



Democratic People's Republic of Korea

Preliminary Report of the National Nutrition Survey 2012

October 2012



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Contents

ACRONYMS.....	2
1. EXECUTIVE SUMMARY	3
2. CONTEXT	5
3. SURVEY OBJECTIVE.....	6
4. METHODOLOGY	7
4.1 Target population	7
4.2 Sampling method	7
4.3 Sample size.....	7
4.4 Indicators	8
4.5 Standards	9
4.6 Morbidity	10
4.7 Multi-micronutrient supplementation for pregnant women.....	10
4.8 Vitamin A supplementation in children.....	10
4.9 Feeding practices	10
4.10 Questionnaires.....	10
4.11 Anthropometric equipment and haemoglobin meter.....	10
4.12 Survey staff	11
4.13 Training and evaluation	11
4.14 Data management.....	12
4.15 Weighing and Variance	13
4.16 Surveyor’s manual	13
4.17 Risks, probable bias and assumptions.....	13
5. ETHICAL ISSUES.....	15
6. RESULTS	16
6.1 Children.....	16
6.2 Women.....	23
7. DISCUSSION.....	26
Stunting (Chronic malnutrition)	26
Wasting (Acute Malnutrition):.....	26
Other aspects in children:.....	28
Mother’s nutritional status:	28
Historic of malnutrition in DPRK.....	29
8. CONCLUSIONS AND RECOMMENDATIONS	31
9. ACKNOWLEDGEMENTS	32
Annex 1 - Data appraisal for key indicators per Province, DPR Korea, October 2012....	33
Annex 2 - Children and Women questionnaire, DPR Korea, October 2012	35
Annex 3 – Composition of multi-micronutrient supplementation tablets for pregnant and lactating women, DPR Korea, October 2012	39

ACRONYMS

BMI	Body mass index
CBS	Central bureau of statistics, DPR Korea
CMAM	Community management of acute malnutrition
ENA	Emergency nutrition assessment software program
FAO	Food and agriculture organisation of the United Nation
GAM	Global acute malnutrition
H/A	Height-for-age
ICN	Institute of Child Nutrition, DPR Korea
IDDS	Individual dietary diversity score
MUAC	Mid upper arm circumference
MOPH	Ministry of public health
MAM	Moderate acute malnutrition
MCM	Moderate chronic malnutrition
MICS	Multiple indicator cluster survey
NCHS	National Centre for Health Statistics of USA
PSU	Primary sampling unit
PPS	Proportional to population sampling
RTI	Respiratory tract infection
SAM	Severe acute malnutrition
SCM	Severe chronic malnutrition
SMART	Standardised monitoring and assessment of relief and transition
UNICEF	United nations children's fund
WASH	Water, Sanitation and Hygiene
W/A	Weight-for-age
W/H	Weight-for-height
WG/PC	Working Group / People's Cluster
WFP	World food programme
WHO	World health organisation

1. EXECUTIVE SUMMARY

The last nationwide survey including nutrition indicators was the Multiple Indicator Cluster Survey (MICS) carried out in 2009. It showed that 32.4% of children <5y (0-59 months) were stunted (Chronic malnutrition) (8.4% severely stunted) and that 5.2%¹ of children were acutely malnourished (0.5% of the severe form). Since then two screenings of mid-upper-arm circumference (MUAC) have been done (October 2011 and February 2012) in the counties where a community management of acute malnutrition (CMAM) program is on-going. Another nutrition assessment using MUAC methodology was conducted in November 2011 in WFP operational counties. All of the MUAC assessments were conducted in different times so comparison of the findings with the national data is not possible but gives indication of seasonal child acute malnutrition in the assessed geographical areas.

The present survey was therefore needed to update the indicators for the population nutritional status. All 10 provinces have been included². Data collection was done from September 17th to October 17th 2012.

The methodology is based on SMART³ and MICS⁴ surveys. It is a clustered, stratified by provinces, two-stage sampling survey. The target population includes children under 5 and their mothers. The sample size per province is 400 children in Pyongyang municipality and 812 children in all other provinces for most indicators.

The table 1 shows the main preliminary results at national level.

Tab. 1: Main results of National Nutrition Survey 2012. DPR Korea, October 2012.

Indicator	Age group	Prevalence	95% confidence intervals
Children			
Global chronic malnutrition (stunting)	0 – 59 months	27.9%	26.3-29.4
Severe chronic malnutrition (severe stunting)	0 – 59 months	7.2%	6.4-7.9
Global acute malnutrition (wasting)	0 – 59 months	4.0%	3.5-4.5
Severe acute malnutrition (severe wasting)	0 – 59 months	0.6%	0.4-0.7
Underweight	0 – 59 months	15.2%	14.2-16.3
Low MUAC (< 125 mm)	6 – 59 months	4.1%	3.6-4.6
Anaemia	6 – 59 months	28.7%	26.5-30.9
Women			
Anaemia	15-49 years	31.2%	29.6-32.9
Low MUAC (< 225 mm)	15-49 years	23.2%	21.9-24.5
(< 210 mm)	15-49 years	5.3%	4.7-5.9

Chronic malnutrition, despite a modest drop since MICS 2009 (from 32.3% to 27.9% at national level) remains in the ranges labelled 'medium'. Stunting has irreversible impact on

¹ Prevalence of height-for-age <-2 z-score (stunting) and weight-for-height < -2 z-score (acute malnutrition) from the median according to WHO 2006 growth standards.

² 8 Provinces had representative samples, while Nampo and South Pyongan provinces have been coupled due to the small size of the first one and only one representative sample was drawn for the two.

³ Standardised monitoring and assessment of relief and transition. For more details see: Measuring Mortality, Nutritional Status and Food Security in Crisis Situations: SMART METHODOLOGY. April 2006. Available at : www.smartindicators.org (accessed on October 18, 2012).

⁴ Multiple Indicator Cluster Surveys. For more details see: http://www.childinfo.org/mics3_background.html (accessed on October 18, 2012).

the development of children as a result on the Country development. The prevention of stunting in early life (starting during or even before pregnancy) as well as the prevention of anaemia in mothers and their children (mainly those under 2 years old) through different multi-sectoral interventions combining nutrition, health, WASH, social protection, food security and agriculture requires more efforts and resources.

The survey also shows a picture of the acute nutritional status of children modestly improved since 2009. The situation is not critical and does not suggest emergency operations. However, attentions need to be paid to such factors as essential medicines, WASH situation and food security which affect the vulnerable children. The presence of acute malnutrition in women is also of concern. Programmes like the management of acute malnutrition at hospital and community levels (CMAM) need to be continued and expanded. Provision of nutritious food for children at institutions should also continue. On-going monitoring of the nutritional situation is important to identify the trends and changes in the situation and bring support as soon as possible when the situation is negatively changing⁵.

In reference to the MDG 1, the achievement in decreasing underweight over time (from 60.6% in 1998 (MICS1 to 15.5% in the actual survey), as well as chronic and acute malnutrition, are primarily due to concerted efforts between the Government, the UN Agencies and others partners in DPRK in addressing the different causes of malnutrition. But malnutrition still remains and requires continued and strengthened interventions on chronic and acute malnutrition in order to have more impact on the underweight prevalence and to ensure a more optimal growth to the children.

⁵ MUAC screenings, nutrition surveillance in clinics and hospitals and surveys are the three main methods of nutritional assessment.

2. CONTEXT

DPR Korea has a surface of approximately 120,540 km², 80% of which is made up of mountains and uplands. The total population is 24 488 861⁶. Children under five are 1 705 620 (6.96%). The population of women from 15 to 49 years old is 6 564 148.

The climate is continental with long and cold winters, while most rains fall from July to August. Agricultural activities are also concentrated during the spring and most crops are harvested from September to October. Main foods produced are, in order of decreasing production figures⁷, rice, maize, potatoes and soybeans.

Primary healthcare is provided at Ri/Up/Ku/Dong hospitals (clinics) where the number of doctors appointed depend on the population (one doctor is in charge of approximately 150 households i.e. approximately 44 children). Hospitals are located in County and Province capitals.

The main fields of intervention of aid agencies (including UN and NGOs) are food security, health and nutrition, education, water and sanitation.

DPRK already has on-going valuable nutrition interventions such as farming interventions and fortified food distribution for children and pregnant and lactating women. Ten Provincial Maternity Hospitals are certified Baby-Friendly Hospitals and are doing promotion of breastfeeding. Micronutrient supplementation and deworming of at least 98% of children happens two times per year through the Child Health Days while the supplementation of multi-micronutrients powders is being done only on a small scale. Weekly iron and folic acid supplementation of pre-pregnant women 23-28 years and daily supplementation of pregnant and lactating women is done countrywide. Community interventions need to be developed to strengthen the counselling on infant and young child and women's feeding practices.

The CMAM was implemented in 2008 in the 14 Baby Homes and 4 Counties while the in-patient treatment of severe acute malnutrition in the 10 Provincial Paediatric Hospitals has been ongoing for more than 12 years. In 2011 CMAM was established in 50 counties of North and South Hamyong, Ryanggang and Kangwon. At the moment of the survey, CMAM is still implemented in 29 Counties and 14 Baby Homes while the in-patient treatment of severe acute malnutrition is done in 12 Provincial Hospitals and at least 29 County Hospitals. The number of CMAM counties targeted was reduced after March 2012 due to lack of funding.

Children have received nutritious meals at child institutions while pregnant and lactating women have also received nutritious food in selected counties. This interventions could also have influence the data on acute malnutrition.

⁶ Data released by CBS in June 2012, number of population at the end of 2011. .

⁷ FAO, 2011-2012 agricultural season.

3. SURVEY OBJECTIVE

The survey objective was to collect updated information on the nutritional and health status of children and women in DPRK and inform policy makers and program managers on priority sectors and strategies.

This survey collected information on some key indicators of interest for MOPH, UNICEF and other institutions and organisations programs. Data collection was done from September 17th to October 17th 2012.

The selected indicators are acute and chronic malnutrition, MUAC, morbidity, anaemia, vitamin A supplementation coverage, feeding practices in children and dietary diversity in women.

4. METHODOLOGY

4.1 Target population

The target population includes all children aged 0 to 59 months and their mothers aged 15 to 49 years living in DPRK. Women who lost their children are not included. Some indicators, such as mid-upper-arm circumference in children or micronutrient supplementation in women, are only be assessed in sub-groups such as children aged from 6 to 59 months and women who gave birth in the last 2 years.

4.2 Sampling method

The National Nutrition Survey 2012 is a cross-sectional, stratified, two-stage cluster survey based on the SMART and MICS methodology.

The sampling plan is designed to provide estimates at the Province and Country levels. Using non self-weighting provincial samples, national estimates are derived by weighting the Provincial findings according to population size.

Ten (10) domains are identified, one for each of the nine (9) Provinces, plus one for the Pyongyang Municipality. The Nampo Municipality is included in the South Pyongan Province to make up one domain. The primary sampling unit (PSU) is the Ri/Up/Ku/Dong, an administrative unit including an average of approximately 10 villages.

In the first stage, 40 Ri/Up/Ku/Dong (or Clusters) were selected by the Central Bureau of Statistics (CBS) among all the Ri/Up/Ku/Dong in each Province with a systematic probability proportional to size (PPS) method.

In each cluster one Working Group/People's Cluster (WG/PC), which is the administrative divisions below the Ri/Up/Ku/Dong in rural and urban areas respectively, was randomly selected by field staff just before data collection. Then, in the selected WG/PC, 21 children aged 0-59 months were randomly selected from the list of all children in that age group living in that WG/PC (except in Pyongyang where the number of children was 12 – more explanation given in sample size section on this particularity). If there were less than 21 children in the WG/PC (or 12 in Pyongyang) all of them would be included and the sample would be completed in the nearest WG and so on. In most cases several WG/PC were needed to achieve the sample needed. Therefore the WG/PC stage is a virtual stage, and due to the PPS selection of clusters in the first stage, the variance of the estimates will unlikely be affected. In data analysis with SPSS/PASW complex samples module, this stage has not been computed. This method of sampling and analysis is also known as ultimate cluster approach⁸ and widely used in complex surveys with clustering and stratification.

4.3 Sample size

The required sample size was calculated, within each Province, for five key indicators under evaluation. The purpose was to choose among them a single sample size (the largest) to cover all the indicators and so simplify the work during data collection. Ideally only one sample size for all provinces and for all indicators would have been selected.

The key indicators for children are the followings: global acute malnutrition (6-59 months), anaemia prevalence (6-59 months), exclusive breastfeeding rate (0-5.9 months). As for 15-49 years mothers, the key indicators were: low MUAC and anaemia prevalence.

ENA (delta version, June 2011) was used to estimate sample sizes. The formula used is:

$$N = DEFF (t^2 \times p (1-p) / m^2)$$

⁸ Journal of the Royal Statistical Society. Series A (General), Vol. 142, No. 2 (1979), pp. 210-222.

where: N = sample size
DEFF = design effect
t = 1.96 for a confidence level of 95%
m = desired precision
p = expected prevalence

Design effect was estimated at 1.5. 2009 MICS result data was used for design effect. In 2009 MICS, design effect for weight for height(wasting) was 1.5. The most recent data from surveys (mostly MICS 2009 and National Nutrition Survey 2004) were used to estimate prevalence.

Once we calculated the 50 samples sizes (10 strata times 5 key indicators) in number of children and women they were converted into households, using CBS census data 2008. The census data were not needed to estimate population absolute figures but proportions were used as they are not likely to change significantly over few years. This procedure allows the comparison of sample sizes coming from different groups (children/mothers, and different age groups within these categories). In all Provinces the largest sample size, of approximately 9 000 to 10 000 households, was needed for the exclusive breastfeeding rate, due to the small age group under study. However this was far higher than other indicators sample sizes and not feasible within this survey. The GAM variable needed on average the second largest sample size. For most Provinces (8 out of 10) the GAM sample size was in the range of 2 500-3 200 households and the latter figure was retained as main sample size. This figure was then re-converted in number of children, which gave 812 children as main sample size. Nevertheless, data on exclusive breastfeeding has been collected, but, like in the MICS, only national and not provincial estimates will be provided for this indicator.

Two exceptions were made to this main (n=812) sample size:

- In Pyongyang municipality the largest required sample size is for haemoglobin in women (2883 households), so it has been preferred because as it still include enough children in the household sample for the other indicators and it reduces costs and efforts compared to the main one.

- The haemoglobin check in children is the most expensive one and needed for only about-half the main sample size (1 500-1 600 children 6-59.9 according to Province). Therefore it has been done only in odd numbered children.

Therefore three different sample sizes were retained:

- 812 children for all Provinces but Pyongyang and for all indicators but haemoglobin
- 406 children for all Provinces but Pyongyang for haemoglobin
- 423 children for Pyongyang for all indicators.

All the mothers of the above children, aged 15-49 years, were included.

To attain the above mentioned sample sizes we chose to select 40 clusters (Ri/Up/Ku/Dong) in each Province and 21 children in each cluster. Haemoglobin concentration was only assessed in every second child so that 11 children in each cluster were included. In Pyongyang 40 clusters and 12 children in each cluster were selected; haemoglobin concentration being tested for all of them. Therefore the final number of children to be assessed per Province was:

- 840 children for all Provinces but Pyongyang and for all indicators but haemoglobin
- 440 children for all Provinces but Pyongyang for haemoglobin
- 480 children for Pyongyang for all indicators.

4.4 Indicators

The table 2 presents the indicators assessed separately for children and women according to age group of interest.

Only key results are presented in the preliminary report while all results will be presented in the final report.

Tab. 2: List of indicators for children and women detailed by age group.

Children	Age group (months)	Mothers	Age group (years)
Global chronic malnutrition (GCM) / Stunting Height-for-Age <-2 z-score	0-59.9	% with MUAC <210mm	15-49.9
Severe chronic malnutrition (SCM) / Severe stunting Height-for-Age <-3 z-score	0-59.9	% with MUAC <180mm	15-49.9
Moderate chronic malnutrition (MCM) / Moderate stunting Height-for-Age ≥-3 z-score and <-2 z-score	0-59.9	% with MUAC <225mm (old MICS threshold)	15-49.9
Global acute malnutrition (GAM) / Wasting Weight-for-Height <-2 z-score	0-59.9, 6-59.9	Prevalence of anaemia in all women Hb <12 g/dL if non-pregnant Hb < 11g/dL if pregnant	15-49.9
Severe acute malnutrition (SAM) / Severe wasting Weight-for-Height <-3 z-score	0-59.9, 6-59.9	Prevalence of anaemia in pregnant women (only national estimate) Hb < 11 g/dL if pregnant	15-49.9
Moderate acute malnutrition (MAM) / Moderate wasting Weight-for-Height ≥-3 z-score and <-2 z-score	0-59.9, 6-59.9	Proportion of women who received multi-micronutrient supplement during pregnancy	15-49.9 with U2 children
Kwashiorkor (nutritional oedema) prevalence	0-59.9	Multi-micronutrient supplement compliance	15-49.9 with U2 children
% with MUAC <125mm	6-59.9	IDDS14 (Individual dietary diversity score over 14 food groups)	15-49.9
% with MUAC <115mm	6-59.9		
Prevalence of anaemia (Hb < 11.0 g/dL)	6-59.9		
% who received Vitamin A in last 6 months	6-59.9		
Morbidity prevalence (sickness) over 14 previous days	0-59.9		
Prevalence of diarrhoea and RTI	0-59.9		
Exclusive breastfeeding proportion	0-5.9		
Timely introduction of solid, semi-solid, soft foods	6-8.9		
Minimum dietary diversity	6-23.9		
Early initiation of breastfeeding	0-23.9		
Continued breastfeeding proportion at 1 year	12-15.9		

4.5 Standards

WHO 2006 growth standards⁹ were used to compute W/H, W/A and H/A indices in z-scores. Commonly used thresholds have been used for analysis of MUAC and anaemia.

4.6 Morbidity

Morbidity was assessed retrospectively over 14 days, by asking to the caretakers whether the child had been sick or not. Symptoms were also investigated although for programmatic interest and simplicity we chose to include only three options: diarrhoea, cough, rapid breath or respiratory tract infections and others.

4.7 Multi-micronutrient supplementation for pregnant women

In DPRK, pregnant women can benefit from daily multi-micronutrient supplementation for 6 months. To estimate the proportion of women who received the multi-micronutrient supplementation, surveyors asked to women who gave birth in the last two years if they had received the micronutrient supplementation, and, if so, for how long. A sample of tablets was shown.

4.8 Vitamin A supplementation in children

Vitamin A is given twice per year during Child Health Days held in May and November each year to all children from 6 months up to 5 years. To evaluate the proportion of children who received vitamin A in the last 6 months, caretakers of selected children were asked if the child had received a capsule during the last 6 months. A sample of the capsule was shown.

4.9 Feeding practices

Methods used to collect and analyse information about feeding practices in children is based on WHO (2010) manuals: 'Indicators for assessing infant and young child feeding practices' parts 1, 2, 3. Dietary diversity was assessed in women 15-49 years old using the FAO (2007) 'Guidelines for measuring household and individual dietary diversity'. A qualitative 24h recall method was used in both cases. A comprehensive list of food groups, adapted to local foods, was included in the questionnaires. Nursery staff participated in data collection to provide information about meals consumed by the children at the nursery the day before.

4.10 Questionnaires

Two questionnaires, one for children and one for women were used (Annex 2). The questionnaires were administered to the mother or the caretaker of the child. The questionnaires were tested during the pre-survey in Pyongyang but no changes were needed. Questionnaires and all other tools used were in Korean. They were initially designed in English, translated by CBS and then back-translated by an independent person to check for inconsistencies.

4.11 Anthropometric equipment and haemoglobin meter

⁹ WHO Multicentre Growth Reference Study Group (2006). WHO Child Growth Standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: Methods and development. WHO Genève.

MUAC tape of plasticized paper, children and adult type, three colors with thresholds at 115/125mm and 210/230mm respectively) , weight scales (SECA, electronic, 0.1 Kg division), and wooden height boards (Shorr, 0.1 cm division, two pieces) were provided by UNICEF and comply with UNICEF standards.

Hemocue meters (mod. Hb 201+), kindly provided by WHO, were used to estimate haemoglobin blood concentration in children and women

4.12 Survey staff

Field staff is made up of 2 teams per Province, i.e. 20 teams in total. Each team include three staff, a team leader and two enumerators (or measurers). The team leader is responsible of the application of methodology and for administering the questions to the caretaker. One enumerator is in charge of the scale and of taking the weight while the other is in charge of the height board and of taking height. The enumerators were assigned to their task following a standardisation test completed at the end of the enumerators' training (see details in the following section). The enumerators' roles were exclusive and teams were requested not to exchange roles during the data collection.

As per DPRK Ministry of Public Health regulations, only doctors can manipulate blood samples. Based on this requirement, one local clinic doctor for each cluster was involved to collect the blood sample and filling the cuvette for the haemoglobin test. Then, one enumerator operated the Hemocue meter, inserting the cuvette and reading the measure.

Selected staffs for the survey were from CBS and Institute of Child Nutrition (ICN). Most of them had experience in participating in MICS and nutrition survey. All from ICN have medical doctor background. Team leaders were selected according to their experience in surveys, training in statistics, public health and epidemiology. A lower profile is needed for enumerators, which need only basic math, logical and communication skills.

4.13 Training and evaluation

Two training of trainers sessions were conducted by an international nutrition consultant on 18-19 July and 13-14 August 2012. Eleven officers from CBS and Institute of Child Nutrition officers attended both. The objective was to prepare a pool of trainers/coordinators for nutrition surveys. The main subjects were sampling methods, field procedures for surveys and software utilisation for data entry and analysis.

The training session was conducted on 27-29 August and 3-5 September All survey staff was trained on their specific duties. The training was facilitated by CBS staff with the support of the international consultant provided by UNICEF. The total duration of the training was 6 days, although it varied according to the role of personnel. Team leaders were trained for the whole 6 days. Enumerators received a training of 3 days (including standardisation test, and pre-survey). A half day training session was given to the Hemocue operators.

The agenda of the training is set out in table 3.

Tab. 3: Training planning.

Day	Module
1	Lecture: survey methodology I
2	Lecture: survey methodology II
3	Lecture: ENA (morning) - Lecture & practical: haemoglobin test (afternoon)

4	Lecture: recap of methodology, anthropometric theory (divide in two groups)
5	Pre-survey (divided in two groups)
6	Standardization test (divided in two groups)

The selection of measurers after the training was based on the ENA software “evaluation of the enumerators” test, also known as standardisation test. The supervisor and the measurers measured two times the weight, height and MUAC of 10 children. The accuracy (differences between the enumerator values and the supervisor values) and the precision (differences between the two measurements taken by each enumerator) were then calculated. The results were showing that 3 enumerators were not reaching the required measurement quality so they were retrained and the test repeated and passed by all of them. Standardisation test results will be annexed to the final report.

A one-day pre-survey was carried out before the standardisation test.

A survey manual was provided to each team leader, which included instructions, weight for height tables, random number table and reference tables.

4.14 Data management

Data collection was done from September 17th to October 17th 2012.

All teams were supervised by technical nutrition staff from UNICEF, WHO, and WFP during the first week of data collection and from CBS during the course of the survey.

One laptop was provided to each survey teams to facilitate data entry of child anthropometry data in the field, everyday. Each team leader was responsible to check data quality, ensure correction of mistakes, retake measurements if needed and assess the team work. A plausibility check is included in the ENA software (delta version) and it runs the most common statistical quality tests for such data.

Double entry of all data was performed. The first data entry was initiated on the field, with ENA (ver. delta, 2011), and completed in Pyongyang by CBS with CSPro (ver. 4.0). The second data entry was performed in Pyongyang after the end of data collection with CSPro.

Data cleaning for anthropometric indicators followed WHO cut off as included in ENA / Anthro macro. Anthropometric indices were excluded if they were as follows:

W/H < -5 z-s or > 5 z-s

H/A < -6 z-s or > 6 z-s

W/A < -6 z-s or > 5 z-s.

The above values are referred to the WHO reference population mean and not to our sample observed mean

MUAC <90 or >190 mm in children was excluded. Haemoglobin values was excluded if negative or > 25,6 g/dL, which is the Hemocue range.

As there is no agreed international cut-off for data cleaning for MUAC in women, no “reasonably wrong” values for MUAC in women were identified.

Children anthropometric indices have been computed with Anthro macro for SPSS/PASW (ver. 18).

Data analysis was done with SPSS/PASW (ver. 18).

Clothes worn by children at weighing were recorded with a multiple choice question. 4 categories were included: naked, with pants, with t-shirt, with diapers. The average weight of these clothes was assessed in a nursery with the following results: 20g for pants, 40g for t-shirt and 80g for the diaper. These weights were later subtracted from the children’s measured weight to obtain the estimated naked weight.

Sample sizes presented in the report are unweighted count of cases.

4.15 Weighing and Variance

As provincial samples were not self-weighing, national estimates were calculated taking into account the Province population from DPRK Census 2008¹⁰. The weighing factor used was: $((\text{Province population}/\text{National population})/(\text{Province sample}/\text{National sample}))$. Inclusion probability was constant across any Province so no province specific weights were applied. The complex sample module available in SPSS/PASW (ver. 18) was used to estimate standard errors and confidence intervals at both provincial and national level. An analysis plan for PASW complex samples module was drawn to account for the cluster and stratification applied.

4.16 Surveyor's manual

Detailed field procedures were included in the surveyor's manual, which was given to all team leaders. This document will be attached to the final report.

4.17 Risks, probable bias and assumptions

- In Ryanggang, Jaggang, South and North Hamgyong Provinces an insufficient number of hemocue kits was accidentally provided to teams at the beginning of the data collection. For logistical reasons it was not possible to provide the missing kits to the teams. Therefore very soon, after the first 3 days of data collection, it was decided to divide the number of tests left by the number of clusters remaining to decrease bias. The results are therefore slightly biased toward the first 2-3 clusters. The final samples in these Provinces are slightly smaller than planned, with Ryanggang being the Province with the largest undersampling with 213 cases of children measured versus the minimum sample of 254 children required. However, the response rate, which was expected to be around 60%, was much higher due to a good sensitization of participants by the surveyors.
- The final stage of selection was done through a simple random selection of children from a list prepared by local village leaders. Recall bias as well as intentional exclusion of some children could have occurred. Team staff were repeatedly sensitized on this risk and asked to avoid any exclusion. If recall bias and intentional exclusions happened, they are expected to have been equally distributed across age groups.
- During the data collection period, the main crops harvesting was almost finished and the nutritional status of the population could be better off than in the previous weeks/months due to the seasonal variation of acute malnutrition possibly associated with changes diarrhoea and pneumonia incidence and accessibility to diversified food items
- All estimates for women are only representative of mothers aged 15-49.9 of children aged 0 to 59.9 months. They are not representative of all mothers neither of all women.
- Nurseries are very popular in DPRK for children between 3 months and 4 years of age. In nurseries, infants and children usually spend the morning and have lunch.

¹⁰ This is the latest census available. It was assumed that the relative Province populations had not significantly changed since the 2008 Census.

Dietary diversity will therefore be assessed in two stages, at home and at the nursery for the children who have been at the nursery the day before. Recall bias is likely to affect the nursery staff, since they are dealing with many children at the same time. The most probable bias is not remembering a deviation from the standard diet at the nursery, in particular the refusal of some food. In this case food diversity might be overestimated.

- Vitamin A supplementation and deworming campaigns (Child Health Days) are usually done every 6 months (in May and November each year). Mothers of children who have received their dose at the nursery may not be aware or remind this fact. Underestimation of vitamin A coverage could occur.

5. ETHICAL ISSUES

Participation in the survey was on a volunteer basis and verbal consent was asked to all respondents (mothers and caretakers were answering for their children). A further authorisation was asked to perform the haemoglobin test. The answer was marked on the questionnaire.

Children were weighted naked if the caretaker gave the authorisation, if not with the minimum possible clothes dressed.

Moderate and severe acute malnourished (assessed with Weight-for-Height or with MUAC) and anaemic children and mothers were informed of their condition. A supply of 1 month of iron/folic acid supplements were given to anaemic women and 1 month of micronutrient powders to anaemic children to ensure a minimum of supplementation until their household doctor could suggest appropriate treatment.

Non-malnourished and non-anaemic children and mother were informed of their good nutritional status.

6. RESULTS

6.1 Children

6.1.1 Anthropometry

Anthropometry results are based on WHO 2006 growth standards. All sample sizes presented are unweighted. National estimates are weighed to the provincial population.

In table 4, chronic malnutrition figures, based on height for age, are presented. Chronic malnutrition, also known as stunting or growth faltering, is due to a prolonged exposition to poor nutrition. Moreover it has an intergenerational effect, as shorter mothers are likely to give birth to small-for-gestational-age infants¹¹. Stunting is irreversible after 24 months of age¹². Global chronic malnutrition is the sum of moderate and severe.

Tab. 4: Prevalence of global (H/A < -2 Z-scores), moderate (H/A ≥ -3 Z-s et < -2 Z-s), and severe (H/A < -3 Z-s) chronic malnutrition based on height for age z-score per sex, province and age group in children aged 0-59 months. DPR Korea, October 2012.

		Unweighted count	Global chronic malnutrition (95% CI)	Moderate chronic malnutrition (95% CI)	Severe chronic malnutrition (95% CI)
Total	total	8 036	27.9 (26.3-29.4)	20.7 (19.5-21.9)	7.2 (6.4-7.9)
Sex	Boys	4 115	29.9 (28-31.8)	21.7 (20.1-23.2)	8.2 (7.2-9.3)
	Girls	3 921	25.8 (23.7-27.8)	19.7 (17.9-21.4)	6.1 (5.2-7)
Province	Ryganggang	840	39.6 (35.2-44)	27.5 (24.3-30.7)	12.1 (9.8-14.4)
	North Hamgyong	840	28.7 (24.6-32.8)	20.5 (17.6-23.4)	8.2 (5.8-10.7)
	South Hamgyong	840	32.9 (28.4-37.3)	23.5 (20.6-26.3)	9.4 (6.5-12.3)
	Kangwon	836	28.6 (23.6-33.5)	20.7 (16.8-24.6)	7.9 (5.1-10.7)
	Jagang	840	33.3 (29.5-37.2)	23.6 (20.4-26.8)	9.8 (8-11.6)
	North Phyongan	840	29.4 (24-34.8)	21.3 (17-25.6)	8.1 (5.2-11)
	South Phyongan/Nampo	840	25.8 (21.3-30.3)	21.2 (17.4-24.9)	4.6 (3-6.3)
	North Hwanghae	840	28.7 (24.3-33)	20.6 (17-24.2)	8.1 (5.9-10.3)
	South Hwanghae	840	25.6 (22-29.2)	18.9 (15.9-22)	6.7 (4.8-8.5)
	Pyongyang	480	19.6 (15.1-24)	15.6 (12-19.3)	4.0 (2.3-5.6)
Age group (month)	0-5	643	3.7 (2-5.4)	3.3 (1.6-4.9)	0.5 (0-0.9)

¹¹ Black et al, Lancet 2008

¹² Victora et al, Lancet 2008

6-11	939	8.4 (6.2-10.5)	6.7 (4.7-8.7)	1.7 (0.9-2.5)
12-23	1 631	27.0 (24.4-29.6)	20.7 (18.3-23)	6.3 (5-7.7)
24-35	1 671	36.8 (33.8-39.7)	26.4 (23.7-29)	10.4 (8.7-12.1)
36-47	1 558	33.3 (30.3-36.3)	24.7 (22.1-27.3)	8.6 (6.9-10.3)
48-59	1 594	35.4 (32.3-38.5)	26.2 (23.6-28.8)	9.2 (7.7-10.8)

Table 5 display the acute malnutrition prevalence based on weight-for-height by category and degree of severity. This is also known as wasting or thinness and is an indicator of insufficient dietary intake¹³ over a relatively short period of time. No cases of nutritional oedema (a condition also known as kwashiorkor) were found during the survey. Therefore, global acute malnutrition is the sum of the moderate and severe form¹⁴.

Tab. 5 : Prevalence of global (W/H < -2 Z-scores), moderate (W/H ≥ -3 Z-s and < -2 Z-s), and severe acute malnutrition (W/H < -3 Z-s) per sex, province and age group in children aged 0-59 months. DPR Korea, October 2012.

		Unweighted count	Global acute malnutrition (95% CI)	Moderate acute malnutrition (95% CI)	Severe acute malnutrition (95% CI)
Total		8 035	4.0 (3.5-4.5)	3.4 (2.9-3.9)	0.6 (0.4-0.7)
Sex	Boys	4 114	4.1 (3.5-4.8)	3.6 (3-4.2)	0.6 (0.3-0.8)
	Girls	3 921	3.8 (3.1-4.5)	3.2 (2.6-3.9)	0.6 (0.3-0.8)
Province	Ryganggang	840	6.1 (4.4-7.7)	5.0 (3.6-6.4)	1.1 (0.4-1.8)
	North Hamgyong	840	4.8 (3.4-6.1)	4.2 (2.9-5.5)	0.6 (0.1-1.1)
	South Hamgyong	840	4.3 (2.4-6.2)	3.6 (2-5.1)	0.7 (0.1-1.3)
	Kangwon	836	4.7 (3-6.3)	3.9 (2.4-5.4)	0.7 (0.2-1.3)
	Jagang	839	5.7 (3.6-7.9)	5.0 (3.1-6.9)	0.7 (0.1-1.3)
	North Phyongan	840	3.8 (2.4-5.2)	3.5 (2.2-4.8)	0.4 (0-0.8)
	South Phyongan/Nampo	840	3.6 (2.5-4.7)	3.2 (2.1-4.3)	0.4 (0-0.8)
	North Hwanghae	840	4.4 (2.9-6)	3.6 (2.1-5.1)	0.8 (0.1-1.6)
	South Hwanghae	840	3.3 (1.9-4.8)	2.9 (1.6-4.1)	0.5 (0-0.9)
	Pyongyang	480	2.3 (1-3.6)	1.9 (0.6-3.1)	0.4 (-0.2-1)
	Age group (month)	0-5	642	4.3 (2.7-6)	3.6 (2.1-5.1)
6-11		939	4.9	3.4	1.5

¹³ Although acute malnutrition is mostly a consequence of protein and energy deficit, micronutrient deficiencies are often associated.

¹⁴ In some cases in this table GAM prevalence is 0.1 smaller or greater than the sum of MAM and SAM. This is due to rounding of numbers to the first decimal digit.

		(3.4-6.4)	(2.2-4.6)	(0.6-2.4)
12-23	1 631	4.3 (3.3-5.3)	3.6 (2.7-4.5)	0.7 (0.3-1.1)
24-35	1 671	3.9 (2.9-5)	3.4 (2.4-4.3)	0.6 (0.1-1)
36-47	1 558	3.6 (2.5-4.8)	3.5 (2.4-4.7)	0.1 (0-0.2)
48-59	1 594	3.3 (2.4-4.2)	3.0 (2.2-3.9)	0.3 (0-0.5)

Table 6 shows the results of MUAC measurements. MUAC is habitually not used to determine the population prevalence but is a good indicator for acute malnutrition. As well as weight for height ratio, low MUAC is associated with a higher of mortality. It is then also used for diagnosis of acute malnutrition in children and referral to proper care according to the severity of their status. In children from 6 to 59 months¹⁵ the most common thresholds for severe and moderate malnutrition are 115 and 125 mm respectively.

Tab. 6: Proportion of low MUAC in children aged 6-59 months per sex, province and age group, DPR Korea, October 2012.

		Unweighted count	MUAC < 125 mm (95% CI)	MUAC ≥ 115 & < 125 mm (95% CI)	MUAC < 115 mm (95% CI)
Total		7 382	4.1 (3.6-4.6)	3.4 (3-3.9)	0.6 (0.4-0.8)
Sex	Boys	3 783	3.1 (2.5-3.6)	2.6 (2.1-3.1)	0.5 (0.3-0.7)
	Girls	3 599	5.1 (4.3-5.9)	4.4 (3.6-5.1)	0.8 (0.5-1.1)
Province	Ryganggang	762	6.6 (4.8-8.3)	5.5 (4.1-6.9)	1.0 (0.3-1.8)
	North Hamgyong	770	4.4 (2.9-5.9)	3.8 (2.2-5.3)	0.6 (0.1-1.2)
	South Hamgyong	782	4.3 (2.6-6.1)	3.6 (1.9-5.3)	0.8 (0.1-1.4)
	Kangwon	766	4.8 (3.2-6.4)	4.2 (2.9-5.5)	0.7 (0-1.3)
	Jagang	751	5.9 (4-7.7)	4.9 (3.4-6.4)	0.9 (0.2-1.7)
	North Phyongan	790	5.1 (3.3-6.8)	4.3 (2.7-5.9)	0.8 (0.1-1.4)
	South Phyongan/Nampo	770	3.9 (2.6-5.2)	3.2 (2-4.5)	0.6 (0.1-1.2)
	North Hwanghae	782	4.5 (3.2-5.8)	3.8 (2.6-5.1)	0.6 (0.1-1.2)
	South Hwanghae	778	2.6 (1.5-3.7)	2.1 (1-3.1)	0.5 (0-1)
	Pyongyang	431	2.1 (0.9-3.3)	1.9 (0.7-3)	0.2 (-0.2-0.7)
Age group (month)	6-11	933	4.7 (3.3-6.2)	3.9 (2.5-5.2)	0.9 (0.3-1.5)
	12-23	1 630	7.1	6.0	1.0

¹⁵ Cut-offs values for MUAC were validated by WHO for children aged 6-59 months.

		(5.7-8.4)	(4.8-7.3)	(0.5-1.6)
24-35	1 669	4.9 (3.7-6)	4.2 (3.1-5.3)	0.7 (0.3-1.1)
36-47	1 558	1.6 (1-2.3)	1.4 (0.8-2)	0.2 (0-0.4)
48-59	1 592	2.2 (1.4-3)	1.8 (1.1-2.5)	0.4 (0-0.8)

Underweight or weight-for-age is presented in table 7 and is one of the Millennium Development Goal (MDG) indicators for MDG 1; to eradicate poverty and hunger. Underweight was largely used in the past because of its simplicity but as it gives information on both acute and chronic malnutrition at the same time, it lacks a certain precision for definition of interventions. More specific indicators like weight for height (or MUAC) and height for age are preferred for programme purpose.

Tab. 7: Prevalence of global (W/A < -2 Z-scores), moderate (W/A ≥ -3 Z-s et < -2 Z-s), and severe (W/A < -3 Z-s) underweight based on weight for age z-score per sex, province and age group in children aged 0-59 months. DPR Korea, October 2012.

		Unweighted count	Global underweight (95% CI)	Moderate underweight (95% CI)	Severe underweight (95% CI)
Total	total	8 036	15.2 (14.2-16.3)	12.4 (11.5-13.3)	2.9 (2.4-3.3)
Sex	Boys	4 115	15.5 (14.1-16.9)	12.3 (11.1-13.6)	3.2 (2.6-3.7)
	Girls	3 921	15.0 (13.6-16.4)	12.4 (11.2-13.6)	2.6 (2-3.1)
Province	Ryganggang	840	20.0 (16.6-23.4)	14.5 (11.7-17.3)	5.5 (3.8-7.2)
	North Hamgyong	840	16.4 (13.7-19.1)	14.0 (11.4-16.7)	2.4 (1.3-3.5)
	South Hamgyong	840	18.6 (14.9-22.2)	13.9 (11.3-16.5)	4.6 (2.8-6.5)
	Kangwon	836	18.7 (15.2-22.2)	14.6 (11.9-17.3)	4.1 (2.3-5.9)
	Jagang	840	16.5 (13.6-19.5)	13.6 (10.8-16.3)	3.0 (1.9-4)
	North Phyongan	840	17.1 (13.1-21.2)	13.3 (10.2-16.5)	3.8 (2.2-5.4)
	South Phyongan/Nampo	840	13.0 (10-15.9)	11.5 (8.8-14.3)	1.4 (0.5-2.3)
	North Hwanghae	840	14.6 (12-17.2)	12.0 (10-14.1)	2.6 (1.3-3.9)
	South Hwanghae	840	14.6 (11.7-17.6)	11.4 (8.7-14.2)	3.2 (2.1-4.3)
	Pyongyang	480	10.0 (7.1-12.9)	8.8 (6.2-11.3)	1.3 (0.1-2.4)
	Age group (month)	0-5	643	2.9 (1.6-4.3)	2.2 (1-3.4)
6-11		939	8.2 (6.1-10.2)	6.6 (4.7-8.5)	1.6 (0.8-2.4)

12-23	1 631	13.6 (11.6-15.6)	10.9 (9-12.7)	2.7 (1.9-3.5)
24-35	1 671	18.5 (16.3-20.7)	14.7 (12.6-16.7)	3.8 (2.8-4.8)
36-47	1 558	18.0 (15.8-20.3)	14.9 (12.9-17)	3.1 (2.1-4.1)
48-59	1 594	20.0 (17.6-22.3)	16.5 (14.4-18.6)	3.5 (2.5-4.4)

6.1.2 Other results

Anaemia is one of the most common nutrition conditions worldwide¹⁶¹⁷. It is defined as haemoglobin concentrations that are below 11 g/dL in children and pregnant women and 12 g/dL in non-pregnant women¹⁸¹⁹. The main causes of anaemia are: dietary iron deficiency, infectious diseases such as malaria and hookworm infections, deficiencies of other key micronutrients (folic acid vitamin B12), etc. Iron deficiency is however considered the most important single determinant of high anaemia prevalence in populations²⁰. The consequences of anaemia includes greater risk of dying during the perinatal period, increasing the risk of maternal mortality, delayed or impaired children's mental and physical development and reduced productivity in adult life²¹. Table 8 presents the percentages of anaemic children²².

Tab. 8: Anaemia prevalence (Hb < 11.0 g/dL) in children aged 6-59 months per sex, province and age group. DPR Korea, October 2012.

		Unweighted count	Percent anaemic (95% CI)
Total		2 773	28.7 (26.5-30.9)
Sex	Boys	1 464	30.0 (27-33)
	Girls	1 309	27.3 (24.3-30.4)
Province	Ryganggang	213	33.3 (26.4-40.3)
	North Hamgyong	223	29.1 (21-37.3)
	South Hamgyong	225	35.1 (27.2-43)
	Kangwon	270	39.3 (32-46.5)
	Jagang	219	33.8 (26.9-40.7)
	North Phyongan	315	27.6 (21.4-33.8)
	South	285	30.2

¹⁶ Black RE et al, Lancet 2008.

¹⁷ WHO (2012), Health Topics: Anaemia, <http://www.who.int/topics/anaemia/en/>

¹⁸ WHO 2001; Iron Deficiency Anaemia, Prevention, and Control, A guide for programme managers WHO/NHD/01.3

¹⁹ Standards for Maternal and Newborn care (2006), "Iron and folate Supplementation," Integrated management of pregnancy and childbirth [Online], Available at: http://www.who.int/reproductivehealth/publications/maternal_perinatal_health/iron_folate_supplementation.pdf

²⁰ WHO/NHD/01.3 (2001), "Iron Deficiency Anaemia Assessment, Prevention and Control" A guide for programme managers, [Online], Available at: http://www.who.int/nutrition/publications/en/ida_assessment_prevention_control.pdf

²¹ Algarín C et. al. (2003), "Iron deficiency anemia in infancy: Long-lasting effects on auditory and visual system functioning," *Pediatr Res* 2003; 53:217-23.

²² WHO and CDC. Assessing the iron status of population. 2nd ed. 2007.

	Phyongan/Nampo		(23.5-36.9)
	North Hwanghae	323	28.5 (23.6-33.4)
	South Hwanghae	285	28.1 (21.9-34.2)
	Pyongyang	415	23.9 (19.2-28.5)
Age group (month)	6-11	305	45.4 (39-51.8)
	12-23	654	47.9 (43.1-52.8)
	24-35	627	22.9 (19.1-26.8)
	36-47	587	19.1 (15.4-22.8)
	48-59	600	15.1 (12-18.2)

Worldwide, vitamin A supplementation to children aged from 6 to 59 month has shown a large impact on child survival and is one of the most common public health programs targeting children (Black et al, Lancet 2008). In DPRK, it is usually distributed twice in a year through nurseries and Household doctors. The proportion of children who received one dose of Vitamin A in the last six months can be found in table 9.

Tab. 9: Proportion of children aged 6-59 months who received vitamin A supplementation in the last 6 months per sex, province and age group. DPR Korea, October 2012.

		Unweighted count	Percent (95% CI)
Total		7 393	97.8 (97.4-98.2)
Sex	Boys	3 788	97.9 (97.4-98.4)
	Girls	3 605	97.7 (97.1-98.3)
Province	Ryganggang	762	97.8 (96.8-98.7)
	North Hamgyong	770	98.3 (97.5-99.2)
	South Hamgyong	782	98.2 (97.1-99.3)
	Kangwon	768	97.8 (96.7-98.9)
	Jagang	753	97.7 (96.6-98.9)
	North Phyongan	790	98.5 (97.7-99.3)
	South Phyongan/Nampo	771	96.6 (95-98.2)
	North Hwanghae	784	96.8 (95.5-98.1)
	South Hwanghae	779	98.2 (97.3-99.1)
	Pyongyang	434	98.4

		(97.3-99.5)
Age group (month)	6-11	939 96.5 (95.1-97.9)
	12-23	1 631 98.2 (97.5-98.9)
	24-35	1 671 97.8 (97-98.6)
	36-47	1 558 98.1 (97.4-98.9)
	48-59	1 594 97.9 (97-98.7)

Caretakers were asked if their child had been sick in the last two weeks and, if so, did it suffer from diarrhoea, respiratory tract infections or others. Disease and infections are important determinants of nutritional status. Results are shown in table 10.

Tab. 10: Morbidity prevalence or reported sickness over the last 14 days and prevalence of diarrhoea and RTI (over the total sample) in children aged 0-59 months per sex, province and age group. DPR Korea, October 2012.

		Unweighted count	Morbidity prevalence (95% CI)	Percent with diarrhoea (95% CI)	Percent with respiratory tract infection (95% CI)
Total		8 040	14.0 (13.1-15)	8.5 (7.8-9.3)	6.5 (5.8-7.2)
Sex	Boys	4 117	14.8 (13.6-16.1)	9.3 (8.3-10.3)	6.7 (5.7-7.6)
	Girls	3 923	13.2 (12-14.4)	7.7 (6.8-8.7)	6.3 (5.4-7.2)
Province	Ryongyang	840	15.8 (13.7-18)	9.0 (6.9-11.2)	5.6 (4.1-7.1)
	North Hamgyong	840	18.0 (14.8-21.1)	12.3 (9.5-15)	7.0 (4.4-9.7)
	South Hamgyong	840	14.5 (12-17)	8.9 (6.7-11.2)	6.2 (4.3-8.1)
	Kangwon	840	14.9 (12.5-17.2)	8.5 (6.4-10.5)	8.6 (6.9-10.3)
	Jagang	840	15.0 (12.4-17.6)	9.5 (7.2-11.8)	6.2 (4.4-7.9)
	North Phyongan	840	11.3 (8.8-13.8)	7.9 (6.1-9.6)	7.5 (5.3-9.7)
	South Phyongan/Nampo	840	11.5 (9.3-13.8)	8.0 (6.1-9.9)	4.6 (3.3-6)
	North Hwanghae	840	16.3 (13.4-19.3)	7.4 (5.7-9.1)	8.0 (5.8-10.2)
	South Hwanghae	840	11.0 (8.4-13.6)	7.0 (5-9)	6.3 (4.4-8.2)
	Pyongyang	480	15.8 (12.4-19.3)	8.1 (5.5-10.7)	6.5 (3.9-9)
Age group (month)	0-5	647	9.8 (6.9-12.7)	9.8 (6.9-12.7)	6.7 (4.4-9.1)
	6-11	939	11.1 (8.9-13.3)	11.1 (8.9-13.3)	8.7 (6.7-10.8)

12-23	1 631	11.8 (10.1-13.5)	11.8 (10.1-13.5)	6.7 (5.3-8.2)
24-35	1 671	8.6 (7-10.1)	8.6 (7-10.1)	6.3 (4.9-7.6)
36-47	1 558	6.6 (5.1-8)	6.6 (5.1-8)	7.3 (5.8-8.8)
48-59	1 594	9.7 (8.1-11.3)	5.1 (3.8-6.4)	4.3 (3.3-5.4)

6.2 Women

MUAC is also used also in adults to diagnose acute malnutrition. Unlike BMI (body mass index) it is not affected by pregnancy. Two commonly used thresholds²³ for program admissions are 180mm for severe acute malnutrition and 210mm for moderate. The prevalence of MUAC < 225 mm is also presented as it was used in the last MICS survey (2009) and still in use in several countries.

The main results concerning the mothers of selected children, aged 15-49 years, are presented in tables 11.

Tab. 11: Proportion of women aged 18-49 years with low MUAC per province and age group. DPR Korea, October 2012.

	Unweighted count	MUAC < 210 mm (95% CI)	MUAC ≥ 180 and < 210 mm (95% CI)	MUAC < 180 mm (95% CI)	MUAC < 225 mm (95% CI)	
Total	7 622	5.3 (4.7-5.9)	5.0 (4.4-5.6)	0.3 (0-1)	23.2 (21.9-24.5)	
Province	Rygangang	801	6.6 (5-8.3)	6.1 (4.5-7.8)	0.5 (0-1)	23.1 (19.9-26.3)
	North Hamgyong	813	5.9 (4.2-7.6)	5.5 (3.9-7.2)	0.4 (0-0.8)	19.9 (17-22.9)
	South Hamgyong	795	6.2 (4.3-8)	5.8 (4-7.6)	0.4 (0-0.8)	26.4 (22.6-30.2)
	Kangwon	790	6.1 (4.2-8)	5.8 (4-7.7)	0.3 (-0.1-0.6)	22.9 (19.2-26.6)
	Jagang	822	5.6 (4.1-7.1)	5.2 (3.8-6.7)	0.4 (0-0.8)	18.1 (15.1-21.2)
	North Phyongan	783	4.7 (3.1-6.3)	4.5 (2.9-6)	0.3 (-0.1-0.6)	21.5 (18-24.9)
	South Phyongan/Nampo	787	5.2 (3.1-7.1)	5.0 (3-6.9)	0.3 (-0.1-0.6)	22.2 (18-26.4)
	North Hwanghae	778	5.5 (3.7-7.4)	5.3 (3.6-6.9)	0.3 (-0.2-0.8)	26.7 (22.5-31)
	South Hwanghae	780	5.4 (3.9-6.9)	5.1 (3.6-6.6)	0.3 (-0.1-0.6)	28.2 (24.7-31.7)
	Pyongyang	473	3.8 (1.9-5.7)	3.6 (1.7-5.5)	0.2 (-0.2-0.6)	21.8 (17.5-26.1)
Age group (year)	15-19	1	0.0 (0-0)	0.0 (0-0)	0.0 (0-0)	0.0 (0-0)
	20-29	3 675	6.0	5.8	0.2	25.2

²³ Unlike MUAC in children there is no international consensus on MUAC thresholds in adults.

		(5-6.9)	(4.9-6.7)	(0.1-0.3)	(23.4-27.1)
30-39	3 648	4.8 (4-5.5)	4.4 (3.7-5.1)	0.4 (0.2-0.6)	21.4 (19.7-23)
40-49	298	4.1 (1.8-6.4)	3.8 (1.5-6)	0.3 (-0.3-1)	21.8 (16.4-27.2)

Anaemia prevalence assessed through haemoglobin concentration in mothers of surveyed children is presented in table 12.

Tab. 12: Prevalence of anaemia (Hb < 11 g/dL if pregnant and <12.0 g/dL if non-pregnant) in women aged 15-49 years per province and age group. DPR Korea, October 2012.

		Unweighted count	Percent anaemic (95% CI)
Total		5 843	31.2 (29.6-32.9)
Province	Rygang	522	36.0 (31.7-40.3)
	North Hamgyong	520	33.5 (28.3-38.6)
	South Hamgyong	527	33.8 (29.3-38.3)
	Kangwon	676	34.2 (29.2-39.1)
	Jagang	529	34.2 (29.6-38.8)
	North Phyongan	640	29.8 (24.8-34.9)
	South Phyongan/Nampo	666	28.7 (24.1-33.2)
	North Hwanghae	636	32.5 (29.1-36)
	South Hwanghae	680	31.5 (26.9-36)
	Pyongyang	447	28.9 (24.3-33.5)
Age group (year)	15-19	1	0.0 (0-0)
	20-29	2 816	31.8 (29.5-34.1)
	30-39	2 805	30.2 (28.1-32.3)
	40-49	221	38.7 (31.6-45.7)

As soon as a woman knows that she is pregnant she can benefit of a multi-micronutrient supplement (one tablet daily for 6 months) through the primary healthcare system. This supplement includes 15 different types of vitamins and minerals (see annex 3 for detailed composition), including iron, folic acid, iodine and vitamin A. The main purpose is to prevent anaemia and provide extra micronutrients for the pregnancy requirements. Results are

presented in table 13. Duration in month of the supplementation will be presented in the final report.

Tab. 13: Proportion of women aged 15-49 who received the micronutrient supplement during pregnancy per province and age group. DPR Korea, October 2012.

		Unweighted count	Percent (95% CI)
Total		3 110	74.0 (72.1-75.8)
Province	Ryganggang	334	55.1 (50-60.1)
	North Hamgyong	328	62.5 (57.9-67.1)
	South Hamgyong	322	69.6 (64.3-74.8)
	Kangwon	346	76.9 (72.3-81.5)
	Jagang	325	65.5 (60.6-70.5)
	North Phyongan	310	76.1 (70.5-81.7)
	South Phyongan/Nampo	334	72.5 (66.6-78.3)
	North Hwanghae	313	73.2 (67.3-79)
	South Hwanghae	299	80.3 (74.3-86.2)
	Pyongyang	199	88.4 (83.7-93.2)
	women age	15-19	1
20-29		1 999	73.7 (71.3-76.1)
30-39		1 047	74.3 (71.5-77)
40-49		63	78.7 (68.3-89.1)

7. DISCUSSION

Stunting (Chronic malnutrition)

Global Chronic Malnutrition (GCM) or Stunting prevalence is 27.9% at national level and is considered as a ‘medium’ public health significance according to WHO standards. Jaggang, South Hamgyong and Ryanggang are ‘high’ category, with Ryanggang being near to the ‘very high’ threshold. Apart from Pyongyang and Ryanggang all other Provinces have very similar level of chronic malnutrition.

Tab. 14: Classification of public health significance of chronic malnutrition prevalence (Stunting) (% of children with H/A <-2 z-score).

WHO (2001)	Low	Medium	High	Very high
	<20%	20-29%	30-39%	≥40%

At national level boys are slightly more at risk than girls of chronic malnutrition and, as expected, older boys have higher prevalence than younger ones. The final report will provide further insight into these findings.

This GCM situation even if considered as a medium public health issue at national level it is still preoccupying. Chronic malnutrition which is also called stunting or growth faltering brings irreversible damages on the children. The important consequences on children’s development, their learning capacity and their productivity at adult age can affect the development of the country. The inter-generational effect of stunting needs also to be considered. A woman of short stature and low weight is at more risk to get a new born of short stature and lower weight. An infant or a young child being exposed to a vicious cycle of repeated diseases and a food intake of low diversity / quality is at more risk of growth faltering. The “window of opportunity” to prevent stunting is during the pregnancy and the first 2 years of life of the child, cumulating a critical period for intervention of 1 000 days. Unfortunately, after two years of age, it is extremely difficult to intervene and catch-up growth, leading to irreversible damages in the development of the child.

In DPRK, some interventions are already targeting pre-pregnant, pregnant and lactating women and children (mainly micronutrients supplementation and fortified food support). However, more concerted multi-sectoral efforts need to be considered to have more impact on children’s development and women’s nutrition.

Wasting (Acute Malnutrition):

Global Acute Malnutrition (GAM), based on Weight for Height did not show significant difference between sexes ($p > 0.4$) and among age groups ($p > 0.4$). The national prevalence of GAM is 4%, which is therefore ‘acceptable’ according to the public health significance cut-offs²⁴ for global acute malnutrition as shown in Table 14.

Nevertheless, two regions, Ryanggang and Jaggang fall in the ‘poor’ category while Pyongyang Province is less worrisome .

Apart from Pyongyang (GAM 2.3%), most other regions show similar GAM prevalence, below or around the 5% threshold. According to WHO suggested classification, the acute

²⁴ WHO (2000). The Management of Nutrition in Major Emergencies. WHO, Genève.

malnutrition situation in these regions is at the limit between acceptable and poor situation.²⁵ Several factors such as sufficient WASH facilities and practices, access to essential medications and food security affect children's daily life.

It is important to note some key aspects about interventions and several factors in DPRK:

- The interventions on agriculture, food security, health, WASH and nutrition all play a major role in the nutritional status in children and women. It is highly possible that a decrease of any of these interventions could affect negatively the nutritional status of children.
- The data collection was conducted during the harvest season where the food diversity and food intake of children may be somewhat higher than in other seasons with a wider availability to wild food and consumption of household authorized production.
- It is known through medical records that the acute malnutrition is decreasing in September compared to June-July-August period.
- In 2012, the agricultural season was less affected by environmental challenges (floods, dryspell, drought) as compared to 2011 allowing then the Government to maintain an average food ration of 370g (rice, maize, potato, wheat, barley or soya depending on the season and the location) per day per person almost throughout the year (350-400g).

The public health significance thresholds and the international triggers for emergency operations, must be used sensibly for making decision concerning nutrition-related programs. Acutely malnourished children have a much higher risk of mortality than normal children and do not grow properly during acute malnutrition episode putting them at higher risk of stunting and thus negatively impacting on their mental development²⁶. Regardless of malnutrition prevalence, national institutions should ensure a regular identification of all acutely malnourished children and provide proper treatment. This illustrates the importance of regular monitoring of the nutritional status in the most affected areas.

The prevalence of GAM based on MUAC is similar to the Weight for Height²⁷ results, showing differences between gender (p from *chi-square* <0.001) or age groups (p from *chi-square* <0.001).

Tab. 15: Classification of public health significance of acute malnutrition prevalence (% of children with W/H <-2 z-score and/or oedema).

	Acceptable	Poor	Serious	Critical
WHO (2000)	<5%	5-9%	10-14%	≥15%

This survey is not designed to count the number of children with chronic or acute malnutrition. However, extrapolation can still be done based on the actual population of children aged 0-59 months (population at the end of 2011: 24 488 861 with 1 705 620 children 0-59 months (about 6.96% of population).

Chronic malnutrition does not vary during the year and will show variation over many years instead of months as opposed to acute malnutrition. If the extrapolation is done with chronic malnutrition, it is then estimated that, at the time of the survey, 475 868 children are stunted (122 805 being severely stunted). There are about 4523 Ri/ Up/Ku/Dong (village / urban

²⁵ WFP-UNHCR (2011). Guidelines For Selective Feeding: The Management Of Malnutrition In Emergencies January 2011.

²⁶ Black et al, Lancet 2008.

²⁷ However this does not means that the two methods identify the same children.

neighbourhood) in DPRK. This means that in every Ri/Up/Ku/Dong, there are about 105 stunted children (27 being severely stunted).

At the time of the survey (September 17th to October 17th), still 68 225 children were acutely malnourished (10 234 being severely acute malnourished) with about 15 children with acute malnutrition in every Ri/Up/Ku/Dong (2 being in a severe status). It is likely that each Province may have Counties or part of Counties with either higher or lower prevalence of acute malnutrition. This result of acute malnutrition varies monthly and even weekly according to season and the accumulated number must be considered for the whole year.

Other aspects in children:

According to WHO²⁸ classification of severity in table 16 DPRK presents a 'moderate' level of anaemia prevalence and disaggregated provincial figures are also in this same category.

Tab. 16: Classification of public health significance of anaemia (% of children with Hb < 11.0 g/dL).

	Normal	Mild	Moderate	Severe
WHO (2001)	<5%	5-19%	20-39%	≥40%

A high peak of anaemia was found in infants below 2 years of age, which may depend on inadequate breastfeeding and complementary feeding practices, including low nutrient quality of complementary food, especially in iron. Prevalence of infectious disease may also be a reason although prevalence of diarrhoea and/or acute respiratory infections was not particularly high in this age group. Deworming and micronutrient supplementation (or distribution of fortified food support) strategies need to be revised to improve effectiveness of interventions in the fight against anaemia in children under 2 years.

Vitamin A supplementation was almost universal, as on average almost 98% of mothers reported that their child had received a capsule in the last 6 months. No significant differences among Provinces, age groups or sexes stand out. Vitamin A is distributed two times per year through the Child Health Days. This result is in accordance with the coverage reported in the MICS 2009.

Morbidity in children was reported by 14% of respondents. No international cut-off exists for the public health importance of this level. Comparison with previous survey data will tell more.

Mother's nutritional status:

The mothers' situation is very similar to the one in their children. Acute malnutrition prevalence, based on MUAC < 210mm, was 5.3% and anaemia 31.2%. Compared to MICS 2009 and Nutrition Assessment 2004 a slight reduction in acute malnutrition (based on MUAC < 225 mm) (from 25.6% to 23.2%) and anaemia has been found but still no statistically significant difference was noted. These data will be disaggregated by pregnancy status in the final report.

Multi-micronutrient supplementation during pregnancy was reported by 74%²⁹ of interviewed mothers, ranging from 55% in Ryanggang to 80.3% in Pyongyang. The duration of the

²⁸ WHO (2001). Iron Deficiency Anaemia Assessment, Prevention, and Control. A guide for programme managers.

²⁹ Compliance with the therapy will be reported in the final report.

supplementation will be further explored in the final report. This program should also be strengthened to achieve a wider coverage as it has proven a highly effective public health intervention to prevent anaemia.

Historic of malnutrition in DPRK

In the table 17 the main nutrition findings of previous surveys are set out for comparison. A decrease trend in malnutrition and anaemia is apparent although further analysis is needed to assess trends in the nutritional status of the population. Moreover, in some cases different coverage, sampling methods, standards and age groups were used making comparisons uneasy.

Tab. 17: Historical records of nutrition and health surveys in DPRK since 1998.

Survey	Month and year of data collection	Coverage	Sample size for acute malnutrition	GCM	SCM	GAM	SAM	Global Under weight	Vitamin A children	Anaemia children	Anaemia women
Nat. Nut. Survey 2012	Sep.-Oct. 2012	National	8035	27.9 %	7.2%	4.0%	0.6 %	15.2%	97.8%	28.7%	31.2%
MICS 3	Sep.-Oct. 2009	National	2172	32.4 %	8.4%	5.2%	0.5 %	18.8%	98.0%	NA	NA
DPRK Nutrition Assessment*	October 2004	7 Provinces and 1 Municipality	4795	37.0 %	12.2 %	7.0%	1.8 %	23.3	98.2%	NA	34.7%
DPRK Nutrition Assessment*	October 2002	National	5994	39.2 %	NA	8.1%	2.7 %	20.1	98.6%	NA	33.6%
MICS 2†	May 2000	National	4175	45.2 %	22.4 %	10.4 %	4.2 %	27.9	80.2%	NA	NA
MICS 1‡	Sep.-Oct. 1998	130 over 212 national counties	1762	62.3 %	NA	15.6 %	NA	60.6	NA	31.7%	34.7%

* NCHS 1977 standards. Anthropometry for children from 0 to 7 years. Anaemia threshold in women 12.0 g/dL. Anaemia only in mothers of under 2. Vitamin A in children 6-24 months

** NCHS 1977 standards. Anthropometry for children from 0 to 7 years. Vitamin A in children 6-24 months

† NCHS 1977 standards. Anthropometry children 0-59 months

‡ NCHS 1977 standards. Anaemia and anthropometry in children aged 6 to 84 months.

Figure 1 illustrates more specific the changes in GAM from last MICS 2009 survey. GAM levels are plotted by province. Error bars represent the confidence intervals and allows for a first assessment of significance of variation³⁰. As it is apparent from the figure, there is slight, consistent, dropping in malnutrition estimates across all Provinces. However these reductions are not statistically significant. Large confidence intervals in MICS survey are due to the smaller sample size.

³⁰ The more the confidence intervals of two estimates overlap, the more that difference is likely due to chance and so is not significant. If confidence intervals do not overlap

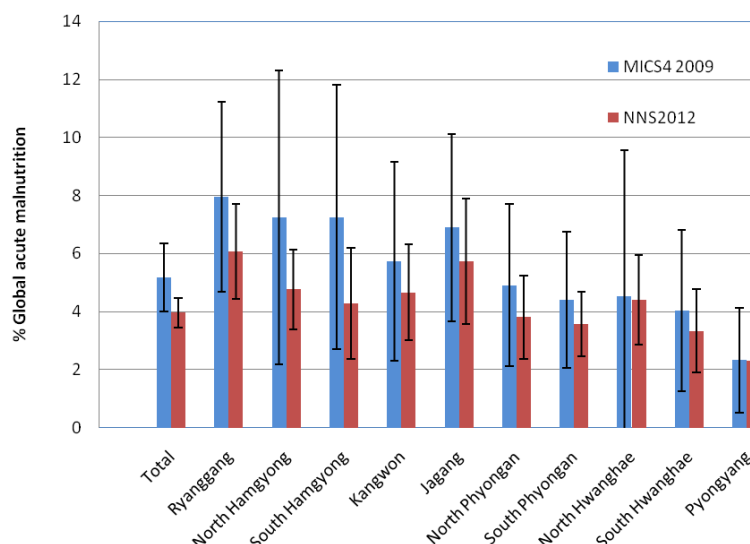


Fig. 1 : GAM prevalence and confidence intervals of MICS 2009 and National Nutrition Survey 2012 surveys.

The Millennium Development Goals (MDG) 1 was to eradicate extreme poverty and hunger between 1990 and 2015³¹. Three indicators should be used to assess achievement of a country for this MDG:

- 1- Decrease by 50% the proportion of people who suffer from hunger
- 2- Decrease by 50% the proportion of population below the minimum level of dietary energy consumption
- 3- Decrease by 50% the prevalence of underweight children under five years of age

The actual survey was not designed to bring information on the objectives 1 and 2. Despite the difficulties to compare the different surveys completed since 1998, this National Nutrition Survey allows to look at the situation for the third indicator related to the underweight prevalence.

The table 17 presents the prevalence of underweight obtained in the different nutritional surveys since 1998. The achievement in decreasing underweight over time, as well as acute and chronic malnutrition, are primarily due to concerted efforts between Government, UN Agencies and others partners in DPRK in addressing the different causes of malnutrition. But malnutrition still remains and requires continued and strengthened interventions on acute and chronic malnutrition in order to have more impact on the underweight prevalence.

³¹ United Nations Development Group. Thematic Paper on MDG 1: Eradicate extreme poverty and hunger

8. CONCLUSIONS AND RECOMMENDATIONS

Global Chronic Malnutrition (GCM) or Stunting prevalence is 27.9% at national level and is considered as a 'medium' public health significance according to WHO standards. It is estimated that 475 868 children are stunted in DPRK. Stunting has irreversible impact on the development of children and as a result on the Country development. The prevention of stunting in early life (starting during or even before pregnancy) as well as the prevention of anaemia in mothers and their children (mainly those under 2 years old) through different multi-sectoral interventions combining nutrition, health, WASH, social protection, food security and agriculture requires more efforts and resources.

The acute nutritional status of children is modestly improved since the last MICS assessment in 2009. The situation is not critical and does not suggest emergency operations. However, attentions need to be paid to such factors as essential medicines, WASH situation and food security which affect the vulnerable children. The presence of acute malnutrition and anaemia in women is important as these women should be targeted with more specific interventions during pregnancy and lactation to offer the best start as possible for their children. Programmes like the management of acute malnutrition at hospital and community levels (CMAM) need to be continued and expanded to allow early identification of these children and cover a maximum of children. At the moment of the survey, 68 225 children were acutely malnourished in the Country and 10 234 of them were severely affected. On-going monitoring of the nutritional situation is important to identify the trends and changes in the situation and bring support as soon as possible when the situation is negatively changing³².

The prevalence of anaemia is quite high in children and women and requires more attention as it has important impact on the outcome of pregnancy and children development. Causal relationships cannot be extrapolated from this survey but further analysis will be presented in the final to suggest possible relationship between anaemia, food diversity and nutritional status.

In reference to the MDG 1, the achievement in decreasing underweight over time, as well as chronic and acute malnutrition, are primarily due to concerted efforts between the Government, the UN Agencies and others partners in DPRK in addressing the different causes of malnutrition. But malnutrition still remains and requires continued and strengthened interventions on acute and especially chronic malnutrition in order to have more impact on the underweight prevalence and to ensure a more optimal growth to the children.

³² MUAC screenings, nutrition surveillance in clinics and hospitals and surveys are the three main methods of nutritional assessment.

9. ACKNOWLEDGEMENTS

It was the first time for the CBS to conduct national nutrition survey in September and October 2012 based on SMART survey. SMART is a survey methodology which enables to monitor and evaluate nutrition and health status of the children and mothers in emergencies.

2012 DPRK national nutrition survey was done successfully with close relationship between national agencies as CBS, ICN, MoPH, NCC, and international organizations as UNICEF, WFP and WHO.

Many people from CBS, every provincial and city, county people's committee and statistical offices, and ri/up/ku/dong office worked hard for success of the survey.

2012 nutrition survey indicators gave technical assistance for scientific accuracy of the survey to nutrition persons from ICN by evaluating nutrition and health status of the children and mothers.

We pay thanks to all the agencies and people for the assistance to the 2012 survey.

Also special thanks are expressed to the respondents who answered personal questions of the enumerators with deep understanding and generosity. Without their voluntary and positive participation, this survey could not be done properly.

We show gratitude to UNICEF, WFP and WHO for giving support to successfully conduct the survey.

Sampling, data processing procedure and processing based on standardized SMART methodology provided by UNICEF enhanced CBS nutrition survey team's capacity to analyze more profoundly about the general sampling survey and gave a lot of help for future statistics.

In the whole process of the 2012 nutrition survey, UNICEF consultant David Rizzi endeavoured for training, sampling, accuracy of data processing and tabulation, and preliminary report writing and etc.

We are grateful for all the technical, financial assistance by UNICEF during the whole survey period and devoted efforts of UNICEF nutrition team in all stages of the nutrition survey for successful implementation.

Annex 1 - Data appraisal for key indicators per Province, DPR Korea, October 2012

		N	Mean ± SD	Design effect		Missing values		Out of range values	
				Variable	Value	Count	Percent	Count	Percent
Total	W/H	8 035	-0.30 ± 1.00	< -2 z-s	1.36	5	0.1	0	0.0
	W/A	8 036	-0.94 ± 1.09	< -2 z-s	1.92	4	0.0	0	0.0
	H/A	8 036	-1.30 ± 1.29	< -2 z-s	2.45	4	0.0	0	0.0
	MUAC children	7 382	145.24 ± 11.78	< 125 mm	1.24	11	0.1	1	0.0
	Hb children*	2 773	11.46 ± 1.30	< 11.0 g/dL	1.74	4620	62.5	0	0.0
	MUAC women	7 622	238.72 ± 20.52	< 210 mm	1.46	27	0.4	0	0.0
	Hb NPW**	5 745	-0.30 ± 1.00	< 12 g/dL	1.81	1904	24.9	3	0.0
Ryanggang	W/H	840	-0.29 ± 1.05	< -2 z-s	.30	0	0.0	0	0.0
	W/A	840	-1.14 ± 1.13	< -2 z-s	.45	0	0.0	0	0.0
	H/A	840	-1.66 ± 1.31	< -2 z-s	.51	0	0.0	0	0.0
	MUAC children	762	140.5 ± 11.22	< 125 mm	.28	0	0.0	0	0.0
	Hb children	213	11.16 ± 1.33	< 11.0 g/dL	.30	549	72.0	0	0.0
	MUAC women	801	239.47 ± 21.27	< 210 mm	.26	6	0.7	0	0.0
	Hb NPW	511	12.23 ± 1.32	< 12 g/dL	.32	296	36.7	0	0.0
North Hamgyong	W/H	840	-0.38 ± 0.97	< -2 z-s	.87	0	0.0	0	0.0
	W/A	840	-1.03 ± 1.02	< -2 z-s	1.08	0	0.0	0	0.0
	H/A	840	-1.35 ± 1.33	< -2 z-s	1.73	0	0.0	0	0.0
	MUAC children	770	142.12 ± 10.16	< 125 mm	1.03	0	0.0	0	0.0
	Hb children	223	11.67 ± 1.43	< 11.0 g/dL	1.54	547	71.0	0	0.0
	MUAC women	813	241.39 ± 22	< 210 mm	.99	0	0.0	0	0.0
	Hb NPW	516	12.37 ± 1.38	< 12 g/dL	1.46	297	36.5	0	0.0
South Hamgyong	W/H	840	-0.36 ± 0.98	< -2 z-s	2.48	0	0.0	0	0.0
	W/A	840	-1.04 ± 1.14	< -2 z-s	2.42	0	0.0	0	0.0
	H/A	840	-1.39 ± 1.37	< -2 z-s	2.50	0	0.0	0	0.0
	MUAC children	782	144.97 ± 11.86	< 125 mm	1.91	0	0.0	0	0.0
	Hb children	225	11.26 ± 1.2	< 11.0 g/dL	1.78	557	71.2	0	0.0
	MUAC women	795	236.06 ± 19.72	< 210 mm	1.55	7	0.9	0	0.0
	Hb NPW	513	12.52 ± 1.34	< 12 g/dL	1.47	289	36.0	0	0.0
Kangwon	W/H	836	-0.46 ± 0.93	< -2 z-s	.82	4	0.5	0	0.0
	W/A	836	-1.06 ± 1.1	< -2 z-s	1.06	4	0.5	0	0.0
	H/A	836	-1.29 ± 1.38	< -2 z-s	1.57	4	0.5	0	0.0
	MUAC children	766	142.35 ± 10.94	< 125 mm	.68	2	0.3	0	0.0
	Hb children	270	11.02 ± 1.16	< 11.0 g/dL	.82	498	64.8	0	0.0
	MUAC women	790	239.21 ± 20.23	< 210 mm	.79	0	0.0	0	0.0
	Hb NPW	667	12.36 ± 1.13	< 12 g/dL	1.08	123	15.6	0	0.0
Jagang	W/H	839	-0.33 ± 1.03	< -2 z-s	1.01	1	0.1	0	0.0
	W/A	840	-1.08 ± 1.06	< -2 z-s	.73	0	0.0	0	0.0
	H/A	840	-1.48 ± 1.3	< -2 z-s	.78	0	0.0	0	0.0
	MUAC children	751	143.03 ± 13.86	< 125 mm	.63	2	0.3	0	0.0
	Hb children	219	11.25 ± 1.28	< 11.0 g/dL	.58	534	70.9	0	0.0
	MUAC women	822	241.85 ± 21.35	< 210 mm	.47	6	0.7	0	0.0
	Hb NPW	517	12.25 ± 1.11	< 12 g/dL	.69	311	37.6	0	0.0
North Phyongan	W/H	840	-0.5 ± 0.91	< -2 z-s	1.40	0	0.0	0	0.0
	W/A	840	-1.13 ± 1.02	< -2 z-s	2.87	0	0.0	0	0.0
	H/A	840	-1.38 ± 1.27	< -2 z-s	3.56	0	0.0	0	0.0
	MUAC children	790	145.94 ± 11.87	< 125 mm	1.54	0	0.0	0	0.0

Preliminary Report, National Nutrition Survey 2012, DPRK

		N	Mean ± SD	Design effect		Missing values		Out of range values	
				Variable	Value	Count	Percent	Count	Percent
South Phyongan/Na mpo	Hb children	315	11.29 ± 1.08	< 11.0 g/dL	1.57	475	60.1	0	0.0
	MUAC women	783	240.01 ± 19.91	< 210 mm	1.30	0	0.0	0	0.0
	Hb NPW	630	12.34 ± 1.41	< 12 g/dL	2.17	153	19.5	0	0.0
	W/H	840	-0.3 ± 0.95	< -2 z-s	1.27	0	0.0	0	0.0
	W/A	840	-0.91 ± 1.02	< -2 z-s	2.81	0	0.0	0	0.0
	H/A	840	-1.24 ± 1.18	< -2 z-s	3.80	0	0.0	0	0.0
	MUAC children	770	147.34 ± 11.86	< 125 mm	1.57	1	0.1	0	0.0
	Hb children	285	11.46 ± 1.35	< 11.0 g/dL	2.30	486	63.0	0	0.0
	MUAC women	787	239.7 ± 20.59	< 210 mm	2.53	1	0.1	0	0.0
North Hwanghae	Hb NPW	659	12.27 ± 0.99	< 12 g/dL	2.79	129	16.4	0	0.0
	W/H	840	-0.19 ± 1.03	< -2 z-s	1.07	0	0.0	0	0.0
	W/A	840	-0.94 ± 1.06	< -2 z-s	1.01	0	0.0	0	0.0
	H/A	840	-1.44 ± 1.15	< -2 z-s	1.73	0	0.0	0	0.0
	MUAC children	782	144.87 ± 11.44	< 125 mm	.71	2	0.3	0	0.0
	Hb children	323	11.43 ± 1.32	< 11.0 g/dL	.74	461	58.8	0	0.0
	MUAC women	778	236.68 ± 19.24	< 210 mm	1.15	7	0.9	0	0.0
	Hb NPW	624	12.38 ± 1.24	< 12 g/dL	.71	161	20.5	3	0.4
	W/H	840	-0.28 ± 1.02	< -2 z-s	1.28	0	0.0	0	0.0
South Hwanghae	W/A	840	-0.88 ± 1.1	< -2 z-s	1.44	0	0.0	0	0.0
	H/A	840	-1.21 ± 1.28	< -2 z-s	1.40	0	0.0	0	0.0
	MUAC children	778	144.31 ± 10.83	< 125 mm	.89	1	0.1	0	0.0
	Hb children	285	11.31 ± 1.01	< 11.0 g/dL	1.12	494	63.4	0	0.0
	MUAC women	780	231.92 ± 15.3	< 210 mm	.81	0	0.0	0	0.0
	Hb NPW	666	12.4 ± 1.26	< 12 g/dL	1.49	114	14.6	0	0.0
	W/H	480	0.03 ± 1.09	< -2 z-s	2.17	0	0.0	0	0.0
Pyongyang	W/A	480	-0.51 ± 1.15	< -2 z-s	2.73	0	0.0	0	0.0
	H/A	480	-0.97 ± 1.29	< -2 z-s	3.56	0	0.0	0	0.0
	MUAC children	431	148.75 ± 11.58	< 125 mm	1.85	3	0.7	1	0.2
	Hb children	415	11.72 ± 1.38	< 11.0 g/dL	2.54	19	4.4	0	0.0
	MUAC women	473	241.2 ± 22.56	< 210 mm	2.66	0	0.0	0	0.0
	Hb NPW	442	12.49 ± 1.42	< 12 g/dL	2.65	31	6.6	0	0.0

* Haemoglobin in children

** Haemoglobin non-pregnant women

Annex 2 - Children and Women questionnaire, DPR Korea, October 2012

Q1 – Nutrition/Health Children

Province : _____ Ri/Up/Gu/Dong: _____ WG/PC: _____ Date (yy/mm/dd): _____

C1-C8 CHILD IDENTIFICATION	
C1. Cluster number: _____	C2. Household number: _____
C3. Team's number: _____	C4. Child's ID: _____
C5. Child's name: _____	C6. Child's Sex (m/f): _____
C7. Birthday (yyyy/mm/dd): _____	C8. Child's age in months: _____

C09-C12 ANTHROPOMETRY			
<i>For all children between 0 and 59.9 months (muac from 6 months)</i>			
C9. Weight (Kg) ± 100g	_____ / _____ Kg	C10. Height (cm) ± 0.1cm	_____ / _____ cm
Shorts.....1	Pants.....1	W/H (z-score)	_____
T-shirt.....1	Diapers.....1		
C11. Oedema (y/n)	Yes1 No2	C12. MUAC (mm) 6 to 59.9 months old	_____ mm

C13-C14 MORBIDITY	
<i>For all children between 0 and 59.9 months</i>	
C13. HAS (NAME) BEEN SICK IN THE LAST 14 DAYS?	Yes1 No2 → Go to C15 DK8 → Go to C15
C14. WHAT DID (NAME) SUFFER OF ?	Diarrhea.....1 Cough, rapid breath., respiratory tract infection2 Other.....3

C15-C16 BREASTFEEDING	
<i>For all children between 0 and 23.9 months</i>	
C15. HOW LONG AFTER BIRTH DID YOU FIRST PUT (NAME) TO THE BREAST?	Immediately...000
<i>If respondent reports she put the infant to the breast immediately after birth, circle '000'. If less than 1 hour, circle '1' for hours and record '00' hours. If less than 24 hours, circle '1' and record number of completed hours, from 01 to 23. Otherwise, circle '2' and record number of completed days.</i>	Hours.....1 _____
	Days.....2 _____
C16. WAS (NAME) BREASTFED YESTERDAY DURING THE DAY OR AT NIGHT?	Yes1
	No2

C17-C18 HEMOGLOBIN CONCENTRATION, VITAMIN A	
<i>Only for children between 6 and 59.9 months</i>	
WE WOULD LIKE TO ASK YOU THE PERMISSION TO DO A BLOOD TEST FOR HEMOGLOBINE CONCENTRATION ON (NAME). THIS WILL CAUSE A LITTLE BIT OF PAIN. THERE IS NO RISK FOR HIS HEALTH THOUGH. WE WILL PROVIDE YOU THE RESULTS, SO IN CASE OF ANEMIA, YOU CAN SEEK CARE AT THE CLINIC.	<input type="checkbox"/> Yes, permission is given
	<input type="checkbox"/> No, permission is not given → Go to C18
C17. Haemoglobin concentration (g/dL)	_____ / _____ g/dL
<i>If Hb < 11 g/dL refer to the clinic.</i>	
C18. HAS (NAME) RECEIVED A VITAMIN A DOSE LIKE (THIS) WITHIN THE LAST 6 MONTHS?	Yes1 No2 DK8

C19 DIET

For children between 0 and 23.9 months

PLEASE DESCRIBE EVERYTHING THAT **(NAME)** ATE YESTERDAY DURING THE DAY OR NIGHT, WHETHER AT HOME OR OUTSIDE THE HOME.
 As the respondent recalls foods, underline the corresponding food and circle '1' in the column next to the food group. If the food is not listed in any of the food groups below, write the food in the box labeled 'other foods'. If foods are used in small amounts for seasoning or as a condiment, include them under the condiments food group.
 Once the respondent finishes recalling foods eaten, read each food group where '1' was not circled, ask the following question and circle '1' if respondent says yes, '2' if no and '8' if don't know. YESTERDAY DURING THE DAY OR NIGHT, DID **(NAME)** DRINK/EAT ANY (FOOD GROUP ITEMS)?

Other foods - Please write down other foods in this box that respondent mentioned but are not in the list below:

		YES	NO	DK
Porridge, bread, rice, noodles and other foods made from grains	A	1	2	8
Pumpkin, carrots, sweet potatoes and other vitamine A rich vegetables (yellow or orange inside)	B	1	2	8
Potatoes and food made from potatoes	C	1	2	8
Chrisantemum leaves, spinach, broccoli, sea weed and other dark green vegetables	D	1	2	8
Apricot, peach	E	1	2	8
Any other vegetable and fruit (cabbage, cucumber, tomato, eggplant, apple, pear, watermelon, etc)	F	1	2	8
Liver, kidney, heart, or other organ meats	G	1	2	8
Any meat, such as beef, pork, lamb, goat, chicken, or duck	H	1	2	8
Eggs of all sorts	I	1	2	8
Fresh or dried fish, shellfish or seafood	J	1	2	8
Any food made from beans, peas, lentils, nuts ,or seeds	K	1	2	8
Breastmilk	L	1	2	8
Animal milk (fresh milk, milk powder, infant formula, tinned milk), yogurt, other milk products	M	1	2	8
Cheese	N	1	2	8
Oil, butter, or foods made with any of these	O	1	2	8
Sweets, honey, caramel, chocolate, biscuits, cakes and other candy	P	1	2	8
Drinks (tea, cofee, coke, fanta, sprite, tonic, etc.)	Q	1	2	8
Water	R	1	2	8
Fruit juice (strawberry, apple, pear, etc)	S	1	2	8
Clear broth, thin soup	T	1	2	8
Condiments such as pepper, parsley, salt, soy sauce, garlic, fish powder, etc	U	1	2	8
Other foods	V	1	2	8

Q2 – Mothers

Province : _____ Ri/Up/Gu/Dong: _____ WG/PC: _____ Date (yy/mm/dd): _____

M1-M6 MOTHER IDENTIFICATION	
M1. Cluster number: _____	M2. Household number: _____
M3. Team's number: _____	M4. Woman's ID: _____
M5. Woman's name:	M6. Woman's age in years: _____
M7. Pregnant Yes1 No2	

M8 - M9 MICRONUTRIENT SUPPLEMENTATION	
<i>Only for women who gave birth in the last 23.9 months</i>	
M8. DURING THE PREGNANCY FOR THIS CHILD, DID YOU TAKE MICRONUTRIENT TABLETS? <i>Show common type of tablet</i>	Yes1 No2 → go to question M10 DK8 → go to question M10
M9. FOR HOW MANY MONTHS DID YOU TAKE MICRONUTRIENT TABLETS DURING THE PREGNANCY?	_____ months DK 99

M10 HEMOGLOBIN CONCENTRATION	
<i>For all women 15-49.9</i>	
WE WOULD LIKE TO ASK YOU THE PERMISSION TO DO A BLOOD TEST FOR HEMOGLOBINE CONCENTRATION. THIS WILL CAUSE A LITTLE BIT OF PAIN. THERE IS NO RISK FOR YOUR HEALTH THOUGH. WE WILL PROVIDE YOU THE RESULTS, SO IN CASE OF ANEMIA, YOU CAN SEEK CARE AT THE CLINIC.	<input type="checkbox"/> Yes, permission is given <input type="checkbox"/> No, permission is not given → Go to M7
<i>Refer to clinic if:</i> - pregnant women Hb < 11 g/dL - non-pregnant women Hb < 12 g/dL	M10. Haemoglobin _____ / _____ g/dl concentration

M11 MUAC	
<i>For women 18-49.9</i>	
M11. MUAC MEASURE (mm)	_____ mm

M12 DIET

For all women 15-49.9

PLEASE DESCRIBE THE FOODS (MEALS AND SNACKS) THAT YOU ATE YESTERDAY DURING THE DAY AND THE NIGHT, WHETHER AT HOME OR OUTSIDE THE HOME. START WITH THE FIRST FOOD EATEN IN THE MORNING.

Write down all food and drinks mentioned by the respondent. When the respondent has finished, probe for meals and snacks not mentioned, at home or outside.

Breakfast	Snack	Lunch	Snack	Dinner	Snack

When the respondent recall is complete, fill in the food groups based on the informations recorded above. For any food group not mentioned, ask the respondent if a food item from this group was consumed.

		YES	NO	DK
Porridge, bread, rice, noodles and other foods made from grains	A	1	2	8
Pumpkin, carrots, sweet potatoes and other vitamin A rich vegetables (yellow or orange inside)	B	1	2	8
Potatoes and food made from potatoes	C	1	2	8
Chisanemum leaves, spinach, broccoli, sea weed and other dark green vegetables	D	1	2	8
Other vegetables (cabbage, cucumber, tomato, eggplant, etc)	E	1	2	8
Apricot, peach (vitamin A rich fruits) and their juices	F	1	2	8
Other fruits (apple, pear, watermelon, etc) and their juices	G	1	2	8
Liver, kidney, heart, or other organ meats	H	1	2	8
Any meat, such as beef, pork, lamb, goat, chicken, or duck	I	1	2	8
Eggs of all sorts	J	1	2	8
Fresh or dried fish, shellfish or seafood	K	1	2	8
Any food made from beans, peas, lentils, nuts ,or seeds	L	1	2	8
Milk (fresh milk, milk powder, tinned milk), yogurt, cheese, other milk products	M	1	2	8
Oil, butter, or foods made with any of these	N	1	2	8
Sweets, honey, caramel, non-fruit juice (coke, fanta, sprite, tonic), chocolate, biscuits, cakes and other candy	O	1	2	8
Condiments and beverages such as pepper, parsley, salt, soy sauce, garlic, fish powder, tea, coffee, alcoholic beverages	P	1	2	8

Annex 3 – Composition of multi-micronutrient supplementation tablets for pregnant and lactating women, DPR Korea, October 2012

Micronutrient, film-coated tabs/PAC-1000

General Description:

Micronutrient tablets, film coated

Each tablet contains:

Retinol (vitamin A) 800 RE

Vitamin E 10 mg

Vitamin D 200 I.U.

Vitamin B1 1.4 mg

Vitamin B2 1.4 mg

Niacin 18 mg

Vitamin B6 1.9 mg

Vitamin B12 2.6 microgram

Folic Acid 400 microgram

Vitamin C 70 mg

Iron 30 mg (as iron fumarate or iron sulphate)

Zinc 15 mg (as zinc sulphate)

Copper 2 mg

Selenium 65 microgram

Iodine 150 microgram

Packed in a tamper-evident container of 1000 tablets.