



NUTRITIONAL SURVEY

OF PREGNANT WOMEN AND
SCHOOL CHILDREN IN KOSOVO



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SCHOOL CHILDREN
IN KOSOVO

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Executive Summary

Worldwide Iodine and Iron deficiencies are the most common micronutrient deficiencies and cause public health problems in many countries all over the world.

It is estimated that over 2 billion people are affected by a micronutrient deficiency, usually more than one deficiency. Pregnant women and young children are the most vulnerable group.

Kosovo similar to other places enters to a group with micronutrient deficiencies. The population in Kosovo is estimated at about 2.1 million. Kosovo was known before with a few endemic areas for goiter and iodine deficiency.

The results of Micronutrient Status Survey in 2001 showed that although 84% of households used iodized salt only 51% of childbearing aged women and school aged children had a normal value of iodine in urine. The severity of iodine deficiency was illustrated by the fact that 14% of children had iodine excretions below 50 µg/L.

UNICEF has facilitated coordination of different institutions involved in the Iodine Deficiency Disorders and Universal Salt Iodization (IDD/USI) programme and supported developing capacities of National Institute of Public Health. The multi-sectoral Iodine Deficiency Disorders (IDD) and other micronutrient working group is approved by MoH. Ministry of Health has endorsed Administrative Instruction for salt thus strengthening monitoring system at importation and retails levels and ensuring quality salt. All salt shipments that enter in Kosovo are checked at the border prior to the release of the shipment.

National Institute of Public Health (NIPH) supported by UNICEF in 2007, conducted survey to assess biological status of school children due to iodine deficiency and salt iodization. The survey covered seven regions and included 523 children from selected schools. The results show that only 12 salt samples were non iodized (2.4%). Overall, 78.8% of salt samples had ≥ 15 mg iodine/kg and 41.3% were within the mandated range for salt imports of 12–18 mg/kg. The iodine content was 8.1 to 26.1 mg/kg in 95% of all the household salt samples. Among 521 school children of second class the median urinary iodine was 161 µg/L. Overall, 21.9% of children had UI < 100 µg/L and the UI of 95% of the children ranged from 51 to 315 µg/L.

Based on assessment of progress towards achievement of iodine deficiency elimination by international consultant in May 2008, most of the international UNICEF, WHO and ICC/IDD standards have been met already.

This survey provides information related to iodine deficiencies and verify that the current practice of iodized salt supply in Kosovo is ensuring adequate iodine nutrition status not only in school aged children but also among pregnant women who are the most vulnerable group in the population.

The study is transversal and included 30 clusters for all Kosovo selected randomly. 900 school children and 900 pregnant women living in the same household were target groups for this survey.

The prevalence of anemia among the survey participants was determined from hemoglobin (Hb) levels collected from capillary blood samples using a Hemocue. The Hb distribution of the 900 children in this survey had a mean of 12.8g/dl (SD 1.29; range 7.0 – 16.5). The anemia prevalence in all the children of Kosovo was 15.7%, indicating a mild public health problem of anemia among school children. The anemia prevalence in the children did not differ significantly between gender (boys 15.3%; girls 16.0%) and between residence (rural 17.2%; urban 13.0%).

The Hb distribution of the 900 pregnant women in this survey was with a mean of 12.0g/dl (SD 1.55; range 6.9-16.0) thus revealing a moderate public health problem of anemia among pregnant women. The prevalence of anemia did not differ by age or location (urban/rural).

All the household salt samples collected in this survey were iodized. The mean Salt Iodization (SI) in the 900 household salt samples was 17.7 mg/kg (SD 4.6) and 605 (67%) salt samples had a SI value ≥ 15 mg/kg.

The median Urinary Iodine at school children was 176 μ g/l (95% CI: 168-182) and the range 43-486 μ g/l. The UI was $<100\mu$ g/l in 44 children (4.9%); in 488 children (54.2%), the Urinary Iodine (UI) was in the optimal range of 100-199 μ g/L, and 111 children (12.2%) had UI $\geq 300\mu$ g/l. The UI in children did not differ significantly between boys and girls, between urban and rural residence. The median iodine intake estimate among the children was 137 μ g/d (95% CI: 129-144) and the range 26-636 μ g/d.

The median UI in pregnant women was 183 μ g/l (95% CI: 173-187) and the range 27-632 μ g/l. The UI in pregnant women was $<150\mu$ g/l in 338 women (38%); in 317 women (35%) the UI was in the optimal range of 150-249 μ g/l; 244 women (27%) had UI values between 250 and 499 μ g/l, and UI $>500\mu$ g/l was observed in 1 woman (0.1%).

The UI in pregnant women did not differ significantly between urban and rural residence, nor was there a significant relationship of the UI in pregnant women with their level of education, pregnancy duration or pregnancy semester. The UI concentrations of pregnant women and children living in the same households were strongly correlated.

The weights and heights of children increased steadily with age. Up to age 10, boys were 1.5-3.5 kg heavier on average than girls, while old girls were 1.5-2 kg heavier than boys are ages 11 and 12y. At the ages of 13 and 14y, the weights of boys and girls in the survey were not different. The average body weight of boys and girls at ages 13 and 14y was 50 kg.

Boys were 2-6 cm taller than girls up to age 10y. At ages 10 and 11y, in contrast, girls were 5 cm taller than boys and there was no difference in stature between boys and girls at ages 13 and 14y. At ages 13 and 14y, the average stature of boys and girls in Kosovo was 155 cm.

Underweight (WFA <-2 ; 2.1%) and overweight (WFA $>+2$; 3.9%) were low among the children, although overweight was above the expected prevalence of 2.3%. Only 8 children (0.9%) were

severely underweight ($WFA < -3$) and 12 children (1.3%) were severely overweight, or obese ($WFA > +3$).

Stunting ($HFA < -2$) was identified in 15.5% of the children and severe stunting ($HFA < -3$) affected 42, or 4.7%, of the children in this survey. Tallness ($HFA > 2$) was identified in 5.1% of the children and 18 children, or 2.0%, were extremely tall ($HFA > 3$). Thus, smallness and tallness were found to affect a high proportion of children, although the stature measurements were likely less accurate than desired.

On average, the children in this survey reported (in descending order) weekly consumption frequencies for milk & milk products (5.2 times), eggs (4.7), fruit (4.3), vegetables (4.2) and starchy food (3.5) for at least half of the number of days. Meat & meat products (3.2 times on average) and sweet meat (2.7 times) were less frequent, and fish (0.5 times on average) and legumes (1.8 times) were minor items in the consumption frequency of the children in Kosovo.

In general results of the survey will contribute in further programme planning and strengthen interventions for elimination of micronutrient deficiencies in Kosovo.

1. Background

Worldwide Iodine, Iron and Vitamin A deficiencies are the most common micronutrient deficiencies and cause public health problems in many countries all over the world. Pregnant women and young children are the most vulnerable group. It is estimated that about 2 billion people are affected by iron and iodine deficiencies and that more than 20 million of those people develop disorders of their neural system, thereby seriously reducing their ability to learn and earn a living from productive employment.

The presence of endemic goiter, functional disorders of the thyroid gland, prenatal death, mental retardation down to cretinism, abortions and increased infant mortality are some of the serious problems facing public health due to micronutrient deficiencies. These diseases and disorders directly affect social and economical development of countries and their population.

Iodine deficiency in pregnancy is causing as many as 20 million babies a year to be born mentally impaired. Severe iron deficiency anemia is causing the deaths of an estimated 50,000 young women a year in pregnancy and childbirth. Folic acid deficiency is causing approximately 200,000 severe birth defects every year and is associated with approximately 1 in every 10 adult deaths from heart disease. Half of children with Vitamin and mineral deficiencies are suffering from multiple deficiencies. (Vitamin and mineral deficiency, A Global Progress Report).

2. History of Micronutrient Status in Kosovo



Kosovo, similar to other places, is affected by micronutrient deficiencies. The population of Kosovo is estimated at about 2.1 million with 92% Albanian, 5.3% Serbian and 2.7% other ethnic origins. The population is relatively young, with estimated half of its population being under 18 years. Kosovo is mainly rural with 63% living in villages and 37% in urban settings.

Kosovo was divided into 30 municipalities and administratively into 3 health regions. Recently are established 3 new municipalities (Mamusha, Junik and Hani-Elezit/Elez Han). Public health activities are coordi-

nated through central National Institute of Public Health located in Prishtinë/Prishtina and 6 Regional Public Health Institutions (Pejë/ Peć, Prizren/Prizren, Gjiļan/Gnjilane, Ferizaj/Uroševac, southern Mitrovicë/Mitrovica and Gjakova/Đakovica). The health sector is affected negatively by political issues that continue a parallel health system. This restrains the collaboration of the Institute of Public Health in southern Mitrovicë/Mitrovica with other institutions.

Kosovo was known before with a number of endemic areas for goiter and iodine deficiency such as municipality of Deçan/Decan, some part of Pejë/ Peć, Gjakova/Đakovica and Prizren/Prizren located municipality in western part of Kosovo, but also municipality of Vitia in South Eastern part of Kosovo. A study in 1960 – 1980 showed a high prevalence of goiter in these regions from 30% up to 60%. The soil study from the agricultural agencies showed very low levels of iodine in many regions of Kosovo.

The paucity of data on micronutrient deficiencies and disorders was the reason for conducting the Micronutrient Status Survey in 2001 with technical assistance of the Institute of Food and Nutrition (INRAN) – Rome, Italy, by the National Institute of Public Health (NIPH) with support from UNICEF. The results from this survey showed that although 84% of households used iodized salt only 51%

*This map does not reflect a position by UNICEF on the legal status of any country or territory or the delimitation of any frontiers"

of childbearing aged women and school aged children had adequate iodine in urine. The severity of iodine deficiency was illustrated by the fact that 14% of children had iodine excretions below 50µg/L. The thyroid gland was palpable in 3% of women with a small percentage (0.2%) of the women with visible goiter.

Mild and moderate anemia was observed in 16% of the children (6-59 months). And in 14% of the women of fertile age (18-45 years). Low height-for-age was found in 10% of the children aged 6-59 months.

In 2004, supported by UNICEF it was realized a pilot project by NIPH in 10 schools in municipality of Deçan/ Decani whereby the results from this study revealed that 27.5% of studied children had below 50 µg/L of iodine in urine.

During this period UNICEF has facilitated coordination of different institutions involved in the IDD/ USI programme and supported developing capacities of National Institute of Public Health. The multi-sectoral IDD and other micronutrient working group is approved by the Ministry of Health and includes professionals from public health institutions, clinicians, sanitary inspectors, representative of salt importers, laboratory technicians, civil society and private sector. During 2008, the Ministry of Health endorsed an Administrative Instruction for salt that regulates that all salt for human consumption should be iodized with KIO₃ at 30-40 mg iodine per kg salt, strengthening the monitoring system at importation and retail levels for ensuring adequate quality of iodized salt.

Salt enters Kosovo by road through 5 border crossings guarded by Customs of Kosovo. Mandatory inspection of all salt import shipments is conducted by the Veterinary Border Inspection under the Ministry of Agriculture, Forestry and Rural Affairs. Samples are analyzed by titration in the NIPH in Prishtina or the Institute of Agriculture in Pejë/Peć.

UNICEF continued to advocate and provide support to the National Institute of Public Health (NIPH) for regular monitoring and reporting of the iodine concentration in salt samples and of urinary iodine excretion. All salt shipments that enter in Kosovo are checked prior to the release of the shipment from the border point. Testing is performed at National Institute of Public Health and Institute for Agriculture in Pejë/Peć. Salt shipments are checked according to administrative instruction for salt issued by Ministry of Health and referred to above.

During 2007, UNICEF supported the National Institute of Public Health (NIPH) to conduct a pilot survey to assess biological status of school children due to iodine deficiency and salt iodization. The survey covered seven regions and included 523 children from selected schools.

Salt samples for laboratory iodine analysis were obtained from the homes of second grade school children. The results show that only 12 samples were non iodized (2.4%). Overall, 78.8% of salt samples had ≥15mg iodine/kg and 41.3% were within the mandated range for salt imports of 12–18mg/kg. The iodine content was 8.1 to 26.1mg/kg in 95% of all the household salt samples. Among 521 school children of second class the median urinary iodine was 161µg/L. Overall, 21.9% of children had UI <100µg/L and the UI of 95% of the children ranged from 51 to 315 µg/L.

UNICEF during May 2008 supported an external assessment of progress towards achievement of iodine deficiency elimination. Based on the consultant assessment report most of the international UNICEF, WHO and ICC/IDD standards have been met already.

Since 2008, one private company near the capital city - Prishtinë/Pristina has started importing non-iodized salt, fortified with iodine, packed and distributed for sale in Kosovo. This private company is obeying the required standards according to the Administrative Instruction and is collaborating with NIPH.

Rationale for the present survey

Upon the completion of the pilot survey in 2007 and after the endorsement by the Ministry of Health in 2008 of an improved Administrative Instruction, the present survey set out to obtain a formal, state-of-the-art assessment of the iodine nutrition situation of the population in Kosovo. The survey aimed to cover some shortcomings related to representativeness and coverage of the required information of the dietary iodine supply and iodine status of the most vulnerable groups, and included the question whether the Administrative Instruction was successfully ensuring universal good quality iodized salt supplies.

Moreover, the Government of Kosovo desired information of the public health situation in respect to iron deficiency and anemia with a view to inform the ongoing discussions about the need for flour fortification, and it was in need to assess the common food consumption among school-going children to inform on the need, if any, for school lunches.

These 3 strands of interest, in combination, formed the rationale for the present survey.

3. Objective of the survey

This survey planned to achieve following objectives:

- To determine the prevalence and severity of anemia and iodine deficiency in pregnant women;
- To determine prevalence and severity of anemia, assess food consumption, determine nutritional status (measure weight and height) and iodine deficiency among school children from 6 – 13 years;
- Percentage and levels of iodized salt used in the households.

4. Methodology of work

The study is transversal and included 30 clusters for all Kosovo selected in proportion of the size of the population by district and municipality. Schools of the 3 additional established municipalities are included. The study was realized in following phases:

4.1 TARGET GROUPS, SAMPLING DESIGN, SAMPLE SIZES, PREPARATORY WORK

Children enrolled in primary schools and pregnant women living in the same household were the target groups for this survey.

The study had 3 inter-related elements:

Element 1: Measurement of nutritional status, including a food use questionnaire, among children attending primary schools;

Element 2: Assessment for prevalence of anemia and iodine deficiency among school-age children and percentage of iodized salt used in their households; and

Element 3: Assessment for prevalence of anemia and iodine deficiency among pregnant women living in the same households as the children.

From Departments of Education in all municipalities an updated list of elementary schools, places and the number of pupils was obtained. Despite many efforts it was not possible to establish communication in some areas populated by Serbian community. List of schools for northern Mitrovicë/Mitrovica, Zvečan/Zvecan and Zubin Potok/Zubin Potok were therefore obtained from other sources.

The available information such as list of schools, places and number of pupils entered in excel. The selection of schools for inclusion in data collection was based on the school-child population, and 30 schools were selected for all of Kosovo proportionally to the total number of children enrolled in primary schools. In the selected schools, all attending children were interviewed whether they had a pregnant woman resident in their household, and a list was prepared of all affirmative responders for random selection of households to be visited later by the field teams.

In cases where not enough data were obtained from children, field team has requested for additional data from primary health care centers, located in the same school location or settlement.

The lists of potential pupil enrolments were sorted alphabetically by family & first names in ascending sequence and all pupils numbered sequentially. A table of random numbers was used to identify pupils and pregnant women until 30 respondents were completed.

In case that in one school, the number of children responding positively was below the required number of 30, a next school at closest location was added to the enrolment protocol to complete the required number of child-woman pairs to 900. In this way 900 pregnant women and 900 children of school age were obtained who lived in the same family.

Seven field teams were identified from the National Institute of Public Health and six Regional Institutes of Public Health in Pejë/Peć, Prizren/Prizren, southern Mitrovicë/Mitrovica, Ferizaj/Uroševac, Gjilan/Gnjilane and Gjakova/Đakovica. Field teams were trained by experts before conducting the survey on how to measure weight, length, completing questionnaires, use and calibration of equipment, Hemocue measurements, transport of samples for testing, etc. The NIPH provided the necessary equipment for the survey such as scale weight, length meter, Hemocue testing equipment, etc.

For survey elements 1 and 2, the school children thus selected were included in assessments of food consumption and measurements of height and weight.

At the same children have been collected and tested capillary blood sample with Hemocue, a salt sample and urine samples. Salt and urine was transported for testing at NIPH.

For survey element 3, at the same households from the pregnant women have been collected and tested capillary blood samples for prevalence of anemia and urine for urinary iodine excretion. At the same household have been collected sample of salt.

The NIPH was responsible for monitoring the execution of the survey in different places. This was done through the project coordinator, project assistant and responsible officials of the Regional Public Health Institutes.

During the conduct of the survey, a meeting of the IDD and Micronutrient Deficiencies Working Group was held to share information about the study and other activities.

4.2 THE METHODOLOGY FOR EXAMINATION OF SALT AND URINE AT NATIONAL INSTITUTE OF PUBLIC HEALTH

4.2.1 Analysis of the salt samples

Salt collected from the households was tested with titration in NIPH. From each selected family 2-3 table spoons of salt was obtained and brought to the NIPH laboratory where firstly, the salt samples were tested by rapid test kits to identify the fortificant (KI or KIO₃).

After identification of the fortificant, chemical analysis was performed for all samples with the appropriate standard titration methods (AOAC 925.56).

The iodine in salt is released with sulphuric acid, and then the free iodine is titrated with sodium thiosulphate, with starch used as an indicator. The technique varies somewhat depending on whether the iodine added to the salt is in the form of iodide (KI) or iodate (KIO₃). This titration method is recommended for checking the salt at importation level, when precise checks are required.

$$\text{KI (mg/kg)} = \frac{\text{ml} \times 0.2676 \times 1000}{p_m}$$

ml – of sodium thiosulphate used for titration;

p_m - sample mass;

$$\text{KIO}_3 \text{ (mg/kg)} = \text{ml} \times 10.58$$

ml – of sodium thiosulphate used for titration;

4.2.2 Analysis of urinary iodine

The field teams collected urine samples with special cups from pregnant woman as well as from school children. Cups were labeled, sealed and transported to NIPH.

Through the digestion process the urine sample is treated with ammonium persulphate, then the Sandell-Kolthoff reaction takes place, in which the iodine (in the form of iodide) has the role of a catalyst of the oxide-reducing reaction. During this reaction, the yellow color of the reaction mixture disappears with a speed that is proportional to the concentration of iodide in the sample.

Laboratory procedure for measuring urinary iodine

- The urine samples and the solution B must have the room temperature;
- The urine samples are mixed until homogenization of the suspended sediment, and pipette 250 μl of the sample into 13x100mm test tube;
- Prepare standards by pipetting 0, 10, 20, 40, 60, 100 and 250 μl of Standard Solution B in duplicate into 12 test tubes containing 250, 240, 230, 210, 190 and 150 μl of H₂O respectively, to give a volume of 250 μl in each tube. This gives standard curve with the following iodine concentrations- 0, 20, 40, 80, 120, 200 and 500 $\mu\text{g/L}$;
- One ml of solution of ammonium persulphate is added to each test-tube and is then mixed slowly;
- The test-tubes are placed in a thermostatic block and heated for 1 hour at a temperature between 91 and 95°C;
- The test-tubes are cooled to room temperature;
- 3,5 ml of arsenic acid solution are added to each test-tube, mixed with a "Vortex" mixer and left for about 15 minutes;
- 400 μl of ceric ammonium sulphate are added to each test-tube at 30 second intervals (which is observed with a stopwatch). Each time the solution is added, it is followed by mixing with the "Vortex" mixer;
- Exactly 30 minutes after addition of the ceric ammonium sulphate solution to the first test-tube, the absorbance (at 420 nm) for each sample is read in single-beam spectrophotometer in 30 sec interval;
- The iodine concentration in urine is determined in the base of the value of absorbance plotted from the standard solution.

4.3 ANALYSIS OF HEMOGLOBIN CONCENTRATIONS IN PREGNANT WOMEN AND SCHOOL CHILDREN

Trained field teams used Hemocue equipment¹ to measure the blood hemoglobin concentration by taking capillary blood by finger prick from pregnant women and school children. Parents, children and pregnant women were informed about purpose of the study and after consent finger prick blood have been taken following safe practices and with sterile equipment.

4.4 ASSESSMENT OF FOOD CONSUMPTION AND MEASUREMENT OF HEIGHT AND WEIGHT OF SCHOOL CHILDREN

A special questionnaire was used to assess the weekly frequency of consumption of specific food groups by the school children.

Measurement of weight and height of children was performed using standard bathroom weighing scales and stadiometers. The measurements were analyzed and compared with international standards.

Survey teams were instructed to repeat measuring the subjects until two measures differed by no more than 0.5 cm and then to record the second of the two measures. Children height was measured to the nearest 0.1 cm using UNICEF height measuring tool.

Children were weighed on digital electronic scales (UNICEF cat. no. 01-410-15) and the measurements recorded to the nearest 0.1 kg. The subjects were dressed in a standard way, with skirt, blouse and underwear and without shoes hence a fixed value of 1 kg will be subtracted from the recorded weight during data analysis.

4.5 DATA MANAGEMENT

The last phase of the project was statistical elaboration of the acquired results. Inputs from assessment were entered in Excel by the project coordinator and the project assistant. Analysis of data was performed in collaboration with the international expert.

¹ Hb 301, see <http://www.hemocue.com/index.php?page=3004>

5. Results of the study

A total of 30 schools were selected proportional to their enrolment size from the list of schools obtained the Municipality Departments of Education. In each school the target number of children for enrolment in the survey was 30. Children were considered eligible when they reported having also a pregnant woman living in their household.

The results are presented in five chapters:

- Demographic characteristics of the respondents
- Anemia in pregnant women and school age children
- Iodine supply, iodine consumption and iodine status in pregnant women and school age children
- Child anthropometry
- Food consumption frequency among children

5.1 DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

5.1.1 Age, gender, residence

The age of the 900 children included in the survey ranged from 5 to 14 y old (Table 1) and their mean age in years was 9.7 (SD 2.7). 709 (79%) children were 6-12 y old. The children were divided equally by gender (Male=47.2%; female=52.8%). The majority of children and women was living in rural Kosovo (Urban=36.6%; Rural=63.3%). The average age of the 900 pregnant women was 28y (SD 6) and the age range 14-51 years. The majority of women (n=872; 97%) was in the 1st or 2nd semester of pregnancy.

Table 1 Demographic characteristics of survey participants, Kosovo, 2009

Target group		Gender		Residence	
Children	N (%)	Boys	Girls	Urban	Rural
Age 5-8y	343 (38)	156 (45)	187 (55)	141 (41)	202 (59)
9-13y	471 (52)	238 (51)	233 (49)	158 (35)	313 (66)
14y	86 (10)	31 (36)	55 (64)	31 (36)	55 (64)
All children	900	425	475	330	570

5.1.2 Socio-economic characteristics

The large majority of the women (Table 2) were housewives (90%); other reported professions included Student (n=27; 3%); Economist (n=13; 1.4%); Professor (n=13; 1.4%); Physician (n=12; 1.3%), etc.

The majority of women had completed elementary (n=596; 66%) or secondary (n=262; 29%) education.

Table 2 Socio-economic characteristics of women

Pregnant women	N (%)
Age 14-24y	260 (29)
25-34y	486 (54)
35+y	154 (17)
Education Elementary	596 (66)
Secondary	262 (29)
High school	42 (5)
Profession Home maker	810 (90)
Other	90 (10)
Semester First	275 (31)
Second	597 (66)
Third	28 (3)

5.2 PREVALENCE OF ANEMIA

The prevalence of anemia among the survey participants was determined from hemoglobin (Hb) levels collected from capillary blood samples using a HemoCue. WHO classifies anemia as a problem of public health significance based on prevalence estimates from hemoglobin values [UNICEF/UNU/WHO, 2001]. Table 3 presents the classifications for severe, moderate, mild and normal levels of anemia in a population.

Table 3 WHO classification of public health significance of anemia in populations based on the prevalence of hemoglobin [UNICEF/UNU/WHO, 2001]

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

5.2.1 Hemoglobin in School Children

The Hb distribution of the 900 children in this survey (Figure 1) had a mean of 12.8g/dl (SD 1.29; range 7.0 – 16.5). As to the age-related cut-off levels defined by UNICEF/UNU/WHO, Hb values below 11.5g/dl was found in 93 out of 630 5-11y old children, or 14.8%. In 12-14y old children, Hb below 12g/dl was found in 48 out of 270 children, or 17.8%. The difference in anemia prevalence between the age groups is not statistically significant.

The anemia prevalence in all the children of Kosovo was 15.7%, indicating a mild public health problem of anemia among school children.

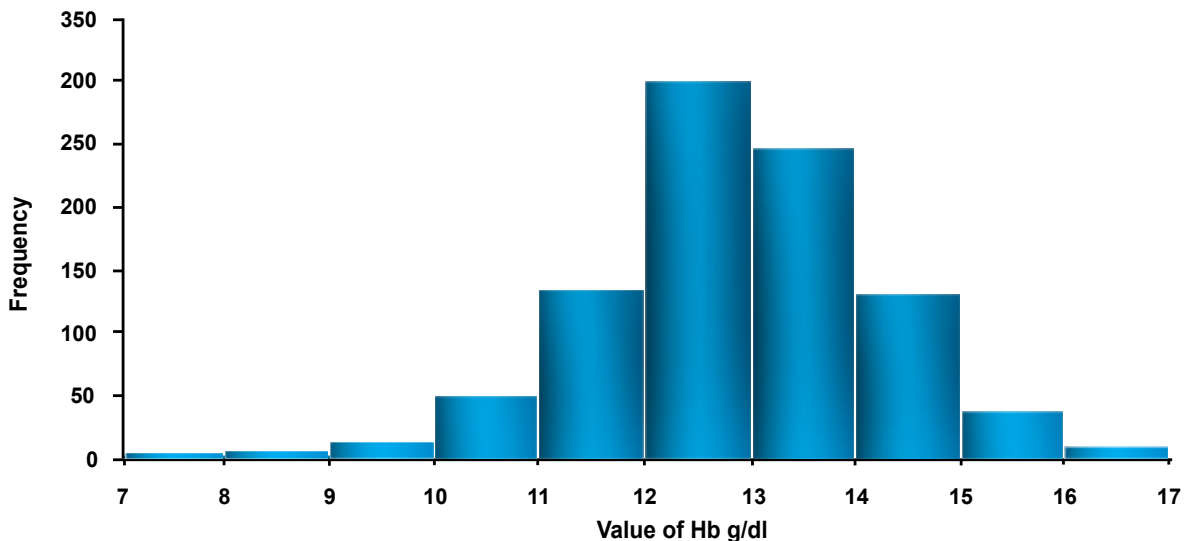


Figure 1 Distribution of hemoglobin levels among school-age children, Kosovo 2009

Although girls had somewhat lower mean Hb values than boys (12.7 vs. 12.9g/dl, respectively) the difference in Hb was not significant. Also, children living in rural areas had somewhat lower Hb values than those in urban areas (12.7vs. 12.9g/dl, respectively) but again, this is not a significant difference.

Also the anemia prevalence in the children did not differ significantly between gender (boys 15.3%; girls 16.0%) and between residence (rural 17.2%; urban 13.0%).

5.2.2 Hemoglobin in Pregnant Women

The Hb distribution of the 900 pregnant women in this survey (Figure 2) was normal shaped, with a mean of 12.0g/dl (SD 1.55; range 6.9-16.0).

The Hb was below 11.0g/dl, the cut-off for anemia among pregnant women (UNICEF/UNU/WHO, 2001), in 207 women or 23.0% (95% CI: 20.4-25.9), thus revealing a moderate public health problem of anemia among pregnant women.

The prevalence of anemia did not differ by age or location (urban/rural).

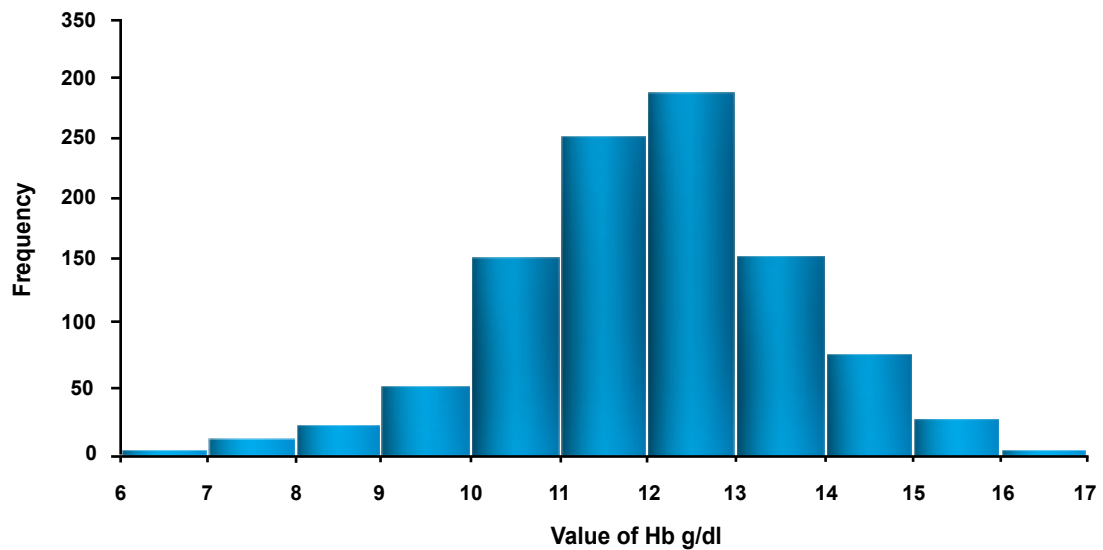


Figure 2 Distribution of hemoglobin levels among pregnant women, Kosovo 2009

The Hb level and thus, anemia prevalence was related to the duration of pregnancy (Figure 3): Hb levels diminished from entering the 2nd semester. The prevalence of anemia among the women during the 1st semester (months 1-3) was 13.5%, whereas it was 27.8% ($p < 0.001$) among the women in the 2nd semester (months 4-6).

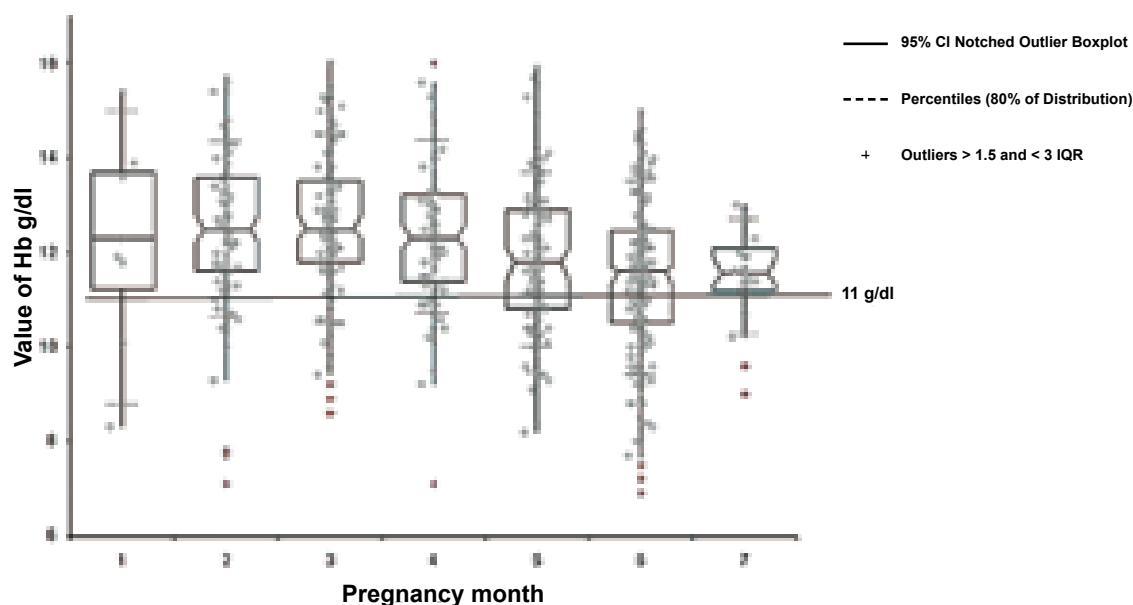


Figure 3 Hemoglobin levels among pregnant women by pregnancy month, Kosovo 2009

5.2.3 Anemia and iron (Fe) supplement use in pregnant women

The mean Hb level among the 144 women who reported using a Fe-supplement (12.2g/dl; SD 1.65) was slightly higher ($p < 0.05$) than in the 756 remaining women (mean 11.9g/dl; SD 1.53) who did not report the use of a Fe-supplement. Table 4 shows the analysis of Hb levels by pregnancy semester, Fe supplement use and the duration of Fe supplement use.

Table 4 Effect of Fe supplement use among pregnant women, Kosovo 2009

Characteristic	N	Mean \pm SD (g/dl)	P-value	Anemia prevalence
1st Semester: Fe users	49	13.1 \pm 1.30	<0.01	6.1%
Fe non-users	226	12.4 \pm 1.51		15.5%
2nd Semester: Fe users	91	11.8 \pm 1.68	n.s.	31.9%
Fe non-users	506	11.8 \pm 1.52		27.1%
2nd Semester, Fe users only < 1 month	23	10.8 \pm 1.65	<0.001	56.5%
\geq 1 month	56	12.2 \pm 1.52		21.4%

Table 4 shows that the Hb level diminishes with pregnancy semester for Fe users and Fe non-users alike. Fe supplement users during the 1st semester have significantly higher Hb levels ($p < 0.01$) and lower anemia prevalence, but this difference is not apparent for the pregnant women in their 2nd semester. When analyzing the Fe supplement use among the women in their 2nd semester by the duration of Fe-supplement use, however, a clear difference in Hb level and anemia prevalence

is found: Pregnant women who reported using a Fe supplement for 1 month or longer had significantly higher Hb levels ($p < 0.001$) and lower anemia prevalence (21.4% versus 56.5%) in their 2nd semester of pregnancy than those who were using a Fe supplement for a shorter duration.

5.3 IODINE SUPPLY, IODINE CONSUMPTION AND IODINE STATUS

5.3.1 Salt iodine content

The salt iodine (SI) content in household salt samples was measured by titration (Sullivan et al, 1995) and distinguished either the potassium iodide (KI) or potassium iodate (KIO₃) fortificant. The technical guidelines of the Government of Kosovo make it compulsory that salt destined for human consumption should be iodized at 20-30mg iodine per kg salt at the time of importation.

Notably, all the household salt samples collected in this survey were iodized. The frequency distribution of SI contents (Figure 4) was sizably skewed, with a median of 16.5mg/kg (95% CI: 15.7-16.9) and range between 8.8 and 29.6mg/kg.

The mean SI in the 900 household salt samples was 17.7mg/kg (SD 4.6) and 605 (67%) salt samples had a SI value ≥ 15 mg/kg.

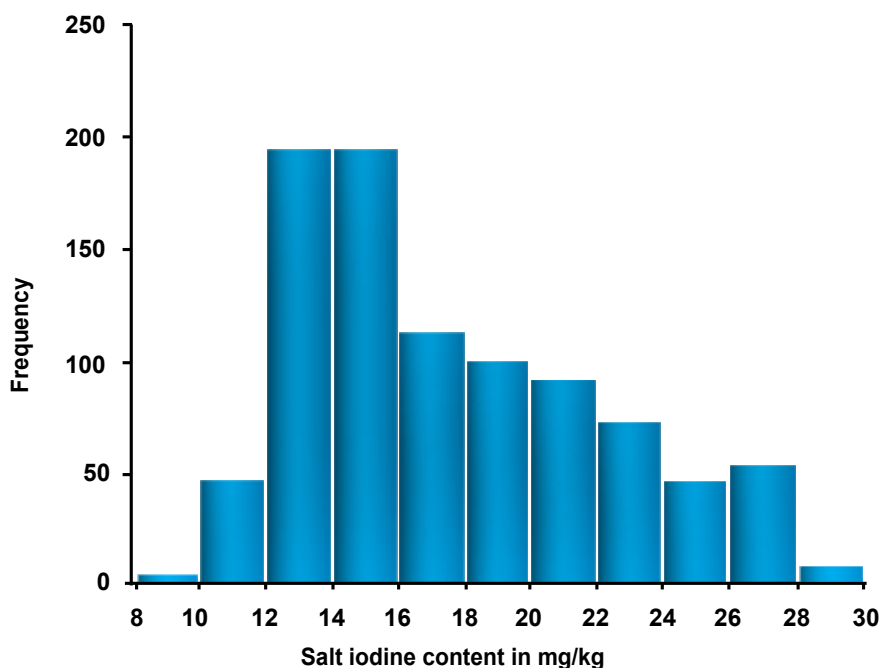


Figure 4 Frequency distribution of iodine content in household salt, Kosovo 2009

As shown in Figure 5, the SI content was associated with the type of fortificant used in the production of iodized household salt. The mean SI in the 381 (42%) salt samples iodized with KI was 22.1mg/kg (SD 3.4), which is significantly higher ($p < 0.0001$) than in the 519 (58%) samples iodized with KIO₃ (mean 14.5mg/kg; SD 1.8).

The SI content was not related to any maternal or child characteristic (mother's age, child's age, month and semester of pregnancy, maternal education, child gender, etc), nor with residence (urban, rural) of the household.

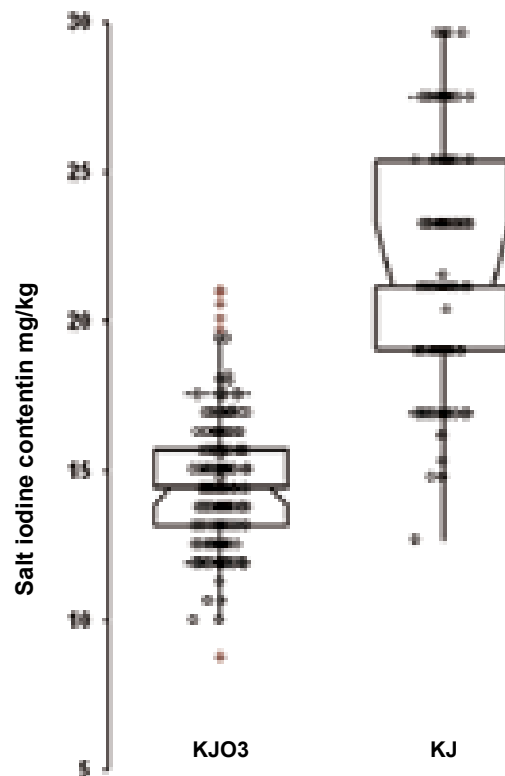


Figure 5 Salt iodine content by type of fortificant, Kosovo 2009

5.3.2 Iodine consumption and status

The iodine status in school children and pregnant women was determined by measuring the iodine concentration in a casual urine sample by the cerium-arsenic reaction after mild digestion (Sandell & Kolthoff, 1937). During the processing of the urine samples, the laboratory of the National Institute of Public Health participated with success in the quality-assurance program for this assay, named EQUIP, managed by CDC, Atlanta. The certificate for 2008 is illustrated in the accompanying figure.

The NIPH laboratory continued participating in the EQUIP program during 2009. The majority of urine samples from this survey was analyzed during the 2nd round EQUIP sample exchange. The results of the NIPH laboratory in comparison with the EQUIP sample targets were as follows:

Sample code	060412	CV	060425	CV	060443	CV	060475	CV
CDC Target	74		20		438		199	
Acceptable range	56-93		14-26		373-504		159-239	
NIPH results	80	4.3	25	3.4	467	0.6	225	1.6



WHO classifies iodine deficiency as a problem of public health importance based on the median urinary iodine (UI) concentration in a representative sample of the population (WHO/UNICEF/ICCIDD, 2007). Table 5 presents the epidemiological criteria for the classification of iodine intake and iodine nutrition, using the median UI concentration of 6-12y old school-age children (upper part) and pregnant women (lower part).

Table 5 WHO classification of iodine nutrition in a population

Population group and median urinary iodine concentration	Iodine intake	Iodine nutrition
School-age children <20µg/l 20-49µg/l 50-99µg/l 100-199µg/l 200-299µg/l >300µg/l	Insufficient Insufficient Insufficient Adequate More than adequate Excessive*	Severe iodine deficiency Moderate iodine deficiency Mild iodine deficiency Optimum Risk of iodine-induced hyperthyroidism in susceptible groups Risk of adverse health consequences (iodine-induced hyperthyroidism, autoimmune thyroid disease)
Pregnant women <150µg/l 150-249µg/l 250-499µg/l >500µg/l	Insufficient Adequate More than adequate Excessive*	** ** ** **

*The term excessive means in excess of the amount needed to prevent and control iodine deficiency.

** There is no information in the WHO/UNICEF/ICCIDD assessment classification about iodine nutrition based on UI values among pregnant women.

5.3.2.1 Iodine status of school children

The UI frequency distribution of the 900 school children in this survey (Figure 6) was significantly skewed, making the median a better descriptor of the group's iodine status. The median UI was 176µg/l (95% CI: 168-182) and the range 43-486µg/l. The UI was <100µg/l in 44 children (4.9%); in 488 children (54.2%), the UI was in the optimal range of 100-199µg/L, and 111 children (12.2%) had UI ≥300µg/l.

The UI in children did not differ significantly (p=0.78) between boys (median 178µg/l) and girls (174µg/l), between urban (178µg/l) and rural (174µg/l) residence (p=0.87), or between the households using salt iodized with KI (182µg/l) or KIO3 (169µg/l) (p=0.19). The UI values in children were also not significantly related (p=0.13) to their age. In none of the survey clusters was the median UI less than 100µg/l.

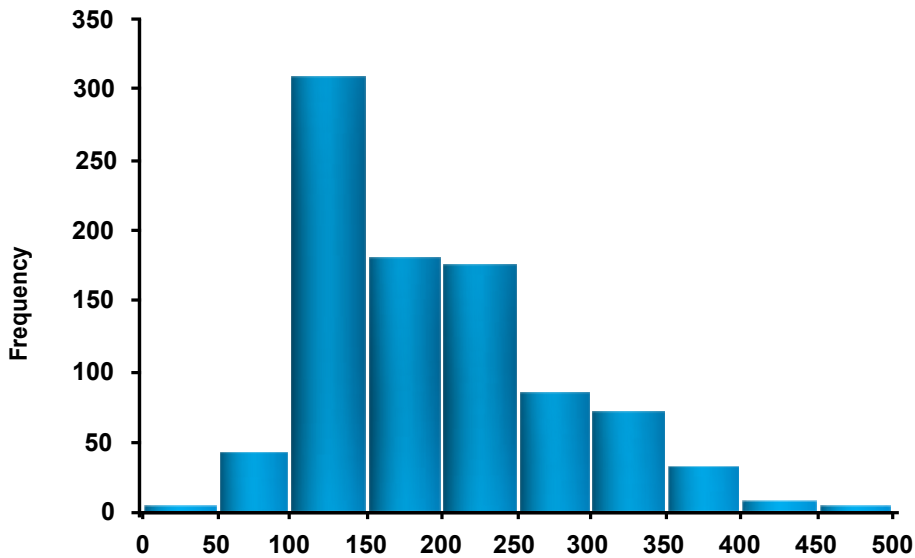


Figure 6 Frequency distribution of UI concentration ($\mu\text{g/l}$) in school children, Kosovo 2009

5.3.2.2 Iodine consumption estimates in children

When using their body weight measurements, the UI concentrations in children may be converted to estimates of iodine consumption. As explained in the report by the Institute of Medicine (IOM, 2001), the conversion equation to obtain the 24-h iodine intake is:

$$\text{Iodine intake } (\mu\text{g/d}) = 0.0235 \times \text{body weight (kg)} \times \text{urinary iodine } (\mu\text{g/l})$$

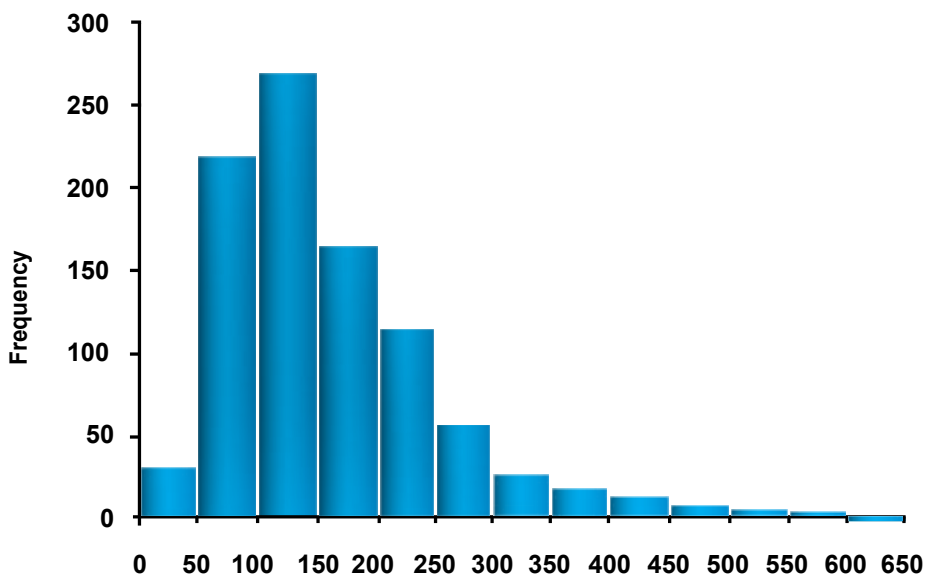


Figure 7 Frequency distribution of iodine intake estimates ($\mu\text{g/d}$) in school children, Kosovo 2009

As Figure 7 shows, the frequency distribution of iodine intake estimates in children was significantly skewed. The median iodine intake estimate among the children was $137\mu\text{g}/\text{d}$ (95% CI: 129-144) and the range 26-636 $\mu\text{g}/\text{d}$. The iodine intake estimates were not significantly different ($p=0.46$) between boys (median $137\mu\text{g}/\text{d}$) and girls ($138\mu\text{g}/\text{d}$), nor was there a significant difference ($p=0.15$) between children in urban ($129\mu\text{g}/\text{d}$) and rural ($142\mu\text{g}/\text{d}$) households, or between children in households using salt iodized with KI ($140\mu\text{g}/\text{d}$) or KIO₃ ($136\mu\text{g}/\text{d}$) ($p=0.19$).

The iodine consumption estimates in the children were, however, significantly related ($p<0.0001$) to their age, as shown in Figure 8. The estimated iodine intake increased from approx. $80\mu\text{g}/\text{d}$ at age 5-6y to $200\mu\text{g}/\text{d}$ at 13-14y of age.

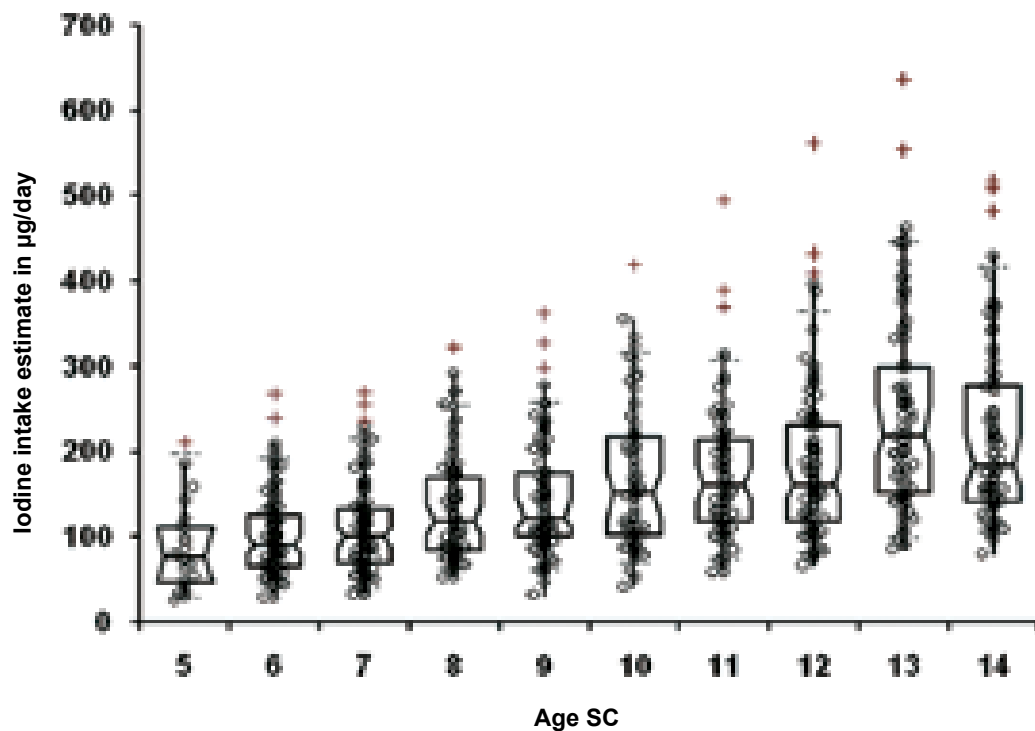


Figure 8 Iodine intake estimates ($\mu\text{g}/\text{d}$) among children and their age, Kosovo 2009

The U.S. Institute of Medicine (IOM, 2001) has developed recommended dietary iodine allowances (RDA) for children, i.e., $90\mu\text{g}/\text{d}$ for children aged 4-8y, $120\mu\text{g}/\text{d}$ for children aged 9-13y and $150\mu\text{g}/\text{d}$ for children aged 14y and older. Calculating the iodine intake estimates in children as fraction of the RDA in each respective age group creates a dietary iodine sufficiency index for children in this survey. The median iodine sufficiency among all the children in this survey was 1.24 (95% CI: 1.19-1.28), indicating that the children in Kosovo typically were consuming a diet that supplied iodine 24% above their RDA. The iodine sufficiency index was <1.0 in 313 (35%) of children; 435 (48%)

of children had an iodine sufficiency index of 1.0-1.99, and the remaining 152 children (17%) were consuming iodine above 2 times their RDA.

Figure 9 expresses the iodine sufficiency in children by age group. The median iodine sufficiency index among the 5-8y old children was 1.12 (95% CI: 1.02-1.18), or 12% above RDA, and significantly lower than the median iodine sufficiency in 9-13y old children (1.32; 95% CI: 1.26-1.41; $p < 0.0001$) and in children aged 14y (1.22; 95% CI: 1.06-1.47; $p = 0.02$). The indices for dietary iodine sufficiency in the latter two age groups were not significantly different ($p = 0.99$).

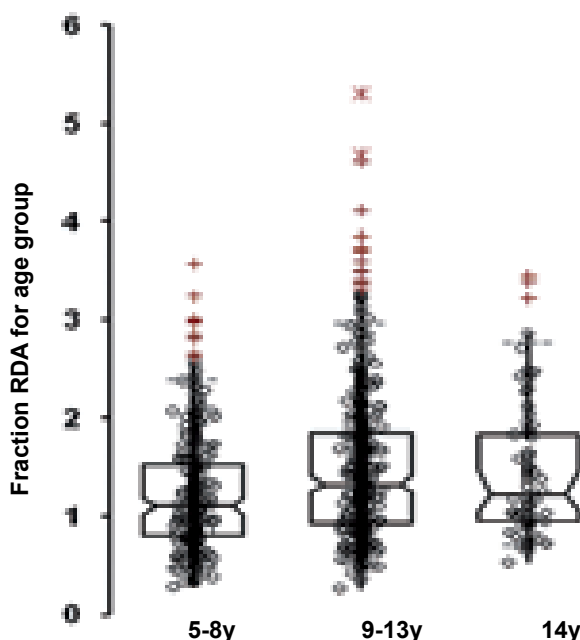


Figure 9 Iodine sufficiency indices (Fraction of RDA) among children by age group, Kosovo 2009

5.3.3 Iodine status of pregnant women

Similar as in their children, the frequency distribution of UI concentrations among the pregnant women in this survey (Figure 10) was significantly skewed. The median UI in pregnant women was $183 \mu\text{g/l}$ (95% CI: 173-187) and the range $27\text{-}632 \mu\text{g/l}$. The UI in pregnant women was $<150 \mu\text{g/l}$ in 338 women (38%); in 317 women (35%) the UI was in the optimal range of $150\text{-}249 \mu\text{g/l}$; 244 women (27%) had UI values between 250 and $499 \mu\text{g/l}$, and UI $>500 \mu\text{g/l}$ was observed in 1 woman (0.1%).

The UI in pregnant women did not differ significantly ($p = 0.20$) between urban (median $174 \mu\text{g/l}$) and rural ($184 \mu\text{g/l}$) residence, nor was there a significant relationship of the UI in pregnant women with their level of education ($p = 0.57$), pregnancy duration ($p = 0.60$) or pregnancy semester ($p = 0.99$).

The UI concentration in pregnant women who were living in households that were using salt iodized with KI (median 186 $\mu\text{g/l}$; 95% CI: 176-214) was slightly higher ($p < 0.05$) than in households with salt iodized with KIO_3 (176 $\mu\text{g/l}$; 95% CI: 164-186).

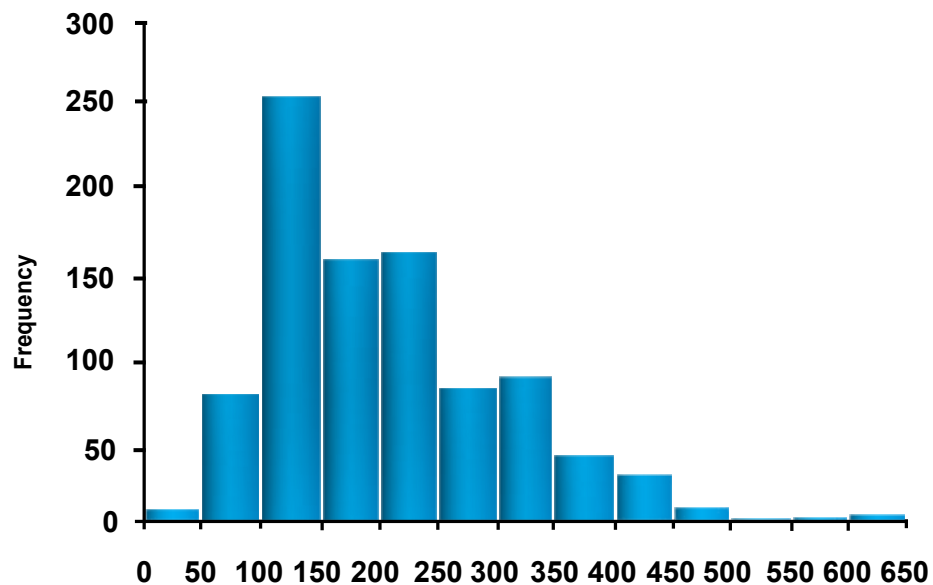


Figure 10 Frequency distribution of UI concentrations ($\mu\text{g/l}$) in pregnant women, Kosovo 2009

5.3.4 Relationship of UI concentrations in pregnant women and children

The UI concentrations of pregnant women and children living in the same households were strongly correlated ($r=0.63$, $p < 0.0001$). Figure 11 shows the scatter plot and regression of the UI concentrations, while assuming that there was no intercept.

The slope of the regression line ($b=1.002$; 95% CI: 0.98-1.03) was not statistically different from unity, indicating that the UI concentrations of the women and children from the same households were indistinguishable. This relationship was not different for the households using salt iodized with either KI or KIO_3 , or for the three different age groups of children (see above).

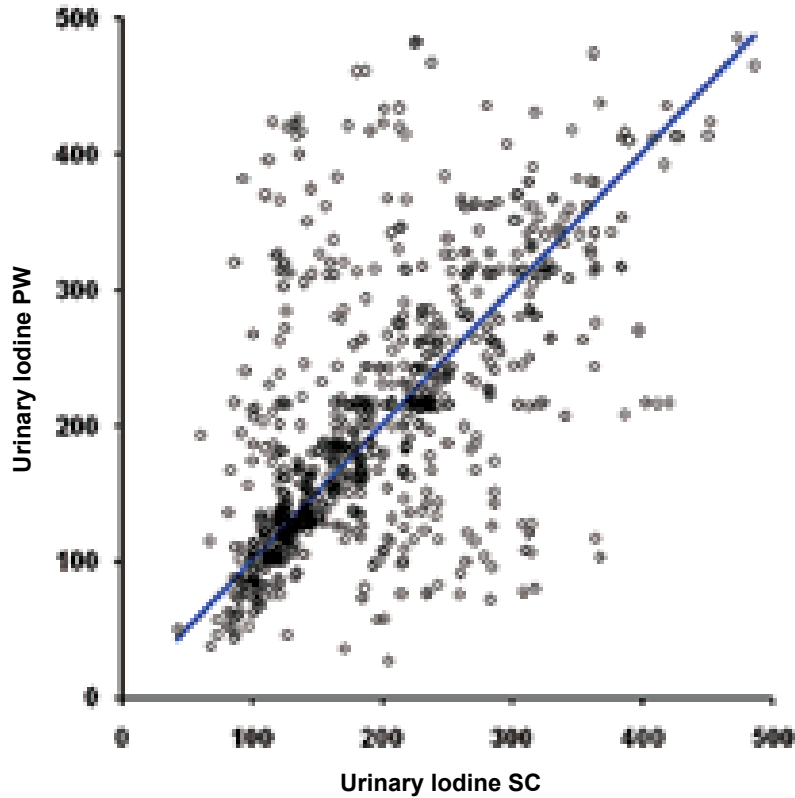


Figure 11 Relationship of UI concentrations in pregnant women and school-age children living in the same households, Kosovo 2009

5.3.5 Salt iodization fortificant, salt iodine level, and iodine status

As reported above, the different types of fortificant in iodized salt -KI and KIO_3 - were not associated with different UI concentrations in children but in pregnant women, the UI concentrations from the households which used salt iodized with KI were slightly, but significantly higher than in the households with salt iodized with KIO_3 . Since the household salt iodine content was related to the type of fortificant (Figure 5 above), it is important to analyze the relationship of the iodine status or the iodine consumption of the survey participants with the iodine content in their household's salt. These relationships are illustrated in Figures 12 and 13 for the school children and in Figure 14 for the pregnant women.

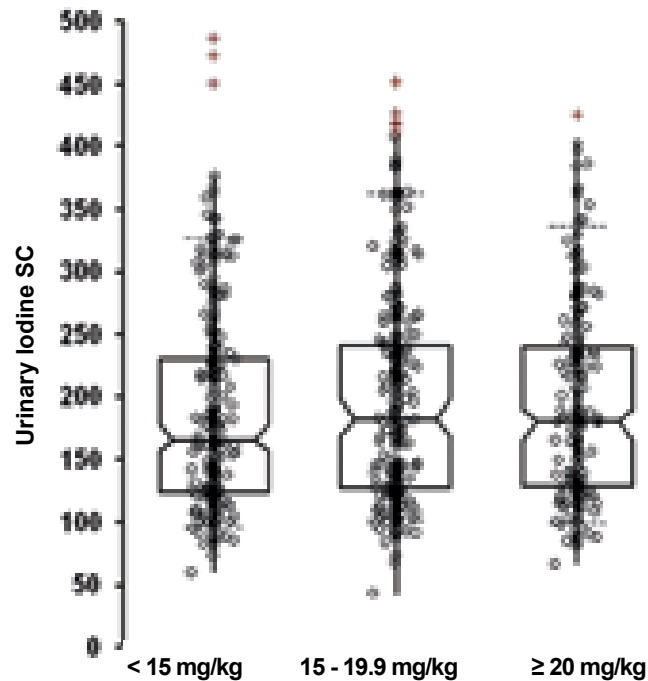


Figure 12 Relationship between the household salt iodine content and UI concentrations in children, Kosovo 2009

As Figure 12 illustrates, although the children from the households using salt with iodine content <15 mg/kg had the lowest UI concentrations (median 165µg/l; 95% CI: 158-178), the UI differences with the children from households using salt iodized at 15-19.9 mg/kg (182µg/l; 95% CI: 168-199) or at ≥20 mg/kg (181µg/l; 95% CI: 165-190) were not significant ($p=0.13$). Similarly, no significant differences existed ($p=0.46$) between the iodine intake sufficiency indices in children, expressed as fraction of their RDA, at different household salt iodine levels (Figure 13).

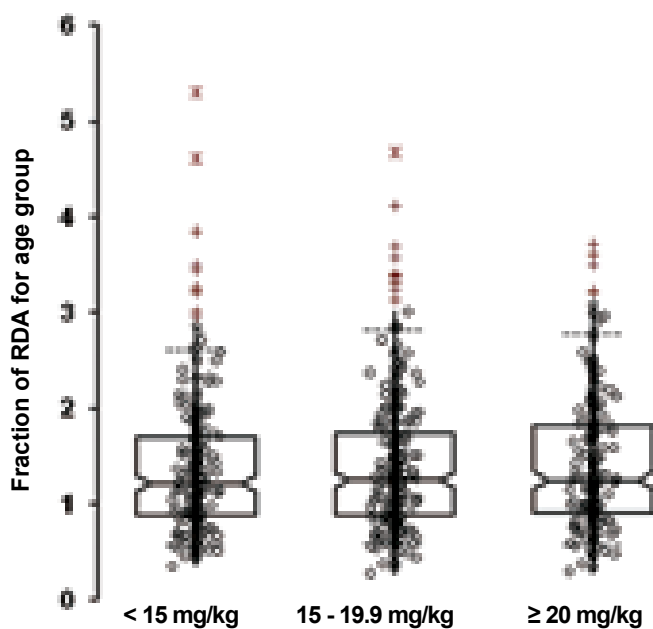


Figure 13 Relationship between the household salt iodine content and estimated iodine intakes in children, Kosovo 2009

Figure 14 shows that, as was also the case in children, the UI concentrations in pregnant women from the households using salt iodized at <15 mg iodine/kg were lowest (median 174 $\mu\text{g/l}$; 95% CI: 164-186), but the UI differences with pregnant women in the households using salt iodized at 15-19.9 mg/kg (184 $\mu\text{g/l}$; 95% CI: 164-208) or ≥ 20 mg/kg (186 $\mu\text{g/l}$; 95% CI: 168-211) were insignificant ($p=0.70$).

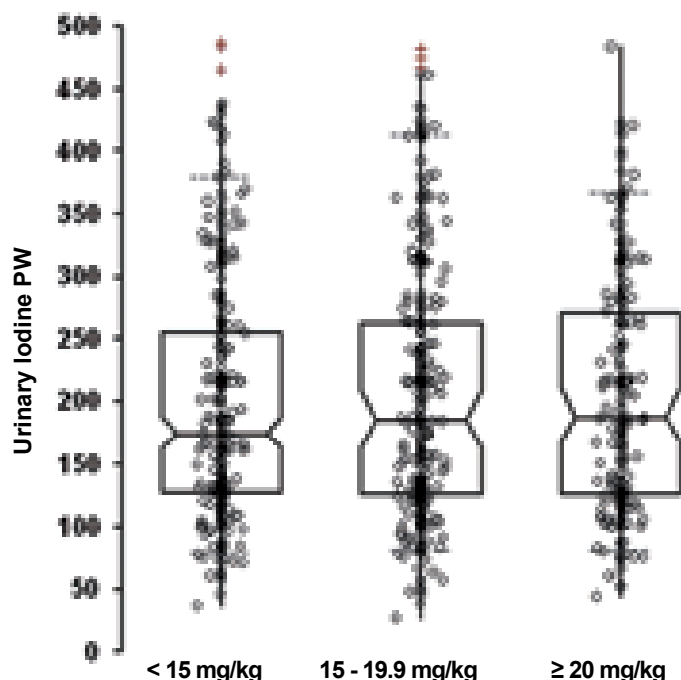


Figure 14 Relationship between the household salt iodine content and UI concentrations in pregnant women, Kosovo 2009

5.4 CHILD ANTHROPOMETRY

This section documents the anthropometric measurements body weight and stature of children, uses them for estimating the prevalence of nutritional indicators of growth and compares them to their age, gender and residence, and reported frequencies of food consumption.

5.4.1 Interpretation of anthropometric indicators for school-age children

Reference: The growth charts developed by the Centers for Disease Control and Prevention for U.S. children was used for interpreting the anthropometric data of the children. The CDC charts are based measurements of U.S. children who were healthy and assumedly well-nourished. Healthy and well-nourished children from most Western countries have growth patterns similar to these charts.

Z-Scores: The anthropometric indices used for describing the nutritional status of the children include weight-for-age (WFA) and height (stature)-for-age (HFA), which are interpreted using classifications based on Z-scores (standard deviation units from the CDC median). The reference Z-score distributions for WFA and HFA each have a mean of 0.0 and a standard deviation (SD) of 1.0. A Z-score of -2 corresponds to the 2.3rd percentile of the reference distribution, while a Z-score of +2

corresponds to the 97.7th percentile. Thus, with any of the Z-score indicators, a prevalence below or equal to 2.3% is regarded as the surveyed population being free of malnutrition based on that indicator.

A Z-score cut-off point of <-2 is used to classify low weight-for-age (underweight) and low height-for-age (stunting) of children. Conversely, a Z-score cut-off point of $>+2$ for WFA is used to indicate the children who are having high weight-for-age, or overweight.

Data quality: The standard deviation (SD) of the Z-score provides information on the spread of the WFA and HFA indicator distributions and offers an indication of the quality of the anthropometric measurements taken during the survey. As stated above, the SD of the Z-score reference distribution for each indicator is 1.0. An observed Z-score SD >1.0 and <1.2 indicates that the distribution of measurements is more widely spread than the reference. A Z-score SD >1.3 is suggestive of inaccurate anthropometric measurements and/or inaccurate age information.

Data cleaning: Two records with potentially erroneous stature data were excluded from the analysis, based on a Z-score <-6.0 .

5.4.1.1 Body weight and height (stature) of children

The weights and heights of children increased steadily with age, as illustrated in Figures 15, 16 and 17. Up to age 10, boys were 1.5-3.5kg heavier on average than girls, while girls were 1.5-2kg heavier than boys at ages 11 and 12y (Figure 15, 16). At the ages of 13 and 14y, the weights of boys and girls in the survey were not different. The average body weight of boys and girls at ages 13 and 14y was 50kg.

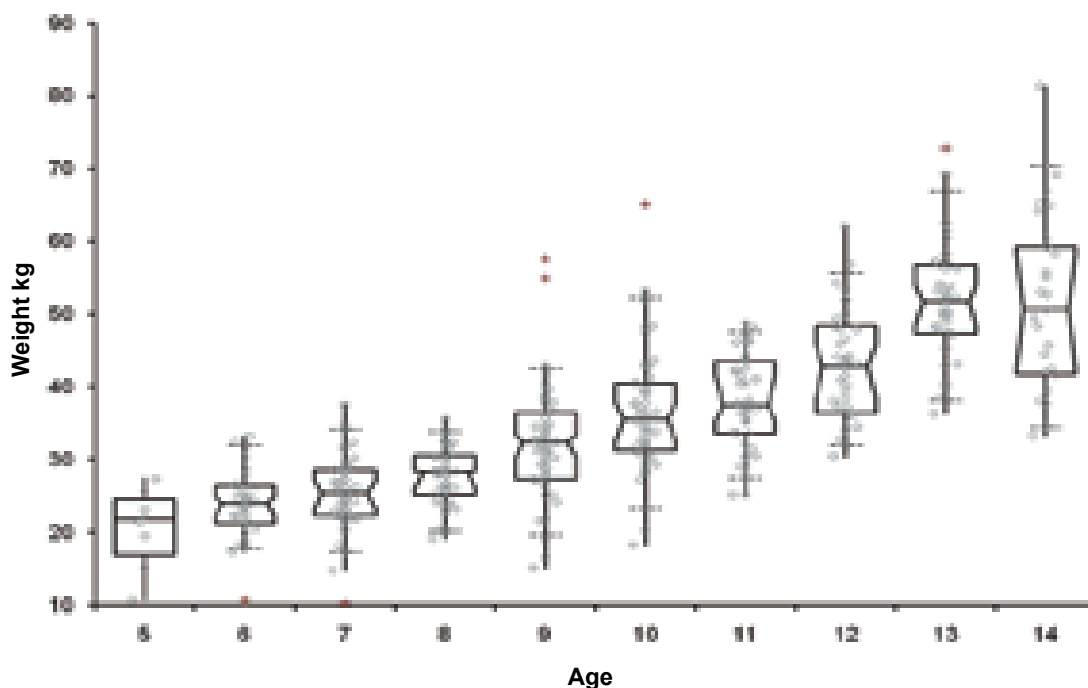


Figure 15 Body weight of school-age boys, Kosovo 2009

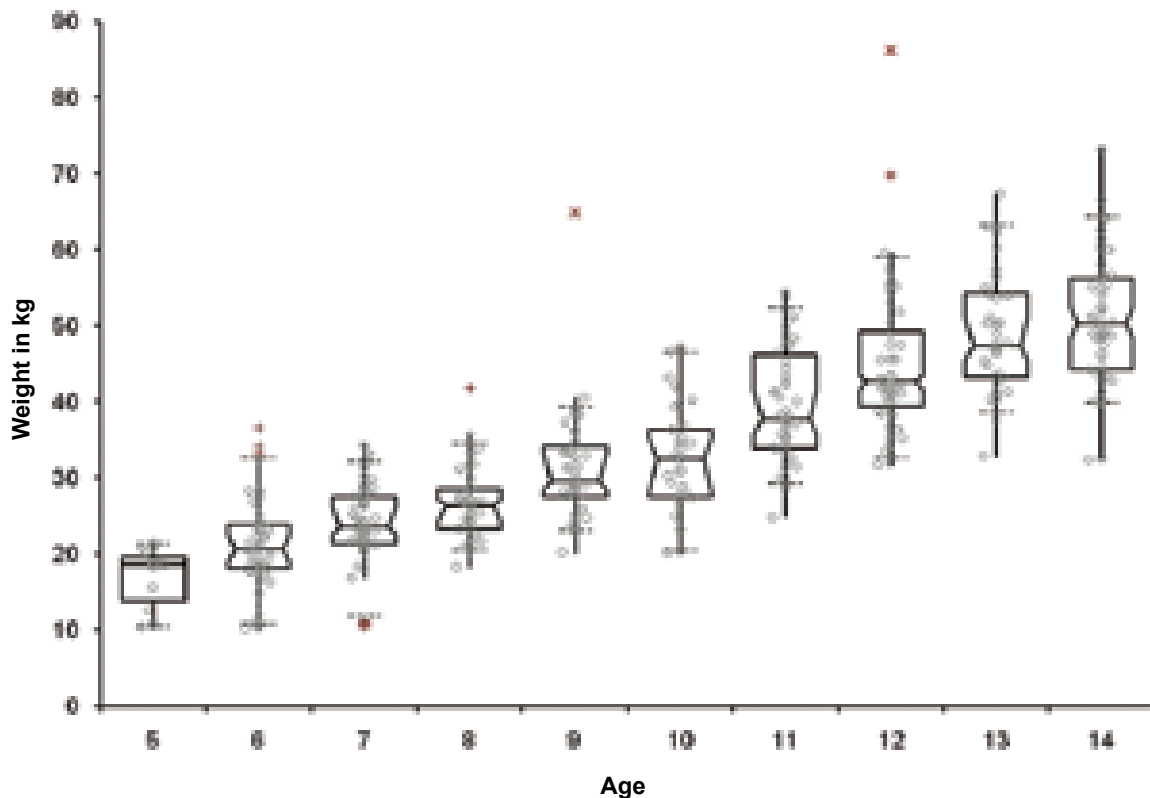


Figure 16 Body weight of school-age girls, Kosovo 2009

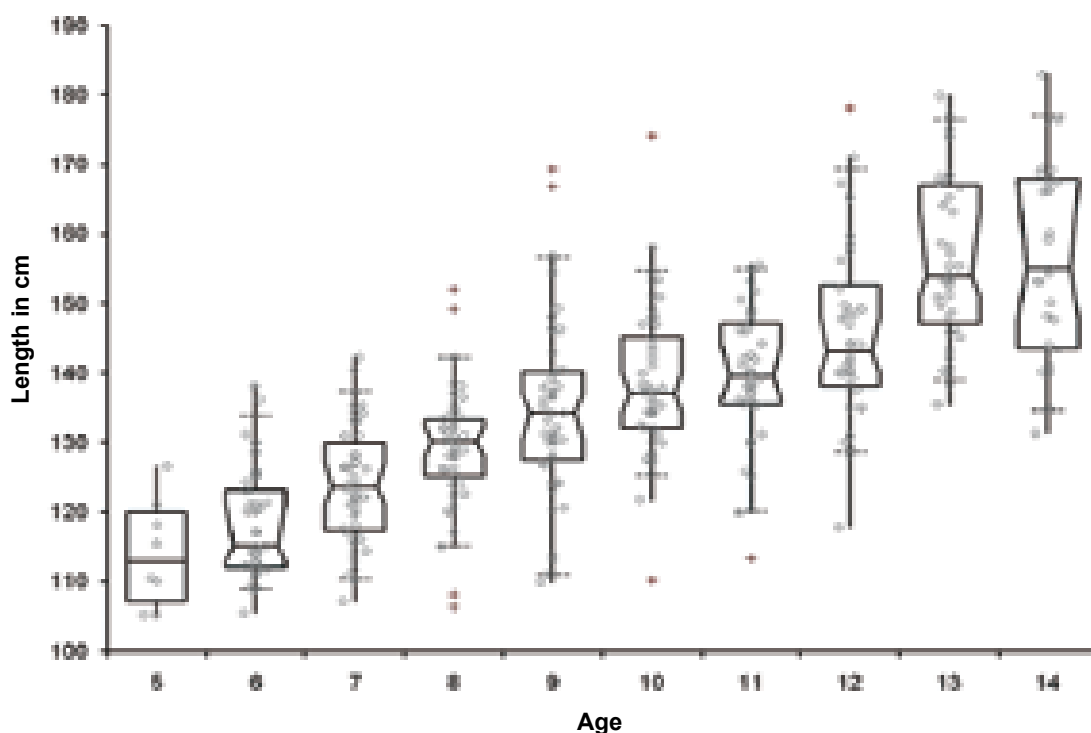


Figure 17 Body stature of school-age boys, Kosovo 2009

Boys were 2-6cm taller than girls up to age 10y (Figure 17 and 18). At ages 10 and 11y, in contrast, girls were 5cm taller than boys and there was no difference in stature between boys and girls at ages 13 and 14y. At ages 13 and 14y, the average stature of boys and girls in Kosovo was 155cm.

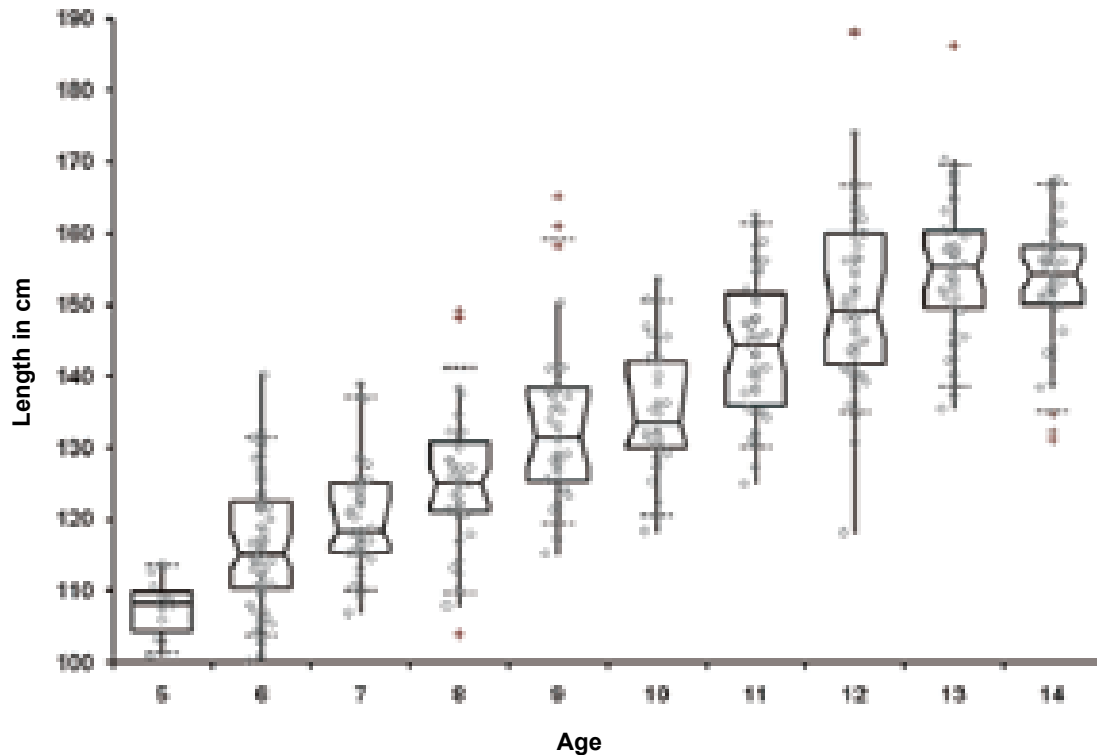


Figure 18 Body stature of school-age girls, Kosovo 2009

5.4.2 Nutritional status of children

A total of 898 children aged 5-14y had valid length, weight and age data to calculate the WFA (under- and overweight) and HFA (stunting) Z-scores. Table 6 shows the results of these indicators and Figure 19 shows their frequency distributions.

Table 6 Anthropometry indices (Z-scores) of school-age children, Kosovo 2009

Anthropometry index	N	Mean	SD	Range
WFA	900	0.07	1.09	-3.5 – 5.3
HFA	898	-0.56	1.54	-5.1 – 5.2

The SD of the WFA Z-scores indicates that the body weight measurements and age determination was sufficiently accurate, but the magnitude of the SD of the HFA Z-scores suggests that the body stature measurements were less accurate.

Underweight (WFA<-2; 2.1%) and overweight (WFA>+2; 3.9%) were low among the children (Table 7), although overweight was above the expected prevalence of 2.3%. Only 8 children (0.9%) were severely underweight (WFA<-3) and 12 children (1.3%) were severely overweight, or obese (WFA>+3).

Stunting (HFA<-2) was identified in 15.5% of the children and severe stunting (HFA<-3) affected 42, or 4.7%, of the children in this survey. Tallness (HFA >2) was identified in 5.1% of the children and 18 children, or 2.0%, were extremely tall (HFA >3). Thus, smallness and tallness were found to affect a high proportion of children, although the stature measurements were likely less accurate than desired.

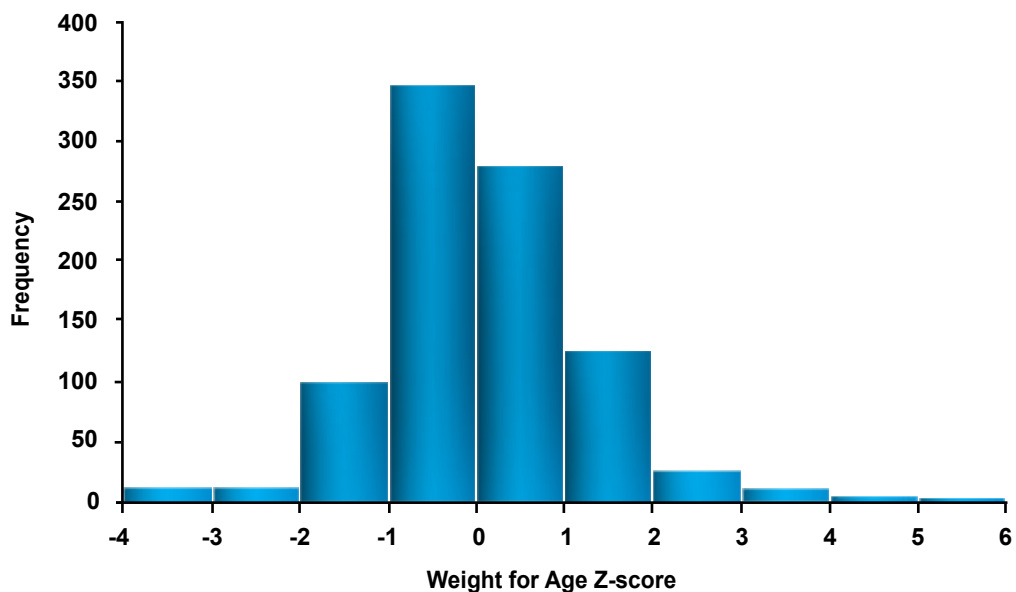


Figure 19 Weight-for-Age and Stature-for-Age distributions of school-age children, Kosovo 2009

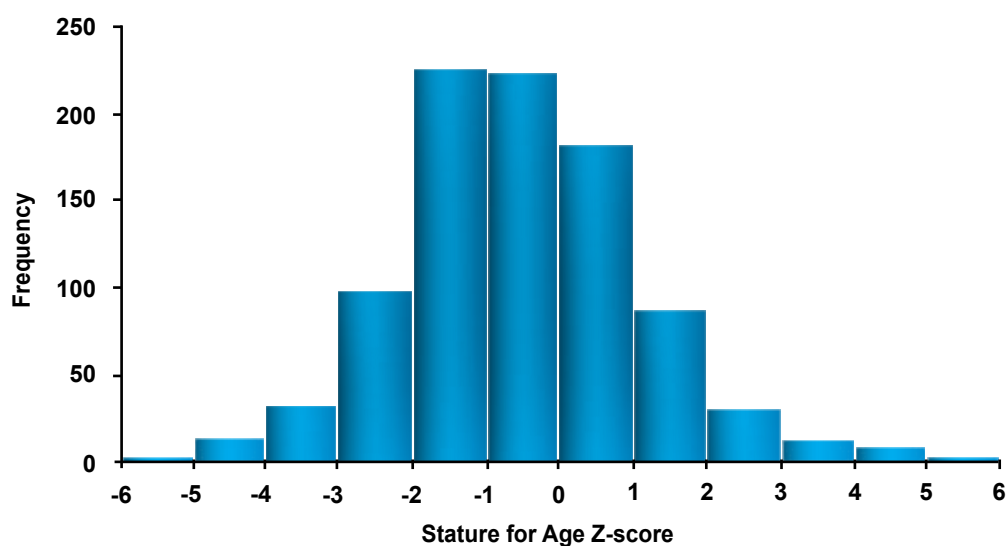


Figure 19 Weight-for-Age and Stature-for-Age distributions of school-age children, Kosovo 2009

Table 7 Prevalence of low and high anthropometry indices among children, Kosovo 2009

Anthropometry index	N	Prevalence (%)	95% CI	Status
Low WFA (underweight)	19	2.1	1.4 – 3.3	Acceptable
High WFA (overweight)	35	3.9	2.8 – 5.4	Elevated
Low HFA (stunting)	139	15.5	13.3 – 18.0	Elevated
High HFA (tallness)	46	5.1	3.9 – 6.8	Elevated

Analysis of Z-scores did not find a relationship in distributions or prevalence for the genders or the urban or rural location of the households with age or age groups.

The average WFA Z-scores in girls were lower ($p < 0.001$) by 0.17 SD units than in boys. The prevalence of underweight (WFA < -2), however, did not differ between the genders. Instead, the prevalence of overweight (WFA > +2) was higher among boys (5.6%) than girls (2.3%). The prevalence of underweight and of overweight did not differ between the children living in urban or rural households.

The Z-score distributions for HFA (smallness-tallness) did not differ between boys and girls, or between urban and rural residence. Also, no differences were found in prevalence of smallness and tallness between the genders or the location of the households.

5.5. FOOD CONSUMPTION PATTERN OF CHILDREN

An analysis of food consumption patterns was performed with a view to identify a group of children who reported to consume foods at the lower end of the frequency distribution. The analysis set out by assigning for each child a score of 1 to each food item that the child reported consuming less than the median frequency of all children. Food items with reported food consumption frequencies equal or higher than the median frequency for the respective food items were given a score of 0. The “food risk score” for each child was obtained as the sum of individual scores of the reported consumption frequencies of all the foods.

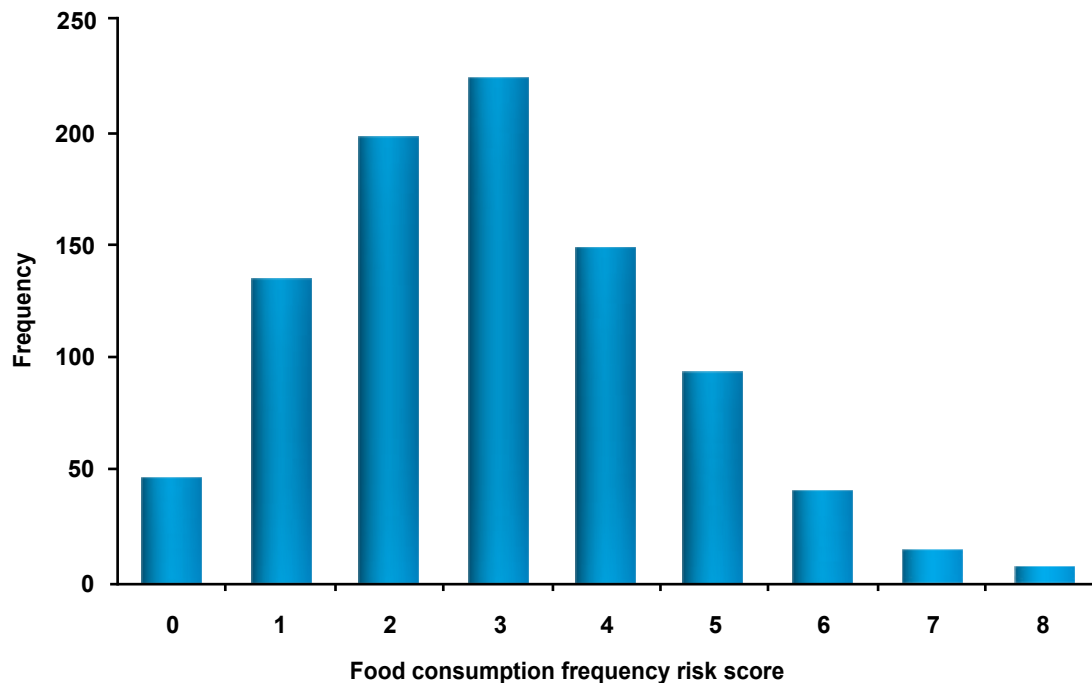


Figure 20 Food consumption frequency risk scores, School children Kosovo 2009

For the 9 food items in the food frequency questionnaire, the distribution of “consumption risk score” is shown in Figure 20. The average risk score was 2.9 (SD 1.6), with inter-quartile range 2-4. The risk scores varied from 0 (“lowest risk”; n=46; 5%) to 8 (“highest risk; n=5; 0.6%). 17% of the children (n=153) had a food frequency risk score of 5 and above, meaning that they reported relatively low frequencies of consumption across all the food items in the questionnaire. The risk score was not related to gender or age of the children.

Table 8 compares the risk scores between urban and rural residence of the children’s households. As compared to rural households, the children living in urban areas were found to have disproportionate higher risks ($p<0.001$) of low food consumption frequencies.

Table 8 Association of low food consumption frequency with household residence (Urban/rural), school-age children Kosovo, 2009

Household residence	Risk of infrequent food consumption,		N (%)
	Low risk (scores 0-4)	High risk (scores 5-8)	Total N
Urban	256 (78)	74 (22)	330
Rural	491 (86)	79 (14)	570

5.5.1 Nutritional status and food consumption

Children were interviewed on the frequency of their consumption of major food items. On basis of the reported weekly consumption frequencies, a risk score was devised that assumed children having risk of inadequate food consumption when the sum total of individual food consumption frequencies was below the median for the majority of foods. In this way, 153 children in this survey were identified with risk of (relatively) low food consumption. Figure 21 shows that the WFA Z-score distribution among children with high risk of low food consumption was significantly lower ($p=0.004$) than among the children with no risk of low food consumption. The statistical analysis is shown in Table 9. A similar analysis for the HFA Z-score distribution did not reveal a relationship.

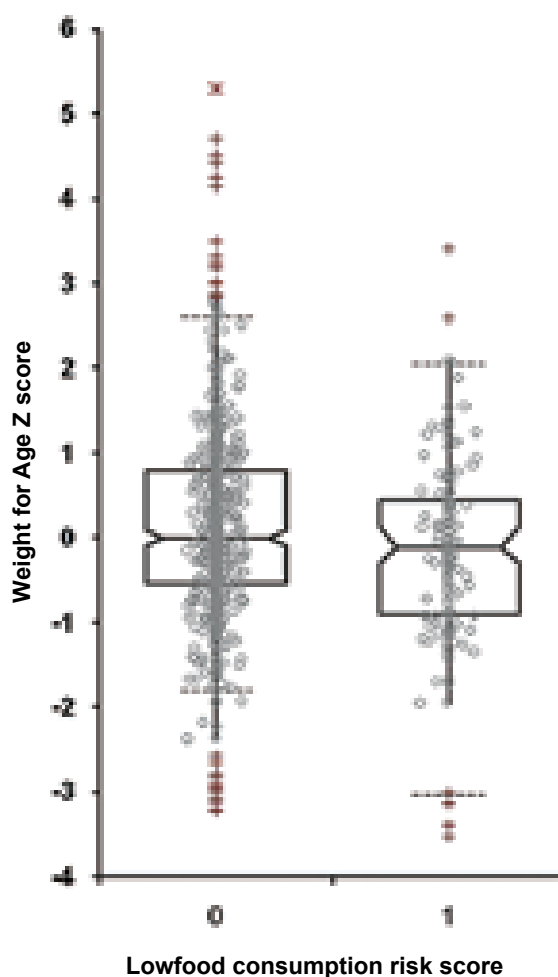


Figure 21 Relationship between WFA Z-score and risk of low food consumption in children, Kosovo 2009

Table 9 Analysis of WFA by risk of low food consumption in children, Kosovo 2009

Low food consumption	n	Mean WFA	SD		
No risk	747	0.12	1.09		
Elevated risk	153	-0.16	1.07		
ANOVA Source of variation	Sum of squares	DF	Mean square	F statistic	p
Food risk	9.80	1	9.799	8.33	0.0040
Residual	1,056	898	1.176		
Total	1,066	899			

5.5.2 Food consumption frequency among children

The children were interviewed to report on the number of times per week that they consumed major food items. The results of these interviews are summarized in Table 11. On average, the children in this survey reported (in descending order) weekly consumption frequencies for milk & milk products (5.2 times), eggs (4.7), fruit (4.3), vegetables (4.2) and starchy food (3.5) for at least half of the number of days. Meat & meat products (3.2 times on average) and sweet meat (2.7 times) were less frequent, and fish (0.5 times on average) and legumes (1.8 times) were minor items in the consumption frequency of the children in Kosovo.

Milk & milk products was the food item most frequently consumed (median on 6 days/week), followed by eggs (5), fruits and vegetables (4 each). The majority of children (63%) reported not eating any fish. Legumes (median 2 days/wk) and sweet meat (2) were infrequently eaten.

As shown in Table 10, more than half the children reported that they were consuming the following foods less than half of the weekdays: Fish (99% of children), Legumes/beans (98%), sweet meat (78%), Meat & meat products (65%) and starchy foods such as pasta, rice and pizza (61%). More than half of the children reported consuming Milk & milk products (66%) and Eggs (53%) for more than half of the days in a week.

Food items	Weekly frequency, N (%)	
	0-3 times	5 times or more
Meat & meat products	588 (65)	163 (18)
Fish	888 (99)	4 (0)
Eggs	268 (30)	476 (53)
Milk & milk products	203 (23)	591 (66)
Pasta, rice and pizza	551 (61)	237 (26)
Fruit	345 (38)	379 (42)
Vegetables	406 (45)	356 (40)
Sweet meat	700 (78)	100 (11)
Legumes, white beans	882 (98)	6 (1)

Food items	Number (%)										Mean (95% CI)	
	None	once	twice	3 times	4 times	5 times	6 times	7 times	more	Median		Mode
Meat & meat products	21 (3)	91 (10)	197 (22)	279 (31)	149 (17)	63 (7)	35 (4)	65 (7)	0 (0)	3	3	3.2 (3.1-3.3)
Fish	568 (63)	240 (27)	52 (6)	28 (3)	8 (1)	3 (0)	0 (0)	1 (0)	0 (0)	0	0	0.5 (0.5-0.6)
Eggs	15 (2)	27 (3)	55 (6)	171 (19)	156 (17)	105 (12)	140 (16)	227 (25)	4 (0)	5	7	4.7 (4.6-4.9)
Milk & milk products	9 (1)	26 (3)	45 (5)	123 (14)	106 (12)	129 (14)	119 (13)	343 (38)	0 (0)	6	7	5.2 (5.1-5.3)
Pasta, rice and pizza	7 (1)	116 (13)	201 (22)	227 (25)	112 (12)	73 (8)	35 (4)	129 (14)	0 (0)	3	3	3.5 (3.4-3.6)
Fruit	3 (0)	62 (7)	83 (9)	197 (22)	175 (19)	115 (13)	64 (7)	200 (22)	0 (0)	4	7	4.3 (4.2-4.4)
Vegetables	1 (0)	97 (11)	99 (11)	209 (23)	137 (15)	89 (10)	35 (4)	232 (26)	0 (0)	4	7	4.2 (4.0-4.3)
Sweet meat	7 (1)	242 (27)	210 (23)	241 (27)	100 (11)	32 (4)	13 (1)	55 (6)	0 (0)	2	1	2.7 (2.6-2.8)
Legumes, white beans	21 (2)	275 (31)	467 (52)	119 (13)	9 (1)	2 (0)	0 (0)	4 (0)	0 (0)	2	2	1.8 (1.8-1.9)

Table 11. Reported consumption frequencies (days/week) of major food items by school-age children, Kosovo 2009

6. Discussion and conclusions

6.1. IODINE DEFICIENCY IN KOSOVO

The report of this survey provides information related to iodine deficiencies and offers evidence that the current practice of iodized salt supply in Kosovo is ensuring adequate iodine nutrition status not only in school aged children but also among pregnant women who are the most vulnerable group in the population. The study complements previous survey data and an external assessment and can be used to support further application for international recognition towards elimination of iodine deficiency disorders in Kosovo based on WHO, UNICEF and ICC/IDD standards. The survey results speak in favor that Kosovo has attained safe iodine deficiencies elimination in the population.

Results obtained for the amount of iodine in salt found not a single sample of salt in the households that had not been iodized, confirming that the entire population is being supplied with additional iodine consumption due to ensured exclusive importation of only iodized salt. The average content of iodine in salt was 17.7mg/kg and median 16.5m/kg.

The median urinary iodine concentration in children was 176 μ g/l, and safely in the optimal range. Only 4.9% of children had values lower than 100 μ g/l. Also it is important to mentioning that none of the median values of urinary iodine in any clusters was below 100 μ g/l.

The median iodine intake estimate among the children was 137 μ g/d. The iodine consumption estimates in the children were significantly related ($p < 0.0001$) to their age, but in none of the age groups was the iodine intake estimate lower than the Recommended Dietary Allowance, again confirming that the population is consuming optimum dietary iodine. The estimated iodine intake increased from approx. 80 μ g/d at age 5-6y to 200 μ g/d at 13-14y of age.

The median UI in pregnant women was 183 μ g/l, which as in the children is safely in the optimum range of dietary iodine consumption. The UI concentrations of pregnant women and children living in the same households were strongly correlated ($r = 0.63$, $p < 0.0001$).

The results obtained gives solid grounds to suggest to MoH to apply for international recognition that Kosovo has reached optimum iodine nutrition through sustainable USI.

The present survey included for the first time also iodine status measurements of pregnant women. This was considered essential in view of the recognition that pregnant women are among the most vulnerable section of the population and are more meaningful for monitoring because the brain damage of iodine deficiency to the developing fetus occurs early in pregnancy.

The comparison of results of the school-age children and pregnant women living together in the same households illustrates that the urinary iodine concentrations did not differ between the two groups. For assessing the outcome(s) of the USI strategy, observations among pregnant women are therefore a reliable information source for future surveillance.

6.2. IRON DEFICIENCY AND ANEMIA IN KOSOVO

This survey yielded population-representative estimates of the anemia prevalence among school children and pregnant women in Kosovo. Although causes other than low dietary iron consumption cannot be ruled out, the major underlying cause for the observed anemia prevalence is iron deficiency.

The anemia prevalence in school-age children of Kosovo was 15.7%, indicating a mild public health problem. Among pregnant women, the survey results indicate a prevalence of 23%, indicating a moderate public health problem of anemia. The anemia prevalence among pregnant women increased with the duration of pregnancy. Because the proportion of women in their 3rd trimester was under-represented, it should be recognized that the estimate of 23% is likely an underestimate of the true anemia problem in this population group.

In comparison, the Kosovo Micronutrient Survey of 2001 found 14% anemia among women of reproductive age and 16% among children aged 6-59 months.

Given the higher requirements for dietary iron during pregnancy, the higher burden of anemia among pregnant women is not surprising. Pregnant women during the 1st semester had similar anemia prevalence as their school-age children, indicating that the pregnancy-related anemia becomes worse with the duration of pregnancy.

The prevalence of anemia among the women during the 1st semester (months 1-3) was 13.5%, whereas it was 27.8% ($p < 0.001$) among the women in the 2nd semester (months 4-6).

The analysis of Hb levels in pregnant women found evidence that Fe supplements were beneficial among women in the 2nd semester only when used for an extended duration. This confirms the assumption that the anemia observed in the present survey population is indeed attributable to low dietary iron consumption.

The Government of Kosovo is considering launching a program of mandatory flour fortification. The results of prevalence of anemia in pregnant women and school children obtained during this study may serve as rationale and baseline to introduce and implement flour fortification with iron and folic acid in Kosovo.

The results justify implementation of flour fortification with folic acid and iron (Fe) as soon as possible in Kosovo. It is worth mentioning that Ministry of Agriculture, Forestry and Rural Development has appointed group that developed the law on flour fortification. This law is expected to be passed in parliament in the first half of 2010.

6.3. NUTRITIONAL STATUS AND FOOD CONSUMPTION IN SCHOOL CHILDREN OF KOSOVO

The prevalence estimates of anthropometric nutrition indicators in school age children of this survey indicate that underweight (2.1%) and overweight (3.9%) were not problems of public health importance, although overweight was above the expected prevalence of 2.3%. Only 8 children (0.9%) were severely underweight and 12 children (1.3%) were severely overweight, or obese.

In contrast to body weight indicators, linear growth indicators of the school children in this survey were concerning. Stunting was identified in 15.5% of the children and severe stunting affected 42, or 4.7%, of the children. Although the stature measurements were likely less accurate than desired, the survey results offer evidence that the children of school age in Kosovo have suffered chronic undernutrition in the past. Any effort to counteract chronic undernutrition, however, needs to be directed to the younger age groups, because stunting at school age is irreversible.

Children were interviewed on the frequency of their consumption of major food items. On basis of the reported weekly consumption frequencies, a risk score was devised that assumed children having risk of inadequate food consumption when the sum total of individual food consumption frequencies was below the median for the majority of foods. In this way, 153 children in this survey (17%) showed risk of (relatively) low food consumption (that they reported relatively low frequencies of consumption across all the food items in the questionnaire).

A relationship analysis of underweight and risk scores for low food consumption showed that children who reported (relatively) lower food consumption frequencies had lower body weights. This affected particularly the school children in urban areas.

These results speak for only a mild problem of food intake related to nutritional status in the school children of Kosovo.

7. Recommendations

Based on this survey, the following recommendations are proposed:

1. Ministry of Health to progress toward an official application of international recognition that iodine deficiency has been overcome in Kosovo through USI
2. Iodine Deficiency Disorders (IDD) and other micronutrient deficiencies Working Group should continue its collaboration and oversight of the iodine nutrition situation to prevent recurrence of IDD
3. The Working Group should be supported to extend its work and include other relevant institutions to also combat other micronutrient deficiencies especially iron deficiency.
4. Follow international recommendations for use of flour fortification with iron and folic acid to prevent anemia and birth defects.
5. In collaboration with Ministry of Health and Ministry of Education, Science and Technology to develop action plan to implement interventions to address nutritional deficiencies and promote of healthy food targeting specifically mothers, infants and young children.
6. To organize social mobilization activities to increase knowledge and skills of population to combat micronutrient deficiencies.

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