

MEASURING CHILDREN
AS A MEANS OF EVALUATING PUBLIC NUTRITION PROGRAMS:
A STUDY OF INDIAN SCHOOL FEEDING PROGRAM IN THE STATE OF ORISSA

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I. Introduction

This paper reports on an unusual research effort which was designed to develop reliable data on the effects of a mass feeding program on children in one of India's poorest and most backward states--Orissa. The research was undertaken by an Indian organization, the Council for Social Development (CSD), under contract with the United States Agency for International Development (USAID) Mission in New Delhi. The research effort was unusual because:

- 1) The sample size and quality was unusually large for a rural survey, particularly one conducted in a backward area of India.
- 2) It appears to be the first time a sample survey has been used to evaluate the effects of a large operating nutrition program.
- 3) A new technique for developing data on nutrition intake of children was developed.

In the process of gathering data relevant to an understanding of the child feeding program, extensive data on nutrition, school attendance and enrollment, and other aspects of rural society were gathered which should be of interest to social scientists concerned with underdeveloped countries.

This paper focuses on the development of survey techniques as a means for evaluating a major program to combat malnutrition. The results of the survey are not emphasized because (1) the data are still being processed and analyzed, and (2) the Council for Social Development will shortly publish the results and it would be unfitting at this point to anticipate in detail what the Council's report will say.

II. The School Lunch Program, Nutrition, and Foreign Aid

In the United States, a school lunch program existed over 50 years ago. However, it was not until the interwar depression that school feeding developed into a mass effort to combat child malnutrition. Since World War II, federal funds approaching four billion dollars have been spent to subsidize school lunches.

These funds have supported the distribution of surplus commodities under the National School Lunch Act of 1946.

Abroad, the concept of improving child nutrition through a school lunch has largely been spread by American-based voluntary agencies. In Japan, the program, initiated during the post-war American occupation as a relief program, is now fully supported by the Japanese and covers 90 percent of the school children.

In India, the school lunch program began in 1952 and has grown rapidly, largely under the auspices of CARE and Catholic Relief Services. About 18 million school and preschool children are now fed with U. S. foodstuffs provided on a grant basis. The food is brought into India by U. S. -based voluntary organizations such as CARE, and financed by the Department of Agriculture under authorization provided by Public Law 480. The Agency for International Development is authorized by the Foreign Assistance Act to finance the ocean freight cost of transporting the commodities to recipient countries. CARE's expenses are largely limited to those necessary to cover its administration of the program. In India, state governments pay for the freight within India and are responsible for getting the food to the schools. In some instances additional foods--primarily flavoring foods--are added by local contribution or through funds provided by the states.

III. Need for Evaluation

The shared financing of the program leads to unclear responsibility. From CARE's point of view, the program is largely free, since the food and its distribution is financed elsewhere. The Department of Agriculture has found programs under Title II of PL 480 (which includes not only school lunch programs but food for work and disaster relief) to represent a relatively small part of its total outlays for overseas food shipments. The program is popular with Congress and has been (like the domestic program) integrally connected with price support operations. From AID's point of view, the program appeared useful and since it was administered by CARE, largely financed by the Department of Agriculture, and popular with Congress, the payment of freight seemed a reasonable enough contribution. The Indian

states' departments of education, although facing serious budget constraints, have generally found that the costs of local distribution are worth the benefits of having a school lunch program.

Under the circumstances, the opportunity cost of the program seemed very low to all those responsible: no single organization was faced with the full cost of the program. However, the program does represent substantial budgetary outflows for the U.S. as a whole. Although it is understood that to a substantial degree these expenditures may be fulfilling agricultural price support goals, increased pressure on U.S. budgetary expenditures resulting from the need to expand domestic antipoverty programs, the cost of the Vietnam war, and the desire to reduce inflationary pressures, resulted in serious questions being asked about the value of the program to developing countries. In August 1968, the USAID Mission in India decided to seek ways of stepping up earlier efforts to evaluate the usefulness of the school lunch program.

IV. Approach

There is ample evidence that if children who are malnourished are given a dietary supplement of three ounces of CSM¹ and one-fourth ounce of vegetable oil each day they will be healthier, taller and heavier. This is the ration provided for each child (ideally) in the Orissa school feeding program. The usefulness of this supplement can be demonstrated by taking small samples of malnourished children and carefully controlling their entire diets. But the 18 million children who benefit from the school lunch program in India do not live in such a controlled environment. Indeed, how many are malnourished and to what extent is largely unknown. Furthermore, an important justification for the program is that it improves school attendance and reduces drop-outs--obviously a hypothesis which cannot be tested in a nutrition laboratory.

It appeared, therefore, that a research approach which would evaluate what the program does for children in the field under actual uncontrolled (in the scientific sense) conditions would be required if a relevant evaluation of the program were to be obtained. Moreover, the urgency attached to developing some basic data on the benefits of the program, if any, precluded the use of a longitudinal study--typically the approach used in the nutrition field. The USAID Mission in India therefore opened discussions with a number of local research

institutions on the feasibility of conducting a sample survey to gather basic data on the school lunch program.

The American aid program has in the field a small staff, particularly in relation to the large volume of resources involved in the U.S. program in India. It was out of the question for AID to do such a study itself. But even if it had been feasible, it would have been inappropriate, given the available research capabilities in India. AID's role was to finance the study, to provide consultants to the survey where needed, and to cooperate with the Council for Social Development on the structure of the study. The responsibility and credit for the study belong exclusively with the Council.

The goals of the study were:

- 1) to determine if children participating in the school lunch program are significantly different physically from those not in the program;
- 2) to determine if student enrollment and attendance are different in schools with a lunch program from schools without one;
- 3) to determine if health of students in the lunch program is better than those not in the program;
- 4) to determine if students in the program performed better academically than those not in the program;
- 5) to determine if the food supplement provided was in addition to or a substitute for food provided in the home.

The technique decided upon was to sample a known population of students attending schools participating in a school lunch program and compare it with a similar sample of students attending schools not in the program.

The approach was tested through a pilot study in the Indian State of Andhra Pradesh, using a sample of 2,028 students. At that time various approaches to measuring students were attempted under field conditions in Indian villages. In addition, the pilot survey provided essential experience in questionnaire design, sampling problems, training of interviewers, and means of providing checks on the quality of data. Although the data resulting from the pilot survey were not sufficiently good to provide definitive answers to the hypotheses under consideration, it did prove essential to the success of the full-scale study, and many of the successes of the

full-scale study can be directly attributed to the experience gained in the pilot study.

The sample survey in the State of Orissa was formally begun in November 1969. The Council for Social Development established a collaboration with the Department of Psychology of Utkal University, which is located in the capital of Orissa. The University provided a source of staffing to the project--both senior professionals and interviewers--and a base of operations.

V. The Orissa Survey

The State of Orissa is largely rural and one of the most backward areas of India with little industry and low per capita incomes. Of all Indian states, Orissa ranks first in infant mortality, last in the percentage of students passing matriculation examinations. It is India's least urban state, with 94 percent of the people classified as rural. It also has the highest percentage of "backward" people of any Indian state--that is, people recognized officially as belonging to scheduled (untouchable) castes, or to tribal groups. Orissa is estimated to have the second lowest per capita income (with Bihar having the lowest).^{2/}

It is located on the East Coast of India, south of West Bengal and Calcutta. The coastal areas consist of extensively irrigated, rice-growing level land. Further inland, there are hills where most of the tribal people live. Many villages of the state cannot be reached by any vehicles at all; others can be reached by jeep roads during the dry seasons of the year. During the monsoons, communications are limited to those relatively few areas accessible by all-weather roads.^{3/}

The state is a good target state for the CARE school lunch program because of its low incomes. Yet at the same time, it is a state in which such a program is very difficult to carry out; logistics alone are a formidable challenge.

From the point of view of surveying the effects of a mass-feeding program, the state had appeared to have real advantages. Among them:

-- The feeding program reaches enough schools to provide a large universe from which to sample, but not so many as to cause difficulties in developing the control sample.^{4/}

-- The feeding program reached children from a variety of religious, ethnic and economic backgrounds.

-- The logistic problems of the state made it possible to judge the effects of the program under tough conditions; some schools were able to provide the frequency of feeding desired but others inevitably could not.

On the other hand, Orissa is probably the most difficult state in India in which to do social survey work. The number of trained and experienced field interviewers who speak Oriya is virtually nil and the problems of carrying out a carefully designed sample involved great effort on the part of field teams.

VI. Structure of the Survey

The major variables to be tested were as follows:

- 1) Weight of children (nearest one-tenth of a kilo)
- 2) Height of children (nearest one-half centimeter)
- 3) Chest of children (nearest millimeter)
- 4) Biceps of children (nearest millimeter)
- 5) Skinfold biceps of children (nearest millimeter)
- 6) Skinfold scapula point of children (nearest millimeter)
- 7) School attendance
- 8) School enrollment
- 9) Health (days absent because of illness)
- 10) Dropout rates
- 11) School grades
- 12) Total calories
- 13) Total protein.

Three questionnaires were used for the entire sample--one for the student, one for the teacher, and one for the student's parents. These questionnaires recorded data for variables 1-11, with various cross checks. In addition, they recorded data on attitudes toward the program, social and economic background of the child, age of the child, size of family, etc.

It is worth noting here that age represents a serious research problem because it is often not known. There is often a substantial

difference between the age recorded on school records, the parents' estimate, and the child's estimate. The questionnaires were designed to cross check age, and parents were asked to identify all their children and rank them according to age. These procedures may have improved accuracy, but certainly did not insure it.

The sampling design was based on the administrative units of the State of Orissa. The state is divided into 13 districts and 314 blocks, 15 to 41 per district. Four districts are classified as predominantly tribal. Except in tribal areas, blocks have roughly the same population.

Before drawing the sample, a sampling frame was developed. To do this, each school sub-inspector was sent a set of cards--one card for each of the schools under his supervision. He was instructed to fill in a card for each school indicating location, enrollment, whether the school was in the feeding program, if so, how many days it actually served lunch during the past two years, and other basic data. The strength of the survey was helped by the prompt and accurate response that came from this mailed questionnaire. Within three weeks over 40 percent of the cards were returned and eventually 98.6 percent were returned. The importance of having these data for sampling is illustrated by the fact that at the outset there was no accurate count on even the number of schools in the state. Estimates varied between 22,000 and 26,000. These data provided a useful quality check by comparing them with overlapping data which interview teams gathered. Moreover, they provided substantial information not subject to sampling error.

The basic approach was to select a sample of schools in the feeding program and match it with schools not in the feeding program. This design had to be altered in four districts because the proportion of schools in the program was so great. These districts are predominantly tribal and represent the most backward areas of Orissa. In these districts virtually all the schools which are accessible are in the feeding program. No matching with nonfeeding schools was therefore possible.

At the first stage of sampling, the number of blocks to be selected from each district was determined in proportion to children in the district participating in the school lunch program. Once the number was determined, the sample plus two alternates were selected at random. Within the blocks, schools were selected proportional to enrollment. This was done by assigning serial numbers to the schools, based on

enrollment. The first school with 200 students was assigned 1-200, the second with 160 students 201-360, the third with 120 students 361-480, etc. A table of random numbers was then used to select schools. Schools which were not within one or two miles of a jeep road were deselected for logistic reasons.

Within the schools, ten boys were selected at random from grades three and four. Boys were selected because few girls attend school and including them would have complicated data interpretation. The grades were selected because of the desire to test children who had been in the program at least two years.

The matching schools were selected according to the following criteria:

- 1) Similar size of school (plus or minus 20 percent;
- 2) Similar size of village (plus or minus 20 percent;
- 3) Similar representation from cultivator caste (plus or minus 10 percent);
- 4) Similar representation of scheduled castes or scheduled tribes (plus or minus 10 percent).

Children in this matched sample of nonfeeding schools were selected in the same way as for the feeding schools.

In the event, the sampling was somewhat more complicated than outlined here, but the basic approach was not altered.

The diet survey to determine the food consumed in the home (described below) was too elaborate to be conducted on the entire sample. Therefore a 40 percent subsample was selected for home diet surveys. Table 1 summarizes the sample.

Table 1

Sample Distribution Obtained in the
Orissa School Lunch Survey

<u>Basic Sample</u>		
	<u>Nontribal Areas</u>	<u>Tribal Areas</u>
Districts	9	4
Blocks	35	15
Schools Selected		
Feeding	180	150
Nonfeeding	165	a/
Children Sampled		
Fed	1,388	808
Not Fed	1,222	a/
<u>Nutrition Subsample</u>		
Districts	9	4
Blocks	35	15
Schools Selected		
Feeding	72	59
Nonfeeding	68	a/
Children Sampled		
Fed	507	302
Not Fed	485	a/

a/ In tribal areas virtually all accessible schools had feeding programs; hence no non-feeding sample could be selected.

VII. Substitution Feeding

The Diet Survey was designed to answer the question of whether the school lunch is a substitute for or an addition to food provided at home. The earlier pilot survey suggested that the usual recall method of determining diets was highly inaccurate for children in rural India. One problem was that since the subjects were young children, they were less responsive to questions on

what they had eaten the day before than adults might be expected to be. A second was that in rural areas where food self-sufficiency is on a family basis, there is limited sophistication to measures of food. An urban consumer is more conscious of amounts because he purchases food frequently and pays for it in terms of some standard measures. But rural families are largely outside of the market economy and draw food from their own stores.

The alternative of having an observer in the family was also considered unsatisfactory since his presence would be likely to change eating habits. Moreover, for the large sample contemplated it was impractical.

The technique used in the Orissa survey was record keeping.^{5/} The selected children were given a set of three aluminum bowls similar in shape to those used in Orissa. Each was marked with a line indicating the half-full point. Each was marked with a number. The child was then instructed to take the food after it was served to him and measure it in the appropriate bowl. He was also given a large illustrated questionnaire on which to record each meal. Adult family members were asked also to measure the food before they cooked it and after, so as to provide data for converting cooked food into basic nutrients.

The family got to keep the bowls, partly as an incentive and partly because it was unclear what the Council for Social Development would do with hundreds of used aluminum bowls. The taboos which are part of the Indian caste system precluded using bowls over again by other families. As it turned out, the results were well worth the cost.

This approach was used only after full pretesting. During the two months before the full survey began, the technique was worked out with a field sample of 100 families. Results suggested that the technique was considerably more accurate than one-day recall.

VIII. Training and Field Operations

Training of interviewers was of critical importance, since the pilot study in Andhra Pradesh had revealed a large degree of interviewer error. Eleven interview team leaders and 30 interviewers were selected and formed into teams of two senior and six junior investigators. Six reserve interviewers were also selected, all of whom eventually ended up in the field. The interviewers were in their midtwenties and most had degrees in the social sciences from Utkal Univer-

sity. The "senior investigators" were hired two months before the interviewers. They received training and participated in the organization of the survey, the pretesting of the questionnaire, and the development of the sample frame.

The interviewers began training on January 7. They were taught accurate techniques for taking physical measurements and given lots of practice. Similarly, they were trained for the diet survey by practicing it on themselves. A mechanic taught them how to take apart, adjust, and repair the balance scales used for measuring weight. After three weeks they were sent out to an area (not in the sample) for field practice. Overlapping interviews were arranged so that teams could compare results. Careful supervision by the project directors was an essential aspect of the training.

The field teams consisted of a leader and a co-leader, plus six investigators. Each team had at least two female members for handling the nutrition work and for conducting parent interviews, since there was concern that mothers would be reluctant to talk to male investigators. In fact, this later proved not to be the case. The teams were divided into subteams, each with the assignment of handling a separate school. Each team was provided with a jeep, four of which had trailers. The logistics were complicated by the limited number of jeeps available, which in turn reflected the high cost of jeeps in India relative to the cost of other aspects of survey work. The jeeps delivered the subteams to their respective villages each day and carried the measuring instruments from one subteam to another. Removed from the survey by time and distance, the logistics seem to be an unnecessary preoccupation of those who worked on the survey. However, much of the success of this kind of work depends on handling purely mechanical problems. Ease of access to sampling units and the availability of cheap, adequate transportation for whatever personnel and equipment is assigned are luxuries which the social scientists of India do not enjoy. They need to worry about finding gasoline stations, keeping vehicles repaired, squeezing equipment and personnel into very restrictive vehicle space, and even finding responsible, reliable and motivated drivers.

Field work actually started on February 6, 1970, in six blocks fairly close to headquarters so that the teams could be within easy reach of supervision during the early stages. The result of the first month's work was brought in, coded and analyzed so that the teams could examine what kind of quality was being achieved. The

Survey quality check team had been reinterviewing 10 percent of the sample. This 10 percent reinterview was then checked with the first interview. The results of this check during the first month of interviewing were extremely helpful from two points of view. First of all, the check indicated which teams were strong, which teams were weak, and what measurements were not being accurately taken. Secondly, the quality check turned out to provide a major element of motivation for the teams since they began competing to see which could achieve the highest degree of correspondence with the quality check team.

Field work was completed in May of 1970.

IX. Quality Control

The two elements of the quality check have already been mentioned but should be restressed because of their importance in reassuring the project directors of the validity of the data that were gathered. The first was in the design of the sample frame; many of the basic data on the schools were collected and sent in by mail during the frame development stage of the survey. Subsequent overlapping interview data provided by the field teams showed a very high degree of correspondence with the frame development data. The 10 percent reinterview provided an even more important quality check. The 10 percent quality check tested two separate things: (1) interviewer quality and (2) response error. Measurements of a child which were significantly different during the reinterview indicated clearly a problem of the quality of the field workers. However, age or attitudinal questions which turned out differently could have been an error on the part of the interviewers, or could have been because the respondents simply provided a different set of answers.

In the event, most physical measurements and the objective data which interviewers gathered from the records turned out to correlate highly with the quality check data. An exception was the skinfold thickness measurements. The problem in that case was probably due to the difficulty of using the only instruments available at the time of the survey. In addition, these measurements do require greater care and are inherently less reliable than height or weight.

There was considerably less correspondence between interviewers and quality checks in areas where respondents could be expected to give different answers at different times. As a result, a number of the questions, particularly those dealing with attitudes towards the school lunch

program or with judgments (e.g., teacher evaluation of child's health) appeared to include too high a degree of response error for meaningful analysis. But for objective measurements the quality of the interviewing appears to have been very high indeed, which is a tribute both to the teams themselves and the training and leadership provided by the management of the survey.

X. Results of the Survey

As stated at the outset, the full analysis of the data has not yet been completed and the Council for Social Development, which is responsible for the research, has not completed its final report. It is not the purpose of this paper to prejudge what the survey in fact has to tell us, but rather to report on the status of what appears to be a rather interesting and unusual piece of research. However, a number of papers summarizing preliminary data analysis were prepared for a conference in New Delhi, which was held in October 1970. At that time, some interesting preliminary results were evident and are perhaps worth listing with the appropriate caveat that they are subject to later revision.

Overall, there were no statistically significant differences in physical measurements between those in the feeding program and those outside the feeding program. However, an analysis of students in schools which fed 200 or more days a year indicates significant differences in height, weight and chest circumference, with the children in the schools offering the school lunch being larger in these respects. This would appear to indicate that the feeding program does have a measurable effect if it is carried out according to specifications. More analysis is needed to see how the number of days fed correlates with differences in physical measurements. Moreover, the data show differences which are in some cases more striking than one would expect and need to be examined with some care. However, the fact that (1) all three measurements show statistically significant results supporting the hypothesis that supplemental feeding produces better physical development, and (2) the reliability of the data as indicated by the quality checks suggests there is reason to believe that a well-run feeding program produces measurable results.

Another tentative conclusion is that school feeding is additional to what the children receive at home. The diet survey indicated no significant difference in the protein and calorie intake at home between children who attended schools where lunches are provided and those who at-

tended schools with no lunch program.

School attendance and enrollment analysis was complicated by the likelihood that the program is self-selecting. The frame analysis data show, for example, that enrollment in tribal areas is much higher in schools with a feeding program than in schools without it. But this is most probably explained by the fact that the larger schools are more accessible and therefore are selected for the school feeding program. Data on enrollment in the nontribal areas is inconclusive but does not suggest any strong tendency of the program to draw more students. Similarly, the first analysis of data on attendance does not reveal any reason to believe that the existence of a school lunch program decreases absenteeism due to better health or that the lunch program provides a greater incentive to attend school. However, considerably more subanalysis needs to be done before the hypothesis that the school lunch program increases attendance can be considered disproved. In particular, further data analysis may suggest that schools which achieve a highly successful feeding program, i.e., 200 days a year or more, do induce increased attendance.

School dropout rates appear to be higher in fed schools than nonfed schools, which was contrary to the hypothesis being tested. One explanation of this phenomenon would be that more students are drawn to the schools in the first instance by the feeding program and thus there is a greater tendency for dropouts after the children reach the age where they can assume family work responsibilities.

XI. Conclusion

The initial purpose and the basic purpose of the survey was to develop hard data on the basis of which those responsible for the financing and administration of the school lunch program could make judgments as to its usefulness and as to ways it could be improved. The use of this technique for program evaluation is uncommon, particularly in the area of nutrition and child measurement, which tends to be carried out using much smaller samples and a longitudinal research design.

The survey has produced a mass of data, many of which appear of good quality, about the effects of the school lunch program and how it operates. In addition, there was developed a great deal of data necessary for supporting analysis, but which also should be of major interest to those concerned with other aspects of social development. For example, the diet survey work resulted in an enormous store of information on

who consumes how much of what varieties of food in the State or Orissa. These data can be analyzed in terms of geographical area and economic and social background. Similarly, a mass of data are available on school attendance, school dropout rates, and school enrollment, with the socio-economic background of the students again identified. This raises the hope that analysts interested in these questions will take advantage of the tremendous field effort which went into the survey and use the data for other kinds of analysis. Indeed, perhaps the most important function of this paper is to bring to the attention of the academic community the availability of this body of data. It is expected that a duplicate set of data will be recorded on magnetic tape and deposited in an American university so as to be available easily to researchers in the United States.

There is also a lot to be learned from this survey about conducting social science research in underdeveloped countries. The process of putting together and training a group of researchers was an exciting one to watch. The enthusiasm and interest of the young postgraduates in the field was also gratifying. As is often the case in underdeveloped countries, the university graduates were from the wealthier groups in society and were largely urban based. During the field work, many of them discovered their own state for the first time. Moreover, they were exposed to standards of sampling techniques and quality checks which were quite new to them.

It is worth noting as a final word that no survey such as the one described here, evaluating the effects of the school lunch program, has ever been undertaken in the United States.

1/ CSM is a blend of corn flour, soya flour and nonfat dried milk.

2/ Data compiled from various official sources by M. P. Srivastava, "U. P. in the Socio-Economic Map," Eastern Economist, April 24, 1970, pp. 794-801.

3/ As visitors to the subcontinent know, these are referred to as "pukka" roads, as opposed to "kucha." "Pukka" in Urdu or Hindi means durable or lasting. Pukka buildings are made of cement or brick; pukka roads are surfaced. It is a term those exposed to the subcontinent find hard to do without and one which could usefully be added to American English.

4/ This proved less true than hoped. As explained below, CARE and the Orissa State Government reached too high a proportion of the tribal areas to permit good sampling of nonfeeding schools.

5/ Record keeping is a new technique only in the sense of being adopted for use in rural Indian societies where literacy is limited and the concept of standard measures not part of the culture so far as home consumed food is concerned.

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