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Knowledge, Attitudes, Reported Practices and Anthropometric Indicators of Children's Nutritional Status

A Baseline Survey conducted in Dioro, Koutiala and Macina

1990

Nutrition Communication Project

REPUBLIC OF MALI

Knowledge, Attitudes, Reported Practices and Anthropometric Indicators of Children's Nutritional Status

A Baseline Survey conducted for Nutrition Communication Project Activities in Dioro, Koutiala and Macina

November 11 - December 16, 1990

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ABBREVIATIONS[1]

AED	Academy for Educational Development
A.I.D.	Agency for International Development
CNIECS	Centre National de l'Information, Education et Communication pour la Santé
DNAS	Direction Nationale de l'Action Sociale
DNSP	Direction Nationale de la Santé Publique
DSF	Division Santé Familiale et Communautaire (Division of Family and Community Health)
GRM	Government of the Republic of Mali
HDO	Health Development Officer
HKI	Helen Keller International
IEC	Information, Education and Communication
IFAHS	Integrated Family Health Services Project
JNSP	Joint Nutrition Support Project (UNICEF & WHO - In French abbreviated as PCAN)
KAP	Knowledge, Attitudes and Practices (Survey)
MCH	Maternal and Child Health
MSPASPF	Ministère de la Santé Publique de l'Action Sociale et de la Promotion Feminine (Ministry of Public Health, Social Action and the Promotion of Women)
MOH	Used to designate the MSPASPF
NCP	Nutrition Communication Project (RD/N, AED)
NGO	Non-governmental Organization (ONG in French)
ORT	Oral Rehydration Therapy

[1] Based on Government Organization Chart in existence December 12, 1991.

PMI	Protection Maternelle Infantile (Maternal & Child Health Centers)
P/N	Porter/Novelli
PRITECH	Technologies for Primary Health Care AID Program managed by Management Sciences for Health
PVO	Private Voluntary Organization
RD/N	A.I.D. Bureau for Research and Development, Office of Nutrition
RTM	Radio Télévision Mali
SIES	Service de l'Information et Education pour la Santé (Health Information and Education Service of the DSF)
SN	Service Nutrition (Nutrition Service of the DSF)
UNFPA	United Nations Fund for Population Activities
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development (Mission)
VITAP	Vitamin A Technical Assistance Program, Helen Keller International
VMI	Vision Mondiale Internationale (World Vision International - Mali chapter)
WHO	World Health Organization

I. EXECUTIVE SUMMARY

Between November 11 and December 16, 1990, the Nutrition Communication Project (NCP), in collaboration with the Malian Ministry of Health, Africare, CARE, and World Vision, conducted a survey of nutrition-related knowledge, attitudes and practices (KAP) among parents of children under three years of age living in 47 villages in Dioro, Koutiala and Macina. In addition, the weight and height of the children whose parents participated in the survey were measured.

The survey's primary purpose was to collect baseline data related to nutrition behaviors and children's nutritional status in a representative sample of the population who will participate in NCP program interventions, as well as a "control" group who will not participate during the period of investigation (effectively January, 1991 - January, 1993).[2] These baseline findings will be compared to those from future surveys to determine if beliefs, attitudes, reported practices and children's nutritional status change as a result of intensive health worker, village-based, and radio promotion of selected themes.

In addition to providing the benchmark for measuring the impact of NCP interventions, findings related to socioeconomic and cultural factors measured in association with children's nutritional status will be used to fine-tune NCP nutrition education and communications strategy and materials. More in-depth treatment of the data will be reserved for the follow-up survey. In addition, site-specific analyses will be transmitted to each of the PVOs participating in the baseline.

Key Findings

- **Sample Characteristics**

48 villages in the three PVO sites (out of a total 132) were selected for the study, half to participate in NCP interventions (designated as "case") and half to participate once the efficacy of the communications intervention is demonstrated (control) The research team visited 47 villages (one village was not visited in Dioro due to time constraints). At baseline, there were virtually no significant differences between case and control villages in children's nutritional status or knowledge, attitude or practice variables. "Exposure to a nutrition message" and "training of birth attendant" did vary between case and control villages, although the implication of the difference may be negligible.

The total sample consists of 835 women, 524 men and 657 children two weeks through 36 months of age. There were an equal number of girls and boys in the sample, although this occurrence was entirely random. Women between the ages of 15-45 were interviewed according to their current status: Pregnant (24%), with infant 0-6 months (21%), with infant 6-12 months (25%) and with toddler 12-36 months (29%). In a small

[2] The formative research, strategic plan, and media development pretesting reports are available from the Nutrition Communication Project.

number of cases, the same woman was interviewed in her dual capacity as a pregnant woman and the mother of a child less than three years old. In order to emphasize weaning in the study, children through 12 months represent 69%, 13-24 months are 23% and those 25-36 months are 8% of the sample.

- **Demographic, Population and Maternal Variables**

Respondents were principally farmers from stable, rural, Bambara-speaking villages. Half of the surveyed households were polygamous. The men reported their average number of children as 5.0 and the women as 3.5. Women were younger (27) than men (39), and estimated giving birth to their first child at 17.5 years. Half had been assisted by untrained attendants. Half of the women ate "more than usual" during their most recent pregnancy with the rest equally divided between consuming "less" or "as usual" at this time. Contraceptive use was negligible with most of the 11.5% male and 6.0% female "users" citing "traditional" methods.

- **Economic indicators**

A range of common items scaled according to relative cost (table, radio, sheep, bike, etc.), as well as grain duration estimates, were used to measure household "wealth," although the figure is more reflective of the extent to which men can nominally stretch their income beyond basic food and shelter. Both the total score (ranging from 0-25), as well as a household "per capita" score (which ranged from 0-4) were used in analyses. Households in Koutiala were significantly "wealthier" than in either Dioro or Macina, where the levels were equivalent. This wealth index was one of several variables found to be positively associated with children's nutritional status at baseline.

As the survey was conducted at the end of the current year's harvest, men could speak authoritatively about the number of filled granaries and grain duration. Average household grain duration was 11.2 months. However, the proportion who reported grain lasting 6 months or less varied significantly by site: Koutiala 6.2%, Macina 14.9% and Dioro with the largest proportion of families (19.4%) reporting this paucity. As will be discussed below, the nutritional status of children in Dioro is <u>relatively</u> good, where the lack of food in general does not seem to have been as great a problem as in Macina.

- **Nutritional Status**[3]

Malnutrition was pervasive in the sample population:

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[3] NCP followed guidelines provided by A.I.D. (1991 Child Survival questionnaire question 4-7a), in which the preferred definition of malnutrition is: "the proportion of children whose (anthropometric measurement) is below two standard deviations of the norm established by the National Center for Health Statistics (the norm endorsed by the World Health Organization)." Readers are referred to the UNICEF *Information for Action Issue Paper: Growth Monitoring of Preschool Children*, 1985, pp. 16-17, for a clear discussion of Standard Deviation Units, Z-Scores and their equivalents in percentiles or percentage of the median on the WHO/NCHS growth chart.

- 14.0% were *acutely* malnourished using **weight/height** Z-score equal or less than -2 SD below the NCHS reference, and 29.6% were between -2 SD and -1 SD of the reference.[4]

- 13.0% were *severely* malnourished using **weight/age** Z-score equal or less than -3 SD below the NCHS reference.

- 28.9% were *moderately* malnourished using **weight/age** Z-score between -3 SD and -2 SD below the NCHS reference.

- 39.6% were stunted or *chronically* malnourished using **height/age** Z-score equal or less than -2 SD below the NCHS reference.

While the figures for general malnutrition (weight/age) are roughly equivalent to those reported in the 1987 DHS survey for Mali, acute malnutrition is 3 percentage points higher, and chronic malnutrition is approximately 15 percentage points higher.

♦ Infant Feeding Practices

Breastfeeding

Three-quarters of the children received something other than breastmilk as their first food, and virtually all regularly receive other liquids (chiefly water) before four months of age. Children were breastfed on average for 23 months. Early weaning was primarily associated with a mother's subsequent pregnancy. Children weaned prematurely were more likely to be malnourished than other children.

Complementary Feeding

On average, complementary feeding was delayed until 9-10 months. Excluding children who were only breastfed, one third of the children under a year ate less than three times per day compared to 11% of the older children. Few children ate regularly with adults: 26% ate two or more meals by themselves, 22% ate two or more meals/day with their mother, and a scant 6% ate *any* meal with their father.

♦ Knowledge and Attitude Factors

Approximately half of all women living in high PVO contact (case) villages had heard a "nutrition" message, compared to 19% among those with less contact (controls). The majority of the women (80%) said that health workers were their primary information source, where as the 36% of men who had heard a nutrition message were equally likely to have heard it on the radio or from health workers.

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[4] As weight-for-height is relative to the child's own development, and not as tied to age, even children more than one half of a standard deviation below the median have a greater risk of morbidity and mortality.

Using a series of pictures[5] to ask about physical symptoms (measles rash, emaciation, edema, night blindness), only a small number of respondents could identify children afflicted with marasmus (10%), kwashiorkor (0.5%) or measles (17% women, 36% men). Women were better able to identify night blindness, with 76% identifying a woman and 36% a child with the condition.

Pictures were also used to pose hypothetical situations. More men (27%) than women (16%) thought a man should buy his child a carrot as a snack in the marketplace, primarily because the carrot was thought to be better for the child. In general, women did not approve of forcing a child to eat, although 39% thought this was acceptable if the child was ill and refused to eat.

- **Nutritional Status in Relation to Other Variables**

As so large a proportion of the sampled children had low nutritional status compared to NCHS reference data, few statistically significant associations ($p < .05$) could be found with other variables when absolute Z-scores were used. Among the sampled children, nutritional status decreases sharply with age from 1 month through 25 months, at which point it remains at a low plateau through 36 months. Additional significant associations follow:

Acute Malnutrition

Mean weight-for-height Z-score (WHZ) varied significantly by site, with children in Koutiala having the smallest deviation from the NCHS mean using this indicator[6]:

Koutiala (-0.16) Dioro (-0.75) Macina (-1.31)

Using regression on WHZ, as well as Weight-for-Age (WAZ), positive associations were found with timely introduction of protein foods (meat-fish). Analysis of variance also showed children with better WHZ-scores less likely to have received fluids before 4 months of age.

Chronic Malnutrition

Height-for-age Z-score (HAZ) showed two interesting associations:

- Positive association with timely introduction of solids (including porridge).

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[5] See Appendix B.

[6] Keep in mind the numbers are all below the mean of 0.

- Mothers who were the first as compared to the second wife in a polygamous household had children with significantly better HAZ (i.e. less chronic malnutrition).

In order to tease out a greater range of associations, the data were regrouped to compare the sampled children against their own distribution of the anthropometric indices -- instead of the NCHS (WHO) reference data. Secondly, the strong effects of age were controlled by comparing children within groupings of 2-3 months. Children who were **at or above** their group's mean Z-score for weight/height were classified as having *relatively* **"good"** nutritional status as compared to those **below** the sample mean, who were classified as having *relatively* **"bad"** nutritional status. This relative comparison drew out several significant differences within and between sites in association with other socioeconomic and behavioral variables. There was no difference in the nutritional status of girls and boys in this population.

Children who had a relatively "good" nutritional status were more likely to:

- live in Koutiala (65% of the children in this village were "good", compared to Dioro, 41%, or Macina, 20%.)

- come from households with higher relative wealth scores, although this difference was largely accounted for by its very strong effect on the older, more malnourished children (27+ months).

- come from households with a greater mean number of granaries (5.5 compared to 2.6).[7]

- have received fluids only after four months of age.

- have received protein foods prior to eight months.

- have been weaned after 23 months.

- have mothers who could identify a malnourished child from the drawing shown during the survey.

- have fathers who could recognize a child with measles from the drawing shown during the survey.

- have fathers who selected carrots (rather than macaroni) as the more appropriate snack for the child, despite the child asking for the macaroni, within the hypothetical situation of the survey.

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[7] As the size of the granary was not accounted for in the study, grain duration rather than this variable was used to construct the wealth score.

A few variables were associated with the "good"/ "bad" classification in a way that defy simple explanation:

Women who were likely to have --

- eaten more during pregnancy,
- known how to treat and avoid night blindness,
- selected carrots as the more appropriate snack,
- claimed to filter water or use bleach --

were more likely to have children with "bad" nutritional status.

These women were also more likely to come from Macina, which contributed a disproportionately large percentage of the children with bad nutritional status. Therefore, whatever else affects nutritional status in Macina, and not necessarily health knowledge and practice, is also affecting children's nutritional status strongly in this area.

The remaining KAP and socioeconomic indicators were not associated with nutritional status at baseline.

The implications of the baseline survey on the NCP strategy is discussed in the Conclusion, beginning on page 47. As the KAP baseline and follow-up surveys are conducted with populations receiving and not receiving the communications interventions, we should also be able to measure whether these behavioral objectives are affected in a way that we may attribute to the impact of the communications strategies. This information will be used to design future communications interventions in maternal and child nutrition.

II. INTRODUCTION

A. Overview

Between November 11 and December 16, 1990, the Nutrition Communication Project (NCP) in collaboration with the Malian Ministry of Health, Africare, CARE, and World Vision, conducted a survey of nutrition-related knowledge, attitudes and practices (KAP) among parents of children under three years of age living in 48 villages in Dioro, Koutiala and Macina. *(See Figure 1 below.)* In addition, the weight and height of the children whose parents participated in the survey were measured.

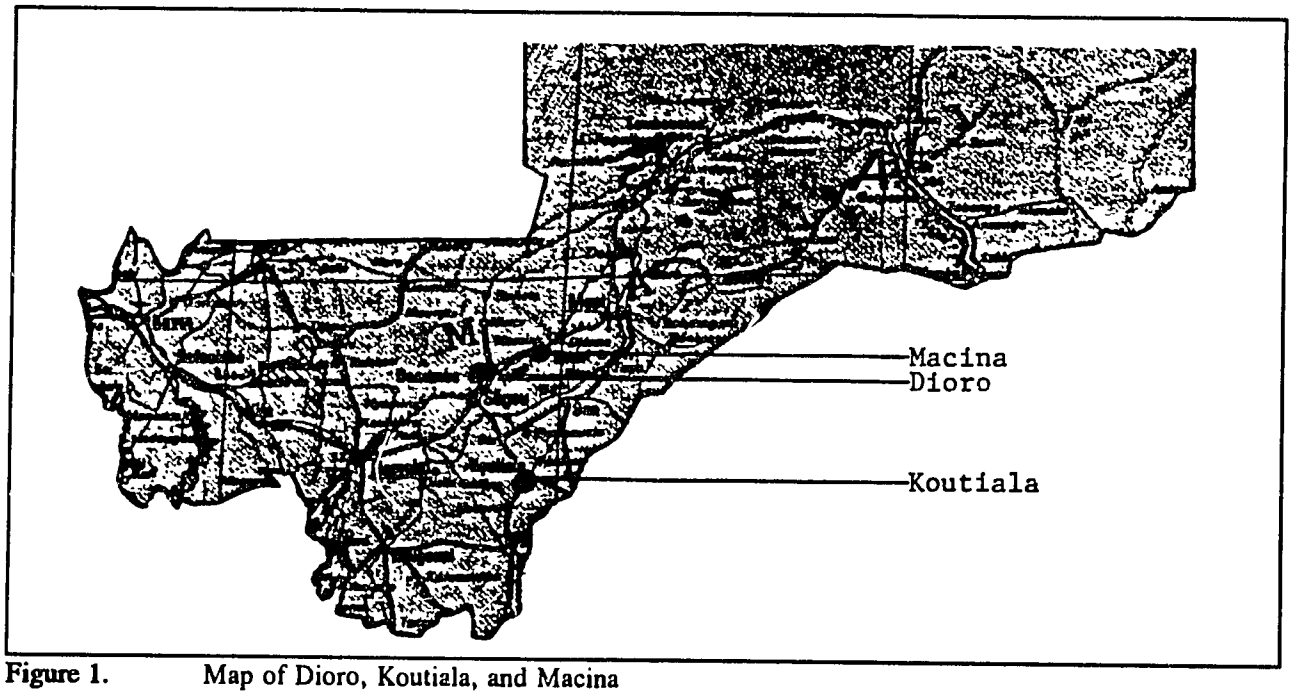


Figure 1. Map of Dioro, Koutiala, and Macina

The survey's primary purpose was to collect baseline data related to nutrition behaviors and children's nutritional status in a representative sample of the population who will participate in NCP program interventions, as well as a "control" group who will not participate during the period of investigation (effectively January, 1991 - January, 1993). These baseline findings will be compared to results of future surveys to determine if beliefs, attitudes, reported practices and children's nutritional status change as a result of intensive health worker and village-based media promotion (December 1992 wave); and/or in association with rural and national radio promotion of selected themes (December 1993 wave) conducted in addition to the activity above.

In addition to providing the benchmark for measuring the impact of NCP interventions, findings related to socioeconomic and cultural factors measured in association with children's nutritional status will be used to fine-tune NCP nutrition education and communications strategy and materials.

The NCP Intervention

NCP hopes to promote beneficial changes in maternal and child nutrition, emphasizing consumption of Vitamin A-rich foods. Africare, CARE and World Vision health promoters and regional MOH health staff involved in the Child Survival Projects of Dioro, Macina and Koutiala were trained in nutrition behavioral assessment, counseling, and behavior change monitoring and evaluation. Throughout the first year (1990 - 1991), they were supported by a range of print media that enabled them to perform these tasks more effectively. In 1992, community media, such as village plays and market place events and games, will be added to make the basic messages more exciting and memorable to the audience. Finally, rural and national radio spots and educational programs will reinforce key themes and introduce related concepts through different channels in late 1992.

The general behavioral objectives of the communications strategy are as follows:

1. Women will eat a better diet during pregnancy (stressing Vitamin A-rich foods);

2. Women will eat well during the breastfeeding period (same foods as above);

3. Mothers will give the baby breastmilk only, with no supplementation, through the first 4-6 months;

4. Caregivers will introduce appropriate foods prepared from the family pot after 6 months of age;

5. Men will provide women with more money or food for themselves and their children;

6. Men will give their children food directly;

7. Men and women will purchase healthier foods for household consumption in the marketplace;

8. Men and women will purchase healthier snacks for themselves and their children in the marketplace.

Objective Number 4 is highlighted as it contains two operational sub-objectives that will be stressed in communications to parents:

a. Parents will actively feed infants 6 to 12 months of age using a small bowl or gourd containing an identifiable portion of food for the child.

b. Parents or older siblings will supervise and assist children 9 to 24 months of age, taking note of whether the child consumes his portion.

B. Survey Methods

The survey was designed to collect information on parents's current knowledge, attitudes and reported practices related to the behavioral objectives above. As NCP will emphasize nutrition-related behaviors connected with early infancy through the weaning period, children between the ages of 1 through 36 months were the focus of the survey. All mothers and a representative proportion of the fathers of these children were individually asked about their own dietary habits as well as infant and child care. In addition, women were interviewed about their own health and nutrition during pregnancy.

Schedule

November 11 - 16, Dioro (Africare)
November 20 - 24, Koutiala (World Vision)
December 10 - 16, Macina (CARE)

Management

Considerable effort went into preparing PVO field staff for the survey, selecting villages to participate, managing the field logistics, informing villagers of the day when the survey team would arrive, and having mothers, fathers and children present. The project directors and staff of the PVO Child Survival Projects deserve full credit for all of these aspects, which occurred with extreme efficiency.

Interview Teams

NCP consultant Dandara Kanté and Mariam Haidara (DSF Nutrition Service, Bamako) supervised field activities, assisted by the Child Survival Project Directors, in all three sites. Claudia Fishman provided overall direction at the first site (Dioro), and participated in the survey in Koutiala. At each site, two interviewing teams were trained composed of one health agent from the Child Survival Project and four interviewers (1 man, 3 women) recruited from MOH health centers outside the PVO Child Survival project. Responsibilities were divided as follows:

- Child Survival Project staff recruited participants in the village for the survey, handled village introductions and hospitality, checked children's birth and current age records, and usually performed the anthropometric measurements.

- Outside interviewers asked all remaining questions to prevent biasing responses from interviewees who might hope to please the regular health worker.

- Child Survival Project Supervisors accompanied the teams to the field daily and checked forms for accuracy and consistency each day. Their intensive supervision guaranteed a high quality of data and created an atmosphere of cooperation and enthusiasm among team members.

Selection of Villages

A "case-control" design was attempted to enable NCP to measure the impact of NCP interventions, while excluding the influence of other variables operating in the environment. Villages designated as "case" will participate in NCP program interventions between 1991-1993. Those designated as "control" will not participate until the efficacy of the communications intervention is tested (in December 1992). PVOs were requested to identify and match 8 case and 8 control villages based on the following factors, such as:

1. Length of time participating in the Child Survival program.

2. Presence of wells, vaccination, gardening projects.

3. Presence of a maternity center or other health post nearby.

4. Ethnic group (study villages were limited to 75% Bambara and 25% Bozo, where possible).

In Dioro, "control" villages had not yet participated in the PVO Child Survival Project. In Macina, villages that had been visited by CARE health workers for less than one year (*en formation*) were used as controls for those being phased into more self sufficient health monitoring (*en stabilisation*) following a year of intensive PVO oversight. As a result, PVO health staff were more familiar with "case" villages than controls. This affected the baseline in some subtle ways, which are indicated in the report. During the intervention phase, PVO staff should discuss other child survival interventions equally in case and control villages, but use the nutrition materials only in the case villages until after the follow-up survey is conducted in December, 1992.

When feasible, case villages were geographically isolated from control villages. As we hoped, villages arbitrarily designated as case and control show no significant differences in outcome variables under study (child's nutritional status, nutrition attitudes and practices). Differences in confounding variables, such as maternal age or training level of birth attendant, can be statistically controlled at the time of the follow-up evaluation.

Sampling

Sample size was computed based on the quantifiable anthropometric variables being used to measure outcome in children's nutritional status. The estimated prevalence of moderate malnutrition reported in the DHS 1987 survey for Mali was approximately 25%. In order to assess the impact of NCP interventions on this estimated rate of malnutrition with a 95% confidence interval (5% allowable error), the total sample of children for a simple random sample would be[8] 4 (25)(75)/25 = 300 children. As we hope to examine "case" children

[8] Standard equation for estimating sample size is $N = 4pq/L^2$, where p=the proportion with condition in the population, q = 1-p, L = error^2

separately from "control" children, approximately 300 in each group were sought. Smaller numbers could have been used had we used a "cluster" framework," which the study resembles. As has been true in other child survival project surveys, the absolute number of participants is limited by actual sizes of villages and the number of villages that can be surveyed given cost and time limitations. In all three sites, the team visited 47 villages of which 32 participated in the Child Survival Projects at the time of the survey. *(Please see Appendix A for names of villages and numbers of women, men and children surveyed).* Therefore, the team surveyed 32 out of 132, or approximately 25% of the villages participating in the three Child Survival Projects. Within each village, the team measured virtually every child under one year of age and interviewed all accompanying mothers. This level of analysis is the most critical for the intervention, as NCP will work with the entire village as a unit to improve the nutritional status of its children. At the individual level, the KAP survey included 3 percent of the women and 5 percent of the children in each Child Survival Project's total target population in Dioro and Macina, and 1 percent of each group in Koutiala. Additional information on the completed sample appears in the findings below.

Interview Methodology

Following weighing and measuring of the children, adult participants were interviewed individually using a research instrument[9] consisting of two parts:

I. Family Life Questionnaire

In this section, researchers asked participants a series of open-ended questions concerning family characteristics, food choices and food-related behavior. Most respondents provided answers consistent with those derived during pretesting of the questionnaire, and hence, pre-coded choices were checked on the answer sheet. Due to the personal nature of the questions, efforts were made to match the gender of the researcher with that of the respondent during this phase. Women were asked either about their own experience during pregnancy or the first three months of breastfeeding, or they were asked questions concerning their youngest child. Men were asked to comment on their wife's pregnancy or about their youngest child.

II. Hypothetical Illustrations

The technique for this section approximates the "Thematic Apperception Test," a standard approach used in psychological testing to allow respondents to project their opinions, values and demonstrate their knowledge in a non-direct manner. Ten illustrations (*Please see Appendix B*) were used to explore reactions to hypothetical situations, or called for visual identification of physical conditions, such as kwashiorkor, marasmus or measles. The drawings had been pretested two months earlier in a different set of villages (SEE GOTTERT, NCP TRIP REPORT SEPTEMBER 3-15, 1990.) At this time, comprehension varied from 25% for the more difficult concepts (such as measles or night blindness in a child) to 100% for more obvious situations

[9] The French language Questionnaire is available from NCP. The drawings, and their key questions are reproduced in Appendix B.

(breastfeeding, bloating or wasting in children, purchasing foods, eating), with about 80% of viewers able to identify the situation portrayed for the majority of the illustrations.
During pretesting, respondents had no difficulty or discomfort participating in this hypothetical and impersonal section of the survey with interviewers of the opposite sex. Therefore, half of the research team (3 women and 1 man) ended up "specializing" in the illustrated section, and interviewed either men or women sequentially.

The questionnaires were written in French and then translated into Bambara. At the time of the survey, only one researcher apart from the field supervisor, Ms. Kanté, could read written Bambara. A full morning in each site was devoted to oral transmission of the Bambara for the questions, which researchers annotated as each found necessary. Once the research team was comfortable with the survey, a single respondent could be interviewed in approximately 40 minutes. Field supervisors circulated to insure that questions were asked, and answers recorded, in a consistent manner.

Analysis

EPI Info, a Center for Disease Control (CDC) software program, was used to analyze the data. *Epi Info* is in the public domain and can be obtained from CDC (or copied) for the cost of reproducing the materials. Data cleaning involved correcting obvious data entry errors and creating a household identification number that allowed women, men, and children from the same household to be linked together.

Weight for age, weight for height, height for age Z-scores and percentiles were calculated using the CDC *ANTHRO* program. A "flag" system was used to identify records were there were missing data or a high likelihood of error. Flagged records were excluded from the analysis. Records with missing values and the missing code "99", for the particular variable being tested, were excluded from analysis. Consequently, total sample size for each question or variable varies according to the numbers of men and women responding to that question.

Statistical tests and variables reported were chosen based on relevance to NCP objectives and PVO program needs. Basic frequency distributions were calculated and Chi-square, relative risk, and ANOVA tests used to determine differences between sites and case-control villages. Preliminary simple and multiple regression were used to test the relationship between a child's nutritional status, as defined by weight for age Z-scores, and other continuous co-variates or dependent factors. Cross tabulations were occasionally computed to test differences between other sub-groups and the variables in question. Significant findings and the level of significance (p-values) are reported in the results section of this report.

III. RESULTS

A. Demographic, Population and Maternal Variables

Questionnaires were completed for 857 women and 538 men and height (length) and weight measurements were taken from 657 children (1 to 36 months-old). After data cleaning, the final sample sizes used for the analysis were: 835 women, 524 men, and 637 children. Figure 2 depicts the numbers of adults and children by site and case-control status.

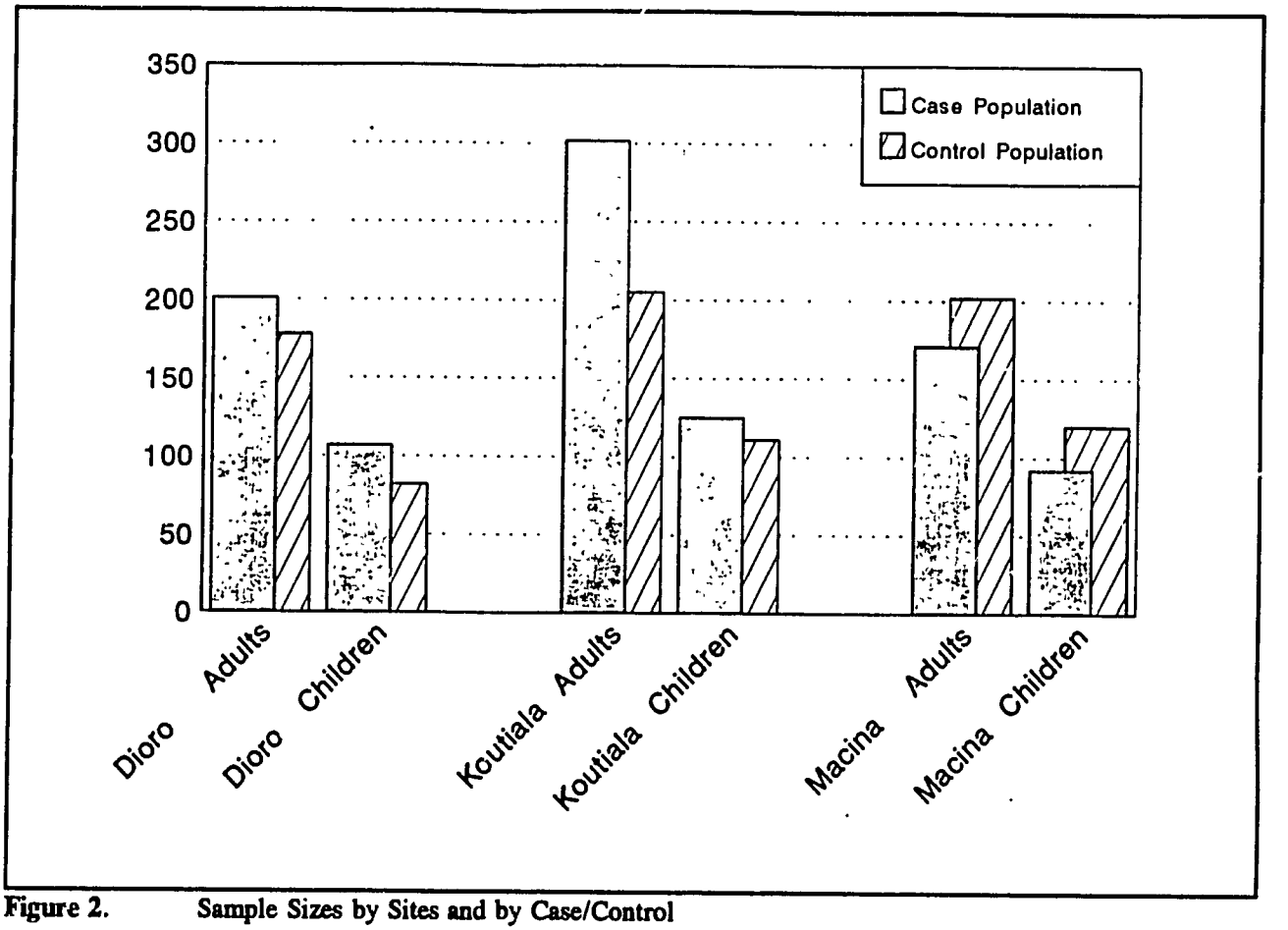


Figure 2. Sample Sizes by Sites and by Case/Control

At the individual level, Table 1 on the next page presents the number of mothers and children included in the survey (gray KAP box) compared to the target population for each Child Survival Project at the time of the survey[10].

[10] All Child Survival Projects are increasing or have increased the number of target villages since the survey. Many of the "control" villages are included in the project extensions, which is appropriate, provided that only routine nutrition screening and education (i.e. activities undertaken prior to NCP training, e.g. 4 food groups, enriched porridge) occurs in the 23 villages designated as controls.

Table 1. Sample per Child Survival Project						
CSP	Target Villages	Total Population of Target Area	Mothers 15-45 years of age		Children 3 years or less	
Africare *	30	31,000	Target	KAP	Target	KAP
			6746	234	3635	189
CARE **	67	144,000	8295	272	4500	212
World Vision ***	35	121,174	25,240	329	13,000	236

Sources:
* Child Survival Project Baseline, 1989
** Annual Child Survival Report, FY 1991
*** Detailed Implementation Plan, 1988

The KAP survey included 3 percent of the women and 5 percent of the children in each Child Survival Project's target population in Dioro and Macina, and 1 percent of each group in Koutiala.

Duration of Time Lived in Villages

KAP survey respondents represent a typically stable, rural population. Ninety-five percent named farming as their primary occupation. Fifteen percent of the men had secondary occupations as merchants and 9% raised animals. Sixty percent of the men and 41% of the women said that they had "always" lived in their village or had lived there a "long" time and only 6% of the men claimed five years or less. Among the remaining respondents, men resided an average of 27 years and women 8.3 years. The gender-specific differences reflect the practice of women moving to their husbands' villages at marriage. (For additional information, see Table A in Appendix A).

Household Composition

In all three sites, approximately half of the households were polygamous with 53% of the men reporting one wife and 47% reporting two or more wives. While 49% of the men had seven children or more, on average the number for men was 5.0 children and for women, 3.5, which is consistent with polygamous marriage. Women from case villages reported 3.7 children compared to 3.3 from controls, which probably resulted from random error.

An economic measure of household size was determined by asking how many adults and children eat together. Women reported an average household size of 9.3: 4.7 adults and 4.6 children eating together. Men reported 10.3: 5.0 adults and 5.3 children. While women's answers were consistent across sites and sampling classification, men from "case" villages reported 1.3 more

adults and 1.4 more children than controls. The differences in household eating units reported by men in case and control villages is a potentially confounding factor which will need to be accounted for in the follow-up survey. As Koutiala contributed a larger percentage of case men to the sample, and households tend to be relatively wealthier in Koutiala (see below), it is possible that this sampling error accounts for the difference. It is not related to any outcome variables.

Age Distribution of Adults

Only 40% of the women and 77% of the men knew or could estimate their age. Based on this reduced sample, women's mean age was 27 years and men's was 39. (See Figure A, Appendix A for distribution.) Polygamy also accounts for this difference, as both monogamous young men and polygamous older men tended to have younger wives. The cultural norms for marriage also favor women being younger (15-16 years old) than men (20-25 years old).

Women's Maternal Status

We attempted to recruit women of childbearing age, in equal proportions, according to the following categories: pregnant, having a child less than six months old, having a child 6 to 12 months old, and having a child 13 to 36 months old. The numbers obtained were close to the desired proportions; however, there was slight under-sampling of women with newborns. More could not be found without adding additional villages to the sample, which was not practical for programmatic reasons. Figure 3 illustrates the final proportion of women in each group.

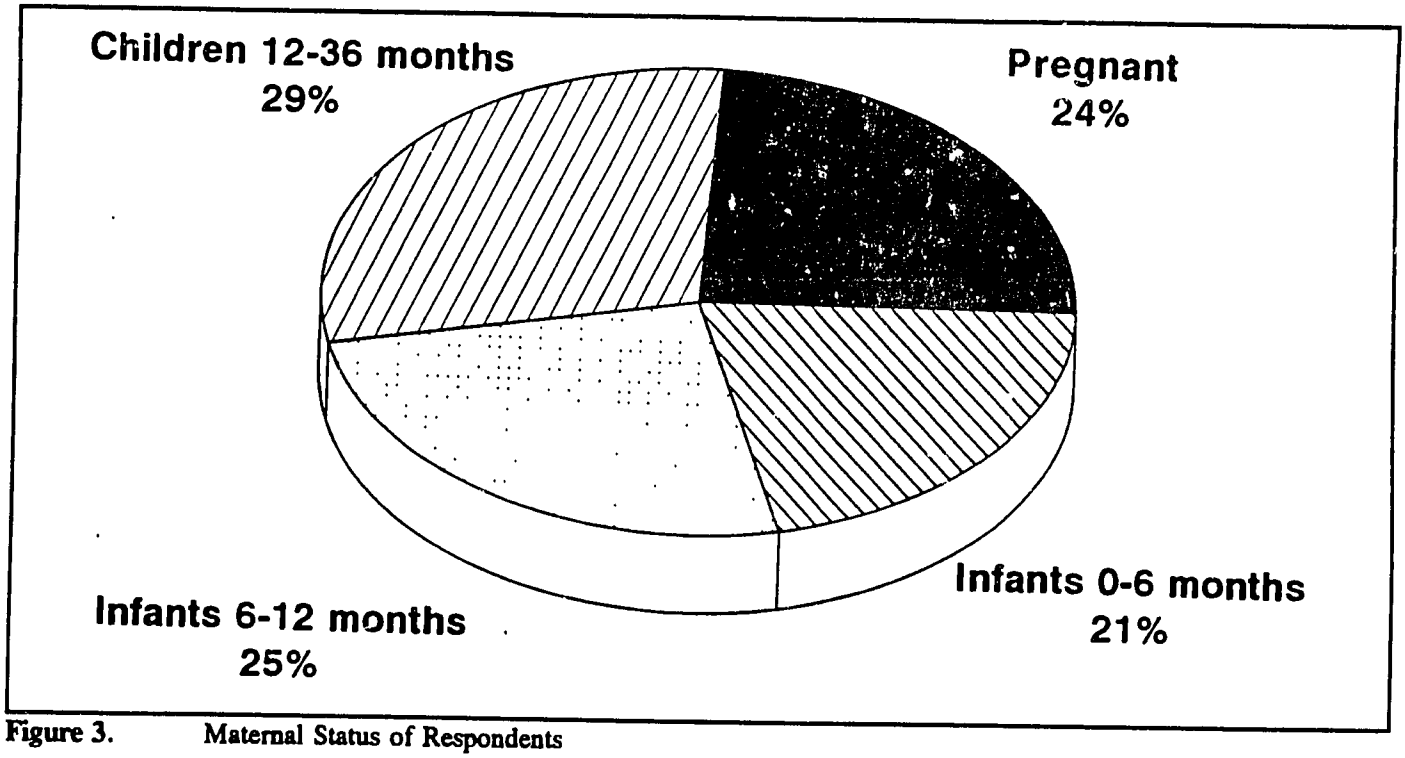


Figure 3. Maternal Status of Respondents

Fertility and Delivery

While there was a great deal of uncertainty, case village women estimated they were on average 17.7 years old when they had their first child compared to control village women, who estimated 17.0 years. The women often arrived at their age by calculating back from the age of their oldest child and the presumed age of marriage, traditionally 15. PVO project staff tended to know "case" village women longer than controls, which may have improved age calculation. However, it is likely that the difference is random. Strikingly, 42.4% of the women had their first child between the ages of 14 and 16 -- indicating that "marriage at 15" and "birth of first child" tend to be concurrent events.

Birth Attendants

As can be seen in Figure 4 below, women who were attended at birth by female relatives or "others," which includes self delivery, accounted for half of the sample. One-third of the women were attended by a trained nurse or midwife. Case village women were much more likely to have an attendant trained in safe delivery practices than control village women, as 42% compared to 17% of the deliveries were assisted by midwives and nurses. Correspondingly, only 19% of the case village women, compared to 40% of the control women, were assisted by a female relative. Traditional birth attendants (TBAs) assisted 18% of the deliveries. The MOH and several PVOs have been training TBAs, hence they are not necessarily un-trained in hygienic delivery practices. This significant "case" vs. "control" difference will need to be carefully analyzed at the time of the follow-up. Level of obstetric care was a variable we were trying to hold constant, and this great variation at baseline may nullify the design hypothesis that "case" and "control" villages are matched on important non-nutrition related health interventions.

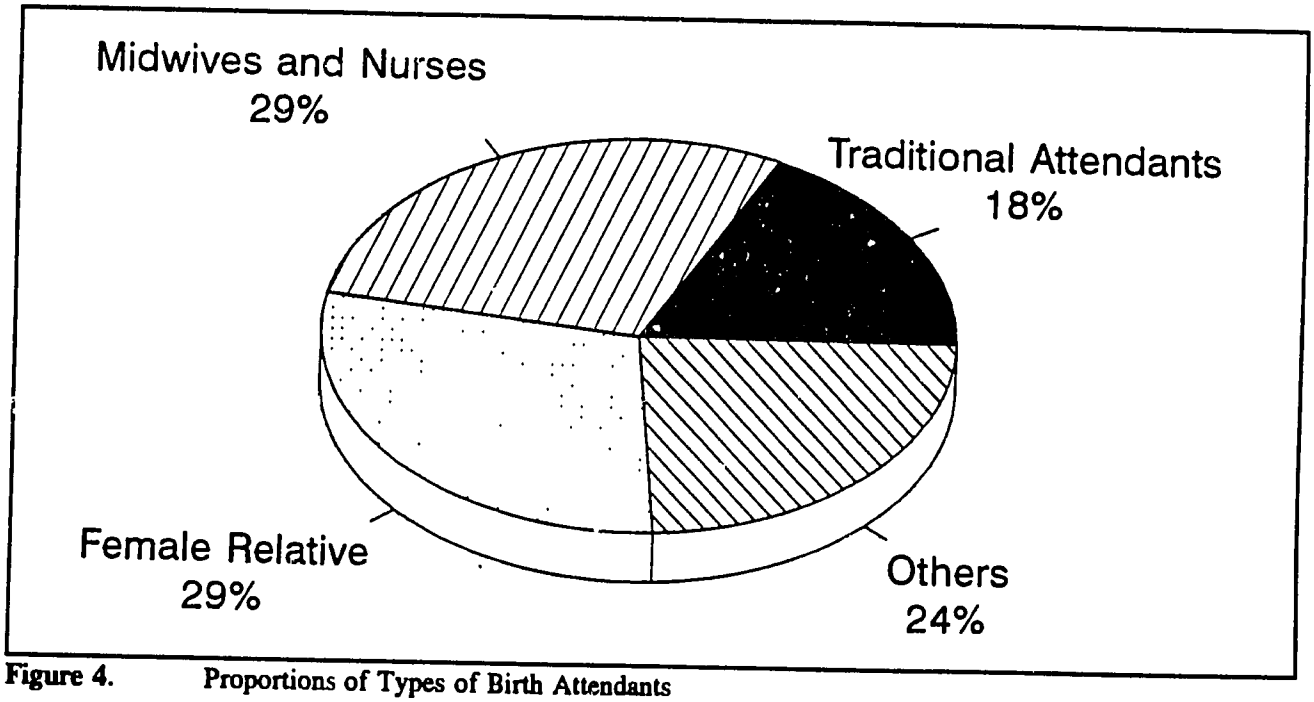


Figure 4. Proportions of Types of Birth Attendants

Contraceptive Use

Only 56 of the men (11.5%) and 49 of the women (6.0%) reported using contraception, of which 80% reported using a "traditional method". From all sites, **only 6 men and 13 women** claimed to use pills, condoms, injectables, or sterilization. Men from case villages were 70% more likely to say they used contraception than men from control villages. Greater exposure to education or information may have created a greater tendency to report answers consistent with health worker teaching.

B. Proxy Measures of Household Food Security and Wealth

A large number of factors influence health and nutritional status, including environmental, social, or household factors. Since NCP can not keep these factors constant or change them, their effect on the dependent variables must be excluded, or "controlled for", so that the true effect on the experimental variables can be measured. The term "confounding" is used because these factors can hide or obscure the results if they are not "controlled for". Confounding variables measured by the KAP survey are proxy measures of household food security and wealth.

Food Security

Number of Granaries

While granaries vary slightly in size, the absolute number provides a rough measure of family food security. The average number of granaries reported by men was 2.4. The total was distributed as follows in the sample:

No. of Granaries	% of Sample
0 - 3	34
4 - 7	60
8 - 11	5
12+	1

Grain Duration

Average household grain duration was 11.2 months. However, the proportion who reported grain lasting 6 months or less varied significantly by site: Koutiala 6.2%, Macina 14.9% and Dioro with the largest proportion of families (19.4%) reporting this paucity. As will be discussed below, the nutritional status of children in Dioro is relatively good, where the lack of food in general does not seem to have been as great a problem as in Macina.

NCP consulted both the A.I.D. Food Operations Cable for November, 1990 sent to the Famine Early Warning System (FEWS) Project as well as the November and December 1990 *Bulletins*

Systeme d'Alerte Precoce, which report statistics sub-regionally on harvest outcomes, food availability, and prices in the three regions. Dioro and Macina are located in two regions that are routinely surveyed by these two famine warning systems. The harvest was almost over at the time of the survey late November, early December of 1990. The Koutiala region reported a good harvest while the harvests in Macina and Dioro were not as good -- possibly due to less rainfall -- and there were significant pockets that were devastated by pests. During the months preceding the survey, Koutiala reported 622 tons of grain stocks in October and 49 in November, while the Ségou region, where Dioro is found, reported only 8.9 and 6.3 tons on reserve during these months. As harvest crops entered the market, the price of millet dropped in Ségou but increased in Macina, revealing an acute food situation. As the price of food increased in Macina, the price of goats decreased, revealing that farmers were being forced to sell their capital to obtain grain prior to the completion of their harvest. The food shortage in Ségou is likely to have contributed to a higher level of malnutrition in this area compared to Koutiala. However, these secondary data do little to illuminate the differences in nutritional status found between Macina and Dioro, as will be discussed below.

Wealth

Assets

Men were asked whether they owned a range of simple items, and points were assigned according to the relative local cost of the item. The table below lists the items and points assigned.[11] Three men were found to own cars, so they and their families were excluded from further analysis, as this level of wealth far outstrips the project's target population.

Table 2: Point Values Assigned for Ownership of Items and Total Points Possible

Points	1 pt	2 pts	3 pts	excluded
Items	goat radio sheep table watch	bike cart cow mule	horse motor-bike small shop windmill	car
Total	5	8	12	
Cumulative Total	**5**	**13**	**25**	

[11] The original list of items, and concept of the "wealth index" comes from Dr. Michael Chapko, Baseline survey conducted for Africare, Niger, 1989.

Owning all the items listed above gives an asset score of 25. The mean score was 8.7 (+/- 4.4). As can be seen by the distribution of mean scores below, men in Koutiala seemed better able to afford the items listed, which may be considered "extras," presumably to be purchased out of surplus grain stocks.

Region	Koutiala	Dioro	Macina
X Asset Score	10.3	7.1	6.2

There were no significant differences between case and control villages.

Per Capita Wealth

A second index was created that added the number of months men reported their grain to last (1-12) to the assets scores created above. This total number was then divided by the total number of women and children the man claimed to support. Per capita wealth scores ranged from 0 to 11, with a mean of 4.43.

Per capita wealth was distributed in the sample as follows:

Score	%
0 - 1	10
1 - 3	47
3 - 5	21
5+	22

While this is a very crude measure, the "per capita wealth score" not only indicates a general level of poverty, it also suggests a local norm for how many assets a man can acquire before he is considered "wealthy enough" to increase his number of dependents by taking on additional wives, children, or other relatives.

C. Nutritional Status

Age and Sex Distribution of Children

While no attempt was made to recruit children by gender, proportions fell naturally into 49.5% female and 50.5% male. Larger sample surveys (DHS) indicate a similar, slight proportional increase in the number of boys born. However, under-5 child survival rates are slightly better for girls. Our sample of under-3's seems to reflect these macro-population effects. Figure 4 below shows the proportion of children in each three month age group.

As NCP is most interested in behaviors associated with infant feeding, the final sample of children is weighted with 69% 12 months old or younger. Only 6.9% of the children are older than 24 months. This undersampling of children age 2-3 was not intended, and may be the result of birth intervals, the fact that not many children in this age range were presented by women who were pregnant, had a child under age 1, or for whom the two- to three-year-old was the "youngest" child in the household. We also can not rule out the possibility of mortality striking this age group.

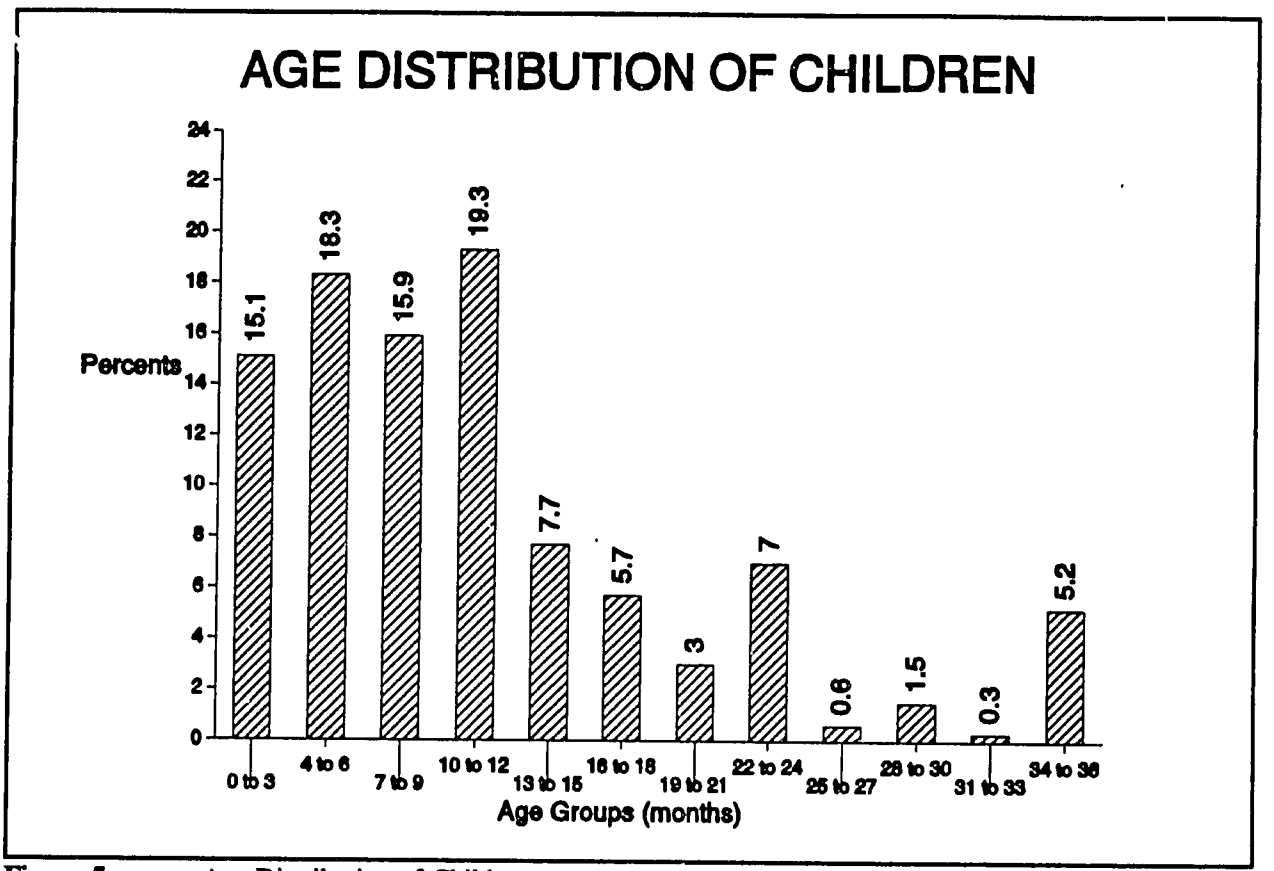


Figure 5. Age Distribution of Children

Anthropometric Indicators of Children's Nutritional Status

Children's nutritional status is discussed two ways below. First, we compare children's measurements to the WHO (NCHS) reference data. These comparisons provide an indication of their absolute nutritional status. As will be discussed, the entire sample is skewed, with a few children falling above the WHO/NCHS reference mean. This downward skewing was also found in the 1987 DHS survey for Mali. Second, children within the sample are compared to each other, holding age constant. This allows us to contrast "better" and "worse" growth in the sample, looking for possible associated factors.

Comparison of Children to WHO/NCHS Reference Population

The mean weight-for-age and height-for-age percentiles for the first 36 months are graphed in Figure 6.

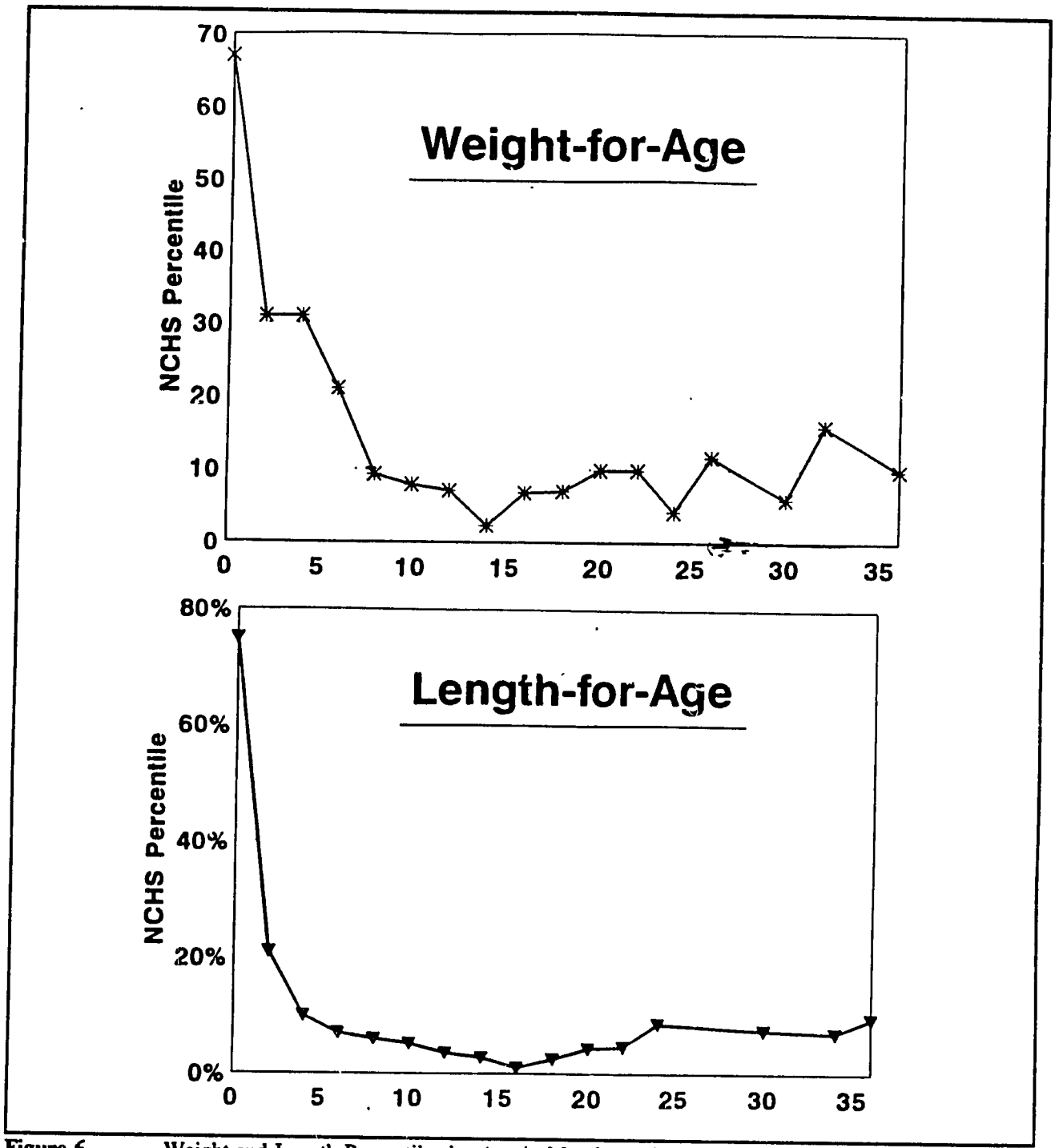


Figure 6. Weight and Length Percentiles by Age in Months: All Children

As can be seen, children's weight rapidly descends from above the 30th percentile at 2 months to about the 10th percentile at six months. Their weight for age continues to sink to about the WHO/NCHS 2nd percentile between 12 and 15 months. After that time, children appear to recover slightly, maintaining a plateau between the 5th and 10th percentile through age three. Length follows a smoother and steeper descent slightly behind the weight curve, as to be expected.

Children's age impacts their nutritional status significantly. Figure 7 translates the growth percentile curve (shown above) into standard deviations (SDs) away from the mean (Z-scores) clustered by age group.

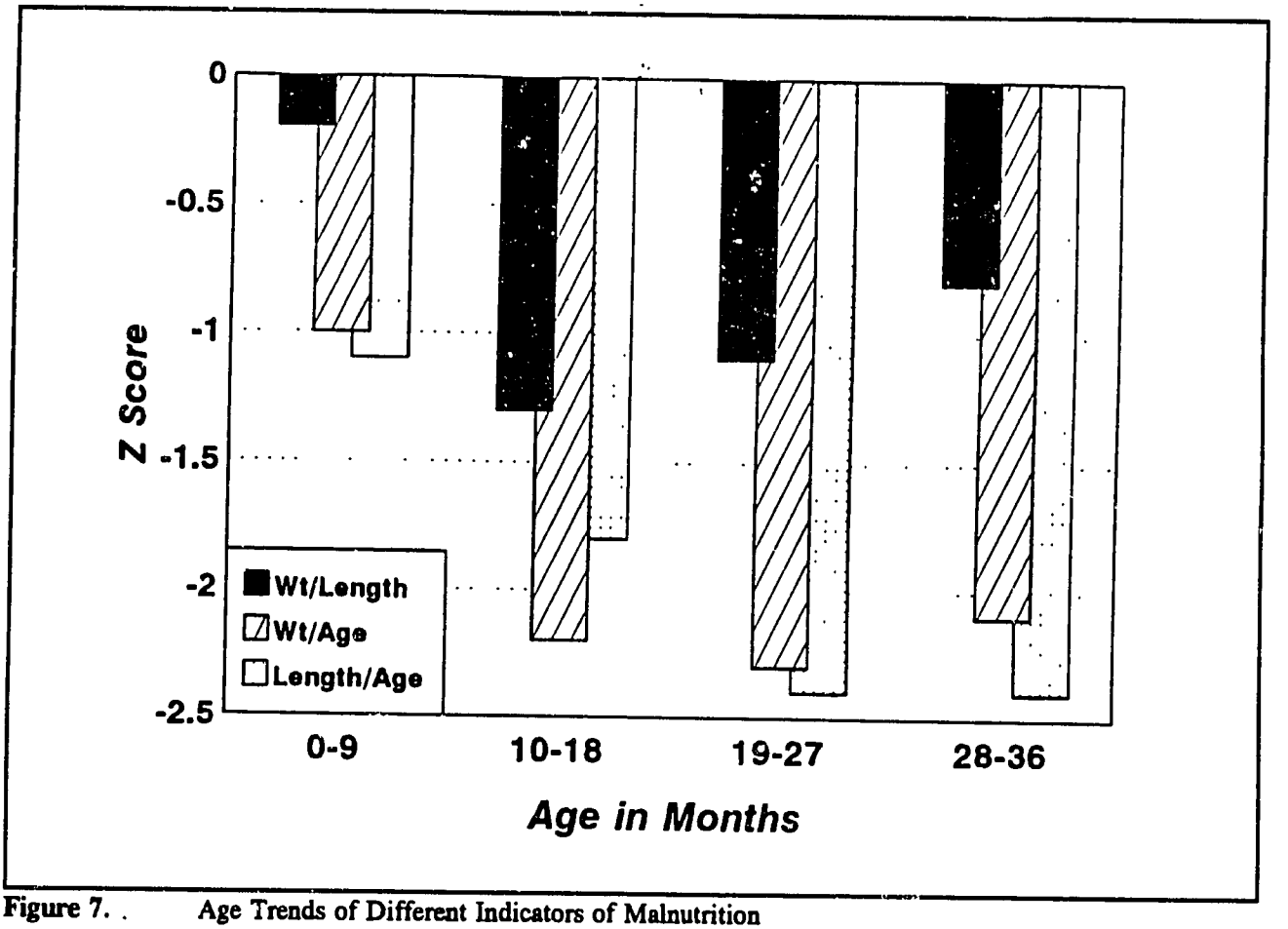


Figure 7. . Age Trends of Different Indicators of Malnutrition

As can be seen above, the children's weight and length are fairly normal (within one negative standard deviation of the mean) through 9 months of age. Weight and length decreases sharply through their second year of life, and weight then improves moderately, while height continues to descend through age three. The figure illustrates why weight-for- height can be a misleading indicator, as it appears to improve after 18 months of age, when, in fact, children are merely chronically malnourished, and therefore stunted so that their weight appears proportionately good.

The proportions of malnourished children in the entire sample population demonstrate malnutrition patterns typical of rural African populations. Assessing nutriture of each child comparing their weight at their reported age to NCHS standards suggests that approximately 59% are mildly or moderately malnourished. This captures long-term nutritional, environmental and disease insults. As a result, most of these children have stunted heights. Because their heights tend to be less, the weight for length (height) classification finds a smaller proportion of children mildly or moderately malnourished (42%) than the weight for age. The rates of severe malnutrition are even more divergent. When the child's weight is considered alone, 13% are under three standard deviations (99%) of the NCHS standard population. But if these weights are adjusted for length, only 2% are severely wasted.

Specifically, within this sample, we see:

- 14.0% were *acutely* malnourished using **weight/height** Z-score equal or less than -2 SD below the NCHS reference (of which 2% are equal or less than -3 SD), and 29.6% were between -2 SD and -1 SD of the reference.[12]

- 13.0% were *severely* malnourished using **weight/age** Z-score equal or less than -3 SD below the NCHS reference.

- 28.9% were *moderately* malnourished using **weight/age** Z-score between -3 SD and -2 SD below the NCHS reference.

- 39.6% were stunted or *chronically* malnourished using **height/age** Z-score equal or less than -2 SD below the NCHS reference.

These proportions for the whole population are illustrated below in Figure 8. While the figures for general malnutrition (weight/age) are roughly equivalent to those reported in the 1987 DHS survey for Mali, acute malnutrition is 3 percentage points higher, and chronic malnutrition is approximately 15 percentage points higher.

[12] As weight-for-height is relative to the child's own development, and not as tied to age, even children more than one half of a standard deviation below the median have a greater risk of morbidity and mortality.

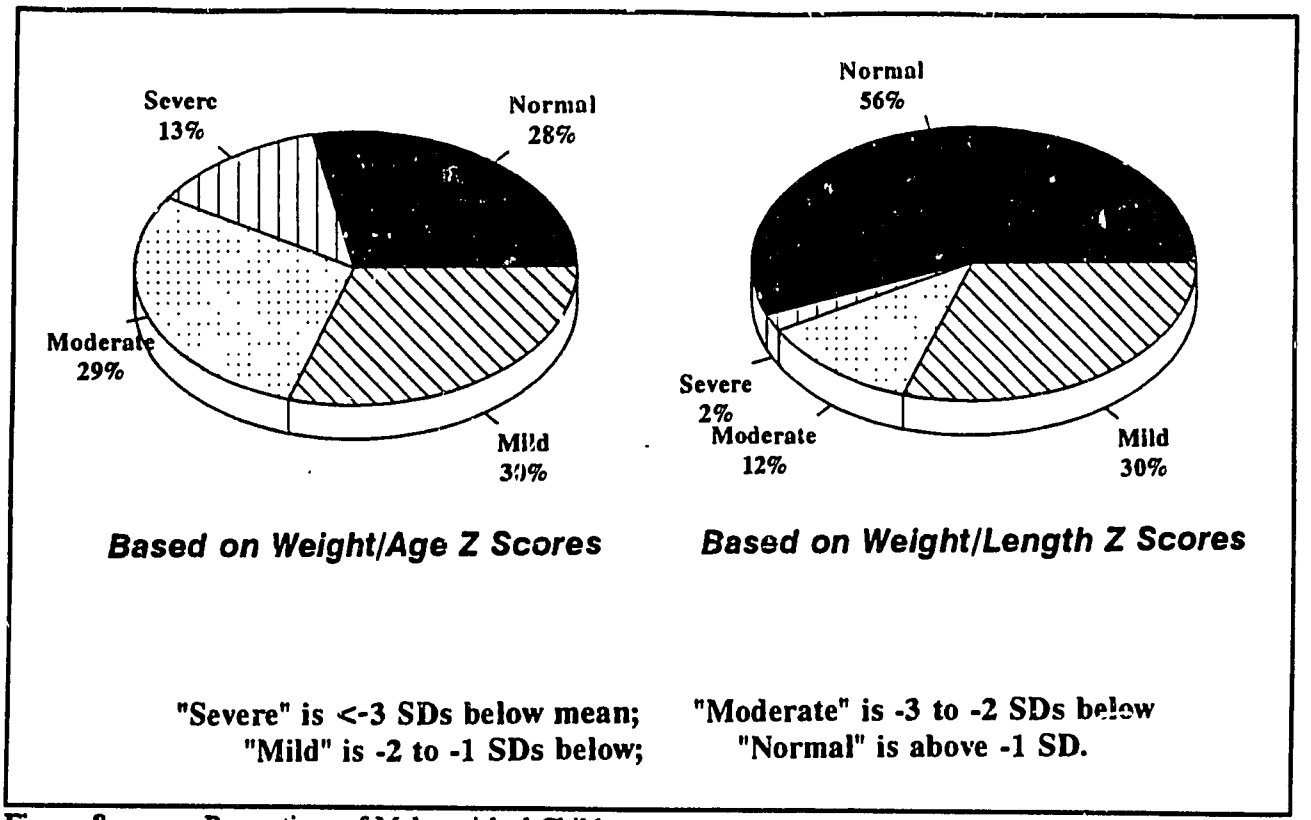
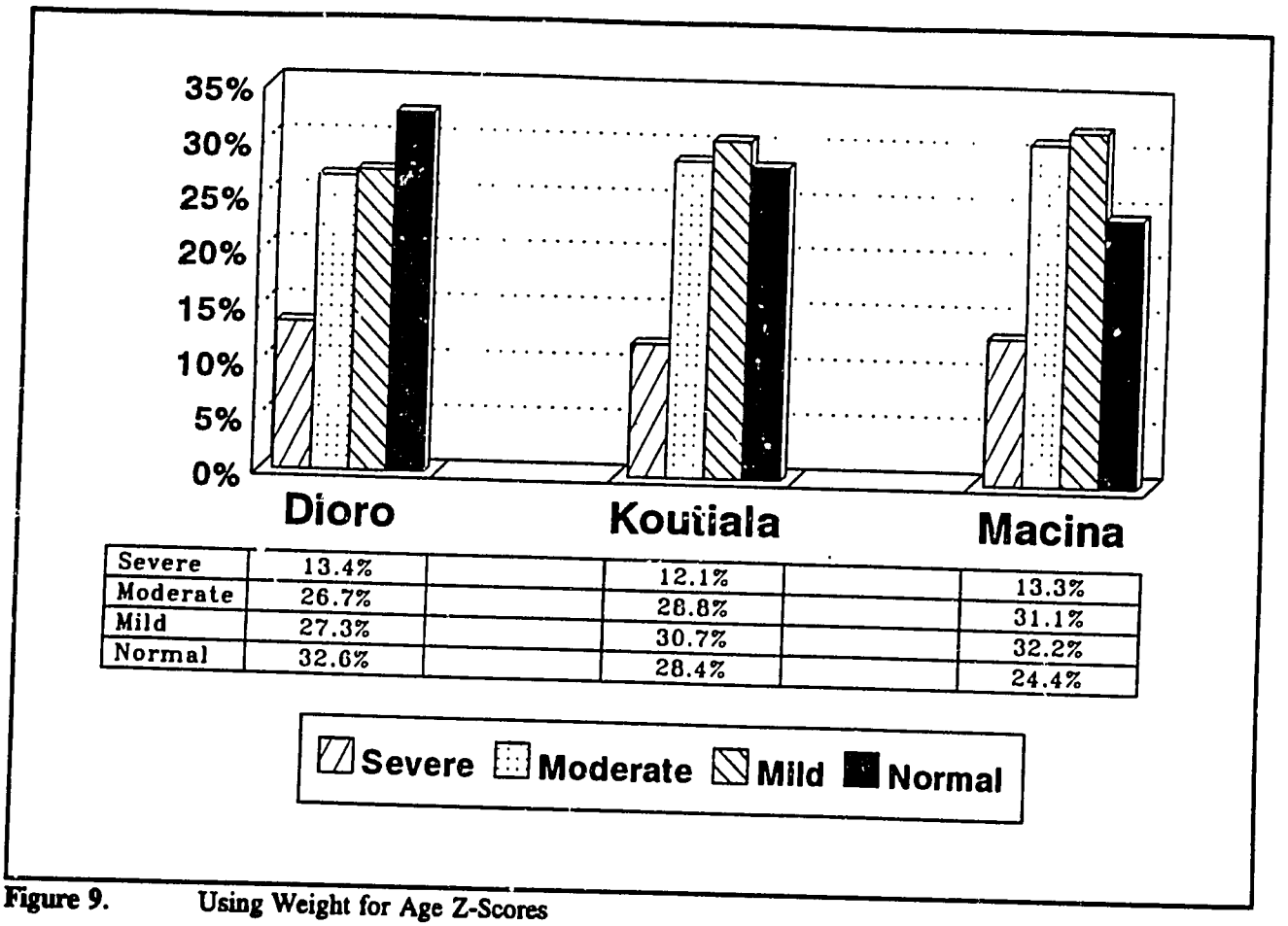


Figure 8. Proportions of Malnourished Children

Figure 9 illustrates the differences between the three project sites for weight/age. At baseline, there are no significant differences between case and control villages in any Child Survival Project area, for any index of malnutrition.



	Dioro		Koutiala		Macina
Severe	13.4%		12.1%		13.3%
Moderate	26.7%		28.8%		31.1%
Mild	27.3%		30.7%		32.2%
Normal	32.6%		28.4%		24.4%

Figure 9. Using Weight for Age Z-Scores

On the growth chart used by the Government of Mali, only "severe" malnutrition (-3 SD) appears in the "red zone", with moderate" (-3 SD to -2 SD) colored as yellow. This possibly conveys a false sense of security to field staff that children in the yellow zone are not at risk. Classification of "mild," "moderate" and "severe" malnutrition is based on the Gómez classification derived from mortality rates among hospitalized children in Mexico: mild equivalent to <= 90-76% of the reference (median weight-for-age); moderate equivalent to <=75-60%, and severe equivalent to <= 60%. Children who had "severe" or "third degree" malnutrition were very likely to die.[13]

[13] Jelliffe, D.B. & Jelliffe, E.F.P. 1989 *Community Nutritional Assessment with special reference to less technically developed countries*. Chp. 2 Direct Assessment of Nutritional Status, Anthropometry: Selection of cut-off points: 122-124.

For comparison's sake, figures from the "Iringa Project" in Tanzania demonstrate that the mean weight or height of children who lived to age three were more likely to be above -2 SDs than for children who died, and *mean weight-for-height was more likely to be above -0.5 than for children who died.*

Indicator	Dead	Alive
Z Weight-for-Age	-2.27 +/- 1.21	-1.67 +/- 1.01
Z Height-for-Age	-2.48 +/- 1.32	-2.04 +/- 1.10
Z Weight-for-Height	-0.97 +/- 1.26	-0.49 +/- 0.97

Source: YAMBI, Olivia. 1988. Nutritional Status and the Risk of Death: A prospective study of children six to thirty months old in Iringa region, Tanzania. PhD Thesis, Cornell University.

It is painfully clear that while small numbers of children suffering from "severe malnutrition" are politically and logistically easier to contend with, children at or below -3SDs of weight or height for age, and particularly weight/height, are not likely to survive. Child Survival Projects, by definition, must take action when children have a chance of recovering or averting such severe nutritional deficiency, and therefore, must also direct efforts to the larger number of children considered "moderately" malnourished.

For this reason, while the final report includes several graphs and tables that compare proportions of children "severely" and "moderately" malnourished, for the purpose of NCP's intervention, as well as the Child Survival Report to Congress, these two categories will be combined as children less than -2 SD from the reference median who are "malnourished." In addition, children less than -1 SD but more than -2, classified as "mildly" malnourished, are also considered "at risk" of increased morbidity and mortality.

Comparison of Children to Others Within the Sample

In order to tease out a greater range of associations, the data were regrouped to compare the sampled children against <u>their own</u> distribution of the anthropometric indices -instead of the NCHS (WHO) reference data. Secondly, the strong effects of age were controlled by comparing children within groupings of 2-3 months. Children who were **at or above** their group's mean Z-score for weight/height were classified as having *relatively* "**good**" nutritional status as compared to those **below** the sample mean, who were classified as having *relatively* "**bad**" nutritional status. Figure 10 on the next page illustrates an example of how 12-month-old children were classified according to their relative weight-for-age Z-score.

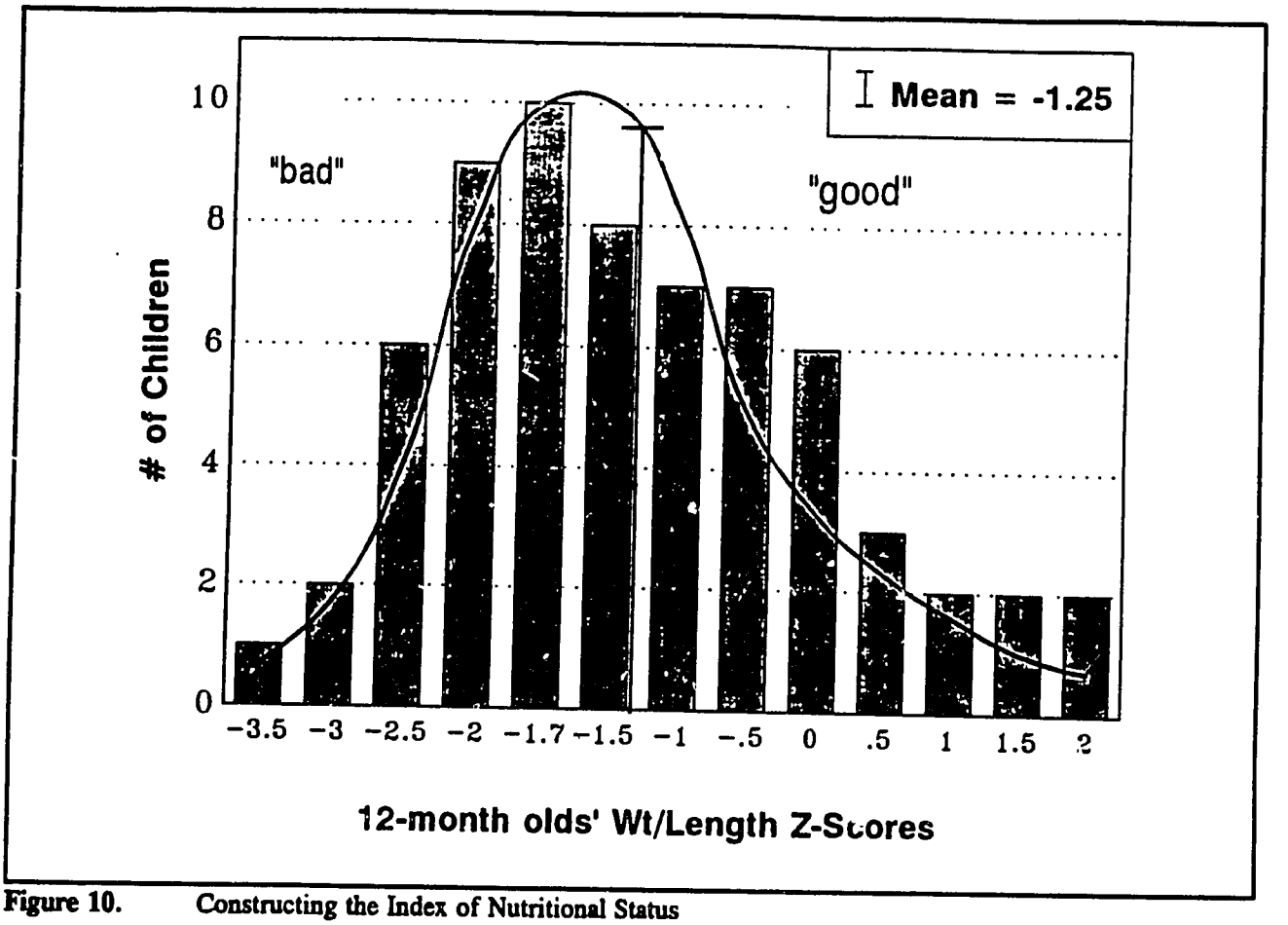


Figure 10. Constructing the Index of Nutritional Status

Figure 10 illustrates that if a 12 month old child had a score to the right of the mean, then the child would be classified as "good"; conversely, children to the "left" have been classified as "bad". Figure 11 below shows the relative proportions of "good" and "bad" children by sex.

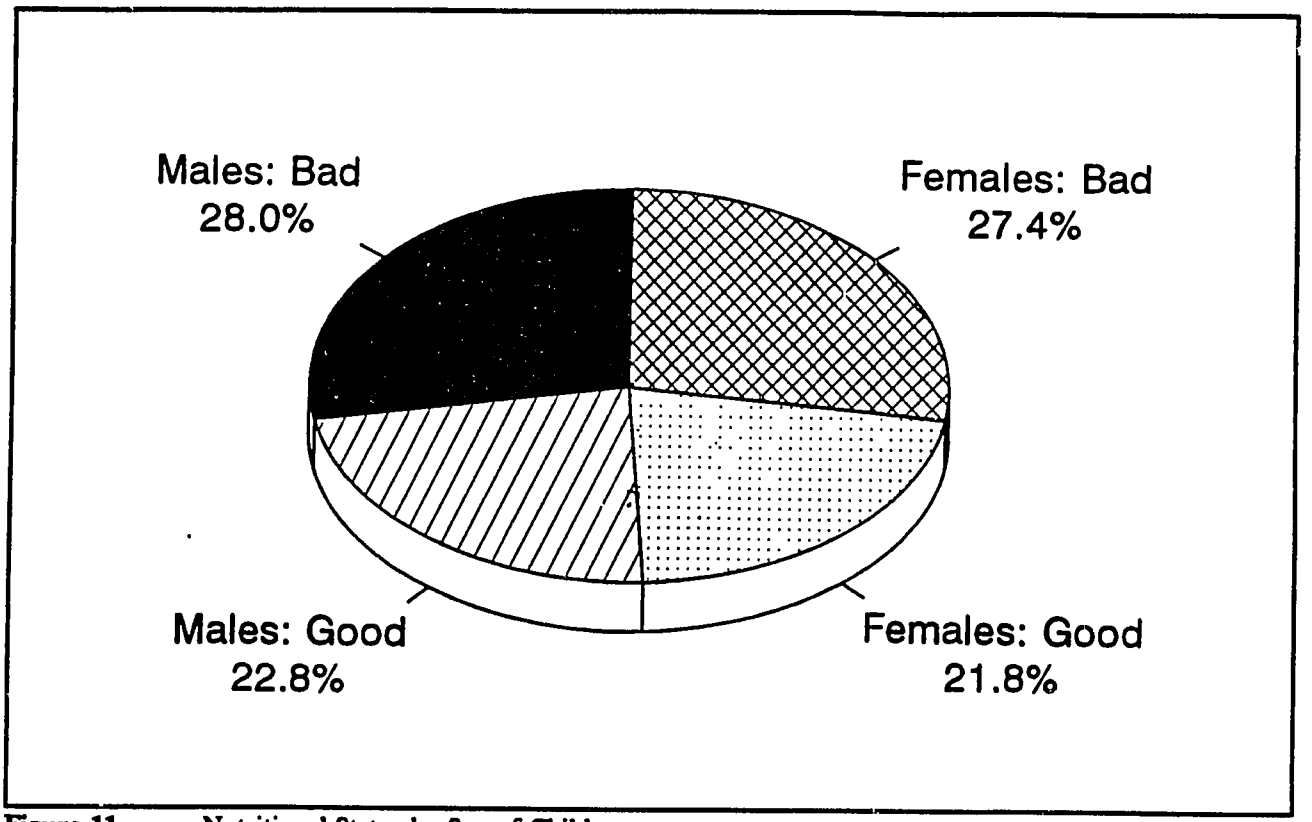


Figure 11. Nutritional Status by Sex of Child

This relative comparison drew out several significant differences within and between sites in association with other variables, although, as can be seen above, gender is not one of them. As many of these variables relate to specific nutrition attitudes and practices, the descriptive data will be presented first followed by a discussion of covariance.

D. Nutrition Practices, Attitudes and Knowledge

Infant Feeding

Breastfeeding

Women were asked to report the first food given to their newborn. The interviewers carefully worded the question so that the women would understand that "food" meant "any substance." Their answers are illustrated in Figure 12 below:

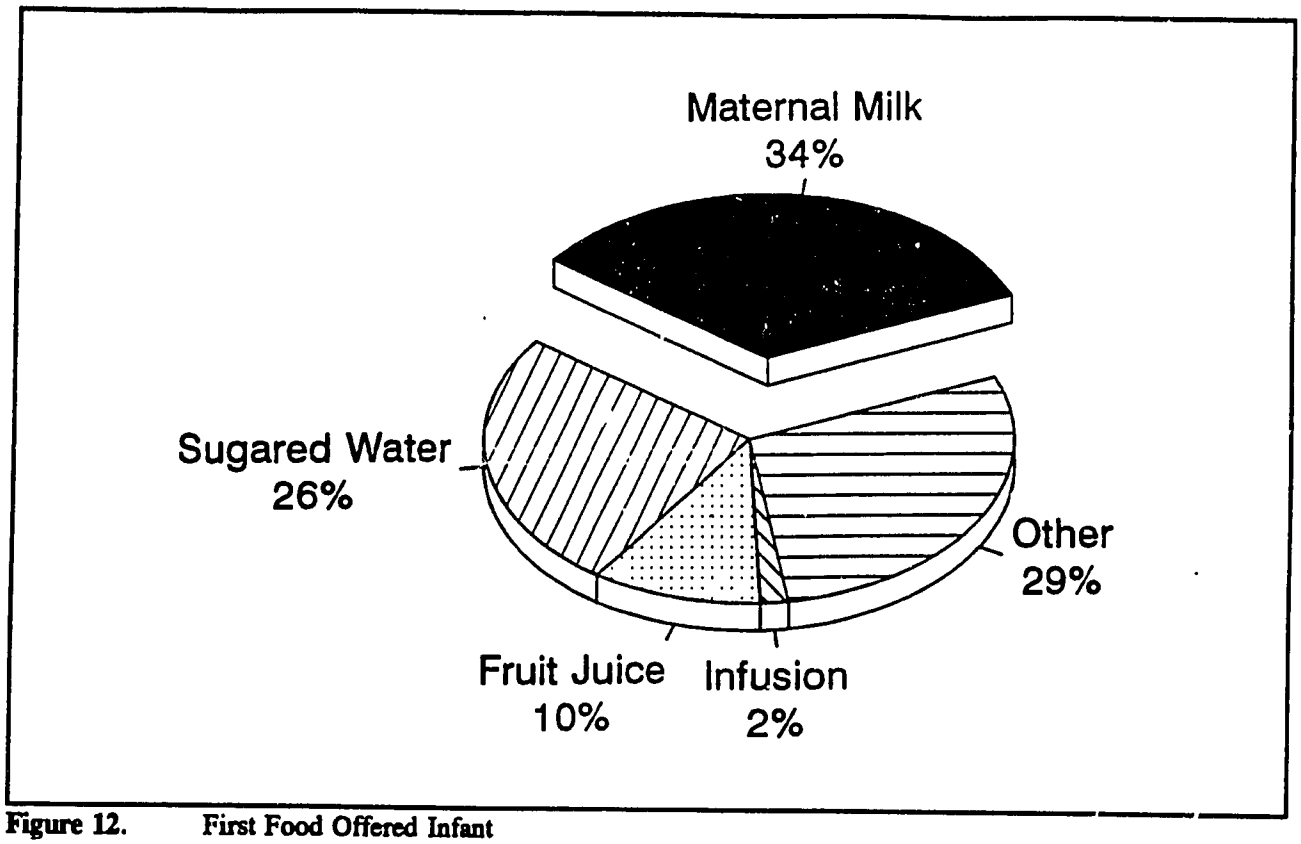


Figure 12. First Food Offered Infant

Only one-third reported breastmilk as the "first substance" offered to their child, with the rest giving plain or sugared water, fruit juice or an "infusion," which may or may not have been made with boiled water. This early introduction of fluids is of concern, since the water quality is poor and 60% of the women do not treat their water. Among the women who reported treating their water, 39% filtered it through a cloth (which is not often cleaned) and the remaining scant percent boiled or added chlorine solution (bleach) to the water. Significant differences in reported water treatment exist between the sites:

Proportion filtering water:

Dioro	Koutiala	Macina
41%	13%	68%

Different Child Survival Project messages are likely to account for the differences across sites. NCP's data correspond closely to CARE's observation that approximately 3% of women who have been taught by health workers use bleach in water compared to 1% in villages where they have not been so instructed[14].

[14] MCHP Annual Child Survival Report 1991:13

Other Fluids and Foods

Families in this population on average introduce fluids earlier, and solids later than current international recommendations for optimal infant feeding. The mean age for introducing various substances appears in Table 3 below:

Table 3. Mean Age for Introducing Foods to a Child's Diet

Food Given	Mean Age (months)
Water	1.1
Juice	5.5
Porridge	7.2
Fruit	7.4
Meat	9.2
Fish	9.3
Rice	10.3
Millet	10.5

While parents state that the cultural norm for giving a child millet or rice is "not before 1 year," both these foods, as well as fish and meat were reportedly introduced earlier. The fish and meat are normally prepared as sauce and served with rice or millet paste (*toh*) and it is unlikely that they appear with regularity before the staple foods also enter the diet.

Weaning

Eighty-five percent of the women sampled were currently breastfeeding. When they were asked when they planned to wean their child, the average age reported was 25 months.

Table 4 below reports actual age of the child at weaning among those no longer breastfeeding:

Table 4. Age of Last Child At Weaning		
Weaning Age	Number	Percent
5 to 9 months	1	0.8%
10 to 12 mo.	13	9.8%
13 to 17 mo.	12	9.1%
18 - 22 mo.	28	21.2%
23 - 27 mo.	58	43.9%
28 - 32 mo.	4	3.0%
33 to 37 mo.	15	11.4%
48	1	0.8%
Total	132	100.0%

Both women who were currently breastfeeding and women who had weaned were asked what reasons precipitated their decision to wean. Seventy-seven percent of the breastfeeding women intended to wean the child when it reached the appropriate age. Another 22% believed they would wean when they became pregnant. In comparison, 65% of the non-breastfeeding women had weaned because of their child's age. One-third of them, 32%, weaned because of a subsequent pregnancy.

Table 5 below illustrates this difference.

Table 5. Difference Between Expected and Actual Reasons for Weaning Child				
	Intended		Actual	
Reason	#	%	#	%
Age	447	76.7%	103	64.8%
Pregnancy	125	21.5%	51	32.1%
Mother Sick	3	0.5%		
Insufficient Milk	2	0.3%	2	1.3%
Others	6	1.0%	3	1.9%
	583	100.0%	159	100.0%

"Insufficient milk" was not a very important reason given for women weaning their children. The slight discrepancy between actual and expected weaning is illustrated in Figure 13:

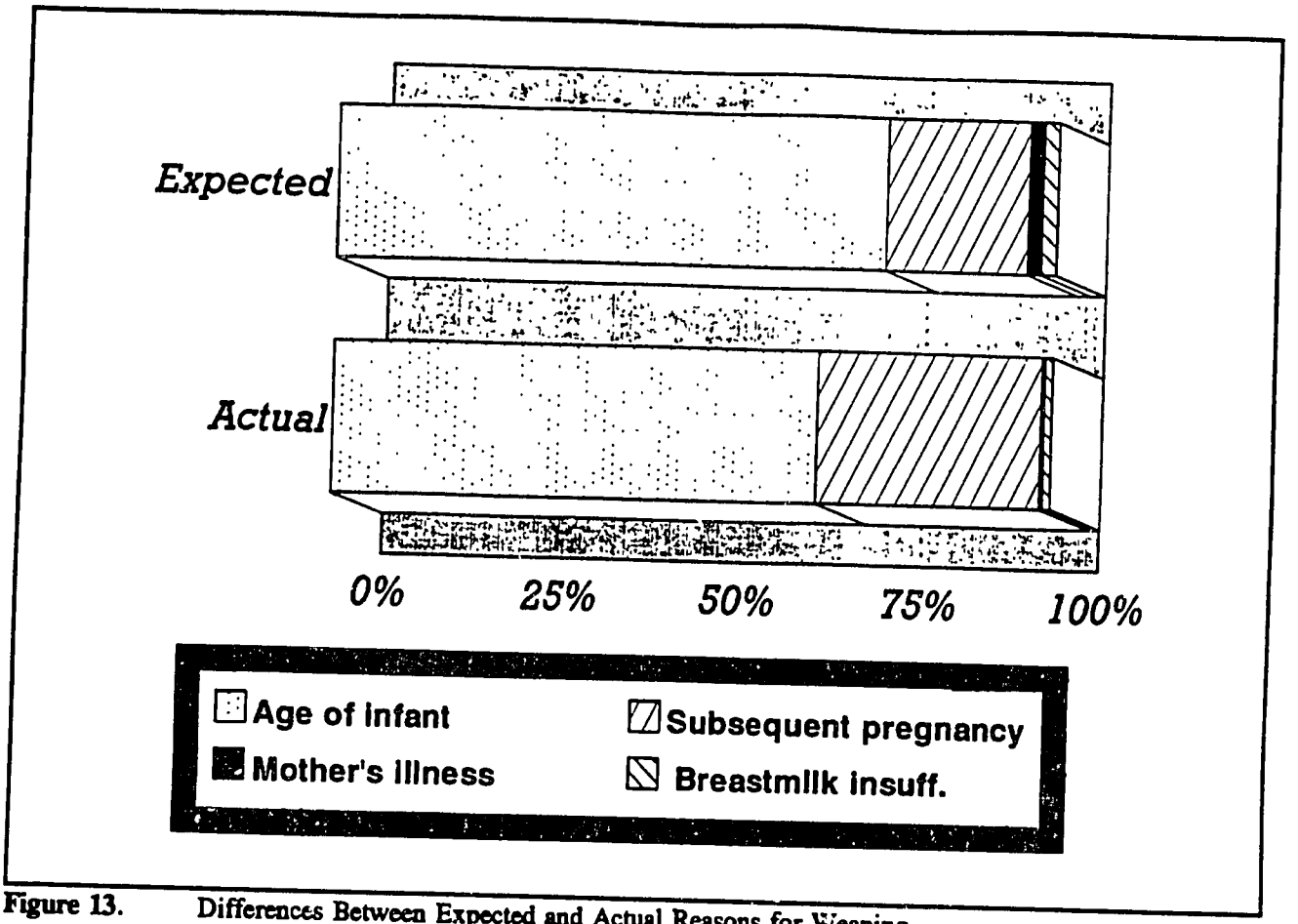


Figure 13. Differences Between Expected and Actual Reasons for Weaning

Women who were currently breastfeeding believed they would be able to nurse for at least two years without stopping due to pregnancy. However, women who had weaned their child because of pregnancy were two times more likely to have weaned prior to 20 months. ($p<0.01$)

Hence, the relationship between birthspacing, breastfeeding, and subsequent pregnancies is clear in this population. These results, combined with the low rate of exclusive breastfeeding in the population at large (89%), leave considerable room for NCP's message which encourages exclusive breastfeeding until the fourth to sixth month.

Decisions about Infant and Child Feeding

Approximately 72.4% of the women said that they decide what changes to make in their child's diet. Eleven percent of the women said their husband decides, while 12% said grandmothers or aunts. The remaining 4% said the child, birth attendant, and "others" decide.

As children are introduced to foods from the family plate, their unique nutritional needs are given little special attention. This attitude or belief influences the frequency and supervision of

a child's meals. NCP plans to encourage mothers to give their infants and toddlers more food in small, definable quantities and to actively assist the child during meals.

Number of Meals

To assess their current practices, mothers were asked how many times per day ("meals") their child eats. After excluding children who were only receiving breastmilk ("zero" meals), 31% of children under one year were receiving fewer than three meals a day. While only 11% of children 12 to 36 months received less than three. Since a number of the children currently receiving only breastmilk should have complementary foods added, the actual proportion of children who are getting too few "meals" is much greater. (See Figure 14.)

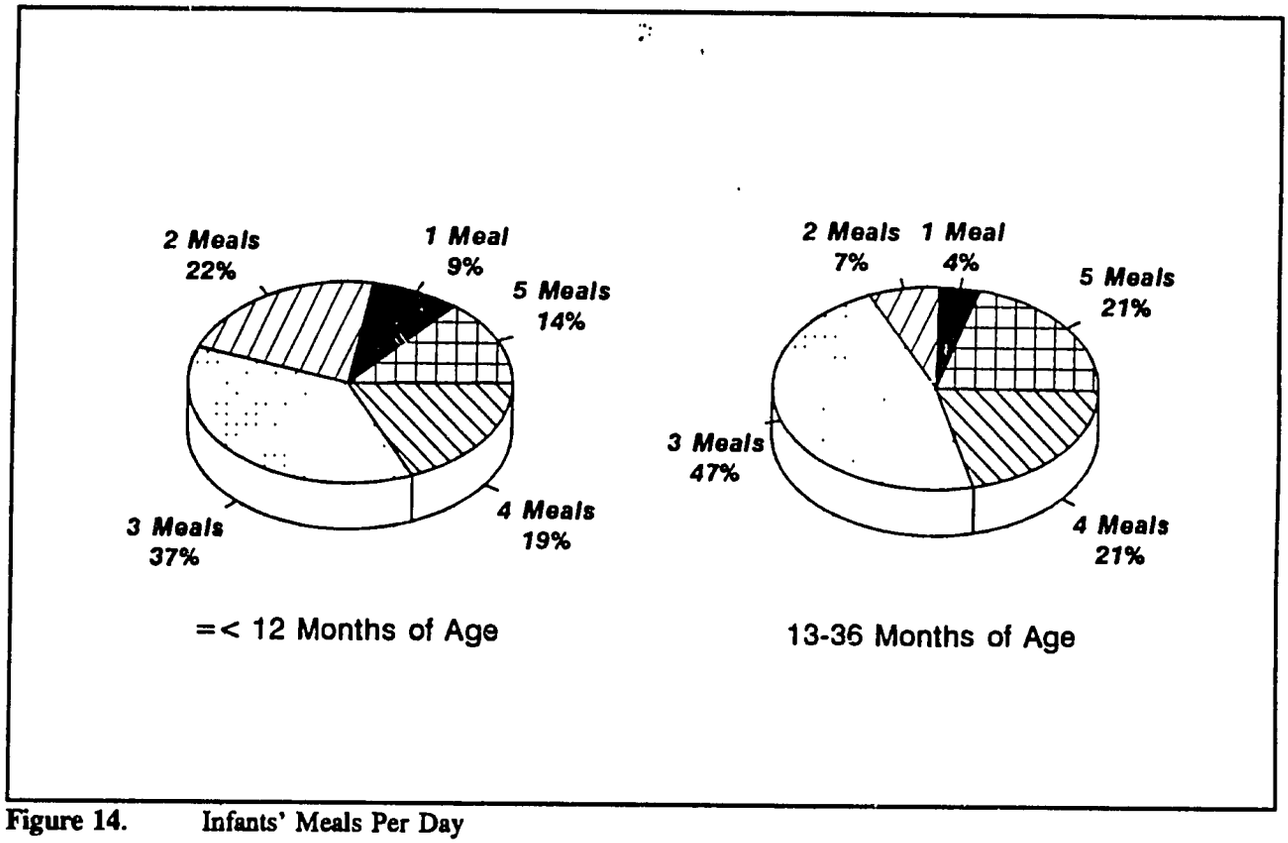


Figure 14. Infants' Meals Per Day

Supervision of Meals

Women were asked who eats with the child at each of his meals. Only individuals who ate two or more meals with the child are reported. Contrary to common perceptions that children always eat with their mothers, only one-fifth of the children ate the majority of their meals with their mothers. Significant proportions of children ate by themselves (26%) or with other children (17%). These proportions are illustrated in Figure 15. Note that only 1% of children's meals are eaten with the father.

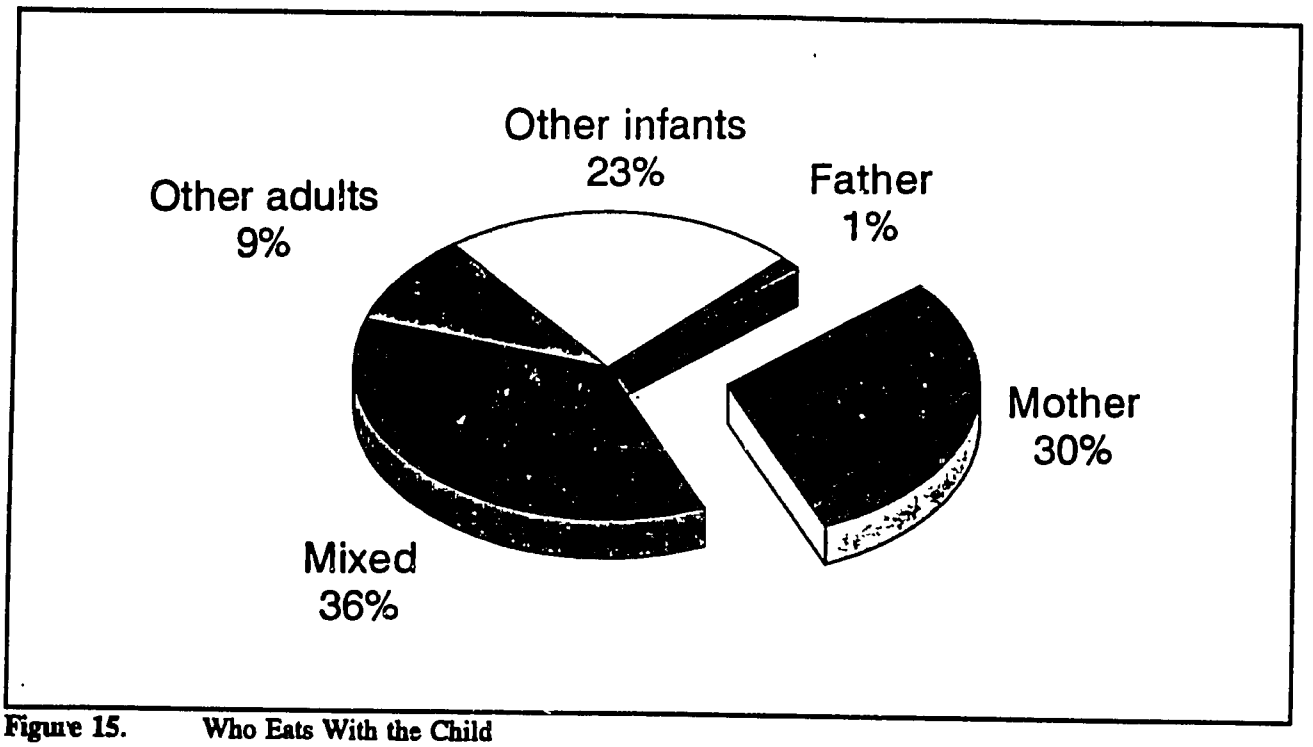


Figure 15. Who Eats With the Child

Nutrition Education

Approximately half of all women living in high PVO contact (case) villages had heard a "nutrition" message compared to 19% among those with less contact (controls). The majority of the women (80%) said that health workers were their primary information source, where as the 36% of men who had heard a nutrition message were equally likely to have heard it on the radio as from health workers. There are significant differences in the proportions of women who have heard a message between project sites. Specifically, 44% of women in Macina, 31% in Dioro, and 24% in Koutiala had heard a nutrition message. Significant differences also exist between case and control villages in the number of both men and women who have heard a message.[15]

[15] Since case villages have had more exposure to health education with the PVO Child Survival projects, excluding the "control" responses made the differences between sites more pronounced.

Source of Information

Table 6. Mode of Transmission of Messages				
Mode	Women		Men	
	#	%	#	%
Health Worker	190	80.1%	54	30.2%
Radio*	13	5.4%	95	53.1%
Television	18	7.6%	-	-
Neighbor	9	3.8%	5	2.8%
Other	7	3.0%	25	14.0%
Total	237	100.0%	179	100.0%
* includes "radio and health agent" for women's questionnaire				

The majority of the women (80%) are clearly reached by health workers, while more men (53%) are reached by radio. The main *nutrition* messages reported by women were: bouillie/porridge (28%), oral rehydration solution (13%), nutrition for pregnant women (7%), and the three basic food groups (6%). Men were more likely to remember hearing messages about: infant feeding, other messages, sanitation, and ORS (listed in descending order). Thus, the extent to which the population has actually been informed about nutrition is somewhat exaggerated by these figures, as many of the messages that are remembered by either men or women (though women are more accurate) pertain to other interventions.

Attitudes and Knowledge Tested through Illustrations

When shown a series of pictures[16] depicting different physical symptoms (measles rash, emaciation, edema, night blindness), only a small number of respondents could identify children afflicted with marasmus (10%), kwashiorkor (0.5%) or measles (17% women, 36% men).

There were significant differences between project sites: 22% of the women from Koutiala, 14% from Macina, and 5% from Dioro said their children were either malnourished or thin.

Women were also asked what could be used to treat or cure marasmus. In response, 13% of the women said to give more food; 50% said a dispensary or modern medicine; 26% said traditional medicine; 5% gave another response and 5% did not know (proportions excluded 25 multiple responses out of 320 total). Two-thirds of the women mentioned giving children appropriate foods. Among these women, 19% cited protein rich foods; 42% said "porridge, milk, rice, or millet"; 8% said both proteins and carbohydrates; and 3% said "rich" foods.

[16] See Appendix B.

Night Blindness in Pregnant Women and Children

Women were better able to identify night blindness, with 76% identifying a woman and 36% identifying a child with the condition. When asked what could be used to cure the condition in the woman, 44% gave a correct response of either: taking Vitamin A capsules, eating liver, or eating plants\juice\liver\fish. The rest of the women either did not know (35%), said traditional medicine (17%), or said that the disease would end when she gave birth (4%).

Nutritional Needs of Pregnant Women

A picture of a pregnant women eating was used to ask women how much food they needed during their pregnancy. Only half of the women said they ate more than usual. The rest were equally divided between those who consumed less food and those who ate the usual amount. NCP's objective to achieve greater sensitization regarding the nutritional needs of pregnant women is an important goal, given that half of the women ate less or the same amount of food during pregnancy.

Among the women who said they needed more food, 20% said they needed more millet, 15% more meat, 14% more meat and fish, 7% more porridge, 2% more milk and 2% more fruit. Twenty-seven percent of the remaining women said more meat and other foods and 13% said a combination of other foods.

Hypothetical Situations

Pictures were also used to pose hypothetical situations.

- Forcing a Child to Eat

  Interviewers showed a picture of a woman trying to get a child to eat, and asked the women why she was doing this. Thirty-eight percent of the women thought the child was sick; 23% thought the woman did not have milk or did not have enough; and 17% thought she was weaning the child. The remaining women either did not know, thought the child refused to eat, or gave another response.

  Next women were asked whether they thought it was appropriate for the woman to force the child to eat. Women were more inclined to say no, although 39% said "yes, it was fine." Among women responding affirmatively, 46% thought it was a good idea because food gives the child strength and 33% said food is necessary to keep the child from losing weight. Among the negative respondents, 55% did not give a reason and 24% of them said you must only give food when the child wants it.

  Thirdly, women were asked whether the child must eat when it is sick. More women, 70%, thought forcing food is acceptable when the child is sick and 29% disagreed. The women's preferred method of giving food was to encourage the child to eat it, 33%, or to give small amounts over time, 20%.

- Market Food Choices

NCP is encouraging men and women to choose healthy snacks for themselves and their children in the marketplace. Men and women were shown a picture of a man buying a snack for a child in the market and asked whether he should buy carrots or macaroni, two commonly found items. More men than women thought he should buy carrots, and this was associated with better nutrition in their children. Eighty-four percent of the women said the man should buy macaroni instead of carrots for the child. The majority, 71%, said macaroni because the child asked for it and 22% because macaroni "satisfies". Among those advocating carrots, 54% said carrots give good health; 17% said carrots keep well and are easy to clean; 14% said that macaroni is "dirty" (includes those who said dirty and some other reason); and 16% did not respond.

When men and women were shown a picture of a man buying liver at the market and asked for whom he was purchasing it, no one said that it was for the man himself. Fifty percent of the women and 31% of the men said the liver was for his children; 29% of both men and women said it was for his family, and 4% of the women and 16% of the men said the liver was for his wife. When given a hypothetical scenario both men and women felt that the man should buy the liver for his family. The actual number of men who would purchase liver for their families is unknown.

E. Association of Children's Nutritional Status with the KAP (Experimental) and Confounding Variables

The purpose of collecting the information, defined as experimental and confounding variables, is to determine its impact on children's nutritional status, the dependent variable. An understanding of the relationships, or associations, between the experimental/confounding and dependent variables is necessary at the start of the project so that the real impact of the NCP interventions can be measured.

The four different measures of a child's nutritional status used to assess existing associations were: weight for age Z-scores, weight for height Z-scores, height for age Z-scores, and "good" vs. "bad" index. Weight for age is a general measure of malnutrition. In contrast, weight for height measures acute malnutrition and height for age measures stunting (chronic malnutrition). Since the indicators define malnourished children differently, they must be tested separately. Statistical tests were used to determine whether a particular variable was associated with childhood nutritional status. Variables were said to be "significantly" related to a child's nutritional status if the probability of making an erroneous statement was less than 5%. This level of "significance" is reported as "$p<0.05$"; lower probabilities were reported as well.

As so large a proportion of the sampled children had low nutritional status compared to NCHS reference data, few statistically significant associations ($p<.05$) could be found with other variables when absolute Z-scores were used. Among the sampled children, nutritional status decreases sharply with age from 1 month through 25 months, at which point it remains at a low plateau through 36 months. Additional significant associations follow:

Acute Malnutrition

- Mean weight-for-height Z-scores (WHZ) varied significantly by site, with children in Koutiala having the smallest deviation from the NCHS mean using this indicator:

  Koutiala (-0.16) Dioro (-0.75) Macina (-1.31)

- Using regression on WHZ, as well as Weight-for-Age (WAZ), positive associations were found with timely introduction of protein foods (meat-fish). Analysis of variance also showed children with better WHZ-scores less likely to have received fluids before 4 months of age.

Chronic Malnutrition

Height-for-age Z-scores (HAZ) showed two interesting associations:

- Children for whom solids (including porridge) were introduced in a timely fashion had less chronic malnutrition.

- Mothers who were the first as compared to the second wife in a polygamous household had children with significantly better HAZ (i.e. less chronic malnutrition). The difference is illustrated in Figure 16 below.

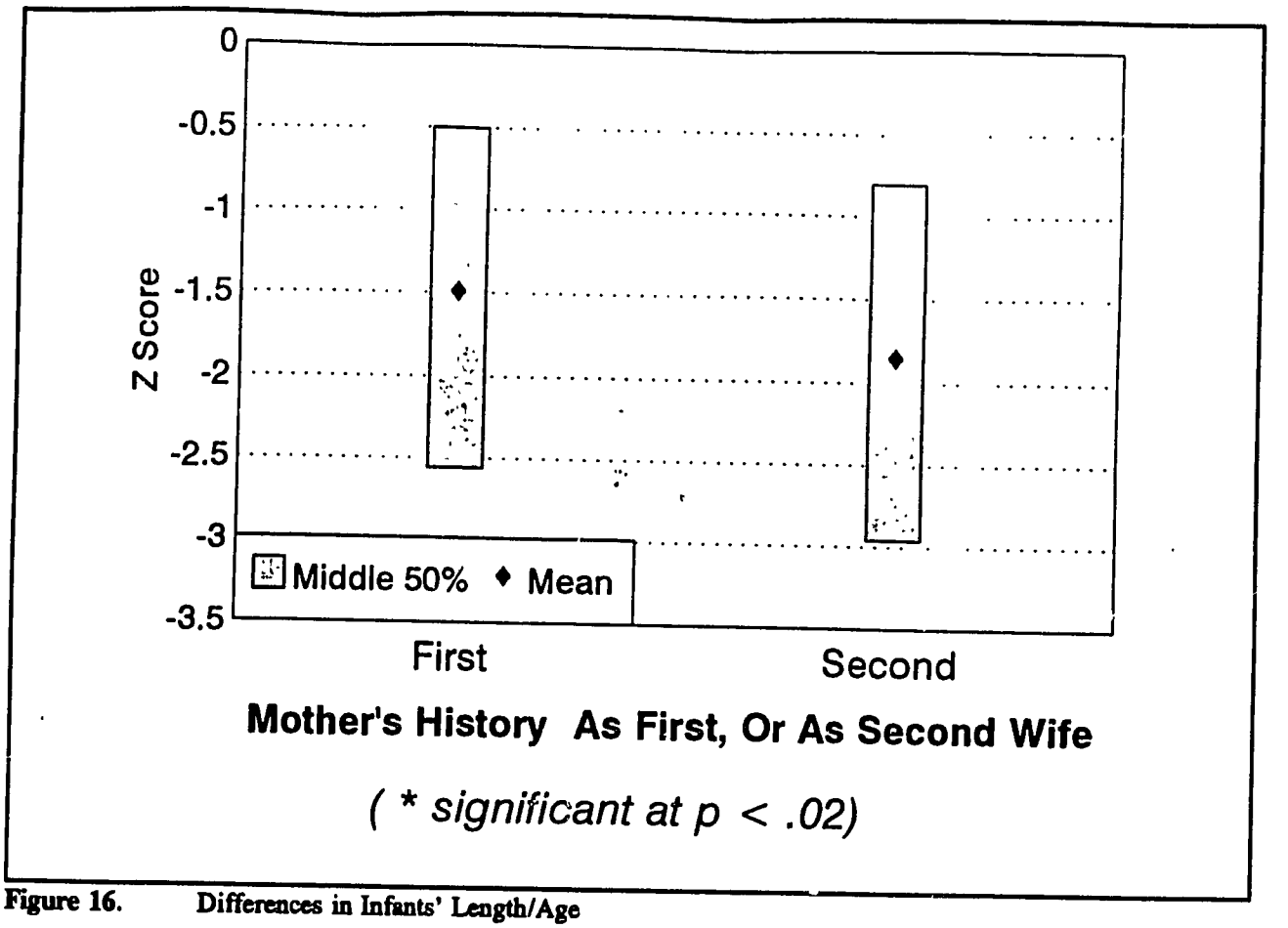


Figure 16. Differences in Infants' Length/Age

Using the Good v. Bad classification, we found that children who had a relatively "good" nutritional status were more likely to:

- **Live in Koutiala.** (Sixty-five percent of the children in this village were "good," compared to Dioro, 41%, or Macina, 20%.) The nutritional status of children by site is illustrated in Figure 17.

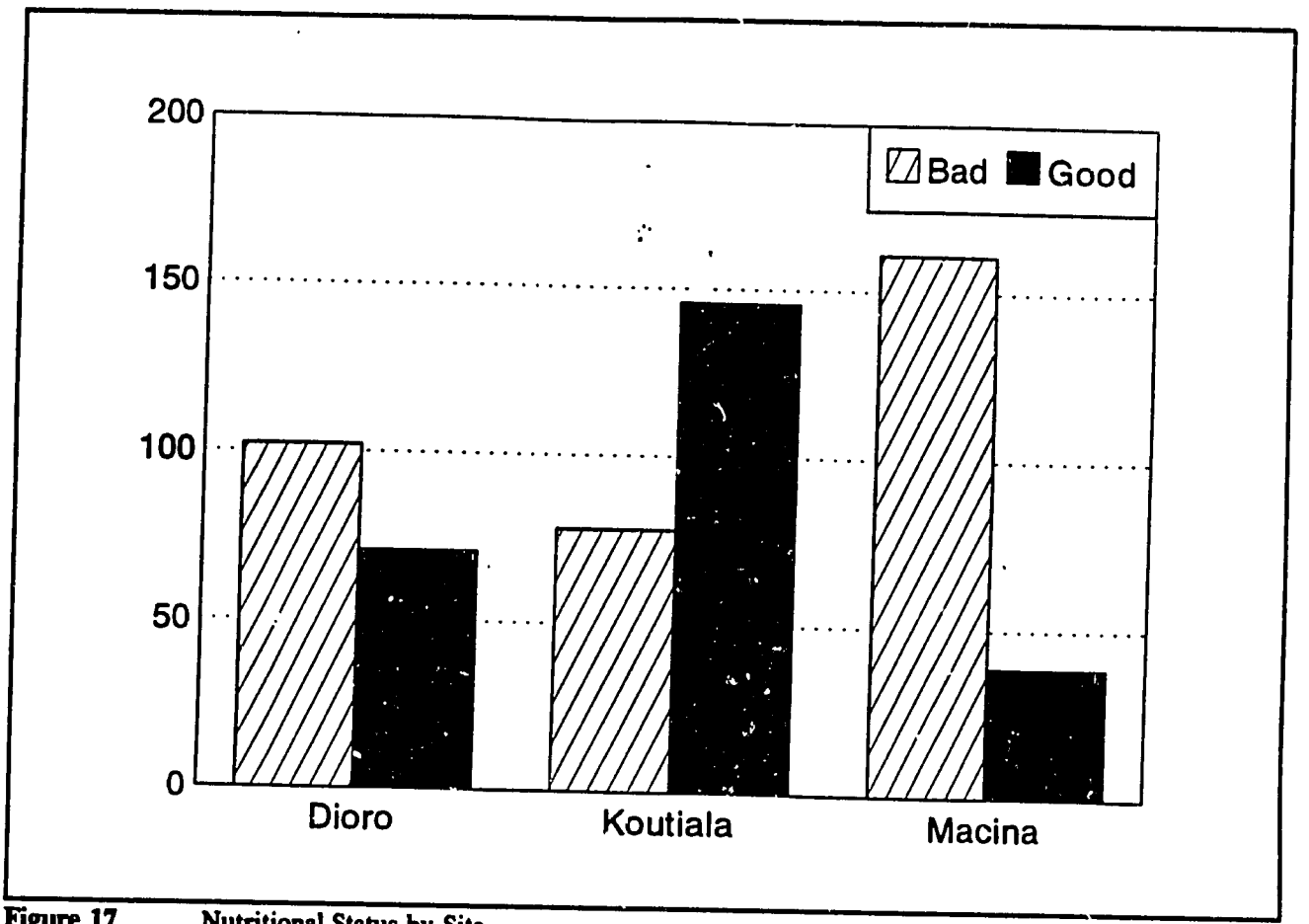


Figure 17. Nutritional Status by Site

- **Come from households with higher relative wealth scores**, although this difference was largely accounted for by its very strong effect on the older, more malnourished children (27+ months). The relationship is illustrated in Figure 18 below:

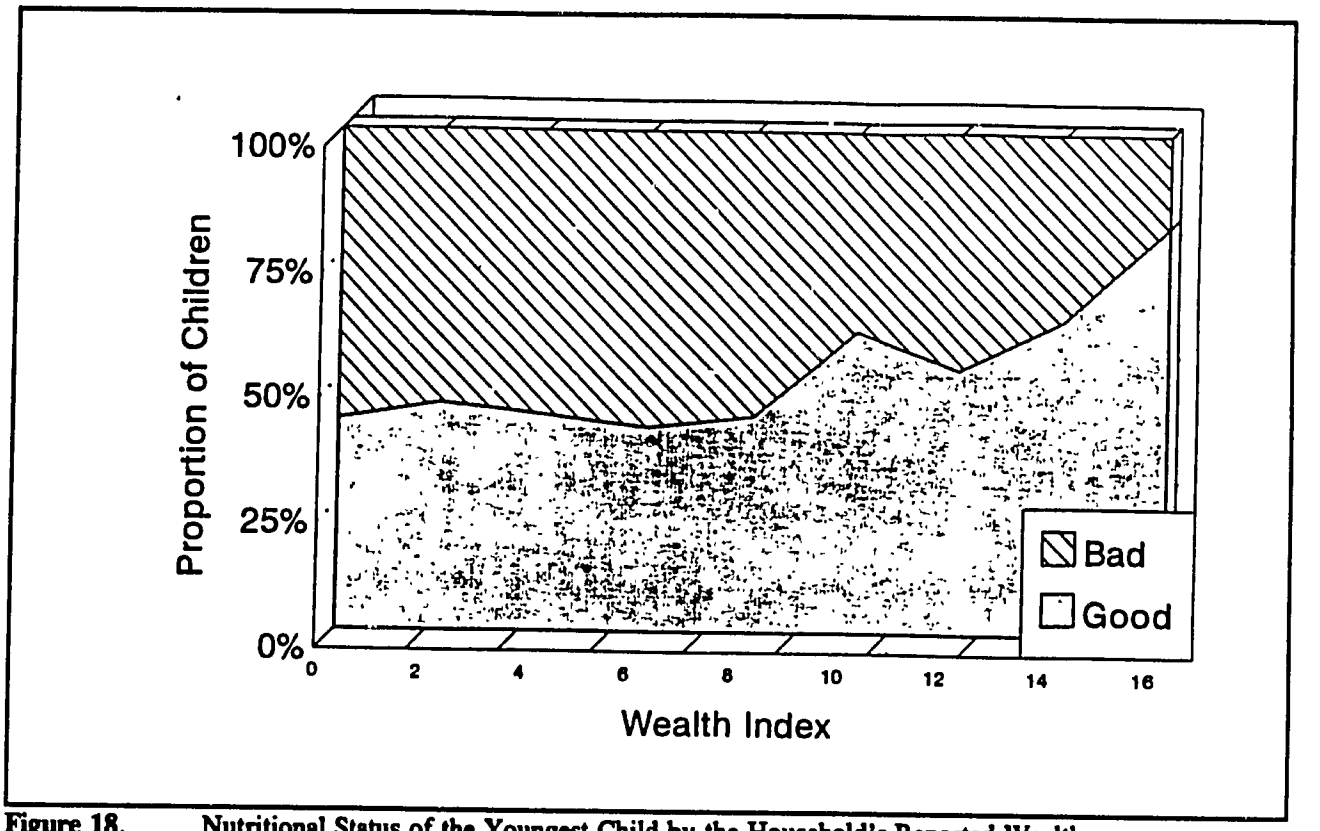


Figure 18. Nutritional Status of the Youngest Child by the Household's Reported Wealth

♦ **Have received fluids only after four months of age.**

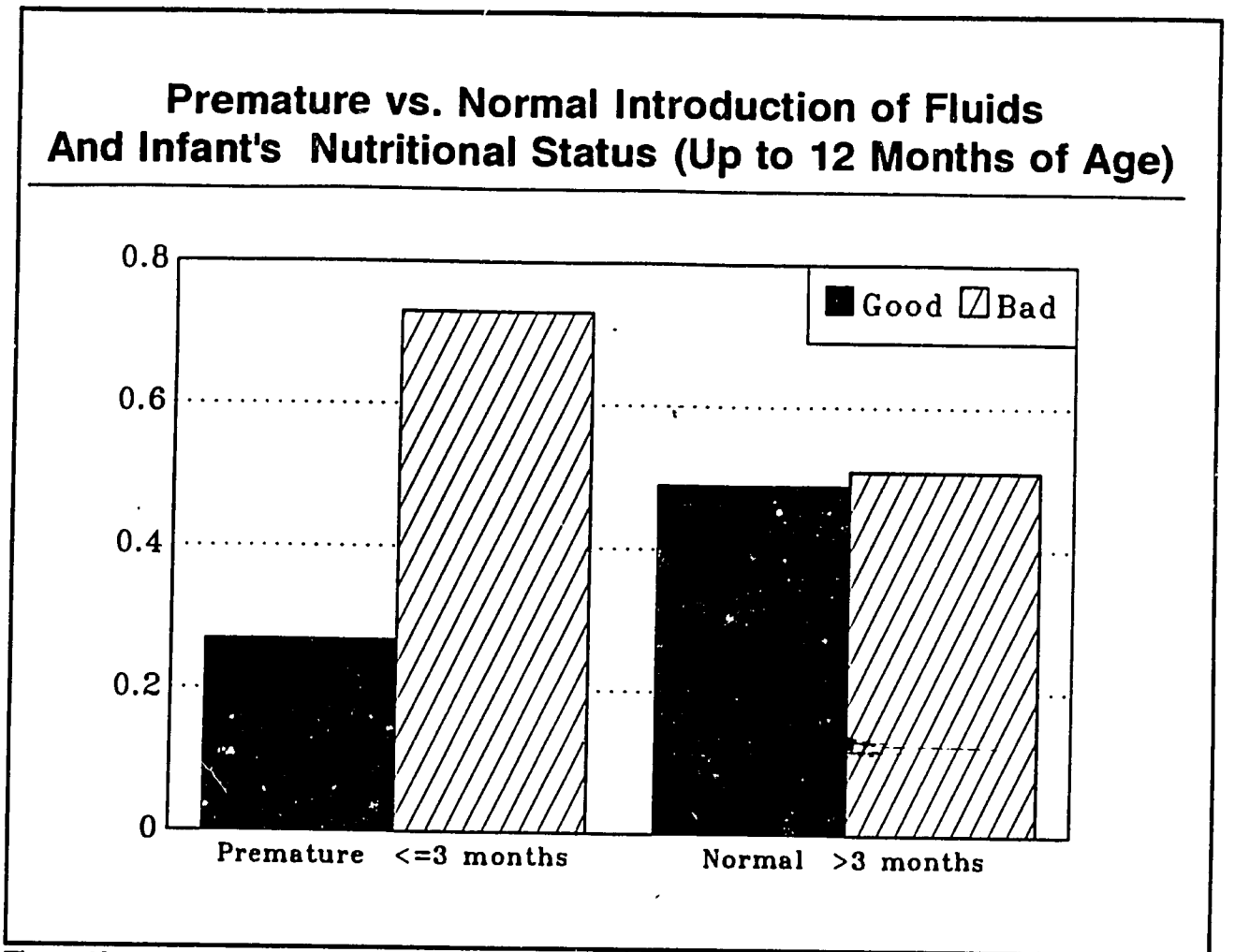


Figure 19. Introduction of Fluids and Effect on Nutritional Status

- **Have received protein foods prior to eight months.**
- **Have been weaned after 23 months.**

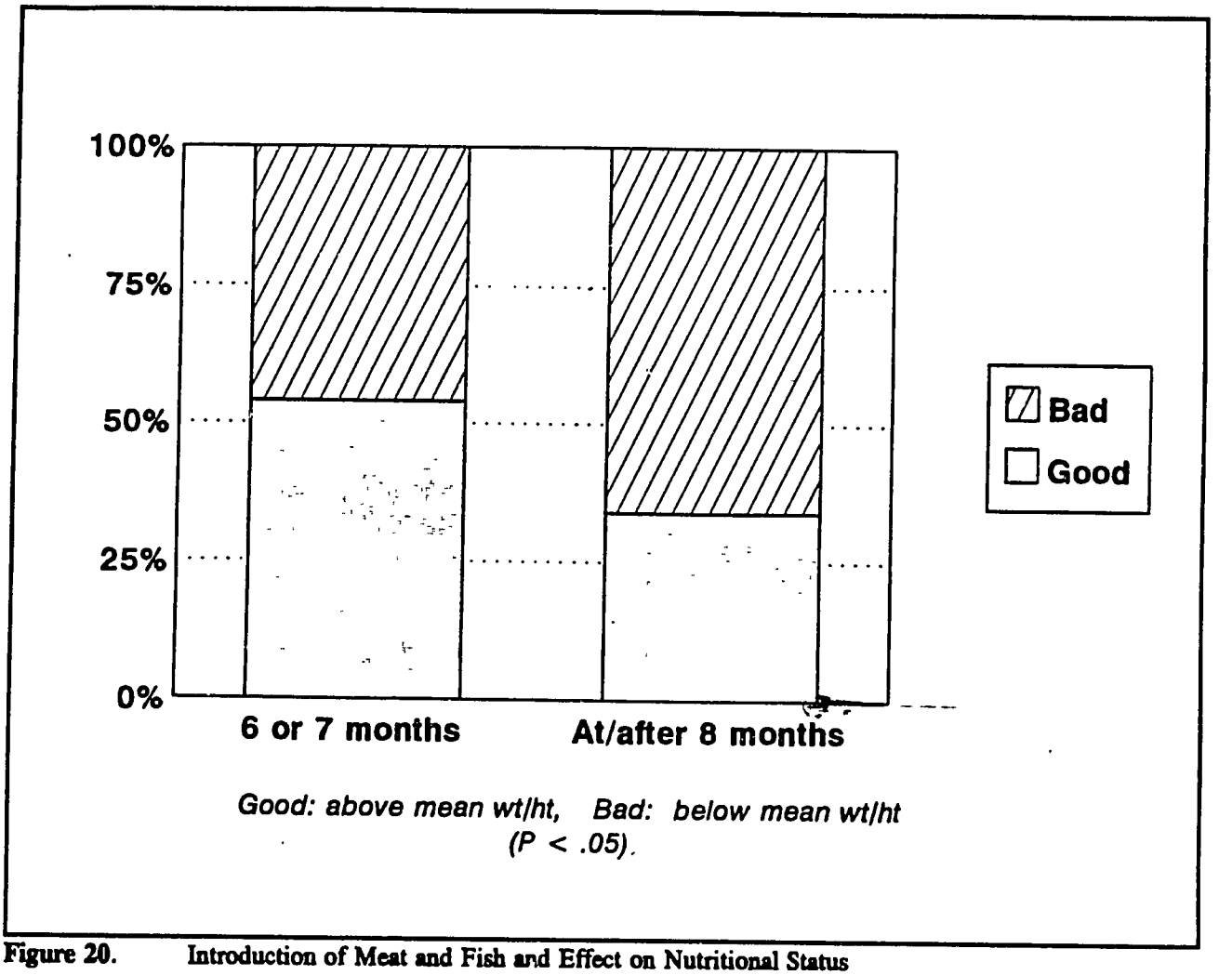


Figure 20. Introduction of Meat and Fish and Effect on Nutritional Status

- **Have mothers who could identify a malnourished child from the drawing shown during the survey.**

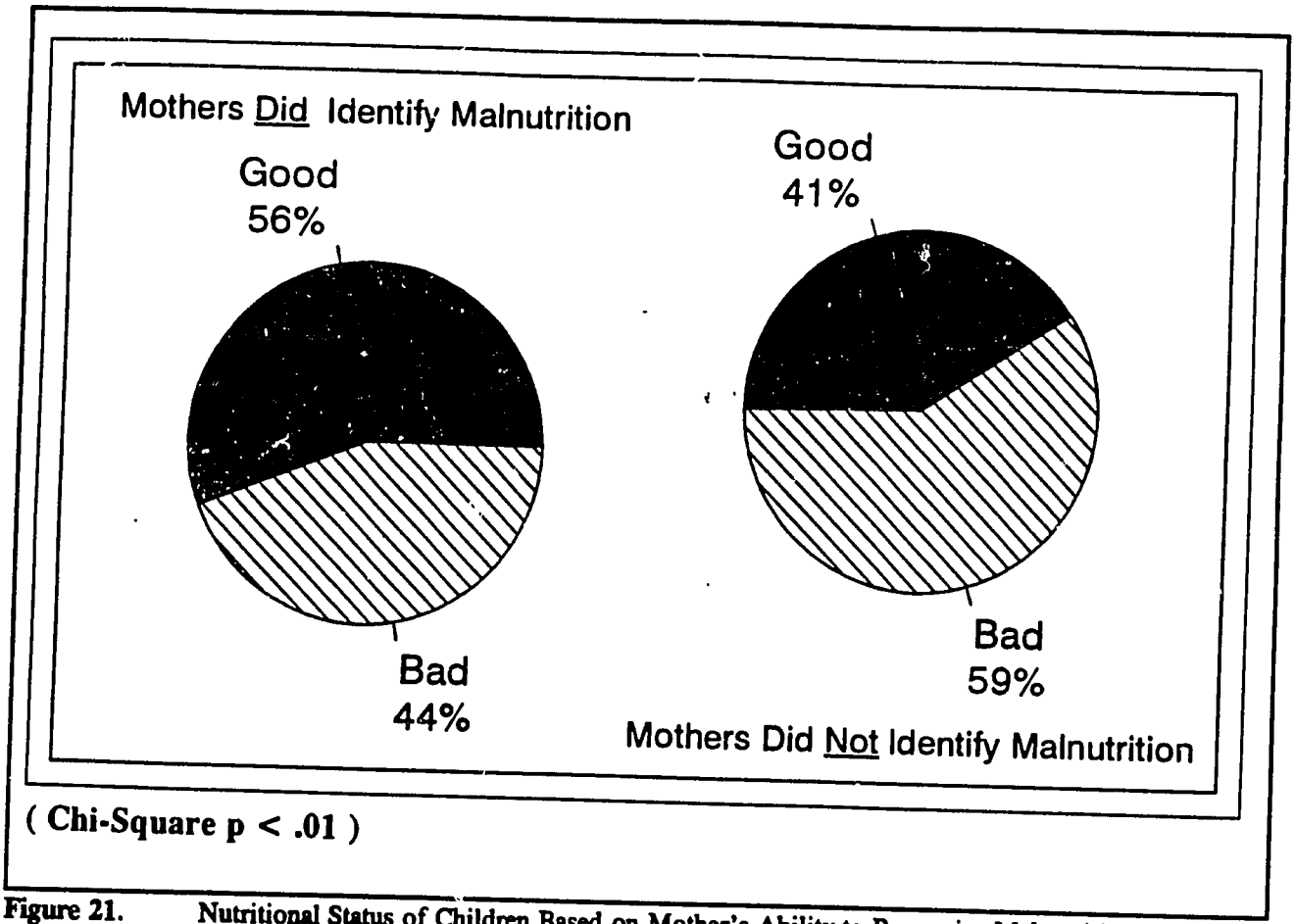


Figure 21. Nutritional Status of Children Based on Mother's Ability to Recognize Malnutrition

- **Have fathers who could recognize a child with measles from the drawing shown during the survey.**

- **Have fathers who selected carrots (rather than macaroni) as the more appropriate snack for the child,** despite the child asking for the macaroni, within the hypothetical situation of the survey.

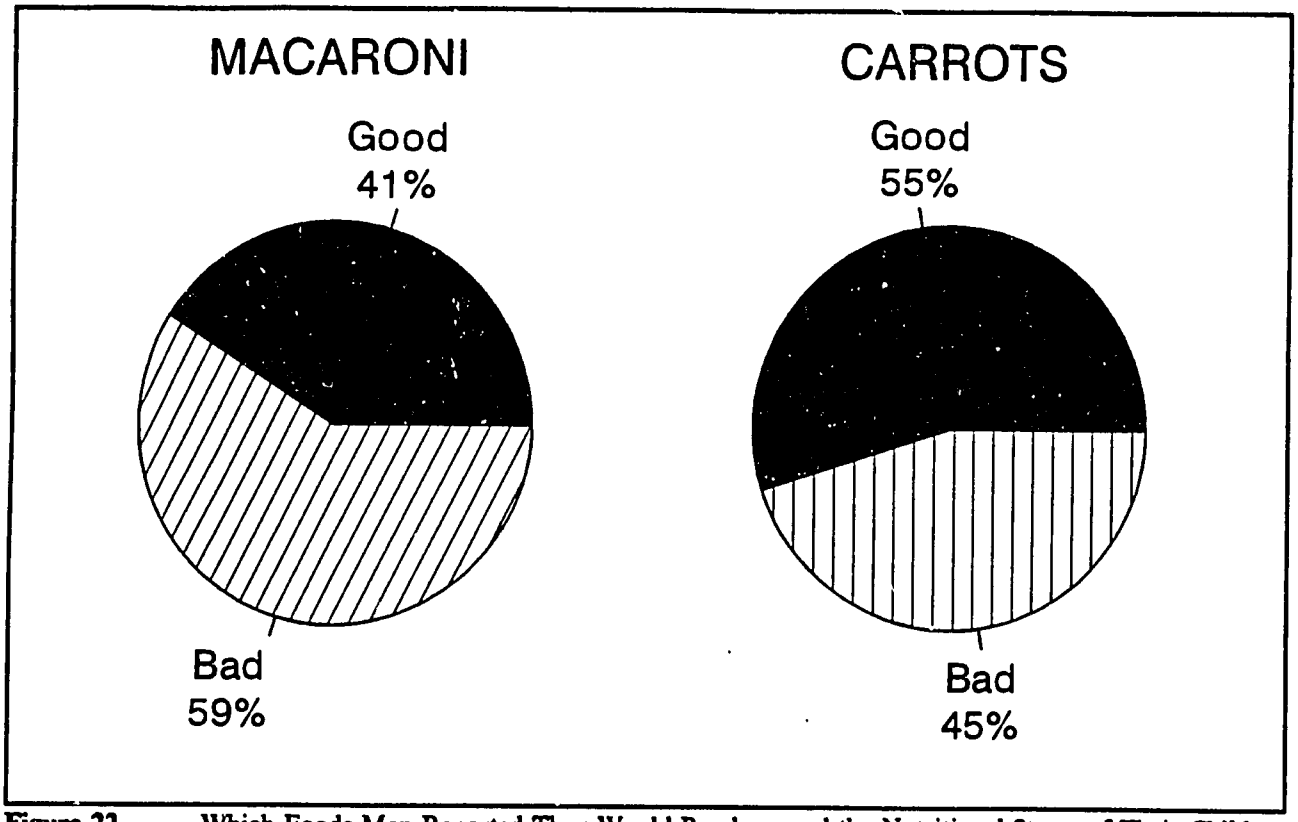


Figure 22. Which Foods Men Reported They Would Purchase and the Nutritional Status of Their Children

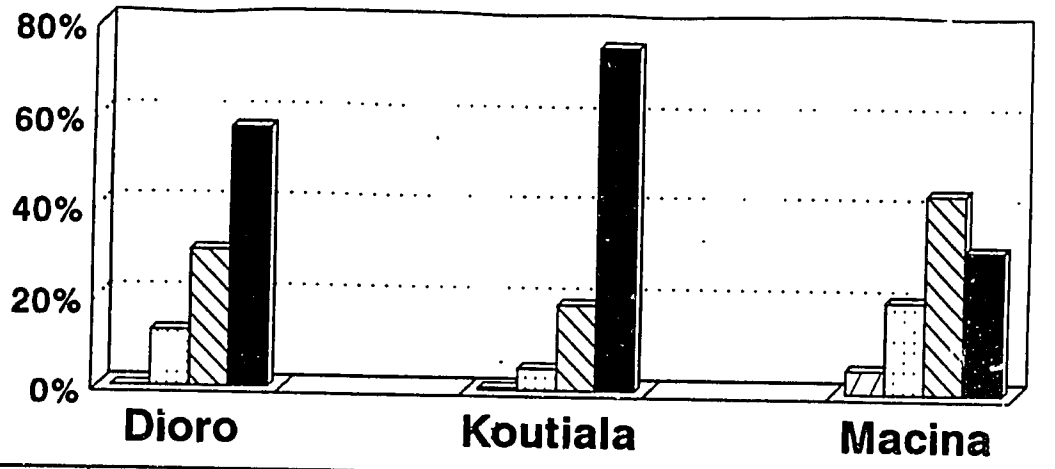
A few variables were associated with the "good"/ "bad" classification in a way that defies simple explanation:

Women who were likely to have --

- eaten more during pregnancy,
- known how to treat and avoid night blindness,
- selected carrots as the more appropriate snack,
- claimed to filter water or use bleach --

were more likely to have children with "bad" nutritional status.

These women were also more likely to come from Macina, which contributed a disproportionately large percentage of the children with bad nutritional status. Therefore, whatever else affects nutritional status in Macina, and not necessarily health knowledge and practice, is also affecting children's nutritional status strongly in this area.



	Dioro		Koutiala		Macina
Severe	0.1%		0.5%		5.2%
Moderate	12.4%		4.9%		20.2%
Mild	30.1%		19%		43.4%
Normal	57.4%		75.6%		31.2%

Severe Moderate Mild Normal

Severe: <= -3 SDs, Moderate: -3 to -2 SDs, Mild: -2 to -1 SDs, Normal: > -1 SDs

Figure 23. Nutritional Status of Children by Project Site Using Weight for Length Z-Scores

The remaining KAP and socioeconomic indicators were not associated with nutritional status at baseline. All tests and their outcomes appear in Appendix C.

IV. CONCLUSIONS

How to interpret the results

It is important to stress that the KAP survey was not conducted for the purpose of testing hypotheses. Only children's weight and height were measured by the research team; all other personal or household variables (e.g. respondents' age, household size, feeding practices) are based on answers provided by respondents. Self-reported information gives us some indication of the true situation, but is not as accurate or reliable as observed or measured data. However, we have analyzed the data to get an indication of the strength and direction of associations of children's nutritional status (our measured dependent variable) with variables representing socioeconomic status, attitudes and knowledge.

At baseline, many of these associations have not been strong, or are not statistically significant. For example, mothers who are able to recognize a child with night blindness (55%) do not have healthier children than mothers who can not. Yet, it would be incorrect for us at this stage of our intervention to accept the "null hypothesis," in this case, that mother's knowledge has nothing to do with children's health. At baseline, variables theoretically linked to better nutritional status (household income, knowledge, positive attitudes, better maternal dietary practices) are also weak. For example, about 28% of the people had heard "a nutrition message;" yet but a relative handful (10%) could identify a child suffering from marasmus as "malnourished." While the individual parents possessing even this low level of awareness appear to have healthier children, we could only show this difference after adjusting for children's age and comparing the children against their own mean, (Good v. Bad nutritional status).

It is important to stress that associations measured at baseline are not very meaningful -- and they specifically do not measure the effectiveness of the individual PVOs in changing health-related behaviors. With prudent interpretation, the behavioral prevalence data, as well as current associations, can provide guidelines for streamlining our communications interventions. Behaviors that are very prevalent (e.g. breastfeeding for 24 months) do not need further promotion at this time; those that are virtually non-existent (e.g. children eating meals with fathers, exclusive breastfeeding through 4 months) would probably not show much improvement after one year. However, they might be considered very important, and the PVOs and A.I.D. might consider these messages "worth the effort" despite guaranteed initial low rates of change. Behaviors found to be already associated with good nutritional status (e.g. fathers' attitudes towards purchasing healthy snacks, mothers' knowledge of malnutrition) are clearly worth intensifying. Those not found to be associated at baseline can not be rejected at this time, as, to reiterate the first statement above, the baseline study was not designed to "test," or in other words, reject, hypotheses. Virtually nothing has really been tried in this region, and no potentially useful avenue should be ignored at this stage.

What we hope to see happen in response to the communications intervention

We intend to increase the strength of the communications interventions in order to foster positive behavior practices which improve nutritional status. We would therefore expect to see a

proportional difference in children's nutritional status between case and control villages at the time of the follow-up survey. We would hope this difference would be associated with increased knowledge, and more positive attitudes and feeding practices in the case villages compared to the controls.

How big a change should we expect to see?

The current baseline survey measures the extent to which nutrition behaviors commonly occur. For example, only 34% of the women report giving breastmilk as the "first substance offered to the newborn," and fewer than 10% report withholding water, juice, porridge or other foods from the infant under four months of age. How much change can we expect to see if there actually is a communications intervention? The answer is based on statistical parameters of our sample size, our acceptable level of error (.05), and the probability that we can demonstrate a significant difference (statistical power), for which the standard level is 80%. The table below shows a rough computation of the minimum effect size, as well as a "guesstimate" of a larger effect size (gray box) we might reasonably hope to be able to measure at the time of our follow-up survey. If the PVOs are able to maintain the case-control distinction, we should see the figures in the right hand columns in villages receiving the interventions, and numbers not as high in the control villages. If the PVOs actually perform NCP-inspired interventions in the villages designated as "control," we will have less ability to attribute any changes we see in behavior to our intervention alone. However, the survey attempted to account for confounding variables so that we can assess our actual impact more clearly, regardless of whether of the case-control design is respected. Therefore, while NCP can do little about polygamy, family planning, or household income, for example, we have measured "proxies" for these factors, have examined their association with children's nutritional status, and will track their variation between the baseline and follow-up surveys in all villages.

Table 7. Summary of Key Indicators Measured by NCP KAP Baseline Survey

Outcome Variables	Current Prevalence at Baseline	Follow-up Measurement to Show Significant Change from Baseline in Case Villages	Optimistic Estimate
Proportion malnourished using weight\hight z-score less than -2 SD	14.0%	12%	5%
Proportion malnourished using weight\age z-score less than -2 SD	41.9%	35%	30%

Table 7. Summary of Key Indicators Measured by NCP KAP Baseline Survey

Outcome Variables	Current Prevalence at baseline	Follow-up Measurement to Show Significant Change from Baseline in Case Villages	Optimistic Estimate
Mothers who give their child breastmilk as the first substance	34.0%	37%	50%
Mothers who give water before child is 5 months old	94.6%	92%	85%
Mothers who introduce rice\millet late (> = 8 months)	29.0%	26%	15%
Children <=12 months who eat more than 3 or more meals a day	69.0%	80%	Same
Children >12 months who eat more than 3 or more meals a day	89%	96%	Same
Children who eat two or more meals with their mother	22%	27%	40%
Proportion of case\control women who heard a nutrition message	49.5% (Case) 19.0% (Control)	56% no change	90%
Proportion of men who heard a nutrition message	36.0%	42%	90%

Table 7. Summary of Key Indicators Measured by NCP KAP Baseline Survey			
Outcome Variables	Current Prevalence at baseline	Follow-up Measurement to Show Significant Change from Baseline in Case Villages	Optimistic Estimate
Proportion of women who could identify a malnourished child	10.0%	14%	20%
Women who said to give more food to child with malnutrition	13% (use n from above)	30%	60%
Women who identified night blindness in child	55%	60%	67%
Women who know the cause of night blindness in children	23% (use n from above)	29%	50%
Women who know how to prevent night blindness in child	10% (same n as above)	15%	25%
Men who think a man should buy carrots for his child as snack	26.5%	34%	50%
Women who think it is appropriate to force a sick child to eat	39%	42%	60%
Women who eat more during pregnancy	52%	58%	70%

These figures are a far cry from arbitrarily set "measurable objectives" to change the behavior of 85-95% of the population. Such objectives may be politically desirable, and may remain our dream, but attainment of such a dream would not be predicted based on the current prevalence of the practice and the relatively long time that is necessary for behavior change to occur when people live in a society that allows them to decide for themselves what the best actions are.

What if we do not see even this level of change at follow-up? There might be four principal reasons for why we would not see the kind of change we hope at the end of our intervention:

1. We were not successful in motivating people to try new behaviors.

2. Competing forces prevented them from acting as they now wished, (for example, a famine occurred in the area).

3. Other negative forces eliminated the positive impact actually achieved (a measles epidemic resulted in widespread infant morbidity and mortality).

4. We made mistakes in sampling and measuring.

We will do what we can to make number 1 a positive reality and prevent number 4 from happening, and admit that 3 and 4 are out of our hands.

Next Steps

When PVO partners were shown the baseline findings, their principal recommendation, which was reinforced by senior USAID management, is to focus our communications efforts over the next year on a reduced set of behavior change objectives. Beliefs and behaviors that are either highly prevalent or nonexistent would not be cost-effective to address in a one-year campaign.

Hence, where NCP has conducted the baseline, we will limit our communications efforts in 1992 to:

1. Promoting Vitamin A-rich foods as the prevention and cure for night blindness.

2. Emphasizing men's responsibilities for women's and children's nutrition.

3. Helping men and women make better food choices in the market place for women and children's snacks.

4. Promoting discrete child feeding behaviors including at least 3 supervised meals/day and use of a separate feeding bowl for children 12 - 36 months old.

An organizational meeting for all collaborating agencies is tentatively scheduled in conjunction with the FAO Vitamin A Communications for the Sahel workshop January 27-31, and a training/"campaign implementation" workshop for all field personnel after Ramadan (early April), 1992.

APPENDIX A

Additional Tables

DESCRIPTIVE CHARACTERISTICS OF SAMPLE

SAMPLE SIZE

The NCP Baseline KAP Survey consists of information obtained from 857 women, 538 men, and measurements taken from 657 children (1 to 36 months). After data cleaning the final sample sizes used for the analysis were: 835 women, 637 children, and 524 men. The table below lists the numbers of women, children, and men by site, village, and case-control status.

SITE		CASE	
Village	Fem.	Mal	Child
DIORO			
Babougou	16	8	14
Soke	18	13	14
Koila	19	13	13
Moribougou	20	7	15
Senenkou	8	7	9
Dougounikoro	14	9	16
Tibi	14	8	11
Koussi	19	8	15
	128	73	107
KOUTIALA			
Nampossela	19	17	19
Karangasso	19	19	13
Zebala	17	11	13
Debala	18	19	15
N'Tossoni	20	11	14
Karaguana	21	18	17
Peguena	20	14	14
Yafola (Central)	30	29	20
	164	138	125
MACINA			
Diosso	19	9	12
Kenne	17	7	13
Dioumediala	8	4	6
Niobougouni	14	2	9
Ouanana	14	4	11
Ninga	15	4	14
Nenana	16	6	12
N'Golokouna	19	7	16
	122	48	93
Case Total	**414**	**259**	**325**

CONTROLS

SITE	Fem	Male	Child
DIORO			
Pogo	17	12	13
N'Gabakoro	13	12	10
Markatinti	20	10	17
Korokonou	16	12	12
Werekoura	13	8	9
Tibiwere	11	7	8
Tatila	16	11	13
	106	72	82
KOUTIALA			
Nintabougourou	22	21	17
Songuela	22	22	17
Bamana	15	8	12
Diela	13	6	8
Pakasso	30	32	25
Dougouniena	21	21	
Zansiola	24	15	19
Yafola	18	15	13
(M'Pessoba)	165	140	111
MACINA			
Gnine	20	8	13
Sokoura	23	8	18
Ouela	20	11	14
Kanguira	14	6	11
Klinkolola	18	6	18
Kaminidjon	18	9	17
N'Dekoye	20	5	13
Djangou	17	5	15
	150	53	119
Control Totals	**421**	**265**	**312**
TOTAL SAMPLE SIZE	**835**	**524**	**637**

Few significant differences between case and control villages were found with the exception of the design variables. Where differences occur, these will be reported.

Table A. Number of Years Lived in Village		
Length of Time	Number	Percent
0 to 5 years	30	5.8%
6 to 16 years	31	6.0%
17 to 27 years	35	6.7%
28 to 38 years	61	11.7%
39 to 49 years	37	7.1%
50 to 69 years	14	2.7%
always	274	52.6%
long	36	6.9%
Total	521	100.0%

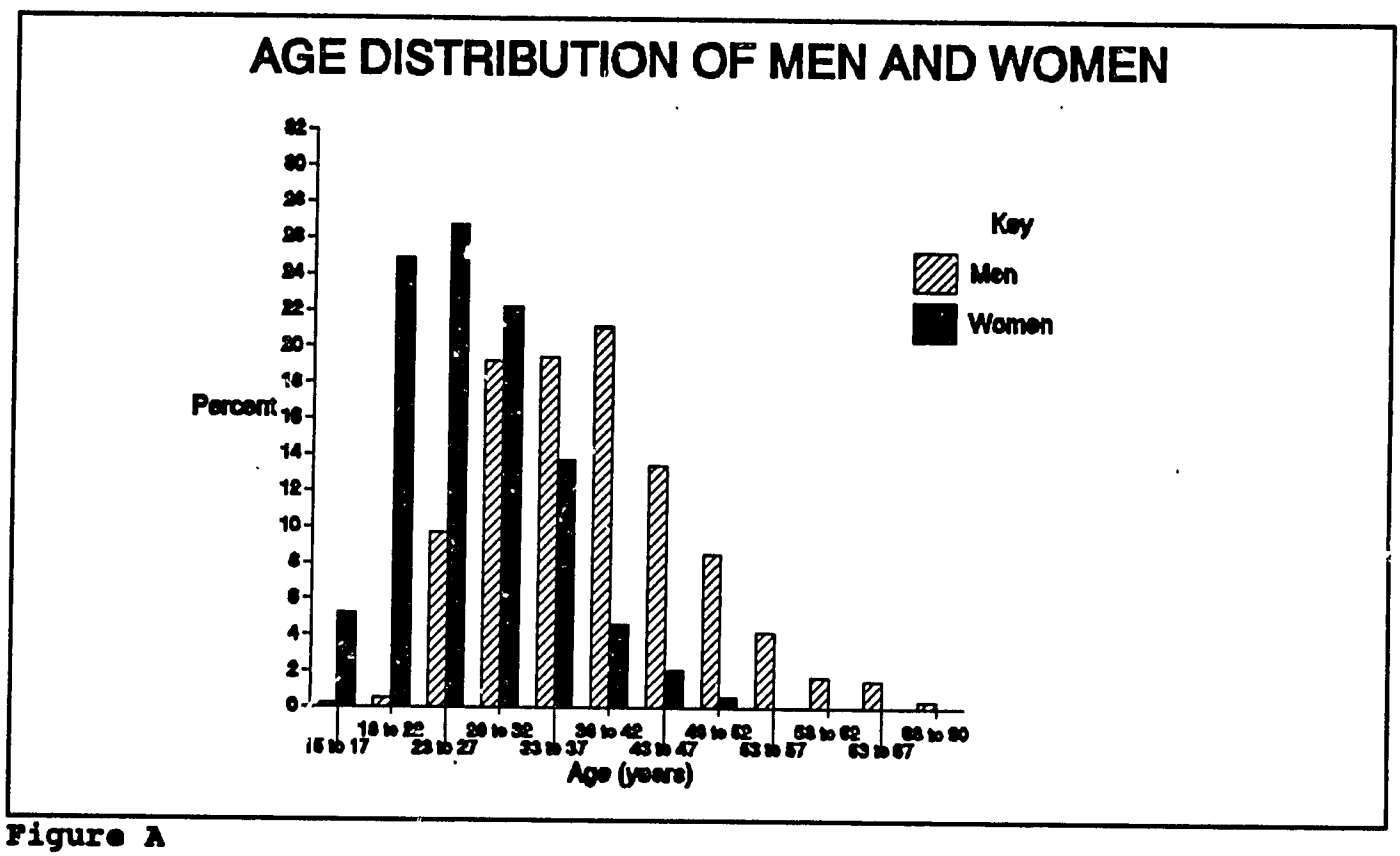


Figure A

Table B. Age Distribution of Children			
Age Group	Number	Percent	Cumulative %
0 to 3 months	96	15.1%	15.1%
4 to 6	116	18.3%	33.4%
7 to 9	101	15.9%	49.3%
10 to 12	125	19.3%	69.6%
13 to 15	49	7.7%	76.7%
16 to 18	36	5.7%	82.4%
19 to 21	19	3.0%	85.4%
22 to 24	45	7.0%	92.4%
25 to 27	4	0.6%	93.1%
28 to 30	9	1.5%	94.5%
31 to 33	2	0.3%	94.8%
34 to 36	33	5.2%	100.0%
Total	635	100.0%	

Table C. Birth Attendant Reported for Last Child (Total/Case-Control)				
Assistant	Number	Percent	Case	Control
Traditional	136	17.8%	20.2%	16.0%
Midwife, Nurse	223	29.3%	42.3%	17.3%
Female Relative	219	28.7%	19.1%	38.7%
Others	184	24.2%	18.3%	28.0%
Total	762	100.0%	(371) $p<0.0000001$	(382)

HOUSEHOLD WEALTH

Relative Wealth (Scores) of Survey Population

Wealth Score Group	Number	Percent	Cum. %
0 to 4	18	3.6%	3.6%
5 to 16	110	22.1%	25.8%
17 to 27	166	33.4%	59.2%
28 to 38	155	31.2%	90.3%
39 to 49	44	8.9%	99.2%
50 to 60	1	0.2%	99.4%
101 to 103	3	0.6%	100.0%
Total	497	100.0%	

Wealth Index Comparison by Site

Wealth Group	Dioro	Koutiala	Macina	Total
0 to 4	3.7%	3.0%	5.5%	3.6%
6 to 16	33.3%	11.0%	38.5%	22.1%
17 to 27	40.0%	26.9%	42.3%	33.4%
28 to 38	20.7%	42.4%	13.2%	31.2%
39 to 49	2.2%	15.1%	0	8.9%
50 to 60	0	0.4%	0	0.2%
101 to 103	0	1.1%	0	0.6%
Total No.	135	271	91	497
sig. p<.0000001	X=20.2	X=29.1	X=18.3	

Interview Classification of Mothers

Groups	Number	Percent
Pregnant	195	23.9%
Infant < 6 months	174	21.3%
Infant 6 to 12 mo.	207	25.4%
Child 12 to 36 mo.	239	29.3%
Total	815	100.0%

Women's Age At First Birth By Group

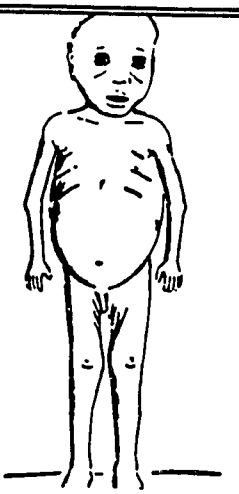
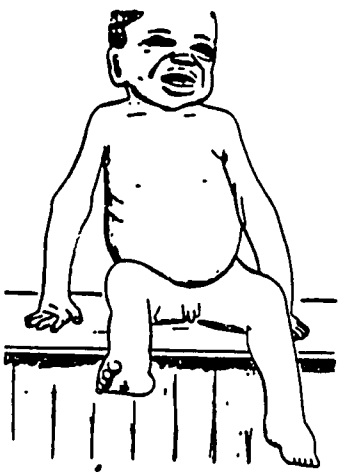
Age Groups	Number	Percent
12 to 13 yrs	4	1.4%
14 to 16	125	42.4%
17 to 19	104	35.3%
20 to 22	47	15.9%
23 to 25	13	4.4%
26 to 28	1	0.3%
29 to 30	1	0.3%
Total	295	100.0%

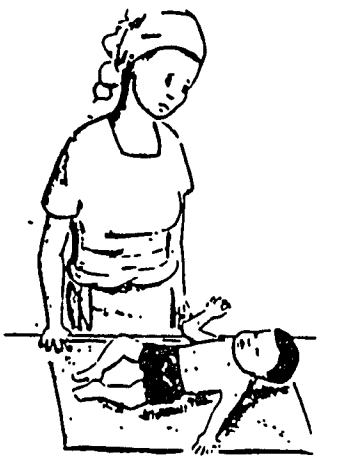
Birth Attendant Reported for Last Child

Assistant	Number	Percent
Traditional	136	17.8%
Midwife, Nurse	223	29.3%
Female Relative	219	28.7%
Others	184	24.2%
Total	762	100.0%

APPENDIX B

Illustrations and hypothetical questions used in KAP survey

	Lead Question	Picture shown to Respondent
A	Do you notice anything special about this child?	
B	Do you notice anything special about this child?	
C	This woman is pregnant and has trouble with her vision. Why does she have problems seeing at night?	

D	Do you notice anything special about this child?	
E	Do you notice anything special about this child?	
F	We are at the market. The woman on the right sells carrots and green vegetables. The woman on the left sells macaroni. The man wants to buy something for his child. The child asks for macaroni. What do you think the man should buy?	
G	This woman is forcing her child to eat. Why do you think she is doing this? Do you think this is a good thing?	

APPENDIX C

Table of Statistical Analyses

NCP MALI KAP BASELINE SURVEY - STATISTICAL TESTS

VARIABLES	STATS TEST	LEVEL OF SIGNIFI-CANCE (p)	DESCRIPTION
whzgroup X site whzgroup = whz-scores split into "bad" vs. "good" categories	chi-square	p<.00000	Koutiala greatest number of good children, Macina greatest proportion bad.
final wealth[1] score X whz scores	regression	n.s.	wealth doesn't predict child's whz-score
whz score x final wealth while controlling for age of child	regression	n.s.	wealth still does not predict even with child's age factored in.
" repeat above for age 0-9	ANOVA	n.s.	no difference in household wealth score for bad vs. good 0-9 month children
" for age 10-18 mo.	ANOVA	n.s.	" for 10-18 months
" for age 19-27 mo.	ANOVA	n.s.	" for 19-27 months
" for age >27 months	ANOVA	p<0.05	out of 27 children the bad children had wealth scores that were 5.453 pts lower than the good children.
final wealth X case-control	ANOVA	n.s.	case vs. control wealth the same, no difference.
final wealth X sites	ANOVA	p<.000000	Koutiala much wealthier
final wealth X whzgroup for Dioro	ANOVA	n.s.	bad vs. good chidren's wealth score same in Dioro.
*final wealth X whznew[2] for Dioro	ANOVA	n.s.	"
" (same as above) for Koutiala	ANOVA	n.s.	same as above in Koutiala
*final wealth X whznew for Koutiala	"	"	"

[1] finalwealth = wealth score based on household items; 1 pt given for table, watch, radio, sheep, goat; 2 pts given for bike, mule, cow, cart; 3 pts given for boutique, windmill, motor bike, horse; 3 cars exculded from scale.

[2] whznew = each child's whz score is defined as "bad" or "good" in relation to the mean whz score for their age-group cohort (month). "Bad" children's whz score is equal to or falls below the mean whz score while "good" children have a whz score that is greater than the mean.

" for Macina	ANOVA	n.s.	same as above in Macina
*final wealth X whznew for Macina	"	"	"
*cumwealth X site	ANOVA	$p<0.01$	Koutiala still wealthier when using cumwealth
*cumwealth X case vs. control	ANOVA	n.s.	no difference in case vs. control villages.
cumwealth[3] X whz scores	regression	n.s.	cumwealth does not predict children's weight for height z-score
cumwealth X haz-scores	regression	n.s.	cumwealth not related to children's height for age z-score
cumwealth X haz-score while controlling for child's age	regression	$p<0.05$	inverse relationship - as haz-scores increase wealth decreases.
cumwealth X child's age	regression	n.s.	cumwealth not related to child's age.
cumwealth X whzgroup	ANOVA	n.s.	no difference in bad vs. good children's wealth
*cumwealth X whznew	ANOVA	n.s.	"
final wealth X whzgroup	ANOVA	$p<0.05$	"bad" children came from households with lower wealth score than "good" children using final wealth.
*final wealth X whznew	ANOVA	$p<0.01$	(same as above, when split into sites, 1st pg., it is no longer significant.)
whzgroup X wive's rank[4]	relative risk\ chi-square	n.s.	the rank of the mother had no effect on whether child was "bad" or "good"
*whznew X wive's rank	"	n.s.	"
cumwealth X whz bad\good X rank	ANOVA stratified into 1st wife or other group	n.s. n.s.	no difference in wealth score of bad vs. good children if mother is 1st wife nor if she is 2nd, 3rd, 4th.

[3] $\text{cumwealth} = \dfrac{\text{wealth score} + \text{no. months grain lasts}}{\text{no. of wives} + \text{no. of children}}$

[4] rank = split into two groups: 1 = 1st wife 2 = 2nd, 3rd, or 4th wives

62.

*cumwealth X whznew X rank	"	"	"
whzgroup X eatmore[5]	relative risk\chi-square	p<0.05 wrong direct- ion	mothers of "bad" children were 25% more likely to say they should eat more when pregnant
*whznew X eatmore	"	p<0.01	"
whzgroup X breastmilk[6]	same as above	n.s.	no difference
*whznew X breastmilk	"	"	"
whzgroup X weangroup[7]	"	n.s.	no difference
*whznew X weangroup	"	"	"
whzgroup X forcechild[8]	"	n.s.	no difference
*whznew X forcechild	"	trend	
whzgroup X carrots[9]	"	n.s.	no difference
*whznew X carrots	"	p<0.01 wrong direct- ion	women with "bad" children more likely to say they would buy carrots
whzgroup X mencarrots	"	trend	men who would not buy carrots are slightly more likely to have "bad" children.
*whznew X mencarrots	"	p<0.05	stronger association than above

[5] eatmore = women who said to eat more during pregnancy vs. other women

[6] breastmilk = women who reported that they gave breastmilk 1st vs. women who gave something else

[7] weangroup = women who said they either they weaned or would wean their child before 20 months vs. women who weaned or would wean at 21 months or more.

[8] forcechild = women who would force child to eat vs. women who would not.

[9] carrots = women who would choose carrots vs. macaroni for their child in the market.

whzgroup X malnourished[10]	"	p<0.05	women who identified malnourished child much less likely to have a "bad" child (lower whz-score)
*whznew X malnourished			
			rence
*whznew X measles	"	n.s.	"
whzgroup X treatnb[11]	"	p<0.05 wrong way!	women who knew how to treat night blindness were more likely to have "bad" children.
*whznew X treatnb	"	p=0.02 to 0.053	same as above - still wrong direction
whzgroup X avoidnb[12]	"	p<0.001 wrong way	women who gave correct answer much more likely to have a "bad" child. (very small sample size)
*whznew X avoidnb	"	p<0.01	same as above - still wrong direction
whzgroup X milletearly (7 months or before)	"	n.s.	no difference.
whzgroup X fruitearly (7 months or earlier)	"	n.s.	no difference
whzgroup X treath20[13]	"	p<0.05 wrong way	women who did not treat water less likely to have "bad" children
whzgroup X nutrition[14]	"	n.s.	no difference
whzgroup X allnutrition[15]	"	n.s.	no difference

[10] malnourished = women who identified a child as malnourished or thin compared to other women.

[11] treatnb = women who said to give liver or carrot\vegetables to treat night blindness.

[12] avoidnb = women who said that night blindness could be prevented by eating vegetable and fruit.

[13] treath20 = women who reported that they filtered, boiled, or bleached water vs. other women.

[14] nutrition = women who specifically reported hearing a nutrition message about children compared to women who had heard any health message.

whznew X no. granaries	ANOVA	p< 0.000001	"badly" nourished children's households had much lower mean number of graineries (2.6) compared to "good" children (5.5).
whzgroup X no. granaries	ANOVA	p<.001	similar to above association not as strong
NEW ANALYSIS VARIABLES	STATS TEST	LEVEL OF SIGNFIC-ANCE	DESCRIPTION
wazscore2[16] X site	ANOVA	n.s.	no difference in waz clumped score by site
whzscore[17] X site	ANOVA	p<0.0001	significantly more severe and moderately malnourished children in Macina than in Koutiala and Dioro.
hazscore X site	ANOVA	p<0.0001	Koutiala appears to have significantly more stunted children but this is most likely due to errors in height measurements.
whz X site	ANOVA	p<0.0001	there is a significant difference in the mean weight-height z-scores for the project sites. Macina's mean is much lower (-1.305) than Koutiala (-.160) and Dioro (-.750)
enfmange X waz "enfmange" = no. of meals child eats a day	regres-sion	n.s.	no. of meals children (>11months) eat a day is not related to their waz score
enfmange X whz	regres-sion	n.s.	no. of meals not related to weight-height z-scores either

[15] allnutrition = women who had heard a nutritional message compared to women who had heard another message or no message.

[16] wazscore clumps the z-scores into groups according to the Malian classification of malnutrition. The three groups are: 1) "severe" indicates children whose weight-age z-score falls 3 standard deviations or more below the mean; 2) "moderate" indicates children between -3 and -2 sd from the mean; 3) "normal" is used for children whose z-score that is above -2 standard deviations from the mean.

[17] same as wazscore2 above

mealgroup[18] X whznew	chi-square	n.s.	there was no difference in the "bad" vs. "good" children's meal group.
mealgroup1[19] X whznew	r.r.\chi-square	n.s.	"badly" nourished children no more likely to eat 3 or less meals than "good" children.
mealgroup2[20] X whznew	r.r.\chi-square	trend wrong way	those who ate 2 or less meals were slightly less likely to have a "bad" nutritional status.
mealgroup2 X whz	ANOVA	$p<0.05$ wrong way	children who ate 2 or less meals had a better mean whz score than those who ate 3 or more.
mealgroup2 X waz	ANOVA	n.s.	no difference in weight-age z-scores
cummeal[21] X waz scores	regres-sion	n.s.	# of meals eaten with another adult has no effect on waz
supmeal[22] X whznew	r.r\chi-square	n.s.	"bad" children no more likely to eat less meals with an adult than "good" children
supmeal X whz scores	ANOVA	n.s.	no difference in whz score
supmeal X waz scores	ANOVA	n.s.	no difference in waz scores
fluid[23] X waz	ANOVA	$p<0.01$ wrong way	children who received fluids "early" had better waz scores
fluid X whz	ANOVA	$p<0.01$	children who received fluids "early" had lower (worse) whz scores

[18] mealgroup = divides children into 3 groups: 1) children who eat "3" meals a day; 2) children who eat less than 2 meals a day; 3) children who eat 4 or more meals.

[19] mealgroup1 = two categories: 1) children who eat 3 or less meals and 2) children who eat 4 or more meals a day.

[20] mealgroup2 = two categories: 1) children who eat 2 or less meals and children who eat 3 or more meals.

[21] cummeal = # of meals eaten with an adult

[22] supmeal = "adult" is the code used for children who eat 2 or more meals a day with an adult and "other" is for children who eat less than 2 meals with an adult.

[23] fluid = "early" (or "bad") is used if water, juice, or porridge was introduced before 4 months (<=3) and "late" ("good") is used if it is introduced at 4 months or more.

fluid X haz	ANOVA	p<0.0001 wrong way	children who rcvd fluids "early" had better haz scores.[24]
fluid X whznew	r.r\chi-square	p<0.0001	more "badly" nourished children had fluids introduced early
fluid X whznew (for children < 13 months)	"	"	" " amongst children 12 months or less
fluid X waz (age < 13 months)	ANOVA	n.s.	not significant for younger children
fluid X whz (age < 13 months)	ANOVA	p<0.0001	children less than 13 months who rcvd fluids before 4 months had a lower (worse) mean whz score
fluid X haz (age < 13 months)	"	p<0.0001 wrong way	children with late intro of fluids had higher mean haz score
solid[25] X whznew	"	n.s.	no difference in early\late intro of solids
solid X waz	"	"	" "
solid X whz	"	n.s.	" "
solid X whznew (children < 13 months)	"	"	" "
solid X waz (age < 13 months)	"	"	" "
solid X whz (age < 13 months)	"	p<0.05 wrong direction	children (<13 mo.) who received solids late had a better whz score than children who received solids early.
solid X haz (age < 13 months)	"	p<0.05	children who received solids early had a better haz score than other children

[24] do to measurement problems some of the scores from Koutiala are too high and this confounds the results.

[25] solid = "early" is for children who received fruit, rice, millet, fish, or meat before 8 months; "late" is for children who received these solids at 8 months or more.

protein[26] X whznew (children greater than 6 months)	r.r.	p<.01	children who received protein "late" were more likely to be "badly" nourished
cereal[27] X whznew (age>6mo)	"	n.s.	no difference
solid X whznew (children greater than 6 months)	"	n.s.	"
cereal X whz (age>6mo.)	"	n.s.	"
protein X whz (age > 6)	"	p<.001	children who rcvd protein early had better whz scores than children who rcvd it late
cereal X waz (age > 6)	"	n.s.	no difference
protein X waz (age > 6)	"	p<.01	children who rcvd protein early had better waz scores
cereal X haz (age > 6)	"	n.s.	no difference
protein X haz (age > 6)	"	n.s.	"

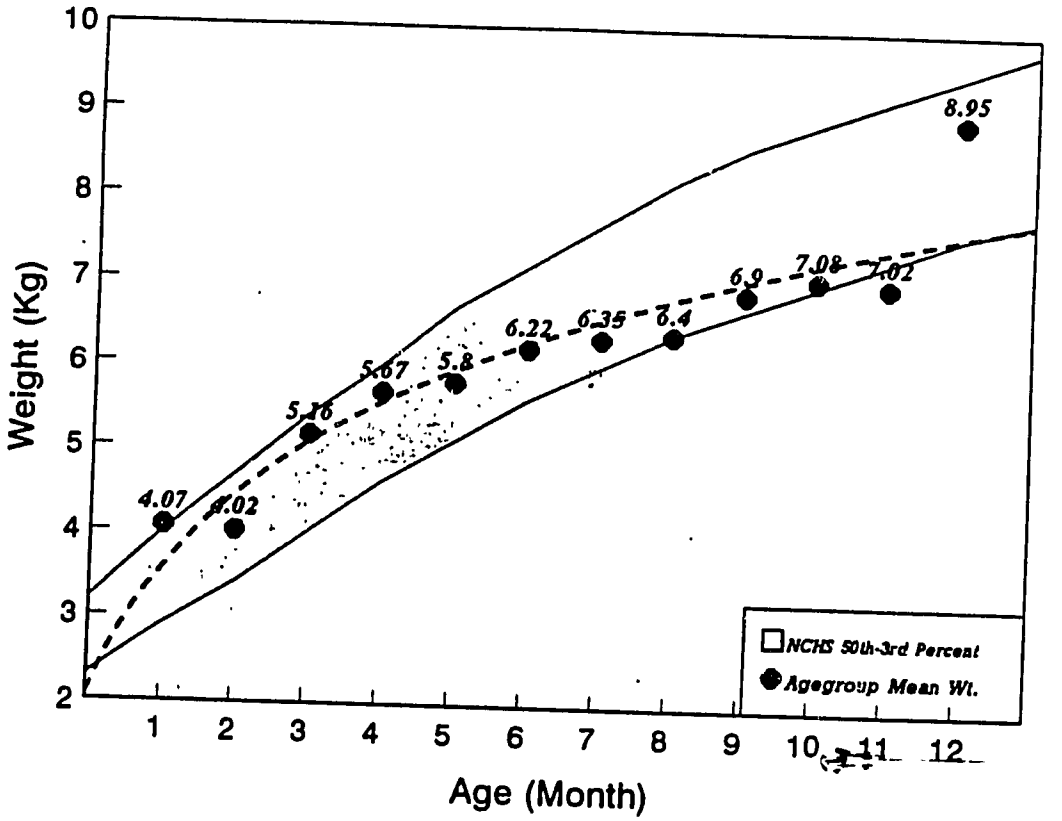
[26] protein = good or "early" are children who received fish or meat before 8 months and "bad" or "late" are those who received it at 8 months or more.

[27] cereal = introduction of millet and riz: "early" or "good" is before 8 months and "late" or "bad" is at 8 months or more

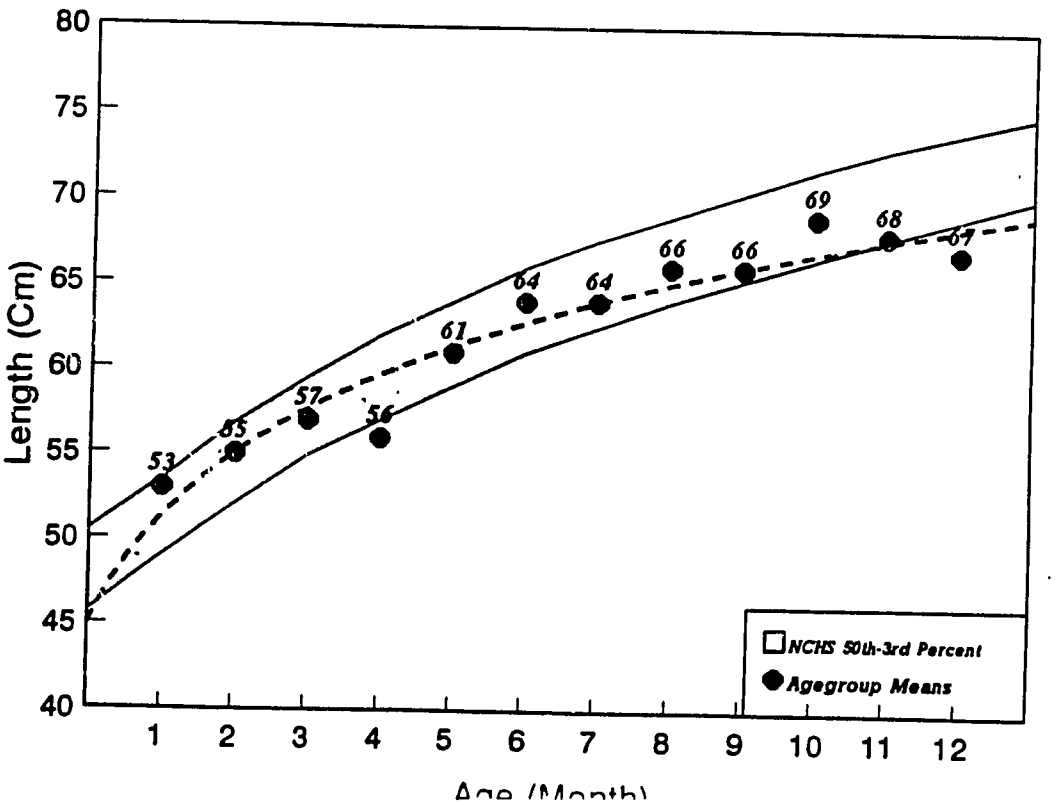
APPENDIX D

Growth curves for sample children

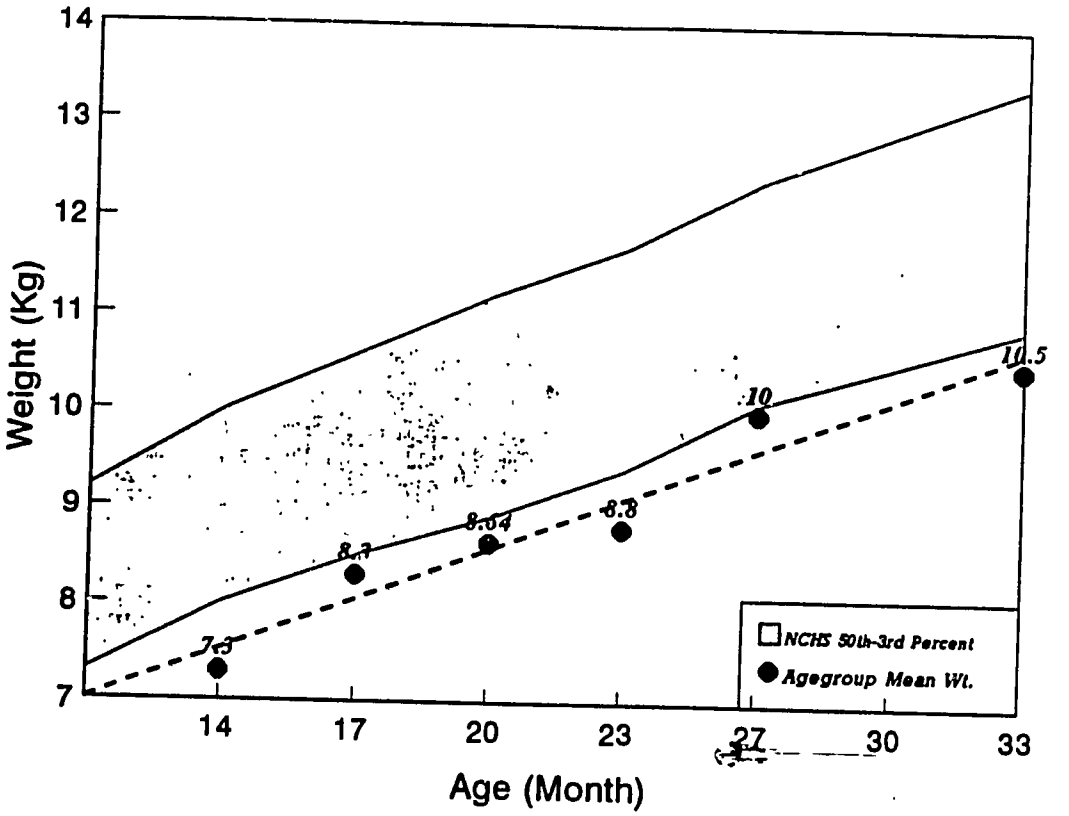
Weight-for-Age of Female Infants



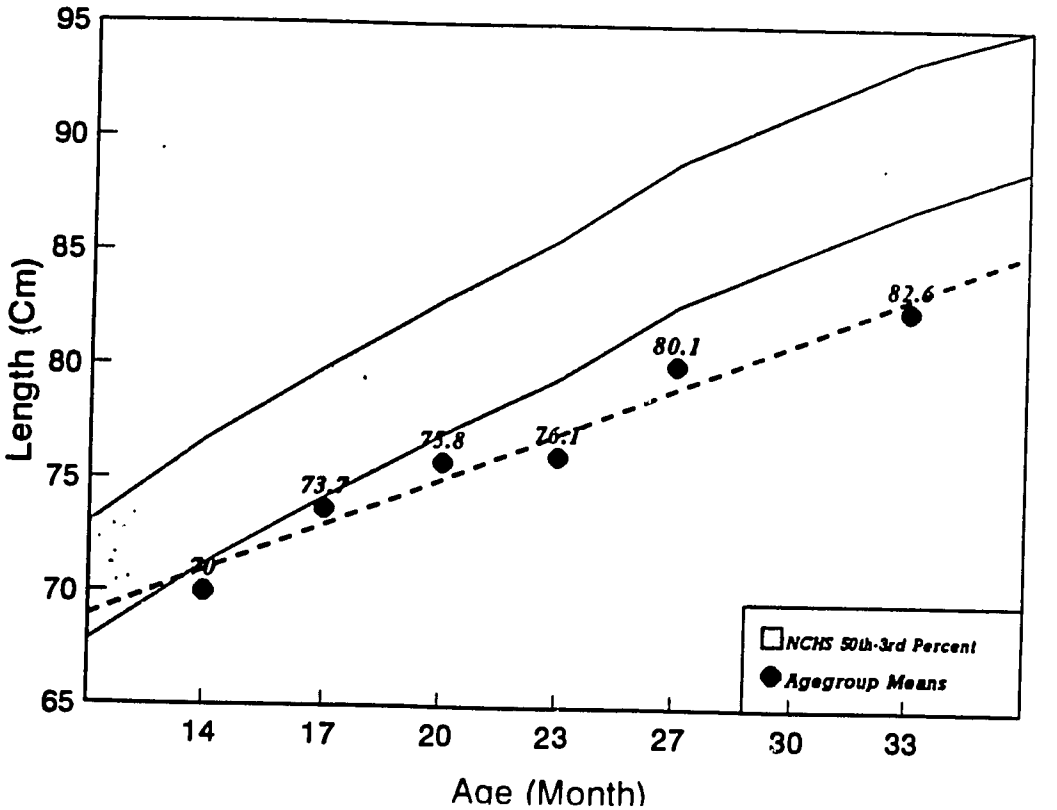
Length-for-Age of Female Infants



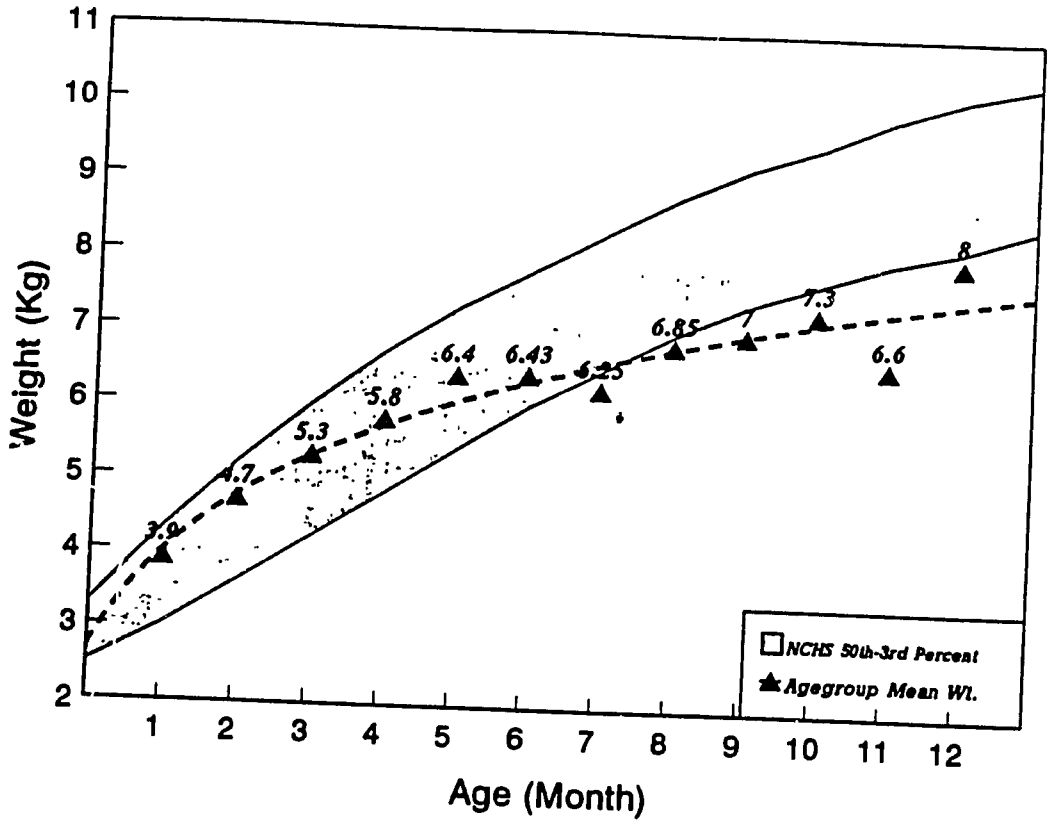
Weight-for-Age of Female Children



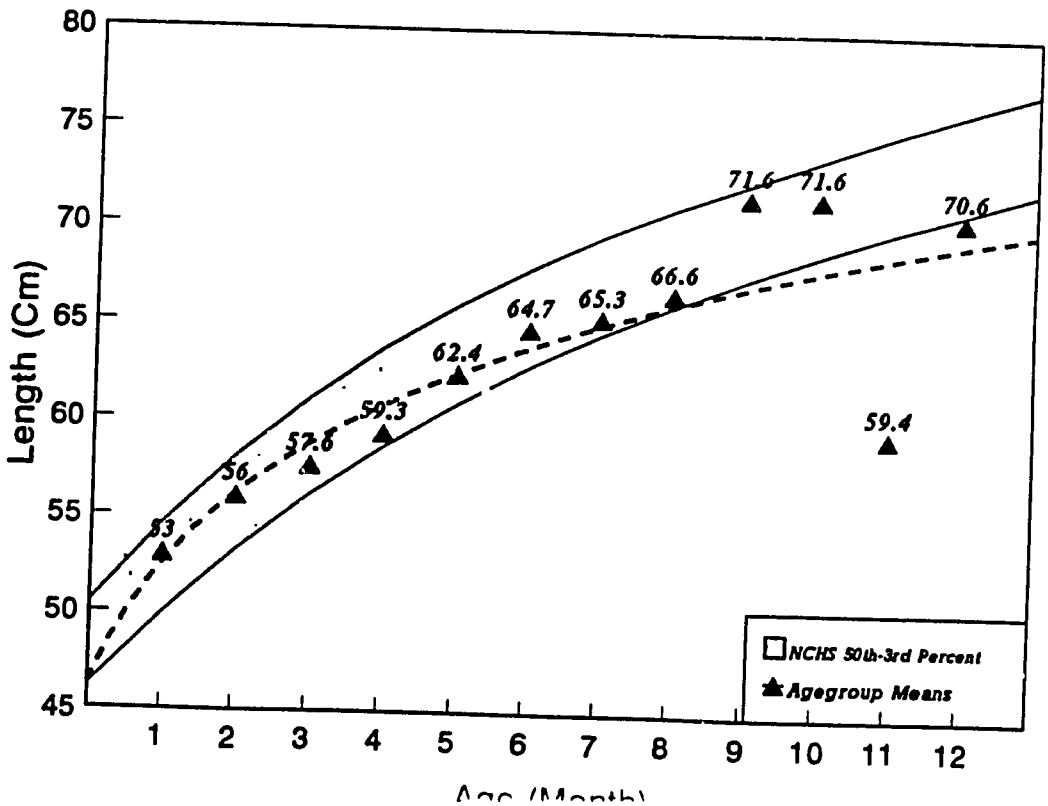
Length-for-Age of Female Children



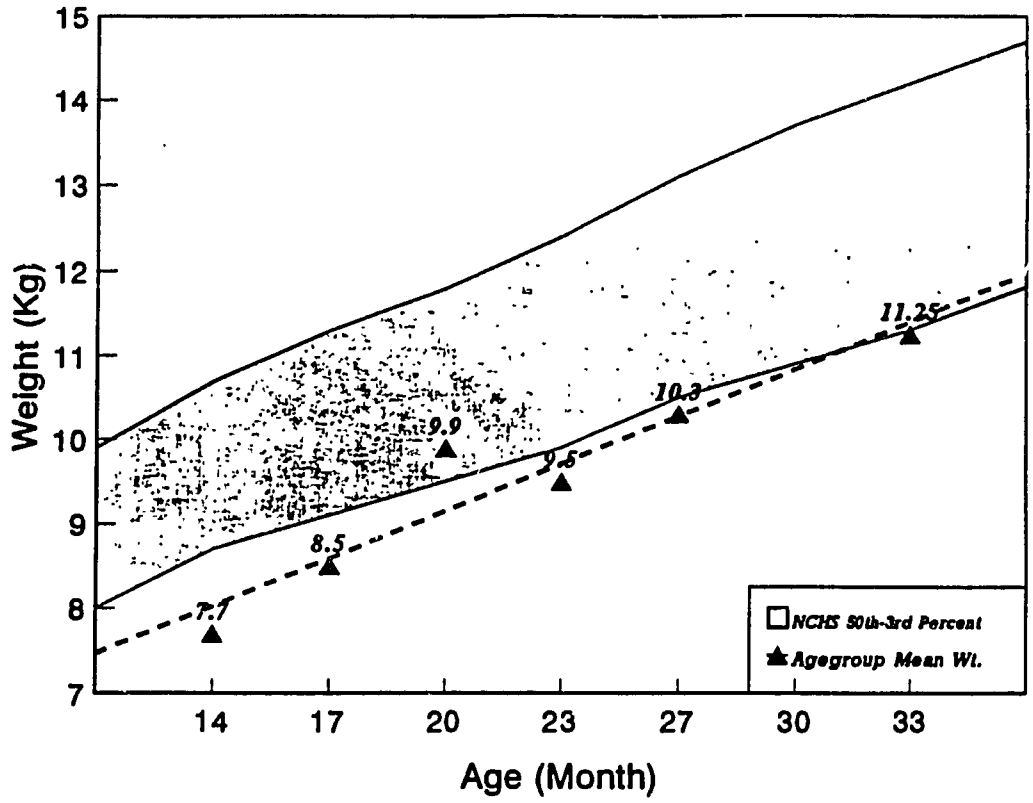
Weight-for-Age of Male Infants



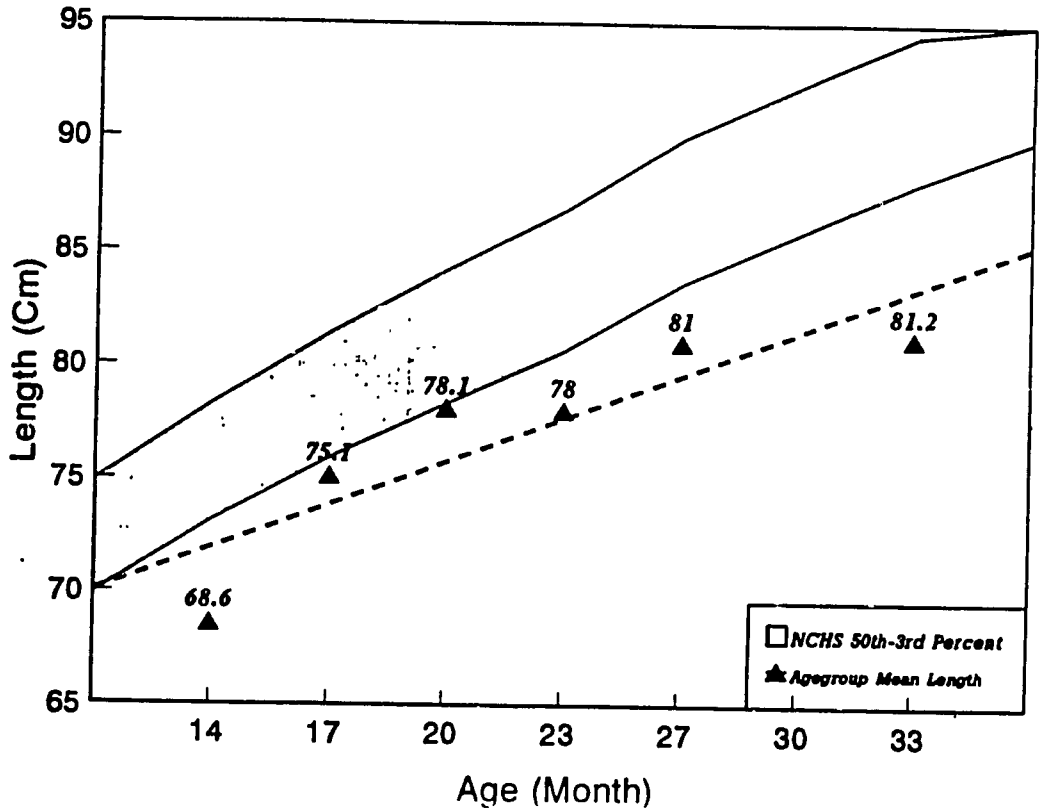
Length-for-Age of Male Infants



Weight-for-Age of Male Children



Length-for-Age of Male Children



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