PD-ABJ-635
91198

Women and Infant Nutrition Field Support Project (WINS)

WINS Project Consultant's Visit to
Uganda

Anthropometric Training Report

July 11 to July 15, 1994

SUBMITTED BY:

Irwin Shorr, MPH, MPS
Consultant in Anthropometry

Education Development Center, Inc.
1250 24th Street, N.W., Suite 300
Washington, DC 20037

August 1, 1994

This assignment was supported by the Women and Infant Nutrition Field Support Project (WINS) under U.S.A.I.D. Contract No. DAN-5117-Q-00-0016-00 with Education Development Center, Inc.

I.J. Shorr, July 1994

MOH/CHDC/WINS Uganda Program
Anthropometric Training Report
July 11 - 15, 1994
Iganga, Uganda

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SUMMARY REPORT
MOH/CHDC/WINS Uganda Program--Anthropometric Training
Iganga, Uganda
July 11 - 15, 1994
Irwin J. Shorr, MPH, MPS

As part of the MOH/CHDC/WINS Uganda Program, preschool-age children and their mothers will be weighed and measured in their households during the baseline survey. Weighing and measuring, i.e., anthropometry, will be done by interviewers on the survey. There will be 5 two-person teams on the survey. Each team consists of two interviewers who will collect all the data on the baseline survey and will weigh and measure selected children and their mothers in households.

The purpose of this summary report is to present the training activities that took place from July 7 - 15, 1994. This consultant worked closely with Dr. Jessica Jita, Director of the Child Health and Development Centre (CHDC), Makerere University, Kampala, and with Mrs. Louise Sserunjogi, Nutritionist with CHDC. Meetings took place on July 7, 8 and 9 to plan the week of anthropometric training in Iganga and to complete training materials and final preparations for the training.

The three anthropometric measurements included in the survey are height, weight and mid-upper arm circumference (MUAC) of preschool-age children and their mothers (MUAC will not be taken on children less than one year of age). The anthropometric measuring instruments used during this training period have been used worldwide on a variety of surveys.

Anthropometric training took place in Iganga during the week of training for the other survey components from July 11 - 15. Twelve people from Iganga District including the District Medical Officer (DMO), were trained in all survey components. Anthropometric training took place for approximately two to three hours each day for the five-day training period in three sites:

1. Presentations, exercises, training and practice for adult measurements (i.e., for application on mothers during the survey) were done on each other in the hall adjacent to the DMO's office, Iganga.
2. Anthropometric training and practice of all measurements of preschool-age children approximately three to five years old took place at the Fairway Nursery School, Iganga. Additionally, a standardization test to evaluate the competency of taking standing height took place at this school on Friday, July 15.
3. Anthropometric training and practice of recumbent length and weight of infants and standing height and weight of mothers took place at the Namungalwe Health Centre.

A field trial took place on Thursday afternoon and early evening, July 14, where all survey components, including anthropometry, were implemented in rural households in Iganga. The field trial was discussed on Friday morning, July 15.

Data collection for the Iganga survey is scheduled to begin in mid-August. Similar training and data collection is scheduled to begin in August in Rukungiri.

Sincere appreciation is expressed to the staff at CHDC, Makerere University, Dr. Jessica Jita, Director, CHDC; Mrs. Louise Sserungogi, Nutritionist, CHDC; Mr. Danstan Bagenda, Makerere University; Dr. James Baguma, DMO, Iganga District; Mrs. Rose Nabulumba, Fairway Nursery School Teacher, to the children of Fairway Nursery School, to the mothers and children of Namungalwe Health Centre and to the families in Iganga who allowed us to visit their homes and weigh and measure mothers and their children.

Sincere appreciation is also expressed to Ms. Bibi Essama, Director, WINS Project, EDC, Washington, D.C. for the opportunity to work on this project. Also, appreciation is expressed to Mr. Jose Lagos, also from the WINS Project, for his assistance in facilitating this consultant's work assignment.

MOH/CHDC/WINS UGANDA PROGRAM
ANTHROPOMETRIC TRAINING IN IGANGA

1.0 INTRODUCTION

As part of the MOH/CHDC/WINS Uganda Program, preschool-age children and their mothers will be weighed and measured in their households during the baseline survey. Weighing and measuring, i.e., anthropometry, will be done by interviewers on the survey.

The purpose of this report is to present the anthropometric training activities that took place from July 7 - 16. This consultant worked in Uganda from July 7 - 16. Training took place in Iganga from July 11 - 15.

*2.0 BRIEF BACKGROUND: THE MOH/CHDC/WINS UGANDA PROGRAM

"In 1992, the Ministry of Health Nutrition Division, in close collaboration with the Child Health and Development Centre (CHDC) conducted an assessment on breastfeeding and young child growth faltering. Logistical and technical support was provided by WINS Project, USAID and UNICEF. The objective of the assessment was to identify community and household level constraints to optimal child feeding and growth and to suggest appropriate entry points and approaches for addressing them. The two districts selected for the indepth study were among the most malnourished areas in the country; the Eastern district of Iganga and the South Western district of Rukungiri.

"The main recommendation from the assessment included the need to strengthen the capacity of district management teams to assess and analyse the nutritional problems affecting their regions and to design cost effective community-based strategies to address them. The Programme goal is to optimise the growth of infants and young children and improve the nutritional status of women in the pilot districts - Rukungiri and Iganga.*" The General Objective of the Workshop held in Iganga is "To enhance the capacity of the district in research methodology.*"

3.0 ANTHROPOMETRIC MEASUREMENTS, MEASURING INSTRUMENTS, EQUIPMENT AND UNITS AND TRAINING MATERIALS

The three anthropometric measurements included in the survey are height, weight and mid-upper arm circumference (MUAC) of preschool-age children and their mothers (MUAC will not be taken on children less than one year of age). The following are the measurements

*From: "Research Methodology Training Workshop; Iganga District, 11th - 15th July 1994; Child Health and Development Centre, Makerere University."

that will be taken on this survey, with measuring instruments and units. The measuring instruments used on this survey have been used in similar surveys worldwide.

Measurement	Measuring Instrument	Units
Weight	Seca Model 770 Floor Scale	0.1 kg
Height	Shorr Height Measuring Board	0.1 cm
Mid-Upper Arm Circumference (MUAC) for Children 1 - 5 years old	Three-Colored Insertion Tape	0.1 cm
MUAC for Adults	Ross Insertion Tape	0.1 cm

Each team of two people will have one complete set of measuring instruments and equipment (see Annex C, "Anthropometric Measuring Instrument and Equipment Checklist" in the Anthropometric Training Manual). Ten sets of measuring instruments will be available for both Iganga and Rukungiri sites. All the measuring instruments were transported with this consultant on arrival in Uganda.

This consultant wrote and compiled the anthropometric training manual used during training and left the following anthropometric training materials with Dr. Jessica Jita for use on subsequent anthropometric training sessions such as in Rukungiri:

1. A copy of the manual, "How To Weigh And Measure Children," I.J. Shorr, U.N., New York, 1986.
2. Anthropometric materials written by this consultant for overhead transparencies.
3. Copies of the National Center for Health Statistics Growth References.
4. Supervisor Anthropometric Qualitative Checklist.

4.0 THE ANTHROPOMETRIC QUESTIONNAIRES

The anthropometric questionnaires for both children and their mothers appear in Annex A. Discussions were held with Dr. Jita and Mrs. Sserungogi about providing more space to write the anthropometric measurements, particularly for height and a section for comments at the bottom of each of the questionnaires.

5.0 PERSONNEL AND DUTIES

There will be 5 two-person teams on the survey. Each team consists two interviewers who will collect all the data on the baseline survey and will weigh and measure selected children and their mothers in households. Dr. Jessica Jita and Mrs. Louise Sserungogi will supervise all data collection in the field including the anthropometric data.

6.0 ANTHROPOMETRIC TRAINING (See Annex B, Anthropometric Training Schedule)

Anthropometric training took place in Iganga during the week of training for the other survey components from July 11 - 15. Twelve people from Iganga District including the DMO, were trained in all survey components. The following were the objectives of the anthropometric training:

a. To learn to weigh and measure children and their mothers.
b. To understand principles of weighing and measuring (i.e., terminology, definitions, measurement error, quality control, measurement procedures, etc.).
c. To become familiar with characteristics of anthropometric measuring instruments.

There was a total of a little more than 12 hours of anthropometric training over the five-day training period (i.e., between two to four hours each day; see Table 1 below).

Table 1
Anthropometric Training Time in Iganga
Monday - Friday, July 11 - 15, 1994

Day	Time	Hours	Minutes
Monday	4:30 - 6:38 PM	2	8
Tuesday	8:40 - 8:50 AM		10
	4:35 - 6:45 PM	2	10
Wednesday	10:20 AM - 1:33 PM	3	13
	2:18 - 2:50 PM		32
Thursday	10:40 AM - 12:25 PM	1	45
	12:55 - 1:46 PM		51
Friday	11:15 AM - 12:30 PM	1	15
		9 hours	184 min =
	Total	12 hours	4 min

Anthropometric training took place in three sites:

1. Presentations, exercises, training and practice for adult measurements (i.e., for application on mothers during the survey) were done on each other in the hall adjacent to the DMO's office, Iganga.
2. Anthropometric training and practice of all measurements of preschool-age children approximately three to five years old took place at the Fairway Nursery School, Iganga. Additionally, a standardization test to evaluate the competency of taking standing height took place at this school on Friday, July 15.

3. Anthropometric training and practice of recumbent length and weight of infants and standing height and weight of mothers took place at the Namungalwe Health Centre.

A field trial took place on Thursday afternoon and early evening, July 14, where all survey components, including anthropometry, were implemented in rural households in Iganga. The field trial was discussed on Friday morning, July 15.

Data collection for the Iganga survey is scheduled to begin in mid-August. Prior to the beginning of data collection, it is planned that Mrs. Sserungogi will conduct a practice session on anthropometric measurements with the interviewers. Similar training and data collection is scheduled to begin in August in Rukungiri.

7.0 ANTHROPOMETRIC STANDARDIZATION TESTING (See Annex C, Anthropometric Standardization Test Results)

The purpose of an anthropometric standardization test is to evaluate the competency of enumerators' ability to take measurements. Because of time constraints, only standing height of preschool-age children was tested. Standing height of preschool-age children was tested using children from the Fairway Nursery School in Iganga. Independent* replicate measurements of standing height were taken on two groups of children (five children/group). The interviewers were divided into two groups (six interviewers/group) to lessen the burden of multiple measurements on the children (i.e., Group 1 measured children 1 - 5; Group 2 measured children 6 - 10). Both Mrs. Sserungogi and this consultant took replicate measurements of standing height on both groups of children.

Replicate measures were taken by each interviewer so that "reliability" can be evaluated (i.e., the ability of an interviewer to take replicate measures with minimum variation) as well as "accuracy" (i.e., the ability of an interviewer to approximate "true" height measurements as determined by the trainer's measurements).

The results of the standardization tests appear in Annex C. The raw data to these tests were left with Dr. Jita on July 15, just prior to this consultant's departure from Uganda on July 16.

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*Interviewers worked in teams of two people/team for the test. One team member took his/her first set of standing height measurements on all five children followed by his/her team partner who took the first set of standing height measurements on the same children. The first team member then took his/her second set of height measurements on the same children followed by his/her team partner who took the second set of height measurements on the same children. Team partners were instructed not to tell each other their respective height measurement results during the test.

Since there were two separate groups of children that were measured by two separate groups of interviewers, the data from each group was evaluated separately. There are, however, three common features between the two groups of interviewers' results. First, with few exceptions (described for those interviewers of concern below), overall, interviewers measured extremely well for both reliability and accuracy on the test. Second, when measurements were classified as "inaccurate" using the criteria described in Annex C, page 20, all but two of the inaccurate measurements were lower (i.e., negative, "-") in comparison to the trainer's results. That is, of the 28 measurements classified as "inaccurate" (i.e., see "+/-" column on page 19), 26 of these measurements (93%) were lower than the trainer's measurements on the same children. This may indicate that the knees of children may have been bent slightly or the head not placed in the correct position. Third, there is approximately an even distribution of "inaccurate" results between the groups (16 for Group 1 and 12 for Group 2).

On examination of the raw data (pages 22 and 23), many of the "inaccurate" results were only slightly out of range (ranges are presented on page 24) as determined by the trainer's results. Of particular note are the measurement results and measurement error statistics of Dr. James Baguma, who measured the best of all the trainees with the lowest Technical Error of Measurement (i.e., had the best reliability of any of the two groups, including in comparison to the trainer's results) and the best accuracy (100%) in comparison to the trainer's measurements.

A bias in any one direction (i.e., "+" or "-") was determined when either the number of "+" or "-" were at least three times the other. That is, five interviewers had a bias in the negative direction (i.e., measured lower when compared to the trainer's results); Mrs. Sserungogi, M. Maseege, Mary B., Robert Omodin and Ruth Namusaabi (see results for "Net Bias %" with an "*" on page 21). However, as mentioned in the above paragraph, most of these results were only slightly out of the ranges as determined by the trainer's results.

Of greater concern were the measurements of Mary B. from Group 1 who had the highest ΣD^2, 8.91; and corresponding high Technical Error of Measurement, .94; (i.e., had the most problems in duplicating measurements on the same children). The problem seems to be accounted for mostly by the replicate measurements of child #1 where there was a 2.5 cm difference as well as a 1.6 cm difference between replicate measurements of child #4 (page 22).

Of some concern was the reliability of measurements of Margaret Mpiira who had the second highest Technical Error of Measurement (.75), which was accounted for mostly by a 2.2 cm difference in replicate measurements of child #8 (page 23). Her accuracy however was determined as very good (90%) in comparison to the trainer's results.

Stephen's reliability was of some concern where there was a 1.7 cm difference between replicate measurements of child #6 (page 23). His accuracy was also of some concern with 70%, but no bias (page 21).

Of less concern were the measurements of Ruth Babirye, where there was a 1.6 cm difference between replicate measurements of child #9 (page 23). Her accuracy was determined as good (80% in comparison to the trainer's results; page 21).

Therefore, it is recommended that the following interviewers be given more practice (listed in order of greatest concern):

- Mary B. (lowest reliability, TE = .94; and second lowest accuracy, 60%)
- Margaret Mpiira (low reliability, TE = .75)
- Stephen (somewhat low reliability, TE = .61; and low accuracy, 70%)
- Robert Omodin (lowest accuracy, 50%; although reliability was good, TE = 1.31)
- Ruth Babirye (fair reliability, TE = .52; and good accuracy, 80%)

8.0 OTHER RELATED ACTIVITES

On Friday morning, July 8, Mrs. Sserungogi and this consultant briefly visited Mr. David Puckett, Technical Advisor for Child Survival, USAID, Kampala to discuss the overall plan and schedule of training during this work period of July 7 - 15. As Mr. Puckett requested, this consultant wrote a preliminary summary report (similar to the Summary Report that appears in this report) and faxed it to Mr. Puckett on July 16 prior to this consultant's departure from Uganda.

On Friday afternoon, July 8, this consultant gave a seminar, "Anthropometric Nutritional Status Assessment" at CHDC. Several slides of other similar surveys worldwide where this consultant has worked were shown.

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 The anthropometric training that was held in Iganga was effective. The anthropometric training objectives were met (see Section 6.0, "Anthropometric Training" on page 5).

9.2 It was planned that Mrs. Sserungogi will conduct a practice session just prior to the beginning of data collection. The interviewers whose weighing and measuring problems were identified through the standardization test (listed above; Section 7, page 8) should be observed more closely during this practice session and during data collection.

9.3 In future training sessions, it would be beneficial to conduct a standardization test for mid-upper arm circumference on preschool-age children. Time constraints did not permit further testing beyond child standing height. The decision was made to select child standing height for testing since it is one of the most difficult, and perhaps, the most important of all the measurements on this study to implement. Although recumbent length is probably the most difficult measurement to implement because of the age of the children (i.e., less than two years of age), it is extremely difficult to conduct a standardization test with several interviewers on a group infants in a clinic setting where multiple measurements on each child is required.

9.4 It should be noted that the training and practice session held at the Namungalwe Health Centre on infants and their mothers was exceptional. In the experience of this consultant, it is extremely rare to have so many infants (less than one year of age) to practice on in one location.

ANNEX A

The two anthropometric questionnaires appear on the following two pages:

Page
Children's Health Status.....11
Maternal Nutrition.....12

8. 18 CHILDRENS HEALTH STATUS (UNDER 5 YEARS OF AGE)

Name of Child	Date of Birth	Age (mths)	Sex F or M	Immunisation Card Yes 1 No 2	ATHROPOMETRY			IMMUNISATION HISTORY				ANY ILLNESS PAST TWO WEEKS
					Weight (Kg)	Height (Cm)	M.U.A.C. (cm)	B.C.G.	POLIO	DPT	Measles	

CODES

Sex

Male (1)	0
Female (2)	1

Immunisaton

Bcg	Polio	Dpt	Measles
0	0	0	0
1	1	1	1
	3	3	

(0 = None)

9. MATERNAL NUTRITION

9.1. Women of chiid bearing Age in the Househcld 15 - 49 years.

NAME	AGE	PARITY	CURRENTLY PREGNANT YES/NO	WEIGHT	HEIGHT	M.A.C.

9.2 List foods prohibited (avoided) in pregnancy.

_____

_____

_____

ANNEX B

Annex B
Anthropometric Training Schedule

Thursday, July 7, 1994
Shorr met Mrs. Louise Sserunjogi, Nutritionist with CHDC and other staff members. Discussions took place concerning the planning for next week's training in Iganga.

Friday, July 8, 1994
9:15 - 9:45 AM, Shorr and Mrs. Sserunjogi met.
9:50 - 10:15 AM, Shorr and Mrs. Sserunjogi met with Dr. Jessica Jita, Director, CHDC.
10:30 - 10:50 AM, Shorr and Mrs. Sserunjogi met with Mr. David Puckett at USAID, Kampala.
11:00 - 11:40 AM, Shorr and Mrs. Sserunjogi met at CHDC to discuss training for next week.
11:45 AM - 1:10 PM, Shorr worked on completion of anthropometric training manual and preparation for afternoon seminar.
1:20 - 2:00 PM, Lunch
2:05 - 2:40 PM, Shorr completed preparations for seminar.
2:45 - 4:30 PM, Seminar given by Shorr at CHDC, "Anthropometric Nutritional Status Assessment."
4:30 - 5:45 PM, Shorr met with Mrs. Sserunjogi and Dr. Jita

Saturday, July 9, 1994, at CHDC
9:30 - 10:00 AM, Shorr met with Mrs. Sserunjogi and Dr. Jita to discuss timetable for next week's training.
10:00 - 3:30 PM, Shorr and Mrs. Sserunjogi worked at CHDC in preparation for anthropometric training, etc. Shorr completed anthropometric training manual. Anthropometric training manual photocopied by CHDC personnel.

Sunday, July 10, 1994
2:45 - 4:30 PM, Dr. Jita, Mrs. Sserungogi, Shorr drove to Iganga.
4:30 - 5:30 PM, Met Dr. James Baguma, District Medical Officer, Iganga; discussed training, viewed training site and organized measuring instruments and equipment.

Monday, July 11, 1994
8:30 AM - 12:30 PM, Shorr visited the following three schools for possible weighing and measuring children practice:
1. Butt villa Kindergarten
2. New Integrate School
3. Fairway Nursing School

4:30 - 6:38 PM, Shorr began Introduction to Anthropometry:
1.0 OPENING DISCUSSION
1.1 Introductory comments
1.2 Distribution of training manual
1.3 Overview of anthropometry training schedule for the week

Annex B
Anthropometric Training Schedule, cont'd

1.4 Presentation of Objectives
- a. To learn to weigh and measure children and their mothers.
- b. To understand principles of weighing and measuring (i.e., terminology, definitions, measurement error, quality control, measurement procedures, etc.).
- c. To become familiar with characteristics of anthropometric measuring instruments

1.5 Discussion of "simplicity" of anthropometric measurements.

2.0 DEFINITIONS

2.1 Anthropometry (Body Measurements)

2.2 Measurements on this survey:
- a. Height
  - (1) Standing height of children $\geq$ 2 years old and their mothers
  - (2) Recumbent length of children $<$ 2 years old and their mothers
- b. Weight of sampled preschool-age children and their mothers
- c. Mid-upper arm circumference (MUAC) of sampled preschool-age children and their mothers

2.3 Malnutrition--means "bad" nutrition and includes:
- a. Undernutrition (see 2.4 below) and
- b. Overnutrition (i.e., obesity)

2.4 Anthropometric Index: mathematical relationship

Index	When "Low", i.e., undernutrition
a. Weight-for-Age	Underweight
b. Height-for-Age	Stunting
c. Weight-for-Height	Wasting

Explanation and discussion of each index including issues of "emergency" nature of wasting, and longer term relationship of stunting and poverty.

2.5 Indicator

2.6 Additional (Concept of anthropometry as it relates to individuals vs. groups):
- a. Cross-sectional surveys
- b. Surveillance
- c. Monitoring (e.g., Growth monitoring using individuals over time; i.e., growth charts)

Annex B
Anthropometric Training Schedule, cont'd

3.0 ANTHROPOMETRIC MEASUREMENTS, MEASURING INSTRUMENTS AND UNITS, MEASURING INSTRUMENT CRITERIA, CHARACTERISTICS AND CARE

4.0 IMPORTANCE OF ACCURACY
4.1 Proper classification
4.2 Associations with other geographic, national, regional or household variables

5.0 TYPES OF ANTHROPOMETRIC ERRORS
5.1 Instruments (minimal)
5.2 Measuring procedures/techniques
5.3 Reading errors
5.4 Recording errors
Examples of each of these errors shown and explained

6.0 BEGAN SUMMARY DISCUSSION OF "RECORDING MEASUREMENTS"

Tuesday, July 12, 1994
At training centre

8:40 - 8:50 AM; Presentation (i.e., review) of nutritional status definitions, "Malnutrition," "Undernutrition," "Underweight," "Wasting," "Stunting" (relationship of stunting to poverty reviewed).

11:30 - 12:30 PM; Shorr visited two centres, Namungalwe and Busesa, to arrange for possible practice of weighing and measuring very young children.

4:35 - 6:45 PM; Shorr continued the following training activities at the training centre:

1. Method of recording numbers for measurements:

   1 2 3 4 5 6 7 OR 7 8 9 0

2. Mathematical definitions of stunting, wasting and underweight using percent of international growth reference median with examples. Explanation of cut-off points using percent of median and standard deviation units (i.e., "Z-score").

3. Reading numbers exercise using height measuring boards (3 groups, 4 people/group using 3 measuring boards); 10 minutes.

4. Training and demonstration of standing height procedure of adults (i.e., mothers) and children including differences between measuring adults and children; proper position of head, feet and knees. All practice in groups proper head position (i.e., "Frankfort Plane).

Annex B, cont'd

Wednesday, July 13, 1994
At training centre

10:20 - 10:50 AM; Assemble and dismantle height measuring boards.
10:50 - 11:20 AM; Demonstration and training of adult height; 3 teams of 2 people/team repeat demonstration in front of rest of group.
11:20 AM - 12:05 PM; All practice adult height in 3 groups (4 people/group).
12:07 - 12:30 PM; Demonstration and practice removing and replacing batteries from scale.
12:30 - 12:55 PM; Demonstration of weight (mother <u>or</u> child <u>alone</u> on scale); 3 teams (2 people/team) repeat demonstration in front of rest of group followed by all teams practice weight in 3 groups (4 people/group).
12:55 - 1:02 PM; Demonstration of weighing infant or young child that must be held by mother (use of weighing mother with blanket demonstrated and practiced).
1:05 - 1:33 PM; Begin mid-upper arm circumference (MUAC) training on adults.
1:35 - 2:15 PM; Lunch
2:18 - 2:48 PM; Complete MUAC training on adults. Two teams repeat demonstration in front of rest of group followed by all teams practice MUAC on each other in 4 groups (3 people/group).
2:48 - 2:50 PM; Review of day's session.

Thursday, July 14, 1994
At Fairway Nursing School

10:40 AM - 12:25 PM; With first group (7 people):

10:40 - 11:20 AM:
1. Demonstration of standing height and weight of children. All 7 people repeat demonstration in front of rest of group (2 teams of 2 people/team and 1 team of 3 people).

2. Demonstration of MUAC of children using 25 cm tri-coloured tape. Two teams (2 people/team) repeat demonstration in front of rest of group.

11:20 AM - 12:25 PM:
3. All 7 people practice standing height, weight and MUAC of children in 3 teams (2 people/2 teams and 3 people/third team).

Annex B, cont'd

11:20 AM - 12:25 PM; With second group (5 people):

11:20 - 11:53 AM:
1. Demonstration of standing height and weight of children. All 5 people repeat demonstration in front of rest of group (2 teams of 2 people/team and 1 team of 3 people).

2. Demonstration of MUAC of children using 25 cm tri-coloured tape. Two teams (2 people/1 team and 3 people/second team) repeat demonstration in front of rest of group.

11:55 AM - 12:25 PM:
3. All 5 people practice standing height, weight and MUAC of children in 2 teams (2 people/1 team and 3 people/second team).

12:40 - 12:50 PM; All drive to Namungalwe Health Centre
12:55 - 1:15 PM; Demonstration of recumbent length and weight of infants held by mother on scale. Two teams (2 people/team) repeat demonstration of length and weight in front of rest group.
1:20 - 1:35 PM; All practice recumbent length and weight of infants in 4 groups (3 people/group).
1:38 - 1:46 PM; Discussion of day's work and pack up.

3:30 - 7:30 PM; Field trial of all of survey questionnaire including anthropometry. Dr. Jita, Mrs. Sserunjogi and Shorr observed teams in field.

Friday, July 15, 1994
At Fairway Nursing School

11:15 - 11:35 AM; All practice child height, weight and MUAC in teams (six teams of 2 people/team).

11:38 - 12:20 PM; Standardization test administered for child standing height with two groups of children:

Group 1	6 people tested	Children #1-5
Group 2	"	Children #6-10

12:20 - 12:30 PM; Closing discussion.

ANNEX C

Annex C
ANTHROPOMETRIC STANDARDIZATION TEST RESULTS

The following documents are enclosed in this annex:

Page
Description of Measurement Error Statistics Used.....19
Measurement Error Statistics of Each Measurer.....21
Raw Data of Anthropometric Standardization Test.....22
Trainer's Statistics for Accuracy Evaluation.....24

DESCRIPTION OF MEASUREMENT ERROR STATISTICS USED

The following is a summary of the measurement error statistics computed from each interviewer's measurements from the standardization test:

1. <u>The Technical Error of Measurement</u> ("Unreliability Standard Deviation"):
The Technical Error of Measurement (TE) is a fundamental equation that is needed for the actual estimation of variance components from data on repeated measures. It is the basis for other estimations of variance; i.e., for estimations of both "reliability" and "accuracy."

$$TE = \sqrt{\frac{\Sigma d^2}{2n}}$$

which is the square root of the sum of the differences between replicate measures squared divided by twice the number of subjects being measured. The smaller the TE, the better the observer is in replicating measurements. The closer the TE of observers (i.e., trainees) comes to the TE of the trainer, the better the reliability.

2. <u>Error Ratio</u>:
The error ratio (ER) grades the "relative reliability" of each observer. The ER essentially "standardizes" each observer's technical error and further facilitates comparisons among observers. The closer the ER is to 1.0, the better; if an observer's ER is less than 1, then the reliability of that observer is better than the trainer.

$$ER = \frac{\text{TE of Trainee}}{\text{TE of Trainer}}$$

3. <u>Coefficient of Variation (CV%)</u>
The coefficient of variation (CV%) rescales each observer's technical errors (TE) by dividing by the mean of their measurements across all subjects for each procedure, thereby facilitating comparisons among observers.

$$CV\% = \frac{TE}{Mean} \times 100$$

The lower the CV%, the better.

4. <u>Accuracy</u>:
Accuracy is the ability of an observer to estimate the "true" value of a particular measure. The trainer's values are used to estimate the "true" value. Accuracy is graded by determining the percentage of means of repeated measurements by each observer for each measure that falls within an interval (i.e., similar to a "confidence interval") bounded by the trainer's measurement ± 3 X the reference TE (i.e., the TE of the trainer).

$$\%A = \frac{\text{n of measurements within 3X TE of the trainer}}{\text{total n of measurements}}$$

The closer the %A is to 100%, the more accurate the observer's measurements.

5. <u>Plus or Minus</u>: "+" or "-"
Values falling outside the "confidence interval" are considered "errors" and scored as positive (+) or negative (-) according to whether they are greater or less than the upper or lower limits of the interval. The "+" and "-" are expressed as a ratio (+/-). A "bias" is considered to exist for an observer's measurements when the number on one side of the ratio is three or more times greater than the number on the other side.

$$+/- = \frac{\text{n of positive errors}}{\text{n of negative errors}}$$

MOH/CHDC/WINS UGANDA PROGRAM
ANTHROPOMETRIC STANDARDIZATION TEST RESULTS
MEASUREMENT ERROR STATISTICS
STANDING HEIGHT OF PRESCHOOL-AGE CHILDREN
Iganga, Uganda
July 15, 1994

GROUP 1	RELIABILITY				ACCURACY		
	Σd^2	TE	ER	CV%	%A	+/-	Net Bias %
Shorr	.59	.24	--	.21	--	---	----------
Sserungogi	.76	.28	1.1	.24	70% (7/10)	0/3	0-3/3= -100%*
M. Maseege	.59	.24	1.0	.21	70% (7/10)	0/3	0-3/3= -100%*
Shaban	1.44	.38	1.6	.33	100% (10/10)	0	0
James Baguma	.27	.16	.68	.14	100% (10/10)	0	0
Moses Kawikizi	1.18	.34	1.4	.3	90% (9/10)	0/1	0-1/1= -100%
Mary B	8.91	.94	3.9	.83	60% (6/10)	0/4	0-4/4= -100%*
Robert Omodin	1.31	.36	1.5	.32	50% (5/10)	0/5	0-5/5= -100%*

GROUP 2	RELIABILITY				ACCURACY		
	Σd^2	TE	ER	CV%	%A	+/-	Net Bias %
Shorr	.71	.27	--	.23	--	---	----------
Sserungogi	1.38	.37	1.4	.33	100% (10/10)	0	0
Maria	.99	.31	1.2	.28	90% (9/10)	0/1	0-1/1= -100%
Ruth Babirye	2.74	.52	2.0	.46	80% (8/10)	1/1	1-1/2= 0
Moses Kalulu	.59	.24	.9	.22	80% (8/10)	0/2	0-2/2= -100%
Margaret Mpiira	5.62	.75	2.8	.66	90% (9/10)	0/1	0-1/1= -100%
Stephen	3.67	.61	2.3	.54	70% (7/10)	1/2	1-2/3= -33.3%
Ruth Namusaabi	.88	.3	1.1	.26	70% (7/10)	0/3	0-3/3= -100%*

*Bias exists

MOH/CHDC/WINS UGANDA PROGRAM
RAW DATA ANTHROPOMETRIC STANDARDIZATION TEST--GROUP 1
STANDING HEIGHT OF PRESCHOOL-AGE CHILDREN
July 15, 1994

Shorr	a	b	a - b	SQUAREDIF	SUMdSQR
1	111.6	112.1	-0.5	0.25	0.59
2	116	116.1	-0.1	0.01	
3	116.3	116.8	-0.5	0.25	
4	108.2	108	0.2	0.04	
5	118.3	118.5	-0.2	0.04	

Louise Sserungogi	a	b	a - b	SQUAREDIF	SUMdSQR
1	111.6	112	-0.4	0.16	0.76
2	115.4	115.3	0.1	0.01	
3	115.9	115.8	0.1	0.01	
4	107.4	107.7	-0.3	0.09	
5	117	117.7	-0.7	0.49	

Margaret Maseege	a	b	a - b	SQUAREDIF	SUMdSQR
1	111.4	111.1	0.3	0.09	0.59
2	115.1	115.6	-0.5	0.25	
3	115.6	116.1	-0.5	0.25	
4	108	108	0	0	
5	117.6	117.6	0	0	

Shaban	a	b	a - b	SQUAREDIF	SUMdSQR
1	111.6	111.4	0.2	0.04	1.44
2	115.4	115.6	-0.2	0.04	
3	116.2	116.2	0	0	
4	108.5	107.5	1	1	
5	118.4	117.8	0.6	0.36	

James Baguma	a	b	a - b	SQUAREDIF	SUMdSQR
1	111.4	111.4	0	0	0.27
2	115.4	115.3	0.1	0.01	
3	116.3	116.2	0.1	0.01	
4	108.1	107.6	0.5	0.25	
5	117.7	117.7	0	0	

Moses Kawikizi	a	b	a - b	SQUAREDIF	SUMdSQR
1	111.5	111.5	0	0	1.18
2	115.5	115.5	0	0	
3	116.9	116	0.9	0.81	
4	107.9	108	-0.1	0.01	
5	118	117.4	0.6	0.36	

Mary B	a	b	a - b	SQUAREDIF	SUMdSQR
1	111.5	109	2.5	6.25	8.91
2	115.3	115	0.3	0.09	
3	116.1	116	0.1	0.01	
4	108.6	107	1.6	2.56	
5	117.6	117.6	0	0	

Robert Omodin	a	b	a - b	SQUAREDIF	SUMdSQR
1	111.4	111.4	0	0	1.31
2	115.2	115.2	0	0	
3	115.4	115.9	-0.5	0.25	
4	107.7	106.8	0.9	0.81	
5	117.2	117.7	-0.5	0.25	

MOH/CHDC/WINS UGANDA PROGRAM
RAW DATA ANTHROPOMETRIC STANDARDIZATION TEST--GROUP 2
STANDING HEIGHT OF PRESCHOOL-AGE CHILDREN
July 15, 1994

Shorr	a	b	a - b	SQUAREDIF	SUMdSQR
6	115.5	115.9	-0.4	0.16	0.71
7	111.6	111.4	0.2	0.04	
8	112.4	113.1	-0.7	0.49	
9	109.4	109.3	0.1	0.01	
10	117.9	118	-0.1	0.01	

Louise Sserungogi	a	b	a - b	SQUAREDIF	SUMdSQR
6	114.6	115.5	-0.9	0.81	1.38
7	111.3	111.3	0	0	
8	112.8	112.3	0.5	0.25	
9	108.7	109.1	-0.4	0.16	
10	117.4	117.8	-0.4	0.16	

Maria	a	b	a - b	SQUAREDIF	SUMdSQR
6	115	115	0	0	0.99
7	110.9	111.2	-0.3	0.09	
8	112.2	112.5	-0.3	0.09	
9	109.3	108.4	0.9	0.81	
10	117.5	117.5	0	0	

Ruth Babirye	a	b	a - b	SQUAREDIF	SUMdSQR
6	115.5	115.6	-0.1	0.01	2.74
7	111.3	111	0.3	0.09	
8	112.4	112.2	0.2	0.04	
9	110.3	108.7	1.6	2.56	
10	117.3	117.5	-0.2	0.04	

Moses Kalulu	a	b	a - b	SQUAREDIF	SUMdSQR
6	115.2	115.2	0	0	0.59
7	111.2	110.9	0.3	0.09	
8	112	111.5	0.5	0.25	
9	108.7	108.3	0.4	0.16	
10	117.5	117.2	0.3	0.09	

Margaret Mpiira	a	b	a - b	SQUAREDIF	SUMdSQR
6	115.5	115.3	0.2	0.04	5.62
7	110.6	111	-0.4	0.16	
8	112.2	114.4	-2.2	4.84	
9	109.2	108.5	0.7	0.49	
10	117.8	117.5	0.3	0.09	

Stephen	a	b	a - b	SQUAREDIF	SUMdSQR
6	116.7	115	1.7	2.89	3.67
7	111.2	111.1	0.1	0.01	
8	112	112.5	-0.5	0.25	
9	109	108.4	0.6	0.36	
10	117.9	117.5	0.4	0.16	

Ruth Namusaabi	a	b	a - b	SQUAREDIF	SUMdSQR
6	115.1	115.2	-0.1	0.01	0.88
7	110.1	110.8	-0.7	0.49	
8	112.2	112.1	0.1	0.01	
9	108.9	108.3	0.6	0.36	
10	117.7	117.8	-0.1	0.01	

MOH/CHDC/WINS UGANDA PROGRAM
ANTHROPOMETRIC STANDARDIZATION TEST
TRAINER'S "CONFIDENCE INTERVAL" FOR ACCURACY EVALUATION
STANDING HEIGHT OF PRESCHOOL-AGE CHILDREN
July 15, 1994

GROUP 1

Shorr	a	b
1	111.6	112.1
2	116	116.1
3	116.3	116.8
4	108.2	108
5	118.3	118.5

3xTE	meanBC	LOWRANGA	UPRANGA	LOWRANGB	UPRANGB
0.7287	111.85	110.8713	112.3287	111.3713	112.8287
	116.05	115.2713	116.7287	115.3713	116.8287
	116.55	115.5713	117.0287	116.0713	117.5287
	108.1	107.4713	108.9287	107.2713	108.7287
	118.4	117.5713	119.0287	117.7713	119.2287

GROUP 2

Shorr	a	b
6	115.5	115.9
7	111.6	111.4
8	112.4	113.1
9	109.4	109.3
10	117.9	118

3xTE	meanBC	LOWRANGA	UPRANGA	LOWRANGB	UPRANGB
0.79938	115.7	114.7006	116.2993	115.1006	116.6993
	111.5	110.8006	112.3993	110.6006	112.1993
	112.75	111.6006	113.1993	112.3006	113.8993
	109.35	108.6006	110.1993	108.5006	110.0993
	117.95	117.1006	118.6993	117.2006	118.7993

ANNEX D

Annex D
Key People Met

Dr. Jessica Jita, Director, Child Health and Development Centre (CHDC), Makerere University, Kampala

Mrs. Louise Sserungogi, Nutritionist, (CHDC), Makerere University, Kampala

Mr. Danstan Bagenda, Makerere University, Kampala

Dr. James Baguma, District Medical Officer, Iganga District

Mr. David M. Puckett, Technical Advisor for Child Survival, USAID, Kampala