

**SCHOOL FEEDING: EFFECTS ON ENROLLMENT,
ATTENDANCE, AND DROP-OUT IN SRI LANKA**

Submitted to:
United States Agency For
International Development

Under Contract Number PDC-0212-I-09-1010-00

Roy I. Miller, Ph.D.
William D. Drake, Ph. D.

October 31, 1983

The views and interpretations expressed in this report
are those of the authors and should not be attributed
to the Agency for International Development

PREFACE

A preliminary draft of this report was prepared in September, 1982. That draft included the analytic results but not the Conclusions and Recommendations section. This final report includes a Conclusions and Recommendations section offering our views and opinions regarding the methodology, views and opinions which matured during the year through discussions with others as well as through our continuing work in this and related fields.

We would like to express our gratitude for the assistance provided us by CARE/Sri Lanka in the compilation of the data and their interpretation. Especially helpful were Mr. Francis W. Kulatunga and Mr. D. D. Jayatilleke. Had it not been for their initiative in generating the data, the study could not have been undertaken.

TABLE OF CONTENTS

PREFACE	ii
LIST OF TABLES	iv
LIST OF FIGURES	v
INTRODUCTION	1
A. THE PROJECT CONTEXT	1
B. PURPOSE AND SCOPE OF THE SCHOOL FEEDING PROGRAM	2
C. PURPOSE OF EVALUATION	3
THEORETICAL FRAMEWORK	6
THE DATA	10
A. MINISTRY OF EDUCATION DATA	10
B. CARE/SRI LANKA DATA	13
C. ADDITIONAL DATA	14
THE ANALYSIS	15
A. MINISTRY OF EDUCATION DATA	15
B. CARE/SRI LANKA DATA	25
C. ADDITIONAL DATA	33
CONCLUSIONS AND RECOMMENDATIONS	37
A. SCHOOL FEEDING, ATTENDANCE AND ENROLLMENT	37
B. METHODOLOGY	38
C. THE PROPER ROLE OF ANALYSIS	42

LIST OF TABLES

1. ENROLLMENT AND ATTENDANCE DATA FOR A SINGLE SCHOOL	12
2. ATTENDANCE BY REGION	18
3. ATTENDANCE BY GRADE	20
4. TOTAL ENROLLMENT BY GRADE IN JANUARY, 1980 ALL SCHOOLS WITH GRADES KG THROUGH 5	23
5. TOTAL ENROLLMENT BY GRADE IN JANUARY, 1980 ALL SCHOOLS WITH GRADES KG THROUGH 7	24
5. DATA GATHERED BY CARE ENROLLMENT BY GRADE AND BY YEAR, IN MARCH	32
7. PERCENTAGE OF SCHOOL AGED POPULATION ENROLLED IN SCHOOL	34
3. ESTIMATED SCHOOL AGED POPULATION AND ENROLLMENT .	35

LIST OF FIGURES

1. DETERMINANTS OF SCHOOL ENROLLMENT AND ATTENDANCE	8
2. ATTENDANCE IN FEEDING AND NON-FEEDING SCHOOLS (Data from 21 Districts 1980)	16
3. ATTENDANCE IN FEEDING AND NON-FEEDING SCHOOLS (CARE Data--21 Feeding and 4 Non-feeding Schools)	26
4. ATTENDANCE RATE, BY MONTH, IN KALUTARA (10 Elementary Schools In Feeding Program) . . .	28
5. ATTENDANCE RATE, BY MONTH, IN BANDARAWELA (11 Elementary Schools In Feeding Program) . . .	29

INTRODUCTION

Using gifted commodities donated by the United States, the Ministry of Education of Sri Lanka, with the support of CARE/Sri Lanka, administers a school feeding program designed to provide a ration of pre-baked biscuits to a target of 1,250,000 elementary school students on 180 school days each year. The biscuits are served in 44 gram portions yielding 190 calories and 7 grams of protein.

A. THE PROJECT CONTEXT

Among nations in the developing world, Sri Lanka is unique. As a result of a longstanding government policy of delivering basic health and education services to the people, Sri Lanka boasts a literacy rate near 80% and an infant mortality rate of 37.1 deaths per 1000 live births. Yet, poverty persists. Per capita Gross National Product in 1980 was Rs. 4,194 or U.S. \$254.¹

As a consequence of these almost paradoxical conditions, there is a large school-aged population suffering from various degrees of undernutrition. In 1973, a survey of school aged children was undertaken by CARE and the Ministry of Education to establish the quantitative basis for selecting needy schools for inclusion in the school feeding program. As reported in the literature, the survey indicated widespread malnourishment.² Using the Quac-Stick method of measuring malnutrition (a method based on the ratio of mid-arm circumference to height), 40.2% of the 1,122,773 children surveyed were found to be malnourished. Even though the cut-off point for defining

¹Ministry of Health--Sri Lanka, Annual Health Bulletin, 1980 (Colombo, Sri Lanka: Ministry of Health, 1980) p. 1 and p. 6.

²Mary Ann Anderson, "Use of height-arm circumference measurement for nutritional selectivity in Sri Lanka school feeding," The American Journal of Clinical Nutrition 28 (July, 1975) pp. 775-777.

below normal growth was relatively lenient (90% of a locally generated standard), such a high prevalence of deprivation is indicative of a serious nutrition problem in school-aged children.

In 1979, another survey was completed by CARE and the Ministry of Education. The objectives of this survey were:

- 1) to obtain a statistically valid assessment of the nutritional status of primary school children in the country,
- 2) to obtain baseline information that can be used in establishing a primary school nutrition surveillance system, and
- 3) to identify education districts and schools with the largest number of children who are at risk and who need remedial and preventive action.

The results of this survey were no more optimistic than the earlier one. Fifty percent of the children were suffering from chronic undernutrition--extrapolated nationwide, this is almost 1,000,000 malnourished children. In this survey, chronic undernutrition was defined as a height-for-age reading below 90% of the National Center For Health Statistics (NCHS) reference standard. Also, 3.41% of the children showed the signs of acute undernutrition or wasting. Acute undernutrition was defined as a weight-for-height reading below 80% of the NCHS reference standard.'

B. PURPOSE AND SCOPE OF THE SCHOOL FEEDING PROGRAM

An intuitively appealing response to such widespread nutritional deficiency is a feeding program. Accordingly, and consistent with its policy of widespread delivery of welfare services, the Government of Sri Lanka (GSL), through its Ministry of Education, has been involved in some form of school feeding--almost continuously--since 1931. Although not documented officially, the cessation of school feeding

¹CARE/Sri Lanka, Sri Lanka Primary School Nutrition Survey (Colombo, Sri Lanka: CARE/ Sri Lanka, 1981) pp. 2-5.

for a couple of years in the mid-fifties, due in-part to steadily increasing costs of maintaining the program, resulted in the formation of a new government committed to reintroducing the program.

Coincident with the advent of the new government, CARE initiated its assistance in the school feeding program. At first, CARE provided the midday meal, a wheat-based bun and a cup of milk made from United States' gifted commodities. Since that time, CARE has worked closely with the Ministry of Education to refine the food product used in school feeding. Today, a wheat-based biscuit, baked at two Sri Lanka factories, is distributed to 1,250,000 primary school children. By preparing the biscuit at only two sites (the bun had been baked at many local bakeries throughout the country), consistency in the product is assured, distribution is facilitated, and preparation at the school site is nil.

As stated by the CARE country director in the preface to the report describing the recent primary school nutrition survey:

Through this program we are attempting to bridge the gap between the requirements of a growing child and the intake of food at home. Educational development is not compatible with nutritional deprivation. They cannot go together. A child if he is to develop fully, both mentally and physically, should receive his basic nutrition needs.'

C. PURPOSE OF EVALUATION

Supplementary feeding of school children has recently come under increasing scrutiny. The original premise that feeding must help has been replaced by the argument that feeding school age children provides "too little, too late" to improve the nutritional well-being of designated beneficiaries. Recently, as AID/Washington has emphasized

'Ibid' p. 2.

October 31, 1983

SCHOOL FEEDING IN SRI LANKA

the attainment of nutritional improvement as a consequence of its food donation programs, school feeding has been assigned a low priority among available options for using gifted commodities.

During a recent P.L. 480 Title II evaluation in Sri Lanka³, the question of school feeding was of paramount importance. As noted earlier, Sri Lanka has had some form of school feeding, almost continuously, since 1931. The government in power today has promised to expand⁴ the existing school feeding program beyond its current coverage of 1,250,000 children to include all 2,000,000 children in the Sri Lankan elementary schools. Thus, the priorities of Sri Lanka and the priorities of AID/Washington are not totally congruent.

Recognizing this, the evaluation team addressed the issue of the impact of school feeding somewhat guardedly. Quantitative data on nutritional status in school children was largely unavailable. The aforementioned survey conducted by CARE provides a potential baseline for further studies. Concurrent with the analysis phase of this study of school feeding, CARE was planning a longitudinal (three-year) study of the nutritional progress of children in a sample of schools in Sri Lanka. The proposed study design combines some nutrition education elements with regular anthropometric measurements in an effort to ascertain the impact of school feeding. But, in the school system today, there is no widely available source from which to retrieve quantitative anthropometric data for establishing nutritional benefit from school feeding.

³William D. Drake, John N. Gunning, Abraham Horwitz, Roy I. Miller, Harold L. Rice and Gnani Thenabadu, Nutrition Programs in Sri Lanka Using U.S. Food Aid (An Evaluation Of P.L. 480 Title II Programs) (Ann Arbor, Michigan: Community Systems Foundation, 1982).

In its final report, the evaluation team reviewing the P.L. 480 Title II program expressed considerable skepticism regarding the prospects of discovering measurable change in nutritional status in school children using anthropometrics. In brief, the ration is really quite small, is given only half the days of the year, at best, and is often shared with siblings, even though the Sri Lanka program is based on on-site feeding. (One school principal interviewed during the field visits made as part of that evaluation, commented on the need to conduct recess for grades in the feeding program at a different time from the upper grades not receiving food to minimize the passage of biscuits from younger children to their older siblings.) More important than the ration size, conventional anthropometric measurements--weight and height combined with age--are unlikely to respond to intervention in a school aged population due to the body's adaptation to nutritional deficiency in the preschool years. (Previously stunted children can not exhibit full catch-up growth.)

Given its low expectation for seeing nutritional impact from school feeding and the absence of existing data, the evaluation team sought to test the proposition that school feeding was a positive incentive for school attendance. Toward this end, several data sets were generated based on existing attendance records in selected Sri Lankan schools. (The data are described more fully, subsequently.) A third claim for school feeding is that the infusion of calories in the middle of the school day increases the attentiveness and ability to learn on the part of the beneficiaries (especially in poverty laden communities where breakfasts are either haphazard affairs or non-existent). A test of hypotheses related to this claim requires observation and testing of participants and non-participants over a period of time. Although a worthwhile undertaking, such observation and testing were beyond the scope of a short term project such as this.

THEORETICAL FRAMEWORK

Whereas it is possible to explore the empirical relationships in a set of data in an effort to discover pertinent patterns without having a strong theoretical premise to guide that search, as analysts, we believe it is both easier and wiser to develop a theoretical basis for any analysis prior to undertaking a quantitative investigation. Such a theoretical basis is particularly useful in a study of complex social phenomena characterized by a series of interconnected and, at times, inconstant relationships. The dynamic relationships of the factors influencing school attendance and enrollment make up one such complex social phenomenon.

In developing a theoretical framework for investigating any social issue, we are concerned, primarily, with the identification of forces at work in a system which might overshadow the relationships expressed in the principal hypotheses of the study. For example, the impact of a supplementary feeding program on the nutritional well-being of a target population might be overshadowed by changing economic conditions or changes in the health service delivery system, etc. These other forces offer competing explanations for observed changes in the primary factors (variables) under investigation. To insure proper interpretation of empirical observation, it is necessary to consider the possibility that competing explanations and not the principal hypotheses are the cause of analytic results. The development of a theoretical framework is tantamount to compiling a catalog of those potential competing explanations.

With regard to the relationship between school feeding, attendance and enrollment, the primary hypothesis is that the provision of a snack or a meal during the school day contributes to both enrollment and attendance. However, many other factors influence enrollment and attendance.

Figure 1 presents a schematic diagram of the decision points in the process leading to graduation from school.

The decisions represented by the three middle boxes in the schematic diagram--enrollment, attendance, and continued attendance--reflect decisions made in very different time frames. The decision to enroll in school initially is made just once and represents a long term commitment to attain an education. The decision to attend school on any given day or in any given season is made on the basis of all the factors influencing the initial enrollment decision as well as some short term factors such as the state of the economy and, even, the weather. Finally, the decision to continue on in school is made once or, at most, twice, each year--with the start of each new semester. Of particular importance in considering the impact of school feeding on enrollment and attendance in Sri Lanka is the decision to continue on in school after the feeding program is terminated, between the fifth and sixth grades. Some children switch to a new school, often less proximate than the elementary school, to attend the upper classes. Others continue on at the same physical location. For all children, the end of the fifth grade marks the end of the first phase of educational pursuit.

Historically in Sri Lanka, the cultural and familial incentives to enroll and stay in school are extraordinarily strong. The near 80% literacy rate attests to that fact. Thus, a priori, we might expect school feeding to play a lesser role in prompting children to come to school than in other developing countries with school feeding programs. Also, children assist in doing farming chores or in substituting for their parents around the home during the busiest agricultural seasons; therefore, we can anticipate a seasonality in attendance.

The data for this study was collected to facilitate testing various specific hypotheses with regard to the role

FIGURE 1

DETERMINANTS OF SCHOOL ENROLLMENT AND ATTENDANCE

Enrollment Determinants:

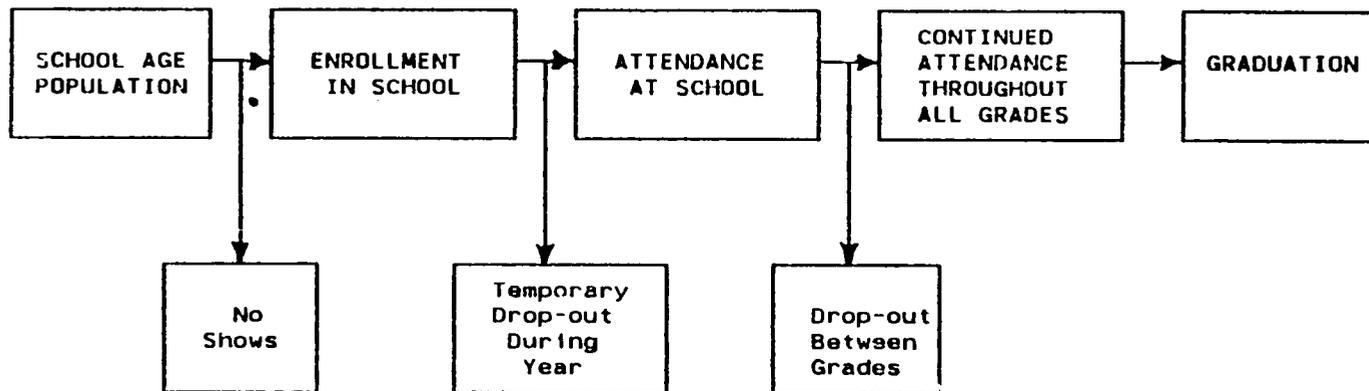
- School Feeding
- Parental and/or school affluence
- Parental Incentive
- Child motivation

Attendance Determinants:

- All Enrollment determinants
- Short term economic fluctuations
- Weather

Continued Attendance Determinants:

- All Attendance determinants
- Proximity to school if a change
- Life cycle change as a function of child age



of school feeding in determining long term enrollment as well short term attendance in Sri Lanka. By comparing schools included in the feeding program with schools not in the program, it was hoped that the effect of these competing explanations for attendance and enrollment would be minimized.

THE DATA

A. MINISTRY OF EDUCATION DATA

A special survey was designed jointly by the evaluation team and the Ministry of Education of Sri Lanka which was then carried out by Ministry staff. Attendance and enrollment was sampled in 112 schools throughout Sri Lanka. The schools were drawn from twenty-one regions in nineteen of the twenty-four administrative Districts of Sri Lanka. The five Districts not represented were the smaller (in terms of population) and more remote Districts. Of the 112 schools, fifty-nine participated in the school feeding program while fifty-three did not. In eleven of the regions, three feeding schools and three non-feeding schools were selected for consideration while, in the remaining regions, fewer than three of one or the other type of school were included. In the analysis described below, only 107 schools are included--inconsistencies in the data in the remaining five schools caused their exclusion.

The data consists of two entries for each month of 1980 for each grade in each school--monthly enrollment and average attendance for the month. In addition, totals were generated, by month, for the elementary school grades, the upper grades (if any) and the school as a whole. (These totals were recomputed in the computer as a cross-check of the data entry and the summations done in the field.) Clearly, this set of data is conducive to testing the hypothesis that ongoing attendance in schools with feeding programs is higher than in those schools without such programs.

One immediate problem which arises in the analysis is the definition of an attendance rate for any collection of months, grades and/or schools. For any single month, the computation of an attendance rate for any grade in a single school is straightforward--attendance as a percent of enrollment.

Let $A_{i,j,k}$ = attendance in month i , grade j , school k
 $E_{i,j,k}$ = enrollment in month i , grade j , school k
 $R_{i,j,k}$ = att. rate in month i , grade j , school k

Then

$$R_{i,j,k} = \frac{A_{i,j,k}}{E_{i,j,k}} \times 100.$$

Suppose, however, one wishes to define the attendance rate for all elementary school grades (kindergarten through grade 5) in a single school. This can be computed in two ways.

$$\text{Method 1: } R_{i,k} = \frac{\sum_j R_{i,j,k}}{6}$$

where j ranges from kindergarten through grade five

$$\text{Method 2: } R_{i,k} = \frac{\sum_j A_{i,j,k}}{\sum_j E_{i,j,k}} \times 100.$$

where j ranges from kindergarten through grade five

The results, $R_{i,k}$ (the attendance rate in elementary school k in month i), are not equivalent. For example, consider the enrollment and attendance data for the month of January in the Etdattalla Vidyalaya School (School number 10) in Anurhadhapura. These data are shown in Table 1.

TABLE 1

ENROLLMENT AND ATTENDANCE DATA FOR A SINGLE SCHOOL

Grade	Enrollment	Attendance	Monthly Rate
Kg	24	18	75.0%
1	15	14	93.3%
2	2	1	50.0%
3	7	6	85.7%

In this particular school, there were no grades higher than grade 3. Applying method 1 as defined above:

$$R_{1,10} = \frac{\sum_j R_{1,j,10}}{4} = \frac{75+93.3+50+85.7}{4} = 76.0$$

Similarly, applying method 2 as defined above:

$$R_{1,10} = \frac{\sum_j A_{1,j,10} \times 100}{\sum_j E_{1,j,10}} = \frac{(18+14+1+6) \times 100}{(24+15+2+7)} = 81.25$$

We chose to use method 2 in our calculations to minimize the weighting of a small grade (one with relatively few students) in the computation.

Note, the problem of aggregating to find attendance rates in subsections of the data is compounded when combining attendance and enrollment figures for different months because the attendance figures are already averages and the number of school days in each month is different. A reported attendance of 20 in January might represent the average attendance for 19 days while the reported figure for February, say 22, might cover only 17 days. The average of the reported figures, 21, is not the average attendance for February and January. The true average is weighted by the

number of days, a figure not reported in this instance by the Ministry of Education; in this example, 20.94.

B. CARE/SRI LANKA DATA

Simultaneously, the evaluation team, working jointly with CARE/Sri Lanka, designed a form to gather a second, independent, set of data. CARE field staff transcribed attendance and enrollment data from twenty-five schools in two districts of Sri Lanka for selected months over a three year period. The districts of Bandarawela and Kalutara were singled out because they experienced a cessation of school biscuit delivery during six months of 1981 as a result of a fire in one of the two commercial outlets producing biscuits and nation-wide power shortages which seriously curtailed output at the second production facility. Of the thirteen schools in Bandarawela, eleven were in the biscuit program while ten of the twelve in Kalutara were part of the program.

In Bandarawela, the data from each of seven months-- January, February, March, May, June, July and September-- were gathered for the years of 1979, 1980 and 1981. In Kalutara, the January and February figures were not collected. Biscuit flow into both districts was stopped in mid-February, with the second of six scheduled distributions, and resumed again in September, with the fourth distribution. However, we do not know the biscuit flow pattern in each individual school. It is quite possible that residual biscuits in each school or in regional warehouses sustained the flow of biscuits for some weeks in some schools beyond mid-February or that delays in "filling the pipeline" extended beyond the production cessation period ending on the first of September. Clearly, this data is conducive to testing the hypothesis that a cessation in school feeding adversely affects attendance in the short run.

Again, the problem of defining the attendance rate is quite real. It is resolved by using the same definition as before, that which we called method 2--the computation of the rate afresh for each aggregation rather than the averaging of individual monthly rates.

C. ADDITIONAL DATA

Additional pieces of information were provided by CARE and the Ministry of Education to supplement the first two data sets. These include:

- a) school system wide dropout rates in 1980 for grades kindergarten through grade eight,
- b) school system wide student population by district in 1980 for grades kindergarten through five by medium of instruction (language),
- c) annual enrollment by grade from 1952 through 1980,
- d) total population of Sri Lanka by year and by district from 1951 to 1981, and
- e) an estimate of the age distribution of the population from 1950 through 1980.

This data facilitates additional analysis to explore the long term effect of school feeding on attendance by examining enrollment changes throughout the single period in recent Sri Lankan history where no school feeding programs were in operation.

THE ANALYSIS

A. MINISTRY OF EDUCATION DATA

The first hypothesis to be tested with the data collected for this study by the Ministry of Education of Sri Lanka is a test of the short term effect of school feeding on attendance.

Hypothesis 1: Attendance as a percent of enrollment is higher in schools participating in the biscuit program.

Using the formulas described earlier, attendance rates were calculated for grades kindergarten through five (the grades covered by school feeding) for each month of 1980 in all feeding schools and all non-feeding schools. Figure 2 presents the results in graphic and numeric form.

The graphs in Figure 2 show that, in our sample, attendance in non-feeding schools was higher than in feeding schools for every month in 1980.

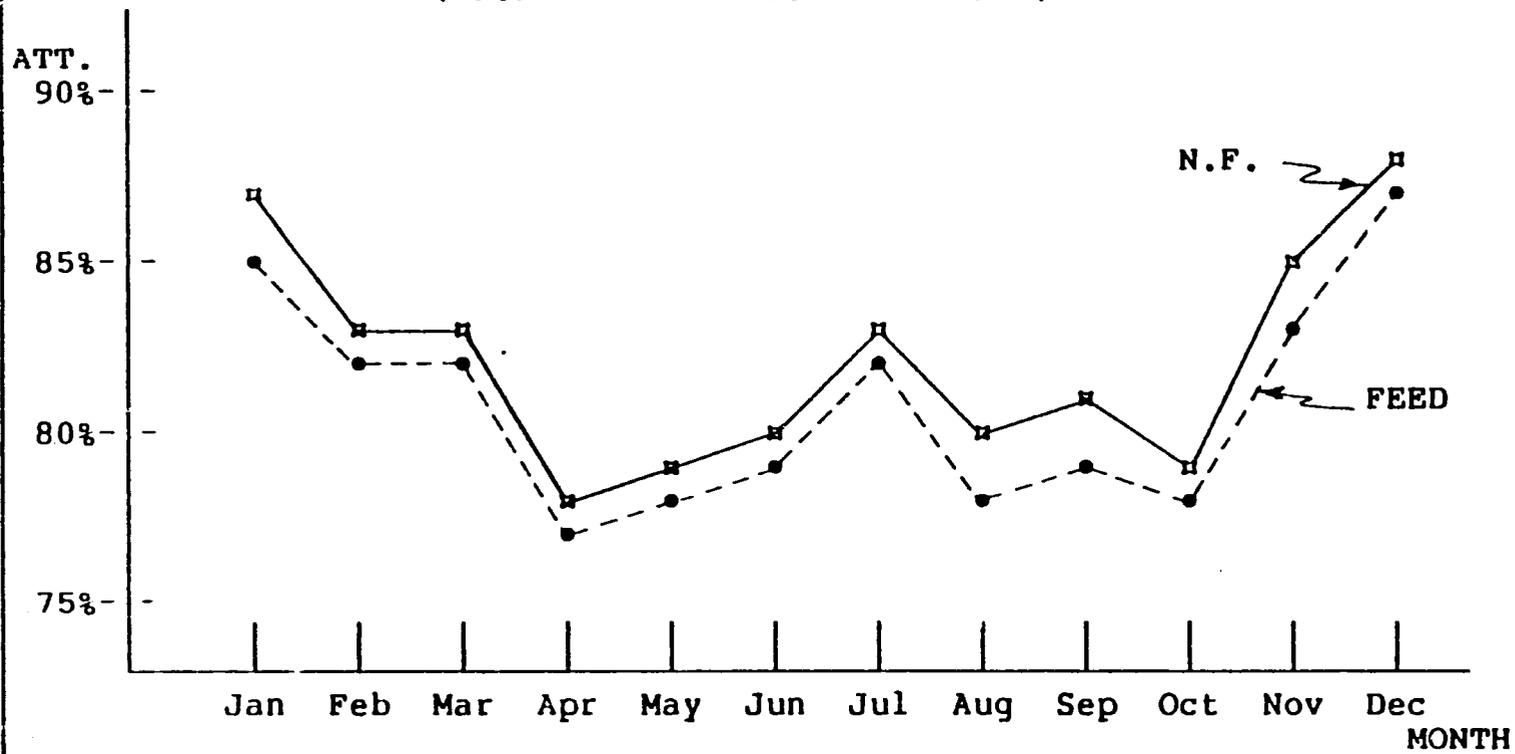
This is a truly unanticipated result, one that prompted us to search immediately for other possible interpretations. Had attendance been higher in feeding schools, it could have been argued that the biscuits were responsible. However, if one presumed the worst case and contended that biscuits are not an incentive for attendance, the attendance rates in the two groups of schools should be the same. That attendance in non-feeding schools is uniformly higher suggests a bias in the sample selection procedure.

We explored this bias from two perspectives. First, we disaggregated the data in a variety of ways attempting to understand better the causes for the unanticipated result. Then we "visited" the field, with the help of Mr. Kulatunga of CARE/Sri Lanka, to learn more about the schools in the sample.

First, we disaggregated the data by region. Table 2 presents the monthly attendance for both the feeding and non-feeding schools in each district. (The number of

FIGURE 2

ATTENDANCE IN FEEDING AND NON-FEEDING SCHOOLS
(Data From 21 Districts--1980)



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
FEED	85.3	82.4	81.6	76.7	77.5	78.7	81.7	77.5	78.9	78.0	83.0	87.0
N.F.	86.5	83.2	83.3	77.9	78.6	79.6	83.3	79.6	80.6	78.7	85.1	88.1

plusses is a count of the number of months for which attendance in feeding schools was higher than attendance in non-feeding schools.) We see overwhelmingly higher attendance in non-feeding schools in both Kalutara and Colombo South. Overall, non-feeding schools had higher attendance in six regions; lower attendance in seven regions; and fluctuating attendance in 8 regions (defined as 5 through 8 plusses). However, the substantially higher attendance in the non-feeding schools in the six regions, in the aggregate, causes the overall analysis to show higher attendance in non-feeding schools.

A similar disaggregation was done by grade. Table 3 presents the monthly attendance in feeding and non-feeding schools by grade. In kindergarten, feeding schools have higher attendance in eight of twelve months; however, in grades 1 through 5, the non-feeding schools have higher attendance in almost every month. In the upper grades, where there is no school feeding, there is no visible difference between feeding and non-feeding schools.

One possible explanation offered by knowledgeable Sri Lankans was as follows. Because of the 1973 screening of schools based on nutritional status, many of the non-feeding schools across the nation are the "better" schools or, at least, schools in the wealthier communities. This is especially true in the major urban areas where there are large "prestige" schools which draw children from families where education is highly valued. One might expect attendance to be higher in these schools. Kalutara and Colombo South are regions where such prestigious schools exist.

In an effort to learn more about the Ministry Of Education sample, questionnaires were sent to the principals of the schools included. Slightly more than half of the schools responded. An inordinately high percentage of the non-feeding schools had participated in the feeding program

TABLE 2
21 DISTRICT DATA--1980
ELEMENTARY SCHOOL ATTENDANCE AS A PERCENT OF ENROLLMENT
BY DISTRICT

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
REGION 1: GALLE													
FEEDING	86.81	82.33	83.06	74.25	79.42	83.66	81.54	76.46	80.89	80.35	86.78	89.46	FEEDING SCHOOLS 3; NON-FEEDING SCHOOLS 2
NON-FEED	83.69	80.75	78.54	77.56	75.70	76.85	76.51	70.48	75.76	75.66	79.76	91.46	
	+	+	+	-	+	+	+	+	+	+	+	-	NUM PLUSSES = 10
REGION 2: AMURADHAPURA													
FEEDING	77.72	73.54	75.56	74.44	83.20	80.27	81.49	81.22	78.12	77.03	75.91	86.27	FEEDING SCHOOLS 3; NON-FEEDING SCHOOLS 3
NON-FEED	86.28	81.63	80.00	80.76	75.34	75.33	81.73	80.92	57.10	74.27	81.11	81.76	
	-	-	-	-	+	+	-	+	+	+	-	+	NUM PLUSSES = 6
REGION 3: KURUNEGALA													
FEEDING	86.07	83.69	80.76	74.39	78.30	82.07	83.82	74.45	81.47	77.90	87.11	90.88	FEEDING SCHOOLS 3; NON-FEEDING SCHOOLS 3
NON-FEED	79.67	78.54	80.09	82.99	79.65	77.95	81.57	77.08	80.13	77.40	82.84	85.75	
	+	+	+	-	-	+	+	-	+	+	+	+	NUM PLUSSES = 3
REGION 4: RAINAPURA													
FEEDING	82.02	73.58	73.54	69.97	63.62	68.11	73.74	73.37	77.31	74.69	77.06	85.39	FEEDING SCHOOLS 3; NON-FEEDING SCHOOLS 3
NON-FEED	80.52	77.83	75.18	73.05	75.64	69.93	72.26	61.03	72.71	70.89	79.53	81.41	
	+	-	-	-	-	-	+	+	+	+	-	+	NUM PLUSSES = 6
REGION 5: BANDARAWELA													
FEEDING	88.82	85.26	85.48	81.39	84.32	83.57	85.69	81.96	85.37	85.35	86.57	92.57	FEEDING SCHOOLS 3; NON-FEEDING SCHOOLS 3
NON-FEED	84.06	77.63	78.93	73.89	78.34	73.70	78.08	78.03	74.66	74.76	76.37	84.15	
	+	+	+	+	+	+	+	+	+	+	+	+	NUM PLUSSES = 12
REGION 6: CHILAW													
FEEDING	88.16	81.85	81.64	85.80	80.76	76.62	83.94	82.22	80.11	78.22	86.15	89.41	FEEDING SCHOOLS 3; NON-FEEDING SCHOOLS 3
NON-FEED	88.89	86.67	84.11	76.85	76.85	77.30	82.78	77.93	78.56	77.51	87.29	91.05	
	-	-	-	+	+	-	+	+	+	+	-	-	NUM PLUSSES = 6
REGION 7: AMPARAI													
FEEDING	81.21	71.55	74.44	70.01	74.61	77.43	83.00	81.70	70.52	67.92	73.32	84.35	FEEDING SCHOOLS 3; NON-FEEDING SCHOOLS 2
NON-FEED	91.60	89.45	85.11	79.40	84.55	87.45	90.00	80.87	85.22	83.48	86.09	49.57	
	-	-	-	-	-	-	-	+	-	-	-	+	NUM PLUSSES = 2
REGION 8: KALUTARA													
FEEDING	87.71	76.14	79.78	68.42	76.89	75.76	80.16	72.41	76.54	75.19	82.17	86.51	FEEDING SCHOOLS 3; NON-FEEDING SCHOOLS 3
NON-FEED	87.74	81.99	85.11	76.43	81.51	80.81	81.36	77.34	80.88	80.59	88.10	93.23	
	-	-	-	-	-	-	-	-	-	-	-	-	NUM PLUSSES = 0
REGION 9: GAMPAHA													
FEEDING	91.63	92.87	83.03	72.94	78.24	83.26	85.51	69.95	87.32	90.14	89.62	94.34	FEEDING SCHOOLS 1; NON-FEEDING SCHOOLS 3
NON-FEED	81.03	83.93	79.26	74.03	75.30	76.82	79.95	80.60	80.35	77.66	84.15	82.76	
	+	-	+	-	+	+	+	-	+	+	+	+	NUM PLUSSES = 9
REGION 10: KANDY WEST													
FEEDING	89.13	87.37	83.40	85.06	79.95	80.15	83.67	78.97	80.72	82.25	85.10	86.92	FEEDING SCHOOLS 3; NON-FEEDING SCHOOLS 2
NON-FEED	88.19	86.16	81.72	67.47	77.85	77.08	84.83	76.04	78.72	78.05	90.24	92.68	
	+	+	+	+	+	+	-	+	+	+	-	-	NUM PLUSSES = 9
REGION 11: BAITICALOA													
FEEDING	81.75	84.44	86.22	90.63	85.27	83.93	82.14	82.59	86.61	85.27	88.39	92.41	FEEDING SCHOOLS 2; NON-FEEDING SCHOOLS 2
NON-FEED	81.61	81.31	80.72	74.51	74.84	77.05	74.40	75.09	77.74	75.00	77.74	78.83	
	+	+	+	+	+	+	+	+	+	+	+	+	NUM PLUSSES = 12

TABLE 2--Continued

REGION 12: JAFFNA													
FEEDING	90.83	88.03	94.02	99.15	91.67	90.83	95.83	94.17	95.93	96.72	95.90	93.44	
NON FEED	95.15	90.20	93.14	99.02	89.42	89.52	96.08	95.10	93.14	92.16	96.08	99.02	NUM PLUSSES = 6
	-	-	+	+	+	+	-	-	+	+	-	-	
REGION 13: KANDY WEST													
FEEDING	86.20	91.00	86.82	82.66	85.25	85.60	85.71	78.60	83.00	84.46	85.67	89.27	
NON FEED	89.02	84.97	86.21	86.71	84.00	84.48	85.71	81.61	84.66	84.75	85.88	87.01	NUM PLUSSES = 5
	-	+	+	-	+	+	+	-	-	-	-	+	
REGION 14: TANGALLA													
FEEDING	80.48	82.35	83.42	74.34	73.03	73.81	83.31	76.53	75.25	74.05	80.87	80.70	
NON FEED	87.93	81.30	81.84	76.28	73.80	73.30	78.89	76.14	72.96	74.93	80.98	80.96	NUM PLUSSES = 6
	-	+	+	-	-	+	+	+	+	-	-	-	
REGION 15: MATARA													
FEEDING	86.76	80.98	79.90	77.42	79.01	79.70	82.40	78.81	78.44	77.08	85.32	88.52	
NON FEED	85.57	79.52	80.89	70.19	77.46	77.77	83.44	82.58	81.60	80.21	84.43	91.86	NUM PLUSSES = 6
	+	+	-	+	+	+	-	-	-	-	+	-	
REGION 16: HOMAGAMA													
FEEDING	87.32	84.91	84.15	79.48	75.41	82.68	85.17	81.07	83.64	84.18	87.12	88.18	
NON FEED	87.43	88.90	89.14	83.79	77.17	86.01	88.12	86.26	84.97	82.82	87.35	90.42	NUM PLUSSES = 1
	-	-	-	-	-	-	-	-	-	+	-	-	
REGION 17: COLOMBO SOUTH													
FEEDING	82.69	80.00	79.84	74.14	70.83	73.33	73.72	72.94	74.57	70.97	79.97	84.74	
NON FEED	92.39	85.10	89.78	88.27	86.74	86.17	89.04	86.58	89.12	82.09	92.35	94.99	NUM PLUSSES = 0
	-	-	-	-	-	-	-	-	-	-	-	-	
REGION 18: MATALE													
FEEDING	82.85	80.65	79.29	80.38	77.11	79.28	83.15	78.61	76.11	76.88	78.83	85.24	
NON FEED	90.35	88.99	84.57	77.80	82.66	83.12	87.45	82.54	82.44	81.56	87.08	94.18	NUM PLUSSES = 1
	-	-	-	+	+	-	-	-	-	-	-	-	
REGION 19: NUWARA ELIYA													
FEEDING	88.87	86.14	79.41	71.96	72.74	69.04	71.82	69.07	71.88	71.19	74.69	79.51	
NON FEED	78.87	79.17	77.14	77.14	74.29	74.29	72.86	72.86	65.71	72.73	78.46	82.81	NUM PLUSSES = 4
	+	+	+	-	-	-	-	-	+	-	-	-	
REGION 20: MONERAGALA													
FEEDING	80.80	79.08	79.95	63.85	74.15	73.91	79.13	69.81	70.86	68.13	78.69	83.86	
NON FEED	76.18	74.34	71.30	60.78	64.37	71.00	77.88	71.00	69.16	64.37	69.49	92.35	NUM PLUSSES = 10
	+	+	+	+	+	+	+	+	+	+	+	-	
REGION 21: KULIYAPITIYA													
FEEDING	86.12	90.14	88.36	81.13	86.07	82.54	87.48	84.57	84.31	85.20	89.30	88.95	
NON FEED	81.34	83.31	84.38	71.66	75.20	81.06	86.57	72.52	85.11	81.63	84.72	79.64	NUM PLUSSES = 11
	+	+	+	+	+	+	+	+	-	+	+	+	

TABLE 3
 21 DISTRICTS - 1980
 SCHOOL ATTENDANCE PERCENT OF ENROLLMENT
 BY GRADE

GRADE	FEEDING SCHOOLS								NON-FEEDING SCHOOLS				MEAN	STD
GRADE K:	FEEDING SCHOOLS 56;								NON-FEEDING SCHOOLS 49					
FEEDING	84.83	82.54	80.70	76.34	75.55	76.97	80.90	78.61	78.30	78.35	82.03	85.94	MEAN = 80.09;	STD = 3.31
NON-FEED	84.24	80.95	80.96	76.04	75.52	75.99	79.86	76.16	79.87	77.27	83.25	86.07	MEAN = 79.68;	STD = 3.57
	+	+	-	+	+	+	+	+	-	+	-	-	NUM PLUSSES =	8
GRADE 1	FEEDING SCHOOLS 56;								NON-FEEDING SCHOOLS 48					
FEEDING	86.11	81.96	81.28	77.34	77.36	79.03	81.74	78.14	80.46	79.87	83.74	87.29	MEAN = 81.19;	STD = 3.23
NON-FEED	85.92	82.73	83.20	80.72	78.82	80.58	83.61	79.93	81.59	78.33	85.12	88.70	MEAN = 82.52;	STD = 2.96
	+	-	-	-	-	-	-	-	-	+	-	-	NUM PLUSSES =	2
GRADE 2	FEEDING SCHOOLS 56;								NON-FEEDING SCHOOLS 46					
FEEDING	85.68	83.48	83.69	78.97	80.30	80.47	83.49	79.13	82.43	80.79	86.18	90.05	MEAN = 82.90;	STD = 3.27
NON-FEED	87.73	85.97	84.29	78.62	79.39	79.26	84.37	80.86	81.96	78.80	86.82	90.21	MEAN = 83.26;	STD = 3.86
	-	-	-	+	+	+	-	-	+	+	-	-	NUM PLUSSES =	5
GRADE 3	FEEDING SCHOOLS 56;								NON-FEEDING SCHOOLS 46					
FEEDING	85.35	81.40	81.77	77.04	77.13	77.81	81.51	75.84	77.30	76.64	81.83	86.06	MEAN = 79.97;	STD = 3.49
NON-FEED	87.28	80.37	83.14	77.13	79.06	80.03	83.51	79.51	80.33	78.62	85.15	89.07	MEAN = 81.93;	STD = 3.70
	-	+	-	-	-	-	-	-	-	-	-	-	NUM PLUSSES =	1
GRADE 4	FEEDING SCHOOLS 56;								NON-FEEDING SCHOOLS 44					
FEEDING	85.50	82.68	81.02	75.28	76.26	79.05	81.01	76.81	77.49	76.80	82.11	85.88	MEAN = 79.99;	STD = 3.60
NON-FEED	87.48	84.50	83.88	76.81	79.30	80.61	83.81	80.61	81.80	78.88	84.70	90.24	MEAN = 82.73;	STD = 3.80
	-	-	-	-	-	-	-	-	-	-	-	-	NUM PLUSSES =	0
GRADE 5	FEEDING SCHOOLS 55;								NON-FEEDING SCHOOLS 42					
FEEDING	83.89	81.43	81.24	74.91	78.14	78.86	81.30	76.13	77.18	75.18	82.04	87.07	MEAN = 79.78;	STD = 3.71
NON-FEED	87.44	85.94	84.74	78.90	80.21	82.04	85.75	81.48	81.37	78.61	85.53	89.70	MEAN = 83.48;	STD = 3.54
	-	-	-	-	-	-	-	-	-	-	-	-	NUM PLUSSES =	0
GRADE 6	FEEDING SCHOOLS 33;								NON-FEEDING SCHOOLS 24					
FEEDING	83.81	83.02	78.72	71.16	75.21	76.69	79.69	69.53	77.81	75.29	78.66	87.40	MEAN = 78.03;	STD = 5.09
NON-FEED	84.97	84.04	83.13	71.90	77.21	79.80	84.19	78.84	81.08	75.74	84.28	89.28	MEAN = 81.21;	STD = 4.76
	-	-	-	-	-	-	-	-	-	-	-	-	NUM PLUSSES =	0
GRADE 7	FEEDING SCHOOLS 33;								NON-FEEDING SCHOOLS 24					
FEEDING	82.61	80.40	79.22	70.02	76.63	78.37	82.88	72.93	77.08	74.13	81.23	85.26	MEAN = 78.40;	STD = 4.48
NON-FEED	82.84	83.27	83.94	69.58	77.16	80.15	83.93	71.46	79.13	73.41	82.01	81.59	MEAN = 79.04;	STD = 5.04
	-	-	-	+	-	-	-	+	-	+	-	+	NUM PLUSSES =	4
GRADE 8	FEEDING SCHOOLS 30;								NON-FEEDING SCHOOLS 22					
FEEDING	83.31	82.76	80.00	70.73	75.92	76.66	83.85	72.30	77.65	74.41	80.40	85.83	MEAN = 78.65;	STD = 4.82
NON-FEED	79.74	80.54	81.35	67.24	76.19	78.53	83.02	71.35	77.86	73.73	82.19	83.21	MEAN = 77.91;	STD = 4.98
	+	+	-	+	-	-	+	+	-	+	-	+	NUM PLUSSES =	7
GRADE 9	FEEDING SCHOOLS 27;								NON-FEEDING SCHOOLS 18					
FEEDING	79.42	76.22	75.39	63.44	72.22	72.60	78.53	64.03	76.74	72.86	81.68	82.83	MEAN = 74.66;	STD = 6.13
NON-FEED	80.08	81.78	83.63	67.45	76.67	77.80	84.36	71.06	81.03	72.82	81.31	79.13	MEAN = 78.09;	STD = 5.22
	-	-	-	-	+	+	+	-	+	+	+	+	NUM PLUSSES =	3
GRADE 10	FEEDING SCHOOLS 27;								NON-FEEDING SCHOOLS 17					
FEEDING	77.56	73.86	74.11	65.56	75.94	79.93	85.40	76.04	79.92	79.63	84.63	89.38	MEAN = 78.50;	STD = 6.26
NON-FEED	70.71	74.19	72.28	63.34	73.27	73.86	77.05	72.23	76.74	67.56	71.46	76.89	MEAN = 72.47;	STD = 4.00.
	+	-	+	+	+	+	+	+	+	+	+	+	NUM PLUSSES =	11
GRADE 11	FEEDING SCHOOLS 9;								NON-FEEDING SCHOOLS 5					

TABLE 3--Continued

FEEDING	66.27	73.49	63.86	68.67	78.42	76.10	82.28	78.71	84.62	76.65	74.70	73.65	MEAN = 74.78;	STD = 6.17
NON-FEED	89.71	88.24	91.18	77.94	80.83	81.82	85.26	69.04	83.38	70.09	74.79	68.60	MEAN = 80.07;	STD = 8.03
		-	-	-	-	-	-	+	+	+	-	+	NUM PLUSSES = 4	
GRADE 12														
FEEDING	79.49	80.00	80.00	84.48	75.61	80.73	78.57	78.26	70.19	66.35	67.65	71.29	MEAN = 76.05;	STD = 5.79
NON-FEED	71.72	76.44	69.88	53.31	78.80	61.65	55.07	39.23	66.37	53.26	61.02	48.18	MEAN = 61.24;	STD = 11.95
	+	+	+	+	-	+	+	+	+	+	+	+	NUM PLUSSES = 11	
GRADE 11														
FEEDING	85.27	82.41	81.64	76.70	77.46	78.70	81.68	77.46	78.91	78.00	83.01	87.06	MEAN = 80.69;	STD = 3.34
NON-FEED	86.53	83.24	83.29	77.94	78.63	79.62	83.36	79.64	81.13	78.75	85.07	88.92	MEAN = 82.18;	STD = 3.48
		-	-	-	-	-	-	-	-	-	-	-	NUM PLUSSES = 0	
GRADE 10														
FEEDING	81.23	79.48	77.28	68.98	75.50	77.16	81.74	71.76	77.98	75.29	80.46	85.54	MEAN = 77.70;	STD = 4.51
NON-FEED	78.44	80.00	78.94	65.89	76.60	76.55	79.61	69.39	77.95	70.22	77.54	77.45	MEAN = 75.72;	STD = 4.58
	+	-	-	+	-	+	+	+	+	+	+	+	NUM PLUSSES = 9	
GRADE 09														
FEEDING	81.25	81.68	80.55	74.79	76.97	78.32	81.69	76.08	78.68	77.35	82.40	86.69	MEAN = 79.95;	STD = 3.54
NON-FEED	81.17	82.31	82.04	74.48	78.06	78.74	82.27	76.67	80.21	76.30	82.91	85.61	MEAN = 80.31;	STD = 3.46
	+	-	-	+	-	-	-	-	-	+	-	+	NUM PLUSSES = 4	

prior to the 1973 survey but were eliminated because of their relatively high nutritional well-being. We must conclude that the Ministry of Education sample was biased in favor of prestigious urban schools which, quite often, exhibit higher attendance rates.

Additional hypotheses to be tested with this data concern the relationship between school feeding and drop-out rates. These hypotheses test the longer term influence of a feeding program on participation in the educational system.

Hypothesis 2: Drop-out rates in grades kindergarten through five are less in feeding schools.

Hypothesis 3: In schools with grades kindergarten through seven, drop-out rates in feeding schools are higher between the fifth and sixth grades.

Because this data set covers enrollment and attendance for one school year only, several assumptions must be made to define a drop-out rate. At first, we thought it reasonable to assume an equal distribution of school aged children, nation-wide, over all ages. That is, we made the assumption that there would be an equal number of five, six, seven, eight, nine, and ten year olds eligible for enrollment in all the schools. If this assumption is valid, then it is also reasonable to assume an equal age distribution in our sample. Then, the number of children enrolled, by grade, would reflect the drop-out rate. The decline in enrollment from grade i to grade $i+1$ would be an estimate of the drop-out rate. We know, by looking at the data on individual schools, that this assumption is not valid on a school by school basis. However, we can assume that by aggregating over all schools in our sample, differences in the age distribution in individual schools would cancel.

To make this last assumption concerning aggregation more plausible, it was necessary to limit consideration to those schools which held classes in all of the grades relevant for the particular comparison being made. (In the

extreme, there was one "high school" in our sample, in Jaffna, where there were no classes held in kindergarten through fifth grade. If the sixth grade students enrolled in this school were included in the count of sixth graders in the sample, it would create the effect of an overpowering negative drop-out rate.) Thus, to test the hypothesis that drop-out rates in grades kindergarten through five are less in feeding schools, we considered only those schools which conducted classes in each of those grades.

When we computed the enrollment, by grade, in all such feeding and non-feeding schools, we did not find a "steadily" declining enrollment in either the feeding or non-feeding schools. Yet, the patterns cast by the enrollment figures were roughly parallel for the two school types, indicating an unequal distribution of students by grade in the entire sample. Table 4 contains the total enrollment in all feeding and non-feeding schools conducting classes in all of the elementary school grades.

TABLE 4

MINISTRY OF EDUCATION DATA

TOTAL ENROLLMENT BY GRADE IN JANUARY, 1980
ALL SCHOOLS WITH GRADES KG THROUGH 5

GR	53 FEEDING SCHOOLS			37 NON-FEEDING SCHOOLS		
	ENR.	CHANGE	% CHANGE	ENR.	CHANGE	% CHANGE
KG	1855			1527		
1	1966	111	5.98%	1679	152	9.95%
2	1975	9	.45%	1578	-101	-6.01%
3	2100	125	6.33%	1727	149	9.44%
4	1968	-132	-6.29%	1422	-305	-17.66%
5	1734	-234	-11.89%	1196	-226	-15.89%

We see that the fluctuations in enrollment, both negative and positive, are greater in the non-feeding

schools. This may be taken as an indication that school feeding has a moderating effect on other factors which determine enrollment behavior. Furthermore, in the fourth and fifth grades, where enrollment dropped for both types of school, the drop-out rate in the feeding schools was lower.

Although many assumptions were made to arrive at a reasonable set of figures, drop-out rates throughout the elementary school grades in feeding schools are somewhat lower than the rates in non-feeding schools.

Table 5 contains the total enrollment in all feeding and non-feeding schools conducting classes in grades six and seven as well as in all elementary school grades. The number of schools incorporated into this table is far less than in the earlier table because of the limited number of schools in the sample conducting classes beyond the fifth grade.

TABLE 5
 MINISTRY OF EDUCATION DATA
 TOTAL ENROLLMENT BY GRADE IN JANUARY, 1980
 ALL SCHOOLS WITH GRADES KG THROUGH 7

GR	31 FEEDING SCHOOLS			18 NON-FEEDING SCHOOLS		
	ENR.	CHANGE	% CHANGE	ENR.	CHANGE	% CHANGE
KG	1152			858		
1	1277	125	10.85%	949	91	10.61%
2	1312	35	2.74%	867	-82	-8.64%
3	1327	15	1.14%	947	80	9.22%
4	1235	-92	-6.93%	801	-146	-15.42%
5	1126	-109	-8.82%	665	-136	-16.98%
6	975	-151	-13.41%	597	-68	-10.22%
7	715	-260	-26.67%	482	-115	-19.26%

The pattern observed for grades kindergarten through five repeats itself for this subset of those schools conducting classes at the elementary level. However, the

smaller declines in enrollment in the fourth and fifth grades in the feeding schools do not carry over to the higher grades. In fact, the pattern is reversed,

The drop-out rates, as we have defined them, in both the sixth and seventh grade, are higher in the feeding schools than in the non-feeding schools.

This result tends to support the notion that feeding has a positive effect on enrollment in the early grades because of the higher drop-out rate in schools with feeding programs upon cessation of those programs.

B. CARE/SRI LANKA DATA

Several of the same hypotheses tested using the Ministry of Education data can also be tested with the data gathered by the staff of CARE/Sri Lanka. First, we consider the comparison between attendance rates in feeding schools and non-feeding schools--a test of the short term effect of school feeding on attendance.

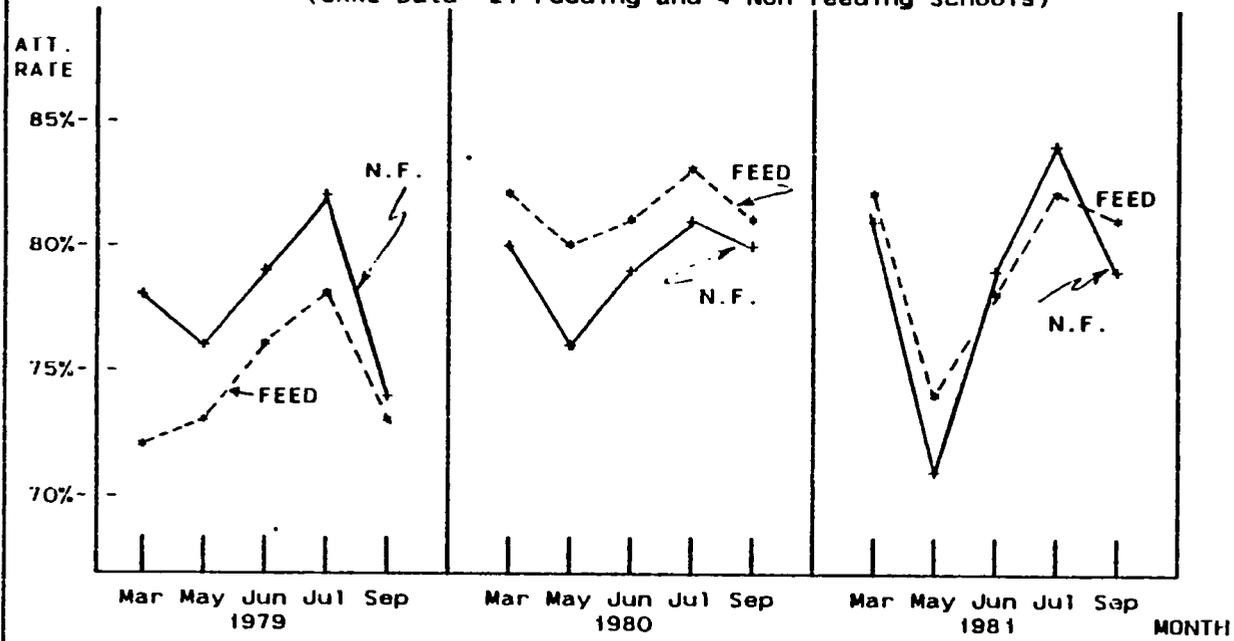
Hypothesis 1: Attendance as a percentage of enrollment is higher in schools participating in the biscuit program.

In total, there are twenty-one feeding schools and only four non-feeding schools in the data gathered by CARE. Because of the small number of non-feeding schools, we must be cautious in interpreting results derived in making this comparison. Again, attendance rates, aggregating over all elementary school grades, were computed. Figure 3 is both a graphic and a numeric representation of the data.

In 1979, the non-feeding schools had higher attendance rates in each of the months in which data was collected. In 1980, the feeding schools showed the higher attendance in all months. In 1981, the year in which biscuit delivery was interrupted between February and July, the result was mixed--feeding schools had higher attendance in three of the five months.

FIGURE 3

ATTENDANCE IN FEEDING AND NON-FEEDING SCHOOLS
(CARE Data--21 Feeding and 4 Non-feeding Schools)



	1979					1980					1981				
	MAR	MAY	JUN	JUL	SEP	MAR	MAY	JUN	JUL	SEP	MAR	MAY	JUN	JUL	SEP
FEED	72.1	72.7	76.2	78.4	73.2	82.4	79.6	81.3	83.0	80.9	82.3	74.1	78.5	82.4	81.2
N.F.	77.9	76.2	79.0	81.8	74.2	79.9	75.6	78.7	80.6	79.9	80.6	71.3	79.2	83.8	79.2

2/6

In the data collected by CARE, there is no relationship between attendance and the presence or absence of feeding in the schools.

One curious aspect of Figure 3 needs special attention. For 1980, the 21 district survey conducted by the Ministry of Education showed uniformly higher attendance rates in the non-feeding schools. The exact opposite relationship marks the data gathered by CARE, data gathered in only two districts, but only in that same year, 1980. This can be taken as an indication that other factors influencing attendance in the short run, possibly factors relevant at the regional level, are more important than school feeding in determining attendance rates.

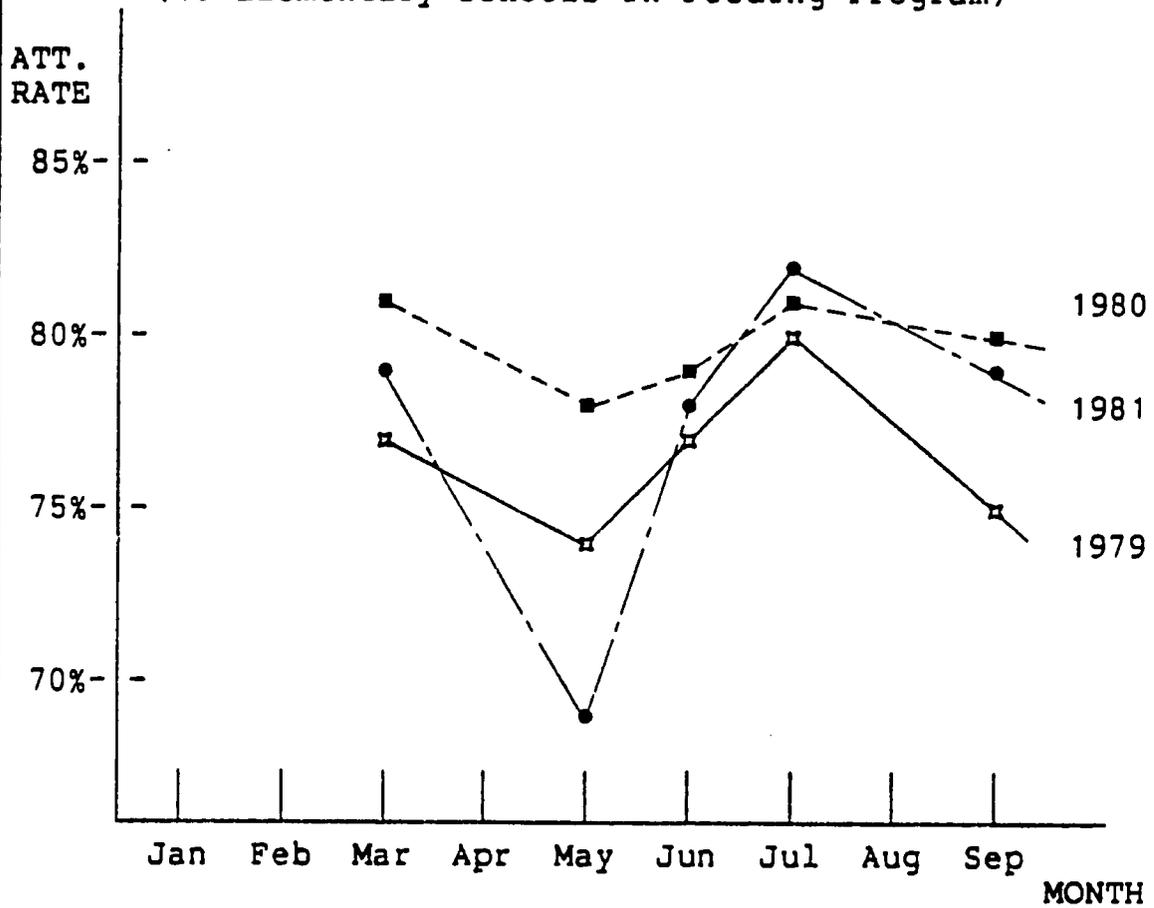
The CARE/Sri Lanka data offers the unique opportunity to test a hypothesis concerning the very short term effects of school feeding on attendance.

Hypothesis 2: Attendance as a percentage of enrollment drops in 1981 as a consequence of the unscheduled but sustained cessation of biscuit delivery for a six month period.

The testing of this hypothesis is made possible because of a fire in one of the two manufacturing plants and severe power shortages, nationwide, which restricted production in the other plant. Attendance rates in the elementary school grades were calculated for each of several months (five months in Kalutara and seven months in Bandarawela) for the years 1979, 1980 and 1981. Figure 4 presents the attendance rate curves for Kalutara; Figure 5, for Bandarawela. The interruption in biscuit delivery took place from March through July. (More precisely, the interruption covered three of the six yearly distributions covering the period from mid-February through July.)

FIGURE 4

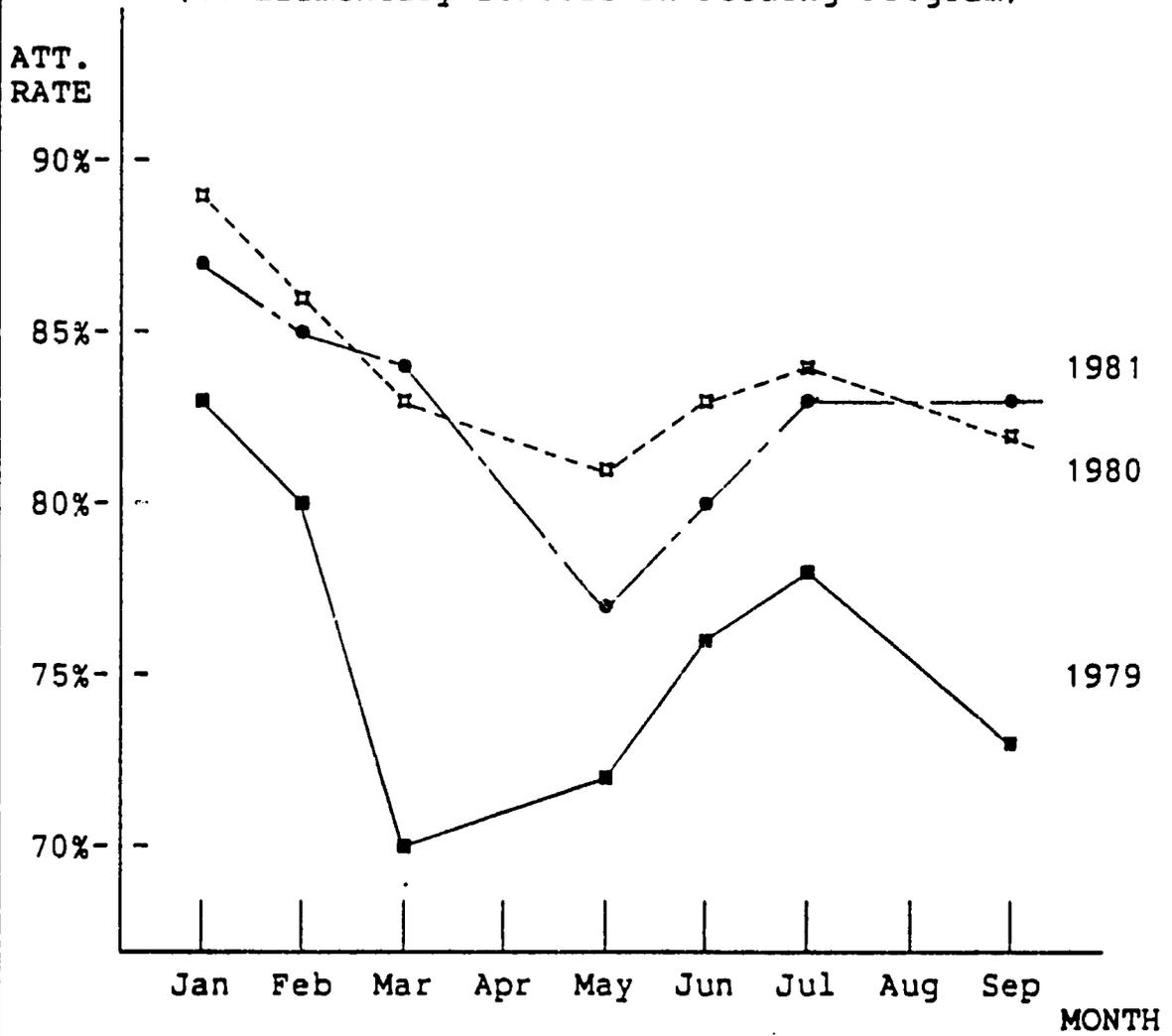
ATTENDANCE RATE, BY MONTH, IN KALUTARA
(10 Elementary Schools In Feeding Program)



	Mar	May	Jun	Jul	Sep
1979	76.9	74.2	76.7	79.8	74.5
1980	80.6	77.7	78.8	81.2	79.4
1981	79.1	68.8	76.8	82.0	79.0

FIGURE 5

ATTENDANCE RATE, BY MONTH, IN BANDARAWELA
(11 Elementary Schools In Feeding Program)



	JAN	FEB	MAR	MAY	JUN	JUL	SEP
1979	83.0	80.0	69.7	71.8	75.9	77.7	72.6
1980	89.2	85.7	83.3	80.5	82.7	83.9	81.6
1981	86.9	84.7	84.0	76.8	79.4	82.6	82.5

In general, in Bandarawela, attendance in 1981 fell midway between the attendance in the years of 1979 and 1980. In Kalutara, there was a sharp drop in attendance in May, but a recovery prior to the end of the interruption period. Moreover, the recovery brought attendance levels to their highest point in all three years by July, still in the period of no biscuit distribution.

Due to the lack of definitive trends, it appears that the interruption in biscuit delivery did not effect attendance.

This lack of a relationship is supported in that the two non-feeding schools included in each district, though not comprising a statistically valid control, did follow similar patterns in attendance. Given the somewhat unpredictable nature of biscuit delivery in Sri Lanka, this result is not surprising. The period of interruption is defined by the failure to deliver biscuits to the entire region during the months specified. However, it is quite possible that residual biscuits remained in regional storage facilities or in the schools themselves. Thus, the actual period of interruption in a given school might be quite different than that assumed on the basis of the regional delivery schedule. Furthermore, it is not known whether the causes or the expectations with regard to the length of the interruption were announced in the schools. Thus, it is quite possible that many families continued to send their children to school expecting biscuits to arrive when, in fact, delivery did not resume for six months.

An additional feature of all the figures presented thus far is the marked seasonality in school attendance. Note, in the Ministry of Education data in Figure 1, there is an unexplained drop in attendance between March and June--the very period of the interruption in biscuit delivery in 1981. Consequently, it is difficult to attribute the apparent "minimums" in the curves in Kalutara and Bandarawela during the interruption to the interruption itself.

The unusually large drop in attendance in Kalutara in May of 1981, though at first believed linked to the cessation of biscuit delivery, appears to be due to some unknown factor. The non-feeding schools (see Figure 3) exhibited a similar drop in attendance in that month. When we inquired, in Sri Lanka, if there was any known reason for this untoward drop in attendance, no explanation was found.

We now turn to the longer term effects of school feeding on enrollment. We consider the same hypotheses regarding enrollment as those explored for the Ministry of Education data.

Hypothesis 3: Drop-out rates in grades kindergarten through five are less in feeding schools.

Hypothesis 4: In schools with grades kindergarten through seven, drop-out rates in feeding schools are higher between the fifth and sixth grades.

In reviewing this second data set, we can make fewer assumptions in defining a drop-out rate because the data cover a three year period. By looking at changes in enrollment from year to year, we can develop estimates of drop-out rates. Moreover, we can track enrollment in a cohort of children as that cohort moves through two changes of grade.

Table 6 presents the enrollment data in a manner conducive to tracking cohorts. The top segment displays the enrollment in the 21 feeding schools; the bottom segment, in the 4 non-feeding schools. Each column shows the progression of a cohort of children as it makes two grade transitions. For example, for the feeding schools in the column headed by the grade sequence "K-1-2", there were 878 children enrolled in kindergarten in 1979. When that group of children moved on to the first grade in 1980, there were 945 children enrolled and, finally, when that group moved on to the second grade in 1981, there were 932 children enrolled. The drop-out rate for this cohort between

kindergarten and the first grade is the percent change in enrollment between those years, or 7.6%. (A positive percent change is indicative of a "negative" drop-out.)

TABLE 6
DATA GATHERED BY CARE
ENROLLMENT BY GRADE AND BY YEAR, IN MARCH

Year	Grade (Sequence of rows)							
	K	K	1	2	3	4	5	6
	1	2	3	4	5	6	7	8
21 FEEDING SCHOOLS								
1979		878	895	1036	955	919	825	752
1980 % Ch.	866	945 7.6%	958 7.0%	1053 1.6%	913 -4.4%	867 -5.7%	808 -2.1%	654 -13.0%
1981 % Ch.	895 3.3%	932 -1.4%	954 -.4%	1037 -1.5%	833 -8.8%	783 -9.7%	703 -13.0%	595 -9.0%
4 NON-FEEDING SCHOOLS								
1979		155	152	187	168	154	154	95
1980 % Ch.	145	131 -15.5%	157 3.3%	156 -16.6%	172 2.4%	150 -2.6%	120 -22.1%	78 -17.9%
1981 % Ch.	139 -4.1%	129 -1.5%	161 2.5%	142 -9.0%	149 -13.4%	108 -28.0%	89 -25.8%	71 -9.0%

The patterns in enrollment in the CARE data are roughly parallel to the patterns observed in the Ministry of Education data. In the early grades, there is frequently a negative drop-out rate (an increase in students) or a relatively small positive drop-out rate (a decrease in students). The magnitude of the attrition between grades increases steadily into the higher grades. (This is encouraging evidence that our definition of drop-out for the

Ministry of Education data was reasonable.) However, we cannot define a true drop-out rate in either data set--only the net change in enrollment which includes migration of children into and out of the schools.

Consider, first, a comparison of drop-out rates (defined as change in enrollment) in the grades in which the feeding program is carried out. The figures are displayed in the first five boxes with an indicated percent change in each of the 1980 and the 1981 rows. In all but three of these ten grade transitions, the drop-out rate in the feeding schools was less than in the non-feeding schools.

There is indication of a positive relationship between school feeding and enrollment in the elementary grades.

In the two cohorts that make the transition from fifth to sixth grade, we find a result opposite from that found in the Ministry of Education data. (The boxes indicating these two transitions are circled.) The attrition in enrollment after cessation of the feeding program in the feeding schools is surprisingly less than the attrition in the non-feeding schools--2.1 and 9.7 percent as compared to 22.1 and 28.0 percent. Moreover, the drop-out rate continues to be lower in the feeding schools in the remaining few transitions of the upper grades.

In the CARE data, losses in enrollment between the fifth and sixth grades are lower in the feeding schools than in the non-feeding schools.

ADDITIONAL DATA

During the evaluation of the P.L. 480, Title II program, an attempt was made to determine the very long term impact of school feeding on attendance by estimating the percentage of eligible children enrolled in school before, during and after the cessation of all feeding programs in the middle nineteen fifties.

We estimated the percentage of school aged children enrolled in school in each year, nationwide, by first estimating the school age population from the total population of the country and then computing the percentage of those enrolled using actual enrollment figures. The results depend greatly on the method of estimating school age population. We chose a figure of 20% of the total for lack of a more precise estimate.

The table generated by the evaluation team is reproduced here as Table 7.

TABLE 7

PERCENTAGE OF SCHOOL AGED POPULATION ENROLLED IN SCHOOL

Year	Pct.	Year	Pct.
1952	73.9%	1957	78.9%
1953	74.6%	1958	81.2%
1954	74.3%	1959	83.1%
1955	73.9%	1960	82.9%
1956	74.3%		

Additional data describing the age distribution of the population of Sri Lanka, over time, was assembled in the hope that a better estimate than "20%" for those eligible to go to elementary school would be forthcoming. Tables partitioning the total Sri Lanka population into five year age intervals, by sex, were reproduced from government documents; the source of the tables were cited as the Registrar-General's Department. However, investigation of the data suggested that the tables were themselves estimates, based on results of periodic census information. (A census was done in Sri Lanka in 1946, 1953, 1963 and 1971.) Figures for the years between the census years appear to have been derived using various interpolation

⁴Ibid., p. 59.

procedures. Thus, it is not possible to develop a yearly estimate of the school aged population in Sri Lanka.

Moreover, our attempt to develop a single estimate of the number of children in the pool eligible for elementary school enrollment produced some contradictory results. We attempted to estimate the size of the pool by taking all children in the 5 to 9 year age group plus 20 percent of all children in the 10-14 year old group. This latter figure is, itself, an estimate of the number of ten year olds in the 10-14 year old category. The results, along with the reported school enrollment for the years 1952 through 1960 are displayed in Table 8.

TABLE 8
ESTIMATED SCHOOL AGED POPULATION AND ENROLLMENT

Year	Estimate of Eligible Pool	Reported Enrollment
1952	1,159,000	1,193,521
1953	1,191,800	1,237,191
1954	1,225,000	1,266,610
1955	1,255,000	1,289,327
1956	1,391,600	1,329,543
1957	1,428,800	1,446,624
1958	1,462,800	1,525,013
1959	1,500,000	1,599,241
1960	1,542,000	1,642,881

In only one year, 1956, does our estimate of the size of the elementary school aged population exceed the reported enrollment. This, of course, is impossible. (The estimates work out to near 15% of the total population--14.6% through 1955 and 15.5% thereafter.)

This is indicative of the lack of reliability, of aggregate data generated from independent sources. Counts of large populations are often "off" by too much to enable

precise comparisons such as the one attempted above. In this instance, the population figures may ignore large segments of the population who are not officially citizens of Sri Lanka (some Indian Tamils working on the tea estates are still thought of as Indian citizens). Or, the school enrollment figures may be double counting students who migrate during a year or, for some other reason, switch schools.

CONCLUSIONS AND RECOMMENDATIONS

We approach the conclusions and recommendations section of this report with a cautionary note. In recent years, we have observed a penchant on the part of some policy makers for overreacting to quantitative analysis of complex social phenomena. In this study, we fear that such exuberance for the "numbers" may lead to premature and, perhaps, inappropriate response. In the text, we emphasized the quantitative findings by using italics but, in many cases, we offered evidence of the existence of alternative explanations for the results other than the central one regarding the role of school feeding in determining attendance and enrollment. These alternative explanations were often at least as plausible as the explanations made in terms of school feeding. Although we will summarize the quantitative findings here, we will emphasize the existence of these competing explanations to forestall premature overreaction. This lack of complete determinacy should not, however, keep us from arriving at some conclusions which combine both the results of our analytic work and our judgment. Finally, we will comment on the appropriate methodology for analyzing complex problems such as that presented by school feeding and enumerate some suggestions on the best way to utilize that methodology.

A. SCHOOL FEEDING, ATTENDANCE AND ENROLLMENT

Overall, the data suggests that enrollment and attendance in the lower grades is enhanced by school feeding but that the short run decision to attend school on a particular day or in a given month is not related to school feeding.

However, our knowledge of the context of the data collection, much of which was garnered during the analysis as we consciously sought proper interpretation, prevents us from placing too great a reliance on the quantitative results at this time. The Ministry of Education data proved

to be less convincing than anticipated because, out of necessity, schools without feeding programs had been screened and eliminated from the program on the basis of nutritional criteria. Thus, comparisons between those schools and the participating schools are immediately suspect. The CARE data also proved to be less definitive than hoped because the cessation of biscuit delivery to a district did not necessarily coincide with the cessation of feeding in the schools in that district due to the unmeasurable but very real residual supply in the distribution "pipeline". (A similar argument exists for the resumption of feeding, only in reverse.) More importantly, we know little about the awareness of the school population regarding the expected duration of the cessation--individuals may well have continued to attend school in hopes of an early resumption to school feeding.

Finally, as we noted in the body of this report, education has always been highly valued and nearly universal in Sri Lanka. Thus, school feeding, while important, should be viewed as a relatively minor determinant of school attendance and/or enrollment. The inconclusive results of the analysis should not be surprising given this cultural predisposition to attend school.

B. METHODOLOGY

We are advocates of an evaluation methodology predicated on the ongoing analysis of data by appropriate experts but with the active involvement of local practitioners.' Such an approach creates the possibility

'William D. Drake, Roy I. Miller and Donald A. Schon, "The Study of Community-Level Nutrition Interventions: An Argument For Reflection-In-Action," A paper to be published in Human Systems Management, 1983, and

William D. Drake and Roy I. Miller, "Nutrition Intervention and Evaluation: A Call For Reflection-In-Action," A paper to be published in Food and Nutrition Bulletin, 1983.

of gathering additional data, in real time, to help eliminate some, if not all, of the competing explanations which so often confound retrospective and/or quasi-experimental studies.

In the context of school feeding, this calls for the creation of a rapid (nearly real time) data collection and analysis system geared to answer the pertinent questions. The first very real problem with this (or any) approach is the identification of those pertinent questions. Historically, school feeding programs were established with a variety of human welfare objectives: to improve nutrition, to enhance enrollment and attendance and to help marginally nourished children maintain a high level of attentiveness throughout the school day. (To some degree, these programs were motivated by non-humanitarian objectives; for example, the disposal of surplus American agricultural production, the creation of new markets for American commodities, or other foreign policy concerns. In these cases, the individuals running the programs often superimposed their own human welfare objectives on top of these others.) Whatever the objectives, most programs were designed, implemented and continued to evolve to fit local political and logistical constraints rather than to optimize performance relative to one or more welfare objectives. Consequently, an evaluation of an existing program on the basis of any one or a combination of these objectives, as we have done in Sri Lanka, may be unwise and, perhaps, will be unfair. (It is unfair to belittle a program for showing no nutritional impact if the beneficiary level, mandated by the host government, and the commodity allotment, designated by USAID, lead to a ration size that is, in all probability, too small to induce measurable change.)

In response to this potential lack of clarity regarding objectives, we suggest that the first step in any evaluation be the clarification of the program's operational objectives

and an honest assessment of the degree to which the program design is likely to meet those objectives. We argued that in Sri Lanka, the size of the ration, the cultural proclivity for intra-familial sharing and the fact that feeding is scheduled on only half the days in a year mitigate against the possibility of demonstrating nutritional impact. (This does not mean that there is no impact, only that our methods of detecting it are inadequate to isolate it.) Studies to show nutritional impact could be undertaken, such as the one proposed by CARE, but any result other than "no impact" would be highly unlikely.

Similarly, we have argued that the cultural emphasis on education in Sri Lanka mitigates against school feeding being a large determinant of attendance and enrollment. This may not be the case in other countries where the commitment to education is less strong or the nutritional condition of children more harsh. Of course, in Sri Lanka, many informed individuals argue that, in the very long run, school feeding has contributed to this strong cultural emphasis on education.

We have not addressed the attentiveness objective in our study at all. However, the state of the art of measuring as ephemeral a quality as attentiveness is, to our knowledge, not too well developed. Attempts to draw conclusions regarding attentiveness by measuring performance are fraught with all the problems associated with measuring learning, in general, and would require a "leap of faith" to attribute improved performance to changing attentiveness.

In the face of the aforementioned arguments, perhaps a somewhat special approach is called for. This approach might recognize the need to build slowly but steadfastly, toward greater understanding of the educational process with emphasis on the role of school feeding in that process. Toward this end, we recommend a series of small scale, narrowly defined studies be undertaken with the objective of

detecting limited evidence of the possibility that school feeding contributes nutritionally and/or educationally. Such studies should be done using ongoing data collection and the rapid feedback of results to knowledgeable individuals in the field to promote intelligent interpretation. We would begin with studies on enrollment and attendance because they are most likely to reveal impact. (The measurement of nutritional status using anthropometrics in school age children is so terribly difficult because of the variation in the time of initiation and the duration of the second growth spurt in school aged children and other measures of nutritional status are, by and large, unavailable.)

Studies such as these should take advantage of naturally occurring phenomena to create "quasi-experimental" conditions; for example, the close monitoring of attendance in schools slated to begin school feeding before and after the introduction of the program. Local educators should be made aware of the intention of the study and asked to become aware of other local phenomena which might be at work to create independent changes in attendance or enrollment, phenomena such as seasonality or widespread disease. Interviews of selected families might be undertaken to add evidence of attitude changes to support or refute the more direct measures of attendance and enrollment.

Whatever the ultimate design of such studies, we have learned of some important potential pit-falls in their execution.

- 1) Because of the difficulty of identifying matched treatment and control groups in real settings, it may well be necessary to use some set of schools as their own control; that is, to observe changes in attendance, enrollment or nutritional status in those schools in response to changes in the feeding program. (This is a reflexive design.)
- 2) The timing of any events thought relevant in changing the role of school feeding must be

monitored at the school level, if not the individual child level. Regional or program-wide approximations are inadequate given the "pipeline effects".

- 3) Multiple strategies of detecting change may be needed to facilitate "triangularization" on actual results; for example, the use of attitude surveys to verify that observed changes are, in fact, due to the hypothesized cause and effect relationship.
- 4) There are several known factors which influence attendance and enrollment which are of sufficient importance to command explicit recognition in the research design. Seasonal variation within a year, climatic variation between years, and variation among geographic region are especially important.
- 5) Migration patterns vary by region and by age of child. Therefore, assumptions that such patterns are constant should not be made.
- 6) When properly used, drop out rates between grades can be a useful and readily available indicator in addition to attendance and enrollment. However, the rates should be determined directly, not through simplifying assumptions such as the equal distribution of students by grade.
- 7) Fluctuations in attendance may be another useful measure of the effects of feeding which should be calibrated up future studies.
- 8) Finally, there are at least two basic ways to define both enrollment and attendance. Results can vary substantially depending upon the method selected.

C. THE PROPER ROLE OF ANALYSIS

It is perhaps clear by now that we believe the ability to detect and isolate the full impacts of school feeding using state-of-the-art evaluation methodologies is difficult indeed. The factors which influence both nutritional well-being in school age children and attendance, enrollment and drop-out in school are numerous, constantly changing and, during the course of a single study, likely to mask the role played by school feeding in their determination.

Yet, we are analysts with a firm commitment to introducing quantitative evidence into policy formulation.

We hope that in the case of school feeding those forming policy approach the first few analytic studies with a skepticism paralleling our own. Until a variety of studies begin to identify patterns of relationships--or fail to do so using diverse techniques--the results should be seriously questioned.

In Sri Lanka, during our brief stay, our interviews with teachers, principals, and officials at all levels (all individuals for whom school feeding was an added task without special remuneration) revealed consistent positive support of school feeding. Until a substantial body of quantitative evidence is developed to refute these local experts, their views should be given equal, if not greater, weight than the tenuous statistical results gathered to date.