REPORT
KYRGYZSTAN

ASSESSMENT OF THE NUTRITIONAL STATUS OF CHILDREN 6–24 MONTHS OF AGE AND THEIR MOTHERS, RURAL TALAS OBLAST, KYRGYZSTAN, 2008

Ministry of Health of the Kyrgyz Republic

U.S. CENTER FOR DISEASE CONTROL AND PREVENTION

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ASSESSMENT OF THE NUTRITIONAL STATUS OF CHILDREN 6–24 MONTHS OF AGE AND THEIR MOTHERS, RURAL TALAS OBLAST, KYRGYZSTAN, 2008

Ministry of Education and Science of the Kyrgyz Republic

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УДК 616
ББК 57,3
0-93

Assessment of the nutritional status of children 6–24 months of age and their mothers, rural Talas oblast, Kyrgyzstan, 2008 - B.: 2010. 66 p.

ISBN № 978-9967-25-918-8

O 4108170000-10

ISBN № 978-9967-25-918-8

УДК 616
ББК 57,3

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Disclaimer:

The findings and conclusions of this report do not necessarily represent the official position of the U.S. Center for Disease Control and Prevention and UNICEF.

Use of trade names is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

ACKNOWLEDGMENTS

The current survey was administered under the Cooperative Agreement between United Nations Children's Fund (UNICEF) and the U.S. Centers for Disease Control and Prevention (CDC). The review was carried out with support from the Central Asian Republics and Kazakhstan Commonwealth Independent States (CARK/CIS) regional UNICEF office, UNICEF in Kyrgyzstan, CDC, the Ministry of Health of Kyrgyzstan (MoH) and the National Statistical Committee of Kyrgyzstan (NSC).

We would like to give special thanks to T. Schafter, UNICEF-Kyrgyzstan representative, and A. Djusupova, program assistant, for their invaluable input and assistance. Thank you to M. M. Karataev, Deputy, MoH; D. Z. Saginbaeva, Department Head; and O. A. Abdykalykov, Head, NSC, for their support. Sincerest thanks to U. M. Tilikeeva, Chairperson, DDPME, Ethics Committee, and her team who provided invaluable input into adapting the protocol to protect survey participants.

We are grateful to the interviewers, field editors, and drivers for their participation in the survey. We give special thanks to the field survey personnel: leaders, S. Satkanalieva and T.Khickova; phlebotomists, N.Ceiitbekova, U..Akhmatova, and E.Kadralieva; and laboratory assistants, A. Ismailova, B.Ibragimova, and E.Kabylova. We are grateful to J. A. Aidarov, Chief Physician, Talas SES Department, and his medical team at Family Medical Center/ Family Group Physicians, S. J.Satkynalieva, Head, Regional Statistic Department, and her team, as well as the citizens of Talas Oblast for their hospitality and participation in the survey.

We would like also to thank the data analysts and statisticians for creating a quantitative database and the representatives of Global Link for their assistance.

EXECUTIVE SUMMARY

This report summarizes the findings of the nutrition survey conducted in the rural areas of Talas Oblast, Kyrgyzstan, in June and July 2008. The collaborating partners included the Ministry of Health Kyrgyzstan (MOH), the National Statistical Committee of Kyrgyzstan (NSC), United Nations Children's Fund (UNICEF), Kyrgyz-Swiss-Swedish Health Project (KSSHP), and the U.S. Centers for Disease Control and Prevention (CDC).

SURVEY OBJECTIVES

The objectives of the 2008 Rural Talas Oblast Nutrition Survey were to -

- Describe the knowledge and practices related to breastfeeding and infant feeding of mothers of children 6–24 months of age.
- Identify the role of village health committees (VHCs) in promoting the nutrition issues of children and pregnant/ nursing mothers.
- Determine the prevalence of stunting, wasting, underweight, and overweight in children aged 6–24 months.
- Determine the prevalence of anemia and iron deficiency in children aged 6–24 months and in their mothers.
- Determine the prevalence of vitamin A and folate deficiency in children aged 6–24 months and in their mothers

A two-stage cluster sampling design was employed by using probability proportional size (PPS) methodology to select 30 clusters of villages and 20 children aged 6–24 months and their mothers within each cluster in the rural areas of the Talas Oblast.

SUMMARY OF FINDINGS

A total of 571 children and 488 mothers were included in the survey. Of these 488 mothers, 420 were nonpregnant mothers. Anthropometry and blood samples were taken from all nonpregnant mothers and all children aged 6–24 months.

Infant and Young Child Feeding Practices

The World Health Organization (WHO) recommends exclusive breastfeeding for the first six months of life and then at six months introducing solid, semisolid, and soft foods to supplement the child's diet [1, 2]. Appropriate infant and young child feeding (IYCF) practices include altering the frequency, variety, and the amount of food as a child gets older, while continuing breastfeeding until two years of age.

Almost all (98.2%) of the mothers reported having ever breastfed their child, yet only 14.0% of the mothers exclusively breastfed for the first six months after childbirth. The majority of mothers considered breastfeeding very important for the healthy growth of their child (85.2%), while only 2.5% considered milk substitutes or formula to be very important for their child's growth. The main reported benefits of breastfeeding were that breastfeeding is healthy for the child or mother (91.8%); it is rich in important vitamins and minerals (80.9%); and it protects the child from infectious diseases (63.3%).

Although mothers, on average, reported that other liquids should ideally be introduced into their infant's diet at 4.4 months standard deviation (SD) 2.7, about half of the mothers reported giving liquids other than breast milk to their child by 3 months of age. Even though mothers, on average, reported that children should ideally be breastfed for 19 months (S.D. 5.8), only about half of the mothers continued breastfeeding at one year, and only 6.7% continued breastfeeding until two years. Less than half (46.5%) of the children aged 6–24 months were fed an adequate diversity of foods.

Sources of Nutrition Information

Mothers reported receiving various sources of advice on diet during pregnancy and breastfeeding practices. Mothers received information on diet during pregnancy and breastfeeding mainly from medical professionals, family members, friends, and neighbors. Among mothers, 6.8% received advice from a member of a VHC on dieting during pregnancy and 3.9% received breastfeeding advice from the VHC. Mothers reported being advised by medical professionals, as well as family, friends, and neighbors to stop exclusive breastfeeding at approximately 7.5 months and to stop breastfeeding at approximately 18 months of age.

Village health committees (VHCs)

Though the educational campaign involving VHCs had already started in Talas Oblast, only 28.9% of the mothers had ever heard about VHCs, and 14.3% had ever discussed health issues with a VHC member. Among mothers who had consulted with a VHC member previously, the most common topics discussed were using iodized salt, diet during pregnancy, and infant feeding practices. None of the mothers reported discussing micronutrient powders with the VHCs. We expected this because the micronutrient powders campaign had not yet started. Among the 70 mothers who had met with a VHC member previously, 96.3% reported that the sessions were either helpful or very helpful.

Anthropometry

Stunting, height-for-age (HAZ) using z-score < -2, was identified in 10.7% of the children aged 6–24 months. Severe stunting (HAZ<-3) was found in 2.5% of the children. Wasting, weight-for-height using z-score (WHZ) less than -2, and underweight, weight-for-age using z-score (WAZ) less than -2, were low among children (1.1%, 2.3% respectively). Overweight children (WHZ>+2) comprised 5.6% of the population. Stunting and wasting among children increased with age. Among nonpregnant mothers, 7.6% were underweight (Body Mass Index [BMI] <18.5 kg/m2), 63.1% normal weight (18.5 ≤ BMI ≤ 24.9); 21.4%, overweight (25 ≤ BMI ≤ 29.9), and 7.9%, obese (BMI ≥ 30).

Biological Indicators of Nutritional Status

Anemia, iron status, and iron deficiency anemia

Approximately half of the children were anemic. At this level, anemia is considered a severe public health problem according to the WHO. The mean hemoglobin level was 10.8 g/dl (SD 1.4). Almost two-thirds of the children aged 6–24 months were iron deficient (ferritin < 12µg/L), and 45.5% had iron deficiency anemia. When stratified by age, anemia prevalence was 41.6% among children 6–11 months of age, 59.2% among children 12–17 months of age and 51.7% among children 18–24 months of age.

One-quarter of the mothers were anemic; 58.5% were iron deficient; and 23.5% had iron deficiency anemia. Of the mothers who were diagnosed with anemia by a doctor, 63.6% reported taking iron supplements. Of the children who had been diagnosed with anemia, only half (48.7%) received iron supplements. One-third of mothers reported taking iron supplements during pregnancy as recommended by the Ministry of Health.

Folate deficiency

Among children 6–24 months, 2.8% had low whole blood folate. Among nonpregnant mothers, approximately one of four (22.6%) had low whole blood folate. Only 17% of mothers reported receiving folate supplements during pregnancy, though the Ministry of Health recommends that all pregnant women take supplements during the first trimester of pregnancy.

Vitamin A deficiency

About one-fifth of all children (19.5%) were vitamin A deficient-a level that is considered a moderate public health problem according to the WHO. The prevalence of vitamin A deficiency was 24.9% among children aged 6–11 months, 17.3% among children aged 12–17 months, and 15.8% among children aged 18–24 months. Among nonpregnant mothers, the prevalence of vitamin A deficiency was 2.6%.

Use of micronutrient supplements

The majority of mothers reported giving their child vitamin or mineral supplements. The most common supplements given to their children were vitamin D (65.0%), multivitamins (30.5%), and fish oil (8.4%). Among all mothers, 14.3% had ever seen a micronutrient powders package; 10.7% had ever received a micronutrient powders package; and 2.9% had actually given micronutrient powders to their children.

Among children, 93.7% had taken a vitamin A supplement at least one time, and 86.7% took their most recent vitamin A supplement less than 6 months before the interview. Among mothers, 40.8% received a vitamin A dose within the first two months postpartum.

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LIST OF ABBREVIATIONS

AGP	α1- glycoprotein acid
BMI	Body mass index= Weight (kg)/ Height2(m)
CDC	United States Centers for Disease Control and Prevention
CEE	Central and Eastern Europe
CHSD	Center for Health System Development
CI	Confidence Interval
CIS	Commonwealth of Independent States
CRP	C–reactive protein
DEFF	Design effect
DDPME	Department for Drugs, Procurement and Medical Equipment
DHS	Demographic and Health Survey
EDTA	Ethylenediaminetetraacetic acid
FOP	Feldsher Obstetrics Point
FGP	Family Group Practitioners
HAZ	Height-for-age, Z-score
HPU	Health Promotion Unit
ICC	Inter-cluster correlation
IDA	Iron deficiency anemia
IQR	Interquartile range
IYCF	Infant and young child feeding
KR	Kyrgyzstan
KSSHP	Kyrgyz-Swiss-Swedish Health Project
MICS	Multiple Indicator Cluster Survey
MOH	Ministry of Health
NCMCH	National Center for Mother and Child Health
NSC	National Statistical Committee
PPS	Probability proportional to size
RBP	Retinol-binding protein
SD	Standard Deviation
SES	State Health Epidemiologic Surveillance Central Department
SRC	Swiss Red Cross
sTfR	Soluble transferrin receptor protein
T1	Baseline survey
T2	Follow-up survey after program implementation
UNICEF	United Nations Children's Fund
VAD	Vitamin A Deficiency
VHCs	Village health committees
WHO	World Health Organization
WHZ	Weight-for-height Z-score
WAZ	Weight-for-age, Z-score

1. INTRODUCTION

In Kyrgyzstan, anemia is an important public health problem. The 1997 Demographic and Health Survey [3] estimated a prevalence of anemia of 45% in children 6–36 months of age and 65% for women of reproductive age. Nonnationally representative studies undertaken since 1997, suggest that the prevalence of anemia has not declined, despite various campaigns that have included the distribution of iron supplements. These data suggest that micronutrient deficiencies are the most important nutritional problems affecting children in Kyrgyzstan, and innovative approaches must be undertaken to combat them.

The high prevalence of micronutrient deficiencies is likely due to the consumption of diets adequate in energy but poor in micronutrient quality and a low prevalence of exclusive breastfeeding among mothers during the first six months of life [4]. In the absence of breastfeeding, mothers give their children micronutrient deficient liquids (e.g., diluted cow's milk, mixes of milk, sugar, water) and often introduce black tea very early in life. Furthermore, mothers often introduce complementary foods, which are high in calories but low in nutritional quality.

To address micronutrient deficiency and the high prevalence of anemia, the Ministry of Health of Kyrgyzstan (MOH) - in close collaboration with the United Nations Children's Fund (UNICEF)-Kyrgyzstan and Kyrgyz-Swiss-Swedish Health Project (KSSHP)-developed a nationwide health education campaign to improve diet during pregnancy, as well as breastfeeding and complementary feeding practices to improve micronutrient status and to eventually lower rates of stunting and underweight. The campaign is community-based and supposes active involvement of village health committees (VHCs). This program is a nationally owned effort supported by the MOH, National Statistical Committee of Kyrgyzstan (NSC), U.S. Centers for Disease Control and Prevention (CDC), UNICEF, and the KSSHP.

The educational campaign uses the infrastructure of the VHC for the dissemination of educational messages to mothers. The VHCs consist of volunteers (mainly women) who learn about specific public health issues and ways to address the issues. The VHCs then share their knowledge with targeted individuals (i.e., women, mothers) through campaigns and personal interactions. The VHCs are trained by the Republican Health Promotion Center, which works closely with the KSSHP and UNICEF.

In addition to the nationwide VHC health education campaign, in June 2009, the MOH began a pilot program in Talas Oblast, to distribute micronutrient powders (Gulazik) to all children 6–24 months of age. Gulazik is distributed through the medical clinics, and the VHCs follow up with mothers to reinforce the instructions received at the medical clinics on use of Gulazik.

1.1. Goal and Objectives of the Survey

This survey will provide the baseline information that is needed to test the effect of the pilot program of the VHC nutrition education campaign and to determine the distribution of micronutrient powders among all children 6–24 months of age in rural Talas Oblast. A second survey will be conducted (24 months after this survey) to compare the changes in micronutrient status as measured by prevalence of anemia and deficiency of iron, folate, and vitamin A.

The second survey will be used to measure change in micronutrient status and to determine changes in knowledge, attitudes, and practices of breastfeeding, complementary feeding, and the use of micronutrient powders. By performing the second survey 24 months after the first, there will be a sufficient time lapse-from the introduction of micronutrient powders to the survey date-to detect any effect of the micronutrient powders. A final objective is to build capacity at the national and provincial level related to conducting surveys and data analyses.

SURVEY OBJECTIVES

The objectives of the survey were to:

- Describe the knowledge and practices related to breastfeeding and infant feeding of mothers of children 6–24 months of age.
- Identify the role of VHCs in the promotion of nutrition issues of children, their mothers, and pregnant/nursing mothers.
- Determine the prevalence of stunting, wasting, underweight, and overweight in children aged 6–24 months.
- Determine the prevalence of anemia and iron deficiency in children aged 6–24 months and their mothers.
- Determine the prevalence of folate and vitamin A deficiency among children aged 6–24 months and their mothers.

2. METHODOLOGY

2.1. Survey Population

The target populations to assess anemia, iron, and vitamin A status are a representative sample of children 6–24 months of age living in rural areas of Talas Oblast and the mothers of these children. The primary target group for the survey was children 6–24 months of age. The second target group for the survey is mothers of children aged 6–24 months. Mothers were surveyed to provide data on infant feeding practices, knowledge of VHCs, and what sources of information they consulted for health information. Because many nutritional indicators are altered with pregnancy, no blood samples or anthropometry measurements were taken from pregnant women. Nonpregnant mothers provided data to determine nutritional status for women of reproductive age.

2.2. Sampling

2.2.1. Sample size determination

The sample size for the survey was determined by using standard statistical procedures. The anticipated prevalence of nutritional indices (anemia and iron deficiency) during the baseline survey (T1), the anticipated prevalence after the program implementation (T2), and the assumed design effect for each outcome in the main target group of children 6–24 months of age were determined on the basis of the results from previous surveys and studies related to the outcomes of interest. The total population includes all children 6–24 months of age and their mothers living in rural areas of the Talas Oblast. Children from Talas city were excluded. There are 90 villages and approximately 7,500 children between 6–24 months of age in this oblast.

On a population level, anemia and iron deficiency improve with age. Because there is no control group, a pre- and post- follow-up with the same cohort of children would make any inferences regarding the improvement of biological indicators of nutritional status and the impact of the program dubious; therefore, the program evaluation design used in this study was a group randomized survey design with independent samples at each of the two time periods.

We calculated the sample size necessary to detect a relative decline in the prevalence of anemia and iron deficiency of 20%, 25%, 30%, and 40% (Table 2-1). The initial prevalence of anemia was based on 1997 Demographic and Health Survey (DHS) data, which estimated the prevalence of anemia in children 6–36 months of age to be 45%. When the prevalence of anemia is greater than 30–40%, the majority of the anemia is likely from iron deficiency. We assumed that two-thirds of those anemic children, or roughly 30% of the population, were suffering iron-deficiency anemia (IDA), The prevalence of iron deficiency in a population is roughly equivalent to two times the prevalence of IDA [5]. Therefore, a conservative estimate of the prevalence of iron deficiency in this population was 60%.

Table 2-1. Sample size calculation of anemia and iron deficiency for two surveys assuming a design effect of two

	Prevalence T1	Expected % decline	Expected Prev. T2	Design Effect	Respons e Rate	N (calculated
Anemia	45%	20%	36%	2.0	100%	933
Iron Deficiency	60%	20%	48%	2.0	100%	541
Anemia	45%	25%	34%	2.0	100%	620
Iron Deficiency	60%	25%	45%	2.0	100%	348
Anemia	45%	30%	32%	2.0	100%	440
Iron Deficiency	60%	30%	42%	2.0	100%	242
Anemia	45%	40%	27%	2.0	100%	224
Iron Deficiency	60%	40%	36%	2.0	100%	136

Abbreviations: T1,baseline survey; T2,program implementation; N, sample size.

To detect a relative decrease of 20% in the prevalence of iron deficiency, we needed a sample size of 541 participants. As shown in table 2.1, to detect larger changes, smaller sample sizes would be necessary. Previous studies using micronutrient powders with children 6–24 months of age have reported differences in anemia prevalence between control and intervention groups of approximately 43–44% and reductions in anemia prevalence (pre- and post- micronutrient powders intervention) of 37–51% [6-8]. One might expect a larger reduction in iron deficiency than anemia; however, this is a large-scale program, not a controlled trial, and some might expect a smaller reduction in both iron deficiency and anemia than that seen in controlled trials. Assuming that a 20% relative reduction in the prevalence of iron deficiency is possible, we would need a total of 541 subjects in both the baseline and the follow-up surveys to detect such a reduction.

To adjust for a 10% nonresponse rate, 20 children were initially included in each cluster, raising the number of children invited for interviews to 600. However, after the first few days of the survey, the survey team realized that response rates were lower than expected, and the survey coordinator elected to interview 22 mother/child pairs in each cluster instead of 20 mother/child pairs in each cluster. This would ensure that an approximate sample size of 541 would be included in the survey. Clusters were selected using probability proportional to size (PPS). The participants were systematically selected from lists of eligible participants from each village.

2.2.2. Stage 1: selection of clusters

Only rural areas of the Talas Oblast were included in the survey. Talas City was excluded from the sampling frame. UNICEF-Kyrgyzstan in Bishkek, provided us with a list of all villages in the rural areas of Talas Oblast in an Excel spreadsheet and with the estimated number of households and children between 6–24 months of age in the villages as reported by the VHCs. The estimated total population for Talas Oblast is 188,068, of whom approximately 7,500 are children 6–24 months of age. Because of the very small population size of some villages, cluster units were formed by combining villages whose population of children aged 6–24 months was less than two times the targeted number of participants. Combining villages to form a cluster was determined by geographic proximity. For the first stage of sampling, the sampling unit was a cluster. Thirty primary sampling units were selected through PPS cluster sampling. By using this method, the likelihood of a sampling unit being selected is proportional to the size of its population.

2.2.3. Stage 2: random assignment

Before data collection began, the survey coordinator worked with the health care workers (heads or deputy heads of clinics and doctors or nurses in Feldsher Obstetrics Points [FOPs]) in each selected village to obtain an accurate and complete list of the children in each selected cluster between the ages of 6–24 months. A computer-generated random number list was used to select children from each cluster, who were invited on a pre-determined day¬, to the health clinic. The total number of children who arrived at the health clinic for measurement was included in the survey. No substitutions were made for any reason. The mothers of the randomly chosen children were also measured for both anthropometric and biological measurements. Survey team personnel went to the homes and visited any mother/child pair that did not arrive at the health clinic as scheduled.

2.3. On-Site Training and Data Collection

2.3.1. Survey teams

Three field teams collected the data for the survey. Each team consisted of one team supervisor, two interviewers/ anthropometrists, one phlebotomist/ nurse, and a driver (Table 2-2). The survey coordinator was responsible for organizing and transporting supplies and laboratory specimens.

Table 2-2. Roles and responsibilities for each survey team member, Talas Oblast, Kyrgyzstan, 2008

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Role	Responsibilities
Survey Coordinator	Summarize methodology and tools for the survey Oversee the training of field workers and pilot testing of questionnaires and field methods Prepare the villages for the arrival of the survey teams Oversee all data collection Compile data from the three field teams Oversee data management, entry, analysis
Team Supervisor	Coordinate the invitation of mothers and their children to the health clinic on the day of measurement. Maintain records and cluster control sheets Check labels and completed data collection forms Supervise all data collection.
Phlebotomist/Nurse	Perform finger/ heel sticks and collection of capillary blood Manage laboratory specimens during data collection Maintain cold chain until samples are stored
Anthropometrist/ Interviewer	Explain study to mothers Receive informed consent Measure height and weight of children Interview mothers

2.3.2. Training

Personnel from the NSC trained the team on data collection, interviewing, and anthropometry. Trainings included lessons on interviewing, conducting surveys, understanding the survey content, and measuring the children's and their mothers' height and weight.

Laboratory personnel from CDC conducted a 5-day training on blood sampling, identifying hemoglobin levels by using the HemoCue® photometer, maintaining a cold chain, separating plasma, preparing dry blood spots, and freezing blood samples. Team supervisors, phlebotomists, and physicians/laboratory assistants participated in the training sessions. At the first stage of trainings, all team members attended lectures on blood sampling, separating plasma, and taking precautionary measures while blood sampling. Following the lectures, the team members conducted practical assignments by taking blood from each other, and then later from mothers and children who volunteered to participate to provide blood samples. During the second stage of training, personnel from the National Center for Mother and Child Health (NCMCH) and CDC led a discussion on lessons learned. Instructions on the team members' responsibilities, blood sampling, and processing procedures were reiterated during these sessions. Immediately after the training sessions, the questionnaire was pilot tested in a village outside of Talas City in the Talas Oblast. The pilot included 10 child/mother pairs per field team. The interviewers completed the questionnaire and took anthropometric measurements of women and children. The phlebotomists obtained blood samples, and the laboratory technicians processed the blood samples. The pilot clarified questions regarding the questionnaire as well as other complex logistical issues.

2.3.3. Preparation for field surveys

The Ethics Committee, under the Department of Drug Provision and Medical Equipment approved the survey protocol, biological testing procedures, and transportation itinerary to maintain the cold chain for specimen transport. After the Ethics Committee approved the survey protocol, an order of the MOH, #296, dated 12.06.2008, outlined the responsibilities and obligations of health care facilities in the survey.

Before staring the survey, a roundtable was held in Talas City with participation of government representatives from regional/oblast levels, nongovernmental organizations, members of VHCs, and the heads of Family Medicine Center/Family Group Practitioners (the medical workers at the village level). The participants discussed the micronutrient deficiencies of children and women of reproductive age as well as the goals and objectives of the survey. During the discussion of survey methodologies, the main emphasis was placed on confidentiality of information, necessity to obtain consent from respondents, precautionary measures during blood sampling collection, and the actions of team members in case a child or the child's mother was found to be anemic. After these discussions, the Talas Oblast government representatives gave consent to administer the survey.

In each cluster, the head of the primary health care facilities were informed about the survey. In each cluster, the head of the FOP received a schedule of the survey in advance.

Survey respondents were notified two to three days in advance about the date and time of their FOP visit. Respondents were informed that their visit would include a questionnaire interview, anthropometrical measurements, and blood collection. The supervisor of each team received a route schedule, the cluster numbers and the addresses, and locations of where we would administer the survey (Table 2-3).

Table 2-3. Route schedule for the survey, Talas Oblast, Kyrgyzstan, 2008

Date of visit	Region	Team 1 - villages	Team 2 - villages	Team 3 – Villages
30.06.2008	Bakai-ata rayon	Keneral	Yntymak	Kyzyloctiabr
01.07.2008		Ozgorush	Akdobo	Minbulak
02.07.2008		Boterek	Pervoe Maia	
02.07.2008	Karabuura rayon			Karasu
03.07.2008		Amanbaevo	Sheker	Koksai
04.07.2008		Akbashat	Moldoasan	Sulumaimak
05.07.2008		Chimgent	Karabura	
05.07.2008	Talas rayon			Kenesh
06.07.2008		Kopurebazar	Taldybulak	Uchemchek
08.07.2008		Atai Ogonbaeva	Janyaryk-Aksai	Kokkashat
09.07.2008		Kumaryk	Jonaryk	Tasharyk
10.07.2008	Manas rayon	Jailgan	Talas	Kyzyljildyz

2.3.4. Survey implementation

Data collection started on June 30 and was completed on July 10, 2008. Three field teams collected data by conducting face-to-face interviews with mothers or other child caretakers. Three villages were surveyed each day, one per team.

Before the survey began, the survey coordinator contacted the village health worker and obtained a list of all children eligible for inclusion in the survey. The survey coordinator then randomly selected the children for inclusion in the survey by using a computer generated random number list. The list of participants was given to the survey team supervisor and the health worker at the clinic. The health care workers invited those children and their mothers to the health clinic on the predetermined day. Children and their mothers were scheduled to arrive at the medical clinic at predetermined intervals throughout the day.

The survey team arrived at the clinic approximately 30–60 minutes before the arrival of the first mother/child to set up the equipment, prepare questionnaires, and introduce themselves to the medical personnel at the clinic. The survey team received the mother/child as they arrived for their survey appointments, explained the survey to the mother, and received verbal consent before proceeding to data collection. All mothers and children from the predetermined participant list were included in the survey, if verbal consent was received. No substitutions from the original randomly selected participant list were made.

If a mother on the list did not arrive with her child, the medical worker and a member of the survey team visited the home and invited the mother to the health clinic. If the mother refused to visit the health clinic, but agreed to participate, measurements were taken in the home. If the mother refused to participate, the reason was noted on the household questionnaire.

2.4. Data Collection Instrument

The questionnaire consisted of a combined mother/child questionnaire and contained modules on sociodemographic information, diet and breastfeeding patterns, supplement use, knowledge, attitudes about infant and young child feeding practices, VHCs, anthropometric measurements, and blood sampling. The questionnaire was translated into Kyrgyz and Russian languages and pre-tested to ensure that the meanings of the questions were not lost. They were then translated back to English to ensure accuracy. This process was led by a specialist from the KSSHP. Amendments were made to the survey instrument after pre-testing the survey in the field. The questionnaires were reviewed with all the interviewers during the survey training (Appendix 1). The survey questionnaire had 10 modules which are all described in Table 2-4.

Table 2-4. Survey modules, Talas Oblast, Kyrgyzstan, 2008

Module	Scope of questions
1. Demographics	Mother and child's age, child's gender, ethnic group, mother's employment, the reason of mother's absence at interview if applicable, and family size
2. Household characteristic module	Questions regarding household items and building materials.
3. Women's module	Woman's age, education level, reproductive status, and knowledge of child nutrition
4. Breastfeeding and infant feeding module	History of breastfeeding and infant feeding for the child
5. Attitude and behavior module	Attitude of the mother on breastfeeding, knowledge of complementary feeding practices
6. Dietary advice module	From whom mothers receive advice on nutrition, impact of consultations from medical professionals, family, friends, neighbors on breastfeeding and complementary feeding practices
7. Vitamins/supplements module	Vitamin and supplement intake during pregnancy, child history of vitamin or mineral supplement intake including intake in the case of diagnosed anemia
8. Contact module	Knowledge of and contact with VHCs
9. Anthropometry module	Height/length and weight measurements
10.Blood sample module	Blood sample collected, hemoglobin analysis

Once participants had completed the interview process, the interviewer took height and weight measurements from the mother and length and weight measurements from the child.

2.4.1. Anthropometry

For all children, recumbent length was measured to the nearest 0.1 cm by using a field appropriate Shorr stadiometer® (Olney, Maryland, USA). Anthropometrists measured the height of mothers by using a Harpenden Pocket Stadiometer®. All subjects were measured without shoes and hair adornments. UNICEF Uniscales (SECA Gmbh & Co, Hamburg, Germany) were used to measure body weight of women respondents and their child. The weight of the children was assessed using the mother-child function on the scale.

2.4.2. Hemoglobin measurement

Hemoglobin was assessed in the field using the HemoCue® photometric instrument (HemoCue AB, Angelholm, Sweden). Quality control of the HemoCue® instrument was ensured by using the control cuvette for each specific instrument before the instrument was used. Liquid controls were also used at the beginning and end of each day to assure the quality of HemoCue® readings. Log sheets of all the quality control measurements were kept by the phlebotomist/nurse on each survey team. The trained phlebotomists of the survey teams were located at the health facility where the interviews and anthropometry were conducted. These laboratory personnel collected capillary

blood samples through a finger stick from all subjects by using a retractable lancet. The finger was then wiped clean, and the second drop was drawn into a HemoCue® cuvette to evaluate the hemoglobin.

During field surveys, if the hemoglobin value indicated that the child likely had anemia, their mother or caregiver was informed, and the child was referred to a local health worker. If the hemoglobin level indicated that the child likely had severe anemia, the supervisor informed their mother or caregiver and arranged an immediate medical check-up for the child. The same approach was used for hemoglobin measures in mothers.

After each day, the team supervisor gave the head of the local health facility a list of subjects who had hemoglobin measurements that indicated anemia.

2.4.3. Blood collection

Blood samples were collected from the mother and the child to assess levels of hemoglobin, ferritin, soluble transferrin receptor protein (sTfR), whole blood folate, C-reactive protein (CRP), retinol binding protein (RBP) , and 1 – acid glycoprotein (AGP). For each day of data collection in the field, the teams packed the following items:

40 pairs of gloves
20 blue absorbent pads
4 microtainers racks
2 cold boxes with frozen cooling elements
1 sharps container
1 permanent marker
1 thermometer
1 photometer HemoCue®
1 biological hazards disposal bag
1 bag of extra supplies
Self-blocking sterile lancets
HemoCue® control tests
HemoCue® control forms
Sterile alcohol pads
Sterile Band-Aids®
Safety goggles
Auxiliary batteries
Microtainers

A) Microtainer

The blood collection was conducted on blue absorbent pads, and standard laboratory safety and hygiene procedures were followed. Blood was collected by puncturing the index finger of the nondominant hand. The phlebotomist had only two opportunities to draw blood from each participant.

For each women and child, 500uL of blood was collected in the microtainer. Phlebotomists gently inverted the microtainer 10 times before storage to ensure that the blood came into complete contact with the ethylenediaminetetraacetic acid (EDTA). The samples were stored in cold boxes at 4–10°C. Plasma ferritin, sTfR, CRP, and AGP were analyzed from this capillary blood sample.

B) Dry blood spots

Laboratory assistants prepared dry drops of whole blood on a special blotting paper (Whatman 903® Lot W041 A01836) to analyze the content of whole blood folate. After applying two drops of whole blood on paper, lab assistants dried the blotting paper at room temperature for 3 hours. The specimens were then packed in weighing paper with desiccant sachets and stored at -20°C.

2.5. Biological Sample Processing and Storage

Blood samples were delivered to a mobile laboratory twice a day to ensure proper quality control of the measurements, and were maintained at a temperature of 4–10°C throughout the day. Frozen cryovials were transported to the Talas Oblast Center of the State Health Epidemiologic Surveillance Central Department (SES) in Bishkek, after the completion of field work. Samples were placed in the -70°C freezer upon arrival in the Bishkek SES.

2.5.1. Cold chain

To ensure the proper transport of human biological specimens, procedures were followed to maintain a cold chain, and avoid adverse affects on the analysis (Table 2-5).

Table 2-5. Cold chain maintained for blood samples, Talas Oblast, Kyrgyzstan, 2008

	FOP/FGP	Vehicle	Field/ Mobile Laboratory	Vehicle	Bishkek SES
Procedure	Blood draw, Measure Hb	Transport to Mobile Lab	Centrifuge and separate plasma, Store until transport.	Transport to Bishkek SES	Store until shipping
Types of Packaging	Cold box or vaccine carrier	Cold box or vaccine carrier	Freezer	Cold box, vaccine carrier or Styrofoam boxes	Freezers
Tempera-ture	4°C to 10°C	4°C to 10°C	-16°C to -22°C	-16°C to -22°C	-70°C
Duration	Same day as blood draw		1-7 days	3-8 hours	1-2 year
Cold Chain	Store blood in cool boxes that are maintained by frozen cooling elements	Add fresh frozen cooling elements before transport	Freezer at -20C degrees, Generator is provided to ensure electricity supply	Dry ice	Freezer at labora-tory
Verification method	Tempera-ture/ freezing monitor	Tempera-ture/ freez-ing monitor	Tempera-ture/ freez-ing monitor	Tempera-ture/ freezing monitor	Tem-perature/ freezing monitor

The laboratory supervisor and the survey coordinator were responsible for ensuring maintenance of the cold chain. The samples were not frozen or thawed prior to analysis. Special attention was given to the dried blood spots to ensure that they did not reach a temperature above -16°C and to maintain integrity of the blood samples.

In a German laboratory, (DBS-Tech, Willstaett, Germany) the iron status, vitamin A level, and markers of acute inflammation in blood plasma were analyzed by using the biological indicators ferritin, sTfR Ramco, RBP, and CRP and AGP[9]. Analysis of the level of whole blood folate was performed at the Hematology Laboratory of St. James Hospital (Dublin, Ireland) [10]. The Department of Drug Provision and Medical Equipment, under the MOH, granted permission for the analyses to be conducted in these countries.

2.6. Data Reduction and Statistical Analysis

The data were entered into computers using CSPro software. Data were entered in duplicate to ensure quality and consistency of data. The analysis of data was conducted using SAS 9.1 (SAS Institute, Cary, NC, USA), and tabulation algorithms provided by CDC and UNICEF. Life table methods were used to calculate the duration of breastfeeding and when solid/semisolid foods were introduced. Confidence intervals and design effects (DEFF) for key variables were calculated by using complex sampling methods. In each table presented in this report, N is always the denominator.

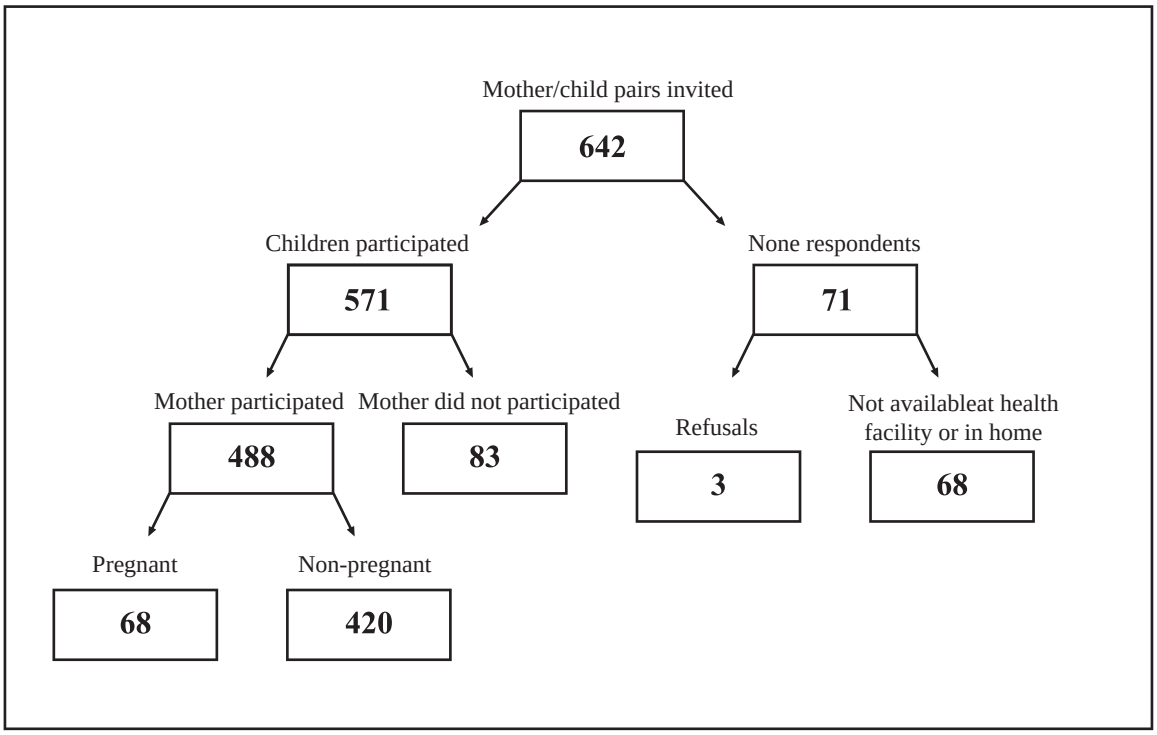
2.7. Data Management

On site, the team supervisors checked, verified, and compiled the questionnaires by cluster. The questionnaires were then delivered to the central office of the NSC for further data processing.

3. RESPONSE RATES

A total of 642 children and their mother were invited for interviews. Among children who were invited for interview, 88.9% (571) children participated in an interview. Mothers attended 85.5% (488) of these interviews. Of those attended by mothers, 68 interviews were completed by pregnant mothers. Anthropometry measurements and blood samples were collected from all children and from nonpregnant mothers. Three mothers refused to participate, and 68 were neither available at the health facility nor their homes for an interview. Refer to Figure 3-1 for an illustration of the number of respondents.

Figure 3-1. Flow chart of interviews, Talas Oblast, Kyrgyzstan, 2008



3.1. Nonresponse

Limited demographic information was collected from health records and health staff on nonrespondent mothers. The principal reasons for nonresponse were the failure to find mothers at home due to absence from the village (52.1%), moving away from the village (25.4%), and seasonal departure to the pastures (18.3%).

4. DEMOGRAPHIC AND SOCIOECONOMIC CHARACTERISTICS OF THE RESPONDENTS

4.1. Age, Sex, and Ethnicity

The age of mothers (N=488) included in the survey ranged from 17–45 years (Table 4-1). The mean age in years was 27.6 years (SD 5.9). For children, the age ranges were divided into three 6-month intervals: 6–11 months, 12–17 months, and 18–24 months. Approximately one-third of all child respondents fell into each age range. The children were divided equally by gender (male=52.4%, female=47.6%).

Table 4-1. Age distribution of survey participants, Talas Oblast, Kyrgyzstan, 2008

Target Group	%
Children (N=571)	
6–11 months	35.4
12–17 months	33.5
18–24 months	31.2
Mothers (N=488)	
17–24 years	37.7
25–35 years	48.0
35+ years	14.3

Almost all respondent mothers (95.7%) self-identified as Kyrgyz (Table 4-2).

Table 4-2. Frequency distribution of mothers' ethnicity (N=488), Talas Oblast, Kyrgyzstan, 2008

Ethnic Group	%
Kyrgyz	95.7
Russian	0.4
Uzbek	0.8
Kazakh	1.4
Other	1.6

4.2. Formal Education and Work Status

Among mothers, 65.4% had completed secondary education, 17.4% had secondary technical education, and 16.4% had higher education (Table 4-3).

Table 4-3. Education level of mothers (N= 488),Talas Oblast, Kyrgyzstan, 2008

Highest level of school completed	% of mothers
Never attended	0.4
Primary (1st–4th grades)	0.0
Incomplete secondary (5th–9th grades)	0.4
Complete secondary	65.4
Technical school	17.4
Higher education	16.4

Approximately 70% of mothers did not work or study at the time of interview. Of the mothers who reported working or studying (N=148), the majority (77%) worked on farms (Table 4-4). Of the working mothers, 20% reported leaving their children for less than 4 hours; 28% left for 4–5 hours; 38% left for 6–8 hours; and 14% left for more than 8 hours per day.

Table 4-4. Type of work among mothers who worked or studied (N=148), Talas Oblast, Kyrgyzstan, 2008

Type of Work	%
Laborer (in the fields)	77.0
Professional	16.9
Sells fruit/other products	2.7
Employee in a business	2.0
Student	0.7
Business owner	0.7

4.3. Reproductive Status

The respondent mothers were asked if they were pregnant during the time of the survey. Of the women (N=488), 13.9% reported that they were pregnant; 84.2% reported that they were not; 1.8% were not sure whether or not they were pregnant. Of those who were pregnant (n=68), 41.8% were in the first trimester, 29.9% were in the second trimester, and 28.4% were in the third trimester.

Among mothers, 24.2% had one child, 50.4% of the mothers had two or three children, and 25.4% of mothers had four or more children (Table 4-5). The mean number of living children was 2.6 (SD 1.3).

Table 4-5. Number of living children as reported by mothers (N=488), Talas Oblast, Kyrgyzstan, 2008

# of living children	% of mothers
1	24.2
2	27.3
3	23.2
4 or more	25.4

4.4. Household Economic Status

4.4.1 Housing materials

The majority of the walls in respondents' homes were made of straw with mud/adobe (Table 4-6).

Table 4-6. Housing characteristics as reported by mothers (N=488), Talas Oblast, Kyrgyzstan, 2008

Wall materials	%
Dirt	27.7
Straw with mud/Adobe	38.9
Cement/Cement blocks/ Slabs	1.8
Stone with lime	0.2
Bricks	26.6
Slag/Slag blocks	0.6
Wood planks/shingles	3.1
Other	0.6
Don't know/remember	0.4

4.4.2. Ownership of household assets

Ownership of household assets was used as a proxy of economic status (Table 4-7). A list of household assets was read to the mothers to determine the assets in the household.

Table 4-7. Percentage of respondents reporting ownership of household assets (N=488), Talas Oblast, Kyrgyzstan, 2008

Household Assets	% of Respondents
Radio	43.2
Bicycle	58.0
Color television	93.2
Mobile telephone	78.3
Non-Mobile Telephone	6.1
Refrigerator	35.7
Animal drawn-cart	52.7
Car/Truck	45.1

4.5. Discussion/Summary Findings

The survey findings are representative of children in rural areas of Talas Oblast, located in the northern region of the country. The majority of mothers self identified as Kyrgyz. Most mothers were 17–35 years of age, with 85.7% under 35 years. The children were 6–24 months of age, with approximately an equal distribution between 6–11 months, 12–17 months, and 18–24 months age groupings. The majority of mothers completed a secondary education while one-third of the women completed technical school or higher education.

5. INFANT AND YOUNG CHILD FEEDING PRACTICES

The WHO recommends exclusive breastfeeding for the first six months of life, then at six months WHO recommends that mothers introduce solid, semisolid, and soft foods to supplement the child's diet. Appropriate infant and young child feeding (IYCF) practices include altering the frequency, variety, and amount of foods as a child gets older, while continuing breastfeeding until two years of age. Optimal IYCF practices during the first two years of life are integral to a child's survival and development [11]. WHO Indicators for Assessing Infant and Young Child Feeding Practices were used in this survey to measure IYCF practices (Table 5-1).

It should be noted that the Talas survey included children 6–24 months of age and therefore the calculation of the two indicators (early initiation of breastfeeding and ever breast feed) included only children greater than six months of age. In addition, the WHO indicators for IYCF practices include children only up to 23.9 months, whereas the Talas survey included children 24 months of age. Because children under six months were not included in the survey, we used maternal recall to estimate exclusive breastfeeding to 6 months of age (Table 5-2). In addition to duration of breast feeding, mothers were asked to recall feeding practices including introduction of liquids, animal milk, or formula, and semisolid or solid foods. We used the recalls to estimate when foods other than breast milk were introduced.

Table 5-1. The WHO definitions of indicators for infant and young child feeding practices [11]*

Early initiation of breastfeeding: Proportion of children born in the last 23.9 months who were put to the breast within one hour of birth
Children born in the last 23.9 months who were put to the breast within one hour of birth
Children born in the last 23.9 months

Ever breastfed: Proportion of children born in the last 23.9 months who were ever breastfed
Children born in the last 23.9 months who were ever breastfed
Children born in the last 23.9 months

Continued breastfeeding at 1 year: Proportion of children 12–15.9 months of age who are fed breastmilk
Children 12–15.9 months of age who received breastmilk during the previous day
Children 12-15.9 months of age

Continued breastfeeding at 2 years: Proportion of children 20–23.9 months of age who are fed breastmilk
Children 20–23.9 months of age who received breastmilk during the previous day
Children 20–23.9 months of age

Minimum dietary diversity: Proportion of children 6–23.9 months of age who receive foods from 4 or more food groups
Children 6–23.9 mo of age who received foods from 4 or more food groups during the previous day
Children 6–23.9 months of age

Consumption of iron-rich or iron-fortified foods: Proportion of children 6–23.9 months of age who receive an iron-rich food or iron-fortified food that is specially designed for infants and young children, or that is fortified in the home
Children 6–23.9 months of age who received an iron-rich food or a food that was specially designed for infants and young children and was fortified with iron, ora food that was fortified in the home with a product that included iron during the previous day
Children 6–23.9 months of age

Milk feeding frequency for non-breastfed children: Proportion of non-breastfed children 6–23.9 months of age who receive at least 2 milk feedings
Non-breastfed children 6–23.9 months of age who received at least 2 milk feedings during the previous day
Non-breastfed children 6–23.9 months of age

* Talas survey included children 6–24 months of age.

Table 5-2 Definitions of other infant and young child feeding practices used

Exclusive breastfeeding under 6 months: Proportion of children 6–24 months of age whose mothers reported that they were exclusively breastfed (i.e., having received no other liquids, milks, or other foods) until 6 months of age
Children who were exclusively breastfed until 6 months of age
Children 6–24 months of age

Less than half of mothers (47.0%) started breastfeeding their newborn infant during the first hour after birth, 41.1% between 1–24 hours, and 6.9% between 24–48 hours after birth. Only 14.0% of children were exclusively breastfed during the first 6 months of their life. Almost all (98.2%) mothers had ever breastfed their children. Half of the women (48.7%) continued breastfeeding at one year of age, while 6.7% continued breastfeeding at two years of age. The median age at which mothers reported to stop breastfeeding their child was 12.1 months (Interquartile range [IQR] 3).

Within the first month after birth, 11.3% of children were given liquids other than breastmilk. By three months of age, almost half of the children were given other liquids (47.8%). Addition of animal milk or formula into the infant diet within the first three months was reported by approximately one in every four mothers (27.7%). The median age of introduction of solid, semisolid, or soft foods was 6 months (IQR 3). Two-thirds of nonbreastfed children aged 6–24 months were fed milk with the recommended frequency (at least two milk feedings a day).

Table 5-3. Prevalence of infants completing each indicator for appropriate infant and young child feeding practices [11], Talas Oblast, Kyrgyzstan, 2008

Indicator	N*	%	95% CI	DEFF
Early initiation of breastfeeding	479	47.0	(39.32,54.63)	2.69
Exclusive breastfeeding under 6 months	487	14.0	(9.60, 18.33)	1.84
Ever breastfed	488	98.2	(96.81,99.51)	1.17
Continued breastfeeding at 1 year	115	48.7	(38.21, 59.18)	1.20
Continued breastfeeding at 2 years	90	6.7	(1.61,11.72)	0.87
Appropriate introduction of solid, semi-solid or soft foods	96	90.6	(84.19, 97.06)	1.10
Consuming minimum dietary diversity	488	46.5	(40.48, 52.55)	1.70
Consuming iron-rich food or iron fortified food	488	59.2	(53.50, 64.94)	1.58
Adequate milk feeding frequency for non-breastfed children	253	68.8	(62.54, 75.01)	1.09

* Refers to the denominator.

5.1. Attitude and Practice of Mothers Regarding Infant and Young Child Feeding

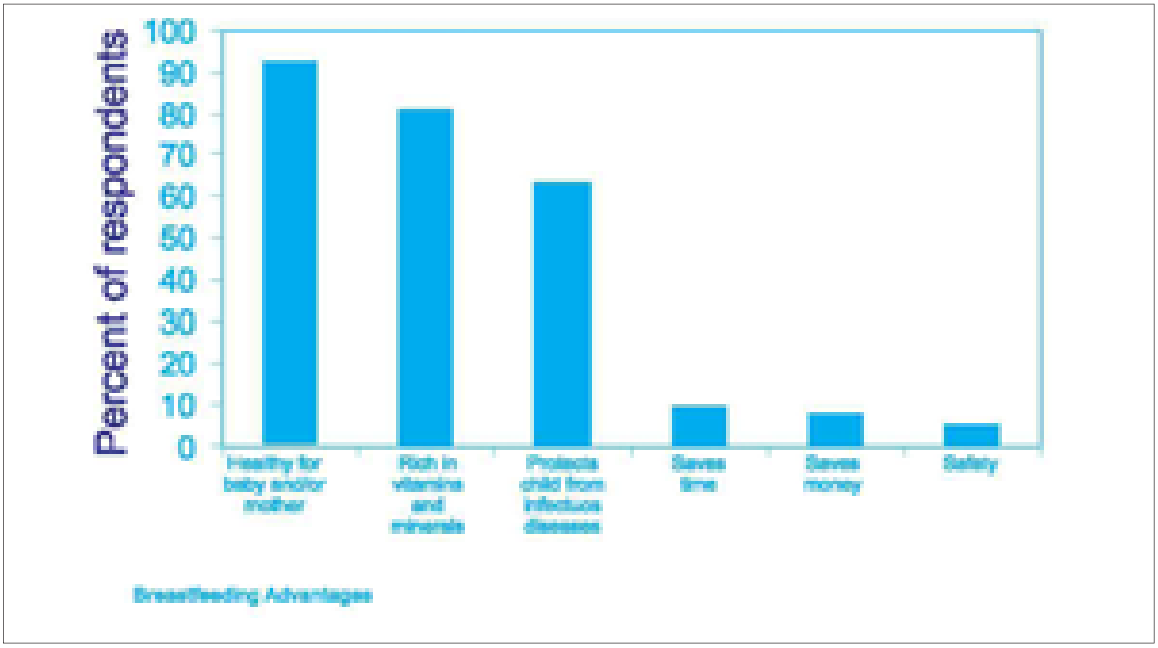
The majority of respondents considered breastfeeding very important for the healthy growth of a child (85.2%), while only 2.5% considered milk substitutes such as formula or other types of milk as very important for the growth of their child (Table 5-4).

Table 5-4. Perceived importance of breastfeeding and feeding other types of milk/formula for a baby's health and nutrition as reported by mothers (N=488), Talas Oblast, Kyrgyzstan, 2008

Feeding practice	%	95% CI	DEFF
Breastfeeding			
Very important	85.2	(80.04, 90.45)	2.51
Important	14.6	(9.47, 19.63)	2.42
Somewhat important	0		
Not important	0.2	(0, 0.63)	1.01
Feeding animal milk or formula			
Very important	2.5	(0.79, 4.13)	1.35
Important	44.3	(38.62, 49.90)	1.50
Somewhat important	49.4	(44.08, 54.69)	1.31
Not important	3.9	(1.65, 6.13)	1.56

The main reported benefits of breastfeeding were that it is: healthy for the child or mother (91.8%), rich in important vitamins and minerals (80.9%), and protects the child from infectious diseases (63.3%). Several mothers noted other advantages of breastfeeding such as saving time, saving money, and safety (Figure 5-1).

Figure 5-1. Prevalence of mothers reporting each advantage of breastfeeding (N=488), Talas Oblast, Kyrgyzstan, 2008



When mothers were asked how long a baby should be breastfed, on average, they reported that children ideally should be breastfed for the first 19.0 months (SD 5.8; median 18.0 [IQR 11.5]). Mothers reported children should be given other liquids (e.g., boiled water, tea, animal milk) at the age of 4.4 months (SD 2.7), and children should start eating soft, semi-solid or solid foods at the age of 6.4 months (SD 2.2).

Among all mothers (N=488), 7.8% thought that breastfeeding had at least one disadvantage. The most common reported disadvantages were that mothers could not leave their children for long periods of time (4.5%), and that mothers must care more about their diets (2.3%). Sore nipples, insufficient production of human milk, and the insufficiency of nutrients in milk were concerns also listed as disadvantages.

Mothers who worked or studied was another concern that surfaced. Of the respondent mothers (N=488), 30.3% were absent for at least 4 hours a day due to work or study. Half of these mothers reported that family members feed the child less than three times a day when they are absent, and 38.1% of these mothers said that family members never feed the child in their absence.

5.2. Discussion/Summary Findings

Mothers have good knowledge about IYCF practices, but there is a gap between knowledge and feeding practices, especially in duration of breastfeeding and timely introduction of complementary foods. Small sample sizes pose a limitation to our findings when using some indicators, for example, breastfeeding at two years.

Though most mothers regard breastmilk as very important for the baby's health and nutrition, the majority of mothers do not exclusively breastfeed their infants. About one of seven mothers (14.0%) exclusively breastfed their babies for the first six months of life. The median age that the mothers stopped breastfeeding their child was 12.0 months of age, although mothers, on average, think that a baby should be breastfed for 19.0 months. Most mothers (85.2%) considered breastmilk very important for a baby's health and nutrition. Half of the children were reported to consume liquids other than breastmilk at 3 months of age. Breastfeeding is recommended up to two years of age; 6.7% of mothers reported breastfeeding their infants for this time period.

6. SOURCES OF NUTRITION INFORMATION

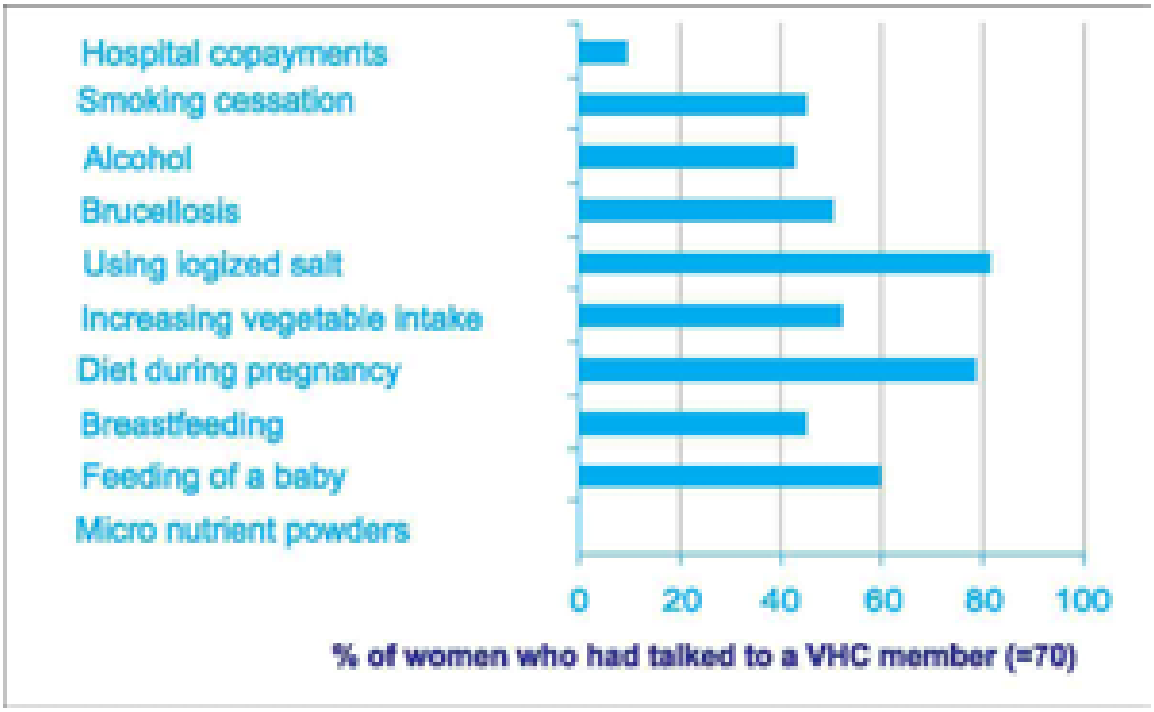
Mothers were asked about the sources that they had consulted for advice about diet during pregnancy and breastfeeding. They were asked questions about the information that they had received from the VHC's, medical professionals, friends, family, and neighbors on nutrition. In addition, because of the key role the VHC's will play in the nutrition program for the Talas Oblast, mothers were asked specific questions about their knowledge of and participation in VHC programs.

6.1. Village Health Committees (VHCs)

Since 2004, VHC volunteers trained by the Republic Center for Health Promotion have been holding interactive discussions with community members throughout Kyrgyzstan on health issues. During these sessions, VHC members talk about various topics including hospital copayments, smoking cessation, alcohol use, brucellosis, hypertension, iodized salt use, and vegetable consumption. To assess the activities of VHCs in Talas Oblast, mothers were asked a series of questions about their interactions with a member of the VHC. In Talas, the VHCs participated in a set of trainings aimed at improving IYCF practices and nutrition during pregnancy. Three trainings were held for VHCs: nutrition for pregnant women (April 2008), exclusive breastfeeding (July 2008), and complementary feeding (October 2008). Trainings on complementary feeding were launched after the survey was complete.

Among all mothers (N=488), 28.9% had heard about VHCs, and 14.3% had ever discussed health issues with a member of a VHC. The most common health topics discussed with a VHC member were the use of iodized salt and diet during breastfeeding. None of the mothers obtained information regarding micronutrient powders from members of the VHC.

Figure 6-1. Among mothers who had talked to a village health committee (VHC) member (N=70), the percentage who reported discussing various health topic, Talas Oblast, Kyrgyzstan, 2008



Among mothers who had discussed health issues with a member of the VHC (N=70), 51.4% had contact with a VHC member less than three months prior to the interview, while 18.6% had contact with the VHC member more than a year prior to the interview. Mothers who had consulted a VHC member about diet and child feeding practices (N=44) reported to have met an average of two times with a member of a VHC with each visit lasting 42.6 minutes (SD 30.9).

6.2. Dietary and Breastfeeding Advice

Mothers reported receiving nutrition advice from multiple sources. Mothers were asked to report all the sources that they had consulted for diet during pregnancy and breastfeeding advice. Of all mothers (N=488), 67.2% reported receiving advice on diet during pregnancy and 86.9% received advice on breastfeeding (Table 6-1). Mothers received information regarding diet during pregnancy mainly from medical professionals (64.3%), and family members, friends, and neighbors (55.9%). Only 6.8% of the mothers received advice from a member of a VHC for nutrition information during pregnancy. Mothers received advice regarding breastfeeding from medical staff (81.9%), and family members, friends, or neighbors (63.1%), while only 3.9% received breastfeeding advice from the VHC.

Table 6-1. Source of advice received on diet and breastfeeding (N=488), Talas Oblast, Kyrgyzstan, 2008

	% of mothers	95% CI
Women who reported receiving advice on:		
Diet during pregnancy	67.2	(59.5,75.0)
Source of advice on diet during pregnancy:		
Doctor, nurse, midwife, feldsher	64.3	(57.0, 71.7)
Family, friend, neighbor	55.9	(48.0, 63.9)
VHC volunteer	6.8	(3.9,9.6)
Source of advice on breastfeeding:		
Doctor, nurse, midwife, feldsher	81.9	(75.5, 88.5)
Family, friend, neighbor	63.1	(55.2, 71.0)
VHC volunteer	3.9	(1.6,6.2)

Mothers were also asked how long they were advised to breastfeed by medical professionals, and family members, friends, or neighbors. On average, mothers reported that medical professionals recommended breastfeeding for 18.0 months (SD 6.0), while family members, friends, and neighbors recommended breastfeeding for the first 18.4 months (SD 5.9) (Table 6-2). Medical professionals, family members, friends, and neighbors advised mothers to exclusively breastfeed for approximately 7.5 months.

Table 6-2. Advice received on breastfeeding, Talas Oblast, Kyrgyzstan, 2008

	N	Mean	SD
Average age advised to stop breastfeeding:			
by doctor, nurse, midwife, feldsher	162	18.0	6.0
by family, friend, neighbor	181	18.4	5.9
Average age advised to breastfeed without giving other liquids or solids:			
by doctor, nurse, midwife, feldsher	368	7.4	4.4
by family, friend, neighbor	274	7.6	6.0

6.3. Discussion/Summary Findings

Though the VHCs had been active in the Talas Oblast for a four-year period prior to the survey, slightly less than one-third of mothers had ever heard of the VHC and only 14% reported ever discussing a health issue with the VHC. Though VHCs were not the primary source of nutrition information for mothers, of the mothers who had consulted VHCs, 96.3% agreed that the meetings were helpful. Because VHCs may be referred to by a different name in some villages, it is possible that mothers may have underreported their contact with VHCs. In regard to advice about diet during pregnancy, it should be noted that the majority of mothers included in this survey were not targeted in the VHC educational campaign to promote appropriate diet during pregnancy as this campaign was directed towards pregnant mothers or those with infants less than six months of age. The VHC campaigns for breastfeeding and complementary feeding and micronutrient powders had not begun at the time of the survey.

Mothers reported receiving nutrition advice most often from medical professionals closely followed by family and friends. According to mothers, both sources gave similar advice in regard to duration of breastfeeding (mean age: 18 months) and exclusive breastfeeding (mean age: 7.5 months).

7. ANTHROPOMETRY

Adequate nutrition is important for child development. The window between birth and 24 months of age is a critical time for optimal growth and healthy development of a child. This chapter documents the anthropometric measurements of children and their mothers and compares them to international standards for growth.

Anthropometric indicators of length/height-for-age, weight-for-age, weight-for-length/height were determined for all children (Table 7-1). The age of the child was calculated on the basis of the difference between the child's birth date and the date of the measurement. Women's ages were based on self-reported age in years.

Table 7-1. Interpretation of anthropometric indicators for children

Reference: The WHO growth curves for nutritional status was used for interpreting the anthropometric data of children under five [12]. This system is based on parameters of height and weight of children receiving optimal nutrition in six different countries. The new WHO system bases growth curves on examples of families where children receive proper nutrition, proper hygiene and health care. The present system is appropriate to use for all population groups. Healthy and well-nourished children from most countries have growth patterns similar to the parameters of this system.

Z-scores: The anthropometric indices used for evaluating the nutritional status of children include height-for-age, weight-for-age, and weight-for-height. These indices are interpreted using classifications based on Z-scores (standard deviation units from the reference median). The WHO recommends that a Z-score cut-off point of less than -2 be used to classify low height-for-age, low weight-for-age, and low weight-for-height for estimating the prevalence of malnutrition. The reference Z-score distribution for each index has a mean of 0.0 and a standard deviation of 1.0. A Z-score cut-off of +2 should be used to classify high weight-for-height for estimating the prevalence of overweight or obesity (also a form of malnutrition). A Z-score of -2 corresponds to the 2.3rd percentile on the reference distribution, while a Z-score of +2 corresponds to the 97.7th percentile on the reference distribution.

Height-for-age: A low height-for-age indicates growth stunting, which reflects a long term deficit of nutritional status and/or a history of illness and disease such as diarrhea and acute respiratory infection. On a population level, a high prevalence of stunting is usually associated with poor socioeconomic conditions and a greater risk for frequent and/or early exposure to adverse environmental conditions such as illness and inadequate nutrition. A decrease in the prevalence of stunting usually parallels improvements in economic conditions. In developing countries the prevalence of low height-for-age ranges from 10% to 60%. Countries with a less than 20% prevalence in low height-for-age (Z-score <-2) are classified as countries with low prevalence of stunting by WHO.

Weight-for-height: Low weight-for-height, or wasting, is an indicator of acute under-nutrition and is often the result of severe food shortages and/or severe illness. Unlike the wide variation in stunting rates observed in developing countries, the prevalence of wasting is usually less than 5% in most countries provided there is no severe food shortage. Therefore, a wasting prevalence of more than 5% is of concern; a prevalence of 10% to 14% is considered serious; a prevalence of 15% or higher is considered critical.

Data Quality:
Data Cleaning: The records with potentially erroneous data were excluded from analysis based on the following standard Z-score cutoffs [13]:
Height-for-age Z-score (HAZ)
<-6.0 or >6.0
Weight-for-age Z-score (WAZ)
<-6.0 or >5.0
Weight-for-height Z-score (WHZ)
<-5.0 or >5.0

Standard Deviation (SD): The S.D. of the Z-score provides information on the spread of the distribution and the quality of the anthropometric measurements done for a survey. In the reference population, the standard deviation (S.D.) of the Z-score distribution for height-for-age and weight-for-height is 1.0. A Z-score S.D. that is lower than 0.9 indicates that the distribution is more homogeneous or one with less variation compared to the reference distribution. A Z-score S.D. greater than 1.0 and less than 1.2 indicates that the distribution has a wider spread than the reference. A Z-score S.D. greater than 1.3 is suggestive of inaccurate anthropometric measurements and/or inaccurate age information.

Certain cut-off values are used to measure the severity of growth faltering in a population. The prevalence of low anthropometric indicators was interpreted using the WHO classification presented in Table 7-2; however, it should be noted that the WHO classification is for children less than 5 years of age whereas the Talas survey population included children 6–24 months of age.

Table 7-2. WHO classification for low anthropometric indicators according to public health significance for children less than 5 years of age [13]

Anthropometric Index	Low	Medium	High	Very High
Low WHZ (wasting)	<5.0%	5.0–9.9%	10.0–14.9%	≥15.0%
Low HAZ (stunting)	<20.0%	20.0–29.9%	30.0–39.9%	≥40.0%
Low WAZ (underweight)	<10.0%	10.0–19.9%	20.0–29.9%	≥30.0%

Weight, height and BMI were determined for all nonpregnant mothers (Table 7-3). The categories for low BMI were used to determine the level of public health significance of under-nutrition among women are presented in Table 7-4.

Table 7-3. Interpretation of anthropometric indicators for women

BODY MASS INDEX
Adult nutritional status is assessed by calculating the Body Mass Index (BMI) from the weight and height of nonpregnant women included in the survey (BMI= Weight (kg)/Height^2 (m)). A BMI below 18.5 indicates underweight or thinness. A BMI greater than 25.0 indicates overweight [13]. Underweight < 18.5 Normal weight = 18.5-24.9 Overweight = 25.0-29.9 Obesity ≥ 30.0

Table 7-4. Categories of low BMI (<18.5) population prevalence according to public health significance [13]

Normal	Low Prevalence (warning sign, monitoring required)	Medium Prevalence (poor situation)	High Prevalence (serious situation)	Very High Prevalence (critical situation)
<5%	5–9%	10–19%	20–39%	≥40%

7.1. Children Aged 6–24 months

A total of 571 children aged 6–24 months had valid length/height, weight and age data to calculate height-for-age (stunting), weight-for-height (wasting), and weight-for-age (underweight) z-scores. No data were excluded after applying the z-score cut offs (see data cleaning section above). The standard deviations for all anthropometry indicators suggest that measurements were accurately taken because they fall within the acceptable range (Table 7-5).

Table 7-5. Distribution of anthropometry measurements among children aged 6–24 months, Talas Oblast, Kyrgyzstan, 2008

Anthropometry index	N	Mean	SD	Z-score range
HAZ	**571**	**-0.73**	**1.19**	**(-4.67, 5.98)**
WHZ	**571**	**0.40**	**0.96**	**(-2.91, 3.06)**
WAZ	**571**	**-0.07**	**1.00**	**(-4.00, 3.56)**

Note: Anthropometric values based on WHO growth reference curves [12].

Abbreviations: HAZ, height-for-age- z-score, WHZ, weight-for-height z-score, WAZ, weight-for-age z-score Wasting (1.1%) and underweight (2.3%) were low among children. Overweight children comprised 5.6% of the population (Table 7-6).

Table 7-6. Prevalence of anthropometric values for children 6–24 months of age, Talas Oblast, Kyrgyzstan, 2008

Characteristic of child	N	%	95% CI	DEFF
Wasting (WHZ < -2)	571	1.1	(0.3, 1.8)	0.84
Underweight (WAZ<-2)	571	2.3	(1.1,3.5)	0.92
Overweight (WHZ> +2)	571	5.6	(3.4, 7.8)	1.22

Note: Anthropometric values based on WHO growth reference curves [12]

Stunting was identified in 10.7% of the children aged 6–24 months. Severe stunting was found in 2.5% of the children (height-for-age z-score<-3). When stratified by gender, 5.9% of girls were stunted, while 15.1% of boys were stunted (Table 7-7).

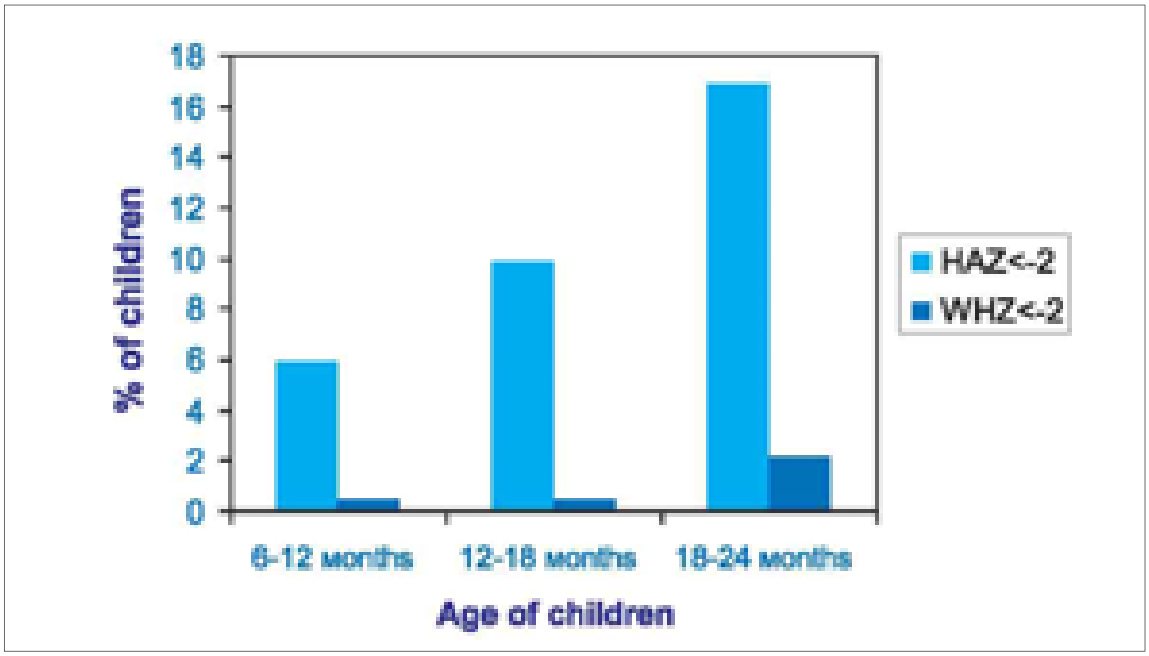
Table 7-7. Stunting by age and gender for children 6–24 months of age, Talas Oblast, Kyrgyzstan, 2008

Characteristic of child	N	% stunted	95% CI	DEFF
Age Group (months)				
6–11	202	5.9	(3.0, 8.8)	0.72
12–17	191	9.9	(5.36, 14.53)	1.07
18–24	178	16.9	(10.6, 23.2)	1.19
Gender				
Male	299	15.1	(10.0, 20.1)	1.42
Female	272	5.9	(2.9, 8.9)	1.07
Total	571	10.7	(7.6, 13.8)	1.36

Note: Anthropometric values based on WHO growth reference curves [12]

Stunting and wasting among children increased with age, which agrees with past surveys [14, 15] (Figure 7-1).

Figure 7-1. Prevalence of stunting and wasting by age among children 6–24 months old, Talas Oblast, Kyrgyzstan, 2008



7.2. Mothers Who Are Nonpregnant

Body mass index (BMI) was calculated only for nonpregnant mothers (N=420). The mean of the BMI measurements was 23.4 (SD 4.3). The prevalence of underweight women (BMI<18.5) was 7.6% (Table 7-8). More than one-quarter of the mothers were either overweight or obese.

Table 7-8. Prevalence of weight status among nonpregnant mothers (N=420), Talas Oblast, Kyrgyzstan, 2008 (13)

Nonpregnant mothers	%	95% CI	DEFF
Obese (BMI ≥ 30.0)	7.9	(5.1, 10.6)	1.05
Overweight (BMI 25-29.9)	21.4	(17.3, 25.6)	1.02
Normal weight (BMI 18.5-24.9)	63.1	(59.5, 66.7)	0.54
Underweight (BMI < 18.5)	7.6	(4.6, 10.6)	1.27

7.3. Discussion/Summary Findings

The prevalence of stunting (10.7%), wasting (1.1%), and underweight (2.3%) were classified as low according to the WHO criteria for public health significance. Although the WHO criteria apply to population estimates for children less than 59 months of age, the Talas survey included only children 6–24 months of age. Among the children surveyed, a higher prevalence of stunting was found among boys than among girls. Also, stunting and wasting increased with age, which agrees with other studies [14, 15]. Among mothers, the prevalence of underweight (7.6%) was considered to be low, but to require monitoring according to the WHO criteria. Though children have a low prevalence of overweight, more than one of four mothers is either overweight or obese.

8. BIOLOGICAL INDICATORS FOR MICRONUTRIENT DEFICIENCY AND THE USE OF MICRONUTRIENT SUPPLEMENTS

This chapter highlights the results from biological tests to estimate the extent of iron, folate, and vitamin A deficiencies and the use of micronutrient supplements in the population of nonpregnant mothers and children aged 6–24 months in Talas Oblast.

8.1. Iron Deficiency

Assessing the magnitude of iron deficiency requires the measurement of several biological indicators, including ferritin, sTfR, and hemoglobin. C-reactive protein (CRP) and α1- glycoprotein acid (AGP) are indicators of infection and have been used to account for the influence of infection on plasma ferritin levels. Cut off levels for biological indicators used to estimate iron load in the blood are in Table 8-1.

Table 8-1. Cut-off points for biological indicators to identify iron deficiency among children aged 6–24 months and nonpregnant mothers, Talas Oblast, Kyrgyzstan, 2008

Indicators	Children	Mothers	Iron status
Plazma ferritin	<12 mg/l	<15mg/l	Plazma ferritin
Indicators	>8.3 mg/l	>8.3 mg/l	Plazma ferritin
Indicators	>10 mg/l	>10 mg/l	Plazma ferritin
Indicators	>1.0 g/l	1.0 g/l	Plazma ferritin

Iron deficiency is the leading cause of anemia, yet not all cases of anemia are caused by iron deficiency; iron deficiency does not necessarily develop into anemia. In our survey, iron deficiency was defined as either decreased ferritin concentration in plasma or increased sTfR levels. Iron deficiency anemia was defined as having both 1) a low hemoglobin value below the appropriate group-specific cut-off point for anemia and 2) low plasma ferritin or high sTfR.

Ferritin is an acute-phase reactant protein and is therefore elevated during infection/ inflammation. To account for the presence of inflammation, the acute phase indicators CRP and AGP were measured. CRP is an acute phase protein that is often used as a marker for acute inflammation, and AGP is used as a marker for chronic inflammation [16, 17]. Iron deficiency as measured by ferritin, and iron deficiency anemia was also calculated for all participants as well as for those participants without evidence of inflammation (i.e., after exclusion of those with high CRP and/or AGP).

8.2. Anemia / Iron Deficiency

The prevalence of anemia was determined from hemoglobin levels collected from capillary blood samples using a Hemocue®. Cut-off values for anemia depend on the age and sex of the person and the altitude where the person lives [18]. For determining the prevalence of anemia in the population, we made adjustments for altitude to account for a reduction in oxygen saturation of blood and a subsequent increase in hemoglobin values. The adjustment for altitude was done using the following formula:

Hb adjustment = -0.032 x [altitude (m) x 0.0032808] + 0.022 x [altitude (m) x 0.0032808)] 2

where the Hb adjustment was the value subtracted from each individual's observed hemoglobin level and then compared to the cut-off values for sea level. The hemoglobin cut-off value for children under 59 months

of age is 11.0 g/dL and for women of reproductive age it is 12.0 g/dL after adjusting for altitude.

WHO classifies anemia as a problem of public health significance on the basis of prevalence estimates from hemoglobin values [18]. Table 8-2 presents the classifications for severe, moderate, mild, and normal levels of anemia in a population.

Table 8-2. WHO classification of public health significance of anemia in populations on the basis of the prevalence of anemia [18]

Category of public health significance	Prevalence of anemia (%)
Severe	≥ 40
Moderate	20.0 – 39.9
Mild	5.0 – 19.9
Normal	≤ 4.9

Note: Anemia is defined as Hb<11.0 g/dL for children and Hb<12.0g/dL for nonpregnant women.

8.2.1. Children aged 6–24 months old

Among all children, approximately half of the children were anemic after adjusting for altitude (Table 8-3). The prevalence of iron deficiency as measured by ferritin was 62.0% (68.4% among children without inflammation as measured by CRP or AGP (Appendix 2). Among all children, 45.5% had iron deficiency anemia (43.4% among children without inflammation).

Table 8-3. Prevalence of iron deficiency and anemia among children aged 6–24 months (N=569), Talas Oblast, Kyrgyzstan, 2008

Iron status	N	%	95% CI	DEFF
Low ferritin	**569**	**62.0**	**(57.3, 66,8)**	**1.32**
High sRfR	**569**	**71.0**	**(66.4, 75.6,)**	**1.42**
Iron deficiency anemia*	**569**	**45.5**	**(40.9, 50.1,)**	**1.17**
Total anemia	**571**	**50.6**	**(45.5, 55.7,)**	**1.41**

* Adjusted for altitude

Note: Iron deficiency anemia was defined as having a Hb level < 11.0 g/dL and low plasma ferritin (<12 µg/L) or high sTfR (>8.3 mg/L).

The average hemoglobin level was 10.8 g/dL (SD 1.4, range [5.2, 13.9]). Severe anemia (hemoglobin level < 7.0 g/dL) was identified in 1% of children [18]. The prevalence of anemia was 41.6% among children 6–11 months of age and 59.2% among children 12–17 months of age (Table 8-4).

Table 8-4. Prevalence of anemia* among children aged 6–24 months stratified by age, and gender, Talas Oblast, Kyrgyzstan, 2008

Characteristics of child	N	% with anemia	95% CI	DEFF
Age Group (months)				
6–11	**202**	**41.6**	**(33.59, 49.58)**	**1.26**
12–17	**191**	**59.2**	**(51.99, 66.34)**	**0.97**
18–24	**178**	**51.7**	**(44.19, 59.18)**	**0.95**
Gender				
Male	**299**	**53.9**	**(48.40, 59.29)**	**0.85**
Female	**272**	**47.1**	**(39.77, 54.35)**	**1.38**

* Adjusted for altitude
Anemia was defined as having a Hb level < 11.0 g/dL

8.2.2. Mothers who are not pregnant

The average hemoglobin level for nonpregnant mothers was 12.8 (SD 1.8, range [6.69, 16.3]). Of all nonpregnant mothers, one-fourth were anemic after adjusting for altitude (Table 8-5). Iron deficiency anemia was found among 23.5% of nonpregnant mothers (24.6% among those without inflammation as measured by CRP and AGP) (Appendix 2). The prevalence of iron deficiency as measured by low plasma ferritin was more than two times higher than the prevalence of anemia (58.5% among all mothers and 62.5% among those without inflammation as measured by CRP and AGP (Appendix 2).

Table 8-5. Prevalence of iron deficiency and anemia among nonpregnant mothers, Talas Oblast, Kyrgyzstan, 2008

Status of mothers	N	%	95% CI	DEFF
Low ferritin	**417**	**58.5**	**(53.7, 63.4)**	**0.96**
High STfR	**417**	**31.7**	**(27.8, 35.5)**	**0.67**
Iron deficiency	**417**	**23.5**	**(18.8, 28.2)**	**1.24**
Total anemia*	**420**	**24.5**	**(19.4, 29.6)**	**1.40**

* Adjusted for altitude

Note: Iron deficiency anemia was defined as having a hemoglobin level < 12.0 g/dL and low plasma ferritin (< 15 mg/L) or high sTfR (> 8.3 mg/L).

8.3. Folate Deficiency

Folate is a water-soluble B vitamin found naturally in foods. Folic acid is the synthetic form of folate that is added to fortified foods and found in supplements [19]. Folate is essential during periods of rapid cell division and growth especially during infancy and pregnancy [20]. Both adults and children require folic acid to prevent anemia and for healthy red blood cells [21]. Folate deficiency in infants and young children can slow overall growth [22]. Adequate consumption of folic acid [23-25] protects fetuses from developing neural tube defects [26] before and during the early weeks of pregnancy [27]. In Kyrgyzstan, women are recommended to take folic acid supplements during pregnancy to prevent the onset of neural tube defects in their developing fetus.

In this survey, whole blood folate levels were assessed from dried blood spot samples collected from nonpregnant mothers and children aged 6–24 months. Folate deficiency was defined as having a dried blood spot folate level of less than 140 ng/mL.

About one in every four nonpregnant mothers (N=417) was deficient in folate (22.6%). Only 17.0% of mothers reported receiving folic acid supplements during pregnancy even though the Ministry of Health recommends that pregnant women take supplements during the first trimester of pregnancy. Only 2.8% of children (N=571) were deficient in folate at the time of interview.

8.4. Vitamin A Deficiency

Vitamin A is an essential nutrient required for the immune system, cell function and growth, and epithelial maintenance [28]. When an individual is vitamin A deficient, a range of disorders can result affecting bone growth, vision, gene transcription, and skin health. Vitamin A deficiency (VAD) is the leading cause of preventable blindness globally. The groups most vulnerable to VAD are infants, young children, pregnant women, and lactating women.

The most common biological indicator to assess the prevalence of VAD in a population is plasma retinol. A plasma retinol concentration less than 0.70 µmol/L indicates mild or subclinical VAD. The WHO classifies the level of public health significance of VAD on the basis of the prevalence of VAD among preschool-aged children in a population (Table 8-6).

Table 8-6. WHO classification of public health significance for VAD in populations based on the prevalence of low plasma retinol (<0.70µmol/L) in preschool-aged children [28]

Public health significance level	Plasma retinol <0.70 µmol/L in preschool aged children
Mild	≥2% - <10%
Moderate	≥10% - <20%
Severe	≥20%

In the Talas survey, retinol binding protein (RBP) was used as a measure of vitamin A status. CDC's nutrition laboratory developed a correlation index comparing plasma retinol to RBP to validate the use of RBP as an indicator of vitamin A status. Approximately equal numbers of specimens from women and children (N=215) were tested for retinol and RBP. About 13% (n=28) were vitamin A deficient using plasma retinol concentration less than 0.70 µmol/L as the cut-off. The correlation between retinol and RBP was strong (r=0.96). It was determined that the RBP cut-off of 0.71 µmol/L provides the best sensitivity and specificity compared with plasma retinol of <0.70 µmol/L. Therefore, the RBP cut-off of less than 0.71 µmol/L was used to indicate VAD among mothers and children. The correlation agreed with past survey showing that RBP behaves like plasma retinol and can be used as an indicator of vitamin A status [29].

RBP is an acute phase reactant which decreases during infection/inflammation. To account for the presence of inflammation, the prevalence of VAD was calculated for all participants as well as for those participants without evidence of inflammation (i.e., after exclusion of those with high CRP and/or AGP).

Among children aged 6–24 months, the prevalence of VAD was 19.5% among all children (N=569) (13.0% among children without presence of inflammation as measured by CRP and AGP– see Appendix 2). Compared to children 12 months and older, the prevalence of VAD among children is higher among children aged 6–11 months (Table 8-7).

Table 8-7. Prevalence of VAD among children aged 6–24 months, Talas Oblast, Kyrgyzstan, 2008

Characteristics of child	N	% with VAD	95% CI	DEFF
Age Group (months)				
6–11	**201**	**24.9**	**(18.67, 31.08)**	**0.99**
12–17	**191**	**17.3**	**(12.34, 22.21)**	**0.77**
18–24	**177**	**15.8**	**(9.23, 22.41)**	**1.37**
Gender				
Male	**298**	**20.5**	**(14.81, 26.13)**	**1.40**
Female	**271**	**18.5**	**(12.51, 24.39)**	**1.51**

Note: Vitamin A deficiency was defined as RBP < 0.71 µmol/L.

Among nonpregnant mothers, the prevalence of VAD was 2.6% among all mothers (N=417) and was 1.8% among mothers without presence of inflammation as measured by CRP or AGP (N=341).

8.5. Use of Micronutrient Supplements and Micronutrient Powders

Mothers were asked about the use of vitamins and supplements in their diet and in their child's diet to assess measures taken to prevent or treat micronutrient deficiencies. The majority of mothers (65%) gave vitamin or mineral supplements to their children. The most common supplements given were vitamin D (65.0%), followed by multivitamins (30.5%), and fish oil (8.4%). Of all mothers (N=488), 14.3% had ever seen a micronutrient powders package, 10.7% had ever received micronutrient powders, and 2.9% had given it to their children for consumption.

8.5.1. Use of vitamin A supplements

The International Vitamin A Consultative Group recommends that mothers be given two vitamin A doses (200,000 IU) at least one day apart immediately after delivery or 10,000 IU daily, or 25,000 IU weekly during the first 6 months after delivery [30]. Preschool children are recommended to be given an oral dose of vitamin A for infants 6–11 months: 100,000 IU as a single dose every 4–6 months at any available opportunity and for children 12 months of age or older, 200,000 IU as a single dose every 4–6 months [30, 31].

Of all the interviewed mothers (N=488), 40.8% received a vitamin A dose within the first two months after their last delivery. Of the children aged 6–24 months, 93.7% had ever taken a vitamin A supplement, while 86.7% of the children received vitamin A within the last 6 last months.

8.5.2. Use of iron supplements

Among all the respondent mothers (N=488), 22.7% reported that they were told their child had anemia. Of these mothers (N=111), 48.7% reported that that their child received pills or iron syrup for treatment. Of all mothers (N=488), 35.7% received iron supplements during pregnancy. More than half of the mothers (56.3%) had been told at some time by their doctors that they had anemia. Of these mothers (N=265), 63.6% took iron capsules or iron syrup to improve their anemia status.

8.6. Discussion/Summary Findings

8.6.1. Anemia/iron deficiency

Iron deficiency affects the cognitive development and growth of infants, and young children as well as compromises immunity against infections for all age groups. Children aged 6–24 months are especially vulnerable to the adverse effects of iron deficiency because of rapid growth that is experienced at this age range. Half of all children in this study were anemic; 45.5% of children had iron deficiency anemia. This level is considered a severe public health problem according to the WHO classification. The average hemoglobin level was 10.8 g/dl (SD 1.4). Also, when stratified by age, children 12–17 months of age had a 59.2% prevalence of anemia while children 6–11 months of age had a 41.6% prevalence of anemia. Anemia is especially high among children 12–24 months, which agrees with findings from other studies [32, 33].

One-quarter of the mothers were anemic, and almost 60% were iron deficient as measured by low serum ferritin (31.7%) as measured by high sTFR). Iron supplements were taken by 64% of mothers, after being informed that they were anemic by medical professionals, while 49% of children received iron supplements after being informed that they were anemic. Only about one-third of mothers met the recommendations from the Ministry of Health and took iron supplements during pregnancy.

8.6.2. Folate deficiency

Inadequate consumption of folic acid before and during the early weeks of gestation has been shown to increase the risk of developing neural tube defects. About one of four nonpregnant mothers was deficient in folate (22.6%), while 2.8% of children aged 6–24 months were deficient in folate. Though the Ministry of Health recommends that pregnant women take supplements during pregnancy, only 17.0% of mothers received folic acid supplements during pregnancy.

8.6.3. Vitamin A deficiency

The prevalence of VAD was 19.5% among children aged 6–24 months and 2.6% among mothers. According to WHO criteria, VAD would be classified as a moderate public health problem on the basis of guidelines for pre-school aged children [28]. Children 6–12 months of age have the highest prevalence of VAD among all other age groups. VAD is distributed almost evenly between boys and girls.

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10. APPENDICES

Appendix 1: Questionnaire

TALAS OBLAST NUTRITION AND DIET SURVEY

DRAFT JUNE 6 2008 - MASTER

Fill the following information before beginning the interview:

H41. Cluster number

H42. Interviewer code

H43. Day/Month/Year of interview: d d m m y y

H44. Supervisor's code

H45 Data entry operator code

H46. Rayon:

Manas	702	Kara-buura	704
Bakai-ata	703	Talas	705

Result of interview	Result of anthropometry	Result of blood collection	Location of data collection
Completed 1	Complete on mother/child 1	Complete on mother/child 1	Clinic 1
Refused 2	Complete on mother only 2	Complete on mother only 2	Home 2
Partially completed 3	Complete on child only 3	Complete on child only 3	Partial in clinic 3
Not available to interview 4	Not completed on either 4	Not completed on either 4	Partial in home

If no data is collected on a mother and child. Find the following information from the clinic, the medical worker, the VHC volunteer or by visiting the home of the mother/child.

How old (in years) is the mother?

How old (in months) is the child?

What is the gender of the child?
1=male 2=female

What is the ethnicity of the mother?

Kyrgyz	1
Russian	2
Kazakh	3
Uzbek	4
Other (specify)	6
Don't know	8

Where does the family live?

Near or in the village center	1
On the outskirts of the village	2
Not in the village	3
Other (specify)	4
Don't know	8

How many brothers/sisters does the child have?

(put 88 if don't know/cannot find out)

Does the mother work/study outside of the home?

1= yes 0 = no 8 = don't know/can't find out

Reason for not completing interview?

family moved from village	1
mother refused	2
family (husband, mother-in-law, etc) refused	3
mother sick	4
child sick	5
mother had to work	6
Other (specify)	7
Don't know/can't find out	8

We are from the Ministry of Health and the National Statistics Committee. We are working on a joint project concerned with mother and child diet, nutrition and health. I would like to talk to you about this and record your answers to some questions that I have. This interview will take approximately 20 minutes. After the interview, we will weigh and measure you and your baby and take a small blood sample from your finger and the finger of your baby. From this sample we will be able to inform you if you or your baby has anaemia. The only direct benefit to you is the knowledge of your and your baby's anaemia status. The risks to you are small and consist of the possible discomfort caused by pricking the finger in order to draw the blood sample. The discomfort will only be temporary and will not be very great. All of the information we obtain will remain strictly confidential and nobody will know that the information is yours. If you agree to participate, I would like you to sign this form. May we begin? Would you please sign?

If permission is given, ask respondent to sign here and begin the interview.

(Signature)_____ (Name)_____

HH 7. What is your name?

(last, first, middle initial)

HH 8. What is the name of the child?

(last, first, middle initial)

HH 9. In what month and year was (child's name) born?

Probe: What is his/her birthday?

d	d	m	m	y	y

(put 88 for day, month, or year if don't know/remember)

Check the birthday with the calendar to be sure the child is between 6 and 24 months of age. If the mother is unsure of the birthday, check the birthdate with the registry at the clinic. It the child is not 6 to 24 months he cannot participate. Explain this to the mother and thank her for coming.

HH10 What is your relationship to (*child's name*):

mother	1	1→ HC1
grandmother	2	
aunt	3	
other(specify)	6	

HH11. Why is (child's name)'s mother not here today?

a working/studying	a	**IF MOTHER IS NOT PRESENT, RECORD REASON AND SKIP TO AN1**
b sick	b	
c did not want to attend	c	
d Family did not allow	d	
e preferred not to attend	e	
f busy at home/with housework	f	
g don't know	g	
h other (specify) _____	h	

1= yes 0= no

If the woman is not the mother, continue the interview and and ask the woman to answer to the best of her ability regarding the mother of the child.

Do not take anthropometric or blood measurements from someone other than the mother.

Household Characteristics Module **HC**

I would now like to ask you a few questions about your home and those who live in it.

HC 1.What is the main material of the walls of your home?

(answer should reflect home where child lives)

Dirt	1
Straw with mud/Adobe	2
Cement/Cement blocks/Slabs	3
Stone with lime	4
Bricks	5
Slag/Slag blocks	6
Wood planks/shingles	7
other (specify) _____	8
don't know/remember	9

HC2. Does someone in your household own the following items

1= yes 0 = no 8=don't know

a Radio	a
b Color TV	b
c Mobile Telephone	c
d Non-Mobile Telephone	d
e Refrigerator	e
f Bicycle	f
g Animal drawn-cart	g
h Car/Truck	h

HC3. Including (child's name) how many children age 6 months -2 years live in your home?

Woman's Module **WM**

WM1 What is your [the mother's] native language?

Kyrgyz	1
Russian	2
Kazakh	3
Uzbek	4
Other (specify) _____	6
Don't know	8

WM2. What is your [the mother's] date of birth?

d d m m y y

(put 88 for day, month, or year if don't know/remember)

WM3. How many live children do you [the mother] have?

WM4What is the highest level of school you [the mother] completed?

Never attended	0
Primary (1-4 grades)	1
Incomplete secondary (5-8)	2
Complete secondary	3
Technical school	4
Higher	5
Religious curriculum	6
Don't know	8

WM5. What is the highest level of school your spouse or partner completed?

Never attended	0
Primary (1-4 grades)	1
Incomplete secondary (5-8)	2
Complete secondary	3
Technical school	4
Higher	5
Religious curriculum	6
Don't know	8

WM6 Do you [the mother] currently work or study outside the home (as an employee, business owner, labour in field, etc.)?

1 = yes 0 = no 8 = don't know → If WM12

WM7 What type of work or study do you [the mother] do?

laborer(in the fields)	1
vender of food, fruit, homemade goods or other	2
employee in a business	3
business owner	4
professional (nurse, doctor, teacher, pharmacists, etc)	5
student	6
other (specify) _____	7
Don't know	8

WM8 How many hours a day do you [the mother] USUALLY work or study outside of the home?

(put 88 if don't know)

WM9 Who USUALLY takes care of (child's name) while you [the mother] are outside of the home?

The mother (takes the child with her)	1
Baby's grandmother	2
Baby's sisters/brothers	3
Baby's father	4
Other family member	5
Baby sitter	6
Other(specify) _____	7
Don't know	8

WM10 Who USUALLY feeds (child's name) while you [the mother] are outside of the home?

The mother (takes the child with her)	1
Baby's grandmother	2
Baby's sisters/brothers	3
Baby's father	4
Other family member	5
Baby sitter	6
Other(specify) _____	7
Don't know	8

WM11. How often does someone other than the mother feed (child's name) meals?

0 times day	0
1 time / day	1
2 times / day	2
3 times / day	3
> 3 times / day	4
Don't know	8

Sometimes if mothers have to leave their child with a friend or family member while they are out of the house, they may not know everything the baby eats because someone else feeds them meals or snacks.....

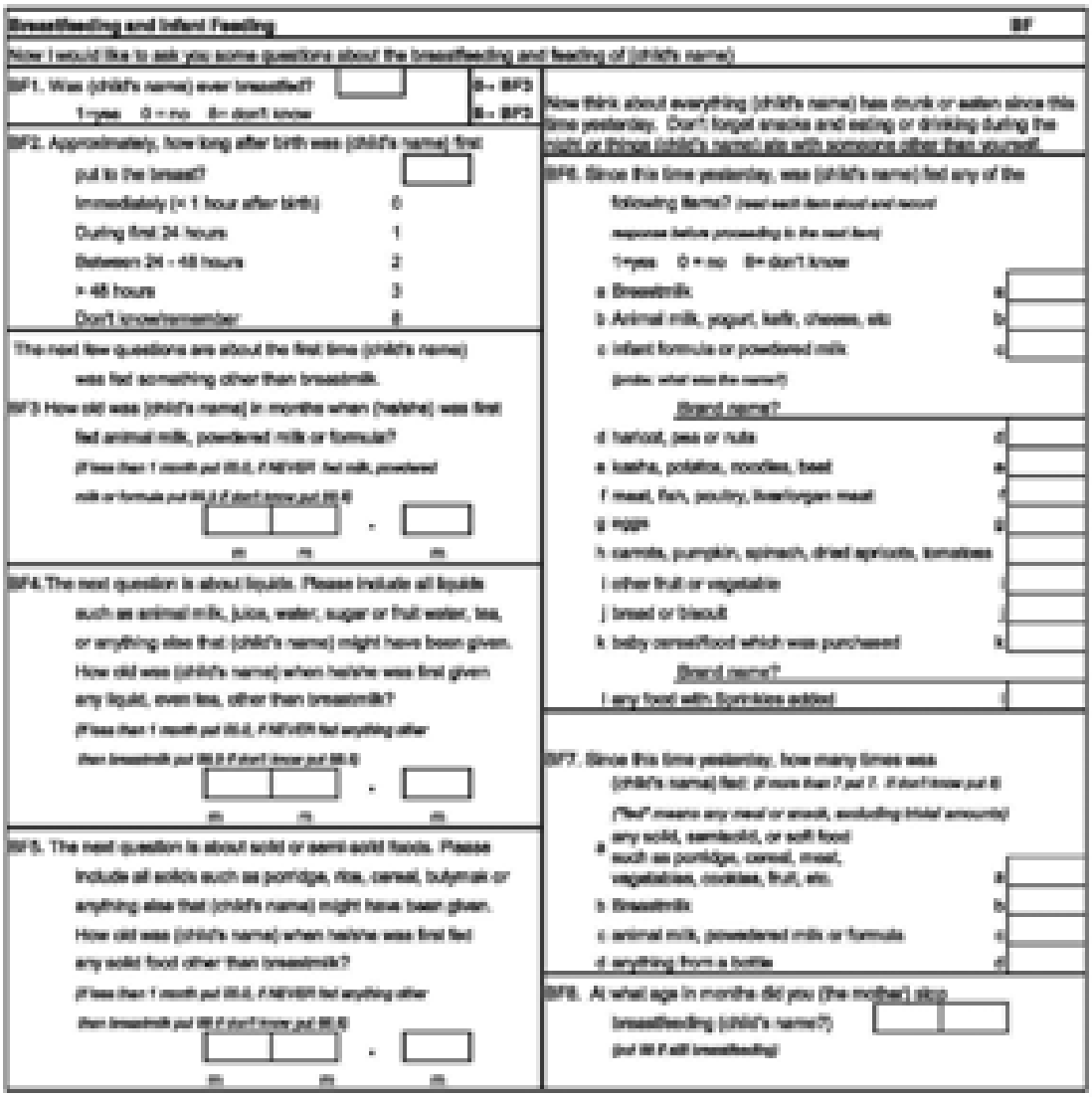
WM12. Using the scale, can you estimate how much you know about what (child's name) usually eats?

(show scale and note number that corresponds to selected figure)

WM13. Has (child's name) received all of the necessary vaccinations for his/her age?

(if the mother does not know, look at the child's vaccination card)

1 = yes 0 = no 8 = don't know



Breastfeeding and Infant Feeding BF

Now I would like to ask you some questions about the breastfeeding and feeding of (child's name)

BF1. Was (child's name) ever breastfed? ☐ 8= BF3
1=yes 0 = no 8= don't know 8= BF3

BF2. Approximately, how long after birth was (child's name) first put to the breast?

Immediately (< 1 hour after birth)	0
During first 24 hours	1
Between 24 - 48 hours	2
> 48 hours	3
Don't know/remember	8

The next few questions are about the first time (child's name) was fed something other than breastmilk.

BF3 How old was (child's name) in months when (he/she) was first fed animal milk, powdered milk or formula?

(If less than 1 month put 00.0, if NEVER fed milk, powdered milk or formula put 99.0 If don't know put 88.8)

☐☐ . ☐
(m) (m) (m)

BF4. The next question is about liquids. Please include all liquids such as animal milk, juice, water, sugar or fruit water, tea, or anything else that (child's name) might have been given. How old was (child's name) when he/she was first given any liquid, even tea, other than breastmilk?

(If less than 1 month put 00.0, if NEVER fed anything other than breastmilk put 99.0 If don't know put 88.8)

☐☐ . ☐
(m) (m) (m)

BF5. The next question is about solid or semi solid foods. Please include all solids such as porridge, rice, cereal, butyrnak or anything else that (child's name) might have been given. How old was (child's name) when he/she was first fed any solid food other than breastmilk?

(If less than 1 month put 00.0, if NEVER fed anything other than breastmilk put 99.0 If don't know put 88.8)

☐☐ . ☐
(m) (m) (m)

Now think about everything (child's name) has drunk or eaten since this time yesterday. Don't forget snacks and eating or drinking during the night or things (child's name) ate with someone other than yourself.

BF6. Since this time yesterday, was (child's name) fed any of the following items? *(read each item aloud and record response before proceeding to the next item)*

1=yes 0 = no 8= don't know

a Breastmilk	a ☐
b Animal milk, yogurt, kefir, cheese, etc	b ☐
c infant formula or powdered milk *(probe: what was the name?)* Brand name?	c ☐
d haricot, pea or nuts	d ☐
e kasha, potatoe, noodles, beet	e ☐
f meat, fish, poultry, liver/organ meat	f ☐
g eggs	g ☐
h carrots, pumpkin, spinach, dried apricots, tomatoes	☐
i other fruit or vegetable	☐
j bread or biscuit	☐
k baby cereal/food which was purchased Brand name?	k ☐
l any food with Sprinkles added	☐

BF7. Since this time yesterday, how many times was (child's name) fed: *(if more than 7 put 7. If don't know put 8)*

("fed" means any meal or snack, excluding trivial amounts)

a any solid, semi-solid, or soft food such as porridge, cereal, meat, vegetables, cookies, fruit, etc.	a ☐
b Breastmilk	b ☐
c animal milk, powdered milk or formula	c ☐
d anything from a bottle	d ☐

BF8. At what age in months did you (the mother) stop breastfeeding (child's name?) ☐☐
(put 66 if still breastfeeding)

Attitude, Behavior Module **AB**

We are interested in knowing what mothers here in Talas think about breastfeeding and feeding of their babies. I would like to ask you what you think about breastfeeding and feeding of your baby. Remember there are no right or wrong answers to any of these questions. We just want to know what you think about these topics.

AB1 Using this scale, how would you describe the importance of breastfeeding for a baby's health and nutrition?

(show the scale and note the number that corresponds to the answer)

AB2 Using this scale, how would you describe the importance of feeding other types of milk or formula for a baby's health and nutrition?

(show the scale and note the number that corresponds to the answer)

AB3. In your opinion, should a baby be breastfed?

1=yes 0=no

9= AB5

AB4. In your opinion, how long in months should a baby be breastfed?

(note 00 if < 1 m) m m

AB5. In your opinion, at what age should a baby start drinking other liquids like tea, water, milk, etc?

(note 00 if < 1 m) m m

AB6. In your opinion, at what age should a baby start eating foods like porridge, cereal, fruit/milk, etc?

(note 00 if < 1 m) m m

AB7. In your opinion, what are some advantages to breastfeeding? (don't read, mark all mentioned with 1)

a healthy for baby and/or mother a
b breastmilk is rich with vitamins/nutrients b
c saves money c
d saves time d
e protects baby from infections e
f safer than feeding from a bottle f
g Other (specify) g

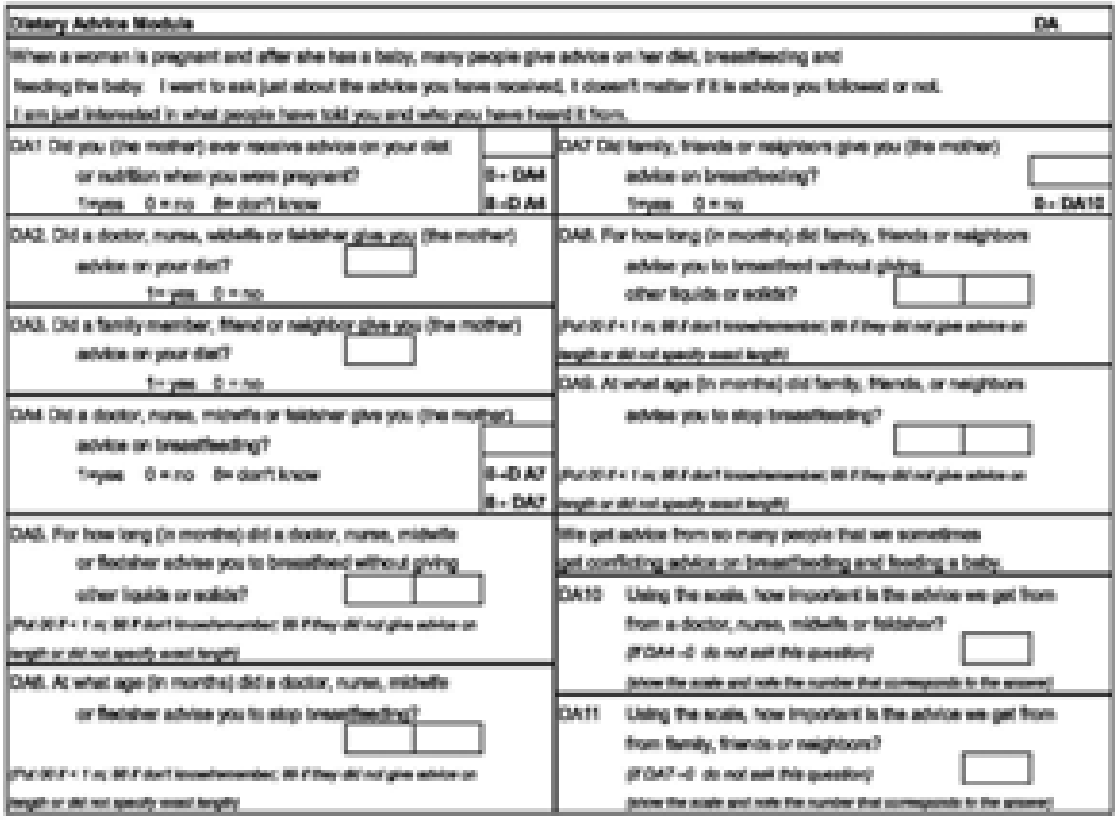
AB8. Some people think there are disadvantages to breastfeeding while some people do not. In your opinion, are there disadvantages to breastfeeding?

1=yes 0=no 9->D A1

AB9. In your opinion, what are some disadvantages to breastfeeding? The things that make it more difficult.

(don't read, mark all mentioned with 1)

a mother cannot leave baby for very long (ie, to work or be outside the home) a
b mother must be very careful about her diet b
c causes sore nipples c
d concerned they are not producing enough milk d
e concerned mother's milk does not contain enough nutrients e
f Other (specify) f



Dietary Advice Module DA

When a woman is pregnant and after she has a baby, many people give advice on her diet, breastfeeding and feeding the baby. I want to ask just about the advice you have received, it doesn't matter if it is advice you followed or not. I am just interested in what people have told you and who you have heard it from.

DA1 Did you (the mother) ever receive advice on your diet or nutrition when you were pregnant?
1=yes 0 = no 8= don't know
8 -> DA4
8 ->D A4

DA2. Did a doctor, nurse, midwife or fieldsher give you (the mother) advice on your diet?
1= yes 0 = no

DA3. Did a family member, friend or neighbor give you (the mother) advice on your diet?
1= yes 0 = no

DA4. Did a doctor, nurse, midwife or fieldsher give you (the mother) advice on breastfeeding?
1=yes 0 = no 8= don't know
8->D A7
8 -> DA7

DA5. For how long (in months) did a doctor, nurse, midwife or fieldsher advise you to breastfeed without giving other liquids or solids?
(Put 00 if < 1 m; 88 if don't know/remember; 99 if they did not give advice on length or did not specify exact length)

DA6. At what age (in months) did a doctor, nurse, midwife or fieldsher advise you to stop breastfeeding?
(Put 00 if < 1 m; 88 if don't know/remember; 99 if they did not give advice on length or did not specify exact length)

DA7 Did family, friends or neighbors give you (the mother) advice on breastfeeding?
1=yes 0 = no
8 -> DA10

DA8. For how long (in months) did family, friends or neighbors advise you to breastfeed without giving other liquids or solids?
(Put 00 if < 1 m; 88 if don't know/remember; 99 if they did not give advice on length or did not specify exact length)

DA9. At what age (in months) did family, friends, or neighbors advise you to stop breastfeeding?
(Put 00 if < 1 m; 88 if don't know/remember; 99 if they did not give advice on length or did not specify exact length)

We get advice from so many people that we sometimes get conflicting advice on breastfeeding and feeding a baby.

DA10 Using the scale, how important is the advice we get from from a doctor, nurse, midwife or fieldsher?
(If DA4 =0 do not ask this question)
(show the scale and note the number that corresponds to the answer)

DA11 Using the scale, how important is the advice we get from from family, friends or neighbors?
(If DA7 =0 do not ask this question)
(show the scale and note the number that corresponds to the answer)

Vitamins/Supplements Module **VS**

I am now going to ask some questions about vitamins and supplements you and your baby might have taken. Some people take these supplements and some don't and that is okay. I will start with the supplements you might have taken.

VS1. During your pregnancy with (child's name), did you take a folic acid supplement like this?
(Show capsule of dispenser)
1=yes 0 = no 8= don't know

VS2. During your pregnancy with (child's name), did you take an iron supplement like this?
(Show capsule of dispenser)
1=yes 0 = no 8= don't know

VS3. In the first two months after the birth of (child's name), did you take a Vitamin A dose like this?
(Show Vitamin A capsule)
1=yes 0 = no 8= don't know

VS4. Have you (the mother) ever been told by a doctor or nurse that you have anemia?
1=yes 0 = no 8= don't know 8→ VS6
8→ VS6

VS5. Did you take iron capsules or iron syrup to improve your anemia status?
1=yes 0 = no 8= don't know

Now I'd like to ask a few questions about vitamins, minerals and supplements that (child's name) might have received. It is okay if (child's name) hasn't received these supplements.

VS6. Has (child's name) ever taken a Vitamin A capsule like this one?
(Show 100,000IU for 6-11 month old) 8→ VS8
(Show 200,000IU for 12-59 month old) 8→ VS8
1=yes 0 = no 8= don't know

VS7. How long ago (in months) did (child's name) take the most recent vitamin A capsule?
(note 00 if < 1 m)
m m

VS8. Have you ever been told by a doctor or nurse that (child's name) had anemia?
1=yes 0 = no 8= don't know 8→ VS10
8→VS 10

VS9.Did (child's name) take iron syrup or tablets to improve his/her anemia status?
1=yes 0 = no 8= don't know

VS10 Have you, or someone else, ever given (child's name) any of these other vitamin or mineral supplements?
(read the list and mark each answer)
a Vitamin D a
b Fish oil b
c Multi-vitamins c
d Other (specify) _____ d
1=yes 0 = no 8= don't know

VS11 Have you ever seen a Sprinkles package like this?
(Show Sprinkles sachet)
1=yes 0 = no 8= don't know 8→ VH01
8→ VH01

VS12 Have you ever received a Sprinkles package like this?
(Show Sprinkles sachet)
1=yes 0 = no 8= don't know

VS13. Has (child's name) ever consumed Sprinkles?
1=yes 0 = no 8= don't know

VHC Context Module VHC

In some villages around Talas Oblast, there are Village Health Committees. I would like to ask you what you have heard of about these Village Health Committees, if anything. Remember no answers are right or wrong we just want to know what you have heard.

VHC1. Have you (the mother) ever heard of the Village Health Committee (VHC)?
1=yes 0 = no 8= don't know [ ] 8 - P1

VHC2. Do you know what the Village Health Committee (VHC) does?
1=yes 0 = no 8= don't know [ ]

VHC3. Have you ever talked to someone from the VHC about health issues?
1=yes 0 = no 8= don't know [ ] 9 - P1 8 - P1

VHC4. What topics were covered by the VHC member when they talked with you?
(don't read, mark all that apply)
a Eating more vegetables [ ]
b Using iodized salt [ ]
c Brucellosis [ ]
d Diet during pregnancy [ ]
e Breastfeeding [ ]
f Feeding of a baby [ ]
g Sorkinlas [ ]
h Alcohol [ ]
i Quitting smoking [ ]
j Copayment in hospitals [ ]
1=yes 0 = no 8= don't know/remember

VHC5. How long ago was the last time you talked with a VHC member about health issues?
> 1 year ago 0 [ ]
6-12 months ago 1
3 - 6 months ago 2
1- 3 months ago 3
< 1 month ago 4

VHC6. How many times total have you talked to a VHC member about health issues? [ ][ ]
(put 88 if don't know/remember)

VHC7 How many times total have you talked to a VHC member about diet during pregnancy, breastfeeding or feeding your baby? [ ][ ]
(put 88 if don't know/remember)

VHC8. How long do the visits with the VHC member USUALLY last? [ ][ ][ ] minutes
(put 888 if don't know/remember)

VHC9. Using the scale, how helpful do you think the visits with the VHC are in general? [ ]
(show the scale and note the number that corresponds to the answer)

VHC10. Using the scale, how helpful do you think the visits with the VHC are on diet, breastfeeding and feeding a baby? [ ]
(show the scale and note the number that corresponds to the answer)

VHC11.Did you learn something new during the visits with the VHC on diet, breastfeeding and feeding a baby?
1=yes 0 = no [ ]

VHC12. What new did you learn about diet, breastfeeding, and feeding a baby from the VHC visits?

Pregnancy

Before we continue, I need to know if you are pregnant.

P1. Are you pregnant right now? [ ]
1=yes 0 = no 8= don't know

P2. How many weeks pregnant are you right now? [ ][ ]
(put 88 if don't know)

If YES (1) Do not take blood or anthropometric measures from the mother. Take measurments only from the child.

Anthropometry AN

Now I am going to measure your height and weight and the length and weight of your baby.

AN1. Were anthropometrics taken from mother? ☐ 0= no 1 = yes 1→ AN3	AN5 Were anthropometrics taken from the child? ☐ 0= no 1 = yes 1→ AN7
AN2 Why not? ☐ 1 = refused 3= not present 2 = pregnant 4 other (specify)	AN6 Why not? ☐ 1 = refused (cried, kicked, etc) 3=not present 2 = mother/guardian refused 4 other (specify)
AN3. Mother's height (cms) ☐☐☐.☐	AN7. Child's weight (kg) ☐☐.☐
AN4. Mother's weight (kg) ☐☐☐.☐	AN8. Child's length (cm) ☐☐☐.☐

Blood Sample Module BS

The last thing we will do today is take a small sample of blood from your finger and the finger of your baby. This might cause a little discomfort from the stick but we will be able to tell you if your or your baby has anemia.

BS1. Was a capillary sample obtained from the mother? 1=yes 0 = no ☐ 1→ BS3	BS5. Was a capillary sample obtained from the child? 1=yes 0 = no ☐ 1→ BS10
BS2. Why not? ☐ 1 = refused 5 Not present 2 = pregnant 4 Technial difficulties 8 other (specify)	BS9. Why not? ☐ 1 = refused (cried, kicked, etc) 3=not present 2 = mother/guardian refused 4=technical difficulties 8=other (specify)
BS3. Approximately how many microliters of blood were collected in the microtainer? ☐☐☐	BS10. Approximately how many microliters of blood were collected in the microtainer? ☐☐☐
BS4. At what time was the sample obtained? ☐☐:☐☐ h h m m	BS11. At what time was the sample obtained? ☐☐:☐☐ h h m m
BS5. What time did you eat for the last time? ☐☐:☐☐ h h m m	BS12. At what time did (child's name) eat for the last time? ☐☐:☐☐ h h m m
BS6. Hemoglobin concentration from Hemocue ☐☐☐.☐ g/L (put 999.8 if not measured/don't know)	BS13. Hemoglobin concentration from Hemocue ☐☐☐.☐ g/L (put 999.8 if not measured/don't know)
BS7. ID Label - **MOTHER** *Affix mother label for blood here*	BS14. ID Label - **CHILD** *Affix child label for blood here*

Don't forget to provide the mother with the Hb measurement results for herself and her baby.

Ask mother to sign here to confirm receipt of Hb measurement results

Signature Date

Appendix 2: CRP and AGP tables

Table 10-1. Iron deficiency indicators taking into account inflammation markers for children 6–24 months of age, Talas Oblast, Kyrgyzstan, 2008

Ferritin	N	% low ferritin	95% CI	DEFF	Mean ferritin	SD
All	569	62.0	(57.3, 66.8)	1.32	14.91	18.76
CRP<10 mg/L	521	64.5	(60.1, 68.9)	1.05	14.04	18.57
AGP<1.0 g/L	343	67.9	(62.9, 73.0)	0.95	12.3	16.41
CRP< 10 mg/L AND AGP<1.0 g/L	339	68.4	(63.3, 73.5)	0.97	12.19	16.45

Iron deficiency anemia		% IDA	95% CI	DEFF
All	569	45.5	(40.9, 50.1)	1.17
CRP<10 mg/L	521	45.9	(41.1, 50.6)	1.13
AGP<1.0 g/L	343	42.9	(38.1, 47.6)	0.76
CRP< 10 mg/L AND AGP<1.0 g/L	339	43.4	(38.6, 48.2)	0.76

Table 10-2. Iron deficiency indicators taking into account inflammation markers for nonpregnant mothers, Talas Oblast, Kyrgyzstan, 2008

Ferritin	N	% low ferritin	95% CI	DEFF	Mean ferritin	SD
All	417	58.5	(53.7, 63.4)	0.96	16.66	17.02
CRP<10 mg/L	398	60.6	(55.1, 65.0)	0.97	16.66	17.00
AGP<1.0 g/L	343	62.4	(57.4, 67.4)	0.87	15.35	16.24
CRP< 10 mg/L AND AGP<1.0 g/L	341	62.5	(57.4, 67.5)	0.88	15.34	16.26

Iron deficiency anemia	N	% IDA	95% CI	DEFF
All	417	23.5	(18.8, 28.2)	1.24
CRP<10 mg/L	398	23.4	(18.7, 28.0)	1.15
AGP<1.0 g/L	343	24.8	(20.0, 29.6)	1.02
CRP< 10 mg/L AND AGP<1.0 g/L	341	24.6	(19.7, 29.6)	1.08

Table 10-3. VAD taking into account inflammation markers for children 6-24 months of age, Talas Oblast, Kyrgyzstan, 2008

VAD	N	% VAD	95% CI	DEFF	Mean RBP (mol/L)	SD
All	569	19.5	(15.3, 3.7)	1.54	0.88	0.22
CRP<10 mg/L	521	16.1	(11.4, 0.8)	2.04	0.90	0.21
AGP<1.0 g/L	343	13.1	(8.9, 17.3)	1.27	0.92	0.20
CRP< 10 mg/L AND AGP<1.0 g/L	339	13.0	(8.8, 17.1)	1.24	0.92	0.20

Table 10-4. VAD taking into account inflammation markers for nonpregnant mothers, Talas Oblast, Kyrgyzstan, 2008

VAD	N	% VAD	95% CI	DEFF	Mean RBP (mol/L)	SD
All	417	2.6	(1.2, 4.1)	0.83	1.28	0.34
CRP<10 mg/L	398	1.5	(0.4, 2.6)	0.82	1.29	0.34
AGP<1.0 g/L	343	1.7	(0.4, 3.1)	0.84	1.29	0.34
CRP< 10 mg/L AND AGP<1.0 g/L	341	1.8	(0.4, 3.1)	0.85	1.29	0.34

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ISBN № 978-9967-25-918-8