

Democratic People's Republic of Korea
Final Report of the National Nutrition Survey 2012
September 17th to October 17th 2012



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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
HAZ	Height-for-age z-score
ICN	Institute of Child Nutrition, DPR Korea
IDDS	Individual dietary diversity score
IYCF	Infant and Young Child Feeding
MUAC	Mid upper arm circumference
MOPH	Ministry of Public Health
MAM	Moderate acute malnutrition
MCM	Moderate chronic malnutrition
MICS	Multiple indicator cluster survey
NCC	National Coordination Committee
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
WAZ	Weight-for-age z-score
W/H	Weight-for-height
WHZ	Weight-for-height z-score
WG/PC	Working Group / People's Cluster
WFP	World Food Programme
WHO	World Health Organisation

1. EXECUTIVE SUMMARY

The last nationwide survey that included nutrition indicators was the Multiple Indicator Cluster Survey (MICS) carried out in October 2009. It showed that 32.4% of children <5years (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 UNICEF supported 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 and areas so comparison of the findings with the national data is not possible but gives indication of seasonal child acute malnutrition based on MUAC 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 423 children in Pyongyang municipality and 812 children in all other provinces for most indicators.

The Table 1.1 shows the main results at national level.

Table 1.1: 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
Early initiation of breastfeeding	0 – 23.9 months	28.1	26.2-30.0
Exclusive breastfeeding	0 – 5.9 months	68.9	65.1-72.8
Timely introduction of solid, semi-solid and soft food	6 – 8 months	66.0	61.4-70.5
Mean number of food groups consumed (maximum 7 food groups)	6 – 23.9 months	2.5	2.4-2.6
Minimum dietary diversity (consumption of 4 out of 7 food groups)	6 – 23.9 months	26.5	24.0-28.9
Women			
Low MUAC (< 225 mm)	15 – 49 years	23.2%	21.9-24.5

¹Prevalence 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.

²8 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.

³Standardised 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).

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

(< 210 mm)	15-49 years	5.3%	4.7-5.9
Anaemia	15-49 years	31.2%	29.6-32.9
Multi-micronutrient supplementation for at least 6 months during pregnancy	15-49 years	26.9%	24.6-29.1
Mean number of food groups consumed (maximum 9 food groups)	15-49 years	3.6	3.5-3.6
Minimum Dietary Diversity (consumption of at least 4 out of 9 food groups)	15-49 years	49.6	47.7-51.4

Chronic malnutrition, despite a modest drop since MICS 2009 (from 32.3% to 27.9% at national level) remains a 'medium' public health concern⁵. Stunting has irreversible impact on the development of children and as a result also 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.

Stunting does not vary according to sex in DPRK but increased up to 2 years old before reaching a plateau at 3 years old. These results highlight the need to focus interventions on the children under 2 years mainly on the promotion of adequate breastfeeding and complementary feeding practices which have important impact on children's growth and learning capacity.

The survey also shows a picture of the acute malnutrition status of children modestly improving since 2009. The situation is not critical and does not suggest emergency operations. However, attention needs to be paid to such factors as essential medicines, Water, Sanitation and Hygiene (WASH) situation and food security which affect the vulnerable children. Programmes like the management of acute malnutrition at hospital and community levels (CMAM) for the treatment of severe acute malnutrition need to be continued and expanded and the treatment of moderate acute malnutrition should be considered. 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 changing⁶.

The presence of low MUAC (<225 mm or <210 mm) and anaemia in women is also of concern as it could have negative impact on pregnancy outcomes. More work is needed to improve the duration of the multi-micronutrient supplementation in pregnant women and to address the low food diversity. Even if women's food diversity needs improvement, it is better than the children's food diversity. Promoting the use of their own available food for their children aged 6 months and more could help mothers to improve food diversity in children.

In reference to the Millennium Development Goal (MDG) 1⁷, the achievement in decreasing underweight over time (from 60.6% in 1998 (MICS1) to 15.5% in this National Nutrition 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 such as those related to agriculture, food security, essential medicines and immunization, nutrition and water, sanitation and hygiene. But malnutrition still remains and requires continued and strengthened interventions on chronic and acute malnutrition in

⁵WHO, 2001. Low <20%, medium 20-29%, high 30-39% and very high ≥40%

⁶MUAC screenings, nutrition surveillance in clinics and hospitals and surveys are the three main methods of nutritional assessment.

⁷MDG1 is to eradicate extreme poverty and hunger between 1990 and 2015. One of the indicators of this MDG is to decrease by 50% the prevalence of underweight in children under five years of age.

order to have more impact on the underweight prevalence and to ensure a more optimal growth to the children and an adequate nutritional status for their mothers.

2. INTRODUCTION

DPR Korea has a surface of approximately 123,138 km², 80% of which is made up of mountains and uplands. The total population is 24,488,861⁸. 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 concentrated during the spring and most crops are harvested from September to October. Main foods produced are, in order of decreasing production figures⁹, rice, maize, potatoes and soybeans.

In 2011, the under-five mortality was 25.2/1,000 while the infant mortality ratio was 18.5/1,000. The estimated mortality for children did not change over the last five years. From 2008 to 2010, the maternal mortality ratio decreased slightly from 85.1/100,000 to 76/100,000¹⁰.

Primary healthcare is provided at Ri/Up/Ku/Dong¹¹ hospitals or clinics where the number of doctors appointed depend on the population (one doctor is in charge of approximately 130 households i.e. approximately 39 children)¹². 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 has already 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 promoting the importance 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 are available country wide. These interventions could be improved and extended to community interventions to strengthen the counselling on infant and young child and women's feeding practices.

The management of severe acute malnutrition through the Community Management of Acute Malnutrition (CMAM) approach 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 on-going for more than 12 years. This approach combines treatment at the hospital for the severe acute malnourished children with medical complications and the treatment at the community level for the cases who does not present medical complications. In 2011, CMAM for severe acute malnutrition was established in 50 counties of North and South Hamgyong, 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. Besides these activities, in 2011 and 2012, children aged 6 months to 6

⁸Data released by CBS in June 2012; number of population at the end of 2011. (Official report to be published in 2013)

⁹FAO, 2011-2012 agricultural seasons.

¹⁰2011 Data released by CBS in June 2012.(Official report to be published in 2013)

¹¹Ri/Up/Ku/Dong are the smallest administrative units in DPR Korea

¹²Medium term strategic plan for health, DPR Korea, 2012

years living in at least 85 Counties, spread over 9 provinces, received nutritious meals at child institutions (6 months to 16 years in orphanages) while pregnant and lactating women are also receiving nutritious food. These interventions could also have influenced the data on acute malnutrition.

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 took place 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 being 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 in DPR Korea.

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) was randomly selected by field staff just before data collection. The WG/PC includes a certain number of households and the number of people in each WG/PC varies according to geographic area (urban / rural). The variance of the WG/PC cannot be assessed. 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 size 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 approach¹³ 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.

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

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

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 the 50 samples sizes (10 strata times 5 key indicators) were calculated 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:

¹³Journal of the Royal Statistical Society. Series A (General), Vol. 142, No. 2 (1979), pp. 210-222.

- In Pyongyang municipality the haemoglobin in women was identified as the largest sample size required (2,883 households). This indicator was selected as it includes 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 indicator and is needed for only about-half of 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 (child number 1, number 3, number 5, etc.).

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

Table 4.1: List of indicators for children and women detailed by age group.

Children	Age group (months)	Mothers	Age group (years)
Global chronic malnutrition / Stunting Height-for-Age <-2 z-score	0-59.9	% with MUAC <210mm	15-49.9
Severe chronic malnutrition / Severe stunting Height-for-Age <-3 z-score	0-59.9	% with MUAC <180mm	15-49.9
Moderate chronic malnutrition / 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	Length of multi-micronutrient supplementation	15-49.9 with U2 children
% with MUAC <125mm	6-59.9	Minimum dietary diversity	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 standards¹⁴ were used to compute W/H, W/A and H/A indices in z-scores. Commonly used thresholds have been used for analysis of MUAC¹⁵ 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. The words “others” was used to include any other diseases or symptoms such as fever that the child could have presented in the last 14 days.

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 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’

¹⁴WHO 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.

¹⁵WHO. Child Growth Standards and the identification of severe acute malnutrition in infants and children, 2009.

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 (Appendix 3). 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

MUAC tape of plasticized paper, children and adult type, three colours 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+), provided by WHO, were used to estimate haemoglobin blood concentration in children and women.

4.12 Survey staff

Field staff was made up of 2 teams per Province, i.e. 20 teams in total. Each team included 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.

The selected survey staff was from CBS and Institute of Child Nutrition (ICN). Most of them had experience in participating in MICS and nutrition surveys. All staff from ICN had a medical doctor background. Team leaders were selected according to their experience in surveys, training in statistics, public health and epidemiology. A different profile was needed for enumerators, which need only basic mathematics, 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 4.2.

Table 4.2: 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 enumerators after the training was based on the ENA software “evaluation of the enumerators” test, also known as standardisation test. The team leader and the enumerators measured two times the weight, height and MUAC of 10 children. The accuracy (differences between the enumerator values and the team leaders’ 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 are presented in Appendix 4.

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 took place 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. UNICEF and CBS completed separately other supervisions during the course of the survey.

One laptop was provided to each survey teams to facilitate daily data entry of child anthropometry data in the field. 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 in 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 survey's sample observed mean.

MUAC <90 or >190 mm in children was excluded. Haemoglobin values were 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. If diaper was wet, mothers were asked to change for a new diaper or to weigh the child naked.

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 2008¹⁶. The weighing factor used was: ((Province population/National population)/ (Province sample/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.

4.17 Risks, probable bias and assumptions

- In Ryanggang, Jagang, 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

¹⁶This is the latest census available. It was assumed that the relative Province populations had not significantly changed since the 2008 Census.

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 in 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. 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. Vitamin A supplementation is registered in all children's file at their nurseries/kindergarten. However, it was not possible for the surveyors to double check information in each child's file.

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 the weight was measured 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

A total of 8,040 children age 0 to 59 months were surveyed among which 51.1% were boys (Table 6.1). National estimates are weighed to the provincial population. Boys and girls were distributed equally among the age group as illustrated in figure 6.1. The number of children according to age in month is illustrated in the figure 6.2.

Data appraisal details of nutritional status and haemoglobin results of children for National and Provincial assessments (means and standard deviation, design effect, missing value and outliers) are presented in Appendix 6.

Table 6.1: Children sample composition, DPR Korea, October 2012.

		% weighted	Number of under-5 children weighted	Number of under-5 children unweighted
Total		100.0	8,040	8,040
Sex	Boys	51.1	4,111	4,117
	Girls	48.9	3,929	3,923
Province	Ryganggang	3.0	244	840
	North Hamgyong	9.9	799	840
	South Hamgyong	13.3	1,068	840
	Kangwon	6.4	511	840
	Jagang	5.7	455	840
	North Phyongan	12.0	968	840
	South Phyongan / Nampo	17.4	1,400	840
	North Hwanghae	9.0	722	840
	South Hwanghae	9.7	779	840
	Pyongyang	13.6	1,094	480
Age group (months)	0-5	7.9	636	647
	6-11	11.8	949	939
	12-23	20.3	1,634	1,631
	24-35	20.7	1,661	1,671
	36-47	19.5	1,570	1,558
	48-59	19.8	1,590	1,594

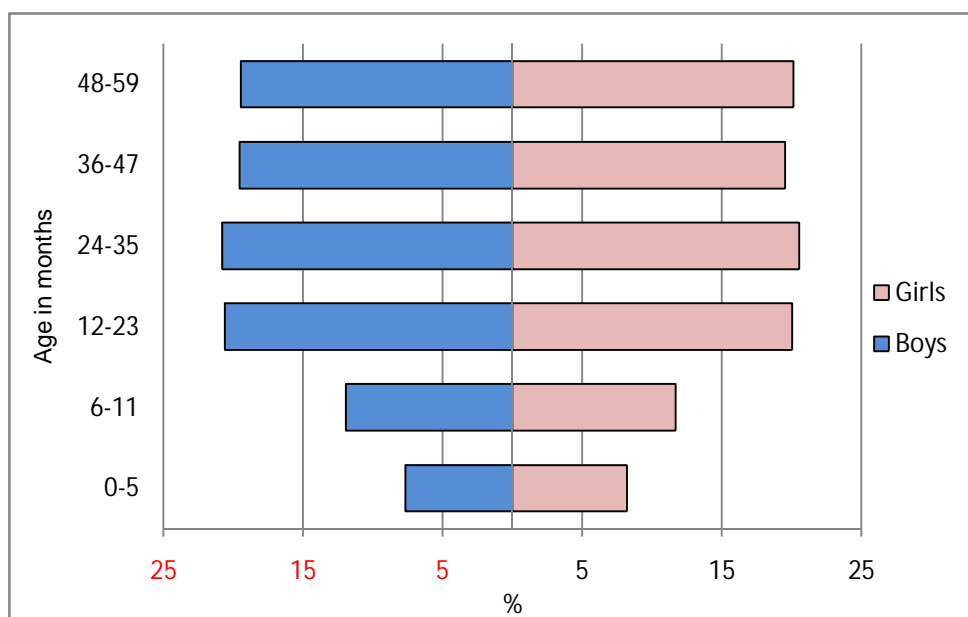


Figure 6.1: Children's population age and sex pyramid

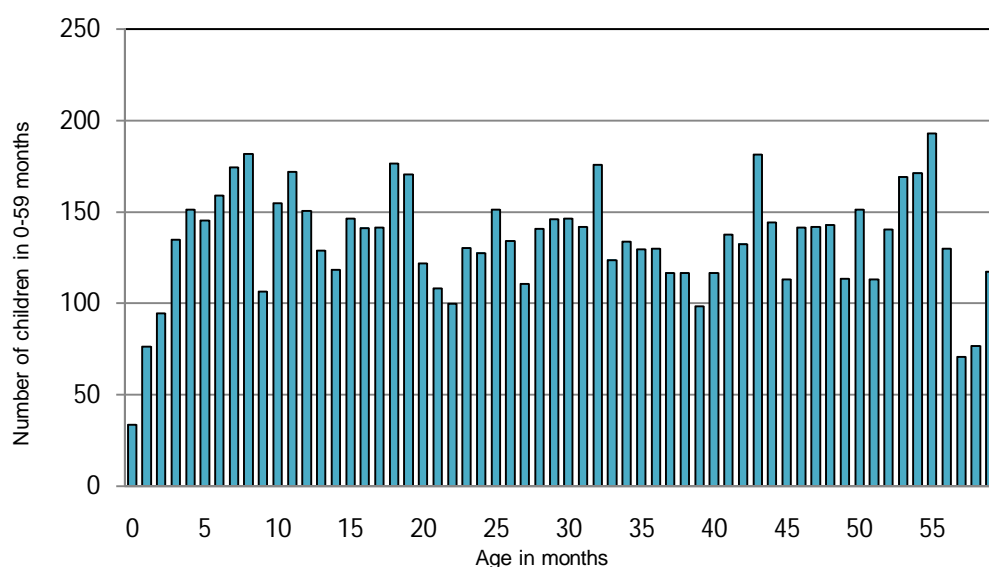


Figure 6.2: Number of children according to age in month

6.1.1 Anthropometry

Anthropometry results are based on WHO 2006 growth standards. All sample sizes presented are unweighted.

Chronic malnutrition or stunting was defined from the height of age (H/A) index. The H/A index is expressed in z-score (HAZ), which represent the number of standard deviations units from the median of the WHO 2006 reference population.

- The global chronic malnutrition (stunting) is defined as $HAZ < -2$ SD.
- Moderate stunting is defined as $HAZ < -2$ SD and ≥ -3 SD.

- Severe stunting is defined as $HAZ < -3 SD$.

Exclusion of z-scores from Zero (reference mean) WHO flags: $HAZ - 6 SD$ to $6 SD$.

Food and nutrition security is present when “all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”¹⁷. In Table 6.2, chronic malnutrition figures, based on height for age, are presented. Chronic malnutrition, also known as stunting or growth faltering, appears in presence of nutrition insecurity combined with other factors like access to quality health care, WASH situation and cares provided at the institution and household levels. Moreover, it has an intergenerational effect, as shorter mothers are likely to give birth to small-for-gestational-age infants¹⁸. Stunting is irreversible after 24 months of age¹⁹. Global chronic malnutrition is the sum of moderate and severe stunting.

The survey results do not show sex difference. Pyongyang presents lower stunting prevalence than other provinces while Ryanggang is presenting the highest prevalence. Figure 6.3 illustrates the cumulative stunting from birth to 23 months then reaching a plateau between 24 and 59.9 months as expected. Provincial deviation from the reference population curve (WHO 2006) are presented in Appendix 7.

¹⁷FAO (1996) Rome Declaration on World Food Security (Food and Agriculture Organization, Rome)

¹⁸Black et al, Lancet 2008

¹⁹Victora et al, Lancet 2008

Table 6.2: Prevalence of global (H/A < -2 Z-scores), moderate (H/A ≥ -3 Z-s and < -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 (months)	0-5	643	3.7 (2-5.4)	3.3 (1.6-4.9)	0.5 (0-0.9)
	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)

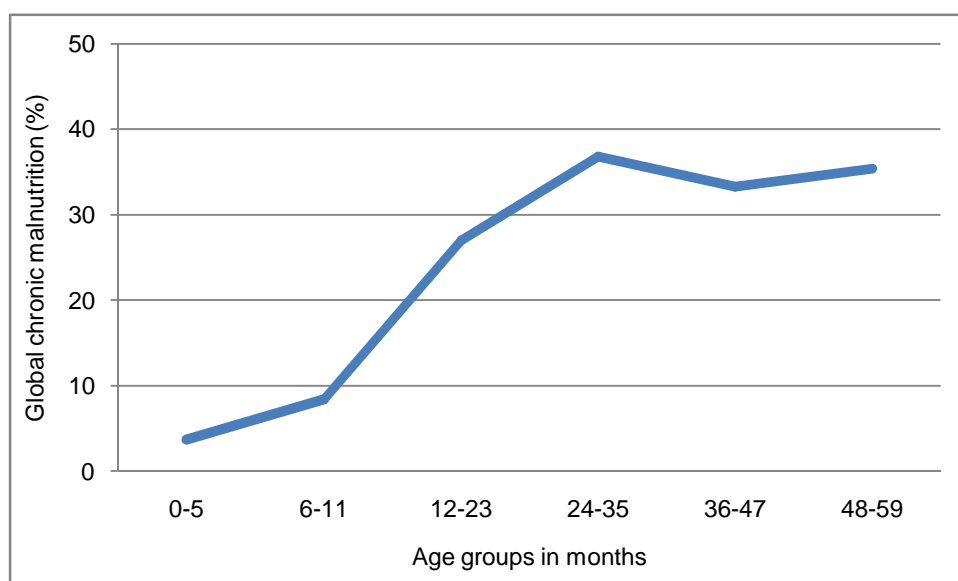


Figure 6.3: Global chronic malnutrition prevalence by age groups in months. DPR Korea, October 2012.

Acute malnutrition was estimated from the weight for height (W/H) index, MUAC and the presence of bilateral pitting oedema. The W/H index is expressed in z-score (WHZ), which represents the number of standard deviations units from the median of the WHO 2006 reference population. The MUAC is expressed in millimetres (mm). The oedema is expressed as present or absent.

- Global acute malnutrition is defined as $WHZ < -2$ SD or $MUAC < 125$ mm or the presence of bilateral pitting oedema.
- Moderate acute malnutrition is defined by $WHZ < -2$ SD and ≥ -3 SD or a $MUAC < 125$ mm and ≥ 115 mm and the absence of oedema.
- Severe acute malnutrition is defined by $WHZ < -3$ SD or a $MUAC < 115$ mm and/or bilateral pitting oedema.

Exclusion of z-scores from Zero (reference mean) WHO flags: $WHZ -5$ SD to 5 SD.

Table 6.3 displays 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 intake over a relatively short period of time^{20,21}. No cases of nutritional bilateral pitting oedema (a condition also known as kwashiorkor) were found during the survey. The weight for height ratio is an indicator of acute malnutrition and is associated with the risk of mortality of acutely malnourished children. Therefore, global acute malnutrition is the sum of the moderate and severe form. As for chronic malnutrition, no sex or age group difference was found in this survey for acute malnutrition. However, acute malnutrition is present in infants under 6 months. Pyongyang city shows the lowest prevalence of acute malnutrition while Ryanggang shows the highest one.

²⁰ Although acute malnutrition is mostly a consequence of protein and energy deficit, micronutrient deficiencies are often associated. It is often linked with the recent history of childhood diseases like diarrhea, bronchitis, pneumonia or others.

²¹ 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.

Table 6.3: 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 (months)	0-5	642	4.3 (2.7-6)	3.6 (2.1-5.1)	0.7 (0-1.4)
	6-11	939	4.9 (3.4-6.4)	3.4 (2.2-4.6)	1.5 (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 6.4 shows the results of MUAC measurements. MUAC is habitually not used to determine the population prevalence but as the weight for height ratio, it is a good indicator of the mortality risk associated with acute malnutrition. It is then also used for identification of acute malnutrition in children and referral to proper care according to the severity of their status. In children from 6 to 59 months²² the most common thresholds for severe and moderate acute malnutrition are 115 and 125 mm respectively²³. The results show a higher prevalence of global acute malnutrition according to MUAC in girls due to a higher prevalence of moderate cases (MUAC ≥ 115 & < 125 mm). As for weight-for-height results, Pyongyang and Ryganggang province show the lowest and highest prevalence of acute malnutrition according to MUAC respectively. The MUAC show a lower prevalence of acute malnutrition in children 36 months or older.

²²Cut-offs values for MUAC were validated by WHO for children aged 6-59 months.

²³WHO. Child Growth Standards and the identification of severe acute malnutrition in infants and children, 2009.

Table 6.4: 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		7382	4.1 (3.6-4.6)	3.4 (3-3.9)	0.6 (0.4-0.8)
Sex	Boys	3783	3.1 (2.5-3.6)	2.6 (2.1-3.1)	0.5 (0.3-0.7)
	Girls	3599	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 (4.0-7.7)	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 (1.0-3.1)	0.5 (0-1.0)
	Pyongyang	431	2.1 (0.9-3.3)	1.9 (0.7-3.0)	0.2 (-0.2-0.7)
	6-11	933	4.7 (3.3-6.2)	3.9 (2.5-5.2)	0.9 (0.3-1.5)
Age group (months)	12-23	1630	7.1 (5.7-8.4)	6.0 (4.8-7.3)	1.0 (0.5-1.6)
	24-35	1669	4.9 (3.7-6.0)	4.2 (3.1-5.3)	0.7 (0.3-1.1)
	36-47	1558	1.6 (1.0-2.3)	1.4 (0.8-2.0)	0.2 (0-0.4)
	48-59	1592	2.2 (1.4-3.0)	1.8 (1.1-2.5)	0.4 (0-0.8)

Beside bilateral pitting oedema, two indicators are used to identify acute malnourished children (WHZ and/or MUAC). Both indicators are validated by WHO²⁴ with their own threshold according to the association with the mortality risk. The Table 6.5 shows that among all children having a WHZ<-2 SD, only 35.6% of them also have MUAC < 125 mm. This means that if only one indicator would be used to identify children, some acutely malnourished children would not be identified or treated in a timely manner until they fit the criteria of this indicator. Both indicators measure different aspects of acute malnutrition and its

²⁴WHO. Growth Standards 2006. <http://www.who.int/childgrowth/en/>

associated mortality risk. MUAC is recognised to better identify younger children which could explain the different results between WHZ and MUAC.

Table 6.5: Differences between WHZ < -2 SD and MUAC<125 mm in children aged 6-59 months.

		Acute malnutrition assessed with W/H index		
		≥-2SD	< -2SD	Total
Acute malnutrition assessed with MUAC	≥ 125 mm	6,903 (97.2%)	186 (64.4%)	7,089
	<125 mm	199 (2.8%)	103 (35.6%)	302
Total		7,102 (100.0%)	289 (100.0%)	7,391

(χ^2 764.1, df 1, p<0.000).

Disaggregation of results by province for the chronic and acute malnutrition according to sex and age groups are presented in tables 6.6 and 6.7. There is no sex difference between boys and girls for stunting or acute malnutrition in any province. As expected, the chronic malnutrition is higher in the 24-59.9 months age group but no difference is found for acute malnutrition. However, a closer look to the chronic malnutrition shows that there is about double stunting in most of provinces in the children aged 24-59.9 months compared to the younger one. The reason for this is that the development of stunting in the first 2 years of life (or 1,000 days if the pregnancy time is considered) is added to the continued growth challenges when the children reach 24 months. As the stunting is irreversible after that age (24 months), it is then essential to focus interventions on the younger age group (0-23.9 months) to have an impact on the total prevalence of stunting.

Table 6.6: Prevalence of chronic (H/A < -2 Z-scores) and global acute (W/H < -2 Z-scores) malnutrition by Province and by sex in children aged 0-59 months. DPR Korea, October 2012.

Province	Sex	Global chronic malnutrition (stunting)		Global acute malnutrition	
		Unweighted count	Percentage (95% CI)	Unweighted count	Percentage (95% CI)
Ryanggang	Boys	421	38.2 (32.4-44.1)	421	6.2 (3.9-8.4)
	Girls	419	41.1 (35.9-46.2)	419	6.0 (3.8-8.2)
North Hamgyong	Boys	428	32.0 (26.5-37.5)	428	4.4 (2.7-6.2)
	Girls	412	25.2 (19.9-30.5)	412	5.1 (2.7-7.5)
South Hamgyong	Boys	430	35.8 (30.3-41.4)	430	4.7 (2.8-6.5)
	Girls	410	29.8 (24-35.5)	410	3.9 (1.2-6.6)
Kangwon	Boys	436	28.7 (22.8-34.5)	436	5.3 (3.3-7.3)
	Girls	400	28.5 (22.7-34.3)	400	4.0 (2-6)
Jagang	Boys	440	34.3 (29.4-39.2)	439	6.8 (3.2-10.4)
	Girls	400	32.3 (27.5-37.0)	400	4.5 (2.4-6.6)
North Phyongan	Boys	438	30.1 (24.6-35.7)	438	3.4 (1.9-4.9)
	Girls	402	28.6 (21.8-35.5)	402	4.2 (2.0-6.4)
South Phyongan/Nampo	Boys	429	30.3 (24.5-36.1)	429	3.7 (2.1-5.4)
	Girls	411	21.2 (15.6-26.7)	411	3.4 (1.6-5.2)
North Hwanghae	Boys	424	30.2 (25-35.3)	424	5.0 (3-6.9)
	Girls	416	27.2 (21.8-32.6)	416	3.8 (1.8-5.9)
South Hwanghae	Boys	428	27.1 (21.7-32.5)	428	3.7 (1.8-5.7)
	Girls	412	24.0 (19.8-28.2)	412	2.9 (1.2-4.6)
Pyongyang	Boys	241	20.3 (15.3-25.3)	241	2.1 (0.3-3.8)
	Girls	239	18.8 (11.2-26.5)	239	2.5 (0.7-4.3)

Table 6.7: Prevalence of chronic (H/A < -2 Z-scores) and global acute (W/H < -2 Z-scores) malnutrition by Province and by age groups in children aged 0-59 months. DPR Korea, October 2012.

Province	Age group (months)	Global chronic malnutrition (stunting)		Global acute malnutrition	
		Unweighted count	Percentage (95% CI)	Unweighted count	Percentage (95% CI)
Ryanggang	0-23.9	348	27.0 (21.8-32.2)	348	4.9 (2.9-6.9)
	24-59.9	492	48.6 (42.9-54.3)	492	6.9 (4.6-9.2)
North Hamgyong	0-23.9	332	16.6 (11.8-21.3)	332	5.7 (3.3-8.1)
	24-59.9	508	36.6 (31.4-41.8)	508	4.1 (2.5-5.7)
South Hamgyong	0-23.9	330	17.0 (12.4-21.5)	330	4.2 (2.1-6.3)
	24-59.9	510	43.1 (36.9-49.4)	510	4.3 (2.1-6.6)
Kangwon	0-23.9	350	16.9 (12.7-21.1)	350	6.9 (4.1-9.6)
	24-59.9	486	37.0 (30.7-43.3)	486	3.1 (1.4-4.8)
Jagang	0-23.9	335	19.4 (14.0-24.8)	334	7.2 (3.8-10.6)
	24-59.9	505	42.6 (37.1-48.0)	505	4.8 (2.3-7.2)
North Phyongan	0-23.9	328	20.7 (15.2-26.2)	328	4.0 (1.6-6.4)
	24-59.9	512	35.0 (26.4-43.5)	512	3.7 (2.0-5.4)
South Phyongan/Nampo	0-23.9	344	16.3 (11.1-21.4)	344	3.8 (2.1-5.5)
	24-59.9	496	32.5 (26.4-38.5)	496	3.4 (2.0-4.9)
North Hwanghae	0-23.9	327	18.7 (14.2-23.1)	327	4.0 (2.1-5.9)
	24-59.9	513	35.1 (29.1-41.1)	513	4.7 (2.3-7.1)
South Hwanghae	0-23.9	318	14.8 (9.8-19.7)	318	4.7 (2.4-7)
	24-59.9	522	32.2 (27.8-36.6)	522	2.5 (1.0-3.9)
Pyongyang	0-23.9	201	11.9 (7.0-16.9)	201	3.0 (0.8-5.2)
	24-59.9	279	25.1 (19.2-31.0)	279	1.8 (0.3-3.3)

Underweight was estimated from the Weight for Age (W/A) index. This index is expressed in z-score (WAZ), which represent the number of standard deviations units from the median of the WHO 2006 reference population.

- Global underweight is defined as $WAZ < -2$ SD.
- Moderate underweight is defined by $WAZ < -2$ SD and ≥ -3 SD.
- Severe acute malnutrition is defined by $WAZ < -3$ SD.

Exclusion of z-scores from Zero (reference mean) WHO flags: WAZ -6 SD to 5 SD.

Underweight or weight-for-age is presented in table 6.8 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. No sex difference is noted for underweight. Not surprisingly, Pyongyang and Ryanggang provinces show the lowest and highest prevalence respectively. The increase of prevalence with age is similar to what is seen for the chronic malnutrition.

Table 6.8: Prevalence of global (W/A < -2 Z-scores), moderate (W/A ≥ -3 Z-s and < -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 (1.9-4.0)
	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 (10.0-15.9)	11.5 (8.8-14.3)	1.4 (0.5-2.3)
	North Hwanghae	840	14.6 (12.0-17.2)	12.0 (10.0-14.1)	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)
	0-5	643	2.9 (1.6-4.3)	2.2 (1.0-3.4)	0.7 (0.1-1.3)
Age group (months)	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 (9.0-12.7)	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 (12.9-17.0)	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 *Anaemia, vitamin A supplementation and morbidity in children*

Children's anaemia

Anaemia is one of the most common nutrition conditions worldwide^{25,26}. It is defined as haemoglobin concentrations that are below 11 g/dL in children and pregnant women and 12 g/dL in non-pregnant women^{27,28}. 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 populations²⁹. The consequence 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 life³⁰. Table 6.9 presents the percentages of anaemic children³¹. No sex or provincial differences are noted but the prevalence of anaemia is significantly higher in children 6-23.9 months compared to those aged 24 months and more as it is observed in other countries.

²⁵Black RE et al, Lancet 2008.

²⁶WHO (2012), Health Topics: Anaemia, <http://www.who.int/topics/anaemia/en/>

²⁷WHO 2001; Iron Deficiency Anaemia, Prevention, and Control, A guide for programme managers WHO/NHD/01.3

²⁸Standards 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

²⁹WHO/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

³⁰Algarín C et al. (2003), "Iron deficiency anaemia in infancy: Long-lasting effects on auditory and visual system functioning," *Pediatr Res* 2003; 53:217–23.

³¹WHO and CDC. Assessing the iron status of population. 2nd ed. 2007.

Table 6.9: 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 (27.0-33.0)
	Girls	1,309	27.3 (24.3-30.4)
Province	Ryganggang	213	33.3 (26.4-40.3)
	North Hamgyong	223	29.1 (21.0-37.3)
	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 Phyongan/Nampo	285	30.2 (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 (39.0-51.8)
	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 (12.0-18.2)

A significant association is found between stunting and anaemia while no association appears between acute malnutrition and anaemia. Both stunting and anaemia may be caused by multiple risk factors. The fact that 33% of stunted children are also anaemic highlight the need to know more about infant feeding, deworming, sanitation and hygiene practices in children as these factors are also associated with anaemia.

Table 6.10: Chronic malnutrition or Acute malnutrition and Anaemia in children aged 6-59 months. DPR Korea, October 2012.

		Chronic malnutrition (stunting)			Acute malnutrition (wasting)		
		≥ -2SD	< -2SD	Total	≥ -2SD	< -2SD	Total
Anaemia	Hb ≥ 11.0 g/dL	1639 (73.0%)	620 (67.0%)	2259 (71.3%)	2185 (71.4%)	73 (68.9%)	2258 (71.3%)
	Hb < 11.0 g/dL	605 (27.0%)	305 (33.0%)	910 (28.7%)	877 (28.6%)	33 (31.1%)	910 (28.7%)
Total		2244 (100.0%)	925 (100.0%)	3169 (100.0%)	3062 (100.0%)	106 (100.0%)	3168 (100.0%)

Chronic malnutrition (stunting) (χ^2 11.566, df 1, p<0.001)

Acute malnutrition (wasting) (χ^2 0.310, df 1, p=0.577)

Vitamin A supplementation to children

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 during nationwide organized Child Health Days. The proportion of children who received one dose of Vitamin A in the last six months can be found in Table 6.11. Results show that vitamin A is distributed without difference to boys and girls, all provinces and age groups.

Table 6.11: 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 (97.0-98.6)
	36-47	1,558	98.1 (97.4-98.9)
	48-59	1,594	97.9 (97.0-98.7)

Children's morbidity

Caretakers were asked if their child had been sick in the last two weeks and, if so, did he/she suffer from diarrhoea, respiratory tract infections or others such as fever. Disease and infections are important determinants of nutritional status. No differences between sex, provinces and age groups were found. Results are shown in Table 6.12. No association was found between chronic malnutrition (HAZ) and morbidity (χ^2 01.522, df 1, p=0.217) or acute malnutrition (WFZ) and morbidity (χ^2 0.300, df 1, p=0.584) (results not shown).

Table 6.12: 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	Ryganggang	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 (12.0-17.0)	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 (3.3-6.0)
	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 (5.0-9.0)	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	15.4 (12.0-18.8)	9.8 (6.9-12.7)	6.7 (4.4-9.1)
	6-11	939	17.8 (14.9-20.8)	11.1 (8.9-13.3)	8.7 (6.7-10.8)
	12-23	1,631	17.0 (14.9-19.1)	11.8 (10.1-13.5)	6.7 (5.3-8.2)
	24-35	1,671	13.5 (11.5-15.4)	8.6 (7.0-10.1)	6.3 (4.9-7.6)
	36-47	1,558	13.2 (11.2-15.1)	6.6 (5.1-8.0)	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)

6.1.3 Feeding practices

Infant and young child feeding (IYCF) practices play an important role in the prevention of undernutrition (chronic and acute malnutrition) in children under 24 months. The core indicators for optimal IYCF practices are the following^{32,33}:

1. Early initiation of breastfeeding (assessed in children aged 0 to 23.9 months)
2. Exclusive breastfeeding under 6 months (assessed in children aged 0 to 5.9 months)
3. Continued breastfeeding at 1 year (assessed in children aged 12 to 14.9 months)
Continued breastfeeding at 2 years was also assessed (assessed in children aged 20 to 23.9 months)
4. Introduction of solid, semi-solid or soft foods (assessed in children aged 6 to 8 months)
5. Minimum dietary diversity (assessed in children aged 6 to 23.9 months)
6. Minimum meal frequency
This indicator was not assessed in the present survey.
7. Minimum acceptable diet
As the minimum meal frequency was not assessed in this survey, the minimum acceptable diet was not calculated.
8. Consumption of iron-rich or iron-fortified food (assessed in children aged 6 to 23.9 months)
Consumption of vitamin A rich food was also assessed (assessed in children aged 6 to 23.9 months).

Breastfeeding practices

Early initiation of breastfeeding within the first hour after delivery is globally associated with the prevention of about 22% of neonatal death while initiation within the first day could prevent up to 16% of deaths in babies³⁴. The following table presents the results for the initiation of breastfeeding within 1-hour of birth. No sex difference is seen but prevalence of early initiation is higher in South Hwanghae and Pyongyang Provinces compared to Ryanggang. There is no age difference between 0 and 23.9 months in the early initiation of breastfeeding. Compared to MICS 2009, there seems to be an increase in early initiation of breastfeeding (from 18% to 28.5%) nationally and in all provinces.

³²WHO, UNICEF, USAID, AED, FANTA, UC Davis, IFPRI. Indicators for assessing infant and young child feeding practices. Part 1: Definition. 2007.

³³WHO, UNICEF, USAID, AED, FANTA, UC Davis, IFPRI. Indicators for assessing infant and young child feeding practices. Part 2: Measurement. 2007.

³⁴UNICEF. Programming guide on Infant and Young Child Feeding. 2011.

Table 6.13: Early initiation of breastfeeding in children aged 0-23.9 months. DPR Korea, October 2012.

		Unweighted Count	Percent of early initiation of breastfeeding within one hour after birth
Total		3,217	28.1 (26.2-30.0)
Sex	Boys	1,654	28.4 (25.9-30.9)
	Girls	1,563	27.8 (25.1-30.5)
Province	Ryganggang	348	19.0 (15.6-22.3)
	North Hamgyong	332	23.5 (18.1-28.8)
	South Hamgyong	330	20.9 (15.6-26.2)
	Kangwon	354	27.7 (21.8-33.6)
	Jagang	335	25.7 (21.2-30.1)
	North Phyongan	328	24.7 (20.2-29.2)
	South Phyongan/ Nampo	344	23.8 (19.8-27.9)
	North Hwanghae	327	28.4 (22.9-34)
	South Hwanghae	318	31.1 (23.4-38.9)
	Pyongyang	201	47.3 (40.7-53.8)
	0-5	647	26.5 (22.4-30.6)
Age in months	6-11	939	29.2 (25.8-32.6)
	12-23	1,631	28.1 (25.5-30.8)

Among all stunted children, 24.4% were breastfed within one hour after birth (Table 6.14). Although this survey does not allow for causal analysis, the significant association between stunting and early initiation of breastfeeding suggests that more efforts on the promotion of the early initiation could play a positive role in the prevention of stunting. However, no association was found with acute malnutrition or anaemia (Table 6.15).

Table 6.14: Chronic malnutrition or Acute malnutrition and early initiation of breastfeeding in children aged 6-59 months. DPR Korea, October 2012.

		Chronic malnutrition (stunting)			Acute malnutrition (wasting)		
		≥ -2SD	< -2SD	Total	≥ -2SD	< -2SD	Total
Early initiation of breastfeeding	More than 1h after delivery	1,900 (71.1%)	411 (75.6%)	2,311 (71.9%)	2,207 (71.8%)	104 (72.2%)	2,311 (71.9%)
	Within 1 hour after delivery	772 (28.9%)	133 (24.4%)	905 (28.1%)	865 (28.2%)	40 (27.8%)	905 (28.1%)
Total		2,672 (100.0%)	544 (100.0%)	3,216 (100.0%)	3,072 (100.0%)	144 (100.0%)	3,216 (100.0%)

Chronic malnutrition (stunting) (χ^2 4.414, df 1, p=0.036)Acute malnutrition (wasting) (χ^2 0.010, df 1, p=0.921)**Table 6.15: Anaemia and early initiation of breastfeeding in children aged 6-59 months.**

		Anaemia		
		Hb ≥ 11.0 g/dL	Hb < 11.0 g/dL	Total
Early initiation of breastfeeding	Within more than 1h after delivery	378 (65.6%)	361 (70.5%)	739 (67.9%)
	Within 1 hour after delivery	198 (34.4%)	151 (29.5%)	349 (32.1%)
Total		576 (100.0%)	512 (100.0%)	1,088 (100.0%)

(χ^2 2.966, df 1, p=0.085).

Exclusive breastfeeding from birth to 6 months can prevent up to 13% of children's death. Breastfeeding is exclusive when no fluids including water and no food items are given beside breastmilk. Continued breastfeeding up to 1 year or 2 years old has positive impact on children's death through the prevention of main childhood disease killers which are diarrhoea and pneumonia³⁵. No sex difference was found in the breastfeeding practices (Table 6.16). Due to low access to other feeding options for infants, most of mothers in DPRK are breastfeeding. The question on exclusive breastfeeding in the MICS 2009 survey brought over-estimation of the exclusive breastfeeding and continued breastfeeding at 1 year. In the present survey, no direct questions were asked to mothers about breastfeeding but all information is extracted from the qualitative 24-h food recall. The results found for exclusive breastfeeding correspond to the DPRK 2004 Nutrition Assessment in which 65.1% of children < 6 months were exclusively breastfed which is much lower than the 88.6% reported in MICS 2009.

³⁵UNICEF. Programming guide on Infant and Young Child Feeding. 2011.

Table 6.16: Percentage of exclusive breastfeeding and continuation of breastfeeding at 1 year and at 2 year. DPR Korea, October 2012.

Age groups	Children 0-5.9 months		Children 12-14.9 months		Children 20-23.9 months	
	Unweighted count	Exclusive breastfeeding (95% CI)	Unweighted count	Continued breastfeeding at 1-year (95% CI)	Unweighted count	Continued breastfeeding at 2-year (95% CI)
Total	647	68.9 (65.1-72.8)	539	77.9 (73.8-82.0)	465	21.5 (17.0-25.9)
Sex	Boys	329	66.1 (60.4-71.7)	298	76.2 (70.8-81.6)	21.2 (15.4-27.0)
	Girls	318	71.7 (66.1-77.4)	241	80.0 (74.3-85.6)	21.8 (15.8-27.7)

Table 6.17 shows that when a mother initiates breastfeeding (within one hour after birth), she will significantly less practice exclusive breastfeeding while if she begins breastfeeding later, exclusive breastfeeding has more chance to be practiced.

Due to small sample size, comparison of exclusive breastfeeding and breastfeeding up to 1 and 2 years with stunting, wasting and anaemia could not be done.

Table 6.17: Exclusive breastfeeding and early initiation of breastfeeding in children aged 0-23.9 months.

		Exclusive breastfeeding		Total
		Non exclusive	Exclusive	
Early initiation of breastfeeding	Within more than 1h after delivery	1,836 70.4%	477 78.2%	2,313 71.9%
	Within 1 hour after delivery	773 29.6%	133 21.8%	906 28.1%
	Total	2,609 100.0%	610 100.0%	3,219 100.0%

(χ^2 14.969, df 1, p=0.000).

Complementary feeding practices and food diversity

The analysis of complementary feeding and food diversity for children was based on the assessment of the qualitative 24-h food recalls containing 22 food items (Table 6.18). During the interview, mothers were listing all the food that their child ate the previous day which was noted on the questionnaire and then the interviewer, read one by one the 22 food items asking the mothers if her child ate that type of food yesterday to gather as much information as possible and to decrease the risk of recall bias by forgetting items. Nursery staff participated in data collection to provide information about meals consumed by the children at the nursery the day before. Despite all efforts to prevent memory lapse, it is possible that the results on complementary feeding are underestimated.

The number of children who consumed any food included in the 22 food items is reported in the Table 6.18 and Figure 6.4. These results show that over the 2,570 children aged 6-23 months, most of them consumed rice/noodles/grains in the previous day. The other popular food items were condiments, breastmilk, water, oil/butter and clear broth/thin soup.

Table 6.18: Number and proportion of children aged 6-23 months who consumed foods included in the 22 food items in the last 24 hours. DPR Korea, October 2012.

	Food items	Number of children aged 6-23.9 months	Proportion of children aged 6-23.9 months
A	Porridge, bread, rice, noodles and other foods made from grains	2,267	89.1
U	Condiments such as pepper, parsley, salt, soy sauce, garlic, fish powder, etc	1,738	70.2
L	Breastmilk	1,708	64.6
R	Water	1,514	62.2
O	Oil, butter, or foods made with any of these	1,434	58.0
T	Clear broth, thin soup	1,374	56.0
P	Sweets, honey, caramel, chocolate, biscuits, cakes and other candy	1,350	54.1
F	Any other vegetable and fruit (cabbage, cucumber, tomato, eggplant, apple, pear, watermelon, etc)	874	37.4
D	Spinach, broccoli, sea weed and other dark green vegetables	685	29.4
C	Potatoes and food made from potatoes	714	28.1
K	Any food made from beans, peas, lentils, nuts ,or seeds	692	28.1
J	Fresh or dried fish, shellfish or seafood	545	23.4
B	Pumpkin, carrots, sweet potatoes, and other vitamin A rich vegetables (yellow or orange inside)	485	20.0
M	Animal milk (fresh milk, milk powder, infant formula, tinned milk), yogurt, other milk products	271	15.5
I	Eggs of all sorts	266	12.6
H	Any meat, such as beef, pork, lamb, goat, chicken, or duck	253	11.5
S	Fruit juice (strawberry, apple, pear, etc)	119	6.3
Q	Drinks (tea, coffee, coke, fanta, sprite, tonic, etc.)	117	5.6
V	Other foods	96	4.0
E	Apricot, peach	61	2.5
G	Liver, kidney, heart, or other organ meats	46	2.2
N	Cheese	14	0.5

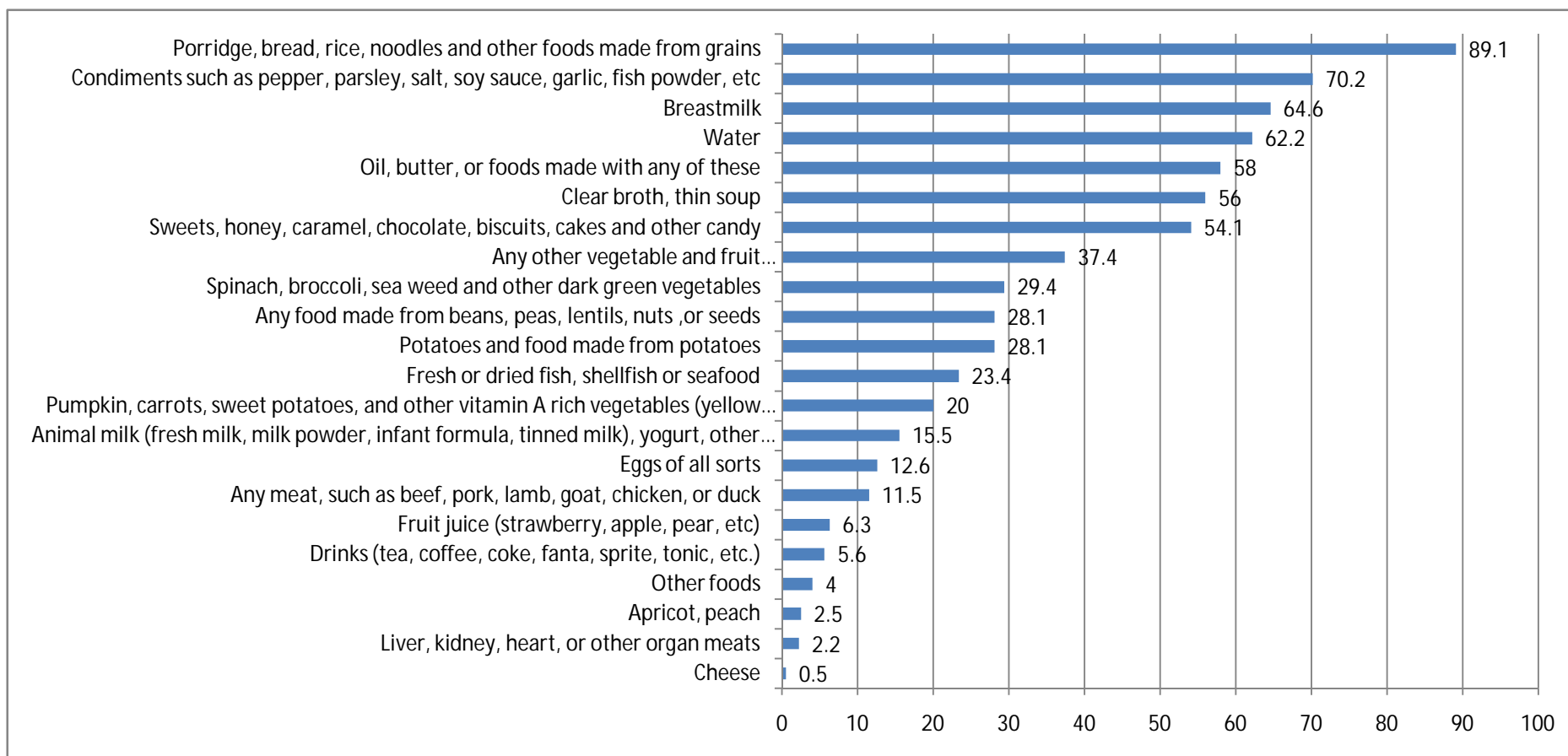


Figure 6.4: Proportion of children aged 6-23 months who consumed foods included in the 22 food items in the last 24 hours. DPR Korea, October 2012.

The first step of analysis was to group the 22 food items in 10 food groups including other food items caloric and non-caloric and breastmilk as food groups number 8, 9 and 10 respectively^{36,37}. This grouping is essential to assess the minimum dietary diversity in infant and young children. Table 6.19 presents the details on which food items were included in each food groups.

Table 6.19: Composition of food groups for dietary diversity analysis based on the food items assessed in the questionnaire. DPR Korea, October 2012.

Food groups for dietary diversity analysis		Food items assessed in questionnaire	
1	Grains, roots, tubers	A	Porridge, bread, rice, noodles and other foods made from grains
		C	Potatoes and food made from potatoes
2	Legumes and nuts	K	Any food made from beans, peas, lentils, nuts ,or seeds
3	Dairy products (milk, yogurt, cheese)	M	Animal milk (fresh milk, milk powder, infant formula, tinned milk), yogurt, other milk products
		N	Cheese
4	Flesh foods (meat, fish poultry and liver/organ meats)	G	Liver, kidney, heart, or other organ meats
		H	Any meat, such as beef, pork, lamb, goat, chicken, or duck
		J	Fresh or dried fish, shellfish or seafood
5	Eggs	I	Eggs of all sorts
6	Vitamin A rich fruits and vegetables	B	Pumpkin, carrots, sweet potatoes, and other vitamin A rich vegetables (yellow or orange inside)
		D	spinach, broccoli, sea weed and other dark green vegetables
		E	Apricot, peach
7	Other fruits and vegetables	F	Any other vegetable and fruit (cabbage, cucumber, tomato, eggplant, apple, pear, watermelon, etc)
8	Other caloric foods	O	Oil, butter, or foods made with any of these
		P	Sweets, honey, caramel, chocolate, biscuits, cakes and other candy
		S	Fruit juice (strawberry, apple, pear, etc)
		V	Other foods
9	Other non-caloric foods	Q	Drinks (tea, coffee, coke, fanta, sprite, tonic, etc.)
		R	Water
		T	Clear broth, thin soup
		U	Condiments such as pepper, parsley, salt, soy sauce, garlic, fish powder, etc
10	Breastmilk	L	Breastmilk

The main food group consumed by children aged 6-23 months is “Grains, roots and tubers” followed by food items included in group “Others” and “Breastmilk”. All other foods groups were consumed by less than 50% of children. This pattern did not vary according to sex and neither in most provinces except in Pyongyang where a higher proportion of children consumed the different food groups (Table 6.20).

³⁶WHO, UNICEF, USAID, AED, FANTA, UC Davis, IFPRI. Indicators for assessing infant and young child feeding practices. Part 1: Definition. 2007.

³⁷WHO, UNICEF, USAID, AED, FANTA, UC Davis, IFPRI. Indicators for assessing infant and young child feeding practices. Part 2: Measurement. 2007.

Table 6.20: Proportion of children aged 6-23 months who consumed the different groups at least one time in the last 24 hours per sex and province. DPR Korea, October 2012.

		Food Group 1	Food Group 2	Food Group 3	Food Group 4	Food Group 5	Food Group 6	Food Group 7	Food Group 8	Food Group 9	Food Group 10
	Unwei ghted count	Grains, roots, tubers (95% CI)	Legumes and nuts (95% CI)	Dairy products (95% CI)	Flesh foods (95%CI)	Eggs (95%CI)	Vitamin A rich foods (95%CI)	Other fruits and vegetables (95%CI)	Other caloric foods (95%CI)	Other non-caloric foods (95%CI)	Breast- milk (95%CI)
Total	2,570	89.2 (87.8-90.6)	28.1 (25.8-30.5)	15.8 (13.8-17.9)	30.0 (27.6-32.5)	12.6 (10.8-14.4)	38.3 (35.7-40.9)	37.4 (34.9-39.9)	73.9 (71.8-75.9)	86.2 (84.5-87.8)	64.6 (62.3-66.8)
Sex	Boys	1,325	89.5 (87.7-91.3)	29.3 (26.3-32.3)	15.8 (13.3-18.3)	28.7 (25.7-31.7)	13.3 (10.8-15.7)	38.3 (35-41.5)	38.9 (35.8-42)	74.5 (71.8-77.1)	65 (62-68)
	Girls	1,245	88.9 (87-90.9)	26.8 (23.7-30)	15.9 (13.3-18.5)	31.5 (28.3-34.6)	11.9 (9.6-14.1)	38.4 (34.8-42)	35.7 (32.4-39.1)	73.2 (70.5-76.0)	64.1 (61-67.2)
Province	Ryanggang	270	85.9 (82.5-89.4)	33.7 (27-40.4)	4.1 (1.8-6.3)	17.0 (12.4-21.7)	4.4 (1.4-7.5)	22.2 (17.2-27.3)	22.6 (16.4-28.8)	65.6 (60-71.1)	71.5 (66.1-76.9)
	North Hamgyong	262	93.1 (90.4-95.9)	26.3 (20.7-32)	9.5 (5.5-13.6)	40.1 (33.8-46.3)	19.1 (14.4-23.8)	32.4 (25.7-39.2)	35.5 (30-41)	83.6 (79.8-87.4)	58.8 (53.1-64.5)
	South Hamgyong	272	84.2 (79.6-88.8)	37.1 (30.3-44)	5.5 (2-9.1)	17.6 (10.9-24.4)	5.9 (3.3-8.5)	44.1 (36.7-51.5)	27.6 (22.3-32.8)	68.0 (62.2-73.8)	59.9 (53.9-66)
	Kangwon	282	84.4 (80.5-88.3)	18.8 (14.9-22.7)	13.8 (8.8-18.9)	24.1 (18-30.3)	8.5 (4.6-12.4)	35.5 (29.2-41.7)	30.9 (25.1-36.6)	76.2 (70.6-81.8)	74.8 (69.4-80.2)
	Jagang	248	89.1 (84.5-93.7)	18.5 (13.5-23.6)	6.5 (2.9-10)	24.2 (18.5-29.9)	11.3 (6.3-16.3)	34.3 (27.1-41.5)	23.4 (18.1-28.7)	69.4 (64.0-74.7)	64.9 (59-70.9)
	North Phyongan	278	83.8 (79.6-88.1)	20.5 (14.9-26.1)	6.1 (2.1-10.1)	28.1 (21.3-34.8)	6.5 (1.7-11.2)	36 (31.7-40.2)	36.3 (29.3-43.4)	66.5 (59.7-73.4)	73 (67.3-78.7)
	South Phyongan/ Nampo	275	91.3 (87.3-95.2)	30.2 (22.8-37.6)	11.6 (7.1-16.1)	35.6 (28.8-42.5)	18.9 (13-24.8)	33.5 (25.8-41.1)	41.1 (33.2-49)	71.6 (65.8-77.5)	65.8 (59.2-72.4)
	North Hwanghae	271	88.2 (84.4-92)	22.1 (16.8-27.5)	5.2 (2.7-7.6)	24.4 (17.4-31.3)	7.7 (4-11.5)	32.1 (24.9-39.3)	28.8 (22.6-35)	76.8 (71.9-81.6)	69 (62.9-75.1)
	South Hwanghae	257	92.2 (88.2-96.2)	31.1 (22.6-39.7)	2.7 (0.5-4.9)	20.6 (15.3-26)	1.2 (-0.1-2.5)	38.1 (29.6-46.7)	47.9 (39.1-56.7)	70.4 (62.9-78)	67.7 (59.5-75.9)
	Pyongyang	155	95.5 (91.8-99.1)	33.5 (26.2-40.9)	67.7 (58.6-76.9)	47.7 (39.2-56.3)	27.1 (19.1-35.1)	56.1 (47.2-65.1)	54.8 (47-62.7)	85.2 (79.2-91.2)	52.3 (44.7-59.8)

The DPRK 2004 Nutrition Assessment and the MICS 2009 reported respectively that 31.4% and 27.8% of children aged 6-9 months or 6-8 months were consuming some complementary food. However, the current survey shows that 66% of all children aged 6-8 months (breastfed or not) consumed food from at least 1 food group (mainly from grains, roots and tubers) and that 62.9% of children aged 6-8 months who are breastfed consumed any food or liquid (mainly from grains, roots and tubers group) including non-human milk and infant formula (when groups 1 to 7 are considered). No sex difference is noted in the complementary feeding. Due to sample size limitation, introduction of complementary feeding cannot be disaggregated by Provinces.

Table 6.21: Proportion of children aged 6-8 months who received timely introduction of solid, semi- solid and soft food in the last 24 hours. DPR Korea, October 2012.

Consumption of at least one food coming from the food groups 1 to 7 (95%CI)			
	Unweighted Count	Children breastfed or Not breastfed	Children currently breastfeeding
Total	511	66.0 (61.4-70.5)	62.9 (58.1-67.8)
Sex	Boys	64.2 (57.8-70.5)	62.2 (55.7-68.7)
	Girls	67.7 (61.4-74.1)	63.6 (56.7-70.6)

The Figure 6.5 shows that at 6 months about 40% of children who were still exclusively breastfed initiate complementary feeding. At 8 months, close to 20% of children are still exclusively breastfed without complementary feeding. The Figure 6.6 illustrates the infant feeding patterns by the child's age in months. At the earliest age, the majority of children (>85%) are exclusively breastfed. At 4 to 5 months, more than 60% of children are exclusively breastfed but this practice decrease as the children are getting older. At 6 or 7 months of age, less than 40% of children are still exclusively breastfed while more than 60% receive complementary food. Positively, in addition to complementary feeding, More than 90% of children aged 6-7 months are still breastfed, over 80% are still breastfed at 12-13 months while at 22-23 months, about 20% of children are still breastfed.

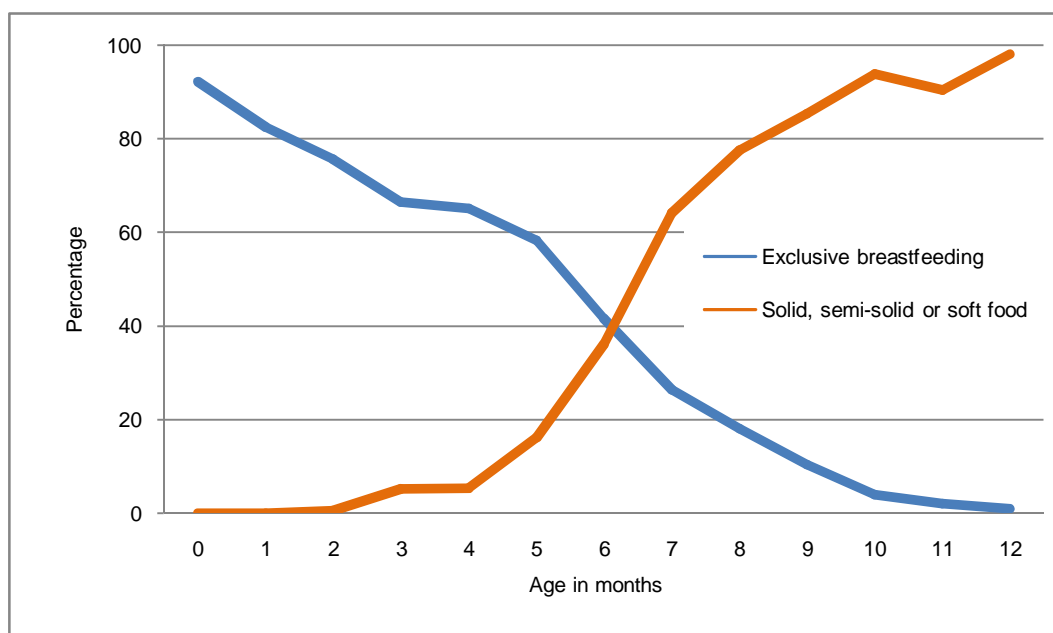


Figure 6.5: Exclusive breastfeeding and complementary feeding practices according to age. DPR Korea, October 2012.

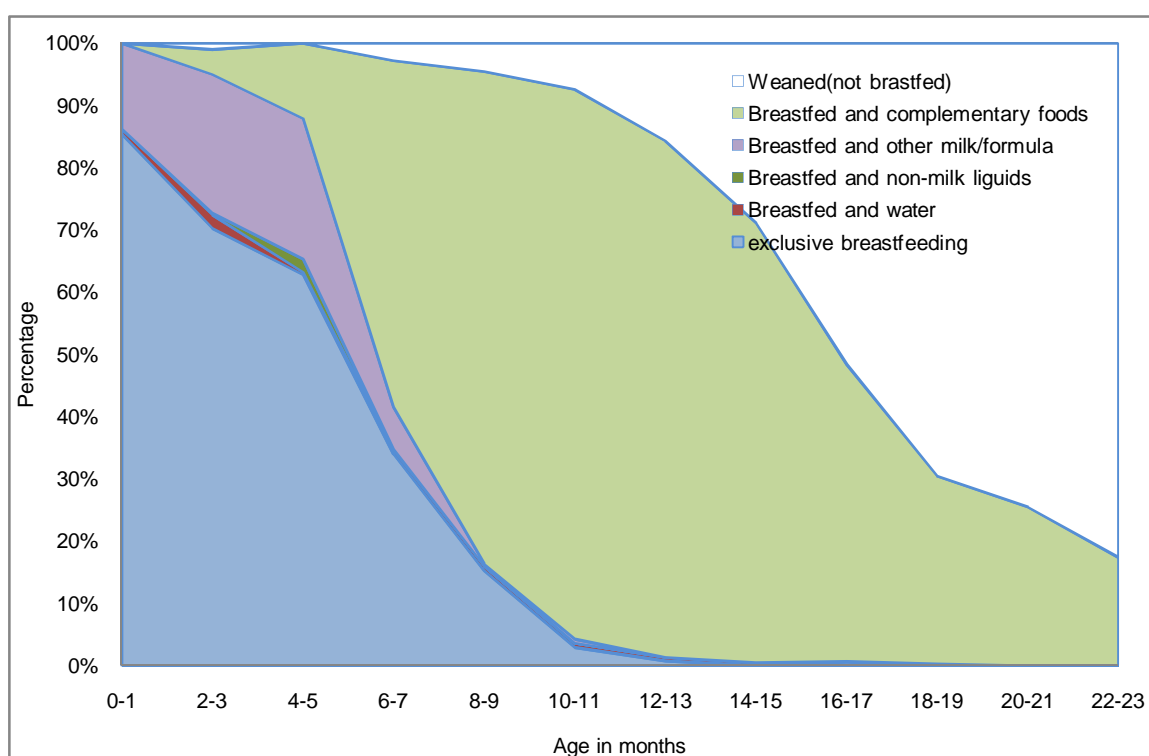


Figure 6.6: Infant feeding patterns by age: Percent distribution of children aged under 2 years by feeding pattern by age group, DPR Korea, October 2012.

The assessment of the consumption of any complementary food (solid, semi-solid or soft food) in addition to breastmilk was done on the group of children aged 6-8 months^{38,39}. The complementary feeding is considered to be breastmilk combined with any food groups from number 1 to number 7. The breastmilk is habitually not considered in the analysis as its intake

³⁸WHO, UNICEF, USAID, AED, FANTA, UC Davis, IFPRI. Indicators for assessing infant and young child feeding practices. Part 1: Definition. 2007.

³⁹WHO, UNICEF, USAID, AED, FANTA, UC Davis, IFPRI. Indicators for assessing infant and young child feeding practices. Part 2: Measurement. 2007.

is not sufficient to cover the nutritional needs of the children after 6 months and the quality of the complementary feeding will influence the growth of children. The groups 8 and 9 (“Others caloric food” and “Others non-caloric food”) cover many items including fat in the daily food consumption but does not bring proteins, vitamins or minerals essential to child growth so the analysis for these groups is presented separately.

The mean number of food groups (estimated over the groups 1 to 7), consumed in the last 24 hour by children 6-23 months is 2.5 (Table 6.22). Once the groups “Other caloric food”, “Other non-caloric food” and “Breastmilk” are included in the analysis, the mean number increase to 3.3, 4.1 and 4.8 food groups respectively. No sex difference is noted while children in Pyongyang seem to have higher food diversity than in other provinces. The results show that only 1.4 over 7 food groups is consumed by children aged 6-11 months (mainly food group 1 with grains, roots and tubers) and that the mean number of food groups increase with age.

Table 6.22: Mean number of food groups consumed in the last 24 hours by children aged 6-23 months by sex, provinces and age groups. DPR Korea, October 2012.

		Unweighted Count	Mean number of food groups (groups 1-7)	Mean number of food groups (groups 1-8)	Mean number of food groups (groups 1-9)	Mean number of food groups (groups 1-10)
Sex	Total	2,570	2.5 (2.4-2.6)	3.3 (3.2-3.4)	4.1 (4.0-4.2)	4.8 (4.7-4.9)
	Boys	1,325	2.5 (2.4-2.6)	3.3 (3.2-3.4)	4.1 (4-4.3)	4.8 (4.7-4.9)
	Girls	1,245	2.5 (2.4-2.6)	3.2 (3.1-3.4)	4.1 (3.9-4.2)	4.7 (4.6-4.9)
Province	Ryganggang	270	1.9 (1.7-2.1)	2.6 (2.4-2.8)	3.3 (3.1-3.5)	4.0 (3.8-4.2)
	North Hamgyong	262	2.6 (2.4-2.7)	3.4 (3.2-3.6)	4.3 (4.1-4.5)	4.9 (4.7-5.1)
	South Hamgyong	272	2.2 (2.0-2.5)	2.9 (2.6-3.2)	3.8 (3.5-4.1)	4.4 (4.1-4.6)
	Kangwon	282	2.2 (1.9-2.4)	2.9 (2.7-3.2)	3.7 (3.4-4)	4.5 (4.2-4.8)
	Jagang	248	2.1 (1.9-2.3)	2.8 (2.5-3.0)	3.6 (3.3-3.8)	4.2 (4.0-4.5)
	North Phyongan	278	2.2 (1.9-2.4)	2.8 (2.5-3.1)	3.6 (3.3-4.0)	4.4 (4.1-4.7)
	South Phyongan/Nampo	275	2.6 (2.4-2.9)	3.3 (3.1-3.6)	4.2 (3.9-4.5)	4.9 (4.6-5.2)
	North Hwanghae	271	2.1 (1.9-2.3)	2.9 (2.6-3.1)	3.7 (3.4-4.0)	4.4 (4.1-4.6)
	South Hwanghae	257	2.3 (2.1-2.6)	3.0 (2.7-3.4)	3.9 (3.6-4.3)	4.6 (4.3-4.9)
	Pyongyang	155	3.8 (3.5-4.1)	4.7 (4.3-5.0)	5.6 (5.2-6.0)	6.1 (5.7-6.5)
Age in months	6-11 months	939	1.4 (1.3-1.5)	1.9 (1.8-2.0)	2.6 (2.4-2.7)	3.5 (3.4-3.7)
	12-23 months	1,631	3.1 (3.0-3.2)	4.0 (3.9-4.1)	5.0 (4.9-5.1)	5.5 (5.4-5.6)

The minimum dietary diversity was assessed by calculating the proportion of children aged 6-23 months who received 4 food groups or more (among groups 1 to 7) during the last 24

hours. Breastmilk is not included in the analysis as the minimum dietary diversity is meant to reflect the quality of the complementary food^{40,41}.

There are 26.5% of children who are eating the recommended minimum of at least 4 food groups per day (Table 6.23). There is no sex difference in the complementary feeding quality but children in Pyongyang have access to a more diversified diet compared to all other provinces. However, there are still 40% of children in Pyongyang who do not eat the minimum daily requirement of 4 food groups. The low proportion of children aged 6 to 11 months and 12-23 months consuming at least 4 food groups per day highlight the need to revise the actual interventions on infant and young child feeding promotion to address this important issue.

Table 6.23: Proportion of children who ate food from at least 4 out of 7 food groups (minimum dietary diversity score) among the groups number 1 to number 7. DPR Korea, October 2012.

		Unweighted Count	Proportion of children who ate food from at least 4 out of 7 food groups
	Total	2,570	26.5 (24.0-28.9)
Sex	Boys	1,325	27.9 (24.8-30.9)
	Girls	1,245	25.0 (21.9-28.2)
Province	Ryanggang	270	15.6 (10.7-20.4)
	North Hamgyong	262	20.2 (14.5-25.9)
	South Hamgyong	272	19.1 (12.8-25.4)
	Kangwon	282	18.4 (12-24.9)
	Jagang	248	17.3 (11.1-23.6)
	North Phyongan	278	21.6 (15-28.2)
	South Phyongan/Nampo	275	25.8 (18.8-32.9)
	North Hwanghae	271	18.5 (12.4-24.5)
	South Hwanghae	257	25.3 (17.1-33.5)
	Pyongyang	155	59.4 (51.4-67.3)
Age group (months)	6-11 months	939	6.5 (4.4-8.6)
	12-23 months	1,631	38.1 (34.8-41.4)

⁴⁰WHO, UNICEF, USAID, AED, FANTA, UC Davis, IFPRI. Indicators for assessing infant and young child feeding practices. Part 1: Definition. 2007.

⁴¹WHO, UNICEF, USAID, AED, FANTA, UC Davis, IFPRI. Indicators for assessing infant and young child feeding practices. Part 2: Measurement. 2007.

The dietary diversity (based on food group number 1 to 7) is low in the country without much variation between provinces except Pyongyang. This could explain why there is no significant association between diversity and stunting or anaemia (Table 6.24 and Table 6.25). However, a low food diversity seems to be associated with acute malnutrition (Table 6.24).

Table 6.24: Chronic malnutrition or acute malnutrition and dietary diversity in children aged 6-23 months. DPR Korea, October 2012.

		Chronic malnutrition (stunting)			Acute malnutrition (wasting)		
		≥ -2SD	< -2SD	Total	≥ -2SD	< -2SD	Total
Dietary diversity	Less 4 foods groups	1,528 (74.1%)	373 (71.6%)	1,901 (73.6%)	1,806 (73.2%)	96 (82.1%)	1,902 (73.6%)
	4 foods and more	534 (25.9%)	148 (28.4%)	682 (26.4%)	661 (26.8%)	21 (17.9%)	682 (26.4%)
Total		2,062 (100.0%)	521 (100.0%)	2,583 (100.0%)	2,467 (100.0%)	117 (100.0%)	2,584 (100.0%)

Chronic malnutrition (stunting): (χ^2 1.348, df 1, p=0.246)

Acute malnutrition (wasting): (χ^2 4.498, df 1, p<0.05)

Table 6.25: Anaemia and dietary diversity in children aged 6-23 months.

		Anaemia		
		Hb ≥ 11.0 g/dL	Hb < 11.0 g/dL	Total
Dietary diversity	Less 4 foods groups	378 (65.6%)	333 (64.9%)	711 (65.3%)
	4 foods and more	198 (34.4%)	180 (35.1%)	378 (34.7%)
Total		576 (100.0%)	513 (100.0%)	1,089 (100.0%)

(χ^2 0.061, df 1, p<0.805).

The proportion of children aged 6-23 months who consumed iron-rich food in the last 24 hours was assessed by compiling the food items from the questionnaire instead of using the food groups. The food items considered the animal foods in a first analysis and then the animal and vegetal iron-rich food as presented in the list below.

Food items assessed in questionnaire which are rich in iron	
G	Liver, kidney, heart, or other organ meats
H	Any meat, such as beef, pork, lamb, goat, chicken, or duck
J	Fresh or dried fish, shellfish or seafood
D	spinach, broccoli, sea weed and other dark green vegetables

The results show that 30.0% of children aged 6-23 months consumed iron-rich food from animal source while 49.5% ate iron-rich food from animal and vegetal sources (Table 6.26). There is no difference between boys and girls while these food items might be more available in Pyongyang. Due to the low food diversity in children aged 6-11 months, the analysis is not disaggregated by age groups. There was no significant association between anaemia and iron-rich food consumption (Table 6.27).

Table 6.26: Proportion of children aged 6-23 months who received iron-rich foods in the last 24 hours per sex and province. DPR Korea, October 2012.

		Unweighted count	Animal iron-rich foods (food item G,H,J) (95% CI)	Animal and vegetal iron-rich foods (food item D,G,H,I,J) (95% CI)
Total	total	2,570	30.0 (27.6-32.5)	49.5 (47-52)
Sex	Boys	1,325	28.7 (25.7-31.7)	48.8 (45.6-52.1)
	Girls	1,245	31.5 (28.3-34.6)	50.2 (46.9-53.4)
Province	Ryganggang	270	17.0 (12.4-21.7)	28.5 (23.3-33.8)
	North Hamgyong	262	40.1 (33.8-46.3)	51.9 (46.3-57.5)
	South Hamgyong	272	17.6 (10.9-24.4)	47.4 (41.2-53.7)
	Kangwon	282	24.1 (18.0-30.3)	42.9 (36.4-49.5)
	Jagang	248	24.2 (18.5-29.9)	43.1 (36.3-50)
	North Phyongan	278	28.1 (21.3-34.8)	42.1 (35.5-48.7)
	South Phyongan/Nampo	275	35.6 (28.8-42.5)	56.7 (49.5-64)
	North Hwanghae	271	24.4 (17.4-31.3)	43.5 (35.8-51.3)
	South Hwanghae	257	20.6 (15.3-26.0)	34.2 (25.4-43.1)
	Pyongyang	155	47.7 (39.2-56.3)	71.6 (64.1-79.2)

Table 6.27: Anaemia and Animal iron-rich foods, animal foods and vegetable iron rich foods in children aged 6-23 months. DPR Korea, October 2012.

		Anaemia		Total
		Hb \geq 11.0 g/dL	Hb < 11.0 g/dL	
Animal iron-rich foods (food item G, H, J)	Did not consume	384 66.7%	334 65.2%	718 66.0%
	Consumed	192 33.3%	178 34.8%	370 34.0%
Total		576 100.0%	512 100.0%	1,088 100.0%
Animal foods and vegetable iron rich foods (food item D, G, H, I, J)	Did not consume	269 46.7%	210 40.9%	479 44.0%
	Consumed	307 53.3%	303 59.1%	610 56.0%
Total		576 100.0%	513 100.0%	1,089 100.0%

Animal iron-rich foods(χ^2 0.248, df 1, p=0.619)Animal foods and vegetable iron rich foods(χ^2 3.661, df 1, p=0.056)

The proportion of children aged 6-23 months who consumed vitamin A-rich food in the last 24 hours was assessed by compiling the food items from the questionnaire instead of using the

food groups. The food items considered the vegetal foods in a first analysis and then the animal and vegetal vitamin A rich food as per the list below. As tomato was included in the food items F in the questionnaire for children, it was not possible to extract information on its consumption and to include it in the vitamin A rich food analysis.

Food items assessed in questionnaire	
G	Liver, kidney, heart, or other organ meats
I	Eggs of all sorts
B	Pumpkin, carrots, sweet potatoes, and other vitamin A rich vegetables (yellow or orange inside)
D	spinach, broccoli, sea weed and other dark green vegetables
E	Apricot, peach

The results (Table 6.28) show that 38.3% of children aged 6-23 months consumed vegetal vitamin A-rich food while 45.1% ate vitamin A-rich food from vegetal and animal sources. There is no difference between boys and girls while these food items might be more available in Pyongyang. Due to the low food diversity in children aged 6-11 months, the analysis is not disaggregated by age groups.

Table 6.28: Proportion of children aged 6-23 months who received vitamin A-rich foods in the last 24 hours per sex and province. DPR Korea, October 2012.

		Unweighted count	Vegetal vitamin A-rich foods (food items B,D,E) (95% CI)	Vegetal and animal vitamin A-rich food (food items B,D,E,G,I) (95% CI)
Total	total	2570	38.3 (35.7-40.9)	45.1 (42.4-47.7)
Sex	Boys	1325	38.3 (35-41.5)	45.6 (42.3-49)
	Girls	1245	38.4 (34.8-42)	44.5 (41-48)
Province	Ryganggang	270	22.2 (17.2-27.3)	24.8 (19.7-29.9)
	North Hamgyong	262	32.4 (25.7-39.2)	43.5 (37.5-49.5)
	South Hamgyong	272	44.1 (36.7-51.5)	46.7 (39.5-53.9)
	Kangwon	282	35.5 (29.2-41.7)	40.1 (33.4-46.8)
	Jagang	248	34.3 (27.1-41.5)	39.9 (32.7-47.2)
	North Phyongan	278	36 (31.7-40.2)	39.2 (33.7-44.7)
	South Phyongan/Nampo	275	33.5 (25.8-41.1)	46.2 (37.5-54.9)
	North Hwanghae	271	32.1 (24.9-39.3)	36.9 (29.4-44.4)
	South Hwanghae	257	38.1 (29.6-46.7)	39.7 (31.3-48.1)
	Pyongyang	155	56.1 (47.2-65.1)	66.5 (58.4-74.5)

6.2 Women

A total of 7,649 mothers aged 15-49 years old participated to the survey and as for children, the weighted count was done according to provincial population. Most of mothers were aged between 25 and 39 years old as shown in Table 6.29. As mothers of randomly selected children participated to the survey, results are not representative of the women population.

Data appraisal details of nutritional status and haemoglobin results of women for National and Provincial assessments (means and standard deviation, design effect, missing value and outliers) are presented in Appendix 6. The following table present the weighted and unweighted number of women by provinces, by age groups and by pregnancy status.

Table 6.29: Mother sample composition. DPR Korea, October 2012.

		% weighted	Number of women weighted	Number of women unweighted
Total		100.0	7,649	7,649
Province	Rygang	3.0	232	807
	North Hamgyong	10.0	767	813
	South Hamgyong	13.2	1,009	802
	Kangwon	6.5	495	790
	Jagang	5.5	419	828
	North Phyongan	11.7	892	783
	South Phyongan / Nampo	17.7	1,355	788
	North Hwanghae	9.1	693	785
	South Hwanghae	9.4	722	780
	Pyongyang	13.9	1,064	473
Age group (years)	15-19	0	1	1
	20-24	4.8	368	391
	25-29	42.4	3,240	3,300
	30-34	36.0	2,755	2,647
	35-39	13.0	998	1,011
	40-44	3.6	276	287
	45-49	.1	11	12
Pregnant	Yes	1.6	120	135
	No	98.4	7,529	7,514

6.2.1 Anthropometry and anaemia

MUAC is used in adults to assess thinness and is mainly used to identify women in needs of additional food support. Unlike BMI (body mass index), MUAC is not affected by pregnancy. As some women cannot confirm their pregnancy status after a certain time and that the survey did not provide a pregnancy test for all women to confirm their status, BMI assessment could have been biased. Then, the MUAC was considered as the most appropriate indicator

in this survey. Two commonly used thresholds⁴² 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 Table 6.30. No difference between provinces or age groups is noted.

Table 6.30: Proportion of women aged 18-49 years with low MUAC per province and age group. DPR Korea, October 2012.

		Unweighted count	MUAC < 225 mm (95% CI)	MUAC < 210 mm (95% CI)	MUAC ≥ 180 and < 210 mm (95% CI)	MUAC < 180 mm (95% CI)
Total		7,622	23.2 (21.9-24.5)	5.3 (4.7-5.9)	5.0 (4.4-5.6)	0.3 (0-1.0)
Province	Ryganggang	801	23.1 (19.9-26.3)	6.6 (5.0-8.3)	6.1 (4.5-7.8)	0.5 (0-1.0)
	North Hamgyong	813	19.9 (17.0-22.9)	5.9 (4.2-7.6)	5.5 (3.9-7.2)	0.4 (0-0.8)
	South Hamgyong	795	26.4 (22.6-30.2)	6.2 (4.3-8.0)	5.8 (4.0-7.6)	0.4 (0-0.8)
	Kangwon	790	22.9 (19.2-26.6)	6.1 (4.2-8.0)	5.8 (4-7.7)	0.3 (-0.1-0.6)
	Jagang	822	18.1 (15.1-21.2)	5.6 (4.1-7.1)	5.2 (3.8-6.7)	0.4 (0-0.8)
	North Phyongan	783	21.5 (18.0-24.9)	4.7 (3.1-6.3)	4.5 (2.9-6.0)	0.3 (-0.1-0.6)
	South Phyongan/ Nampo	787	22.2 (18.0-26.4)	5.2 (3.1-7.1)	5.0 (3.0-6.9)	0.3 (-0.1-0.6)
	North Hwanghae	778	26.7 (22.5-31.0)	5.5 (3.7-7.4)	5.3 (3.6-6.9)	0.3 (-0.2-0.8)
	South Hwanghae	780	28.2 (24.7-31.7)	5.4 (3.9-6.9)	5.1 (3.6-6.6)	0.3 (-0.1-0.6)
	Pyongyang	473	21.8 (17.5-26.1)	3.8 (1.9-5.7)	3.6 (1.7-5.5)	0.2 (-0.2-0.6)
	15-19	1	0.0 (0-0)	0.0 (0-0)	0.0 (0-0)	0.0 (0-0)
Age group (years)	20-29	3,675	25.2 (23.4-27.1)	6.0 (5-6.9)	5.8 (4.9-6.7)	0.2 (0.1-0.3)
	30-39	3,648	21.4 (19.7-23)	4.8 (4-5.5)	4.4 (3.7-5.1)	0.4 (0.2-0.6)
	40-49	298	21.8 (16.4-27.2)	4.1 (1.8-6.4)	3.8 (1.5-6.0)	0.3 (-0.3-1.0)

Anaemia prevalence assessed through haemoglobin concentration in mothers of surveyed children is presented in Table 6.31. Anaemia prevalence appears higher in Ryganggang compared to Pyongyang Province but no difference is noted between other provinces, age groups or pregnancy status. As the sample of pregnant women was too low, disaggregation of results according to pregnancy status and by provinces and age group was not possible.

⁴²Unlike MUAC in children there is no international consensus on MUAC thresholds in adults.

Table 6.31: Prevalence of anaemia (Hb < 11 g/dL if pregnant and <12 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)
Province	Total	5,843	31.2 (29.6-32.9)
	Ryganggang	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)
	18-19	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)
Pregnant	Yes	98	37.8 (27.9-47.8)
	No	5,745	31.1 (29.5-32.8)

6.2.2 Multi-micronutrients supplementation

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, including iron, folic acid, iodine and vitamin A (Appendix 10). The main purpose is to prevent anaemia and provide extra micronutrients for the pregnancy requirements. Results are presented in Table 6.32. A higher proportion of women in Pyongyang and South Hwanghae provinces receive micronutrient supplementation during pregnancy compared to women living in Ryanggang and North Hamgyong. However, the micronutrient supplementation does not vary according

to age groups.

Table 6.32: 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)
Age group (years)	15-19	1	100.0 (100-100)
	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)

The Table 6.33 shows that only 26.9% of mothers took multi-micronutrient tablets for the recommended period of 6 months during pregnancy while also 26.4% took only during 1 month. Significantly less women living in the four North-Eastern Provinces (Kangwon, South Hamgyong, North Hamgyong and Ryganggang) took the multi-micronutrient tablets for 6 months compared to those living in Pyongyang Province. No difference across age group is noted. It is important to note that recall bias may have under-estimated or over-estimated the results.

As only 98 women in the sample were pregnant at the moment of the survey, the association between anaemia and multi-micronutrients is not presented for this specific group.

Table 6.33: Multi-micronutrient supplement duration of therapy by province and age. DPR Korea, October 2012.

	Unweighted Count	1 months (95% CI)	2 month (95% CI)	3 months (95% CI)	4 months (95% CI)	5 months (95% CI)	6 months and over (95% CI)	Don't know (95% CI)
Total	2,215	26.4 (24.5-28.3)	15.4 (13.7-17)	13.8 (12.2-15.4)	8.4 (7.1-9.7)	8.2 (6.8-9.6)	26.9 (24.6-29.1)	1.0 (0.6-1.5)
Ryanggang	184	33.7 (27.5-39.9)	16.8 (11-22.7)	12.5 (7.9-17.1)	9.8 (5.6-13.9)	8.2 (4-12.3)	17.9 (11.9-24)	1.1 (-0.4-2.6)
North Hamgyong	205	34.6 (27.9-41.4)	18.5 (13.1-24)	11.7 (7.3-16.2)	8.3 (4.7-11.9)	5.9 (2.8-9)	20.5 (15-26)	0.5 (-0.5-1.4)
South Hamgyong	224	34.4 (28.6-40.1)	17.9 (13.1-22.6)	10.7 (6.9-14.5)	8.9 (5-12.9)	6.3 (2.7-9.8)	19.2 (14.4-24)	2.7 (0.3-5.0)
Kangwon	266	23.3 (17.9-28.7)	21.1 (15.8-26.3)	19.2 (12.9-25.4)	6.8 (4-9.5)	10.9 (7.5-14.3)	16.9 (12.5-21.4)	1.9 (0.3-3.5)
Jagang	213	25.8 (19-32.7)	21.6 (15-28.2)	10.8 (6.9-14.7)	9.9 (6.6-13.1)	5.6 (2.5-8.8)	25.4 (19.3-31.4)	0.9 (-0.4-2.2)
North Phyongan	236	23.3 (18.6-28)	21.2 (15.6-26.8)	20.8 (14.4-27.1)	8.9 (5.8-12)	3.4 (1.4-5.4)	22.0 (14.9-29.2)	0.4 (-0.4-1.3)
South Phyongan/Nampo	242	30.2 (24.5-35.8)	13.6 (9.3-18)	7.0 (3.7-10.3)	9.1 (5.2-13)	12.4 (8-16.8)	27.7 (22.1-33.3)	0.0 (0-0)
North Hwanghae	229	33.6 (27.2-40.1)	7.4 (3.9-10.9)	14.4 (10-18.9)	9.2 (4.5-13.9)	4.8 (2.2-7.4)	30.1 (25-35.3)	0.4 (-0.4-1.3)
South Hwanghae	240	25.8 (19.9-31.7)	11.3 (6.7-15.8)	20.4 (15.3-25.6)	7.1 (3.9-10.3)	5.0 (2.1-7.9)	28.8 (22.4-35.1)	1.7 (0.2-3.2)
Pyongyang	176	11.9 (7.7-16.1)	11.9 (7.2-16.6)	14.2 (9.6-18.9)	7.4 (4.1-10.7)	12.5 (7.3-17.7)	40.9 (32.9-48.9)	1.1 (-0.4-2.7)
15-19 years	1	0.0 (0-0)	0.0 (0-0)	0.0 (0-0)	0.0 (0-0)	0.0 (0-0)	100.0 (100-100)	0.0 (0-0)
20-29 years	1,423	25.6 (23.1-28)	15.4 (13.3-17.5)	13.6 (11.6-15.6)	8.5 (6.9-10.2)	8.4 (6.6-10.2)	27.5 (24.7-30.3)	1.0 (0.4-1.6)
30-39 years	745	28.2 (24.8-31.7)	15.2 (12.3-18.1)	13.7 (11.1-16.4)	8.1 (5.9-10.2)	8.2 (5.6-10.7)	25.5 (21.9-29.1)	1.1 (0.3-1.9)
40-49 years	46	20.1 (6.4-33.8)	14.9 (3.6-26.2)	24.0 (10.9-37.1)	9.4 (-2.5-21.3)	1.5 (-1.5-4.6)	30.0 (14.4-45.7)	0.0 (0-0)

6.2.3 Dietary diversity

The analysis of dietary diversity for women was based on the assessment of the qualitative 24-h food recalls containing 16 food items (Table 6.34). During the interview, mothers were listing all the food that they ate the previous day which was noted on the questionnaire. Then, the interviewer read one by one the 16 food items asking the mothers if they ate that type of food yesterday to gather as much information as possible and to decrease the risk of recall bias by forgetting items. Despite all efforts to prevent memory lapse, it is possible that the results on dietary diversity are underestimated.

The number of women who consumed any food included in the 16 food items is reported in the Table 6.34 and Figure 6.7. These results show that among 7,649 surveyed women, most of them consumed rice/noodles/grains with condiments and oil/butter. Vegetables and food made from beans were also consumed by a majority.

Table 6.34: Number and proportion of women who consumed foods included in the 16 food items in the last 24 hours. DPR Korea, October 2012.

Food items		Number of women	Proportion of women
A	Porridge, bread, rice, noodles and other foods made from grains	7,609	99.5
P	Condiments and beverages such as pepper, parsley, salt, soy sauce, garlic, fish powder, tea, coffee, alcoholic beverages	7,587	99.4
N	Oil, butter, or foods made with any of these	6,363	83.3
E	Other vegetables (cabbage, cucumber, tomato, eggplant, etc)	4,600	62.4
D	Chrysanthemum leaves, spinach, broccoli, sea weed and other dark green vegetables	4,107	54.3
L	Any food made from beans, peas, lentils, nuts ,or seeds	4,040	53
C	Potatoes and food made from potatoes	3,232	41.1
K	Fresh or dried fish, shellfish or seafood	2,278	32.6
G	Other fruits (apple, pear, watermelon, etc) and their juices	2,097	30.8
O	Sweets, honey, caramel, non-fruit juice (coke, fanta, sprite, tonic), chocolate, biscuits, cakes and other candy	2,233	30.4
B	Pumpkin, carrots, sweet potatoes and other vitamin A rich vegetables (yellow or orange inside)	1,879	24.6
I	Any meat, such as beef, pork, lamb, goat, chicken, or duck	892	14.6
J	Eggs of all sorts	474	7.6
F	Apricot, peach (vitamin A rich fruits) and their juices	244	3.3
M	Milk (fresh milk, milk powder, tinned milk), yogurt, cheese, other milk products	168	2.4
H	Liver, kidney, heart, or other organ meats	149	2.2

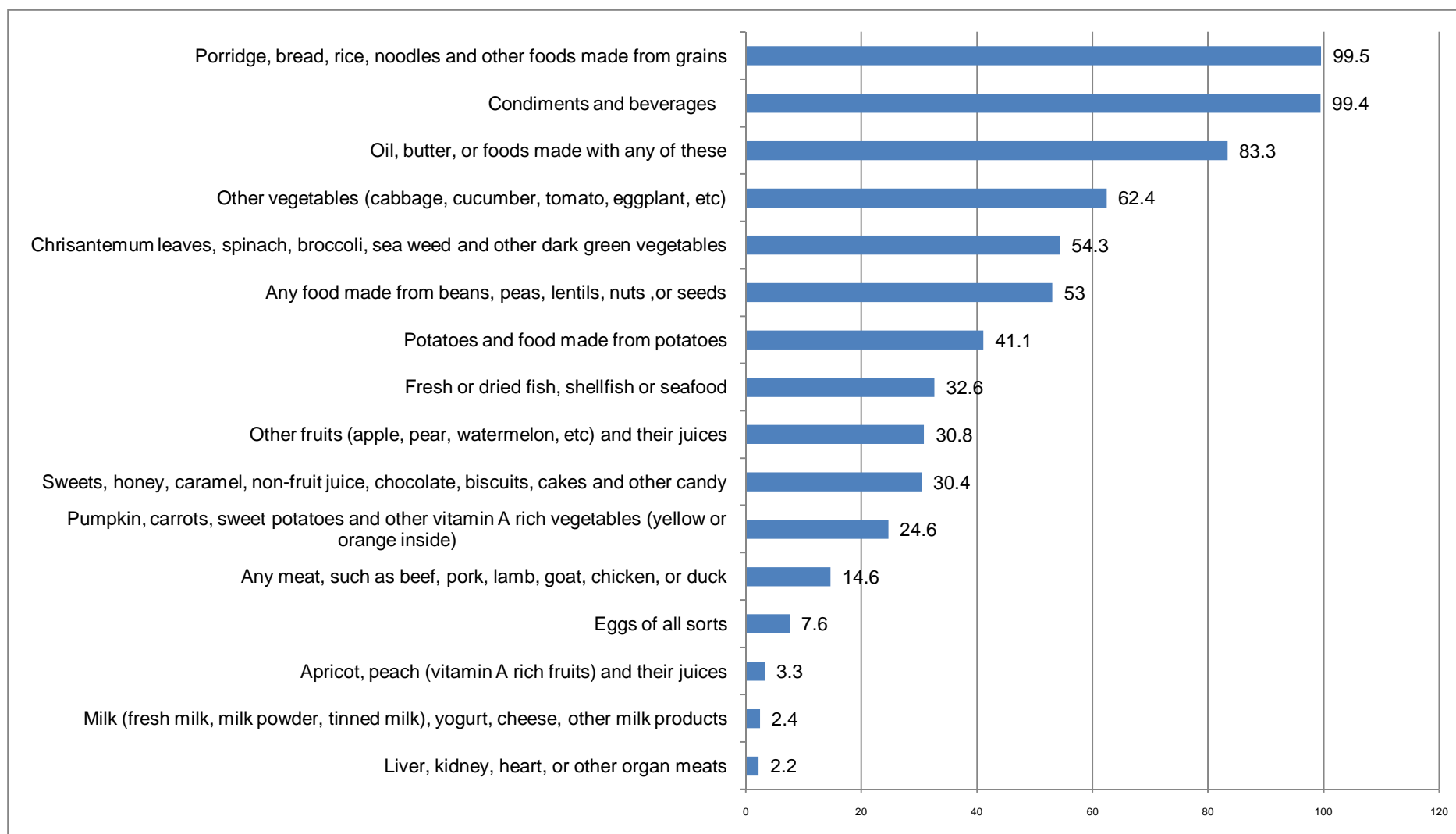


Figure 6.7: Proportion of women who consumed foods included in the 16 food items in the last 24 hours. DPR Korea, October 2012.

The first step of analysis was to group the 16 food items in 10 food groups to gather information on the micronutrient adequacy of the diet⁴³ (Table 6.35). The following table presents the details on which food items was included in each food groups.

Table 6.35: Composition of food groups for dietary diversity analysis based on the food items assessed in the questionnaire. DPR Korea, October 2012.

Food groups for dietary diversity analysis		Food items assessed in questionnaire	
1	Starchy staples	A	Porridge, bread, rice, noodles and other foods made from grains
		C	Potatoes and food made from potatoes
2	Dark green leafy vegetables	D	Chrysanthemum leaves, spinach, broccoli, sea weed and other dark green vegetables
3	Other vitamin A rich fruits and vegetables	B	Pumpkin, carrots, sweet potatoes and other vitamin A rich vegetables (yellow or orange inside)
		F	Apricot, peach (vitamin A rich fruits) and their juices
4	Other fruits and vegetables	E	Other vegetables (cabbage, cucumber, tomato, eggplant, etc)
		G	Other fruits (apple, pear, watermelon, etc) and their juices
5	Organ meat	H	Liver, kidney, heart, or other organ meats
6	Meat and fish	I	Any meat, such as beef, pork, lamb, goat, chicken, or duck
		K	Fresh or dried fish, shellfish or seafood
7	Eggs	J	Eggs of all sorts
8	Legumes and nuts	L	Any food made from beans, peas, lentils, nuts ,or seeds
9	Milk and milk products	M	Milk (fresh milk, milk powder, tinned milk), yogurt, cheese, other milk products
		N	Oil, butter, or foods made with any of these
10	Others	O	Sweets, honey, caramel, non-fruit juice (coke, fanta, sprite, tonic), chocolate, biscuits, cakes and other candy
		P	Condiments and beverages such as pepper, parsley, salt, soy sauce, garlic, fish powder, tea, coffee, alcoholic beverages

In average, women consumed about 3.6 food groups over the 9 food groups in the last 24h suggesting a low micronutrient adequacy (Table 6.36). No age difference is noted while diversity and micronutrient adequacy seems higher in Pyongyang. The analysis including 10 food groups to consider the “Others” food items (oil, sweets, condiments, tea, coffee, etc.) does not suggest a different pattern.

⁴³FAO. Guidelines for measuring household and individual dietary diversity. 2011.

Table 6.36: Mean number of food groups consumed in the last 24 hour by women aged 15-49 years old in the last 24 hours. DPR Korea, October 2012.

		Unweighted Count	Mean number Over9 food groups (95% CI)	Mean number Over10 food groups (95% CI)
Total		7,649	3.6 (3.5-3.6)	4.6 (4.5-4.6)
Province	Ryganggang	807	3 (2.9-3.1)	4 (3.9-4.1)
	North Hamgyong	813	3.6 (3.5-3.7)	4.6 (4.5-4.7)
	South Hamgyong	802	3.4 (3.3-3.5)	4.4 (4.3-4.5)
	Kangwon	790	3.7 (3.5-3.8)	4.7 (4.5-4.8)
	Jagang	828	3.2 (3.1-3.3)	4.2 (4.1-4.3)
	North Phyongan	783	3.3 (3.2-3.4)	4.3 (4.2-4.4)
	South Phyongan / Nampo	788	3.8 (3.6-3.9)	4.8 (4.6-4.9)
	North Hwanghae	785	3.4 (3.3-3.5)	4.4 (4.3-4.5)
	South Hwanghae	780	3.4 (3.2-3.5)	4.4 (4.2-4.5)
	Pyongyang	473	4.1 (3.9-4.2)	5.1 (4.9-5.2)
Age groups (years)	15-19	1	3.0 (3.0-3.0)	4.0 (4.0-4.0)
	20-29	3,691	3.6 (3.5-3.6)	4.6 (4.5-4.6)
	30-39	3,658	3.5 (3.5-3.6)	4.5 (4.5-4.6)
	40-49	299	3.5 (3.3-3.6)	4.5 (4.3-4.6)

Close to 100% of women consumed mainly starchy staple foods with food from the group "Others". A majority ate also other fruits and vegetables, dark green leafy vegetables and legumes and nuts. This pattern does not vary according to Province or age group except for the consumption of meat and fish which is higher in Pyongyang than in other provinces. (Table 6.37)

Table 6.37: Proportion of women who ate the different food groups at least one time in the last 24 hours per province and age groups. DPR Korea, October 2012.

		Food Group 1	Food Group 2	Food Group 3	Food Group 4	Food Group 5	Food Group 6	Food Group 7	Food Group 8	Food Group 9	Food Group 10	
		Unweigh ted count	Starchy staples (95% CI)	Dark green leafy vegetables (95% CI)	Other vitamin A rich fruits and vegetables (95% CI)	Other fruits and vegetables (95%CI)	Organ meat (95%CI)	Meat and fish (95%CI)	Eggs (95%CI)	Legumes and nuts (95%CI)	Milk and milk products (95%CI)	Others (95%CI)
Total		7,649	99.6 (99.4-99.8)	54.4 (51.9-56.9)	26.8 (25.3-28.3)	69.3 (67.8-70.9)	2.2 (1.8-2.6)	40.4 (38.7-42.2)	7.7 (6.7-8.6)	53.2 (51.4-55)	2.4 (1.9-2.9)	99.5 (99.3-99.7)
Province	Ryanggang	807	98.9 (98.2-99.5)	47.5 (39.1-55.8)	15.6 (13.4-17.8)	49.8 (44.1-55.6)	0.9 (0.3-1.5)	21.1 (17.4-24.7)	2.7 (1.4-4)	62.3 (58.9-65.8)	1.9 (0.9-2.8)	98.8 (97.9-99.6)
	North Hamgyong	813	99.9 (99.6-100.1)	40.8 (34.5-47.2)	32.7 (28.3-37.1)	78.4 (74.7-82)	2.6 (1.6-3.6)	46.5 (40.3-52.7)	8 (5.9-10.1)	48.2 (42.6-53.9)	2.6 (1.4-3.8)	99.9 (99.6-100.1)
	South Hamgyong	802	99 (98.2-99.8)	63 (58.6-67.4)	18.8 (15.2-22.5)	71.2 (68.1-74.3)	0.1 (-0.1-0.4)	22.4 (17.6-27.3)	3 (1.6-4.4)	57.6 (51.7-63.5)	2.1 (1.1-3.2)	98.5 (97.6-99.4)
	Kangwon	790	99.9 (99.6-100.1)	72.4 (67.4-77.4)	32.9 (28.2-37.7)	69.7 (64.8-74.7)	3.3 (1.9-4.6)	29.5 (22.5-36.5)	7 (4.8-9.1)	46.1 (41.3-50.9)	5.1 (3.2-7)	99.2 (98.6-99.9)
	Jagang	828	99.3 (98.7-99.8)	58.3 (51.1-65.6)	28.1 (24.3-32)	48.8 (42.1-55.4)	1.6 (0.9-2.3)	34.3 (29-39.6)	6.2 (2.8-9.5)	45.9 (40.8-51)	1.2 (0.6-1.9)	99.3 (98.7-99.8)
	North Phyongan	783	100 (100-100)	43 (35.1-51)	34 (30.5-37.4)	71 (65.7-76.3)	1 (0.3-1.8)	45.5 (40-50.9)	4.2 (2.2-6.2)	34.4 (30-38.7)	0.6 (0.1-1.2)	100 (100-100)
	South Phyongan/ Nampo	788	99.7 (99.4-100.1)	62.4 (52.9-72)	20.9 (16.6-25.3)	51.1 (45.8-56.5)	6 (4.2-7.7)	49.9 (45.1-54.6)	12.1 (8.8-15.4)	72.1 (66.8-77.3)	1.8 (0.7-2.8)	99.9 (99.6-100.1)
	North Hwanghae	785	99.1 (97.8-100.4)	51.5 (43.8-59.2)	31.2 (25.8-36.6)	63.1 (57.9-68.2)	1.1 (0.4-1.9)	34.9 (31-38.8)	4.7 (2.9-6.5)	56.7 (52.8-60.6)	1.4 (0.5-2.3)	98.9 (97.5-100.2)
	South Hwanghae	780	99.9 (99.6-100.1)	42.3 (36.4-48.2)	25.8 (22.7-28.8)	81.5 (77.9-85.1)	1 (0.3-1.8)	24.5 (20.5-28.5)	1.2 (0.5-1.8)	58.2 (51-65.4)	0.9 (0.3-1.5)	99.9 (99.6-100.1)
	Pyongyang	473	99.6 (99-100.2)	56.9 (51.4-62.3)	28.5 (23.3-33.8)	90.7 (88-93.4)	1.9 (0.6-3.2)	63 (57.2-68.8)	17.5 (13.3-21.8)	42.9 (37.8-48.1)	5.9 (3.3-8.5)	100 (100-100)
Age groups (years)	15-19	1	100 (100-100)	100 (100-100)	0 (0-0)	0 (0-0)	0 (0-0)	100 (100-100)	0 (0-0)	0 (0-0)	0 (0-0)	100 (100-100)
	20-29	3,691	99.4 (99-99.7)	55.1 (52.3-57.9)	25.8 (24-27.6)	69.3 (67.2-71.3)	2.2 (1.6-2.8)	41.6 (39.4-43.7)	8.2 (7-9.4)	54.2 (51.8-56.5)	2.2 (1.6-2.8)	99.5 (99.2-99.8)
	30-39	3,658	99.8 (99.6-99.9)	53.4 (50.6-56.2)	28.1 (26.1-30)	69.5 (67.7-71.3)	2.2 (1.6-2.8)	39.5 (37.3-41.8)	7.3 (6.1-8.5)	52.5 (50.2-54.7)	2.6 (1.9-3.4)	99.6 (99.4-99.8)
	40-49	299	99.8 (99.5-100.2)	57.5 (51-64)	23 (17.4-28.5)	67.4 (61.5-73.4)	3.2 (0.8-5.5)	37.7 (31.3-44.2)	6.4 (3-9.8)	50.7 (44.4-57)	2.1 (0.4-3.9)	99.1 (98-100.1)

The proportion of women consuming at least 4 food groups over the 9 food groups is 49.6% (Table 6.38). There is no difference between age group but significantly more women meet the minimum dietary diversity in Pyongyang compared to other Provinces.

Table 6.38: Proportion of women who ate food from at least 4 out of 9 food groups (minimum dietary diversity) among the groups number 1 to number 9. DPR Korea, October 2012.

	Unweighted Count	Proportion of women who ate food from at least 4 out of 9 food groups (groups 1 to 9)
Total	7,649	49.6 (47.7-51.4)
Province	Ryganggang	26.8 (22.9-30.6)
	North Hamgyong	50.1 (44.5-55.6)
	South Hamgyong	42.9 (38.1-47.7)
	Kangwon	53.0 (47.8-58.3)
	Jagang	35.7 (31.4-40.1)
	North Phyongan	40.2 (35.2-45.3)
	South Phyongan/Nampo	57.5 (51.6-63.4)
	North Hwanghae	44.8 (40.-49.7)
	South Hwanghae	41.4 (35.6-47.2)
	Pyongyang	70.8 (65.3-76.4)
	15-19	0 (0.0-0.0)
Age groups (years)	20-29	50.6 (48.5-52.7)
	30-39	49.0 (46.6-51.3)
	40-49	44.7 (38.1-51.3)

Dietary diversity is low in the country without much variation which could explain why there is no significant difference between dietary diversity and anaemia. However, as the significant association between acute malnutrition and low diversity found in children, lower food diversity is associated with a higher proportion of undernutrition in women (Table 6.39).

Table 6.39: Undernutrition or anaemia and dietary diversity in women aged 15-49 years old. DPR Korea, October 2012.

October 2012.

		Undernutrition assessed by MUAC			Anaemia		
		≥ 225 mm	<225 mm	Total	Hb ≥ 11 g/dL if pregnant and ≥ 12 g/dL if non-pregnant	Hb <11 g/dL if pregnant and <12 g/dL if non-pregnant	Total
Dietary diversity	Less 4 food groups over 9 groups	2,896	939	3,835	2,033	981	3,014
		49.4%	53.0%	50.3%	48.7%	51.7%	49.7%
	4 food groups and more over 9 groups	2,961	832	3,793	2,138	915	3,053
		50.6%	47.0%	49.7%	51.3%	48.3%	50.3%
Total		5,857	1,771	7,628	4,171	1,896	6,067
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Undernutrition: (χ^2 6.955, df 1, p<0.01)Anaemia: (χ^2 4.690, df 1, p=0.30)

Iron-rich foods and vitamin A rich-foods were consumed by 73.6% and 71.1% of women respectively. Women living in Pyongyang have a higher consumption of these two food groups compared to Ryanggang province. No difference is noted between age groups. As tomato was included in the food items E in the questionnaire for women, it was not possible to extract information on its consumption and to include it in the vitamin A rich food analysis. The results could be underestimated.

Table 6.40: Proportion of women aged 15-49 years old who ate iron-rich food or vitamin A rich-food in the last 24 hours. DPR Korea, October 2012.

		Unweighted Count	Consumption of iron-rich food (groups 2,5,6) (95%CI)	Consumption of vitamin A rich food (groups 2,3,5,7) (95% CI)
Total		7,649	73.6 (72-75.2)	71.1 (69.2-73.0)
Province	Ryganggang	807	57.9 (50.5-65.3)	57.8 (50.5-65.0)
	North Hamgyong	813	70.1 (64.9-75.3)	61.6 (55.3-67.9)
	South Hamgyong	802	71.9 (67.8-76.1)	73.2 (69.4-77.0)
	Kangwon	790	81.8 (77.4-86.2)	83.9 (80.9-87.0)
	Jagang	828	76.1 (71.6-80.6)	74.4 (70.2-78.6)
	North Phyongan	783	69.5 (64.2-74.7)	65.9 (60.4-71.4)
	South Phyongan / Nampo	788	80.3 (75.1-85.6)	75.3 (68.0-82.5)
	North Hwanghae	785	71.3 (66.4-76.3)	71.6 (66.3-76.9)
	South Hwanghae	780	54.7 (49-60.5)	59.5 (54.2-64.8)
	Pyongyang	473	85.4 (82.4-88.5)	78.2 (74.5-81.9)
	15-19	1	100.0 (100-100)	100.0 (100.0-100.0)
Age groups (years)	20-29	3,691	74.6 (72.7-76.5)	71.0 (68.9-73.1)
	30-39	3,658	72.7 (70.7-74.8)	71.0 (68.7-73.3)
	40-49	299	72.3 (66.4-78.2)	73.9 (68.2-79.7)

The lack of significant association between anaemia and the consumption of iron-rich foods suggest that anaemia might be linked with other factors, like intestinal parasite infections, which were not assessed in this survey (Table 6.41).

Table 6.41: Undernutrition or anaemia and dietary diversity in women aged 15-49 years old. DPR Korea, October 2012.

		Anaemia		Total
		Hb \geq 11 g/dL if pregnant and \geq 12 g/dL if non-pregnant	Hb <11 g/dL if pregnant and <12 g/dL if non-pregnant	
Iron-rich foods consumption	Did not consume	1,061	505	1566
	iron-rich food	25.4%	26.6%	25.8%
	Consumed iron-rich	3,110	1,391	4,501
	food	74.6%	73.4%	74.2%
Total		4,171	1,896	6,067
		100.0%	100.0%	100.0%

(χ^2 0.976, df 1, p=0.323)

7. DISCUSSION

7.1 Stunting (Chronic malnutrition)

Global Chronic Malnutrition or Stunting prevalence found in this survey is 27.9% at national level and is considered as a 'medium' public health significance according to WHO standards. Jagang, South Hamgyong and Ryanggang are falling into the 'high' category, with Ryanggang being near to the 'very high' threshold (Figure 7.1). Apart from Pyongyang and Ryanggang all other Provinces have similar level of global chronic malnutrition classified as medium or high public health issue.

Table 7.1: 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%

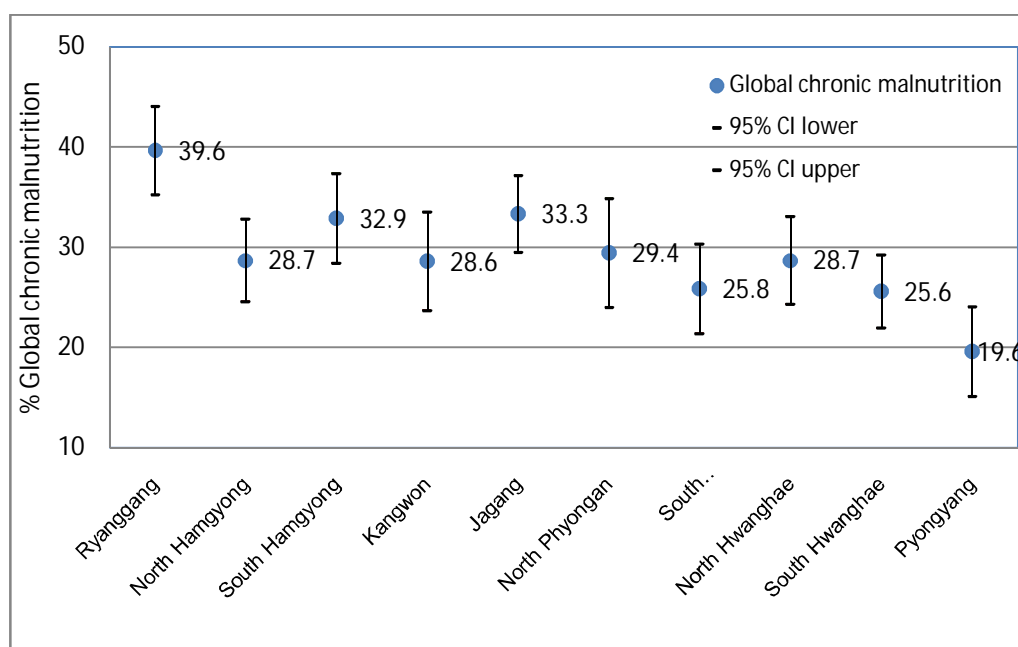


Figure 7.1: Comparison of Global Chronic Malnutrition (stunting) among provinces

The Global Chronic Malnutrition (stunting) situation even if considered as a medium public health issue at national level it is still of concern. Chronic malnutrition which is also called stunting or growth failure brings irreversible damages on children. The important consequences on children's development, their learning capacity and their productivity at adult age can affect the long term 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 weight⁴⁴. 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.

Chronic malnutrition increases with age and reaches a plateau from 3 years old but is

⁴⁴Victora et al, Lancet 2008

irreversible after 2 years old. To succeed in the reduction of stunting in DPRK, interventions must target pre-pregnant women to prepare their body for the pregnancy, pregnant and lactating women to ensure optimal development during foetus and early age life and the children in their first 2 years of life. There are already some interventions 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. The results did not show difference between boys and girls for the prevalence of stunting nationally and while most of provinces have a higher prevalence of stunting than Pyongyang.

The survey methodology was not adequate to do separate analysis to assess the impact of the multi-sectoral approaches implemented in different areas of the country in the last years on the prevalence of stunting in the targeted intervention counties such as agriculture inputs, fortified food distributed in the nurseries and to pregnant and lactating women, multi-micronutrient supplementation for pre-pregnant, pregnant or lactating women, micronutrient supplementation and deworming for children, access to essential medicine or clean water and handwashing promotion. It is possible that these interventions could have benefitted positively on children and contributed to the modest decrease in stunting prevalence.

7.2 Wasting (Acute Malnutrition):

Global Acute Malnutrition (GAM), based on Weight for Height did not show significant difference between sex ($p>0.4$) 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-offs⁴⁵ for global acute malnutrition as shown in Table 7.2.

Table 7.2: 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%

Nevertheless, two provinces, Ryanggang and Jagang fall in the 'poor' category while Pyongyang is of least concern.

Apart from Pyongyang (GAM 2.3%), most of other regions show similar GAM prevalence, below or around the 5% threshold except Jagang and Ryanggang showing a prevalence of about 6% (figure 7.2). Results of acute malnutrition from Kangwon, South Hamgyong, North Hamgyong and Ryanggang need to be interpreted carefully as the community management of severe acute malnutrition is on-going with regular screening and treatment for more than one year in at least 25 counties over the 77 counties of these provinces. If this intervention would stop, it is highly possible that the global and the severe acute malnutrition prevalence in these provinces would rise.

According to WHO suggested classification, the acute malnutrition situation in these regions is at the limit between acceptable and poor situation⁴⁶. Several factors such as sufficient WASH facilities and practices, access to essential medications and food security affect children's daily life. The results did not show any sex difference in acute malnutrition in any province. As expected, the prevalence of acute malnutrition tends to be higher in the 0-23.9

⁴⁵WHO (2000). The Management of Nutrition in Major Emergencies. WHO, Genève.

⁴⁶WFP-UNHCR (2011). Guidelines For Selective Feeding: The Management Of Malnutrition In Emergencies January 2011.

months age group compared to the 24-59.9 months one but it was not significant. The 0-23.9 months groups is more vulnerable to acute malnutrition (as well as chronic malnutrition) as it is a very short period of time over which so many changes happens in feeding patterns (evolving from breastfeeding to family food) and in development pattern from lying, sitting to running.

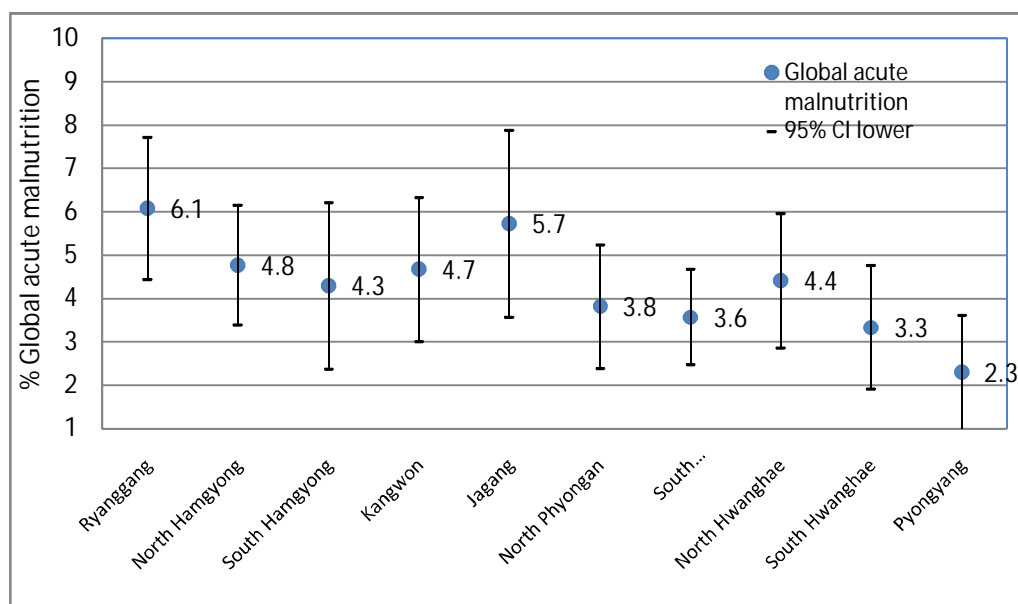


Figure 7.2: Comparison of GAM among provinces. DPR Korea, October 2012.

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

- A decrease of interventions on agriculture, food security, health, WASH and nutrition could affect negatively the nutritional status of children and women.
- 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, and drought) as compared to 2011. This allowed 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 decisions concerning nutrition-related programs. Acutely malnourished children have a much higher risk of mortality than non-malnourished children and do not grow properly during acute malnutrition episode putting them at higher risk of stunting and thus negatively impacting on their mental development⁴⁷. 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 Height⁴⁸ results, showing differences between gender and age groups according to non-overlapping of

⁴⁷Black et al, Lancet 2008.

⁴⁸However this does not means that the two methods identify the same children.

confidence intervals. However, the results also show that these two methods do not identify always same children. It is known that these two indicators are both associated with the mortality risk. The MUAC identified less acutely malnourished children aged 36 months and older compared to the WHZ as it might lose its specificity and sensitivity with growing children. MUAC is an easy tool to use in communities and to be used by household doctors during their household visits as it is light and does not increase the burden of transportation like the weighing scale and the height board. However, it is important to also continue screening using the weight-for-height index as often as possible in the clinics or even the nurseries and kindergarten to offer appropriate treatment for acute malnutrition as early as possible in the development of this disease.

7.3 Extrapolation of number of children stunted or wasted

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 4,429 Ri/Up/Ku/Dong (village/urban neighbourhood) in DPRK. This means that on average 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 2012), it is estimated that 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 of acutely malnourished children must be considered for the whole year.

Table 7.3: Estimated number of children aged 0-59 months of global (H/A < -2 z-s), severe (< -3 z-s) chronic malnutrition and global (W/H < -2 z-s), severe (< -3 z-s) acute malnutrition per Province. DPR Korea, October 2012.

Province	Estimated number of cases of global chronic malnutrition (stunting)	Estimated number of cases of severe chronic malnutrition	Estimated number of cases of global acute malnutrition	Estimated number of cases of severe acute malnutrition
Total	475,868	122,805	68,225	10,234
Ryganggang	20,552	6,307	3,180	600
North Hamyong	48,641	13,951	8,155	1,089
South Hamyong	74,510	21,364	9,817	1,749
Kangwon	31,005	8,577	5,110	840
Jangang	32,162	9,435	5,576	745
North Phyongan	60,427	16,665	7,908	792
South Phyongan / Nampo	76,772	13,822	10,720	1,145
North Hwanghae	43,968	12,428	6,818	1,379
South Hwanghae	42,345	11,049	5,570	850
Pyongyang	45,486	9,210	5,376	1,045

7.4 Children's anaemia, Vitamin A and morbidity

According to WHO⁴⁹ classification of severity (Table 7.4), DPRK presents a 'moderate' level of anaemia prevalence and disaggregated provincial figures are also in this same category.

Table 7.4: 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 relate to inadequate breastfeeding and complementary feeding practices, including low nutrient quality of complementary food, especially in iron. However, stunted children significantly tend to be anaemic compared to non-stunted children. This significant association is of great interest as it strengthens the need to consider the decrease of anaemia as one of the priority topics to be included in the fight against stunting.

There was no significant association between anaemia and acute malnutrition illustrating that other factors may play a larger role in the acute malnutrition prevalence. The association between acute malnutrition and anaemia could be underestimated as different interventions are done in some areas of the country such as agriculture inputs, food support, CMAM, access to essential medicines and safe water and promotion of adequate hygiene practices.

Prevalence of infectious disease may also be a reason why anaemia is high in children although prevalence of diarrhoea and/or acute respiratory infections was not particularly high in this age group. More than 98% of children 24-59 months are dewormed twice per year through the Child Health Days along with vitamin A distribution. However, 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 and with the Ministry of Public Health's vitamin A distribution reports disseminated after each Child Health Day.

Morbidity in the last 14 days in children was reported by 14% of respondents. No international cut-off exists for the public health importance of this level. No association between morbidity and chronic or acute malnutrition was found. As morbidity data were collected only for a very recent period of time (14 days), it is highly possible that the last two weeks will not have immediate impact on the child. In DPRK, diarrhoea increase with the rainy season mainly in July and August but the survey was done mid-September to mid-October while pneumonia is reported more in winter season. The sample size of sick children could be too small (maybe due to seasonal underestimation) to demonstrate clear association. The history over the past months would probably be more significant in the association with chronic and acute malnutrition. However, as the risk of recall bias (mother forgets what happened and can mix up more between children) increase with the period of time considered, this survey limited the recall time to only the last 14 days.

⁴⁹WHO (2001). Iron Deficiency Anaemia Assessment, Prevention, and Control. A guide for programme managers.

7.5 Children's feeding practices

7.5.1 *Breastfeeding*

As it plays an important in the prevention of mortality, early initiation of breastfeeding needs to be strengthened in DPRK. It is mainly promoted in 10 Provincial Maternity Hospitals which are certified Baby-Friendly. However, most of mothers give birth in County or Ri Hospitals so more efforts are needed to extend the promotion of this optimal practice to reach more mothers but also doctors and midwives.

Exclusive breastfeeding was assessed differently in this survey compared to the MICS done in 2009 and results are more realistic. There could be beliefs and barriers to early breastfeeding and exclusive breastfeeding that need to be identified in further surveys in order to demystify them and implement appropriate behaviour change interventions. Due to low access to other sources of milk (infant formula, cow or goat milk, soy milk, etc.), most of mothers are breastfeeding for more than one year. More promotion on the continuity of breastfeeding up to 2 years needs to be considered.

In DPRK, the maternity leave is 3 months after delivery (combined with 2 months before delivery). In addition, all women have the possibility to be assigned to a nursery situated at less than 15 minutes of the work place where she can place her baby during work time. More information is needed on the feeding practices and respect of the exclusivity of breastfeeding of under 6 months babies in the nurseries although the National Breastfeeding Policy clearly states that exclusive breastfeeding should be promoted. The knowledge and the influence on feeding practices (breastfeeding and complementary feeding) of other family members such as grandmothers, fathers, even neighbours is unknown. Although all Provincial Maternity Hospitals are certified Baby-Friendly, more information is needed on the key messages and counselling techniques for the promotion of adequate IYCF practices used with mothers by health staff at County and community levels (doctors in maternities, household doctors, midwives, etc.).

7.5.2 *Complementary feeding*

Low food diversity and lack of association with anaemia and stunting strengthen the concept that stunting is associated with a large panel of factors which can only be addressed through multi-sectoral approaches.

MICS 2009 results showed that 48% of children aged 6-23 months received the minimum number of meals according to their age while in children aged 6-8 months, only 26.5% were receiving the appropriate number of meals, in those aged 9-11 months, 39.8%, in those aged 12-17 months, 57.1% and in those aged 18-23 months, 70.0%. As interventions to promote IYCF were limited since 2009, it is not expected that feeding practices related to the number of meals per day has changed at the moment of the present survey.

There are still about 40% of children at 6 months who do not receive any complementary while the quality of the complementary feeding at this crucial age needs improvement. The low food diversity illustrates the need to strengthen the messages about the adequate duration of exclusive breastfeeding and the importance of giving nutritious foods to the child starting at 6 months to promote adequate growth. The food diversity allows some insight on the quality but the quantity of food offered to children is not assessed and the compliance to international recommended nutrient intake cannot be calculated. The acute malnutrition prevalence is low possibly because the minimum caloric intake is met for most of children but the high prevalence of stunting illustrates the low food diversity.

It is possible that the caloric intake may be sufficient most of the time but somewhat borderline as any changes in the food availability has important impact on the prevalence of acute malnutrition like it was noted with the challenged agricultural season in 2011⁵⁰ compared to a fairly good one in 2012⁵¹. In 2011, an extended MUAC community assessment (180,311 children 6-59 months screened with GAM results of 17.4% and SAM 2.8% in 25 counties spread over Kangwon, South Hamgyong, North Hamgyong and Ryanggang provinces) which led to the implementation of community management of acute malnutrition (CMAM). A similar situation (GAM 14.1%, SAM 1.6%), was noted in another MUAC assessment completed over 696 children aged 6-59 months in WFP supported counties. There was no report of significant increase in acute malnutrition in 2012 but the CMAM intervention is on-going and now part of the regular health care in close to 1,000 Ri/Dong as the acute malnutrition is still present, increasing risk of mortality in children.

7.6 Mother's nutritional status

Although not representative of the women nutrition situation in DPRK, the mothers' situation was 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 undernutrition (based on MUAC < 225 mm) (from 25.6% to 23.2%) and anaemia (from 34.7% to 31.2%) has been found but still no statistically significant difference was noted.

Mother's undernutrition and anaemia results may be underestimated as many interventions targeting them are on-going such as fortified food support and multi-micronutrient supplementation for pregnant and lactating women and iron and folic acid supplementation for pre-pregnant women.

Prevalence of anaemia in pregnant women seems higher but careful interpretation is needed as there is no significant difference between pregnancy status due to the low number of pregnant women in this survey. Nevertheless, due to high anaemia prevalence, iron and folic acid supplementation in pre-pregnant women is still recommended as well as the continuation of the multi-micronutrient supplementation or the consumption of fortified food by pregnant and lactating women.

Daily multi-micronutrient supplementation during pregnancy was reported by 74% of interviewed mothers, ranging from 55% in Ryanggang to 80.3% in Pyongyang. However, only 26.9% of women received it during the 6-month recommended period with similar results in most of the provinces. A weekly iron and folic acid supplementation tablet is also distributed nationwide to pre-pregnant women aged 23-28 years but the compliance to this supplementation is unknown. The fact that no significant difference is noted between the age group 20-29 years compared to other age groups raises many questions about compliance and intestinal parasite infections beside the effect of a low dietary diversity on anaemia. This strongly highlights the need to revise the existing interventions (multi-micronutrient supplement in pregnant and lactating women and iron and folic acid in pre-pregnant, deworming of women, promotion of the consumption of iron-rich food) to achieve a wider coverage of these effective public health interventions to prevent anaemia for women. These revisions could focus mainly the target groups, the promotion of the importance of micronutrient supplementation and the strengthening of the monitoring.

Dietary diversity in women (49.6% consumed at least 4 food groups) is somewhat better than in children (26.5% consumed at least 4 food groups) with a different choice of food items possibly indicating that there is a certain latitude of action to improve children's dietary

⁵⁰WFP and FAO, CFSAM 2011

⁵¹WFP and FAO, CFSAM 2012

diversity inside the household with what is already available. The promotion of adequate women's nutrition need to be strengthened using different channels of communication (national, provincial, health institution, schools, villages and families, etc.) but communication on nutrition should also include the promotion of infant and young children nutrition practices.

As for wasted children, undernutrition in women is associated with lower food diversity. There is a need to help the mothers to identify nutrition accessible seasonal food to increase their own food diversity as well as the one for their children to prevent weight loss and strengthen immunity. These specific target groups need also to receive adequately fortified food ration or multi-micronutrient supplementation to help them fill the nutrient gaps in their nutrient intake while promoting a decreased workload during pregnancy.

7.7 History of malnutrition in DPRK

Figure 7.3 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 variation⁵². 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.

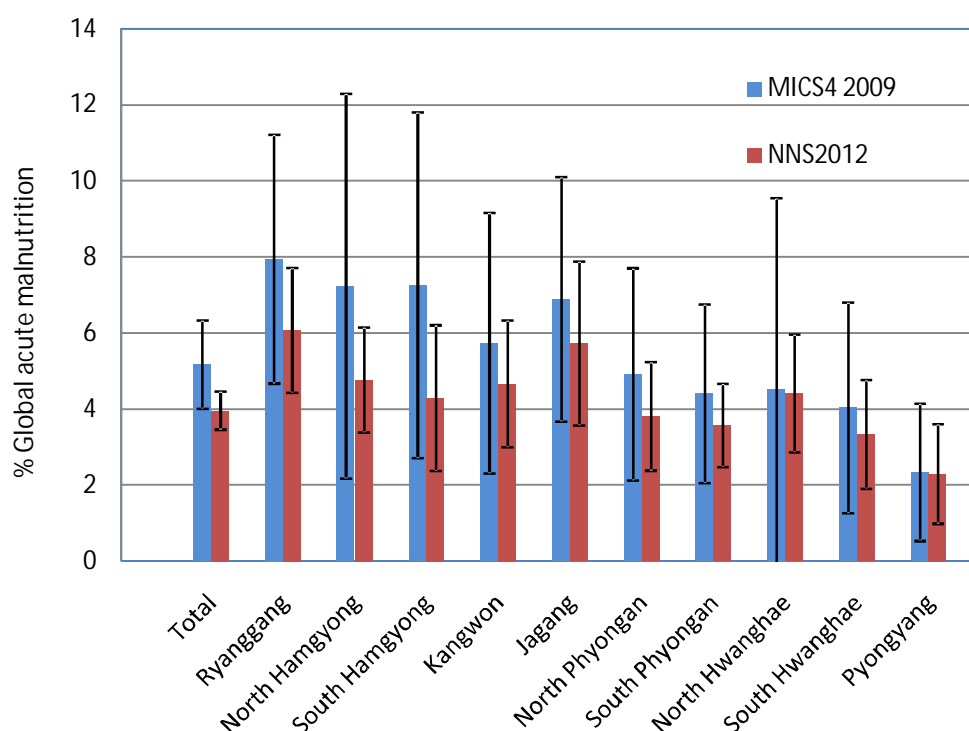


Figure 7.3: GAM prevalence and confidence intervals of MICS 2009 and National Nutrition Survey 2012 surveys.

In the Table 7.5 the main nutrition findings of previous surveys are set out for comparison. A decreasing 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

⁵²The more the confidence intervals of two estimates overlap, the more that difference is likely due to chance and so is not significant.

coverage, sampling methods, standards and age groups were used making comparisons difficult.

The Millennium Development Goals (MDG) 1 is to eradicate extreme poverty and hunger between 1990 and 2015⁵³. 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 5 years of age.

The actual survey was not designed to bring information on the indicators 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.

Table 7.5 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. Malnutrition still remains and requires continued and strengthened interventions targeting the prevention and treatment of acute and chronic malnutrition in order to have more impact on the underweight prevalence.

⁵³United Nations Development Group. Thematic Paper on MDG 1: Eradicate extreme poverty and hunger

Table 7.5: Historical records of nutrition and health surveys in DPRK since 1998.

Survey	Month and year of data collection	Coverage	Sample size for acute malnutrition	Global Chronic Malnutrition	Severe Chronic Malnutrition	Global Acute Malnutrition	Severe Acute Malnutrition	Global Underweight	Vitamin A children	Anaemia children	Anaemia women
Nat. Nut. Survey 2012	Sep. –Oct. 2012	National	8,035	27.9%	7.2%	4.0%	0.6%	15.2%	97.8%	28.7%	31.2%
MICS 3	Sep.–Oct. 2009	National	2,172	32.4%	8.4%	5.2%	0.5%	18.8%	98.0%	NA	NA
DPRK Nutrition Assessment*	October 2004	7 Provinces and 1 Municipality	4,795	37.0%	12.2%	7.0%	1.8%	23.3	98.2%	NA	34.7%
DPRK Nutrition Assessment**	October 2002	National	5,994	39.2%	NA	8.1%	2.7%	20.1	98.6%	NA	33.6%
MICS 2†	May 2000	National	4,175	45.2%	22.4%	10.4%	4.2%	27.9	80.2%	NA	NA
MICS 1‡	Sep. –Oct. 1998	130 over 212 national counties	1,762	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.

8. CONCLUSIONS AND RECOMMENDATIONS

The aim of this National Nutrition Survey was to increase the understanding of the nutrition situation in DPRK. This report will be an important tool for the Government to plan and design interventions to improve promotion of children's growth and women's nutritional status.

Global Chronic Malnutrition 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 an irreversible impact on the development of children and then also on the country development. Although there was no sex difference in stunting, it was significantly associated with anaemia. The low food diversity and the inadequate breastfeeding and complementary feeding practices highlight the need to focus on children under 2 years old. More efforts and resources are needed especially for stunting prevention in early life (starting during or even before pregnancy, up to two years old) through different multi-sectoral interventions combining mother's nutrition, infant and young child feeding and hygiene practices, other nutrition interventions, health, WASH, food security and agriculture.

The acute nutritional status of children is moderately improved since the last MICS assessment in 2009. The situation is not critical and does not suggest emergency operations. However, the presence of several factors in DPRK (mainly lack of essential medicines, precarious WASH situation and food insecurity) affecting the vulnerable children raises many concerns. 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 (September-October 2012), an estimated 68,225 children were acutely malnourished in the Country and an extrapolated 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 provide support as soon as possible when the situation is negatively changing⁵⁴.

The presence of thinness and anaemia in women highlight the needs to target them with more specific interventions during pregnancy and lactation to offer the best start as possible for their children. The CMAM program is one key way to reach these women with supplementary ration according to their pregnancy or lactation status.

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 despite the similar anaemia prevalence, women (74.3%) consume more animal or vegetal iron-rich foods than children (49.5%). It is possible that anaemia in children could be lowered with intensified promotion efforts on the importance of iron-rich food in development as well as multi-micronutrients associated with deworming.

The promotion of infant and young child feeding practices, mainly optimal breastfeeding and complementary feeding behaviours, needs to be re-dynamized. Breastfeeding practice is relatively good with a high proportion of babies being exclusively breastfed from 0-5.9 months. However, the main challenge is to increase the early initiation of breastfeeding as an important preventive factor of neo-natal mortality. The delayed complementary feeding at 6 months needs to be strongly addressed as this has high impact on the development of children enhancing the risk of stunting and acute malnutrition.

⁵⁴ MUAC screenings, nutrition surveillance in clinics and hospitals and surveys are the three main methods of nutritional assessment.

The low food diversity in children and women challenge their nutritional status and immune system. More attention needs to be given to this important problem affecting also the development of the country.

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. Despite all efforts, malnutrition is still of serious concern 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 of children in the DPRK.

9. ACKNOWLEDGEMENTS

This was the first time for the CBS to conduct a 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.

The 2012 DPRK national nutrition survey was undertaken successfully in close relation between national agencies such as CBS, ICN, MoPH, NCC, and international organizations such as UNICEF, WFP and WHO.

Staff from CBS, every provincial and city, county people's committees and statistical offices, and Ri/Up/Ku/Dong office worked hard for the success of this survey.

The 2012 nutrition survey received technical assistance for scientific accuracy of the survey from ICN to evaluate nutrition and health status of the children and mothers.

We pay thanks to all the agencies and people for the assistance to the 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 were based on standardized SMART methodology provided by UNICEF. This enhanced CBS nutrition survey team's capacity to increase understanding on the general sampling survey, to analyze more profoundly the results and brought new knowledge for future nutrition surveys.

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 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.

10. APPENDICES

Appendix 1: Assignment of Clusters

Rygang province

City/county	Cluster
Hyesan	Songhu
	Sinhung
	Hyemyong
	Wiyon
	Ryonbong1
	Songbong1
	Chundong
	Masan
	Hyejang
	Unchong
Samsu	up
	Pungdok
	Kwandok
Kimjongsuk	Ryonghwa
	Samsong
Kimhyongjik	up
	Namsa
	Duji
Kimhyongkwon	up
	Naejung
Pochon	up
	Daesin
Samjiyon	up
	Rimyongsu
Daehongdan	up
	Hongam
Unhung	up
	Ryongpo
	Daedong
	Daedong
Paekam	up
	Dokrip
	Yanghung
	Yangkok
	Yangkok
Kapsan	up
	Dongjom
	Pyonghung
	Huirin
Pungso	up
	Munjo
	Hung

North Hamgyong province

City/county	Cluster
Sinam	Sohung
Chongam	Haebang
	Ryonjin
	Ryonchon
	Namhyang1
Pohang	Namhyang1
Sunam	Malum1
	Ohang
	Sabong
	Unjong2
Songpyong	Ponchon2
	Pyonghwa
	Oyu
	Yokjon
Ranam	Daedong2
	Opok
	Wonpyong
	Palul
Puyun	Pungsan
	Junam
	Kumchon
	Songdong
Kimchaek	Ryongam
	up
	Kundong
	Odaejin
Huiryong	Unkok
	Ryuko
	Yonsa
	Kangson
Kilju	Changryol
	Sokmak
	Sanghwa
	Dongpo
Hwadae	up
	Ryonghyon
	up
	Songsan
Myongchon	Namsan
	Chunghyon
	Wuam
	Wuam
Myonggan	Wuam
	Wuam
	Wuam
	Wuam
Orang	Wuam
	Wuam
	Wuam
	Wuam
Kyongsong	Wuam
	Wuam
	Wuam
	Wuam
Yonsa	Wuam
	Wuam
	Wuam
	Wuam
Musan	Wuam
	Wuam
	Wuam
	Wuam
Puryong	Wuam
	Wuam
	Wuam
	Wuam
Onsong	Wuam
	Wuam
	Wuam
	Wuam
Kyongwon	Wuam
	Wuam
	Wuam
	Wuam
Kyonghung	Wuam
	Wuam
	Wuam
	Wuam
Rason	Wuam
	Wuam
	Wuam
	Wuam

South Hamgyong province

City/county	Cluster
Songchongang	Unjong
Donhungsan	Yangji
	Sinsang
Huisan	Huiyang2
	Sangpong
Sapo	Saegori1
Hungdok	Hungdok1
Haeon	Kumpit
Hungnam	Ungbong2
	Honam
Sinpo	Kwangbok2
	Ryukdae1
Danchon	Yangsan
	Ryongdae
	Tamsa
	Songpa
	Ripa
Hamju	Dongbong
Yongkwang	up
	Sindok
Sinhung	Wondong
Pujon	Chail
Jangjin	Yangmyo
Jongpyong	Pongdae
	Sinpyong
Kumya	Inhung
	Songjae
	Kwangdok
Kowon	up
Rakwon	up
Hongwon	up
	Ryongdok
Pukchong	up
	Jung
Doksong	Cholsan
Riwon	up
	Kokgu
Hochon	Mandok
Sudong	Ungok
	Songnam

Kangwon province

City/county	Cluster
Wonsan	Tap
	Doksong
	Yangji
	Sokwu
	Junchong
	Jangchon
	Kalma
	Pokmak
	Myonsasipri
	Jungpyong
Munchon	Sinan
	Jangpaek
	Pukhang
	Namchang
Anpyon	Okye
	Hwasan
Kosan	up
	Ryongjiwon
	Hyokchang
Tongchon	Up
	Potan
Kosong	up
	Namae
Kumkang	Hahui
	Sinwon
Changdo	Songdo
Kimhwa	Sinpung
Huiyang	up
	Ipo
Sepo	Yaksu
Pyonggang	up
	Hasong
	Munbong
Cholwon	Paekrosan
Ichon	up
	Jangdong
Pankyo	Myongdok
Popdong	Sangso
Chonnae	up
	Hwara

Jagang province

City/county	Cluster
Kangye	Ryudong
	Suchim
	Yahak
	Sokhyon
	Taeung
	Naeryong
Manpo	Namchon
	Kunmak
	Kwanmun
	Kuo2
Huichon	Konjung
	Chongchon
	Chupyong1
	Jonpyong
	Kumsan
Rangrim	Kwanda
	up
	Sinjon
Jonchon	up
	Wunsong
Songkan	Chongdok
	up
	wejung
Jangkang	Sinchong
	Rangrim
	Jongpo
Hwanpyong	Yangkye
Jungkang	Hoha
Jasong	up
	Kujungyong
Sijung	Jongin
Wiwon	Ryongyon
	Kwangchon
Chosan	Anchan
Wusi	up
Kopung	up
Songwon	up
Dongsin	up
	Munhwa
Ryongrim	Dumun

North Pyongan province

City/county	Cluster
Sinwuju	Ponbu
	Namsong
	Majon
	Ryusang
	Yonha
	Hadan
Jongju	Namchon
	Daesan
	Chongnyon
Kusong	Sangsok
	Yaksu
	Kwonchang
Pyokdong	Paekma
Pihyon	up
Ryongchon	Sopuk
	up
Yomju	Ryonkok
Cholsan	Jangsong
Dongrim	up
	Samsong
Sonchon	Inam
	Yaksu
Kwaksan	Chontae
	Up
Wunjon	Dongsam
	Kisong
Pakchon	up
Nyongbyon	Okchang
	Ryongdung
Kujang	Wunryong
	Puksinhyon
Hyangsan	Songbong
Wunsan	up
Taechon	Hakpong
	Sinchang
Chonma	Misong
Wuju	Supung
Sakju	Chongsu
	up
Taeguan	up
Changsong	up

South Pyongan province/Nampo city

City/county	Cluster
Pyongsong	Hacha
	Jurye
	Ojung
Anju	Pungnyon
	Wunsong
Kaecheon	Ryongjin
	Jajak
	Tohwa
Sunchon	Ponghwa
	Kangan
	Obong
Dokcon	Chongsin
	Undok
Daedong	up
	Pankyo
Jungsan	lap
Pyongwon	Taejong
	Ryangkyo
Sukchon	Kumpung
Mundok	up
	Dongrim
Songchon	Jangrim
Sinyang	Kwanghung
Unsan	up
	Chonsong
Pukchang	up
	Okchon
Huichang	up
Daehung	up
Chongnam	Ryongbuk
Hanggu	Munhwa
	Sangdaedu
Wawudo	Songhung
	Ryongsu2
Onchon	Jungak
Ryongkang	Samhwa
Daeon	Wolmae
Kangso	Soki
	Chongsan
Chonrima	Chonjin

NorthHwanghae province

City/county	Cluster
Sariwon	Sanop
	Sinyang
	Sinhung
	Osu
Songrim	Kuchon4
	Dongsong
	Saesalrim1
Kaesong	Haeun
	Unhak1
	Namsan1
	Kaepung1
Jangpung	Sangdo
	Sinsong
	Sasi
Hwangju	up
	Soksan
	Ryongchon
Yontan	Sinhung
	Tosong
Pongsan	Masan
	Kwangmyong
Unpa	Sinchon
	Dongsa
Rinsan	up
	Ponghwa
Suan	Sudok
	up
Yonsan	up
	up
Sinpyong	up
	up
Koksan	up
	Unjong
Sinkye	Haepo
	Sansu
Pyongsan	up
	Paekyang
Kumchon	Sokpong
	Namkang
Tosan	Samsong
	up
Sungho	Jang
Junghwa	
Sangwon	

South Hwanghae province

City/county	Cluster
Haeju	Hyonha
	Haechong
	Ryongdang2
	Namsan
	Jakchon
Kangryong	Kwangchon
	Pyonghwa
Ongjin	Haean
	Songwol
Taetan	up
Jangyon	up
	Changpa
Samchon	Dokchon
Songhwa	up
Unryul	up
	Sokok
Unchon	up
	Ryangdam
Anak	Panryuk
	Wolsan
Sinchon	up
	Palsan
	Wonam
Jaeryong	Yangkye
	Raerim
Sinwon	Yomtan
Pongchon	Hanjong
Paechon	up
	Hwasan
	Panghyon
Yonan	up
	Ahyon
	Songho
Chongdan	Sinhung
	Dongdae
Ryongyon	up
	Sawon
Kwail	Sindae
	Dokjong
Pyoksong	Paekwun

Pyongyang city

City/county	Cluster
Central	Yokjon
Mangyongdae	Mangyongdae
	Dangsang1
	Samhung2
	Kumsong2
	Sanop1
Sonkyo	Tungme2
	Saemaul2
Pyongchon	Jongpyong
	Pyongchon1
	Dongdaewon1
Dongdaewon	Saesalrim
	Rimwon
Ryongsong	Ryongsong
	Paesan
Unjong	Misan2
Daesong	Janghyon
	Pipa1
Moranbong	Jangsan
	Sochon
Sosong	Pulgunori2
	Potonggang1
Potonggang	Dongmun1
Daedonggang	Okryu1
	Songsin1
Sadong	Sokjong
	Sopo2
Hyongjesan	Sokjon
	Yokjon
Sunan	Jaekyong
	Samsok
Samsok	Yangwum
	Dongsan
Ryokpo	Tongil2
	Sungri2
Rakrang	up
	Namgang
Kangdong	Hukryong
	Hadan
	Jangkyo

Appendix 2: Sample size calculation

Sample size calculation for Ryanggang province

Indicator	Age group/category	Estimated prevalence	desired precision	design effect	MINIMUM sample size	Response rate	Sample size including non respondents	Number of members of this age group in the province	Number of HH in the province	Number of members per HH	Number of HH needed
Global acute malnutrition	6-59.9 months old*	7.9%	2.5%	1.5	730	90%	811	46,779	183,200	0.2553	3,177
Haemoglobin <11g/dL	6-59.9 months old	35.0%	7.5%	1.5	254	60%	423	46,779	183,200	0.2553	1,658
Exclusive breastfeeding**	0-5.9 months old	88.6%	5.0%	1.5	253	90%	281	5,166	183,200	0.0282	9,969
Prevalence of MUAC<210mm	Women 15-49.9 mother of under 5 children	20.0%	5%	1.5	401	90%	446	179,446	183,200	0.9795	455
Haemoglobin <11g/dL	Non-pregnant women 15-49.9 mother of under 5 children***	33.0%	7.5%	1.5	247	60%	412	32,745.30	183,200	0.1787	2,303

*GAM will be measured in all children 0-59 months old. However we have determined the sample size on the 6-59 months old group because most SMART surveys are done in this age group. Moreover there is a risk of high non respondent rate in the 0-5.9 months old group, in which case the 0-5.9 months age group can be dropped without affecting the precision of the remaining sample.

**Although exclusive breastfeeding was considered a key indicator, the small age group (0-5.9 months) leads to a very high number of households to be screened to find the needed sample, which was not feasible within this survey. Therefore, like in the MICS, estimates will be made only at national and not provincial level. The final sample size selected for the whole survey was therefore of 3,177 household as determined for GAM rate.

***Although the sample size is calculated only for non-pregnant women to ensure accurate results for this category, all pregnant mothers of eligible children will also be included for Hb tests. Data from pregnant women will only be used for national estimates due to the few cases to be found.

Provincial sample size results according to each key variable for children and women

Number of households	Ryang gang	North Hamgyong	South Hamgyong	Jagang	North Phyongan	South Phyongan/Nampo	Pyongyang	Kangwon	North Hwanghae	South Hwanghae
Global acute malnutrition	3,177	2,870	2,867	2,689	3,011	2,818	1,518	3,538	2,903	2,584
Hemoglobin<11g/dL (children)	1,658	1,629	1,609	1,588	1,569	1,627	1,644	1,599	1,641	1,635
Exclusive breastfeeding	9,969	9,644	9,633	9,789	9,598	9,524	9,894	9,198	9,772	10,116
Prevalence of MUAC<210mm	455	439	441	446	441	434	437	427	443	462
Hemoglobin<11g/dL (women)	2,303	2,264	2,235	2,206	2,180	2,260	2,283	2,221	2,280	2,272
<i>Sample size needed - n. of children 0-59</i>										
Global acute malnutrition & others (rounded up at 2)	812	746	754	716	812	734	391	936	748	668
Hemoglobin<11g/dL (children)	423	423	423	423	423	423	423	423	423	423
<i>Proposed sample size - n. of children 0-59</i>										
Global acute malnutrition & others	812	812	812	812	812	812	423	812	812	812
Hemoglobin<11g/dL (children)	406	406	406	406	406	406	423	406	406	406
<i>Proposed n. of children 0-59/cluster</i>										
Global acute malnutrition & others	21	21	21	21	21	21	12	21	21	21
Hemoglobin<11g/dL (children)	11	11	11	11	11	11	12	11	11	11
<i>Final maximum expected sample size - n. of children 0-59</i>										
Global acute malnutrition & others	840	840	840	840	840	840	480	840	840	840
Hemoglobin<11g/dL (children)	440	440	440	440	440	440	480	440	440	440

Appendix 3: Questionnaires

Q1 – Nutrition/Health Children

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

C1-C8 CHILD IDENTIFICATION				C15-C16 BREASTFEEDING	
C1. Cluster number: _____		C2. Household number: _____		<i>For all children between 0 and 23.9 months</i>	
C3. Team's number: _____		C4. Child's ID: _____		C15. HOW LONG AFTER BIRTH DID YOU FIRST PUT (NAME) TO THE BREAST?	Immediately...000
C5. Child's name: _____		C6. Child's Sex (m/f): _____		<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 _____
C7. Birthday (yyyy/mm/dd): _____		C8. Child's age in months: _____			Days.....2 _____
				C16. WAS (NAME) BREASTFED YESTERDAY DURING THE DAY OR AT NIGHT?	Yes1
					No2
C09-C12 ANTHROPOMETRY				C17-C18 HEMOGLOBIN CONCENTRATION, VITAMIN A	
<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	<i>Only for children between 6 and 59.9 months</i>	
Shorts.....1	Pants.....1	W/H (z-score)	_____	<input type="checkbox"/> Yes, permission is given <input type="checkbox"/> No, permission is not given → Go to C18	
T-shirt.....1	Diapers.....1				
C11. Oedema (y/n)	Yes1 No2	C12. MUAC (mm) 6 to 59.9 months old _____ mm		C17. Haemoglobin concentration (g/dL)	_____ / _____ g/dL
C13-C14 MORBIDITY				<i>If Hb < 11 g/dL refer to the clinic.</i>	
<i>For all children between 0 and 59.9 months</i>				C18. HAS (NAME) RECEIVED A VITAMIN A DOSE LIKE (THIS) WITHIN THE LAST 6 MONTHS?	
C13. HAS (NAME) BEEN SICK IN THE LAST 14 DAYS?		Yes1 No2 → Go to C15 DK8 → Go to C15		Yes1 No2 DK8	
C14. WHAT DID (NAME) SUFFER OF ?		Diarrhea.....1 Cough, rapid breath., respiratory tract infection.....2 Other.....3			

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 vitamin A rich vegetables (yellow or orange inside)	B	1	2	8
Potatoes and food made from potatoes	C	1	2	8
Chrysanthemum 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, coffee, 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		M10 HEMOGLOBIN CONCENTRATION	
M1. Cluster number: _____	M2. Household number: _____	<i>For all women 15-49.9</i>	
M3. Team's number: _____	M4. Woman's ID: _____	WE WOULD LIKE TO ASK YOU THE PERMISSION TO DO A BLOOD TEST FOR HEMOGLOBIN 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. <i>Refer to clinic if:</i> - pregnant women Hb<11 g/dL - non-pregnant women Hb<12 g/dL	<input type="checkbox"/> Yes, permission is given
M5. Woman's name: _____	M6. Woman's age in years: _____		<input type="checkbox"/> No, permission is not given → Go to M7
M7. Pregnant Yes1 No2		M10. Haemoglobin ____ ____ / ____ g/dl concentration	
M8 - M9 MICRONUTRIENT SUPPLEMENTATION		M11 MUAC	
<i>Only for women who gave birth in the last 23.9 months</i>		<i>For women 18-49.9</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	M11. MUAC MEASURE (mm) ____ ____ ____ mm	
M9. FOR HOW MANY MONTHS DID YOU TAKE MICRONUTRIENT TABLETS DURING THE PREGNANCY?	____ months DK 99		

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

Appendix 4: Evaluation of Enumerators

Height:

	Precision: Sum of Square [H2-H1]	Accuracy: Sum of Square [Superv.(H1+H2)- Enum.(H1+H2)]	No. +/- Precision	No. +/- Accuracy
Supervisor	1.55		5/3	
Enumerator 1	3.08 OK	3.55 OK	4/6	9/1
Enumerator 2	2.43 OK	3.40 OK	5/5	7/1
Enumerator 3	2.06 OK	4.43 OK	0/9	5/4
Enumerator 4	1.48 OK	3.11 OK	5/4	4/5
Enumerator 5	2.02 OK	4.81 POOR	7/3	7/2
Enumerator 6	2.83 OK	3.16 OK	5/5	8/2
Enumerator 7	2.38 OK	3.59 OK	4/5	4/4
Enumerator 8	1.67 OK	2.72 OK	5/5	9/1
Enumerator 9	2.51 OK	4.28 OK	3/7	4/5
Enumerator 10	2.17 OK	3.24 OK	5/5	4/5
Enumerator 11	1.56 OK	4.65 OK	4/6	8/2
Enumerator 12	1.60 OK	3.13 OK	6/4	7/2
Enumerator 13	2.32 OK	3.51 OK	3/6	5/2
Enumerator 14	1.58 OK	3.89 OK	5/5	3/2
Enumerator 15	1.67 OK	3.78 OK	2/6	8/2
Enumerator 16	2.23 OK	4.42 OK	2/8	8/2
Enumerator 17	5.48 POOR	2.11 OK	3/7	3/5
Enumerator 18	2.78 OK	3.49 OK	5/5	4/2
Enumerator 19	1.47 OK	4.16 OK	4/6	8/1
Enumerator 20	1.20 OK	4.09 OK	5/5	8/2
Supervisor	1.78		3/5	
Enumerator 1	1.21 OK	4.85 OK	2/4	5/4
Enumerator 2	2.49 OK	3.03 OK	4/5	3/6
Enumerator 3	1.81 OK	1.69 OK	8/2	8/1
Enumerator 4	2.11 OK	4.63 OK	1/9	9/1
Enumerator 5	1.75 OK	2.09 OK	3/6	6/2
Enumerator 6	1.35 OK	4.77 OK	1/9	8/1
Enumerator 7	1.65 OK	4.13 OK	3/7	6/3
Enumerator 8	1.60 OK	1.04 OK	3/6	2/3
Enumerator 9	1.30 OK	0.40 OK	3/7	5/2
Enumerator 10	2.36 OK	2.86 OK	6/3	8/1
Enumerator 11	2.98 OK	0.74 OK	4/6	4/3
Enumerator 12	2.70 OK	3.68 OK	1/8	8/2
Enumerator 13	2.02 OK	2.42 OK	3/6	5/4
Enumerator 14	2.73 OK	5.17 OK	7/3	2/7
Enumerator 15	1.54 OK	3.36 OK	3/7	6/3
Enumerator 16	1.47 OK	1.63 OK	6/4	7/1
Enumerator 17	2.36 OK	3.24 OK	5/4	6/3
Enumerator 18	1.58 OK	5.10 OK	4/6	8/1
Enumerator 19	1.79 OK	3.01 OK	4/6	7/2
Enumerator 20	2.22 OK	2.76 OK	2/5	7/3

MUAC:

	Precision: Sum of Square [MUAC2-MUAC1]	Accuracy: Sum of Square [Superv.(MUAC1+MUAC2)- Enum.(MUAC1+MUAC2)]	No. +/- Precision	No. +/- Accuracy
Supervisor	166.00		8/2	
Enumerator 1	110.00 OK	348.00 OK	7/2	4/5
Enumerator 2	127.00 OK	401.00 OK	7/3	5/5
Enumerator 3	123.00 OK	503.00 POOR	4/5	3/7
Enumerator 4	168.00 OK	356.00 OK	1/7	5/5
Enumerator 5	112.00 OK	194.00 OK	5/5	5/2
Enumerator 6	137.00 OK	181.00 OK	7/3	4/6
Enumerator 7	151.00 OK	385.00 OK	6/3	6/3
Enumerator 8	235.00 OK	415.00 OK	5/4	7/2
Enumerator 9	220.00 OK	184.00 OK	2/7	5/5
Enumerator 10	187.00 OK	93.00 OK	7/3	7/1
Enumerator 11	120.00 OK	38.00 OK	5/4	3/4
Enumerator 12	121.00 OK	43.00 OK	4/6	4/3
Enumerator 13	130.00 OK	140.00 OK	6/4	2/7
Enumerator 14	119.00 OK	413.00 OK	3/5	3/7
Enumerator 15	188.00 OK	420.00 OK	4/5	7/1
Enumerator 16	209.00 OK	287.00 OK	6/2	3/6
Enumerator 17	138.00 OK	454.00 OK	3/3	10/0
Enumerator 18	174.00 OK	52.00 OK	5/5	6/2
Enumerator 19	138.00 OK	386.00 OK	7/3	5/5
Enumerator 20	200.00 OK	318.00 OK	7/3	5/5
Supervisor	141.00		1/6	
Enumerator 1	138.00 OK	277.00 OK	2/4	5/4
Enumerator 2	277.00 OK	256.00 OK	9/0	6/2
Enumerator 3	140.00 OK	373.00 OK	4/5	8/2
Enumerator 4	186.00 OK	369.00 OK	1/8	8/2
Enumerator 5	169.00 OK	460.00 POOR	4/5	6/2
Enumerator 6	18.00 OK	377.00 OK	1/2	10/0
Enumerator 7	11.00 OK	386.00 OK	3/5	5/4
Enumerator 8	139.00 OK	242.00 OK	4/5	5/4
Enumerator 9	195.00 OK	322.00 OK	7/3	10/0
Enumerator 10	133.00 OK	282.00 OK	2/8	9/0
Enumerator 11	215.00 OK	198.00 OK	6/4	8/1
Enumerator 12	207.00 OK	416.00 OK	5/5	7/2
Enumerator 13	26.00 OK	315.00 OK	5/3	5/5
Enumerator 14	232.00 OK	257.00 OK	1/9	7/3
Enumerator 15	195.00 OK	194.00 OK	3/7	6/4
Enumerator 16	116.00 OK	293.00 OK	7/2	7/2
Enumerator 17	145.00 OK	300.00 OK	5/3	7/2
Enumerator 18	201.00 OK	232.00 OK	3/6	6/3
Enumerator 19	205.00 OK	164.00 OK	1/9	8/2
Enumerator 20	103.00 OK	236.00 OK	5/5	6/2

For evaluating the enumerators the precision and the accuracy of their measurements is calculated.

For precision the sum of the square of the differences for the double measurements is calculated. This value should be less than two times the precision value of the supervisor.

For the accuracy the sum of the square of the differences between the enumerator values (weight1+weight2) and the supervisor values (weight1+weight2) is calculated. This value should be less than three times the precision value of the supervisor.

To check for systematic errors of the enumerators the number of positive and negative deviations can be used.

Appendix 5: Plausibility check

Age distribution:

Month 1 : #####
 Month 2 : #####
 Month 3 : #####
 Month 4 : #####
 Month 5 : #####
 Month 6 : #####
 Month 7 : #####
 Month 8 : #####
 Month 9 : #####
 Month 10 : #####
 Month 11 : #####
 Month 12 : #####
 Month 13 : #####
 Month 14 : #####
 Month 15 : #####
 Month 16 : #####
 Month 17 : #####
 Month 18 : #####
 Month 19 : #####
 Month 20 : #####
 Month 21 : #####
 Month 22 : #####
 Month 23 : #####
 Month 24 : #####
 Month 25 : #####
 Month 26 : #####
 Month 27 : #####
 Month 28 : #####
 Month 29 : #####
 Month 30 : #####
 Month 31 : #####
 Month 32 : #####
 Month 33 : #####
 Month 34 : #####
 Month 35 : #####
 Month 36 : #####
 Month 37 : #####
 Month 38 : #####
 Month 39 : #####
 Month 40 : #####
 Month 41 : #####
 Month 42 : #####
 Month 43 : #####
 Month 44 : #####
 Month 45 : #####
 Month 46 : #####
 Month 47 : #####
 Month 48 : #####
 Month 49 : #####
 Month 50 : #####
 Month 51 : #####
 Month 52 : #####
 Month 53 : #####
 Month 54 : #####
 Month 55 : #####
 Month 56 : #####
 Month 57 : #####
 Month 58 : #####
 Month 59 : #####
 Month 60 : #####

Age ratio of 6-29 months to 30-59 months: 0.84 (The value should be around 1.0).

Digit preference Weight:

Digit .0 : #####
Digit .1 : #####
Digit .2 : #####
Digit .3 : #####
Digit .4 : #####
Digit .5 : #####
Digit .6 : #####
Digit .7 : #####
Digit .8 : #####
Digit .9 : #####

Digit Preference Score: 1 (0-5 good, 6-10 acceptable, 11-20 poor and > 20 unacceptable)

Digit preference Height:

Digit .0 : #####
Digit .1 : #####
Digit .2 : #####
Digit .3 : #####
Digit .4 : #####
Digit .5 : #####
Digit .6 : #####
Digit .7 : #####
Digit .8 : #####
Digit .9 : #####

Digit Preference Score: 2 (0-5 good, 6-10 acceptable, 11-20 poor and > 20 unacceptable)

Digit preference MUAC:

Digit .0 : #####
Digit .1 : #####
Digit .2 : #####
Digit .3 : #####
Digit .4 : #####
Digit .5 : #####
Digit .6 : #####
Digit .7 : #####
Digit .8 : #####
Digit .9 : #####

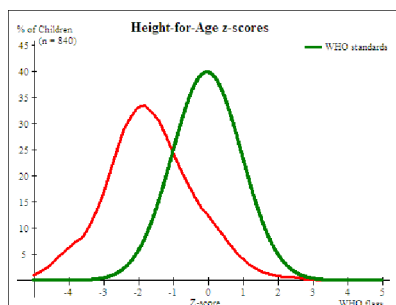
Digit Preference Score: 2 (0-5 good, 6-10 acceptable, 11-20 poor and > 20 unacceptable)

Appendix 6: Detailed data appraisal

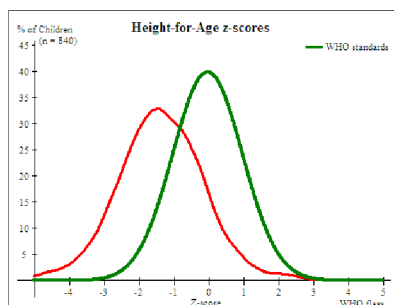
		N	Mean \pm SD	Design effect		Missing values		Out of range values	
				Variable	Value	Count	Percent	Count	Percent
Total	W/H	8,035	-0.30 \pm 1.00	< -2 z-s	1.36	5	0.1	0	0.0
	W/A	8,036	-0.94 \pm 1.09	< -2 z-s	1.92	4	0.0	0	0.0
	H/A	8,036	-1.30 \pm 1.29	< -2 z-s	2.45	4	0.0	0	0.0
	MUAC children	7,382	145.24 \pm 11.78	< 125 mm	1.24	11	0.1	1	0.0
	Hb children*	2,773	11.46 \pm 1.30	< 11.0 g/dL	1.74	4,620	62.5	0	0.0
	MUAC women	7,622	238.72 \pm 20.52	< 210 mm	1.46	27	0.4	0	0.0
	Hb NPW**	5,745	-0.30 \pm 1.00	< 12 g/dL	1.81	1,904	24.9	3	0.0
Ryanggang	W/H	840	-0.29 \pm 1.05	< -2 z-s	.30	0	0.0	0	0.0
	W/A	840	-1.14 \pm 1.13	< -2 z-s	.45	0	0.0	0	0.0
	H/A	840	-1.66 \pm 1.31	< -2 z-s	.51	0	0.0	0	0.0
	MUAC children	762	140.5 \pm 11.22	< 125 mm	.28	0	0.0	0	0.0
	Hb children	213	11.16 \pm 1.33	< 11.0 g/dL	.30	549	72.0	0	0.0
	MUAC women	801	239.47 \pm 21.27	< 210 mm	.26	6	0.7	0	0.0
	Hb NPW	511	12.23 \pm 1.32	< 12 g/dL	.32	296	36.7	0	0.0
North Hamgyong	W/H	840	-0.38 \pm 0.97	< -2 z-s	.87	0	0.0	0	0.0
	W/A	840	-1.03 \pm 1.02	< -2 z-s	1.08	0	0.0	0	0.0
	H/A	840	-1.35 \pm 1.33	< -2 z-s	1.73	0	0.0	0	0.0
	MUAC children	770	142.12 \pm 10.16	< 125 mm	1.03	0	0.0	0	0.0
	Hb children	223	11.67 \pm 1.43	< 11.0 g/dL	1.54	547	71.0	0	0.0
	MUAC women	813	241.39 \pm 22	< 210 mm	.99	0	0.0	0	0.0
	Hb NPW	516	12.37 \pm 1.38	< 12 g/dL	1.46	297	36.5	0	0.0
South Hamgyong	W/H	840	-0.36 \pm 0.98	< -2 z-s	2.48	0	0.0	0	0.0
	W/A	840	-1.04 \pm 1.14	< -2 z-s	2.42	0	0.0	0	0.0
	H/A	840	-1.39 \pm 1.37	< -2 z-s	2.50	0	0.0	0	0.0
	MUAC children	782	144.97 \pm 11.86	< 125 mm	1.91	0	0.0	0	0.0
	Hb children	225	11.26 \pm 1.2	< 11.0 g/dL	1.78	557	71.2	0	0.0
	MUAC women	795	236.06 \pm 19.72	< 210 mm	1.55	7	0.9	0	0.0
	Hb NPW	513	12.52 \pm 1.34	< 12 g/dL	1.47	289	36.0	0	0.0
Kangwon	W/H	836	-0.46 \pm 0.93	< -2 z-s	.82	4	0.5	0	0.0
	W/A	836	-1.06 \pm 1.1	< -2 z-s	1.06	4	0.5	0	0.0
	H/A	836	-1.29 \pm 1.38	< -2 z-s	1.57	4	0.5	0	0.0
	MUAC children	766	142.35 \pm 10.94	< 125 mm	.68	2	0.3	0	0.0
	Hb children	270	11.02 \pm 1.16	< 11.0 g/dL	.82	498	64.8	0	0.0
	MUAC women	790	239.21 \pm 20.23	< 210 mm	.79	0	0.0	0	0.0
	Hb NPW	667	12.36 \pm 1.13	< 12 g/dL	1.08	123	15.6	0	0.0
Jagang	W/H	839	-0.33 \pm 1.03	< -2 z-s	1.01	1	0.1	0	0.0
	W/A	840	-1.08 \pm 1.06	< -2 z-s	.73	0	0.0	0	0.0
	H/A	840	-1.48 \pm 1.3	< -2 z-s	.78	0	0.0	0	0.0
	MUAC children	751	143.03 \pm 13.86	< 125 mm	.63	2	0.3	0	0.0
	Hb children	219	11.25 \pm 1.28	< 11.0 g/dL	.58	534	70.9	0	0.0
	MUAC women	822	241.85 \pm 21.35	< 210 mm	.47	6	0.7	0	0.0
	Hb NPW	517	12.25 \pm 1.11	< 12 g/dL	.69	311	37.6	0	0.0
North Phyongan	W/H	840	-0.5 \pm 0.91	< -2 z-s	1.40	0	0.0	0	0.0

		Design effect				Missing values		Out of range values	
		N	Mean ± SD	Variable	Value	Count	Percent	Count	Percent
	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
	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
South Phyongan/Nampo	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
	Hb NPW	659	12.27 ± 0.99	< 12 g/dL	2.79	129	16.4	0	0.0
North Hwanghae	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
South Hwanghae	W/H	840	-0.28 ± 1.02	< -2 z-s	1.28	0	0.0	0	0.0
	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
Pyongyang	W/H	480	0.03 ± 1.09	< -2 z-s	2.17	0	0.0	0	0.0
	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

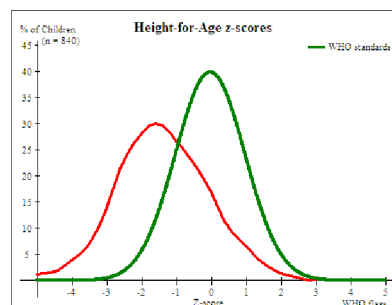
Appendix 7: National and Provincial HAZ distribution according to normal population (WHO 2006)



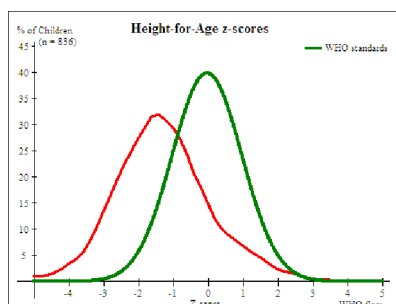
Ryanggang



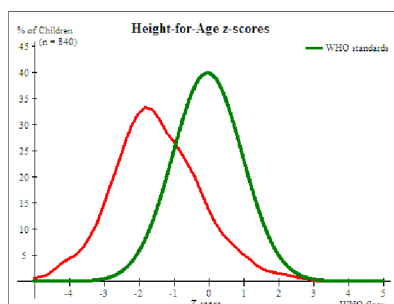
North Hamgyong



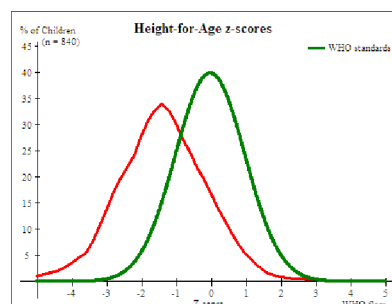
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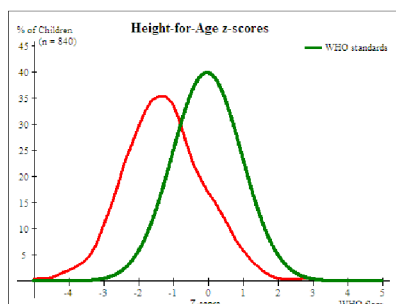
Kangwon



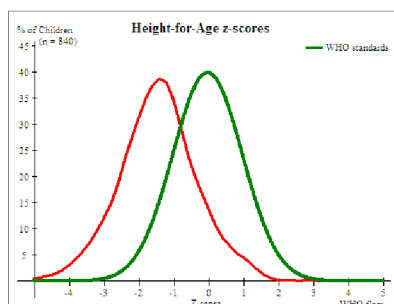
Jagang



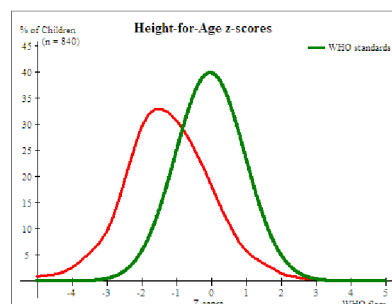
North Phyongan



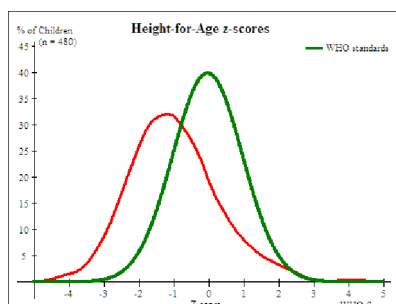
South Phyongan / Nampo



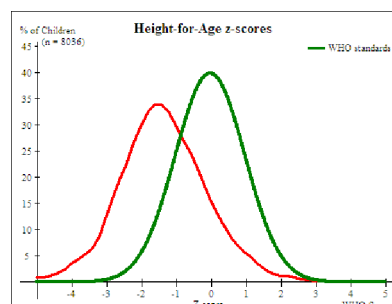
North Hwanghae



South Hwanghae



Pyongyang



DPRK

Appendix 8: Result tables for National Center for Health Statistics (NCHS) growth reference 1977

Prevalence of global chronic (H/A < -2 Z-scores), global acute (W/H < -2 Z-s), and global underweight (W/A < -2 Z-s) per sex (NCHS growth reference standards, 1977). DPR Korea, October 2012.

		Unweighted count	Global chronic malnutrition (95% CI)	Unweighted count	Global acute malnutrition (95% CI)	Unweighted count	Global underweight (95% CI)
Total		8,036	24.2 (22.9 - 25.6)	8,035	4.2 (3.8 - 4.7.)	8,036	21.3 (20.1 - 22.5)
Sex	Boys	4,115	24.6 (23.0 - 26.4)	4,115	4.2 (3.6 - 4.8)	4,115	20.9 (19.5 - 22.5)
	Girls	3,921	23.8 (22.1 - 25.6)	3,920	4.3 (3.6 - 5.0)	3,921	21.6 (20.1 - 23.1)

Appendix 9: List of personnel

Survey coordinator

Pak Yong Suk–Deputy Director General, CBS

Technical coordinator

Won Hyok –Director, CBS

Trainers

Won Hyok – Director, CBS

Kim Ryong Sun –Senior officer, CBS

Kim Myong Chol – Deputy Chief, ICN

Enumerators per Province

Province	Team	Enumerators
Ryanggang	1	Jong Hyon Su, Ri Yong Nam, Kim Il Ok
	2	Jong Ok, Ri Chol San, Choe Un Hui
North	3	Kim Hyong Nam, Kim Jong Sun, Jong Kang Il
Hamgyong	4	Ri Yong Mu, Kim Hun, Choe Ryu Jong,
South	5	Jang Kyong Suk, Ri Hyon Jong, Pang Yu Il
Hamgyong	6	Ri Un Hui, Choe Yun Hui, Kim Ho Yong
Kangwon	7	Jong Pok Sun, Hwang Jong Son, Cha Myong Sim
	8	Ro Song Guk, An Sun Yong, Kim Song Hye
Jagang	9	Kim Kyong Sun, Yang Myong Suk, Kim Chol Jun
	10	Kim Hui Yong, Han Dok Song, Song Chol Jun
North Phyongan	11	Kim Ryu Kyong, Hwang Un Hye, Jo Hyang Sim
South Phyongan / Nampo	12	Jo Kyu Song, Hwang Jong Ran, Kim Song Hui
	13	Kim Ryong Sun, Pak Hyang Mi, Ko Yong Hwa
North	14	Choe Yong Su, Ri Kyong Hui, Kim Myong Sil
	15	Kim Il Hyok, Choe Ok Son, Kang Ok Ju
Hwanghae	16	Ho Ran Hui, Kim Sun Yong, Yang Mun Hui
South	17	Kim Chol, Jon Sun Hui, Choe Un Yong
Hwanghae	18	Hong Ryong Kyu, Han Un Yong, Choe Song Hak
Pyongyang	19	Jang Myong Son, Kim Jong Sun, Kim Kyong Ok
	20	Song Kum Sun, Yu Chun Mi, Kwak Un Ju

Supervisors CBS and ICN

Paek Ki Chon, Won Hyok, Ryu Chol Hwan, Kim Jin Sam,

Pak Su Yong, Ryu Kwang Song, U Hong Sop

Other supervisors

UNICEF, WFP and WHO national and international staff and International UNICEF consultant

Data entry personnel

O Jong Ran, Jang Hye Ran, Kim Song Hye, Yun Un Ha, Kim Un Ju,

Yu Chun Ae, Ko Un Kyong, Kim Son Ok, Pak Son Ok, Choe Myong Ok

Appendix 10: 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 1,000 tablets.