Director Fe y Alegria, Cochabamba Department

Michelle Fryer, Chief of Party, EDC

Jim Hoxeng, Project Officer, Science & Technology, USAID/Washington (by telephone)

Judiann McNulty, Health Education Specialist, Project Office

Emilio Oros, Radio Education Project Director, Fe y Alegria

Jim Terry, A.I.D. Consultant, Washington (by telephone)

Wilson Vera, Financial Manager, Fe y Alegria

Sandra Wilcox, Project Coordinator, Office of Health, USAID/Bolivia

Mr. Salim, Administrator, San Rafael Radio Station

Principals, teachers and students from four schools participating in the formative evaluation in or near Cochabamba

2. List of Documents Reviewed

2.1 Books

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Fryer, Michelle, Quarterly Report: February - April, 1988, May 20, 1988.

Fryer, Michelle, Quarterly Report: August - November, 1989, December 29, 1988.

Fryer, Michelle, Six-month Report, undated.

Fryer, Michelle, Trip Report - Michelle Fryer Radio Mathematics Pilot Project - Bolivia, April 11, 1987 - July 31, 1987.

Jamison, Dean T., et. al., Improving Elementary Mathematics Education in Nicaragua: An Experimental Study of the Impact of Textbooks and Radio on Achievement, World Bank Reprint Series: Number 391, August 1981.

Radio Learning Project, A Proposal to Expand the Radio Education Project to Include the Teaching of Health at the Primary School Level, July 27, 1988

Radio Learning Project, Radio Learning, August 1986.

Radio Learning Project, Radio Learning, April 1988.

USAID/Bolivia, Child Survival Country Strategy, La Paz: USAID/Bolivia, March 1988.

USAID/Bolivia, Country Development Strategy Statement, 1989-1993: Bolivia, April 1988.

USAID/Bolivia, Grant Agreement No. 511-0597-G-00-8222, Attachments 1 and 2, May 1988.

USAID/Bolivia, Project Implementation Order No. 511-0597-3-80071, May 1988.

1.2 Site Visits

Site visits were made on May 30-31 to one or more classrooms at the following four schools, all in or near Cochabamba:

Obispo Anaya School
El Salvador School
Maristas School
Humberto Portocarrero School

Appendix B: The State of Education in Bolivia

1. Introduction

Since the early 1970's, the Bolivian education system has been divided into three cycles - Basic Education which includes the first five grades, Intermediate Education with three grades, and Middle School encompassing grades 9 through 12. The Radio Education Project plans to teach children at the Basic level from Grade 2-5. Thus, statistics will be presented which deal with education at this level.

Demographic and educational statistics in Bolivia are not reliable or consistent. The last official census was conducted in 1976 by INE (Instituto Nacional de Estadísticas). Statistics on the school-aged population for later years must be based upon INE projections of population growth for each Department. The country-wide population growth rate was projected by INE to be 2.73 percent for 1976-1980, 2.3 percent for 1980-1985 and 2.85 percent from 1985-1990. Projections within Departments, however, must take into account internal migration which has been substantial in recent years. Droughts, mine closings and rapid inflation have all contributed to massive population shifts in the 1980's from rural to urban areas and from the altiplano to the Orient.

The 1976 population is reported by five-year groupings (5-9 and 10-14) even though five year olds usually are not yet registered for Basic School Education and 11-14 year olds have usually dropped out or graduated from Basic School. Thus, figures for the school-aged population must be interpolated.

Enrollment statistics reported by the MOE are particularly suspect as many believe that the figures have been artificially inflated for political reasons to show economic and social progression, where in reality there may be none. The quality of the available statistics must be taken into account throughout the following discussion.

2. School-aged Population and Basic School Enrollment

Statistics on the proportion of children 6-10 years of age enrolled in Basic School, the level for which the Radio Education Project is designed, vary from 94 to more than 100 percent for boys and from 81 to more than 100 percent for girls.

The following table presents data on the school-aged population for Basic School.

Population 6-10 by Urban Status, Bolivia 1985

Urban	Rural	Total
354,900	491,000	845,900

Source: UNESCO, reported by CBIAE

The number of children enrolled in schools, both public and private, can be seen in the following table:

Basic School Enrollment, Bolivia, 1984

Type of School	Urban	Rural	Total
Public	413,100	387,500	800,600
Private	93,400	—	93,400
<hr/> Total	<hr/> 506,500	<hr/> 387,500	<hr/> 894,000

Source: UNESCO, reported by CBIAE

In comparing these tables, one is immediately struck by the fact that the urban enrollment is greater than the reported population 6-10 years. Nonetheless, this is what the reported figures show. This could result from children older than 10 years registered or the more likely explanation that rural-urban migration has not been taken into account in INE population projections and that enrollment statistics are inflated.

Westinghouse, reporting data by UNICEF, indicates that 94 percent of the boys and 81 percent of the girls were registered in Basic School education in Bolivia in 1980-84, a substantial increase over 78 and 50 percent, respectively, reported for 1960 (IRD, 1987; Weil, 1974).

3. Dropouts

According to Dr. Rolando Morales in a widely-distributed book sponsored jointly by the Ministry of Planning and Coordination and by UNICEF, the probability that a boy will finish Basic School is only 50 percent while the probability that a girl will finish is 40 percent. There are great differences, however, between dropouts in public vs. private schools and urban vs. rural schools. For 1984, according to statistics reported by the MOE, only 29 percent of children enrolled in rural public schools finished Basic School (Morales, 1988). Even this is an improvement over the 3 percent of rural children who were reported to have completed six years of Basic School under the 1969 school system (Weil, 1974).

4. Repeaters

A 1988 study of dropouts and repeaters in seven provinces of Bolivia found the following percentages of repeaters for the provinces studied:

Percentage of Repeaters, Seven Bolivian Provinces, 1988

La Paz	Chuquisaca		Santa Cruz		Potosi
Rural	Urban	Rural	Urban	Rural	Urban
24%	15%	51%	17%	33%	25%

Source: Centro Boliviano de Investigacion & Accion Educativas (CBIAE)

The study focused upon the causes of dropouts and repeaters, and the provinces chosen for study were specifically selected because they had high rates of each. Therefore, these data cannot be seen to be representative of the whole of Bolivia, but they do demonstrate that there is a substantial problem with repeaters in some areas.

5. Teacher Training and Remuneration

The number of teachers in the system is difficult to determine as many hold two distinct teaching jobs (teaching 3-4 hours a day in each), and some teachers on the MOE payroll are believed to be inactive.

There is no quantitative teacher shortage in the Basic School level; however, many teachers are minimally trained, especially in rural areas. All teachers must complete one year of mandatory service in a rural area before they can be employed elsewhere. As a result, the most inexperienced and transient teachers are in rural areas. In addition, many teachers have not graduated from teaching school. Betty Barron, EDC Evaluation Specialist, estimates that less than half of the teachers in rural public schools have finished teaching school.

It is difficult to attract qualified people to the profession due to the low salary which averages about US\$ 45 a month in the public schools and only slightly more in the private schools.

6. Privatization

In late 1986 a new law was proposed by the MOE to increase community and parent participation and the privatization of education. Since the proposed law, it has become easier to create and legalize private schools in urban and rural areas.

Appendix C:
The State of Child Health in Bolivia: Summary of the Problem

1. Child Mortality

Bolivia has the highest infant and child mortality rates in all of Latin America. The United Nations estimates that in 1980-1985, 12.4 percent of all children born in Bolivia did not reach their first birthday. An additional 7.1 percent died between the ages of 1 and 5 (IRD, 1987). Some sources estimate the death rate in Bolivia to be even higher. The 1976 Census for Bolivia found that 16.8 percent of infants died before age 1, and an additional 11.8 percent died between the ages of 1 and 5 (Morales, 1987). In comparison, the proportion of children dying in Latin American and the Caribbean is 6.3 percent for children under 1 and 2.5 percent for children 1-5 years (IRD, 1987).

The proportion of children dying in rural areas has been found to be significantly higher than in urban areas. A study by UNICEF in Oruro, Potosi and Chuquisaca found that 19.2 percent of children in rural areas of the provinces studied died before reaching 1 year compared to 9.8 percent in urban areas of the same provinces (UNICEF, 1986). Another study in 1983 found that 20.6 percent of infants in rural areas of the altiplano die before age 1 compared to 11.9 percent in principal cities. Equally dramatic differences in infant mortality are observed when comparing rates by socioeconomic class, housing conditions, educational level of the mother and language of the mother (Morales, 1987).

A 1985 survey by UNICEF in three Departments list the following principal causes of death:

Table 1: Principal Causes of Death in Children Under 1 Year
by Urban Status, Bolivia, 1985

Cause of Death	Urban (%)	Rural (%)
Gastrointestinal Disease	33.0	49.5
Respiratory Infections	25.4	16.8
Premature Birth	8.0	15.4
Other Infections	4.7	14.8
Other Causes	28.9	3.5

As can be seen, about two-thirds of all deaths are caused by gastrointestinal disease and respiratory infections (UNICEF, 1986). Mortality records of the Civil Registry indicate that in 1981, vaccine-preventable illnesses accounted for 11.4 percent of deaths to children under 5 years. More recent data on vaccine-preventable illnesses do not exist (USAID, 1988).

Malnutrition is often a contributing cause of death. A 1973 study in Bolivia found that 34.3 percent of all deaths to children under 1 year were associated with malnutrition. A more recent study indicates that the percentage of infant deaths in which

malnutrition was a contributing cause rose to 63.3 percent in 1982-83 (UNICEF, 1986). In developing their child survival strategy, USAID/Bolivia ranked malnutrition third as a "risk factor" due to its importance as a direct or indirect cause of death (USAID, 1988).

2. Child Morbidity

In addition to being the major cause of death, diarrhea is also one of the two most frequently occurring illnesses among children in Bolivia, along with respiratory infections. A study by UNICEF found that children under 5 in Bolivia have an average of six episodes of diarrhea per year. They found great regional variation, however, with an average of 12 episodes each year in rural areas of the altiplano (UNICEF, 1986). This can be compared to an average of two episodes a year for children under 5 in Latin America and the Caribbean overall (IRD, 1987).

According to the MPSSP, in 1986 respiratory infections accounted for the largest proportion of medical consultations for children under 4 in Bolivia, compared with other illnesses, and was second in terms of the major causes of hospitalization. In a 1981 survey, a national incidence rate of 17 percent was found for respiratory illness in children (Morales, 1987).

The most recent data available from the United Nations indicate that in 1975-83 in Bolivia 10 percent of all infants were of low birth-weight, and 52 percent of children under age 5 were at least mildly malnourished, based upon data comparing weight for age. Although data on low birth-weight and malnutrition are not available for all countries in Latin America, the percentages for Bolivia are higher than for the majority of those Latin American countries for which data are available (IRD, 1987). Death rates and morbidity in infants of low birth weight are considerably higher than for infants of normal weight. Twelve to 23 month olds have the highest rates of malnutrition, presumably due to inadequate weaning practices. Bolivian hospital admissions data have shown that the percentage of children treated who are malnourished increased from 1977 to 1983 (UNICEF, 1986).

As was the case with infant mortality rates, the prevalence of malnutrition is disproportionately concentrated in rural areas and in the altiplano. The following table summarizes data from a study by the National Institute of Food and Nutrition:

Table 2: Percent of Children Malnourished, 6 Months to 5 Years, Weight for Age, Gomez Classification, by Region and Urban Status, Bolivia, 1981

Antiplano		Valleys		Plains		Total	
Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
51.8	62.2	46.8	54.4	26.6	36.0	41.7	50.8

As can be seen from the table, the percentage of malnourished children is greater in rural areas in all three regions (an average of 50.8 percent in rural areas compared to 41.7 percent in urban). However, the differences between regions is much greater than the rural/urban difference. The percentage malnourished in the antiplano was 62.2 percent in rural areas in comparison with 54.4 percent in the valleys and 36.0 percent in the plains (UNICEF, 1986).

There is a strong link between diarrhea and malnutrition in children. Diarrhea increases food requirements as well as inhibiting food absorption and decreasing appetite at a time when the child's food requirements are greater. In addition, there is often a tendency for the mother to reduce food or water given to a child with diarrhea. In a recent study by CARITAS, one third of the mothers surveyed in La Paz and Oruro decreased the amount of water they gave their child during an episode of diarrhea (CARITAS, 1987). Just as diarrhea and the social response to diarrhea can lead to malnutrition, malnutrition can reduce the body's ability to resist diarrhea as well as other diseases.

Acute respiratory infection (ARI), the most common infectious disease and the second major cause of death in Bolivia, is also intensified by malnutrition. In Costa Rica, children with severe malnutrition have been shown to be 19 times more likely to develop pneumonia than normal children. Similarly, more than 90 percent of those dying from ARI in hospitals in the Philippines in a 1984 study were malnourished (IRD, 1987).

Another important illness in Bolivia is goiter. Goiter is a major problem in Bolivia with the prevalence ranging from a low of 42.9 percent in the Department of Pando to 74.7 percent in Chuquisaca (Morales, 1987). There are no data on the prevalence of goiter among children under 6; however, a 1983 study of school children found the prevalence to be 40.6 percent for Grade 1A goiter, 19.4 percent for Grade 1B and 5.4 percent for Grade II, for a total of 65.3 percent (CEPROLAI, 1986).

The frequency of Grade II goiter is twice as high in women as men, and children born to women with goiter are much more likely to be deaf, mute or retarded. The most extreme effect of having a mother with goiter upon a newborn is cretinism. In a 1987 study, districts of Chuquisaca where the prevalence of goiter was more than 80 percent had a 1.3 percent prevalence of cretinism (Moreles, 1987). Other studies have found the prevalence of cretinism to be as high as 16 percent in some local areas. Moreover, the incidence of cretinism in Bolivia is the highest in the world (CEPROLAI, 1986).

There are no data in Bolivia concerning the incidence of vaccine-preventable illnesses in children under 6. However, tuberculosis and measles have been among the ten most prevalent infectious diseases in recent years (CEPROLAI, 1986), and vaccine coverage rates are relatively low compared to other Latin American countries (IRD, 1987).

3. Existing Health Resources and Gaps in the Present Health Care Delivery System

The current high death rates for infants and children are due in part to weaknesses in basic health care services delivered through both public and private organizations. The severe economic crisis experienced in Bolivia in recent years has led to a contraction in health services which has affected rural areas and the poor to a disproportionately great extent. From 1980 to 1982, government spending for health programs was reduced by nearly 80 percent in real terms (USAID, 1988).

The Government of Bolivia (GOB) estimates that, in the country as a whole, 63.1 percent of Bolivians have access to health care: 33.5 percent to services offered by the MPSSP, 19.6 percent by the Social Security System and 10 percent to private services (Morales, 1987). Many other sources, however, indicate that there is no reliable information in Bolivia regarding the proportion of persons coverage by health care (UNICEF, 1986), and the proportion covered in rural areas is undoubtedly less than that for the country in general. Data on the location/accessibility of Health Posts and the proportion of children immunized indicate that coverage is far from adequate.

Health coverage is largely a function of availability, accessibility and acceptability. Studies have shown that the utilization of health services decreases dramatically as travel distances increase. In rural developing countries, one study found that utilization was as high as 81 percent within one mile of the health center, decreasing to 49 percent at two miles and 25 percent at three. For those who lived five miles from the center, utilization was only 1 percent (IRD, 1987).

The acceptability of services can also be questioned for an areas where the majority of the population is indigenous and non-Spanish speaking. Many prefer to take their sick children to a traditional healer with whom they share a common culture and language rather than to a Health Post which practices Western medicine which sometimes conflicts with traditional belief systems.

The percentage of children fully immunized by age 1 in Bolivia is less than half of the average for Latin America and the Caribbean for TB, Polio and Measles, as shown in the following summary table, suggesting that coverage is not adequate for even basic preventive health care:

Table 3: Percent of Children Fully Immunized by Age 1 for Bolivia and Latin America and the Caribbean, 1985

Geographic Area	TB	DPT	Polio	Measles
Latin America and the Caribbean	56	53	68	59
Bolivia	24	33	30	21

(IRD, 1987)