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Nutrition CRSP Kenya Project

Semi Annual Report - October 1, 1984 to March 31, 1985

A. INTRODUCTION

This has been an eventful six months in the life of the Nutrition CRSP Kenya Project. The main study started in January 1984, and quickly built up to the full sample size within two months. This report covers the ninth through the fourteenth month of the main study. This period carried the study full strength until February 1985. At this time households were "graduated" having been followed for one year for selected target individuals of interest. Most of the households dropped contained schoolers and a handfull of households contained infants reaching six months.

The remainder of the field operation deals mainly with households containing pregnant women, infants under six months, and toddlers now turning 30 months. A major core activity which started in March 1985 was time allocation. Crop production, done by observation, has been added as a validation tool for the questionnaire and recall on agriculture.

A most notable event has been the famine in the summer and fall of 1985. It has been relieved by moderate rains in October and November 1984. Although food relief is still necessary until the next full harvest (March-April, 1985), the need for food aid has diminished.

There has been a partial change in field staffing. Three senior staff have been replaced by new staff from the University of California. In addition, recruitment for an assistant Kenyan field director has been in progress.

Another notable event was the first Annual Review Meeting in Embu. Participants from each relevant ministry and organization which we felt might be interested in the research project attended. From all feedback, the meeting was a success and many look forward to the next review meeting.

1. PERSONNEL

Kenyan Personnel

Professor Nimrod Bwibo remains co-principal investigator despite his very busy position as Principal of all the health colleges, which is equivalent to a provost at the University of California. He comes to the field most weeks to support the field director, discuss problems, develop policy, and is involved in personnel actions and recruitment. He maintains a remarkable level of contact with the enumerator field staff, making them feel important and that their views are heard and taken seriously. Dr. Bwibo manages trips to the United States for the SCB meetings and attended the Principal Investigator's meeting in Cairo in January, 1985.

Dr. David Koech is a well-trained immunologist with the Kenya Medical Research Institute (KMRI). He replaced Dr. Bowry, an immunologist with the University of Nairobi, School of Medicine. His laboratory is actively involved with the Nutrition CRSP.

An epidemiologist/statistician in the Department of Community Health, who was trained in Birmingham has joined the Medical School for a two year term. He is very interested in the Nutrition CRSP Project and he would like to start a cancer registry and participate in the day to day analysis of morbidity data using a microcomputer.

Dr. Waswa has rejoined the project on a parttime basis. He is a Kenyan physician who was with the project in the early months of 1984 and then left for an MPH course at the University of Nairobi. He has now returned to assist with the morbidity function.

nally decided to recruit a clinical officer, a person with three ye eventive and curative training with a focus on primary health care and maternal/child health. He will be extremely useful for routine physical exams and treatment of minor illness. He will work under the supervision of the physician and work closely with the community nurses in field supervison of the enumerators. The clinical officer was recruited because of the difficulty with physician recruitment.

UNIVERSITY OF CALIFORNIA (UCLA) PERSONNEL CHANGES

Departures

Dr. Eric Carter, after three years -- one year as the acting field director, two years as the field director, departed on February 28, 1985 and will be attending medical school at the University of Miami, a two year Ph.D. to M.D. program. Not only did Dr. Carter direct the preliminary survey but implemented and directed the field operations under very difficult and trying logistic conditions. The Kenya field operation is well organized and tightly managed as attested to by the various visitors to the field site. He managed a very large field staff and carried out, as faithfully as he could, the prescribed research design. Most notable was his response to the famine situtation. His decisive action in finding foodstuffs and distributing these community-wide working through the local famine committee is one of his notable achievements. No doubt lives were saved as a result of his activities and those of the

project staff. There has been a great show of community gratitude marked by many festivities upon his departure.

Mrs. Frances Carter supported Dr. Carter as an adminstrative assistant from the early days of the project, working on a parttime basis. For the first two years she carried a tremendous load often working at night and weekends and provided tremendous administrative support.

Dr. Dorothy Cattle served the project for three years as the field nutritional anthropologist. She and Dr. Carter struggled through the early days, carrying out a preliminary survey, arranging for the mapping, checking out the households against the map, revising it and numbering the households. Dr. Cattle was directly in charge of the following research areas: census update, sanitation and hygiene, socioeconomic studies, activity measures, and case studies. She plans to return to an academic position in anthropology in the USA although she does not know where as yet.

Dr. A. Khelghati, the field physician left the project as of March 31, 1985. Although he was an excellent clinician, he did not have a great feel for research and we felt that he should be replaced at this time. Dr. Khelghati remains in Kenya because of his wife's position there.

Replacements from UCLA

Dr. Michael Baksh is the new field director. He comes from an anthropologic background, having done his main work in food and agriculture production, food intake and related areas. He had a most auspicious introduction to the project staff and to the community through the celebrations in honor of the project and Dr. Carter upon his

departure. These occassions provided an opportunity for the chief to introduce and welcome and Dr. Baksh to the community. Now that two months have passed, the project seems to be in capable hands and proceeding on target.

Dr. Michael Paolisso replaced Dr. Cattle. Dr. Paolisso brings an enthusiasm and new approach to some areas that we have been struggling with - mainly time allocation. Dr. Paolisso is trained in anthropology with an emplasis on agricultural productivity and time allocation. He has started the time allocation study component using a protocol that was largely developed at UCLA by Dr. Allen Johnson. A consortium for carrying out time allocation studies around the world has been funded at UCLA and we are fortunate in having "tapped into" this work.

Dr. Paolisso will also take over the RMR function as he is acquainted with energy expenditure studies and will also work with Dr. Gardner on a pilot study on energy expenditure, time and budget allowing.

Dr. Mark Marquardt is a clinician with family practice training he was an Assistant Professor at the University of California, San Francisco working in Fresno. He overlapped with Dr. Khelghati and has now taken over the Disease and Morbidity function completely. He is asssisted by Dr. Waswa, the clinical officer, and community nurses. Dr. Marquardt has had excellent training in research as a Robert Wood Johnson Foundation Clinical Scholar, a prestigious program through which he earned a Master's of Science in Public Health with an emphasis in Epidemiology.

Mr. James Thomas, a doctoral student in nutritional epidemiology arrived in October 1984. His main interest is in diarrheal disease as it relates to food intake and the factors involved with its incidence. He is greatly assisting the project with anthropometry and morbidity quality

control as well as carrying out microcomputer analyses on morbidity data subsets to keep the project staff abreast of what is being found in the field.

Field Staff Wind-down

From March through December 1985 there will be a gradual diminution of activities as housholds are "graduated" from the study. Some field staff members have already been leaving for nursing school and teaching positions. The hope is that some of the staff can be retrenched if there is a follow up study or if an intervention study is to be conducted. Upon departure from the project, each staff member will be given a letter of recommendation and a job description enumerating their duties and responsibilities. Resumes will be sent to the Central Bureau of Statistics, to the Kenya Medical Research Institute, and to nongovernmental organizations that may be able to utilize their expertise. Hopefully, some type of ongoing activity will require some of these staff. The community was never promised ongoing jobs but the project is doing its best to ways of utilizing this valuable group of people. It is unlikely that the women will leave their immediate locale and families to work elsewhere in Kenya.

Administration

The field operation, management and logistics are basically unchanged. There has been the addition of a motorcycle to serve as a "bloodmobile" to carry specimens from the clinic to the laboratory rather than tying up a vehicle for this. It is about a one-half hour ride from the clinic to the laboratory. One sheep has been added to the Embu Project staff named Rosetta to serve as a constant source of fresh sheep red blood cells for the immunology (E-Rosette determinations)! It has

become the project mascot! The Apple IIE is now being used extensively as we have now acquired a number of very useful software programs in statistics, epidemiology, nutrient content as well as management and scheduling programs.

The Nutrition CRSP Kenya Project was audited by Delloite, Haskins and Sells, Inc. and was given a generally favorable evaluation, to the meticulous work of the administrator, Mr. Bill Martin, and the project accountant, Mr. Tom Nguli. There was a problem in misclassifying certain supply items which were used for remodeling and enlarging office space, however, this has been rectified. The auditors suggested a double system of signatures on checks and purchase orders as safeguards which has been put into effect. The vehicle fleet, despite heavy usage, is managing pretty well with about two vehicles out of commission at any one time. Cost containment in the field operation is a high priority for the administrative staff.

2. Project Consultants and Visitors

A. Dr. Charlotte Neumann - Principal Investigator

Time in Kenya - Jan. 11 - Feb. 4, 1985

The time spent in Kenya was extremely busy and eventful. The main set of activities going on in a short space of three weeks included:

(1) Introduction and orientation of three new UCLA field staff members: field director - Dr. Michael Baksh; field physician - Dr. Mark Marquardt, field anthropologist - Dr. Michael Paolisso.

(2) Debriefing the departing staff: field director - Dr. Eric Carter, field anthropologist - Dr. Dorothy Cattle and field physician - Dr. Amrullah Khelghati.

(3) Meetings were held with the administrative managerial group -- William Martin, project administrator, Tom Nguli, project accountant and Mr. David Cheboi, administrative assistant.

(4) Local officials in Embu -- The District Commissioner, the district Officers, the Provincial Medical Officer, Dr. Agata and the chief, subchiefs and Kararumo Health Center Director, Mr. Mbogo and community nutrition worker were all visited to discuss relevant project issues.

(5) There were numerous meetings and consultations with Dr. Bwibo, the co-principal investigator and with all of the Kenyan counterparts in each of the functional areas, as well as the Kenya senior field staff. The supervisor and enumerator staff were also met with on a cluster basis and by functional areas. A busy recruiting period took place with interviews for a nurse, clinical officer, and Kenyan counterpart Field Director.

(6) Unexpectedly, Dr. Neumann had to spend the first ten days full-time in the field, acting as the field physician for the morbidity function. Dr. Khelghati was hospitalized with fever of unknown origin and Dr. Mark Marquardt had not yet arrived in Kenya. Although this took an unexpectedly large share of time, it provided an opportunity to take a close look at what the problems were in the disease and morbidity function. The work involved doing daily physical examinations, making

home visits to validate illness, morbidity coding, examining newborns, and doing Dubowitz Testing for gestational age.

3. UCLA consultants:

Dr. Gerald Gardner evaluated the entire RMR procedure, quality of testing and data. (Details are presented below.) He also investigated some potential difficulties with the Beckman metabolic cart and arranged for immediate servicing by the regional Beckman technician (from Dubai).

Mrs. Anne Coulson reviewed the data management procedures and reviewed the quality control procedures for each of the functional areas. She instructed the senior staff in the use of some new programs for the Apple Computer -- an epidemiology program, a statistical program, a food nutrient composition program and a management program.

C. Project Visitors: Dr. Lindsay Allen, Principal Investigator of the Mexico Nutrition CRSP Project visited Kenya. She spent three days in Embu and was particularly interested in seeing RMR performed and discussing this aspect of the work with Dr. Garder. She accompanied Ms. Susan Weinberg to observe and discuss the food intake methodology and observed the data collection on child care giving and the general field logistics. Data flow and management were also of interest to her.

D. Dr. Hugh Horan of Management Entity visited Kenya for two weeks (January 14 to January 30, 1985) to become acquainted firsthand with the Kenya Project, its organization, and logistics. He spent seven days in Embu accompanying the field staff in each of the functional and research areas,

spent time with the administrative staff, and went to several staff meetings. He spent a week in Nairobi joining the principal investigators in some meetings and Dr. Nimrod Bwibo set up a meeting with the Kenyan senior investigators. He then visited USAID and other offices relevant to the project. Dr. Horan then returned for the one day Annual Review Meeting in Embu on January 28, 1985.

E. Dr. George Beaton visited the project in mid February 1985 for 3 days paying particular attention to food intake and RMR.

He made valuable suggestions in regard to the food intake validation study and carried food samples back to Toronto for proximate analyses in order to compare the results with those being obtained in Kenya. It appears that the Kenyan results are running low in protein values.

Management Entity has arranged for a number of foods to be analyzed in Berkeley which will be extremely useful for comparison of the results being obtained in Kenya on the main foodstuffs.

3. Cairo Meeting - January 5-11, 1985

A meeting was called by the Principal Investigators of the three Nutrition CRSP Projects. The main purpose of the meeting was to have the projects examine data in hand with a view towards constructing a framework for analysis in order to answer the hypothesis and research questions, and to present a status report to one another in reference to progress to date in all areas of data collection.

The areas reviewed were:

- food intake
- data entry
- estimate of missing data
- clarification of definitions
- realistic appraisal of procedures, methodologies in terms of yeilding quality data
- sharing of common and country specific research data collection

A review of hypotheses, research questions and analytic framework was discussed in great detail. The following areas received priority:

Toddlers: the relation of food intake to morbidity, cognitive and psychologic function and anthropometry.

Pregnancy: the relation of food intake to pregnancy outcome.

There was a good deal of interaction with the Egypt investigators and a visit was made to the field site. Two of the Kenyan staff had RMR tests done in Kalama in order to compare results to be obtained in Embu and at UCLA, to see if the results are comparable in the three sites. also, blood samples were exchanged for quality control purposes.

Management Entity members present were Dr. George Beaton and Dr. Hugh Horan. Dr. Eric Carter and Mrs. Anne Coulson in addition to the principal investigators (Bwibo and Neumann) represented the Kenyan project. Dr. Lindsay Allen represented the Mexico project and Dr. Galal and Harrison and Kirksey the Egypt Project - (please refer to Drs. H. Horan and G. Beaton's trip report re: Cairo).

4. First Annual Review Meeting of the Kenya Nutrition CRSP Project.

Intensive data review and preparation took place for the first annual review meeting scheduled for January 28th, a one day meeting, to which Kenyan representatives of ministries, agencies, nongovernmental and international organizations were invited. The guest list and the Program are found in Appendix 1. The Minister of Water and Embu Member of Parliament addressed the participants and pledged his support for the project's work.

The main purpose of this meeting was to explain in detail what types of data are being collected, what types of analyses are being planned, and to find out from the participants what types of data their organizations are interested in for planning policy and programmatic purposes. We were also interested in stimulating interest in possible intervention in the general study area. The field staff, particularly the junior staff, reviewed the data in hand from printouts brought to Kenya, and from analyses done at the field level. They each presented short summaries of descriptive data to give the participants a sample of what types of data would be available.

We also held a project review meeting for the entire field staff (140) so they could get feedback about their work and what information they had gathered. Because of the limitation of space they were not able to attend the formal review meeting in Embu. Therefore, it was felt that there should be an abbreviated, more simplified version of the findings to provide feedback for the field enumerators and supervisors.

The main meeting was well attended with well over 60 people coming to Embu for the day and a certain number staying overnight so they could see the field work and setting and speak with the staff at greater length.

There was good press coverage (see the clippings) and television coverage both by Voice of Kenya newscast and a special live interview of Drs. Bwibo, Neumann and Carter on a television program "Mandeleo."

One of the most important spinoffs of the meeting was that the field scientists of each of the functional areas and food intake used the print-outs that were brought from UCLA as well as their own analyses and pulled together descriptive data in each of their areas for presentation. For many this was the first time they ever had to give a formal presentation to an audience and the experience was invaluable. The senior scientists tutored the junior ones in their presentations. What was presented was descriptive information with no linkages of variables, and it was stated repeatedly that the data were preliminary merely to give the audience an idea of what was being found.

The meeting was followed by a farewell banquet for the Carters and Dr. Cattle, and a welcome to the new staff. As a farewell to the departing scientists, the world renowned Embu drummers who reside nearby, were invited to give a performance and it was a fantastic performance!

5. Community Cooperation

Community rapport and cooperation with the community district, provincial officials, sublocational leaders and the residents of the area has never been better. There are many expressions of regret that the project has to end and other communities have been inviting the project to come work in their areas. The field director has been invited to sit on the local district development committee. Interest was expressed in ongoing work of the project and possible continuation of some activities with the Central Bureau of Statistics, district authorities or

non-governmental organizations. USAID/Kenya mission advised us that there may be funding for local nongovernmental organizations (NGO's) in Kenya.

An expression of gratitude, respect and farewell to Dr. Eric Carter and his family, Mr. Martin, and the project were extended in three community celebrations in each of the sublocations. These were afternoon programs with speeches, entertainment, giving of gifts and refreshments. This was in direct appreciation for the famine relief work that brought food and seed to the area. The government efforts are just now producing some relief and surely people would have suffered or died had the project not become actively involved in famine relief for the general area. The Dutch government through Dr. Jansen's efforts must be cited for their contributions of funds so that the project was able to quickly purchase foodstuffs as well as seed. UNICEF and CARE helped the project pay for transportation of large amounts of food. The project undertook a community survey of adjacent but nonstudy areas to help the Local Famine Relief Committee decide which families should receive aid. This was done voluntarily by the anthropometry staff on the weekends. The gratitude of the community is touching and heart felt and Dr. Carter deservedly received numerous honors including a wife from each of the communities, as an incentive to return to Kenya! This was an opportunity for each of the communities to introduce the new field staff to their citizens and promise their continuing cooperation. Each of the communities hoped that there would be ongoing efforts on behalf of the communities in the form of programs aimed at helping them with their problems. The challenge will be to bring some suitable intervention to the area and to make maximum use of the excellent field staff that has been trained.

6. Teaching Contribution to the University of Nairobi School of Medicine. Mrs. Anne Coulson gave an epidemiology lecture to the MPH students in the Department of Community Health. Dr. Charlotte Neumann gave a lecture to the postgraduate physicians specializing in pediatrics who wished to learn about the Nutrition CRSP Project and discuss other nutritional topics. These lectures were given prior to departure in February 1985.

Dr. Waswa, an MPH student, is carrying out his research requirement under the supervisor of Dr. A.A. Jansen. James Thomas, a doctoral student from the Epidemiology Department at UCLA is carrying out a study on diarrhea and its relation to food intake.

Staff Education training monies are being sought for Mr. Njeru, data manager, for graduate work in computer and statistics. Dr. Julius Meme, has already received three months of short-term training in child development in 1982. Ms. DeSouza will be seeking her doctoral training in India where she obtained her Master's at the University of Bombay. Mr. Tom Nguli will be seeking a Master's degree in management or business.

Mr. Wilson Mogisha and Mr. Sammy Kabengera are both seeking graduate study opportunities in laboratory science.

B. STATE OF THE SAMPLE

Most of the study households were entered in January and February 1984 and the remainder in March 1984. This was done in order to take maximum advantage of the large operating cost to run the project and complicated logistics involved. In general, attrition has been low with greatest attrition occurring early in the study. During and following the period of drought and famine relief in September to November 1984, except for two households that moved, no households have dropped out. In Table 1 below are listed the original sample composition as well as the projected phase-down schedule for households.

TABLE 1
HOUSEHOLD AND
TARGET INDIVIDUAL LIST

Jan. 1984 through Dec. 1984

	Household	Lead Male	Lead Female	Schooler	Toddler	Preg. & Newborn
Census No. 1						
Jan-Feb 1984 (enrollment)	291	291	291	191	102	76
Census No. 2						
May-June 1984	274	274	273*	181	111	76
Census No. 3						
Aug-Sept. 1984	271	271	27	179	111	76
December 1984	255	255	254	137	111	76
PROJECTIONS						
January 1985	221	221	220	137	111	76
February	177	172	169**	137	111	76
March	169	169	166	*** 137	111	129+
April	146	146	148		111	*** 129+
May	120	120	117		*** 111	
June	101	101	97			
July	67	79	76			
August	55	55	52			
September	43	43	43			
October	32	32	29			
November	22	22	19			
December	2	2	0	0	0	0

* 1 LM died

** 2 more LM died

*** gradual reduction of samples to zero

\+ total number born into study

C. MISSING DATA ESTIMATES

Sources of Information

The form listing, (sample enclosed, from June to December 1984), is the basis for most of the missing data estimates. This computer listing shows exactly which forms have been computer entered and are on tape at UCLA. The listing does not tell us what is "in the pipe line" and which forms have not been computer-entered because all items of data have not been recorded. For example, the laboratory (immunology) forms are being held back waiting for certain laboratory work which is run in batches several times a year. Also, the food intake does not appear in the first year's record because for the first year the food intake was hand calculated and is now being transferred to the new forms for computer analysis of energy intake. The remainder of the missing data information is based on first hand knowledge by the area supervisors for each function. Food intake and personal estimates are made by the field director and data manager.

As seen in Table 2 below, the toddler group has minimal missing data except for blood hematology and immunology with about 30% missing data. Each toddler had at least one round of immunology and hematology and some had two rounds by the end of 1984. The missing data was due to a combination of technical difficulties and refusals.

As an example, the analyses of toddler data on the 18-24 month olds from the computer printout shows the following estimates.

As an example, the analyses of toddler data on the 18-24 months olds from the computer printout shows the following estimates for January 1984 to December 1984.

TABLE 2

Toddler Data from 18 to 24 months

Type of Measure	Prescribed Freq. of Measure	Number of Expected Observations based on n=104*	Actual Missing Observations	% Missing*
Census Update	Every 3 mos.	312	27/312	9
Anthropometry	once/mo.	1248	6/1248	1
Morbidity	once/wk.	1248	60/1248	5
Physical Examination	every 6 mos.	2-3/child 260	24/260	9
Overall Laboratory (Immun. hematology)	every 6 mos.	2-3/child 260	65/260	25
Cognitive	At 18 & 24 mos.	208	2/208	1
Child-Care Taker Interaction	2 mos.	600	6/600	1
Child Care Giving	2 mos.	600	4/600	1

* Number of actually increased to 111 after 3rd month of main study

Missing data estimates for the entire project are presented in Tables 3 A, B, C, D, E, F. These are by Longitudinal Data; Repeat Cross-Sectional Data; Time-specific Data and One-Time Descriptive Data.

Longitudinal Variable (Anthropometry, Morbidity, Food Intake)

Kenya Missing Data

TABLE 3A

Variable/ Measure	Subject	Sample Size	Expected or Prescribed Internal Frequency	% Missing Data in Any One Unit Of Time	% Estimated Missing Data at end of Study	Pattern of Missing Data Retrievability	Comments Implications for Analysis
Food Intake	HH LM LF Sch Toddl Inf	270 270 270 137 111 129	2 days per month - HH and all TIs	HH 3-5 LM 30 LF 3-5 Sch 15 Toddl 3-5	3 % 20 3 10 3	Random Random Random Random Infant & Toddle Missing When LF missing	Because sample size of LM 200 not a major problem starting with N=137 Toddlers- very few get some breast milk at 18 months
Anthropometry	HH LM LF Sch Toddl Inf	270 270 270 137 111 129	Twice in study. Once per mo for all anthro. on all TIs	HH 5-10 LM 30 LF 5 Sch 20 Toddi 5 Inf 5	3-5 10 3 15 3 3	Random but LM and Schooler greater than all targets.	No analytic problem because of freq. measures on adults and Ht. & Wt. in all non-TIs can be obtained twice during any time before end of study
Morbidity	HH LM LF Sch Toddl Inf	270 270 270 137 111 129	Weekly Home visits and subroutine visits or repeat visits for series or prescribed illness. Coded every 4 weeks.	HH 5 LM 5-8 LF 5 Sch 5 Toddl 5 Inf 5	3-5 10 3 15 3 3	Random - LM slightly greater than rest of family- males missing about 20% observations of actual illness- about 75% reported by recall of LF	No analytic prob. because of freq. visits. HH morbidity only prevalence. Minor illness under-estimated on LM. Subroutine as prescribed originally abandoned with 2 of 3 projects. 97% missing. Now using slightly

TABLE 3B

Longitudinal Variables (Activity - Interactions, Child-Care Giving)

Kenya Missing Data

Variable/ Measure	Subject	Sample Size	Expected or Prescribed Interval & Frequency	% Missing Data In Any One Unit Of Time	% Estimated Missing data at end of Study	Pattern of Missing Date Retrievability	Comments Implications for Analysis
Time Allocation	LM LF	169 169	Every 4 days 5-15 minutes visit to sample activity going on at time of "spot visit"	100% until March 1, 1985 time allocation study started	1-3%	Expected to be random. 169 HH left in sample when time allocation started	Time allocation started in year II of Main study for Kenya No analytic problem
Child Care-Giver Interactions	Inf Toddl	120 104	Every 2 months	10-15%	10%	Random-tied to mothers absence	*No analytic problems forseen Repeat visits required for infants because of infants falling asleep during observations
Child Care-Giving Activities	Inf Todd	120 104	Every 2 months	20%	10 %	Random-tied to mother's absence	* No analytic problem seen
Temperature Rainfall	Commun-ity	5 sites	Daily	0	0	0	Government records until June 1984 Now "on site" in each cluster office and Embu office

* Most of Interactions and Care-giving is by mother

TABLE 3C

Variable/ Measure	Subject	Sample Size	Expected or Prescribed Internal Frequency	% Missing Data in Any One Unit Of Time	% Estimated Missing Data at end of Study	Pattern of Missing Data Retrievability	Comments Implications for Analysis
RMR	LM LF Sch.	270 270 137	Every 3 to 4 Months	25 15 35	20 10 25	LM and schoolers greater than LF	Hope to make up missing RMR's before discharge from study. Machine "down-time" caused some of the problem of missing data- 90% have had at least 2 RMR measures

TABLE 3D

Type Of Data: TIME SPECIFIC

Variable/ Measure	TI	Sample Size	Number Measures Now Completed	% Forever Missing	% Predicted Missing by end of study	Comments and Implications for Analysis
Pregnancy Anthropometry 5m 8m	LF (preg)	129 Pregnacies and newborns expected by end of the study	110+ 105	3-5%	3-5%	We expect to have about 129 total pregnancies.
RMR 5m			100 estimate	10%	10%	
Ferritin Immunology			100	10%	10%	We anticipate none to slight analytic problems depending on the final number of pregnancies and deliveries, we actually end up with .
Birth Events Infant Birth Weight Gestational Age (Dubowitz)	Newborn		110+	3-5%	3%	
Anthropometry (Infant) 8 days	Newborn					
Maternal PP Wt. + anthro.	LF+Lact.					
Brazelton Score Day 8	Newborn			3%	3%	
Lactation RMR 1 mo 3 mos 6 mos	LF Lactating			10%	8%	
Colostrum 0-3 d & 1 mo Breastmild 3 mos 6 mos				3-5%	3-5%	

Type Of Data: TIME SPECIFIC

Variable/ Measure Specific Time	TI	Sample Size	Number Measures Now Completed	% Forever Missing	% Predicted Missing by end of study	Comments and Implications for Analysis
Cognitive 6 mos Fagan's Memory Test Bayley Motor Scale Bayley Infant Behavior	Infant	129 129 129	100±	1%	1%	18 and 24 month testing completed with very little missing data Toddler cognitive testing partly completed for 30 month olds
18 mos & 24 mos. Uzgiris Hunt Scale Bayley Mental Scale Bayley Motor Bayley Infant Behavior	Toddler Toddler Toddler	110 110	110 110	2%	2%	
30 months Bayley Mental Beyley Motor Bayley Infant Behavior Record			130±	2%	2%	
7-9 Yrs. June-Sept. 198 WISC-R Raven's Matrice	Schooler	137	133 x 2	3%	3%	3rd round planned on sub sample

TABLE 3E

TABLE 3F

Variable/ Measure	TI or HH	Sample Size	Expected or Prescribed Interval & Frequency	% Missing Data In Any One Unit Of Time	% Estimated Missing data at end of Study	Pattern of Missing Date Retrievability	Comments Implications for Analysis
Immunology							
Skin Testing	LM	270	At start and every 6 mos. (2-3 rounds)	LM 30-40	30	Missing data in infants and toddlers-due to refusals and technical difficulties	Descriptors - Repeat x-sectional, no major analytic problem
Cellular	LF	270		LF 20	15		
	Sch	137		Sch 30	20-25		
	Td	111		Tod 30	20-25		
Saliva*	Inf	129		Inf 30	20-25		
Nutritional Blood Sample						LM > LF	
Hematology & Malaria smears	LM	270	At start & every 6 mos. (2-3 rounds)	LM 30-40%	30%	As Above	
Pre-alb, alb.	LF	270		LF 20%	15%		
Ferritin	Sch	137		Sch 30%	20-25		
Transferrin	Tod	111		Tod 30%	20-25		
	Inf	129		Inf 30%	20-25		
Parasites Intestinal	M	270	At start & every 6 mos. (2-3 rounds)	M 30-40	30		
	F	270		F 20	15		
Physical Exam + Hearing	S	137		Sch 30	20-25		
	Tod	111		Td 30	20-25		
Vision	Inf	129		Inf	20-25		
Household chronic Morbidity Update	HH	270	Every 3-4 months	5%	5%	Random	

TABLE 3G

One-Time Variables (Background Information)

Kenya Missing Data

Variable/Measure	TI HH or Commun.	Sample Size	Expected or Prescribed Interval & Frequency	% Predicted or Estimated at end of Study	Pattern of Missing Data	Implications of analysis - Comments
Household non-target Anthropometry	Non-target HH members	500	2 times each (in "lean" season and post harvest)	10%	Random Males > Females	None Descriptor of HH
Community Description	Entire community	-------	Initially and update annually	None		
Case Studies	Entire HH	20 HH	Beginning of main study, follow up on items of interest e.g. Food Intake being followed closely with immediate analyses for monitoring			
Nutrient Composition of foods	HH	50 cooked and raw ingredients and dishes	throughout study			No adequate food composition tables for Kenya Analyses in progress
Adult Cognitive Tests	LM LF	270 270	Once	5%	Random LM > LF	Minimal

Repeated Cross-Sectional (State Measures-Description)

Variable/ Measure	TI or HH	Sample Size	Expected or Prescribed Interval & Frequency	% Missing Data In Any One Unit Of Time	% Estimated Missing data at end of Study	Pattern of Missing Date Retrievability	Comments Implications for Analysis
Sanitation/ Hygiene (SAHY) Socioeconomic (SES) Census Update (CU) Crop/Agriculture Seed Quest.	HH HH HH HH	270	every 3 mos for all of these in rotation	3% SAHY 3% SES 1% CU 5% 5%	3%	Probably random	very little as this is being done 4 times/ year
Market Survey	local mar-kets and one main mar-ket	6 markets	4 times/year	----	-----	----	----
Rainfall Max-Min Temp Barometric Press	Com-mun-ity	4 clusters and Embu Office	daily	0	0	0	none

(missing data of first 6 mos. was obtained from government recor[illegible].

TABLE 3H

D. SUBSTANTIVE AREAS

1. Food Intake. Food intake data collection is going well. There is very little missing data except for lead males and schoolers. Cooperation on the part of the households has been good regarding food intake, tolerating the enumerators' presence in the households very well. We feel that people may be cooperating as they have seen the project as a source of food and seed aid.

Method. The methodology has been unchanged from the original. The strength lies in maximum weighment and observation and measurement of prepared recipes and leftovers. The enumerators, because they are in the household, can observe the toddler who stays pretty well within the compound. The lead male and schooler intake is often obtained by recall to a greater extent than other family members, especially the lead male. A "bank" of standard recipes has been developed based on 100 typical recipes. These are used when food intake is obtained by recall of dishes eaten outside the household. The field operation is closely supervised by the supervisors and one Kenyan nutritionist (Charity Njiru) and the senior field nutritionist from UCLA (Susan Weinberg).

A major activity activity is that transferring data onto new forms which report all food intake in terms of grams, dish number, and standard recipes for recall for food taken outside the home. Data coding is checked frequently and a manual has been developed for the data transformation. August 18, 1984 was the last time the old form (No. 119) was used which gave Kcalorie summaries for HH and each target individual. From now on a computer program will calculate Kcalories and other nutrients consumed. A food nutrient program for the Apple IIe is

being used to calculate energy intake for day to day monitoring in the field. Twenty households are being watched in depth as a monitoring tool for the community. These households come from each of the clusters. As Kenyan food composition values are obtained they will be substituted for the USDA values in the programs.

Food Intake Validation Study. This has been prepared and carried out in March 1985 by Ms. S. Weinberg and Mrs. G. Njiru with the advice of Dr George Beaton who was in the field in February and Dr. Eric Carter. The households chosen for the validation were those newly graduated from the study, the validation being done just before they leave the study. So far this has been tolerated very well and the protocol is presented here. It is a time consuming protocol because the main study method is compared to full weighment. It starts early in the morning and finishes late at night (see protocol below).

The first comparison of the food intake methods was carried out just prior to the start of the main study in 1983 when recall was compared to weighing. It was then concluded that recall alone would be inadequate.

Presented on pages 30 through 32 are preliminary food intake data from Year I of the main study (Jan. 1984 - Dec. 1984) which covers the period of the famine.

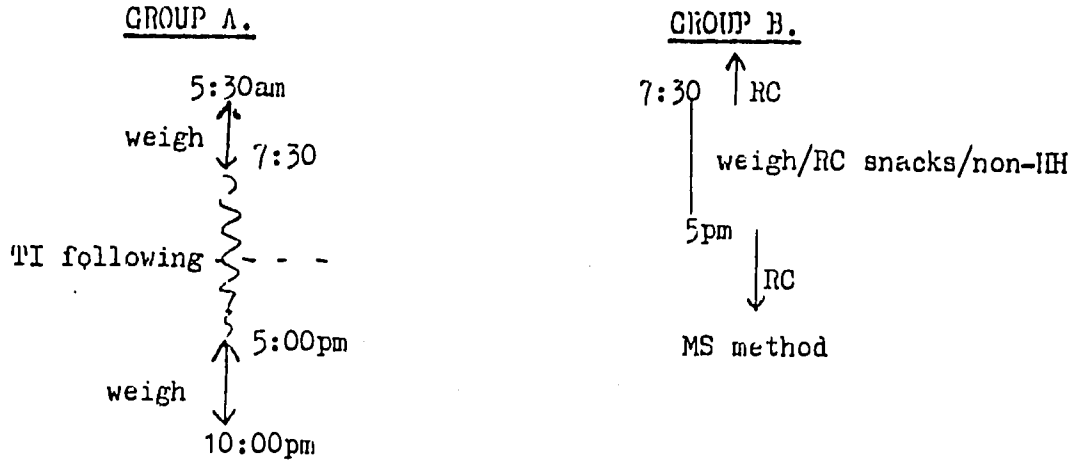
S. Weinberg, 2/85

FOOD INTAKE METHODOLOGY VALIDATION - DRAFT

PURPOSE: a) To test the Main Study Food Intake method versus that of Total Weighment.

b) A means for quality control.

DESIGN:



GROUP "A" a) 5:30am - 1:30pm b) 1:30pm - 10pm

group "A" will do complete weighment of food preparation/consumption which occurs during the hours that no CRSP FI enumerator is normally present in the study hhs (MS method). During the bulk of the day (7:30-5pm) the enumerator will be assigned to follow a specified TI to weigh any foods taken outside of the compound.

GROUP "B" - group B will carry out the routine main study method - arriving at the HH at 7:30 am, weighing meal preparation and consumption, recalling that which occured before her arrival and/or after her departure from the HH as well as Recall of snacks/foods consumed outside of the HH.

HHs involved:

Ten (10) hhs will be visited for 3½ days each, over a two week period. 5 households per week. HHs - newly excluded CRSP hhs. Yield - 30 hh visits.
HHs - 2001, 2002, 2005, 2006, 1044 / 2020,2031,2030,20 ,20

	MON	TUES	WED	THURS.	FRI
Planning & preparation		X	X	X	X

TI FOLLOWING

Personnel:

15 enums, four supervisors -, (3 enums per HH)

2 Supervisors a.m shift
2 Supervisors p.m. shift

All personnel are pulled
from clusters one and two.

Dates of Study. Week one -
26,27,28, Feb.,/March 1st

Week two - 5,6,7,8 March

Equipment

Group A (2 enums) - one equipment bag,

Group B (one enum.) - one full equipment bag.

- Food Intake forms

TORCHES

TRANSPORT:- Early am. shift - pick up at home to arrive in study hhs at 5:30 am.

Late p.m. shift - returned to their homes at ~10pm.

TI Following: Priority of TIs to follow, in descending order -
Toddler, School child, Lead female, Lead male.

Analyses

1) Compute Kcal estimates for

MS method	versus	Total Weighment
RC		W
W		W
RC		W

at the TI level

a) paired -t

b) regression coefficient

c) correlation

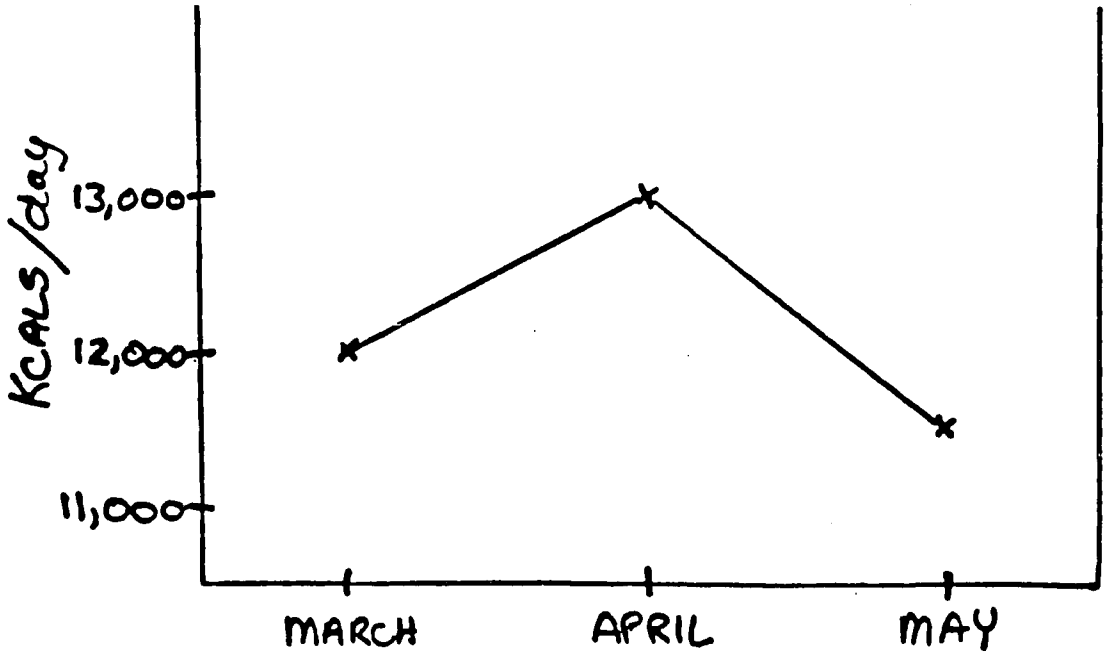
d) Scatter plot

e) compute mean deviation ignoring the sign.

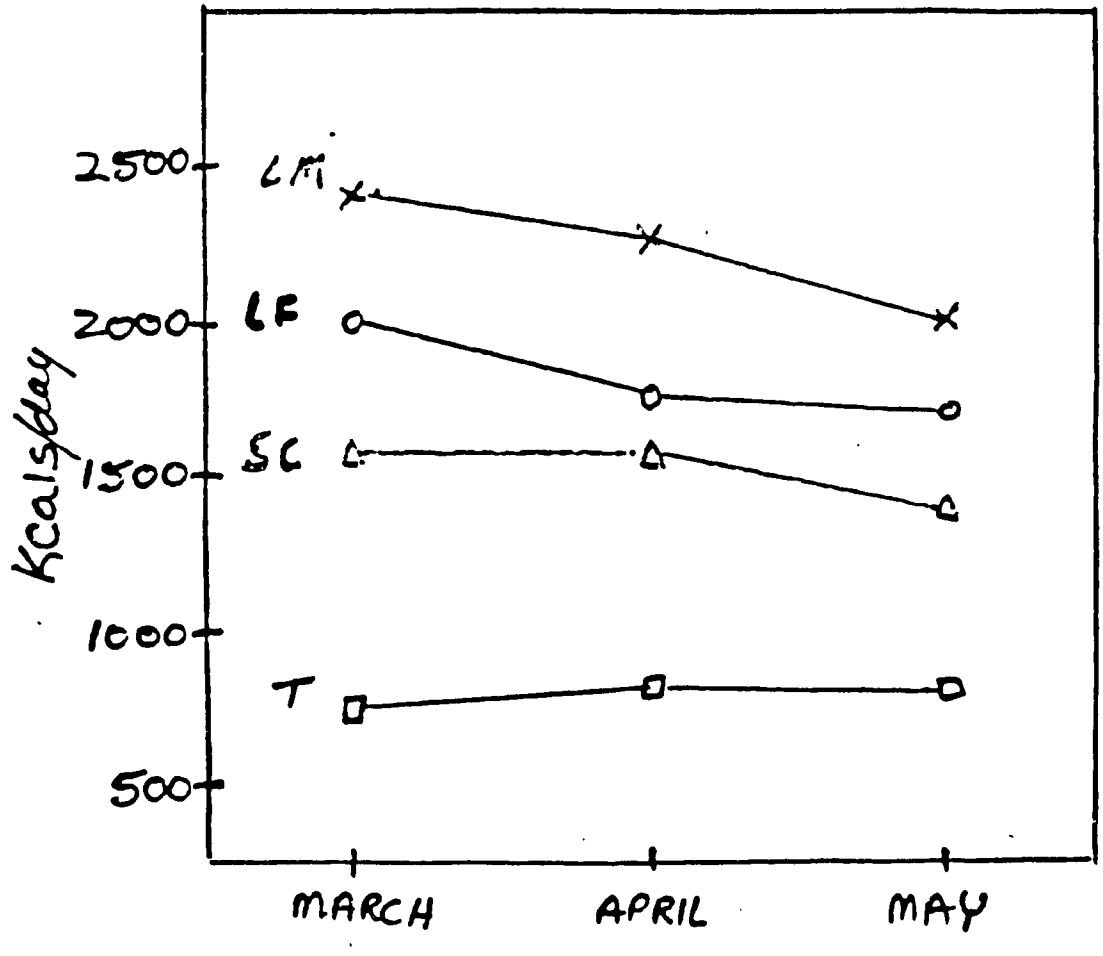
2) HH level - Net Kcal consumption

MS method versus total weighment

3) Look at specific dish types, ingredient types

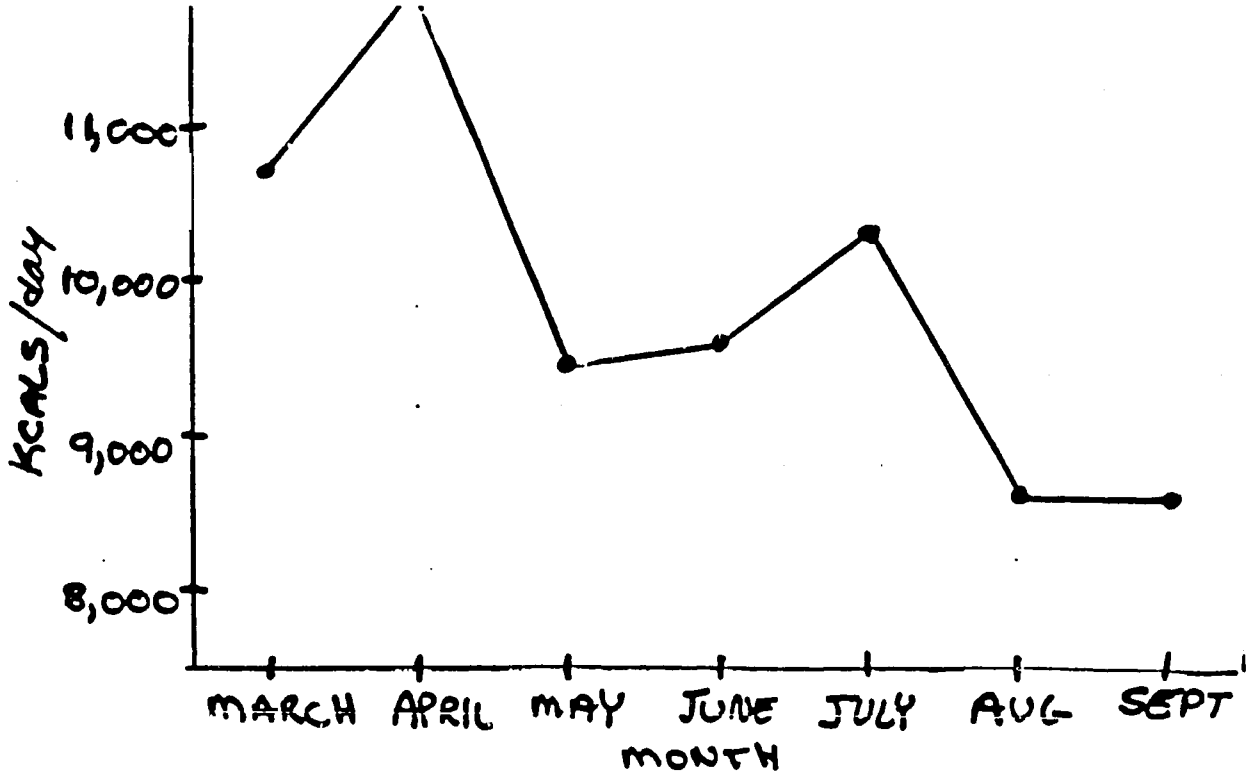


HH Kcals Consumed (All HHs)

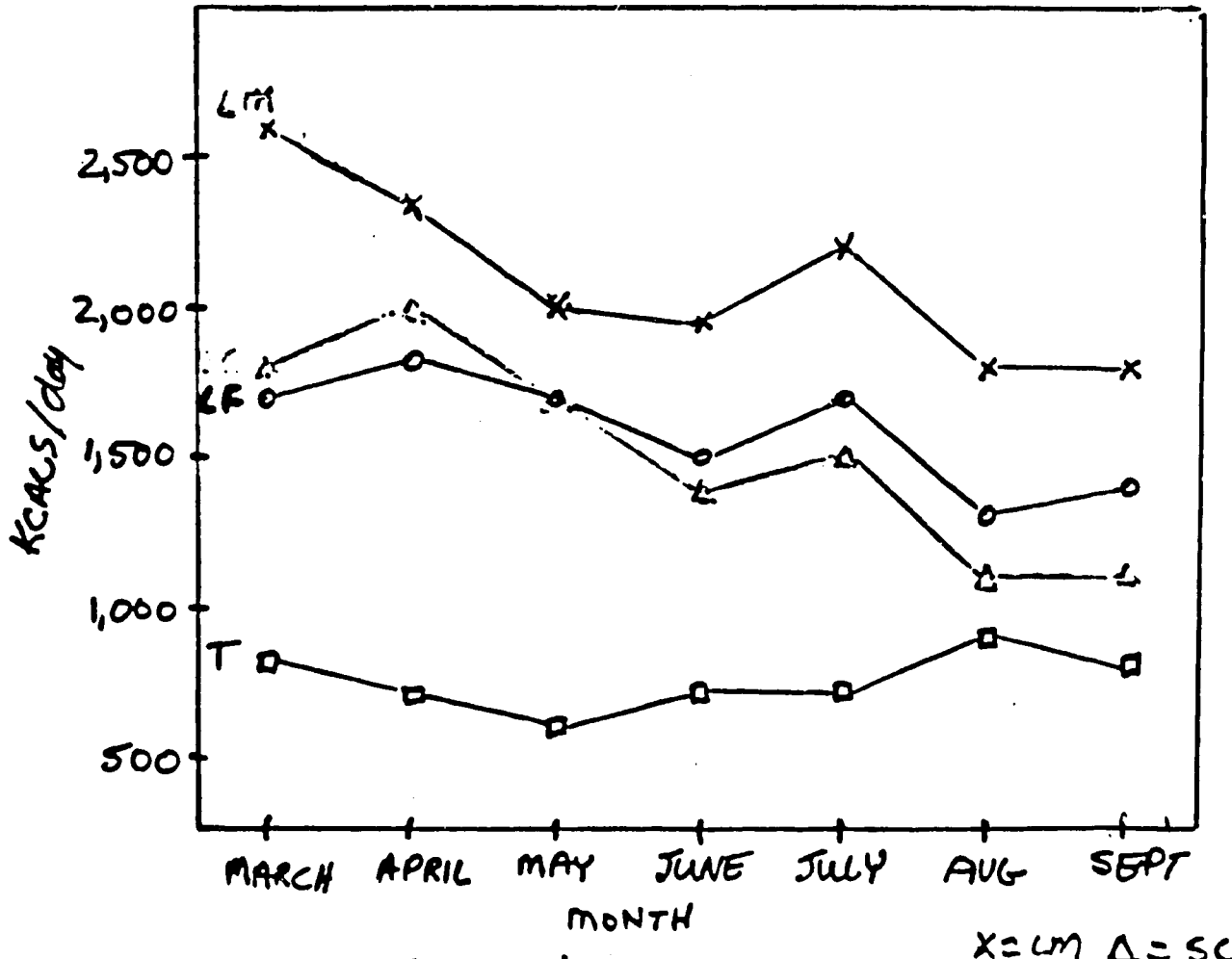


TI Kcals Consumed
(All HHs)

X=LM
O=LF
Δ=SC
□= T

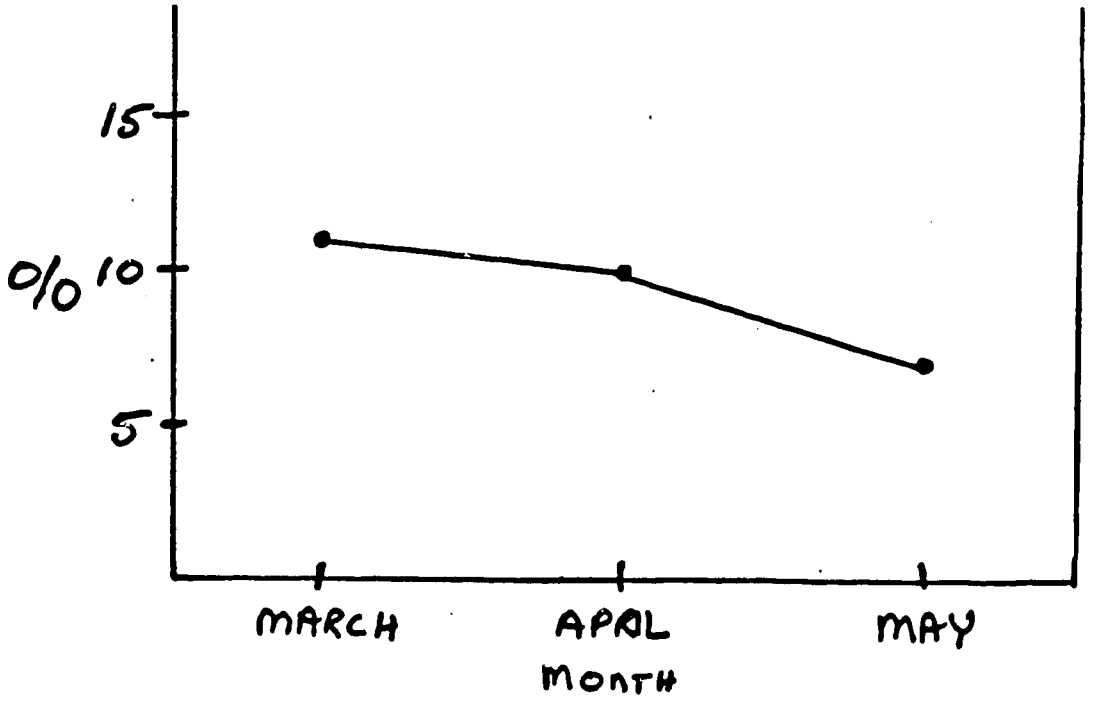


HH Kcal CONSUMED (subsample)

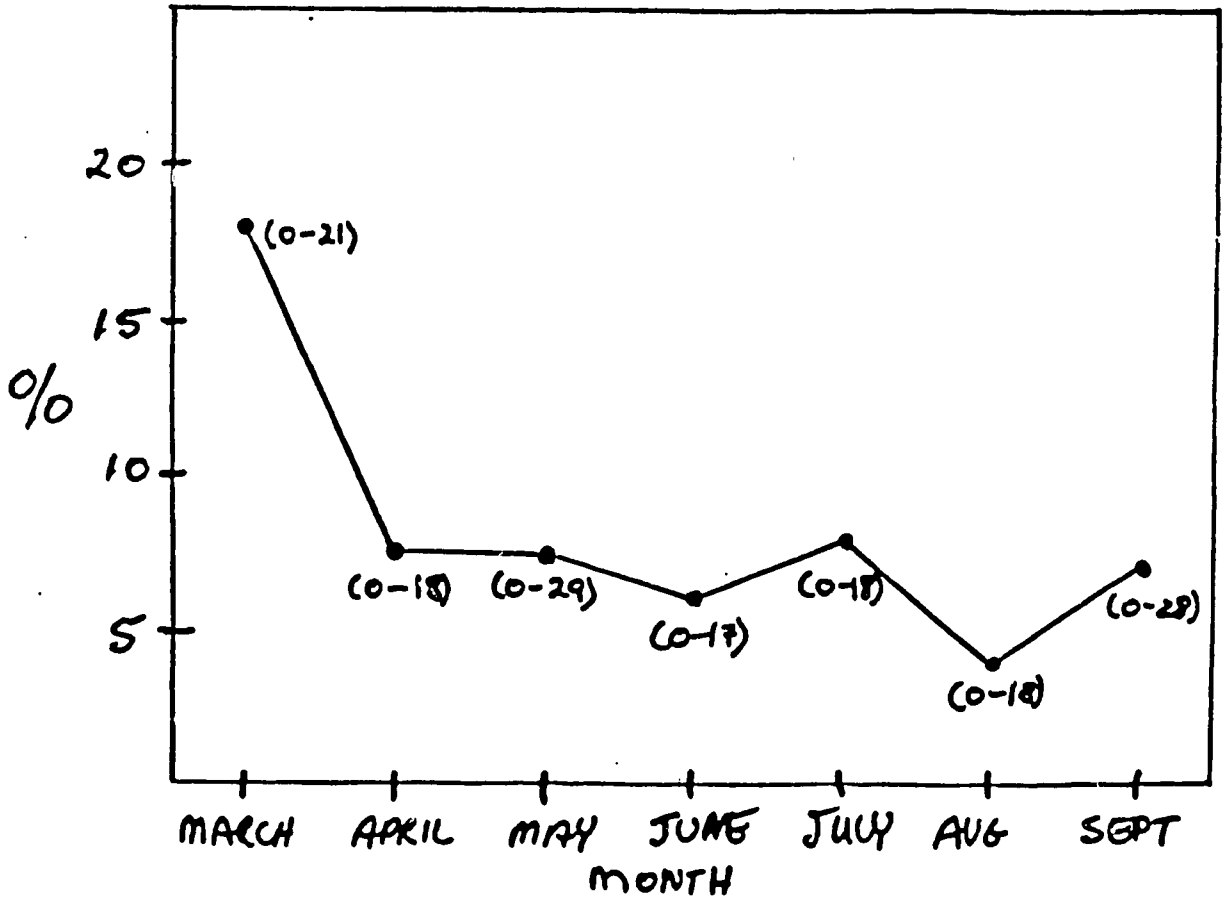


TI Kcal CONSUMED (subsample)

X = LM Δ = SC
O = LF □ = T



% of HH Kcals CONSUMED AS SNACKS/NON-HH FOODS (All HHs)



% of HH KCALS CONSUMED AS SNACK/NON-HH FOODS (subsample)

( ) = RANGE

2. Anthropometry

Anthropometry measurements have been collected on a monthly basis on all target individuals. Additional fatfolds have been collected on pregnant women, consisting of suprailiac, thigh and abdominal fatfolds.

Equipment, namely scales and calipers are calibrated at two weekly intervals as well as the scales in the newborn units of the health center and hospital* and a calibration quality control form is recorded. In addition to a 5% subsample for validation purposes, a formal standardization test is carried out every two months by the senior supervisory staff and retraining is ongoing. Missing data has been minimal in lead females, toddlers, pregnant women, and infants. The lead male has been running about 30% missing data and the schooler about 20% missing data but this situation is definitely improving. However, because measurements are obtained every month, we feel that this will not present any sizeable analytic problem.

Anthropometry has been monitored closely in the field as this has been a very useful indicator of the status of the food situation in the area. The most notable finding during the drought (see enclosed graphs Fig.4,5,6) is that about 25% of the schoolers and toddlers lost weight and about an equal percentage did not gain weight. Also, we found a dramatic increase in the amount of stunting among toddlers during the time of the food shortage over a five month period. Lead males and females lost a mean of 3 kilograms of weight during the period of famine. It must be pointed out though that this does not apply to all houses but to about 1/3 of the households. The households worst affected will be looked at in great detail separately.

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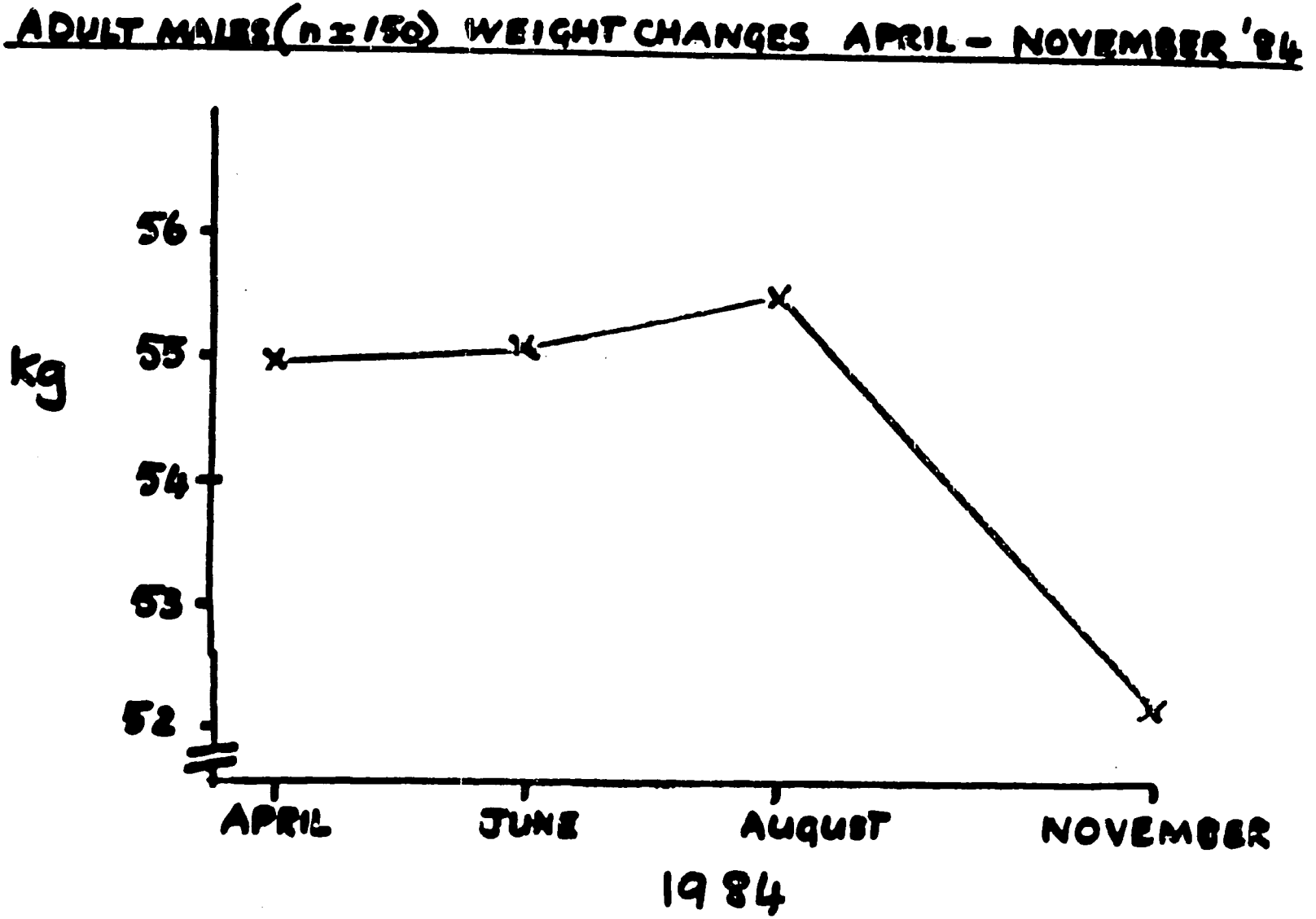
* Usually Nutrition CRSP project scales are used for birth weight but these do serve as a back up.

EC 5

35

Figure 5



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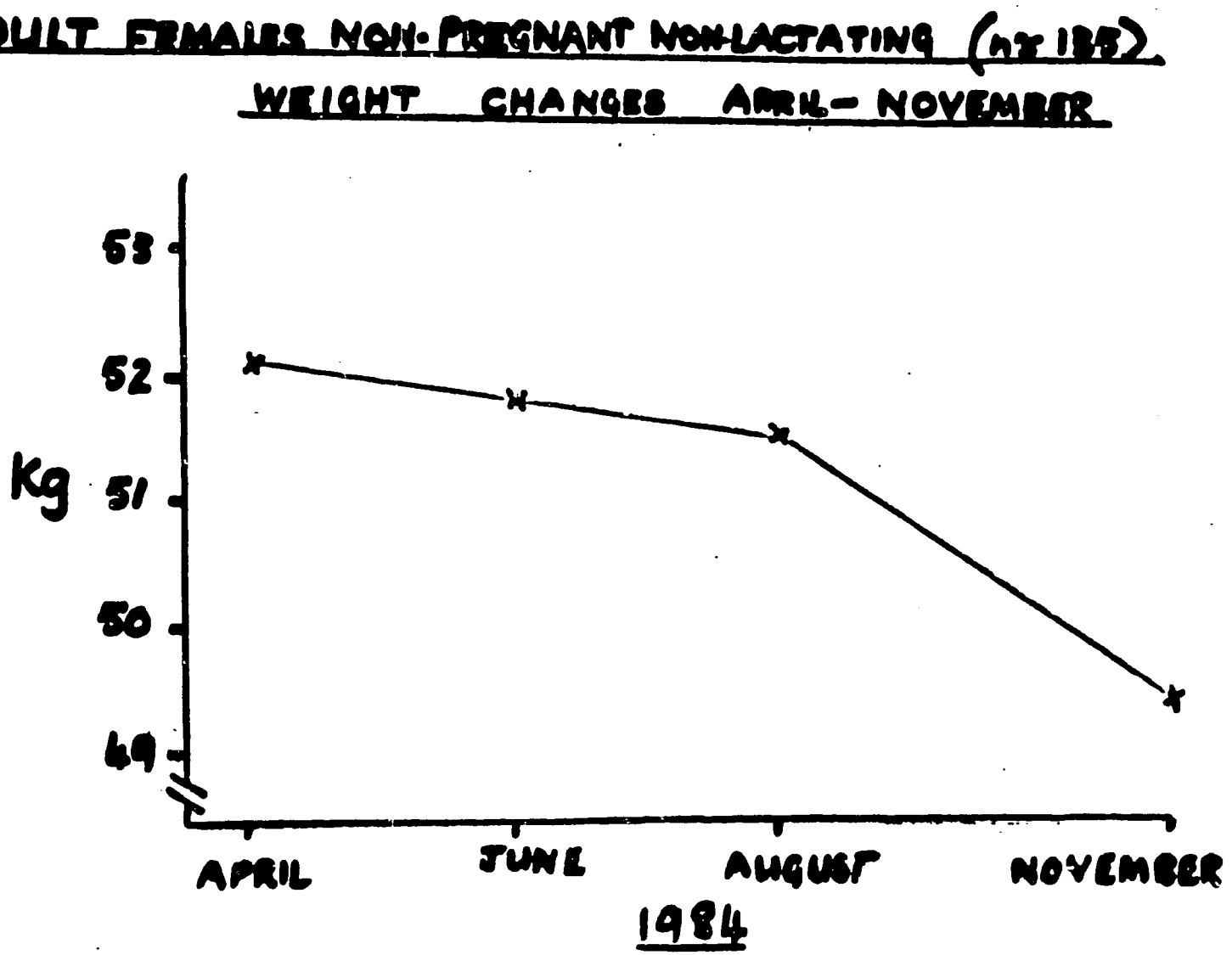
EC 6

Figure 6


ADULT FEMALES NON-PREGNANT NON-LACTATING (n = 135)
WEIGHT CHANGES APRIL - NOVEMBER
Kg
53
52
51
50
49
APRIL
JUNE
AUGUST
NOVEMBER
1984

The anthropometry data demonstrates that there is a wide spread in nutritional status ranging from a small group of severely malnourished to normal individuals, with the largest group in the classical "mild to moderate" range. There have been no cultural problems in obtaining anthropometric measurements and these have been well accepted for both the pregnant women and the newborns.

3. Morbidity

Accomplishments. Household morbidity has been collected continuously with estimates of missing data being 3-5%. Undoubtedly, some illness is being missed because the lead male and schooler are not available for observations as often as are the lead female, toddler and infant. This may be minimizing mild illness in these groups. If the illness were severe they would most likely remain at home. The enumerators seem to need continuous training but have learned an impressively large amount of material considering their high school educational level.

The use of an Apple IIe microcomputer in the field with statistical and epidemiology software run by Mr. Thomas, a doctoral student, has been very helpful. This has been giving a picture on subsamples of current morbidity with excellent and immediate feedback.

Diarrheal disease has been receiving an increasing amount of attention since October 1984 when Mr. Thomas arrived. His doctoral research is concerned with diarrheal disease and how it relates to food intake and other factors. His attention to this condition has appeared to "sharpen up" the detection of diarrhea. The initial low rates were attributed partially to seasonal effects. Now that the under six month olds are in the study we are beginning to see more diarrhea in this age

TABLES 4 and 5

KENYA PROJECT

PROPORTIONATE MORBIDITY

FOR SELECTED DISEASE CATEGORIES

(March through July, 1984) *

	MARCH	APRIL	MAY	JUNE	JULY
Skin	8.2%	9.8%	5.0%	6.8%	6.5%
Eye	17.6%	15.1%	13.1%	8.3%	7.0%
Respiratory	36.5%	41.5%	39.1%	42.5%	49.3%
Digestive	14.1%	8.3%	11.9%	9.5%	8.0%
Communicable	2.0%	0.0	0.6%	0.3%	1.1%
Fever	6.8%	13.6%	15.4%	14.0%	15.3%

* Data on 270 households and 986 individuals

SELECTED DETAILED PROPORTIONATE MORBIDITY*

(5 mos. combined)

Skin

Bacterial Infection	28%
Ringworm	8%
Scabies	6%
Soft Tissue Injury	27%

Eye

Conjunctivitis	94%
Stye	1%
Trachoma	1%
Gonoccal Opth.	1%

Respiratory

Acute Upper	6%
Tonsillopharyngitis	5%
Bronchitis	17%
Pneumonia	3%

Digestive

Diarrhea	34%
Epigastric pain/heartburn	5%

Communicable

Measles	73%
Non-specific Xanthem with fever	9%

Fever

Fever only	9%
Fever + other signs	59%
"Clinical Malaria"	59%

* Data on 986 individuals pooled

group, many of whom receive supplementary foods under 6 months of age. Also more diarrhea is being reported in the toddlers during the warm season.

Currently we have the best staffing pattern we have ever had for field coverage. We have a clinical officer who has an equivalent of three years of physician assistant training, a parttime Kenyan physician, and a senior physician, Dr. Mark Marquardt, who has taken over all the coding and research aspects of morbidity from Dr. Khelghati.

Included in Table 4 and 5 below are data on proportionate morbidity based on some preliminary analyses and some rates calculated on a small side sample. We are constructing a morbidity index which will take into account: type of morbidity, duration, severity and functional impairment.

Selected findings on physical examination are presented in Table 6.

Deaths

The three deaths that have occurred in target individual have all been in lead males: two were due to hepatoma (confirmed in the hospital) and one due to a pharyngeal cancer. Hepatoma is common in East Africa and is associated with a high rate of hepatitis. An epidemiologist in the Department of Community Health at the Medical School hopes to start a cancer registry in Embu. What the role of aflotoxin may be is only conjecture. It has been linked to deaths from liver disease, as has hepatitis.

Hemoglobin and Ferritin data reveal anemia and iron deficiency. Hookworm is the most common intestinal parasite (see Table 7).

TABLE 6

KENYA PROJECT

SELECTED FINDINGS

ON

HEALTH EXAMINATIONS

(n = 620)

Hypertension		4.0%	M > F
Hearing Impairment		1.5%	
Vision Impairment		7.0%	
Thyroid Enlarged		18.0%	Females
	> 1+	6.0%	Female Schoolers
Hepatomegaly		6.0%	
Splenomegaly		2.0%	
Mouth, Tongue, Signs of B Defic.		4.0%	
Mottled Teeth (Fluorosis)		3.5%	

Immunizations Under 5 years

BCG	95%	History + Cards + Scars
Measles	74%	
Polio	95%	
DPT (> 2 DPT)	95%	

TABLE 7

HEMOGLOBIN - Round 1 (January-June 1984)

gm/dl

	LEAD MALE	LEAD FEMALE	SCHOOLER MALE	SCHOOLER FEMALE	TODDLER SEX COMBINED
Number	115	185	65	44	76
Mean gm/dl ± SD	15.1 ± 1.9	12.3 ± 1.8	11.9 ± 1.5	12.1 ± 1.6	10.6 ± 1.5
Range	(10.2-19.7)	(7.1-16.7)	(8.1-14.4)	(17.6-16.7)	(5-13)
% Defic.	(< 13gm) 19%	(< 12gm) 37%	(< 11gm) 21%	(< 11gm) 20%	(< 10gm) 28%

SERUM FERRITIN - Round 1 (January-June 1984)

ng/ml

	LEAD MALE	LEAD FEMALE	SCHOOLER MALE	SCHOOLER FEMALE	TODDLER
Number	164	190	65	44	69
Mean ± SD	72.8 ± 89	23.0 ± 37	35.9 ± 44	33.6 ± 34.7	18.2 ± 23.0
Range	(0-48 5)	(0-420)	(0-240)	(0-195)	(0-135)
% Defic. < 10 ng/ml	12%	40%	30%	23%	50%

PARASITES - Round 1 (January-June 1984)

	LEAD MALE	LEAD FEMALE	SCHOOLER MALE	SCHOOLER FEMALE	TODDLER
Number	151	181	58	39	71
HOOKWORM	7.3 ± 16	8.7 ± 15.4	5.8 ± 9.6	4.5 ± 16.0	1.7 ± 5.4
Ova /gm/stool	(0-99)	(0-99)	(0-33)	(0-99)	(0-61)
% Neg.	60%	52%	70%	71%	90%
Number	151	181	58	39	71
ASCARIS	0.2	0.2	3.1	7.6	6.6
Ova /gm/stool	0-13	0-22	0-99	0-99	0-75
% Neg.	98%	98%	91%	89%	93%

Disease Rates

The rates below are based on a 25% subsample of data for April, 1984. This represents an example of ongoing analyses in the field using the Apple IIe. See Table.

These analyses of samples of mobidity data are not intended to substitute for full-fledged data analysis with which to test hypotheses. They are rather to give feedback relevant to the concerns of the ongoing data collection. Such forseen uses include:

(1) Feedback to the field staff showing them the tangible fruits of their labor, thereby increasing interest and motivation;

(2) Force us to test the quality and "useability" of our data;

(3) Uncover the need for any special substudies;

(4) Generate ideas for quality control of data gathering;

(5) Overtime to follow seasonal trends in absolute and proportional disease rates.

$$\text{Disease Rate} = \frac{\text{number of events of an illness}}{\text{number of TI-weeks visited}} = \frac{\text{events}}{\text{person-time}}$$

TABLE 8

PROPORTIONATE MORBIDITY

AND DISEASE RATES BY TARGET INDIVIDUALS

Adult Males

Illness	# Cases	% of All Illnesses	Rates per 1000 TI Wks.
Dental Abscess	1	6.25	5.5
Acute URI	1	6.25	5.5
Diarrhea	1	6.25	5.5
Abdominal Pain	1	6.25	5.5
Fever w/o Other Sx	1	6.25	5.5
Bronchitis	2	12.5	11.2
Arthritis	2	12.5	11.2
Malaria	3	18.9	15.8
Common Cold	4	25.0	23.5

Schoolers

Illness	# Cases	% of All Illnesses	Rate per 1000 TI Wks.
Impetigo	1	9.1	8.7
Infected Bite	1	9.1	8.7
Dental Abcess	1	9.1	8.7
Common Cold	1	9.1	8.7
Tonsilopharyn.	1	9.1	8.7
Bronchitis	2	18.2	17.4
Conjunctivitis	2	18.2	17.4

Adult Females Illness	# Cases	% of All Illnesses	Rates per 1000 TI Wks.
Scabies	1	3.4	5.6
Ringworm	1	3.4	5.6
Cong Heart	1	3.4	5.6
Fever w/o	1	3.4	5.6
Pneumonia	1	3.4	5.6
Bronchitis	2	6.9	11.2
Abdominal Pain	2	6.9	11.2
Acute URI	3	10.3	16.8
All LRI	3	10.3	16.8
Fever w/	4	13.8	22.5
Common Cold	5	17.2	28.1
Malaria	8	27.6	44.9
All URI	8	27.6	44.9

Toddlers

Illness	# Cases	% of All Illnesses	Rate per 1000 TI Wks.
Allergy	1	3.3	9.7
Burn	1	3.3	9.7
Dental Ab	1	3.3	9.7
Fever w/o	1	3.3	9.7
Pneumonia	1	3.3	9.7
Malaria	1	3.3	9.7
Fever w/	2	6.7	19.4
Diarrhea	3	10.0	29.1
Bronchitis	3	10.0	29.1
Conjunctivitis	4	13.3	38.8
All LRI	4	13.3	38.8
Common Cold	6	20.0	58.2
Acute URI	6	20.0	58.2
All URI	12	40.0	116.5

Immunology: Cell mediated immune studies are going well. T-cell enumeration is being done on a daily basis in Embu with excellent internal and external quality control. This is being done primarily by the two laboratory technicians in Embu. Their work is being checked by the laboratory technician from Dr. Koech's laboratory who comes to the Embu laboratory periodically and does independent measurements of T-cells. To date there have been some low values, mainly among Toddlers (See Table 9 for preliminary results).

Skin testing for delayed cutaneous hypersensitivity is being done using PPD, Tetanus and Candida, a functional measure of cellular immunity. Also tonsillar grading is being done and total lymphocyte counts are being calculated from the routine hematology work (See Table 10).

The immunoglobulin determinations were being done in Dr. Koech's laboratory in Nairobi and there have been some problems. Dr. Koech has found that the specific antisera for each of the immunoglobulins, albumin, and pre-albumin are cross-reacting and giving falsely high values except for C-Reactive protein. He is making up his own plates following standard methodology. The analyses will be suspended until the problem is solved. Fortunately, there are duplicate samples in Kenya and at UCLA. Dr. Stiehm is now testing the antisera that have been returned. Duplicate samples for quality control purposes from this batch of specimens are at UCLA and have been analyzed.

Once the quantitative immunoglobulin values are analyzed we will evaluate whether these analyses are yielding results of interest. The feeling is probably that these will be omitted.

Dr. Chandra has just completed the breast milk secretory IgA, IgG and lysozyme levels and has completed similar tests on saliva. The samples were from round 1 with 600 saliva and 200 breast milk samples.

Immunology - Descriptive Preliminary Findings

Cell Mediated Immunity

The latest and third round to date of T-cell enumeration using percent Rosette Forming Cells (RFC) with sheep erythrocytes yields the following information below. Small rosettes have been counted and will be reported on at a later date.

TABLE 9

SUBJECT	NUMBER	Mean ± SD %T-cells and range	% Subjects with T-cells 50%
Lead Male	65	63.5% ± 9.9 (39.0 - 80.0%)	8%
Lead Female	63	60.8 ± 12.9 (19.0 - 80.0%)	16%
Schooler	23	51.5% ± 10.3 (35.0 - 80.0%)	35%
Toddlers	21	50.0 ± 11.3 (30.0 - 67.0%)	52%

Skin testing for delayed cutaneous hypersensitivity (DCH) is carried out concurrently with T-cell enumeration, but current results are not analyzed as yet. A positive test ≥ 5 mm induration.

The following antigens are being used:

PPD	5TU 1TU	Children Adults	0.1 ml
Tetanus Toxoid	1:5	Children only	0.1 ml
Candida		Children Adults	0.1 ml

TABLE 10

Results of skin testing for DCH from round 1 (January through September, 1984) reveal the following:

		PPD	Candida	Tetanus
LEAD MALE	Number	101	101	101
	Mean (mm) induration	10	11	11
	% no reaction or < 5 mm.	52	58	92
LEAD FEMALE	Number	82	82	82
	Mean (mm) induration	10	12	8
	% no reaction or < 5 mm.	61	50	76
SCHOOLER	Number	51	51	51
	Mean (mm) induration	3	6	9
	% no reaction or < 5 mm.	91	88	85
TODDLER	Number	53	53	53
	Mean (mm) induration	11	14	19
	% no reaction or < 5 mm.	84	70	79

3. Cognitive-Psychologic Function

The cognitive area has been going well under the close supervision of Dr. Marian Sigman who is in charge of cognitive and psychologic function. She has spent three periods in Kenya doing intensive training, follow up and quality control. The day to day supervision of the field work is under Ms. DeSouza, a Kenyan psychologist with a master's degree. The testers are four mature women, two former school teachers, who have been a closely-knit well functioning group.

A. 18 month olds.

The data set on the 18 months is virtually complete with one or two missing tests. Basically all have been tested with the Bayley Motor, Mental Scale and Infant Behavior Record. Also, items from the Uzgiris-Hunt Scale are used. Validation testing has been carried out on a 10% subsample with very satisfactory agreement. The testing has been done in the home.

B. 24 month olds.

Testing is virtually completed using the above Bayley scales and Infant Behavior Record and prescribed Uzgiris-Hunt items. Also the cognitive group has been doing the vision testing in the 24-month old toddlers using the California Preferential Looking Test, a test developed by the California School of Optometry. The hearing is obtained on physical examination by tuning fork.

C. The 30 month testing is now going on with no problems using all of the above. Toy play has not been found useful in Kenya.

The 6-month old testing is now also in progress using the 6-month Fagan Visual Attention Measure and the Bayley motor test. Again no problems are being reported .

All of the above tests are being validated on a 10% of subsample and there is virtually no missing data for the infant and toddler testing.

Newborns

Brazelton tests are being carried out at 7 days of age with no problems. There has been a 10% repeat for validation purposes. The full Brazelton minus the pin prick test is being done in the home. The testing is being carried out by a specially trained newborn nurse and the psychologist.

Adults

The Wechsler Adult Scale of Intelligence is used. The subtests are block design, digit span, arithmetic and similarities. Close to 100% testing on the adults has been carried out and there have been no serious problems. The subtest that presents the most difficulty has been the block design. Ravens Progressive Matrices and the Kenyan Standardized verbal meaning test were also administered.

Schoolers

The schoolers have now completed two rounds of cognitive testing. A third round is planned on a subsample to see if there is any progression over time. Now that there are no longer famine conditions. The testing is being done in the home. In correspondance with the testing have been two rounds of classroom observations as well as observations in the school yard situation.

The WAIS-R Digit Span, Block Design and Arithmetic subtests have been administered, a Goodenough Draw a Man test and a verbal meaning test which

has been standardized for Kenyan children. Concurrent to the observations and the cognitive testing, school attendance, school achievement, and class standing have been collected for the two above periods. Raven's Progressive Matrices are also used.

The adult testing will be used as descriptive and background information to correlate with the child scores and will be used in the analysis of child care giving, sanitation, and morbidity. The child and schooler cognitive studies will be analyzed in association with energy intake, morbidity, anthropometry, child care giving and child-caretaker interaction.

3. Activity

Infant and Toddler Interactions with Care Giver

A. Activity Observations

Preliminary analysis of the interaction data on a small longitudinal sample was carried out by Dr. Marian Sigman. The observations of interaction between child and caretaker from infancy to toddlerhood was carried out for several reasons: (1) to determine the impact of variations of household and maternal energy intake and maternal nutritional status which relate to rearing conditions of the child (2) to understand the impact of variations in the nutritional and rearing environment on the child's cognitive and social development (3) to describe the interactive environment in which each of the infants and toddlers are reared (4) to determine the social and play skills shown by each child. The interaction studies were designed by Drs. Cattle and Sigman and were carried out by the activity enumerators.

For the second year of the study, the caretaker-child interactions will be under the field psychologist. A preliminary analysis of the child interaction is included in Appendix 3.

B. Child-Care Giving

These observations are carried out every two months on infants and toddlers. Data Collection has been going very well and the data is just beginning to be analyzed. A scale of effective/positive versus non-effective/negative care giving is being constructed.

5. Resting Metabolic Rate (RMR)

RMR is being measured on the lead male, lead female and schooler every three months and on the pregnant women at five and eight months and at one, three, and six months on the postpartum women. Subjects are now being tested for the 3rd or 4th time.

Equipment

The CO_2 analyzer broke down on December 15, 1984, and a new part had been purchased for Dr. Gardner to install when he was in Kenya in January 1985. This was subsequently installed on January 10, 1985, but was not the solution to the problem. After repeated requests by Dr. Gardner a Beckman Service man from Dubai finally arrived January 29, 1985, and identified the problem as a defective CO_2 reference cell. Unfortunately he had no replacement part with him and did not know when a new one would be available. As of this writing a new cell still has not been installed although the part has now arrived in Kenya. With only VO_2 values available for the resting energy expenditure (REE calculation) it was necessary to assume a constant RQ so that VCO_2 could be derived. An RQ value of .85 was accepted as the average of all RQs taken during the months March, April, and May. Tables were constructed so that the technician could substitute values for VCO_2 and derive the REE values without having to do any calculations himself.

All calculation since the CO_2 analyzer broke down were recalculated and entered on the computerized data forms.

Calculations

Some question as to which values should be recorded and which values would yield the best data for Resting Energy Expenditure (REE) have been raised. A comparison of calculations based on different minute values was conducted on a random sample of sixty cases between February and October 1984. The results were: (1) REE values calculated at the end of the second ten minute period were less than REE values calculated at the end of the third ten minute period 81% of the time, i.e. $R_2<R_3$. (2) Steady State (SS) values were rarely attained on the first round of testing, but were attained more than 80% of the time on subsequent visits. (3) "Unrealistic" values were discovered in only two cases (3%). (4) Calculations based on either the last data set or SS values (selected for calculation by the MMC) were compared to calculations of the presently recorded three data sets (averaged). Calculations as being performed by the MMC were "better" on the average by 20Kcal/day than the average of the three data sets, i.e. mean REE = 1044 vs. 1066 Kcal/day.

Due to the length of the protocol, which requires schoolers to be quiet for 60 minutes or pregnant women to lie on their backs for 60 minutes, it was decided to compare the REE values calculated from the second 10 minutes with REE values calculated from the third 10 minute period. Of the 23 tests conducted on January 16 and 17, 1985, the mean ($\bar{X}$) value for REE_3 was 960.0 Kcal/day compared to mean of 933.4 Kcal/day for REE_2, a 3.3% difference. It was then decided to make the calculation at the end of each 10 minute period. From this comparison, it appeared that the REE calculated from the second ten minute period was definitely

superior to the REE values calculated from either the first or the last ten minutes. Any shortening of the protocol would be welcomed as the Schoolers become restless and the pregnant women complain of back pain.

Recommendation

The protocol should be abbreviated by 10 minutes and the calculations made at the end of the first 10 minute and the second 10 minute periods. However, prior to this protocol change, a comparison of a random sample of 100 cases minute by minute is being analyzed for the lowest six consecutive values to try to identify the optimal time for reporting O_2 consumption and REE.

Dr. Gardner is quite satisfied that the RMR data from Kenya are reproducible and consistent. All groups of TIs are showing RMR values that appear lower than expected. Again, we have noticed that body temperatures tend to be low in the Kenyan subjects even in the face of infection. The clinical thermometers have been replaced and checked as well as the temperature taking procedures. These findings are consistent with low RMR values.

A sample of RMR data from round 1 and 2 of testing is presented in Table 11 which uses an average of the last 3 minutes of the two last 10 minute periods.

TABLE 11

SAMPLE RMR DATA (MEAN ± SEM)

	No.	REE (Kcal/24hr)	REE (predicted)	REE per Body Mass (kg)	REE/M^2
Lead Male	197	1121±20	(1339)	21±0.4	689±12
Lead Female	242	1037±14	(1305)	21.0.3	681±9
Male Schooler	66	658±23	(950)	30.1.4	756±45
Female Schooler	40	608±30	(1027)	30.1.6	689±38

We have been very fortunate in having an excellent technician, a high school graduate with special training. He is backed up by a senior technician who comes to the field about once a week. The senior Kenyan scientist, Dr. Thairu who was involved and very interested in RMR left for a post in England and was replaced by Prof. Magambi, a cardiologist and chair of the Department of Physiology. Despite technical problems we feel that the measurements are of good quality and that subjects, after the first round, are now easily reaching and maintaining a steady state throughout the study.

The RMR routine is similar to the one in Egypt in that there is a two hour fast, no smoking or drinking for that time, and a thirty minute rest prior to the RMR although the Egyptian subjects have probably a shorter pretest rest period of 10-20 minutes.

Aside from the quality control measures described later, 3 or 4 of the staff have RMR's run regularly once a month. Also 3 of the senior staff had RMR done in Egypt and in Kenya using the same type of equipment and will have a third RMR checked at UCLA.

A rough estimate of "Available Energy for Activity" is presented below in Table 12.

TABLE 12

Available Energy for Activity

(Based on mean RMR and concurrent mean daily food intake)

Target	Food Intake (Mar-May) Kcal/day	REE Kcal/day	"Available" energy-Kcal
Lead Male	2230	1121	1109
Lead Female	1816	1037	729
Schoolers (M&F)	1544	633	911

5. Reproduction: Pregnancy Outcome

The reproductive histories have all been carried out, and reveal that few women have menstrual periods because they are either lactating or pregnant. Pregnancy tests have been carried out with great success and there has been no problem with acceptance.

About 5% of birthweights have been missed or obtained too late to be valid. Seventy-five percent of deliveries have been carried out in the health centers or the local hospitals and the birthweights have been obtained mainly on Nutrition CRSP project scales but occasionally on the hospital scales which have been calibrated by our staff. Results of pregnancy outcome on the first 93 births are presented in Table 13. To date one infant died 8 hours post-partum.

The Dubowitz study has about 10% missing data as of January 1985 but this situation has since improved. A new policy adopted in the second

year states that if a newborn's Dubowitz Test is missed on the third day of age it may be obtained on the fifth day as the literature shows that this is acceptable. If worse comes to worse it will be obtained on the seventh date as this is better than no gestational information at all and one can at least say if the infant is obviously pre-term. The last menstrual period cannot be relied on for gestational age. The Dubowitz Test is being repeated on a 10% subsample for validation purposes.

There have been no problems obtaining anthropometry on the newborn infants or on the postpartum mothers. The physician examines the newborn and the mother within three days of birth. There have been two cases of gonococcal ophthalmitis neonatorum with immediate treatment of the infants and parents.

TABLE 13
PREGNANCY OUTCOME

Descriptive Data is Presented on The Outcome of The First 93 Pregnancies

		No.	Percent
Outcome			
	Live Births	89	95.7
	Still Births/Miscarriage	4	4.3
Delivery Type			
	Vaginal/Vtx	80	87.9
	Breech	2	2.2
	Vac. Extraction	1	1.1
	C-Section	5	5.5
	Missing data	3	3.3
Multiple			
	Singletons	88	93.7
	Twins	3	3.3
Apgar Score			
	1 minute	median value 9	range 1-10
n = 51 of 93	5 minute	median value 10	range 1-10
Where Delivered			
	Home	22	24.2
	Health Center	26	28.4
	Hospital	36	39.6
	Other	4	4.4
	Missing data	8	3.3
Who Delivered			
	Relative	12	13.2
	Traditional Midwife	6	6.6
	Trained Midwife	56	61.5
	Clinical Officer	5	5.5
	Physician	1	1.1
	Other	8	8.8
Birth Weight			
	$\leq$ 2.5 kg	8	9.1
	$>$ 2.5 – 2.8	20	22.7
	$>$ 2.0 – 4.0	60	68.2
	Mean 3.13 kg $\pm$ 0.05 (SE)		
	Median 3.10 kg $\pm$ 0.06 (SE)		
	(Range 2.0 – 4.0kg)		
Gestational Age: Dubowitz Test			
	Mean 40.2 $\pm$ .83 (SE)		
	Median 39.0 $\pm$ .29 (SE)		
	Total $<$ 37 weeks	7	10.6
	Total $\geq$ 37-41 weeks	50	75.8
	Total $>$ 41 weeks	6	9.1
	(Range 32-42 weeks)		

WEIGHT CHANGES DURING PREGNANCY

Period (months)	Weight Gain (Kg)	Range (Kg)	n
0 - 3	1.0	− 3.0 to 4.8	34
3 - 6	3.2	− 7.1 to 17.4	33
6 - 9	2.1	− 5.3 to 8.3	16
Mean Total 0 - 9 month	6.3		

6. Time Allocation

The method for Time Allocation introduced in Year 2 (March) of the main study is the method refined by Dr. A. Johnson, anthropologist at UCLA. UCLA has now formed a consortium for time allocation studies based on protocols used in different parts of the world.

The method consists of direct observation of target individuals of interest which is a quantification of the way people use their time. The method utilizes short duration observations and spot checks to record day time activity. It is a relatively simple method. The enumerator, upon arrival at the household, observes the activity of the household members of interest before the activities are altered due to the field worker's presence. The field worker records the observations of actual activity. The enumerator does not remain in the household recording continuous behavior but goes on to the next household. The short term observations or "spot checks" cause a minimum disruption of the normal activity and requires a few minutes per visit. The enumerator can see many households in the course of a day with the recording of day time activities. For the night-time activities a more limited random visit schedule is carried out, hitting the households every two weeks. The most practical approach, working in an area of 60 square kilometers, is the establishment of a single visiting schedule for the entire area -- a single route that runs from the upper part of the research area to the lower part, then loops back to the start. This seems to be the most efficient and also takes in all the households in sequence. On a daily basis, two enumerators follow the established route. One starts at 7:00 a.m. and follows the route visiting the house that was visited last the day before, follows the route and records spot observations for each household until 12:30 p.m. At that

point the second enumerator takes over and concinues until 6:00 p.m. The next morning the process starts over again. The visiting is done Monday through Saturday, not Sunday as this is unacceptable to the households.

The enumerators follow one route only, completely covering the area, thus guaranteeing that all households will be visited at any time in the day. Because of bad weather, poor roads, length of visit and other problems, over the long run the schedule becomes randomized with the enumerators dropping in at any time in the day. In other words the sequence of visits is controlled but not the times the households are actually visited. The morning and afternoon enumerators are linked by a walkie-talkie so no time is lost. The morning enumerator can inform the afternoon enumerator where to start, similarly the afternoon enumerator can tell the morning enumerator where to start the next morning. The enumerators spend 5-1/2 hours in route and 2-1/2 hours in the office coding and checking records with the route followed in a daily basis. The full route takes 3 to 4 days to complete.

In terms of recording, the enumerator observes and makes mental notes about the activity before the behavior is altered. If the TI is not at home the enumerator will ask for their location. If nearby, the enumerator will locate the target individual and record the activity. If the target is further than a 15 minute walk or ride the enumerator records the reported activity. The randomization of visits then occurs.

Coding for the first two months is not to be on precoded forms in order to see what the data suggests in the way of categories. However, the large categories will be the same as those used by the Egypt and Mexico projects. There will be the general large categories, e.g. agriculture, child care or feeding. The next level of specificity will have

to do with the type of activity. For example, within agriculture is the activity clearing, burning or harvesting? A third level of detail such as burning the field or harvesting coffee, etc., can be added although the third level of detail is probably not necessary.

The equipment being used is 2 bicycles, rain ponchos, watches, 2 inexpensive walkie-talkies. Please see the attached preliminary form.

Simultaneously with Time Allocation Studies, anthropometry and morbidity are carried out in the usual way at monthly intervals so that Time Allocation can be related to energy intake.

Time Allocation will be carried out on the remaining 169 households with estimates of missing data being 1 to 3%.

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TIME ALLOCATION Form No.: ___ (1 2 3) Visit No.: ___ (4 5 6) Country Code: 2 (7) HH No. ___ (8 9 10 11) TI No.: 1 1 (12 13)

Date: ___ (14 15 16 17 18) Enum. No.: ___ (19 20 21) Status: ___ (22) Time: ___ (23 24 25 26)

NAMES OF HH MEMBERS	ID NO (27 28)	ACTIVITY CODES (29 30 31 32 33 34)	BP (35)	ACTIVITY DESCRIPTIONS

Comments

7. Socioeconomic Function (SES)

Four rounds of SES data have been collected. The first round of SES data was subject to factor analyses which proved to be very useful. Four clear-cut clusters of variables (factors) that seem to account for the main variance are as follows: Factor I includes savings, income, belonging to co-ops, bank accounts; Factor II includes ownership of animals, land cultivated, etc. Factor III includes educational level and whether or not agricultural agents had visited and their advice adhered to; Factor IV includes housing, details such as iron roofs, beautification of the compound with flowers and decorations.

This will be applied to the ensuing three montly rounds of SES data collection to look for consistency of the factors identified as accounting of the main variance. Other approaches to SES scoring are being looked into.

Simple regressions of SES factors vs. several other variables yielded the following "significant" (but low) correlations.

SES (factor 2 - employment) vs. energy intake (household)

daily average in May $r = .21$

daily average in June $r = .20$

SES (factor 2 - employment) vs. no.days sick $= -.24$

Data Management

Overall

Data management activities of the Kenya project are proceeding as planned with only the problems naturally associated with long-term studies involving repeated measurements, with studies in which data are collected in one place and analyzed half-a-world away and with studies in which data management costs are a major consideration. A Field Manual was developed and written by Mr. Njeru, the data manager (please see Appendix 4).

Our worst problem was with data entry in Kenya and the compatibility of the entered material with U.S. computers. The original intent was to utilize the ICL computer and data entry resources at the University of Nairobi. Due to a number of factors, including our need for commitment to regular data entry service and their inability to demonstrate that ICL output could be made compatible with IBM equipment, the decision was made to engage a commercial key entry service in Nairobi that would produce IBM compatible tapes. The first commercial service selected was unable to fulfill its contract over the first few months, and it was necessary to transfer to a second service which has to date, provided excellent service to us. In fact, Comprite has been able not only to keep up with the work but also to catch up with the backlog created by the other company's failure. Data from key entry are now as current as the coding of forms; the last collected data on tapes for UCLA are about six weeks from date of collection as the time of arrival at UCLA.

Data management activities have been split between Kenya and UCLA. These activities include:

a) forms development

data collection forms

data coding forms

b) coding/editing/checking

c) key entry

d) range checks and corrections

e) computer entry

f) computer editing/cleaning

g) data base management

h) analysis

a) Forms - the basic concepts of forms development were set out by UCLA and followed by staff in Kenya in consultation with UCLA investigators. Forms developed represent the customary compromise between the needs of data collectors and data management. Paramount, of course, was the collection of scientifically important and valid data.

Most of the forms were wholly or in large part self-coding. For example, anthropometry measurements were key entered from the original entry recorded by the enumerator. However, some data collection forms (food intake and morbidity) require recoding onto other forms. Specially trained calculators and their supervisors perform these transfers in Kenya. This process must be carefully done and is necessarily slower than the direct key entry of self-coded material. The initial six months of food intake were calculated for household and target individual in Kcals.

Since October, new coding forms have been in use which allow for the coding of food, according to a study specific catalog and quantity in grams. This reduces the calculator load substantially, increases the computer work and allows for the calculation of protein, carbohydrate and other nutrients of interest available in the computer data base. Since, the calculators are caught up with current work, they are completing the backlog of

July-October 1984 and then will recode the January-June 1984 food intake forms. The recoding will allow extensive quality control checks not anticipated in the original design.

Development of forms is mostly completed. The exceptions are minor and involve the transfer of information or of data collection. For example, one minor form includes two different immunologic measurements made at different times in different laboratories; these are being separated to speed up data flow of the completed measurements. Food intake enumerators are being asked to make certain observations of sanitation during their days in the households to supplement the interview on practices done by the sanitation enumerators.

b) Coding, editing, checking -- this is performed in Embu under the supervision of the Kenyan data manager. Mr. K. Njeru and is up-to-date for on-line forms. Special checking requests are fitted into the schedule according to the priority assigned to the task.

c) Key entry -- This is done in Kenya with a small proportion repeat key entered at UCLA. Key entry in Kenya is 100% verified. UCLA checks to date have demonstrated a very low rate of error -- generally substantially below one per 1000 keystrokes.

d) Range checks and corrections -- These too are done in Kenya. Programs have been developed and are run on the completed data to identify out-of-range values. These are then returned to the field for correction by enumerator, supervisor or other appropriate staff. The turn-around time for the precoded forms from completion of data collection to return of range check errors to the field is two to three weeks.

e) Computer entry -- Key entry tapes, IBM readable, are shipped via DHL (express courier) to UCLA on a regular basis -- at least once per month and, if the quantity of data or special priority needs justify it, an interim tape

may be sent in mid-month. Tapes are immediately copied to assure that they can be read and to provide a back-up copy.

f) Editing, cleaning -- At UCLA, as data are transferred from tape to disk and added to existing data sets, various editing, checking and cleaning programs are utilized to identify outliers (e.g., systolic blood pressure is 300 mg%) to cross-check between variables that should have a specific relationship (e.g., non-smokers should not have a positive integer entry for number of cigarettes per day), and to cross-check invariant or slowly changing variables across time (e.g., date of birth, adult height, negative change in schooler height). Problem entries are recorded and sent to Embu for check against records, recollection of data, rechecking, etc.

Though this activity is specified as occurring at a particular time in the data flow, it must be understood that data "cleaning" is an ongoing activity that will continue as long as new relationships are sought in the data. The basic screening efforts carried out at this point in the data flow will accomplish a very large percentage of the cleaning, but a small number of questionable entries will continue to be found expanding the database.

g) Database management -- The management of a continually expanding database of this size and complexity is challenging and expensive. High level skills are required in the staff performing the functions, and substantial computer time and storage are needed. At present, we use disk storage with back-up maintained from specific files, adding to each file other information necessary for utilization of that file in "uni file" analyses. In addition, the organization of the record specific files is such that special purpose files can be created from two or more form specific files for "multifile" analyses. This procedure saves substantially on computer costs which would be incurred if the entire file had to be maintained and accessed each time new

data were added from one or more functions, corrections were made, cleaning programs were run or analyses involving few variables were done. The completed data set will be organized into a single database which will then be used for analysis or as the source for specific analytic subfiles.

All of the computer entry, cleaning and data management activities are currently based at UCLA with data input from Embu and, field cooperation in ascertaining correct values and with field response to computer outputs sent to Embu. One of the goals of our database management is to send Apple disks containing subfiles to Embu for use there and to develop an appropriate database of the completed dataset for transfer to Nairobi for use there. The Central Bureau of Statistics leadership has expressed interest in housing the database. They have access to large IBM mainframe computational equipment through the Kenyan government computer facility. It may also be possible to produce the database in a form compatible, or that could be made compatible, with the ICL equipment at the University of Nairobi and this possibility will be explored.

h) Analyses -- preliminary analyses following the study hypotheses are being planned, developed and run. A number of limited analyses have been done on toddlers and toddler related data for the period April - June at the request of the SCB and ME. The analytic component is developing as the database grows and it becomes possible to test the study hypotheses.

A group meets weekly at UCLA. The group is comprised of the Principal Investigator, Dr. C. Neumann, the senior statistician, Dr. A. Afifi, the data manager, Ms. Anne Coulson, the senior programmer, Dr. Ben Browdy, and any of the relevant functional area scientists -- e.g. RMR - Dr. Gardner; cognition/ psychology - Dr. Sigman, etc. Preliminary linkages are being planned and run and ongoing refinement of the functional area analyses are being done.

E. Quality Control

Quality control for field procedures and methods are presented in Appendix 4.

II. Parallel Data Analyses on Toddler Food Intake, Anthropometry and Mobrbidity.

The tables are those constructed per instructions of the data analyses group (DAG). The data for months April, May, and June, 1984 was used. Any toddlers who have three months of continuous data are included. Some toddlers were not enrolles until May, 1984 and were therefore not included.

Table 1.1

Toddler's Food Intake in Median for 6 days KCALS per day
Kenya Project - Observations for period April 1 to June 30, 1984

% of toddlers within each interval [N in ( )]

	≤600	601-1000	1001-1400	≥1401	Total	Missing
Males	11.1 (4)	75.0 (27)	11.1 (4)	2.8 (1)	100.0(36)	0
Females	26.8 (11)	46.3 (19)	22.0 (9)	4.9 (2)	100.0(41)	0

Univariate Statistics

	Males	Females
Mean	827.4	794.6
Standard Deviation	264.8	336.2
Coefficient of Variation	32.0%	42.3%
Highest Value	1616.5	1945.5
Lowest Value	393.5	276.0
Range	1209.0	1669.5

Table 1.2

Toddler's Median Food Intake in KCALS per day per kg of Mean Body Weight

Kenya Project - Observations for period May 1 to June 30, 1984

% of toddlers within each interval [N in ( )]

	≤ 63.00	63.01-94.99	95.00-126.99	≥ 127.00	Total	Missing
Males	16.7 (6)	58.3 (21)	19.4 (7)	5.6 (2)	100.0(36)	---
Females	26.8 (11)	39.0 (16)	26.8 (11)	7.3 (3)	100.0(41)	

Univariate Statistics

	Males	Females
Mean	81.92	84.22
Standard Deviation	24.25	34.38
Coefficient of Variatio	29.9%	40.8%
Highest Value	141.80	185.29
Lowest Value	41.81	29.68
Range	99.99	155.61

Table 2.1

Toddler's Mean Weight in Kilograms *

Kenya Project - Observations for period April 1, to June 1, 1984

% of toddlers within each interval [N in ( )]

	≤8.99	9.00-9.99	10.00-10.99	11.00-11.99	≥12.00	Total	Missing
Males	11.1 (4)	38.9 (14)	27.8 (10)	19.4 (7)	2.8 (1)	100.0(36)	0
Females	31.7 (13)	39.0 (16)	24.4 (10)	4.9 (2)	0.0 (0)	100.0(41)	0

Univariate Statistics

	Males	Females
Mean	10.09	9.42
Standard Deviation	0.97	0.94
Coefficient of Variation	9.6%	10.0%
Highest Value	12.40	11.10
Lowest Value	8.50	6.60
Range	3.90	4.50

*Computed 3-month mean

Table 2.2

Toddler's Mean Length in Centimeters *

Kenya Project - Observations for period April 1 to June 30, 1984

% of toddlers within each interval [N in ( )]

	≤ 74.99	75.00-77.99	78.00-80.99	≥ 81.00	Total	Missing
Males	25.0 (9)	22.2 (8)	27.8 (10)	25.0 (9)	100.0(36)	0
Females	24.4 (10)	46.3 (19)	19.5 (8)	9.8 (4)	100.0(41)	0

Univariate Statistics

	Males	Females
Mean	78.64	76.70
Standard Deviation	3.8	2.89
Coefficient of Variation	4.8%	3.8%
Highest Value	89.20	84.70
Lowest Value	72.50	72.60
Range	16.70	12.10

*Computed 3-month mean

Table 2.6

Estimated 3-Month Weight Change (Prorated for 92 days)*

Kenya Project - Observations for period April 1 to June 30, 1984

% of toddlers within each interval [N in ( )]

Kg	≤ -1.01	-1.00 to 0	.01 to .99	1.00 to 2.99	≥ 3.00	Total	Missing
Males	8.8 (3)	26.5 (9)	41.2 (14)	23.5 (8)	0.0 (0)	100.0(34)	2
Females	5.1 (2)	30.8 (12)	56.4 (22)	7.7 (3)	0.0 (0)	100.0(39)	2

Univariate Statistics

	Males	Females
Mean	0.30	0.23
Standard Deviation	0.86	0.69
Coefficient of Variation	286.7%	300.0%
Highest Value	1.95	1.16
Lowest Value	-1.54	-1.67
Range	3.49	2.83

*Computed as follows: $\frac{\text{Last weight - First weight}}{\text{Date of last weight - Date of first weight}} \times 92$

Table 2.3

Toddler's Skinfolds - Biceps in Millimeters*

Kenya Project - Observations for period April 1 to June 30, 1984

% of toddlers within each interval [N in ( )]

	≤ 4.99	5.00-5.99	6.00-6.99	≥ 7.00	Total	Missing
Males	33.3 (12)	25.0 (9)	19.4 (7)	22.2 (8)	100.0(36)	0
Females	31.7 (13)	31.7 (13)	17.1 (7)	19.5 (8)	100.0(41)	0

Univariate Statistics

	Males	Females
Mean	5.83	5.95
Standard Deviation	1.56	1.66
Coefficient of Variation	26.8%	27.9%
Highest Value	9.60	10.30
Lowest Value	3.60	3.80
Range	6.00	6.50

*Computed 3-month mean

Table 2.4

Toddler's Skinfolds - Triceps in Millimeters*

Kenya Project - Observations for period April 1 to June 30, 1984

% of toddlers within each interval [N in ( )]

	≤ 6.99	7.00-8.99	9.00-10.99	≥ 11.00	Total	Missing
Males	30.6 (11)	41.7 (15)	16.7 (6)	11.1 (4)	100.0(36)	0
Females	17.1 (7)	41.5 (17)	26.8 (11)	14.6 (6)	100.0(41)	0

Univariate Statistics

	Males	Females
Mean	8.10	8.60
Standard Deviation	1.87	1.74
Coefficient of Variation	23.1%	20.2%
Highest Value	12.60	11.90
Lowest Value	5.10	5.70
Range	7.50	6.20

*Computed 3-month mean

Table 2.5

Toddler's Skinfolds - Subscapular in Millimeters*

Kenya Project - Observations for period April 1 to June 30, 1984

% of toddlers within each interval [N in ( )]

	≤ 4.99	5.00-6.99	7.00-8.99	≥ 9.00	Total	Missing
Males	41.4 (16)	44.4 (16)	11.1 (4)	0.0 (0)	100.0(36)	0
Females	39.0 (16)	56.1 (23)	4.9 (2)	0.0 (0)	100.0(41)	0

Univariate Statistics

	Males	Females
Mean	5.17	5.23
Standard Deviation	1.26	1.03
Coefficient of Variation	24.4%	19.7%
Highest Value	8.50	7.50
Lowest Value	3.00	3.30
Range	5.50	4.20

*Computed 3-month mean

Table 3.1

Toddler's Morbidity - Number of Days' Ill*

Kenya Project - Observations for period April 1, to June 1, 1984

% of toddlers within each interval [N in ( )]

	0	1-7	8-14	15-30	1-60	61+	TOTAL
Males	2.8 (1)	2.8 (1)	8.3 (3)	27.8 (10)	52.8 (19)	5.6 (2)	(36)
Females	0.0 (0)	5.0 (2)	7.5 (3)	17.5 (7)	47.5 (19)	22.5(9)	(40)

Univariate Statistics

	Males	Females
Mean	35.4	41.9
Standard Deviation	18.0	22.1
Coefficient of Variation	50.8%	52.7%
Highest Value	71.0	91.0
Lowest Value	0.0	0.0
Range	71.0	91.0

*Computed as follows: Number of calendar days during which one or more illnesses were reported.

Table 3.2

Rate of Toddler's Morbidity - Percent of Days Ill during Period*

Kenya Project - Observations for period April 1 to June 1, 1984

% of toddlers within each interval [N in ( )]

	0	.01-6.99	7.00-14.99	15.00-29.99	30.00-59.99	60.0+	TOTAL
Household with Male toddler	2.8 (1)	2.8 (1)	5.6 (2)	30.6 (11)	44.4 (16)	13.9(5)	100.0(36)
Household with Female toddler	0.0 (0)	2.5 (1)	7.5 (3)	17.5 (7)	42.5 (17)	30.0(12)	100.0(40)

Univariate Statistics

	Males	Females
Mean	38.9	46.0
Standard Deviation	19.8	24.2
Coefficient of Variation	50.9%	52.6%
Highest Value	78.0	100.0
Lowest Value	0.0	6.6
Range	78.0	94.4

Computed as follows: $\left[\frac{\text{Number of calendar days during which one or more illnesses were reported}}{\text{92 days in Period}}\right] \times 100$

Table 3.3

Rate of Household Morbidity (in HHs with target toddlers) - Percent of Person-Days Ill*

Kenya Project - Observations for period April 1, to June 1, 1984

% of toddlers within each interval [N in ( )]

	0	0.01-3.99	4.00-11.99	12.00-23.99	24+	TOTAL
Household with Male Toddlers	2.8 (1)	5.6 (2)	5.6 (2)	25.0 (9)	61.1(22)	100.0(36)
Household with Female Toddlers	2.4 (1)	0.0 (0)	12.2 (5)	31.7 (13)	53.7(22)	100.0(41)

Univariate Statistics

	Males	Females
Mean	26.7	25.8
Standard Deviation	13.5	14.6
Coefficient of Variation	50.6%	56.6%
Highest Value	57.0	64.5
Lowest Value	0.0	0.0
Range	57.0	64.5

*Computed as follows:

$$\frac{\sum_{\text{all targets in hh}} (\text{Number of calendar days ill for each target individual})}{[(\text{Number of target individuals in hh}) \times 92]} \times 100$$

To amplify information in Tables 3.1 and 3.2 illness days are presented by Specific Disease Categories.

TABLE 3.4

NUMBER OF DAYS OF ILLNESS DUE TO SELECTED MORBIDITY IN TODDLERS FOR APRIL-MAY-JUNE 1984

Upper Respiratory	94	17.4 ± 13.2	1-63
Lower Respiratory	18	15.7 ± 8.3	7-30
Diarrhea	29	4.9 ± 4.1	1-20
Measles	2	11.0 ±	3-19
Fever	15	7.1 ± 7.7	1-26
Malaria	23	9.2 ± 6.0	3-23
Pertussis	0	---	---
Total "Severe" Illness	49	14.8 ± 1.6	2-46
Skin	5	11.0 ± 4.5	4-15
Eye	55	14.1 ± 11.7	2-58

Table 4.2

Education Completed by Toddler's Parents

KENYA PROJECT - Observations for period April 1, to June 1, 1984

% of toddlers within each interval [N in ( )]

	No School	STD 1-4	STD 5-8	FROM 1-3	FROM 4	FROM 6	UNIV	OTHER
Lead Males	8.1 (5)	21.0 (13)	50.0 (31)	4.8 (3)	8.1 (5)	0.0 (0)	0.0 (0)	8.1 (5)
Lead Females	12.7 (8)	27.0 (17)	50.8 (32)	3.2 (2)	0.0 (0)	0.0 (0)	0.0 (0)	6.3 (4)

Literacy Testing Being Done

Simple Regressions

Energy Intake vs. a number of anthropometric variablesyielded the following significant (but low) correlations ($p < .05 - .01$) in toddlers

Energy Intake*	April	vs. Wt./Age	May	.22
Energy intake	March → June	vs. Wt./Age	June	.21
			July	.23
			August	.25
Energy Intake	April	vs. Ht./Age	June	.29
			July	.23
			August	.23
Energy Intake	May	vs. Ht./Age	June	.23
Illness Days	April - May	vs Wt./Ht.	May	- .25
			June	- .25
			July	- .27

* Daily Average

APPENDICES

1. Annual Review Meeting Program
2. Preliminary Analysis of Child Interaction
3. Kenya Field Data Management Manual
4. Quality Control Manual

Best Available Document

NUTRITION CRSP—KENYA PROJECT
College of Health Sciences, Nairobi,
University of California, Los Angeles/Berkeley,
P.O. Box 1002, Embu, Kenya
Tel: (0161) 20376.

Functional Effects of Mild/Moderate Malnutrition
Research Permit No. OP/13/001/12C78/(9)

ANNUAL REVIEW MEETING JANUARY 28, 1985

You are cordially invited to attend the first annual review meeting of the Nutrition CRSP - Kenya Project to be held on Monday January 28, 1985 at the Isaak Walton Inn, Embu (R.S.V.P. - regrets only).

Objectives of the Meeting:

The Nutrition CRSP - Kenya Project is a collaborative research project between the University of Nairobi Faculty of Medicine and the University of California, School of Public Health at Los Angeles.

The research, being carried out in rural Embu District, is investigating how moderate food deprivation affects the ability of children and adults to carry out essential or desirable functions such as: 1) resisting diseases and acquiring adequate protection from immunization; 2) bearing and rearing healthy children; 3) working efficiently and productively; 4) making the best use of schooling and other learning experiences; 5) dealing effectively with every-day challenges within the community and making the best use of available resources and opportunities. The findings will, in part, be used to guide appropriate interventions which can be tested in the field. This, together with other findings, will assist local and national Government as well as non-Government organizations to formulate appropriate policies and programmes for improving the nutrition and well-being of the people of Kenya.

Two other Nutrition CRSP projects, one in Egypt and the other in Mexico are also collecting similar information. This replication across countries is in the interest of obtaining findings that are generalizeable to less-developed countries as a whole.

Data has been collected on three-hundred households in one location of Embu District since January, 1984 and this is scheduled to continue until December, 1985. We are now at the half-way stage and it is an appropriate time to review the programme, to disseminate some of the information collected to date and to expose the project's progress and objectives to a wide audience.

The purpose is to increase awareness of the type of information the project is collecting and to initiate discussion as to the best ways that this information can be utilized to improve the effectiveness of the development process.

We therefore, extend an invitation to you to attend this review meeting. We would like to emphasize that although some findings will be presented we are not yet in a position to draw firm conclusions regarding the functional consequences of mild/moderate malnutrition. The aim of this meeting, as stated above, is to alert interested parties of the project's potential role as a source of knowledge essential to development planning and programming in the areas of health and nutrition.

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NUTRITION CRSP—KENYA PROJECT
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Functional Effects of Mild/Moderate Malnutrition
Research Permit No. OP/13/001/12C78/(9)

1st ANNUAL REVIEW MEETING

JAN. 28, 1985

Programme

8:15 - 9:00	Registration/coffee/tea	
9:00 - 9:30	Welcome by Chairman	- Prof. N.O. Bwibo
	Introduction of Project Investigators	- Bwibo, Neumann
	Objectives of the meeting	
9:30 - 10:00	Summary of research design & objectives description of the study area	- Neumann, Carter, Ngare.
10:00 - 10:30	Food Intake	- Weinberg, Njiru
10:30 - 11:00	Coffee/tea break	
11:00 - 11:30	Nutritional status/Reproduction outcome	- Jansen, Carter.
11:30 - 12:15	Morbidity/immunology/Sanitation & hygiene	- Khelghati, Mugisha Koech, Neumann.
12:15 - 12:30	Metabolic studies	- Mugambi, Carter, Gardner.
12:30 - 2:00 pm	Lunch	

Afternoon Session

2:00 - 2:30	Cognition/activity	- D'Souza, Cattle.
2:30 - 3:00	Socio-economics/agriculture	- Ngare, Cattle
3:00 - 3:30	Data management/analysis	- Njeru, Coulson.
3:30 - 4:00	Tea break	
4:00 - 5:00 pm	Future interventions; utilization of findings; summary of meeting	- Bwibo, Kagia Neumann, Kagia
5:30	Bus leaves for Nairobi	

ANNUAL REVIEW MEETING PARTICIPANTS

DR. KISAKA WASWA	- COMMUNITY HEALTH NAIROBI
DR. A. WASUNNA	- DEPT. OF PAEDIATRICS - NAIROBI
DR. A. MINAWA	- COMMUNITY HEALTH NAIROBI
J.M. MWANGI	- FNPU (FOOD NUTRITION PLANNING UNIT) - NAIROBI
MINA DESAI	- MEDICAL RESEARCH CENTRE - NAIROBI
DR. KWAME KWOFIE	- FAO/MIN. FINANCE & PL. FNPU - NAIROBI
MR. DAVID W. IHA	- KEMRI (NAIROBI)
MR. ALEX N. WAMACHI	- KEMRI (NAIROBI)
DR. DAVY KOECH	- KEMRI (NAIROBI)
Ms. GRACE MULE	- USAID (NAIROBI)
MR. CHARLES MANTIONE	- USAID (NAIROBI)
MR. BICK GREENE	- USAID (NAIROBI)
PROF. N.O. BWIBO	- UNIVERSITY OF NAIROBI (PRINCIPAL INVESTIGATOR -CRSP)
MICHAEL BAKSH	- UCLA - FIELD DIRECTOR (CRSP)
GAYLE THOMAS	- UCLA
JIM THOMAS	- UCLA
DR. MARK MARQUARDT	- UCLA
DR. RACHEL N. MUSYOKI	- UNIVERSITY OF NAIROBI
PROF. DANIEL M. KIMINYO	- KENYATTA UNIVERSITY COLLEGE
B.F. MAGANDA	- CBS - NAIROBI
K.O. AGUNDA	- CBS - NAIROBI
DAVE ALNWICK	- UNICEF - NUTRITION
DR. RUTH K. ONYANGO	- KENYATTA UNIVERSITY COLLEGE
ROBERT GREENER	- CBS - NAIROBI
JANE CORBETT	- CBS - NAIROBI
DR. D. HAZLETT	- KEMRI
DR. S. KINOTI	- KEMRI
PROF. MUGAMBI	- KEMRI
JAMES KAGIA	- NAIROBI
DR. NELLEMANS	- KYENI
MRS. NELLEMANS	- KYENI
MRS. WAMBANI	- MINISTRY OF HEALTH HQS.
ANNE COULSON	- UCLA
HUGH HORAN	- UCB
JUDITH GEIST	- MINISTRY OF FINANCE/PLANNING
GERALD GARDNER	- UCLA
Ad JANSEN	- COMMUNITY HEALTH
PAJET STANFIELD	- AMREF COMMUNITY HEALTH
MR. E. MWANGI IRUNGU	- DISTRICT OFFICER RUNYENJES.
DARLENE TYMO	- UNICEF - NAIROBI

MICHAE . PAC ISSO	- UCLA
FESTUS T. OMORO	- CBS
THOMAS E. DOWNING	- NATIONAL ENVIRONMENT SECRETARIAT
DUNCAN K. NGARE	- CRSP
PROF. LEAH MARANGU	- KUC
RICHARD GOLDMAN	- MINISTRY OF AGRICULTURE
KANGETHE GITU	- MINISTRY OF AGRICULTURE
NTONJIRA MWINGIRA	- C.B.S.
MARK HABIBI	- EMI
MRS R.M. NGARURO	- MINISTRY OF HEALTH
MR. NOAH NDWIGAH	- CHAIRMAN RUNYENJES URBAN COUNCIL.
L. ROLANDSEN	- FOSTER PARENTS PLAN INTERNATIONAL
JANE KIMOTHO	- " " " "
EZEKIEL WAFULA	- UNIVERSITY OF NAIROBI - DEPT. OF PAEDIATRICS.
FRED NTHAMBIRI	- SENIOR CHIEF KYENI SOUTH LOC. - EMBU
J.M. KIARIE	- Rep. PROVINCIAL DIRECTOR OF AGRICULTURE - EASTERN PROVINCE.
J.M. MBOGO	- KARURUMO RHTC
E. MUCAI (MRS)	- DISTRICT AGRICULTURAL OFFICER
N.N. AGATA	- PROVINCIAL MEDICAL OFFICER
MUSA	- INFORMATION (PRESS)
SUSAN WEINBERG	- CRSP - NUTRITIONIST
SUSAN D'SOUZA	- CRSP - PSYCHOLOGIST
DAVID CHEBOI	- CRSP - ASST. ADMINISTRATOR
TOM NGULI	- CRSP - ACCOUNTANT
WILSON MUGISHA	- CRSP - LAB. TECHNICIAN
SAM KABENGERA	- CRSP - LAB. TECHNICIAN
DOROTHY CATTLE	- CRSP - ANTHROPOLOGIST
BILL MARTIN	- CRSP - ADMINISTRATOR
ERIC CARTER	- CRSP - FIELD DIRECTOR
CHARLOTTE NEUMANN	- UCLA (PRINCIPAL INVESTIGATOR)
CHARITY NJIRU	- CRSP - NUTRITIONIST
KEN NJERU	- CRSP - DATA MANAGEMENT

NAIROBI TIMES JAN 29 1985

Research aims at helping nutrition

RESEARCH currently being carried out in Kyeni location of Embu district is expected to help government and non-government organisations to formulate policies and programmes for improving nutrition, the principal investigator, Prof. Nimrod Bwibo said yesterday.

Professor Bwibo was addressing the researchers and people from other allied organisations in an annual review meeting held in an Embu hotel.

The research programme is a collaborative effort between the College of Health Sciences of the University of Nairobi and the School of Public Health University of California, Los Angeles.

The researchers are investigating how moderate food deprivation affects the ability of children and adults to carry out essential body functions such as resisting diseases, bearing and rearing of healthy children and making use of the available resources. They also want to find out how children can make the best use of their education.

According to Prof. Bwibo, the research is particularly significant to Kenya because it relates to the well-being and economic performance of a large number of individuals and to the country as a whole.

Town to host nutrition study

Nation Kenya Jan. 25.85

Embu will be the venue of the first annual review meeting of a research programme on nutrition. It is being conducted jointly by the Faculty of Medicine at the University of Nairobi and the School of Public Health at the University of California at Los Angeles in the United States.

According to a press release from the Nutrition Collaborative Research Support Programme based at Embu, the meeting, which would be chaired by Professor Neumann Bwibo of the University of Nairobi, would be held on Monday.

The research, to be carried out in rural Embu District is to investigate how moderate food deprivation affects the ability of both children and adults to carry out essential body functions such as resisting diseases and acquiring adequate protection from immunisation.

The research also seeks to find out how food deprivation affects bearing and rearing of healthy children and the effects it has on work productivity.

The research findings, according to the release, will also reveal how to make the best use of schooling and other learning experiences.

The findings would then be used to guide appropriate interventions which can be tested in the field to assist the Government as well as non-governmental organisations, formulate appropriate policies and programmes for improving the nutrition and well-being of wananchi, the release said.

Already, data had been collected on 300 households in one location of Embu District, by January, last year and this is scheduled to continue. (KNA)

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MEMO

TO: Senior Staff/Visitors

REF: AD/OrF/FIELD

FROM: Field Director

DATE: 17/1/85

SUBJECT: Invitation

We have been invited by the people of Kathunguri sub-location on Saturday 19/1/85 at 3 pm to a ceremony to thank us for the assistance the project has been able to bring to the community during the current drought.

The people of Kasafari would like to express their gratitude in a similar manner on Saturday January 26, 1985 at 3 pm.

Please try to attend both these functions.

FROM: Sub chief — Kasafari 20 Jan. 85

DR. E CARTERS VISIT TO KASAFARI SUB-LOCATION

PROGRAMME.

2.00 pm — Arrival
2.05 pm — Welcome by women groups.
2:15 pm — Assistant chief's introduction to Sublocational Famine Relief and Development Committees,
2.20 pm — Prayers
2.25 pm — Choirs entertain visitors
3:25 pm — Ass chief invite Senior Chief - Fred Nthambiri to give presents to our guests
3.35 pm — Reading of Memorandum
3.40 pm — Ass chief's Speech
3.45 pm — Senior chief's Speech and to invite the Guest of Honour
4.00 pm — Guest of Honour's Speech
4.30 pm — Lunch

Appendix 2

Preliminary Report on Infant-Caretaker Toddler-Caretaker Interactions

The purpose of the following brief report by Dr. Sigman is to provide a sketch of the interactive conditions that have been seen by our observers in this study. The figures given in the text are approximate as data analysis in this area has just started. This information provides the background for the assessment of individual families and children to be used in the final analyses of data.

The activity observations were formulated from both general information about child development and specific conjectures based on preliminary observations carried out on child rearing and child development in rural Kenya. However, there are few studies carried out on child rearing and child development in rural Kenya. For this reason, the longitudinal group data collected on the whole sample will be used to guide our final selection of variables. To give an example, all observers have noted that toddlers are generally cared for by a wide variety of individuals. However, there was no way of knowing whether, for example, grandparents were actually involved with toddlers for substantial periods of time for significant numbers of families. The current longitudinal data suggests that care of toddlers by grandparents is much less frequent than might have been expected, at least, during the hours of our observations.

To start with the infants, we have observation data analyzed on 33 infants at the first visit and 18 infants at the second. At the first visit, the infants are held or carried for 90% of the observational time. The mother holds or carries the infant for 63% of the time, the older sister for 18% of the time, and the older brother, another adult or grandparent for about 5-6% of the time. The amount of time that the infant is held or carried does not change much from the first to the second visit. However, the people holding the infant change somewhat. While the mother continues to carry the infant for most of the time, the proportion of time that the infant is carried by an older sister or brother doubles from the first to the second visit.

As would be expected, toddlers are held or carried much less than infants - for only about 20% of the observation time. The mothers continue to do most of the carrying, 54% of the time that the toddler is held or carried. Older sisters carry the toddlers 25% of the time; older brothers, grandparents, and other children for 5-6% of the time. The amount that toddlers are held or carried declines somewhat from the first visit to the second but then remains stable. The following number of toddlers comprised the sample size at each visit: 107, 103, 90 and 67. These observations were carried out every 2 months.

Physical care constitutes a large proportion of the daily experiences of infants and toddlers. Infants spend a large proportion of the observational time being actually cared for (i.e. fed, washed). At the first observation, they were cared for about 35% of the time which declined by the second observation to 25% of the time. Almost the only caregiver of the infant is the mother who is responsible 85% of the time; the only other people at all involved are the older sisters who provide 6% of the infant's care. All other individuals, consisting of fathers, brothers, grandparents, older children, and other adults are individually responsible for less than 3% of the infant's physical care.

As would be expected, there is much less physical care given to toddlers. The toddlers spend about 12.6% of the observation time being cared for. Mothers still provide the majority of physical care; 54% of the caretaking is done by them. Olders sisters provide 20% of the care of toddlers. Other children provide 10% of the care and older brothers only 6%. Fathers and grandparents do very little caregiving, at least during our observation. Just as toddlers receive less physical care than infants, so physical care declines over visits for toddlers. The major decline is from the first visit to the second; there is a significant drop in the percentage of time that toddlers receive physical care ($F = 9.15$, $df = 3,364$, $p<.001$). It is also possible that this decline represents a change in the family's reactions to the observers.

Infants are involved in a remarkable degree of face to face interaction with other people - 25% of the observational time. The majority of these interactions are with mothers (53%) and older sisters (19%) but older brothers are also involved (10%). For the toddlers, we did not code face to face interaction but substituted social interaction in which the toddler and another person or group were involved in ongoing social exchanges. This was relatively less frequent with only 7% of the observation time being used for social interaction. The vast majority of these were with older sisters or brothers (43%), other children (26%) or groups of individuals (27%) and almost none were between toddlers and mothers (3%), fathers (1%), or grandparents (1%) individually.

On the other hand, mothers talked to their infants and toddlers a great deal. Even infants were talked to about 20-25% of the observation time. Mothers talked most frequently to the infants (47%), then older sisters (28%) and then older brothers and other children (14%). There was little change in the amount of vocalizations to infants over the first two visits. As would be expected, toddlers were talked to even more frequently (38% of the observation time). The proportion of verbalizations to toddlers from mothers, sisters, and other children were more nearly equivalent (35%, 25%, and 21% respectively).

Both infants and toddlers were fairly vocal themselves. At the first visit, infants did not vocalize a great deal (only about 5% of the observational time) but this increased dramatically at the second visit (11.2%). This change in vocalizations over the first two months of infancy is significant ($F = 11.33$, $df = 1, 49$, $p<.002$) and would be expected as the infant matures. At both visits, the infants' vocalizations were not responded to either vocally or physically most of the time (55% for visit 1 and 72% for visit 2) although there were some vocal responses (26% and 18%).

Toddlers talked much more of the time (21.5%) and this increased consistently over the four visits ($F = 5.40$, $df = 3, 364$, $p<.001$). The majority of the toddlers' verbalizations were responded to vocally (57%) although a fair proportion were not responded to either vocally or physically (40%). There was a significant increase in the proportion of vocalizations that were responded to vocally after the second visit. Thus, the toddlers were talking more and others in their environment were listening and responding more.

Just as vocalizing increased from infancy to the toddler period, so crying declined. In fact, there was a significant decrease in crying over the first two visits of the infancy period. At the first visit, infants showed distress for 18% of the time but this declined to 13% by the second

visit. Somewhat surprisingly, responses to the infants' crying at the first visit were equally often vocal (30%), physical (22%), or some combination of the two response styles. About 14% of the infant's distress vocalizations were ignored. There was something of an increase in the number of cries ignored from the first to the second visit in infancy. By the toddler period, crying constituted 8.4% of the observation time. About half this crying was responded to verbally and 25% was ignored. Smiling increased significantly from the first visit to the second during infancy (9% to 16%). During the four visits in the toddler period, there was also a linear increase in smiling from 12% to 17%.

Toddlers were involved in object play for a large proportion of time, 36% of the observation period. The largest proportion of time was spent on simple manipulation or relational play (70%), then on functinal play (18%) and then on symbolic play (11%). While there was no change in the total amount of time devoted to object play, the distribution in types of play varied systematically over time. Simple manipulation and relational play declined somewhat from a total frequency of 29% to a total frequency of 21% ($F = 3.18$, $df = 3, 364$, $p<.02$). Moreover, functional play increased from a total frequency of 4.6% to 10.7% by the fourth visit ($F = 12.8$, $df = 3, 364$, $p<.001$) and the frequency of symbolic play doubled from the first to the fourth visit. Thus, the development of object play followed the same trajectory as has been observed in the United States and Europe. To my knowledge, this is the first empirical demonstration that symbolic play advances in the same fashion in a rural, African setting as in more urban, Western settings.

In summary, the activity observations have provided information on the social rearing conditions of infants and toddlers in our study area. We hypothesize that infants and toddlers who receive more care, are talked to more, are more involved in social interactions, and are responded to more when they cry or vocalize will develop cognitive skills at an earlier point than children who are less involved with other people and receive less physical care. Moreover, we expect that families whose energy intake nutritional status is adequate will have more available resources to care for and interact with their infants and toddlers.

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FIELD MANUAL

DATA MANAGEMENT MANUAL

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Appendix

A Form log

B Entry Check-list

C Range Check

D Error Report - Correction

E Range Check Changes

F Magnetic Tape Corrections

Ken Njeru, Eric Carter, Bill Martin. February 1985

INTRODUCTION

The essence of any research project is the capture, management and analysis of accurate data. Outlined below is the manner by which this project manages and checks its data thereby preparing it in a 'clean' form, best suited for analysis.

DATA CAPTURE FORMS

A) Preparation

Forms are designed by the Senior Investigators in consultation with the Field Director with advice from the Data Manager to insure that:

i) the information is collected in appropriate record lengths.

ii) the design of the form is conducive to fast and accurate key punching.

iii) the codes given are mutually exclusive and exhaustive.

iv) there is a consistent approach in dealing with 'missing' and 'not applicable' data.

The forms, designed to be the same size, are printed and prepared in sets. Each set consists of a white original with a coloured copy and a one-time carbon paper in between; ie., the data is collected in duplicate.

B) Distribution to and from the field.

The functional supervisors request forms from the Embu office through their respective Field Office Supervisor. Each function in each field office has been supplied with three boxes to be used as follows:

a) the functional supervisor places blank forms into the BLANK tray and the enumerators are supplied from this box.

b) the PENDING box is for the temporary storage of partially completed forms.

c) completed forms are placed in the COMPLETE box. From this box the forms are carefully checked by the functional supervisor before being logged out and dispatched to Embu.

All forms are logged by the functional supervisor onto a form log (see appendix A). Two copies of this log are made - one is stored at the field office and the other accompanies its corresponding forms until the key-entry and error-correction steps have been completed. Prior to storage in the field office, the carbon copy of the log is used in Embu to update the master schedule.

PREPARATION FOR COMPUTER ENTRY

Forms are dispatched to the Data Management section of Embu office on a daily basis from the field in manilla folders. Here the forms are re-checked for obvious errors. If a form is found to have any error, it is logged out on an error correction slip and taken back to the field the following day. Correct forms are sorted out into form-types and shelved awaiting preparation for Nairobi.

Data is taken to Nairobi for computer entry on a weekly basis and at the end of the month a magnetic tape is made. Each weekly delivery of data is given a title denoting the tape number and the week number: ie., the first tape to be made was for January 1984 and hence the first delivery of data in January 1984 was called Tape 1, week 1 and the following week was Tape 1, week 2 etc. There are no defined number of weeks that make up a month's tape - it simply depends on the number of times data for that particular month is delivered for key-entry.

For delivery to Nairobi, the forms are subdivided into batches - one batch contains forms of one type from one cluster such that up to four batches of the same form type are expected each week. Each batch is then given a unique batch number. The batch/form numbering system is described below.

As each form type enters the data flow, it is assigned a two digit code and all the batch-numbers for this form type will start with this code. The codes are as follows:

Code	Form #	Form title
00	612	Census Update
01	411	Reproductive History
02	211	Anthropometry
03	412	Pregnancy Survey
04	522	Toddler Interaction
05	341	Laboratory
06	631	SES - Socio Econ
07	641	Care Giving Activities
08	621	Sanitation and Hygiene
09	413	Pregnacy outcome
10	512	Infant Interaction
11	521	Cognitive Toddler
12	323	Clinical Exam - Summary
13	532	Schooler Classroom Observations
14	533	Schooler Playground Observations
15	314	Morbidity Individual Four Weekly Report
16	671	Ag Crop - HH Questionnaire
17	513	Brazelton Test
18	531	Cognitive Schooler - Summary
19	119	Food Intake-Kcal Intake Summary
20	651	Weather Data
21	421	Lactation Questionnaire
22	541	Cognitive Adult - Summary
23	711	Resting Metabolic Rate

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Code	Form #	Form title
24	511	Cognitive Infant-Summary
25	523	Cognitive Toddler - 30 months
26	611	Household Entry/Change/Exit
27	534	School Attendance/Performance
28	114	FI-Meal Preparation-Summary
29	115	FI-Consumer Unit
30	116	FI-Target Individual/Non Target Individual Summary
31	681	Market Survey
32	342	Immunology
33	331	Death Notification
34	301	Disability and chronic diseases quarterly update
35	315	Morbidity - Household Four - Weekly report

The batches are then numbered numerically starting with the one from the cluster with the lowest number: ie., if there were four batches of forms of form type 621 and they were being taken for computer entry for the first time, the numbering would be as follows.

Cluster 1 : 08000

Cluster 2 : 08001

Cluster 3 : 08002

Cluster 4 : 08003

If the following week there were only two batches of this form type, say from cluster 2 and 4, then these would be numbered 08004 and 08005 respectively. The total number of forms and total number of records is recorded on the top form-log (one batch usually contains forms logged out on several days and hence

totals are then entered in a delivery note book which is delivered to the computer bureau together with the forms. This is to make the computer service bureau accountable for each and every form and record it received. It also serves as a tracking device for Data Management/Embu office.

COMPUT[illegible]Y

On [illegible]val at the computer servie bureau, the forms are numbered serially starting with the first one in the first batch up to the last one in the last batch (the batches are first arranged in ascending order of the batch numbers) and hence, each record of data may now be referenced by specifying the record number, page number, (batch number), week number and tape number. The data is then punched onto computer and verified 100%

To ensure that all data that is delivered is, in fact, punched and verified there is a programme that produces a 'Checklist' (see Appendix I). This programme lists the references of all the records by tape number, week number, page number, record number and then gives the number of records expected from that page which is obtained from the columns specifying the number of records on each form. The only form types not possessing this variable are those that have only one record per form, with the exception of form type 211 (Anthropometry) which always has two records per form.

The checklist programme goes through the data and, since the page numbers are given serially, if any number is missing a comment is made. Within each page all records are checked and again, if any is missing or is in excess of what is expected, this is reported. The programme also tags with an asterisk any record that is not verified. The idea of pointing out records that are not verified is that these records are considered invalid and they are neither edited nor written to tape. The Checklist is checked by the computer bureau against our data delivery to see whether any records or pages reported missing are actually not there. After this is done an Input Edit is done producing an Error Report (see Error Corrections) and a Batch Summary.

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The Batch Summary will be a counter-check of whether all the data delivered is actually ready to go onto tape. For each batch, the number of pages, number of records, number of records with errors, and the total number of errors is given. If it is found that the number of records given in the Batch Summary does not tally with what we have in the delivery note, then this has to be checked and the necessary corrections done.

The forms are then retrieved from the computer bureau together with the Checklist, the Error Report and the Batch Summary and taken back to Embu for error corrections the following week.

ERROR CORRECTION

There are three major stages of error detection (see Fig. 1).

i) Primary Error detection

This is done immediately after the data is collected by the enumerators when their function supervisors check the forms. The corrections are then done on the same day or on the day after. Again, error detection occurs when the forms are taken to Embu office and are once again scrutinized. The errors detected would be sent back to the field the following day.

ii) Secondary Error detection - Range Checks

This is done by the computer after key punching and verification is complete. The detection is done by specifying an acceptable range of values for each variable on each record or each form (see Appendix C).

Any record found with one or more 'out-of-range' error is printed on the Error Report described above. Errors are corrected in Embu if possible. If not, the forms with red circles around the incorrect variables, are sent back to the field for correction to be returned to Embu within three days. The corrections are made on the forms as well as on the error print-out where they are marked in red just above the values which were found to be incorrect (see appendix D). The corrections are then key-entered and another input edit is generated to insure that all errors have actually been corrected. Once this final edit is complete, the data is ready to be transferred onto

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To exercise greater quality control, an allowance must be made to cater for any changes that are deemed fit by the project from time to time. Changes may also become necessary if it is found that most data is falling out of the prescribed range. These changes are communicated to the computer bureau on a special form (see Appendix E) and are put into operation with a minimum of delay.

iii) Final Error Detection

Errors detected after transfer onto magnetic tape and/or after linkage-analysis has been carried out are listed and circulated to UCLA and Embu (see appendix F). At some stage the magnetic tapes are modified to reflect this.

STORAGE AND DISPATCH TO UCLA

Since all data is completed in duplicate, the separation of originals from duplicates is done just before the originals are taken to Nairobi for key-entry. After corrections are made, the originals are filed according to their households number (each HH is allocated a file holding the original copy of the data). The HH data is arranged in order of dates for each target individual for each form number.

Duplicate forms are stored in batches awaiting shipment to UCLA and this is done after each magnetic tape has been prepared.

Each month, two identical tapes are made: one is sent to UCLA and the other remains in Embu.

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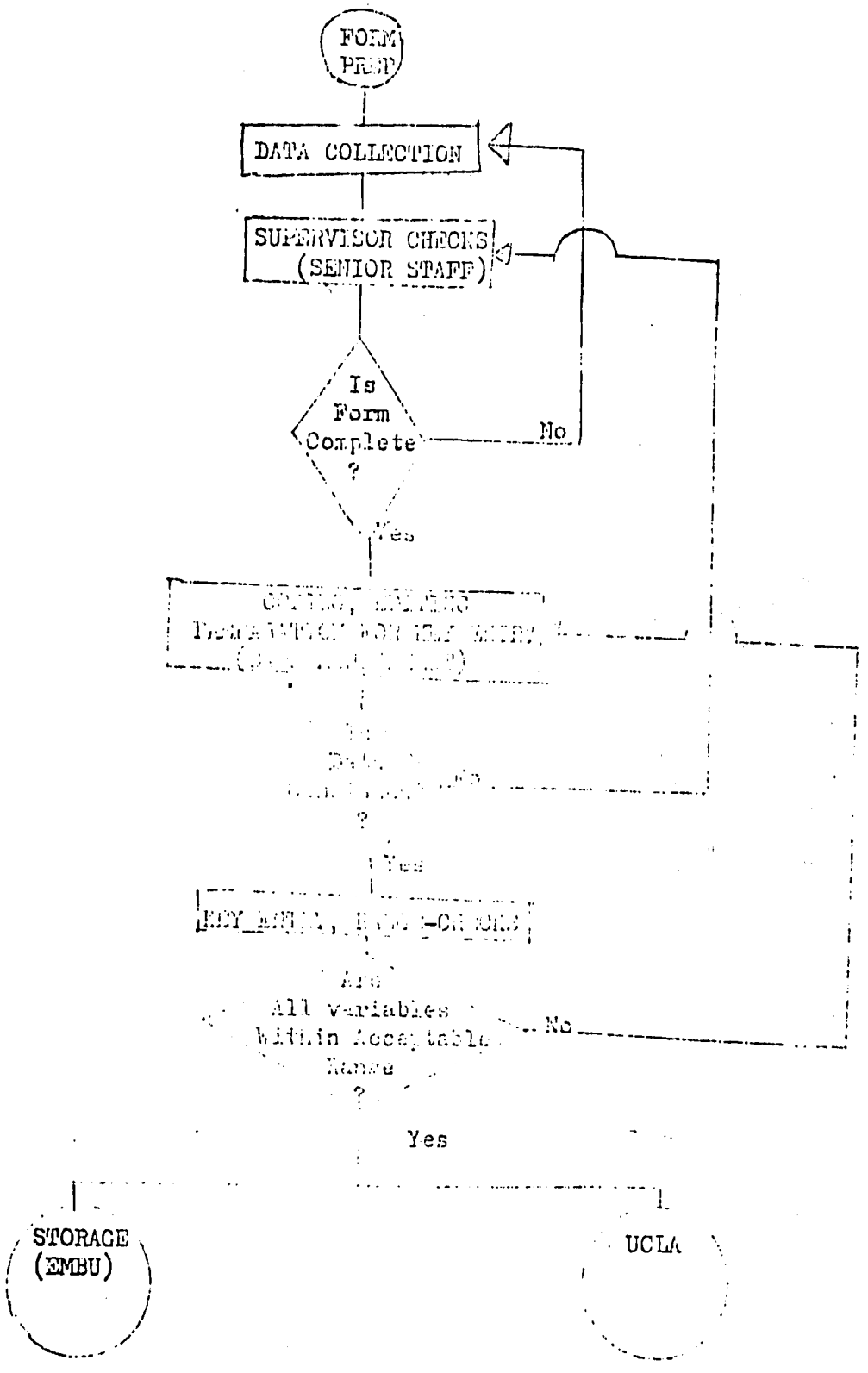
Fig. 1



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NUTRITION CRSP -- KENYA PROJECT

TAPE _____ WEEK _____

Form No.

BATCH TOTAL ..... FORMS RECS.

PAGE ___/___

FORM LOG

CLUSTER NAME ..... BATCH NO. .....

LOG OUT BY ..... DATE: ..... SIGNATURE: .....

RECEIVED BY: ..... DATE: ..... SIGNATURE: .....

RECEIVED BY: ..... DATE: ..... SIGNATURE: .....

RECEIVED BY: ..... DATE: ..... SIGNATURE: .....

RECEIVED BY: ..... DATE: ..... SIGNATURE: .....

DATE ON FORM	VISIT NO.	HH #	TI NO.	# PAGES	# RECS.	DATE ON FORM	VISIT NO.	HH #	TI NO.	# PAGES	# RECS.

SAMPLE

NUTRITION CRSP - KENYA PROJECT

TH	WH	BATCH#	PAGE	OF
09	02	015025	1089	01
09	02	015025	1090	01
09	02	015025	1091	01
09	02	015025	1092	01
09	02	015025	1093	01
09	02	015025	1094	01
09	02	015025	1095	01
09	02	015025	1096	01
09	02	015025	1097	01
09	02	015025	1098	01
09	02	015025	1099	01
09	02	015025	1100	01
09	02	015025	1101	01
09	02	015025	1102	01
09	02	015025	1103	01
09	02	015025	1104	01
09	02	015025	1105	01
09	02	015025	1106	01
09	02	015025	1107	01
09	02	015025	1108	01
09	02	015025	1109	01
09	02	015025	1110	01
09	02	015025	1111	01
09	02	015025	1112	01
09	02	015025	1113	01
09	02	015025	1114	01
09	02	015025	1115	01
09	02	015025	1116	01
09	02	015025	1117	01
09	02	015025	1118	01
09	02	015025	1119	01
09	02	015025	1120	01
09	02	015025	1121	01
09	02	015025	1122	01
09	02	015025	1123	01
09	02	015025	1124	01
09	02	015025	1125	01
09	02	015025	1126	01
09	02	015025	1127	01
09	02	015025	1128	01
09	02	015025	1129	01

NUTRITION CRSP - KENYA PROJECT
CENSUS UPDATE - FORM #612
ACCEPTABLE RANGES

SAMPLE

VERSION 3 (2/1/85) CATTLE/SHARE/NO CRI

VARIABLE NAME	COLUMN #	ACCEPTABLE VALUES	REMARKS
CU01	1-3	612 (only)	
CU02	4-5	02-99	
CU03	6	2 (only)	
CU04	7-10	1000-1075 or 2000-2075 or 3000-3075 or 4000-4075	
CU05	11-12	11 (only)	
CU06	13-14	01-31	
CU07	15-16	01-12	
CU08	17	[illegible] or 9	
CU09	18-20	001-150 or 901-915	
CU10	21	[illegible]	
CU11	22-23	[illegible]	
CU12	24-25	[illegible]	
CU13	26	[illegible]	Blank if [illegible]
CU14	27-28	[illegible]	
CU15	29-30	[illegible]	
CU16	31-32	[illegible]	
CU17	33-34	[illegible] if CU18 =2 [illegible] if CU18 =1	
CU18	35	[illegible]	
CU19	36	[illegible]	
CU20	37	[illegible]	
CU21	38	[illegible]	
CU22	39	[illegible]	
CU23	40	[illegible]	
CU24	41-42	[illegible]	
CU25	43	[illegible]	
CU26	44	[illegible]	
CU27	45	[illegible]	
CU28	46	[illegible]	
CU29	47	[illegible]	
CU30	48-49	[illegible]	
CU31	50	[illegible]	
CU32	51	[illegible]	
CU33	52	[illegible]	Blank if [illegible]
CU34	53	[illegible]	
CU35	54	[illegible]	
CU36	55	[illegible]	
CU37	56	[illegible]	
CU38	57-58	[illegible]	Blank if [illegible]
CU39	59	[illegible]	
CU40	60-61	[illegible]	
CU41	62-63	[illegible]	
CU42	64	[illegible]	

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EKN/gm.

SAMPLE

NUTRITION CRSP - KENYA PROJECT

1 2
1234567890123456789012345678901

211012302491251241224115255280
8002169 P40277

1 2
1234567890123456789012345678901

211012302491251241224120000
8002169 P40277

1 2
1234567890123456789012345678901

211022303600131241111120050
8002169 P40292

1 2
1234567890123456789012345678901

211022303441161241111110955
8002169 P40293
8002169 P40293

1 2
1234567890123456789012345678901

211022304452201241111120951
8002169 P40302

1 2
1234567890123456789012345678901

211122305141181211111184567
8002169 P40312

1 2
1234567890123456789012345678901

211122305141181211111100100
8002169 P40312

1 2
1234567890123456789012345678901

211122305227181241111199-99-

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EKN/84

NUTRITION CRSP - KENYA PROJECT

DATA MANAGEMENT

CHANGES IN VALIDATION CHECKS

I would like to request you to perform the undermentioned changes to our validation checks in Form type_____(Version_____)

Type of change 1=Addition 2=Range 3=Deletion	Record type (No.)	Variable Name	Column Nos	Acceptable values	Comments

These changes should take place w.e.f._____

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NUTRITION CRSP - KENYA PROJECT
DATA MANAGEMENT

EKN/6/84

MAGNETIC TAPE CORRECTIONS SHEET

Sheet No. ..... Date .....

Corrections for tape No. ..... Month .....

Form No.	HH No.	TI No.	Date On Form	Rec. No.	Var. Location (Col. No.)	Wrong Value	Correct Value	Comments

Nutrition CRSP Kenya Project
Quality Control
Anne Coulson, Charlotte Neumann
February 1985

Quality Control

INTRODUCTION

Quality control comprises the methods and procedures whereby the accuracy of collected information is assured. In order to assure this accuracy, a number of controls must be imposed between the development of hypotheses and their analytic tests. These points are expressed here as questions with the general means to assure quality discussed. Specific discussion of quality control procedures for each of the functional areas and data collection efforts follows.

First, it should be noted that information to be collected and processed can be ephemeral, with only one chance at collection: relatively stable for at least short periods of time; or essentially permanent. Ephemeral information would include weighment of foodstuffs as they are added to the cookpot. Relatively stable measures would include anthropometry, perhaps especially height, which would not be expected to change in a day or two, even in a young child. Permanent measures would include date of birth or sex. These different kinds of measures have different quality control implications; for example, repeated measures of ephemeral information are not possible.

Information may also be collected in a relatively coded form, in which the original data collector classifies the observation or records the numeric measurement directly. Or, it may be collected in a relatively raw form in

which the data collector records the verbatim response of the subject or verbal descriptions of characteristics or actions. Finally, information may be recorded in permanent form through photographs, tape recording, or computer output from measuring devices. In this project, examples of the collection of relatively raw data are found in food intake where food names are recorded directly and in some of the morbidity where symptoms and signs are recorded. Examples of relatively coded data include cognitive tests, clinical examinations and care giving activities, where the data collector classifies the activity as safety training, etc. Permanent recordings are available for RMR, for some laboratory tests, and for birth records and school records.

Where the data are collected in relatively raw form, two levels of quality control are needed; the first to assure that information is gathered accurately, the second to assure that the information is coded appropriately. However, the second level can be repeated as needed, as the initial recorded information remains available as hard copy for repeat coding and interpretation. Similarly, the permanent, direct recorded information is available for recoding or reinterpretation at any time. Where data are collected in relatively coded form assurance is needed that the data collector is correctly interpreting and coding the observations. Clearly there are quite different quality control implications and needs inherent in these different types of data recording.

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The first requirement for quality control is reflected in the question:

Is the data collection task well defined?

If the task is not well defined the data collector will be at a loss to collect the appropriate data or make the correct measurements. A well defined-task requires that objectives for the task be specified, that there be definitions for measures and classifications and that measurement techniques be available and fully described. The data collector must be provided with appropriate means of recording collected data, and it must be possible to collect the desired data or make the desired measurements.

The second requirement for quality control is reflected in the question:

Is the data collector able to make the desired observations or measurements?

If the data collector does not have the required skills to make the observations or measurements, the measures cannot be accurate. Special training is required to identify the first and fifth blood pressure sounds (systolic and diastolic respectively). Medical training may be necessary to assess the presence or absence of specific disease; trained technicians may be necessary to maintain and operate complex measuring devices. For other types of data collection, a sympathetic ear or nonjudgemental approach may be needed. Thus the qualifications of the data collector -- both the background

and training and personal characteristics -- can have an impact on quality control. It is therefore necessary to define these qualifications and characteristics in selecting and training data collectors.

In addition, no matter what the qualifications and characteristics of the selected data collectors, it is necessary to train them to the specific procedures and needs of the project. There must be initial training in the making and recording of observations and measurements. If the project is of long duration or if new or different information is to be collected, then in-service or retraining is necessary. For individual data collectors with identified problems in data collection, remedial training becomes necessary.

A special subset of problems occurs when highly trained or skilled data collectors must be retrained to requirements and criteria for the current study. For example, it may be very difficult to retrain a physician to take blood pressure measurements in a standard way.

Given the selection and training, the third requirement is reflected in the question:

Can the data collector make the observations or measurements in the field situation?

If the qualified and trained data collector has difficulty in applying the training in the field situation, data quality can be seriously impaired. The performance of the data collector in the field can be assessed by supervisor observation of field performance. All of the data collection procedures in this project allow for direct supervisor observation of data collector performance, though care must be exercised in introducing an extra observer into the field situation.

Even when the data collector has been carefully trained and observed in the field, it is necessary to check the unobserved field performance. The supervisor's observations of performance assure that the data collector is able to perform the procedures when watched, not that the procedures are always followed. This leads to the fourth requirement, reflected in the question:

Does the data collector make accurate measurements in the field?

Checking field performance in the absence of direct observation is a major problem in quality control. Several mechanisms are available, depending on the stability of the information to be collected and the level of field coding of the information (see above for descriptions of both). Assessment of the quality of relatively stable and permanent data can be done by independent repeat visits by the same

observer, another observer or the supervisor. Unfortunately, assessment of the qualilty of ephemeral data cannot be done by non-simultaneous measurement, but must depend on assessment and check back on reasonableness and consistency of data collected. The collection of similar data (e.g. food intake) over several months allows consistency checking. Recipes may vary with the availability of ingredients but may well retain approximately the same degree of "saltiness" -- so wide variability in the proportion of salt added might indicate a problem; in any event it should trigger supervisor observation of and discussion with the data collector.

A high proportion of errors by data collectors are likely to be in data initially recorded in coded form. The data collector has the chance to make errors at two points: misobservation and miscoding. In the case of numeric measurements, these errors would be misobservation or misrecording. The burden on the data collector, and the data management system make the use of such precodes mandatory; for the numeric information there is no alternative. Consistency from observation to observation can be used to check quality in these cases; the possibility that certain inconsistencies may be legitimate must be considered.

The use of permanently recorded data (e.g. the RMR determinations) presents no remeasurement problems, as repeat calculations of data can be performed as needed for quality control. Equipment and recording devices must be calibrated on a regular schedule according to the appropriate protocol. Similarly, secondary processing

(coding) of relatively raw information (e.g. foods) can be subjected to repeat quality control observations. The quality of such secondary transformation procedures can be materially assisted by the availability of appropriate dictionaries and manuals and suitable selection, training and supervision of personnel.

Data management procedures bring their own quality control problems and solutions. Coding of field data was discussed above; the availability of the raw data allows recoding for quality control. Key entry is quality controlled by duplicate entry by a second operator -- 100% verification -- with any differences resolved by reference to the original document. In this project, an additional key entry verification is performed at UCLA on a sample of each month's data. A two percent random sample of records is used for this purpose, as the initial checks indicated a very low (.008%) error rate in key entry.

Data management activities are themselves quality control checks. Key entry programs are used both to format the input and to check the acceptable ranges and input variables. For example, sex of the subject may take on the numeric values 1 or 2, but not, say, 7. The key entry system will reject an out-of-range value which will then be referred back to the field for correction.

Computer entry offers further quality control measures including cross variable consistency (a nonsmoker of cigarettes should not also have a consumption of 30 cigarettes per day) and cross time consistency (an adult female should not change height by 10 centimeters between, say, May and September).

Flaws of these types may indicate errors in data or wrong identification numbers, or other problems, indicating the need for further quality control measures.

In general, in data collection and management, it is not possible to create a large, wholly clean data set. Quality control measures are important and must be applied 1) preemptively, 2) concurrently and 3) retrospectively. Preemptive quality control involves the clear specification of the data collection task(s), the development of appropriate data collection instruments and the designation, selection and training of data collectors. Concurrent quality control measures include observation of data collection; independent, simultaneous observations, independent, nonsimultaneous observation by same or different observer, feedback on errors; and remedial or inservice training as necessary. Retrospective quality control includes range checks, consistency checks and other data management and analytic activities which may identify improbable sets of characteristics across an individual, a community or time, outliers or other problems.

The function-specific quality control measures are described by function below. As data management procedures are identical for all functions, their description is not included in the function specific discussion.

A. PRE-EMPTIVE QUALITY CONTROL PROCEDURES:

For all of the functional areas -- preferably form by form as many areas have more than one sort of collection and collector -- we need information on "preemptive" quality control. The information should cover in some detail the following points:

1) Specification of skills and training necessary to collect the specific data -- e.g. lab technicians -- O level grad

2) Selection procedures for staff for data collection

3) Training, initial, of staff -- duration, instructors, content, evaluation

4) In service training -- frequency, instructors, format, content, evaluation

5) Remedial training -- planned or actual. The conditions that trigger remedial training must be specified.

6) Form design

7) Manual -- These should be correct and readily available as a reference.

B. CONCURRENT QUALITY CONTROL PROCEDURES

It is assumed that as part of their quality control procedures supervisors will be checking on their enumerators performance and recording such in an ongoing manner. Computer data entries record the enumerator number so that it is also possible to check on the quality and consistency of a given enumerator's data collection through the data base.

A five percent (5%) sample of all measurements are to be repeated by the supervisor or an independent observer. To identify these measures, repeat measurements observations or interviews are recorded on regular code forms, have a "9" instead of a "5" in the box number 17. Thus, that data appears to be 1989 not 1985. subsample of 5% is not a magic number and may not always be appropriate depending upon the nature of the measurement, how difficult it is to obtain, and the usual and acceptable levels of interobserver variability. A list of randomly chosen households will be used for picking the subsample for quality control.

Summary of Quality Control Procedures

The main methods of quality control consist of the following:

1) Training/retraining at regular intervals.

2) Interview -- reinterview e.g. supervisor in same or following day.

3) Simultaneous observations by enumerators and supervisor and by supervisor and Senior Scientists.

4) Forms per se

   a) Careful checking of forms by supervisors before forms leave the field.

   b) Checking of forms and coding by data Assistants in Embu data office before forms are sent for data entry.

5) Range checks -- carried out at data entry site (comprite) in Nairobi with correction procedures in the field at Embu data office (turnaround time 1-2 weeks for final collection). 200% (key entry verification will be done at Comp-rite.

6) Computer checks for internal consistency and for enumerator performance will be done at UCLA, especially for anthropometry and Food Intake entry.

7) Standardization Tests.

8) Validity field trials.

SPECIFIC RESEARCH AREAS

1. FOOD INTAKE

The measures made by data collectors in the field are made on ephemeral variables, such as weight of specific quantities of food. Therefore, quality control measures must be made on the selected sample at the same time as the original measurement.

There are three forms of quality control here --

(1) The observation of data collector activity by the supervisor: the supervisor should be checking everyone under her supervision on a regular basis. Field notes, conferences with data collectors and retraining recommendations should be recorded.

(2) Reweighment and/or remeasuring of volume by a second person -- done as independently as possible is the ideal quality control for this kind of data and should be employed on a 5% sample -- as randomly selected as consistent with field constraints and quality control needs.

(3) Calibration of scales and checking all new equipment.

Scales used for weighing food are checked with standard weights every two weeks and a calibration form is filled in. The scales are Salter, checked with 10kg and 5kg weights and the Chatillon 2kg scales -- checked with 2kg, 1kg, 200gm, 100gm and 50gm standard weights. Faulty or malfunctioning scales are replaced by new repaired scales.

(4) Periodic Market Surveys

This is done to "recalibrate" sizes of fruits, vegetables and weighing of specimens. For example, large, medium, small potato or cabbage will be selected and weighed and average weight recorded.

(5) Comparison of Weighment vs. Recall

A validation study comparing the main study method vs. total weighment will be carried out for 7 days on 10 households and the intake of calories compared. This will be in households and target individuals.

(6) Periodic analyses of variance (ANOVA) for inter and intra subject variation.

(7) Rotation of enumerators to different HH within a given cluster.

(9) Because of the delay in final coding of these data, there is a built-in 100% check on all food intake recorded on forms 119 (from January-October 1984). The Kcal for individuals and households recorded on form 119 will be recalculated by computer from data on forms 114, 115, and 116 and compared with the form 119 data. Error rates will be calculated and any large differences checked.

(10) In addition, one special "retrospective" quality control will be done. The "recipes" will be recreated by the computer for a 5% sample and will be checked back against the original field data collection forms to assure correctness of coding and quantity calculation.

(11) Food Composition

Proximate analyses of commonly used foods (raw) are being carried out in Nairobi by Dr. Kinoti's Laboratory by Miss Meena Desai. A subsample of the food will be analyzed in the USA either at UC Berkeley or University of Arizona.

2. ANTHROPOMETRY

Quality control -- Study documents required that each project should keep data on replicate measurements under actual field conditions (after training of field staff). This will allow comparison among projects for intra- and inter-observer replicability of anthropometric measurements. To maximize the value of these data, they should be collected routinely throughout the period of the project and should include information from all examiners. Enumerators are observed by their supervisors while they are taking measurements. This is done on a daily basis. Field notes, conferences and retraining should be documented for each enumerator.

A. Pre-set Limits of Measurement Differences -- Estimates of inter-observer and/or intra-observer error have been calculated for anthropometric measurements of participants in the Fels Longitudinal growth study and specific pre-set limits for differences of anthropometric measurements have been adapted from Fels' recommendations. See Form 211 for pre-set limits for acceptable differences.

B. To control inter- and intra-observer differences in this longitudinal study, the following protocols should be followed:

1. Intra-observer differences - one additional duplicate measurement by the same observer pair on the same subjects should be done on a 5% subsample. Preferably, duplicates are done with a time interval of a few minutes, hours on the same day or if not possible on the next day at the same time as the original measurement at the latest.

2. Inter-observer differences - a local "expert" team is scheduled to conduct duplicate measurements on an adult and a child every month on each observer pair. A standardization test (see attachment "Standardization Made Easy") will be carried out every two months.

C. Calculation of Reliability Statistics -- Estimates of inter-observer and/or intra-observer error can be calculated in the field for immediate decision-making. Formulae for computing technical error of measurement and coefficient of variation are listed below. These reliability statistics have been used in other anthropometric studies.

d = absolute difference of two measured values ($X_1 - X_2$)

$$\bar{X} = \text{mean} = \frac{x_1 + x_2}{2}$$

o_e = technical error of measurement (standard deviation)

$$= \frac{\text{sum } d^2}{n-1}$$

Coefficient of variation (CV)

$$CV = \frac{\text{standard deviation}}{\text{mean}} \times 100 \text{ or } \frac{\quad \times 100}{\text{mean}}$$

The calculation of the coefficient of variation, an expression of relative error, eliminates the effect of the size of the measurements thus allowing comparison of reliability among different sites or types of measurements.

D. Anthropometry Recording Form

Instructions for anthropometry recording form:

1. All anthropometric parameters are measured by both observers (i.e. Observer A and Observer B) in a paired team.

2. In this first pair of measurements, the difference of measured values by two observers is calculated.

3. A second pair of measurements should be taken by both observers only if the difference of the first pair falls outside the pre-set acceptable limits. The difference of the measured values is calculated again.

4. The same form is used for quality control purposes, but box 17 in the header because "9" in the year 198_ instead of "5".

The mean value of each measurement will be calculated by computer as follows:

(i) If the difference of the first pair of measurements falls within the pre-set limit, the mean is calculated from this first pair of values.

(ii) If the difference of the first pair of measurements falls out-side the pre-set limit, the second pair of measurements is conducted. If the difference is acceptable within the pre-set limit, the mean is

16 a
(insert).

Weekly Weighing Exercise for Day to Day Variability

Please select 10 infants, 10 toddlers, 10 pregnant women. Weigh them dally at the same time of day, use the same scales, for the entire exercise and use the same two enumerators who will each weigh the subject recording both values as in the main study. Under comments, they should note the time of weighing, the time of approximate last defication and urination. The above will give us some idea of the intermeasurer variability as well as the day to day variability. Carry the weighing out for six consecutive days as Sunday will probably not be possible.

calculated from the second pair of values. If the difference is again outside the limit (as occurs in about 10% of measurements) the mean is calculated from all four values.

3. Morbidity

(a) Morbidity Data Collection

1. Repeated training sessions on main conditions seen, e.g., rashes respiratory disease, diarrhea etc. with demonstration of physical signs of illness e.g., ringworm, chest retractions, dehydration, measles etc. This will be demonstrated by the Physician and nurses.

2. Validation of illness is carried out by the Physician of the nurses and enumerators and of the enumerators by the physicians and nurses. Validation of diagnoses are required for a specific number of diseases tested in the morbidity manual which are of particular nutritional relevance e.g., measles, pneumonia, whooping cough.

3. Reinterview and observation of HH by the nurse or physician will be done after the enumerator has carried out her regular morbidity home visit but on the same day. An independent form will be recorded with enumerator's number and this will be done on a 5% subsample only one week of morbidity is collected for quality control purposes. Illness are coded for one week on the form 31 Morbidity Summary Form.

4. The supervising nurse will spend one morning per enumerator once a week accompanying her on her home visits. The nurse will provide instant feedback of performance to the enumerator.

5. The Physician in turn will spend one morning per week with each nurse as she accompanies the enumerator -- this will allow evaluation of the nurse's capabilities.

6. Four weekly coding will be done by the nurse and physician in the presence of their enumerators. This has proven to have excellent training value for all concerned especially the enumerators as questions are raised and errors are detected, and incomplete information is spotted.

7. The nurse checks the morbidity forms every day for completeness, for the need to carry out the illness subroutine and revisits for validation of diagnosis intervention.

8. Opportunistic Checking

   Should the Physician or nurse see an illness in a T.I. at any time it should be checked if the enumerator was aware of the illness and if it was recorded.

9. A 5% subsample of Skin tests reactions are to be measured by the Physician and findings compared to the nurse's measurements.

10. Computer Validation

A comparison will be made of the findings on a T.I. by the Physician on the 6 monthly clinical examination (form 314) with the four weekly morbidity data summary corresponding to the date closest to the clinical examination.

This comparison will be extremely helpful in showing how much is being missed by the morbidity data collection method and the enumerator and nurse respectively.

11. Nurses are shifted from one cluster to another two to three times in the course of field work and enumerators are assigned different households within a cluster every three months.

12. Recoding is being done from raw data in individual morbidity forms to the Morbidity Code Form. The individual morbidity summary form 313 is redone on 5% subsample per month by Mr. James Thomas, an epidemiologist.

(b) Morbidity -- Clinical Examination

Simultaneous observations with independent recording of findings during physical examination by the nurse and physician of each other's examination or measurement is carried out for quality control purposes on a 5% subsample.

(c) Morbidity -- Laboratory

Refer to laboratory quality control procedures.

4. REPRODUCTIVE FUNCTION

a. Reproductive History - Supervisor observation of questionnaire administration is carried out daily. A reinterview independently within one week should be carried out on a 5% subsample by the supervisor.

b. Reproductive Update - Same as above.

c. Pregnancy Outcome - Carry out repeat measures on birthweight and maternal weight within two days of birth and independent Dubowitz examination on a 5% subsample.

d. Lactation Questionnaire - Same as Reproductive History.

5. COGNITIVE PSYCHOLOGIC MEASURES

As with laboratory, quality control measures for these types of observations and tests are well documented. In general -- supervision and observation of tester by supervisor is carried out. Simultaneous independent observation and recording and scoring by two examiners of all tests given including Brazelton is done. Reliability testing as above is done on a 10% subsample.

a. Validation of Scoring

For testing which requires the tester to talk with the subject, the field workers administer the test in Kiembu, the local language. The field worker and the supervising Psychologist then score the test items simultaneously.

Usually, two field workers, working in pairs, each administer tests to the same child and results are compared. Interobserver variation is obtained in this way (the supervising Psychologist, not speaking Kiembu is unable to adminster the test easily).

The above procedures are being done on a 10% subsample for each age group (6 mos-adults) and for each type of test.

b. Brazelton Testing

This test is being performed on newborns by the specially trained nurse and the psychologist separately and results are compared. This is done on a 10% sample.

The Fagan test and visual activity testing is being carried out by pairs of enumerators. The role of each worker that of recorder or tester is alternated from house to house.

The psychologist observes each cognitive field worker once a week with immediate evaluation feedback of her work.

Field workers will not be rotated from one set of households to another as they feel they may upset the rapport they have with the mothers and children in particular.

6. CENSUS UPDATE, SES, SANITATION AND HYGIENE (SAHY)

Supervision, independent reinterview on same or next day on a 5% subsample are carried out. Sequential check of census update data is checked for consistency. With new SAHY observations by Food Intake enumerators, simultaneous observation and recording by supervisors is carried out in a 5% subsample.

7. AGRICULTURAL/CROP/SEE SURVEY

Observation of questionnaire administration by the supervisor and re-interview on a 5% subsample one the same or next day by supervisor or other interviewer is carried out. A validation method for crop production will consist of actual counting of crops produced on a subsample of field squares previously demarcated and these results will be compared to those obtained on questionnaires regarding agricultural production. This procedure will be repeated every three to four months (per agricultural season).

8. RESTING METABOLIC RATE (RMR)

(1) Supervision and observation of the RMR technician is carried out for adherence to the protocol, handling of subjects and care of the Metabolic Machine at frequent intervals. Retraining is carried out periodically and as needed.

(2) The RMR produces a permanent record printed by the instrument. Therefore the observations are not under direct control of the technician so that independent observations are not required.

(3) A set of routines are in effect whereby the technician checks out the generator and systematically checks out the Beckman Machine daily. The machine is checked with a 2 min. flow of calibrating gas once/week.

(4) Subjects are advised about the RMR procedure (two hour fast and no smoking before the RMR) one week in advance, one day in advance and on the morning of the test. The subjects are driven to the test site. Any febrile subject checked by thermometer will be rescheduled.

(5) Subjects rest thoroughly for 30 min prior to each test. The temperature of the test room is kept from over heating or being too cold. The subjects rest with the mask applied but not hooked up to the machine to get used to the mask. During the test should the subject hyperventilate (RQ exceeds 1.2). The readings are not taken as data and the subject is reassured. The subject is trained by the technician to check for and detect leaks around the face mask. The technician does this as well.

(6) Repeat Measurements

a) Three project staff have RMR's run on 2 consecutive mornings every month and the results comapred.

b) A 5% subsample of subjects per month have repeat RMR tests performed the morning after the regularly scheduled test.

c) Three senior investigators have had RMR measurements done at the Egypt Research site Kaloma, in Embu, Kenya and two will also have RMR's done at UCLA all within 4 to 6 weeks apart.

d) A difference of 2 percent in RMR values is acceptable in all the above repeat measures.

9. ACTIVITY OBSERVATIONS

Schoolyard and classroom behavior, mother-child interaction and Child-Care Giving activities are covered for quality control in a similar matter.

Quality control consists of supervision of enumerators and observation of their performance and coding. Simultaneous observation, recording and coding of activities by an independent observer is done on a 5% subsample.

Comment About Child Care Giving

There are problems with data collection in this area largely relating to some confusion about the necessity for observers to make judgments about the child care giving interactions. The quality control of judgments is a most complex area. At present, a modification in the method is being made to record the behaviors and activities observed rather than about the appropriateness of the activity or action taken. When the revisions are completed, by Dr. Paolisso, quality control will be reassessed.

10. TIME ALLOCATION

This data collection activity started in late February 1985 and is based on time-sampled ephemeral variables based on repeat 5-minute observations at different times of the day. Intensive ongoing training observation and supervision by the supervisor and senior scientists and simultaneous independent observations of the activity and of proper coding is to be done on a 5% subsample. Spot checking of the enumerators will be done as well.

LABORATORY QUALITY CONTROL

The following general measures are being employed.

a) Use of internal standards

b) "Unknowns" are provided by a reference laboratory

c) Split samples (duplicates) with bogus study numbers.

d) Repeat of determinations on a 5% subsample by a reference laboratory.

e) Exchange of samples among laboratories.

Embu Laboratory

1. Parasitology - Stool examinations for ova and parasites and Blood smears for malaria parasites.

   i) 2 technicians each examine a given stool specimen independently -

   ii) 5% subsample is sent to parastologist Dr. Pamba at University of Nairobi Medical School and blood smears for malaria parasites (one specimen per month) for stool examinations.

2. Hematology

   Hemaglobin

   - Use of internal standards at high, middle, low level

   - A standard curve is made up for each batch of specimens run

3. For hemaglobin, White blood Cell count and Hematocrit a 5% subsample (or 1 blood per 2 weeks) is run on a Coulter Counter in Nairobi and compared to

the manual methods used at Embu. Morphologic descriptions of Red Blood Cells compared to Coulter Red Blood Cell Indices obtained. The Coulter electronic Counting Method is an excellent standard. The technicians check each others work and the physician reviews blood smears for red cell and white cell morphology.

4. Ferritin

The internal standards or solutions of known Ferritin concentrations are run (high, medium, low) and curves constructed.

External quality control is run by Dr. Nell Kirksey, Purdue University, whose laboratory has been designated as a reference laboratory. A 5% subsample will be analyzed in her laboratory.

The quality control protocols for laboratory work (from ME) are being following and filed with ME. Laboratories out of control are reported to ME.

5. Crematocrit

These are run in duplicate

6. Lymphocytes

The senior Immunology technician from Kenya Medical Research Institute (KMRI) spends one or two days per month in Embu doing duplicate E. Rosette procedures and results are compared to those obtained by the Embu Technicians.

Because of the logistics of sending specimens to Nairobi having the technician come to Embu is preferable. Should it be possible to send specimens to Nairobi periodically then T. Cells can be determined using the Monoclonal Antibody method in Dr. Koech's Laboratory at KMRI.

A subsample of 20 specimens separated lymphocytes were frozen and sent to Dr. E.R. Stiehm's laboratory at UCLA for T. cell determination using monoclonal and standard sheep cells rosetting techniques. These results will be compared to T-cell values obtained at Embu. This is not useful as an ongoing method and tried only one time.

7. Quantitative Immunoglobutins, C-reactive protein, albumin, pre-albumin C3 and Transferrin

All of the above are being carried out by single radial immunodiffusion in duplicate. These run in Dr. Koech's laboratory in Nairobi using locally made agar plates. For the first batch of sera collected during the initial round a 30% subsample is being run by Dr. E.R. Stiehm which have been described as a reference laboratory for the above determinations.

Secretory IgA, IgG and Lysozyme

These are being run on breast milk and saliva.

A subsample will be sent to either Dr. Lars Hanson's laboratory or to Dr. Ronald Watson in Arizona when M.E. informs which Laboratory to use.

8. Food Analyses for Nutrient Composition

Duplicate samples on the main foods eaten (raw and cooked) will be and have been run in USA and Canada Toronto. There appears to be a problem with the protein analyses in Kenya and is being looked at in detail.

Examples

Reliability Study of Classroom & Playground Observation Measures

During February 1984, a small study was carried out in schools in the pilot area by the Activity enumerators and supervisors. The aim of this study was to determine the extent of interobserver agreement on the measures being used in the main study. For this purpose, pairs of enumerator observed the same child's behaviours simultaneously.

For the classroom observation, 18 children were observed, each in 3 classes. Three pairs of enumerators/supervisors saw 4 children while three pairs of enumerators/supervisors saw 2 children. The behaviours observed were "Talks", "Plays". "Off Task", "Out of the Room" and "None". Interscorer agreements were calculated with person product moment correlations. The r's are as follows: r = .71, .87, .93, .93, & .87 for the behaviors listed in respective order. These agreements are adequate for behavioral observations of this kind.

Playground observations were carried out for 12 school children. In this case, each pair of observers saw 2 school children in one playground period of 20 minutes. The behaviors coded were those listed on the playground observation computer form. Certain behaviors were so rarely observed that interscorer agreement could not be calculated. These behaviors were as follows: negative response to bid, seeks help, caretaking, and aggression. The codings for "high" and "too high" activity levels were combined because only one child was considered "too high". Finally, in the ratings of emotional state, the codes "angry" and "cries" were never recorded. Pearson product moment correlations were calculated for 6 behavioral codes, 3 activity levels, and 4 emotional states.

Interscorer agreement was good for the following behavioral codes: involved in ongoing activity (r=.90), solitary behavior (r=.82), leadership behavior (r=.94), and no behavior (r=.93). Interobserver agreement was poor for initiates interaction (r=.25) although the observers agreed in 10 of the 12 cases as to whether or not the child had ever initiated an activity. The interscorer agreement for "Negative Response to B'd" was also low (r=.10). Thus, we are accurate in our observations of the amount of involvement (measured in number of intervals), solitary behavior, and leadership behavior but rather less accurate in observing discrete initiate and response behaviors.

The observations of activity level showed that 55% of the intervals involved moderate activity, 25% involved low activity, and 19% involved high activity. Interrator reliabilities were surprisingly high for these ratings (r= .86 for moderate activity, r= .76 for low activity and r=.84 for high activity). Thus, there is a distribution of activity levels and accuracy in judging the frequency of level of activity for each child.

There was also some distribution of the 4 emotional states observed. Children most often appeared to be happy (70% of the intervals) but they were occasionally anxious (14%), sad (6%), and neutral (10%). The interrater reliability for number of intervals in each state for each child were respectable (rs =.79, .65, .95 & .85). Only the correlation for "anxious" is a bit low.

In order to determine whether some of the behavior ratings and emotional states were completely over lapping, correlations between several codings were calculated. While solitary children were more often rated as sad (r= .48) and involved children were more often rated as happy (r=.58) than sad (r= -.18), the correlations are not so high as to suggest that the observers are responding to only one factor in making the behavioral observation and ratings of emotional states.

To summarize this brief report, the small pilot study indicated that the schooler observations are largely accurate for the behaviors displayed with any frequency in the school setting.

Reliability Study of Maternal-Infant-Maternal-Toddler Observation

In February 1984 a small reliability study was carried out in the pilot area to determine the interscorer agreement of the interaction observations being done in the main study. The observations are done using a time-sampling procedure. The aim was to determine the extent to which pairs of observers agreed on the frequency (number of intervals) of the various behavioral codes for each infant or toddler.

To begin with the toddler interaction observation, 17 toddlers were seen by the 12 enumerators and 3 supervisors. Each pair of observers saw 2 toddlers, each for 40 minutes of observation. The codes used were those on the computer form. All the behaviors were coded with sufficient frequency to allow calculation of interscores agreements. It should be mentioned that the data sheets were collected from the observers immediately following the observations so that there was no opportunity to alter ratings. In addition, we urge the enumerators to carry out ratings idependently.

The interrater agreements were remarkably high as shown below: Care (r=.98), Carry (r=.98), Touch (r=.85), Talk (r=.90), Social Interaction (r=.93), and play with objects (r=.93). Toddler behaviors of vocalized (r=.89), cries (r=.96), and smiles (r=.96) were also coded with high agreement. The observers agreed on the type of play, be it simple (r=.87), functional (r=.87), or symbolic (r=.96).

In terms of responses to the toddler's vocalizations and cries, almost no response involved physical activity. Thus, interscorer agreement was only calculated for vocal response or no response. These agreements were slightly less high than for the interaction and toddler behavior codes but still respectable: Vocal response to toddler vocalization (r=.74); no response to toddler vocalization (r=.94); vocal response to toddler cries (r=.80); no response to toddler cries (r=69). Thus, on the major codes in the interaction observation, there was sufficient accuracy to justify using these codes in the main study.

The inter-observer reliability for the infant interactions were nearly as good. The observers carried out 14 paired observations. However three of these were repeat observation of the same child. Because such repeats tend to decrease the error variance and, therefore, spuriously inflate correlations, the second observations of the three children were not included in the calculations.

The behavior codes were those listed on the infant interaction coding form. For the 11 infants observed for 40 minutes each, the inter-observer agreements for all codes except 'touch' -(r=.63) were very high. The person product moment correlations for pairs of observers are as follows: care -r=.97, carry -r=.94, talk to -r=.89, look at each other r=.84, infant vocalizes -r.85, infant cries -r.93, and infant smiles -r=.81.

Infant vocalizations were rarely responded to with a physical activity alone. Respondents either used the vocal modality or a combined vocal/physical response. Interobserver agreement on the frequency of vocal responses was not too good (r=.58) but observers could agree on whether there was any response at all (r=.80). When vocal responses were combined with both vocal and physical responses, the correlation was somewhat higher (r=.65).

Infant crying was responded to mostly with a vocal response or a combined physical and vocal response although physical responses to infant crying were more frequent than to infant vocalization, as might be expected. Interobserver agreements as to whether a vocal response had agreed alone (r=.69) or incombination (r=.81), whether a physical response had occured alone (r=.65) or in combination (r=.99) and whether no response was shown (r=.92) were all adequate to very high.

In summary, the observers in the Activaty Group show remarkable interobserver consistency in the extent to which they observe and code both the toddler and infant interaction patterns.

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