GENDER COMPARATIVE ANALYSIS OF NUTRITION DIVERSIFICATION

IN THE SOUTH CAUCASUS

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This briefing paper relied on the data collected during the nutrition diversification research carried out in the three countries of the South Caucasus. Elkana coordinated the research for Georgia[1] and Azerbaijan, the field survey was carried out by ACT and the analysis was provided by the nutrition expert Ms Tamar Manjavidze. In Armenia, the research[2] was conducted by APR Group in cooperation with the Ministry of Health of Armenia. The research in all three countries as well as this briefing paper were made possible with the financial contribution of the European Union in the framework of the project "Improving Regional Food Security in South Caucasus through National Strategies and Smallholder Production"

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[1] http://foodsecuritysc.com/wp-content/uploads/2016/05/Oxfam_Nutrition_Research_en.pdf
[2] http://foodsecuritysc.com/wp-content/uploads/2016/07/nutrition-briefing-paper-final.-09.06.pdf

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List abbreviations and acronyms

ANOVA	Analysis of Variance
DDS	Dietary Diversity Score
DGLV	Dark Green Leafy Vegetables
HDDS	Household Dietary Diversity Score
IDDS	Individual Dietary Diversity Score
MDG	Millennium Development Goal
NCDs	Non-Communicable Diseases
WDDS	Women's Dietary Diversity Score
WFS	World Food Summit

1. Executive summary

Timely and accurate information on a population's access to food, dietary intake and the risk factors for nutrient and diet adequacies are very important. Such information forms the basis for the selection and design of effective nutrition strategies which may lead to improved population health. However, the collection of dietary information to monitor a nutrition situation and progress can be demanding and expensive for low-resource countries. As a feasible alternative, Oxfam team conducted research where dietary diversity data of households and individuals during July to October 2015 was collected using a simple, low-cost, proxy tools such as dietary diversity indicators. These indicators are qualitative measures of food consumption that reflect household food access through the Household Dietary Diversity Score (HDDS). In addition, dietary diversity is also a proxy indicator for the diversified diets, a key dimension of diet quality at individual level, evaluated by the Individual Dietary Diversity Score (IDDS). Moreover, dietary diversity has been associated with the micronutrient adequacy of women's diet evaluated by the Women's Dietary Diversity Score (WDDS). The collection and monitoring of WDDS is highly important due to the undeniable problem of maternal malnutrition, which contributes to fetal growth restriction, increasing the risks of neonatal death and stunting in children affected by malnutrition. Additionally, women of reproductive age (15-49 y) living in low resource settings, are also at a greater risk for multiple forms of malnutrition.

In order to collect information on food access, dietary diversity and factors affecting them, qualitative surveys were conducted in the South Caucasus region: Georgia, Armenia and Azerbaijan. In the survey carried out in the South Caucasus, 3600 respondents participated: 1000 respondents from Georgia, 1000 from Azerbaijan and 1600 from Armenia. Oxfam and ACT Research conducted the fieldwork, colleting the surveys with financial contribution from the European Union in the framework of the project "Improving Regional Food Security in South Caucasus through National Strategies and Smallholder Production" (http://foodsecuritysc.com/). The herein information provides a gender comparative perspective within the nutritional diversification topic in the South Caucasus. More specifically, this document evaluates and compares the dietary diversity of women and men in the South Caucasus region and across countries: Georgia, Azerbaijan and Armenia. As well as, it identifies the most likely socioeconomic and demographic characteristics that may affect dietary diversity and nutrition of women. Therefore, providing evidence-base findings and recommendations for:

- Oxfam Food Security project teams in the South Caucasus;
- Policy makers from respective government agencies of three countries, such as the Ministry of Health, the Ministry of Agriculture, the Ministry of Education, State Committee on standards, etc., and other related departments/agencies of state institutions for sharing the learning and best practices within the region;
- Researchers and other NGOs working in the field both within and beyond the South Caucasus region.

The above mentioned stakeholders might use the information for decision making, as a baseline for design and implementation of nutrition interventions and programmes, and for policy advocacy for the improvement of nutrition in Georgia, Azerbaijan and Armenia.

The main conclusions drawn are:

- The majority of the households, 44% of them had low food access (between 1 to 7 food groups in the HDDS), 22% of the households showed a medium food access (HDDS=8 food groups), finally 34% of the households had a high food access (HDDS ≥ 9). This indicates that 44% (n= 1588) of households may have limited food access, suffer from food insecurity and are likely to have nutrition problems such as micronutrient deficiencies.

- The median HDDS value in the South Caucasus region was seven out of twelve food groups for household of low and medium income and a median of nine out of twelve food groups for households of high income. Only households with high income could reach a high household food access.

- At household level, nutrient-rich food consumption such as legumes/nuts/seeds and fish/seafood were reported by less than 50% of the households, which indicates that there might be limited accessibility to these food items, due to prices being too high, or that they are not available in the market.

- The median dietary diversity of women in the South Caucasus was four, indicating that interviewed women consumed an average of four food groups out of nine. The majority of the women 52% (n=1422) had a low dietary diversity (WDDS≤ 4). The highest percentage of women with low dietary diversity were from Georgia 65% (n=484) and Azerbaijan 64% (n=406). While women in Armenia had higher dietary diversity scores, with only 35% of women in the lowest WDDS tertile (n=380).

- There was a significant difference between women's dietary diversity (WDDS=4) and men's dietary diversity (IDDS men=5). Men's dietary diversity was shown to be slightly but significantly higher than women's. The differences were found mainly in the consumption of meat products, fish and seafood, which was higher for men than for women. These differences could be associated to the cultural food habits e.g. women serving the first plate and best portion to men.

- The dietary patterns of the population in the South Caucasus was characterized by the consumption of starchy staples and vegetables, however the consumption of some nutrient-rich foods, such as meat, legumes, nuts and eggs, was lower in all the three countries and the lowest in Georgia.

- For both women and men, there was a low consumption of organ meat (max 6% of the individuals consumed this food) and legumes/nuts/seeds (max 32% of the individuals

consumed this food group), these are food groups that are high in nutrient content, however they were consumed by a very low percentage of the population.

- Low women's dietary diversity and low consumption of nutrient-rich food can have implication on low diet quality and probability of micronutrient deficiencies. In particular risk of iron and vitamin A deficiencies, due to the low consumption of meat products and vitamin A- rich fruits and vegetables.

- Promotion of diverse diets is one of several approaches to improving micronutrient adequacy and reducing deficiencies, and in particular for this population, the consumption of organ meat, nuts/legumes/seeds and eggs should be encouraged in particular for women.

- The respondents also reported that there were some months during the past year that they could not afford enough food to meet their families' needs, these months were winter months (December, January and February).

- Women of low household income, having problems to afford enough food during the whole year and living in the rural areas were shown to be more likely to have a low dietary diversity score than their peers in better conditions.

- Oxfam food security team, policy makers and other researchers in the field can use the evidence-based findings presented in this document for programmatic decision making and designing effective nutrition interventions and programmes.

Accordingly the main project recommendations are:

- ✓ In the present project, data was collected during July and August, it is recommended to collect dietary diversity data in different seasons throughout the year in order to evaluate the seasonality effects on the dietary diversity and food access. The survey should take into consideration seasonality, geographic distribution and socio-economic groups equally distributed.

- ✓ Great attention and action should be devoted to improve individual dietary diversity and in particular women's dietary diversity, it is known that insufficient nutrient intakes before and during pregnancy and lactation can impact the nutrition and health of both women and their infants.

- ✓ Engagement of the governments of Georgia, Azerbaijan and Armenia in integrating dietary diversity into the country's food security and nutrition information system could make it possible to implement a sustainable system for the monitoring and evaluation of food access (HDDS) and women's dietary diversity (WDDS) at national and regional level. These steps are highly relevant to track progress of nutrition and agriculture programmes and interventions in the countries and in the region.

2. Introduction

The South Caucasus countries are different in a range of important ways; the main characteristic of Azerbaijan's economic context is its oil and gas resources. This provides massive resources to support economic development and public services. The biggest food security risk for Azerbaijan, in the long term, is if the instability of hydrocarbon, the country's main resource, causes the country to become food-import dependent without creating growth in the non-oil sector. As for the economic context in Armenia and Georgia, the two countries have greatly been affected by the dissolution of the Soviet Union, in all aspects including the agricultural sector. Another major contextual issue is the geopolitical orientation of the country. Armenia is choosing the Eurasia Customs Union, Azerbaijan remains uninterested and Georgia has just signed the EU Association agreement (Oxfam, 2015).

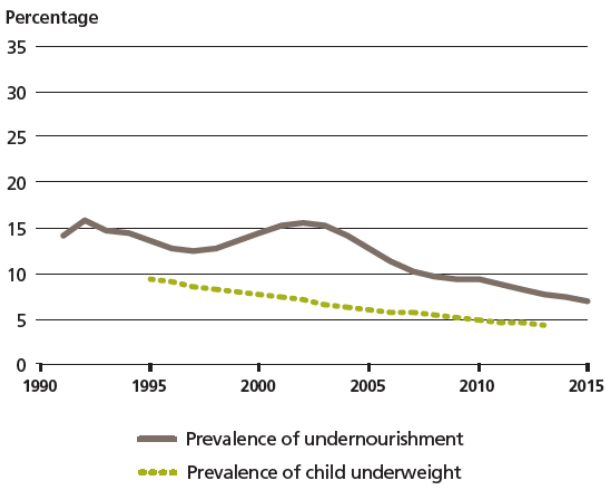


Figure 1. Trends in the prevalence of undernourishment and child underweight in Caucasus and Central Asia
Source: FAO and UNICEF/WHO/World Bank

The state of food insecurity in the world (SOFI) published in 2015 (FAO/IFAD/WFP, 2015) indicated that the countries in the South Caucasus and Central Asia are rapidly progressing in terms of food security and in 2015 have met the WFS (World Food Summit) goal of halving the number of chronically underfed people and MDG 1c (Millennium Development Goal 1c). These achievements are attributed mainly to the rapid economic growth, a resource-rich environment and remittances. The conditions were optimal to reduce undernourishment and child underweight, as it is shown in figure 1.

However, the improvement is slow and the prevalence of undernourishment in children under five years of age is still about 5% (FAO/IFAD/WFP, 2015). In addition a recent report on the baseline research on food security in the South Caucasus area (Oxfam, 2015) has shown that the health impact of high food prices and the over-dependence on starchy foods can be seen in high levels of stunted children in the region: with 27% in Azerbaijan, 21% in Armenia and 11% in Georgia. This illustrates that the major issues in Armenia, Azerbaijan and Georgia are no longer undernourishment, but rather malnourishment. In addition, the poorest quintile of the population still struggles for adequate food access, but the population as a whole tends to lack the right food, leading to a diet with low nutritional diversity.

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life (FAO, 1996). Historically, food security in the countries in the South Caucasus has often been equated with achieving self-sufficiency in agriculture, stability in rice prices, and energy availability (Oxfam, 2015). Currently, efforts are being taken to incorporate all four food security dimensions: availability, access, stability and utilization in development projects. The current research focuses on two of the four key elements of food security: food access and food utilization evaluated through dietary diversity indicators. Indicators of dietary diversity – derived from the recall of the number of foods or food groups consumed over a given time period (usually 24 hours) – have gained increased attention in both the nutrition and food security communities in recent years (Hoddinott *et al.*, 2002; Kennedy G *et al.*, 2010). Dietary diversity indicators prove popular in part because the data are fairly easy to collect and are associated with dietary quality, energy intake, and food security (Arimond *et al.*, 2004; Ruel, 2003). The use of dietary diversity indicators holds promise as a powerful tool for conducting effective needs assessments and target setting, as well as monitoring and evaluation.

The household dietary diversity score (HDDS) is meant to reflect, in a snapshot, the economic ability of a household to ***access a variety of foods*** (FAO, 2010). In regards to the individual dietary diversity score (IDDS), it aims to reflect ***nutrient adequacy***. Dietary diversity scores have been validated for several age/sex groups as proxy measures for macro and/ or micronutrient adequacy of the diet. Several studies have shown that DDS is positively associated with food security (Belachew *et al.*, 2013; Hoddinott *et al.*, 2002; Swindale *et al.*, 2006b), with the probability of dietary diversity adequacy (Arimond *et al.*, 2010; Savy *et al.*, 2005; Steyn *et al.*, 2006), and with the probability of micronutrient adequacy (Arimond *et al.*, 2010; Fujita *et al.*, 2012; Kennedy *et al.*, 2007). A low probability of micronutrient adequacy (low individual dietary diversity) can lead to micronutrient deficiency, which is defined as the lack or shortage of micronutrients (vitamins or minerals) that are essential in small amounts for proper growth and metabolism. People are often said to suffer from “hidden hunger” when they consume enough calories, but suffer from micronutrient deficiencies. This form of hunger may not be visibly apparent in an individual, but it increases morbidity and mortality and also has negative impacts on other aspects of health, cognitive development and economic development. Hidden hunger affects over 2 billion people worldwide (WHO, 1996).

The following food groups are taken into account in the HDDS and WDDS (FAO, 2010):

Table 1. Food groups in the HDDS and IDDS

HDDS (household food access) 12- food groups indicator	IDDS (individual dietary diversity) 9- food groups indicator
Cereals	Starchy staples
White tubers and roots	Dark green leafy vegetables
Vegetables	Other vitamin A rich fruits and vegetables
Fruits	Other fruits and vegetables
Meat	Organ meat
Eggs	Meat and fish
Fish and other seafood	Eggs
Legumes, nuts and seeds	Legumes, nuts and seeds
Milk and milk products	Milk and milk products
Oils and fats	
Sweets	
Spices, condiments and beverages	

Source: FAO, 2010

Description of nutrient rich food groups, which are taken into account to construct the IDDS indicator (FAO *et al.*, 2016):

Food Group 1. Starchy staples, these foods provide energy, and varying amounts of micronutrients (e.g. certain B vitamins provided by grains). Common examples from this group include all types of breads and flatbreads, stiff porridges of maize, sorghum, millet or cassava (manioc), pasta, potatoes, white-fleshed sweet potatoes, white yams, yucca and plantains

Food Group 2. Vitamin A-rich DGLV (Dark green leafy vegetables), are all medium-to-dark green leafy vegetables are vitamin A-rich. Only very light leaves, such as iceberg lettuce, are not. Medium green leaves are included in the group, such as Chinese cabbage, romaine. In addition to being rich in vitamin A, many green leafy vegetables are rich in folate and several other micronutrients. Commonly consumed leaves vary widely by country and region, (e.g. cassava leaves, bean leaves, pumpkin leaves, amaranth leaves and others).

Food Group 3. Other vitamin A-rich fruits and vegetables, these foods may also be good sources of vitamin C and/or folate and/or other micronutrients. The most common vitamin A-rich fruits are ripe mango and ripe papaya; others include red palm fruit/pulp, passion fruit, apricot and several types of melon. When eaten "green" (unripe), mango and papaya are not rich in vitamin A and if consumed "green" should be classified with "Other fruits and vegetables". Other vitamin A-rich vegetables include orange-fleshed sweet potato, carrot, pumpkin and deep yellow- or orange-fleshed squash.

Food Group 4. Other fruits and vegetables, this group includes vegetables and fruits not counted above as dark green leafy vegetables or as other vitamin A-rich vegetables. Diets rich in fruits and vegetables are associated with positive health outcomes. This may be due to their content of micronutrients and bioactive compounds found in fruits and vegetables, including phenolics, flavonoids and fibre.

Food Group 5. Organ meat they are less consumed nowadays, however they were a staple part of our ancestors diets and provide a tremendous nutritional benefit to groups of people who had limited access to other nutrient rich foods. Organ meats content high levels of vitamin A and

other essential micronutrients such as iron, zinc, etc. Within these groups are liver, kidneys, spleen, brain, heart.

Food Group 6. Meat and fish, also referred to as "flesh foods", consist of all kind of meats, poultry and other birds and fresh and dried fish and seafood/shellfish are included. They are important sources of high-quality protein and bioavailable micronutrients, notably iron, zinc and vitamin B12 (the last is available only from animal-source foods).

Food Group 7. Eggs, includes eggs from any type of bird (domesticated poultry and wild birds) but not fish roe, which are classified with small protein foods. Eggs are a good source of protein, vitamin B12 and a range of bioavailable micronutrients.

Food Group 8. Legumes/nuts and seeds, this nutrient-rich group, mainly due to nuts and certain seeds are rich in unsaturated fatty acids, vegetable protein, fibre, minerals, tocopherols, phytosterols and phenolic compounds. This group includes beans, peas and lentils, tree nuts but also includes groundnut (peanut). The group also include mature seeds (beans) and processed products, such as tofu, tempeh and other soy products. Common examples from this group include common bean (black, kidney, pinto), broad bean (fava, field bean), chickpea (garbanzo), pigeon pea, cowpea, lentil and soybean/soybean products or other legume products. They may have unique health benefits related to reducing cholesterol and NCDs (non-communicable diseases).

Food Group 9. Milk and milk products are important sources of high-quality protein, potassium and calcium, as well as vitamin B12 (available only from animal-source foods) and other micronutrients. This group includes almost all liquid and solid dairy products from cows, goats, buffalo, sheep or camels.

Table 2. Micronutrients of interest and corresponding food groups in the dietary diversity questionnaire

Micronutrient	Question number & food group
Vitamin A	**Plant-based food groups:** *question number 3:* vitamin A rich vegetables or tubers *question number 4:* dark green leafy vegetables *question number 6:* vitamin A rich fruits (e.g. mangos, apricots) *food group* with red palm oil or products made from red palm oil if appropriate
	Animal-based food groups: *question number 8:* Organ meat *question number 10:* Eggs *question number 13:* Milk and milk products
Iron	*questions number 8:* Organ meat *question number 9:* Flesh meat *question number 11:* Fish and seafood

Source, FAO, 2010

Gender sensitive indicators are crucial to food security and nutrition policies. It has been shown that women from the South Caucasus are the principal producers and processors of food in the region. Therefore, women are key actors in ensuring there is food access and stability in the household (Oxfam, 2015). Moreover, women's nutrition is of particular importance, in light of

the critical 1000 days – from conception, to pregnancy until a child's second birthday – there have been urgent calls to pay attention to women's diet quality and nutrition. In addition, women's nutrition and diet quality can have a strong impact on maternal health, fetal growth, early child survival and subsequent growth and development and the prevention of obesity and non-communicable diseases. However, despite decades of appeals to improve women's diet quality and nutrition, there has been limited programmatic action. Historically, major impediments have been a lack of suitable indicators to allow for diet assessment, monitoring, advocacy, and accountability together with a lack of effective platforms and programs reaching out to adolescent girls and women of reproductive age outside of prenatal care.

The present briefing document evaluates and compares the household food access and dietary diversity of women and men in the South Caucasus region and across countries: Georgia, Azerbaijan and Armenia. Based on the results, conclusions and recommendations for improving nutrition were drawn. The main project objectives were:

1. To evaluate the dietary diversity and dietary patterns at household and individual level in the South Caucasus and by country
2. Comparative study of the dietary diversity and dietary pattern of women and men in the South Caucasus and in each country
3. To identify the socio-demographic and economic characteristics that may affect dietary diversity and dietary patterns in the South Caucasus.

Finally, this document will provide key messages and recommendations for decision-makers in agriculture and nutrition.

3. Household Food Access in the South Caucasus

- ✓ The majority of the households (44%) had low food access (between 1 to 7 food groups in the HDDS), 22% of the households showed a medium food access with a median of 8 food groups, finally 34 % of the households had high food access with a median score of 9;
- ✓ The reason for low food access in 44% of households (n= 1588) may be mainly due to their low household income. Within other potential reasons are instability of prices and slow agriculture development, limited access to markets.
- ✓ Low household food access is a key element of food security, the results of the project, imply that there are households in the south Caucasus region that experience household food insecurity, which can lead to a various nutritional and health consequences (e.g., undernourishment, micronutrient deficiencies, obesity).

Food access is defined as both physical and resource access. Physical access relates to the connection of individuals to markets and access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods (FAO, 1996).

In the present project, food access at household level was evaluated by the household dietary diversity score (HDDS). Overall, 3600 respondents participated in the South Caucasus region: 1000 respondents from Georgia (27.8 % of the total sample), 1000 from Azerbaijan (27.8 % of the total sample) and 1600 from Armenia (44.4 % of the total sample).

The median household dietary diversity in the South Caucasus was 8 ± 1.6 with a minimum score of 1 and a maximum score of 12 (Table 3). The HDDS is based on the consumption of 12-food group proposed by FANTA (Swindale *et al.*, 2006a). An increase in the average number of different food groups consumed provides a quantifiable measure of improved household food access. The underlying principle of the HDDS as food security indicators is simple; as poor households gain additional income they are better able to regularly access foods needed for a healthy life, thus increasing food security. Poor households often use additional income to purchase additional non-staple foods, thus increasing household dietary diversity. Table 3 shows the different levels of food access (low, medium and high) reported by respondents of low, medium and high household income.

In addition, the dietary diversity scores were divided into tertiles in order to distinguish 'high', 'medium' and 'low' household food access, the tertiles groups are shown in Table 3, and their distribution is depicted in Figure 2 (groupings that have many tied values can result in unbalanced groups because the SPSS procedure used always assigns observations with the same value to the same group, which may explain the different percentages under each group). The majority of the households (44%) had low food access (between 1 to 7 food groups), 22% of the households showed a medium food access with a median of 8 food groups, finally 34 % of the households had a high food access with a median score of 9 (9 to 12 food groups).

Table 3. Food access evaluated -Household Dietary Diversity in the South Caucasus

Household Dietary Diversity Score in the South Caucasus								
	n	**Median**	**Std. Deviation**	**Min**	**Max**	**Low HDDS (min-max)**	**Medium HDDS (min-max)**	**High HDDS (min-max)**
South Caucasus	3600	8	1.6	1	12	7 (1-7) n= 1588 44%	8 (8-8) n=791 22%	9 (9-12) n=1221 34%
HDDS according to the household income								
Low HH Income	1263	7	1.6	2	12			
Medium HH Income	791	7	1.2	2	10			
High HH income	1283	9	1.5	3	12			

The distribution of dietary diversity score at household level is shown in Figure 2.

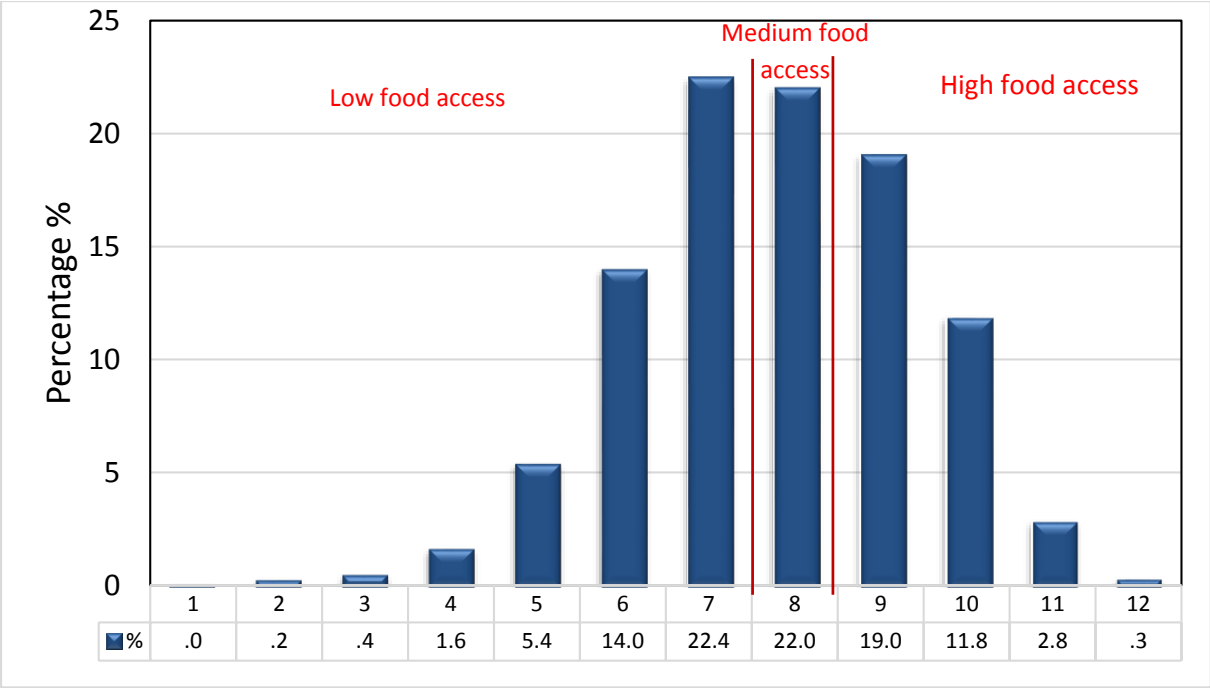


Figure 2. Household Dietary Diversity in the South Caucasus

Adequate food access, according to the highest tertile of household income, is at a score of 9 (Table 3). The results indicated that 34 % of the total surveyed households had adequate food access with a HDDS of 9 or above. However, 44 % (n=1588) of the interviewed households did not meet a medium HDDS above 7, which may indicate that these households have limited food access mainly due to their low household income. Research in other countries have also shown that an increase in dietary diversity is associated with socio-economic status and household food security (household energy availability) (Hatløy *et al.*, 2000; Hoddinott *et al.*, 2002). In previous studies (Belachew *et al.*, 2013; Kirkpatrick *et al.*, 2011) it was shown that low-income households shop in places where food prices are lower, when possible. They also show that food purchases at convenience stores make up a small portion of total food expenditures (2 to 3 percent) for low-income consumers. Moreover, it has been documented that limited food access had a detrimental effect on diet quality and nutrition, which have long been known to influence health outcomes (Larson *et al.*, 2011; White, 2007). One of the key concerns in the food access and nutrition debates has been the question of whether a 'healthy' diet costs more than an 'unhealthy' diet. It seems that nutritious food groups (i.e. fish, meat, eggs, milk products, nuts) that are included in a healthy diet are more expensive than staple foods (i.e. cereals, tubers, fat, sugar). Thus, low income households will be able to afford staple foods but not nutritious foods. Increasing cost constraints decreased the proportion of energy contributed to diet by fruits, vegetables, meats and dairy products and replaced them with cereals, sweets and added fats, thus reducing overall nutrient density. This patterns may lead to nutrition and health consequences, such as micronutrient deficiencies, obesity, non-communicable diseases, etc. (White, 2007).

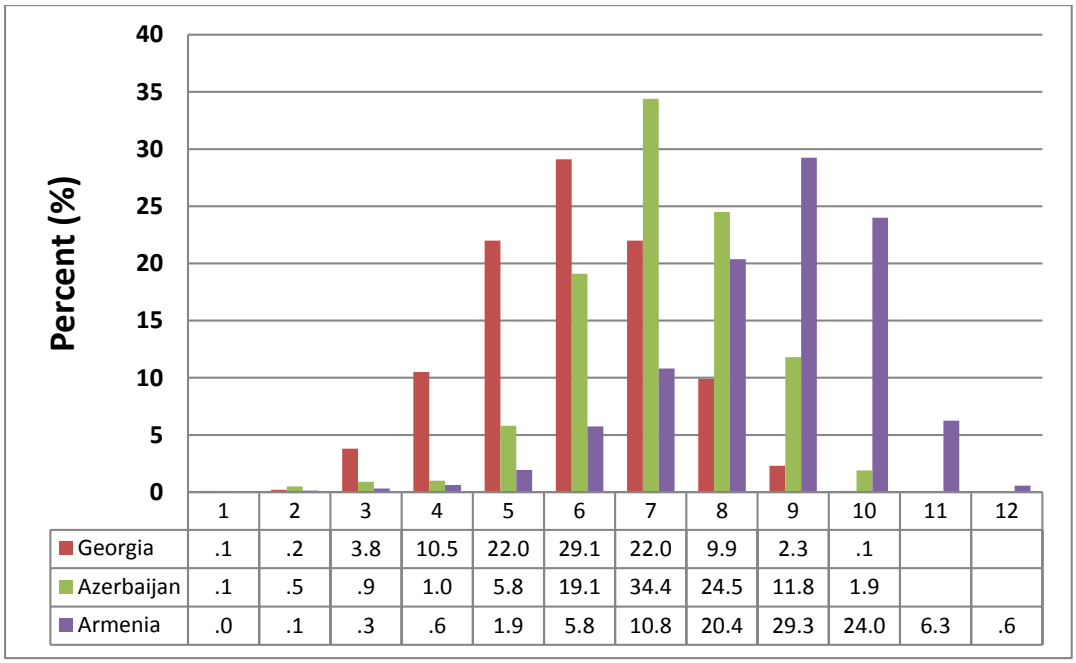
3.1. Comparative analysis of the Household and individual Dietary diversity in Georgia, Azerbaijan and Armenia

- ✓ The comparative analysis between the food access measured by HDDS in Georgia, Azerbaijan and Armenia shows that the highest food access was reported in Armenia with a HDDS of 9 ± 1.5 compared with Azerbaijan (7 ± 1.3) and Georgia (7 ± 1.4).
- ✓ Two relevant factors that may affect the food access are household income and residence area rural/urban. The survey in Armenia had the higher percentage of households located in urban areas (64%), compared to Georgia (44%) and Azerbaijan (43%). In addition, it needs to be addressed that the household income in urban areas in Armenia was almost 100 USD (77%) more than in rural areas in Georgia or Azerbaijan.
- ✓ For a more accurate analysis, t is highly recommended that for future surveys, to take equal distributiqn of households from both rural and urban areas.
- ✓ Other factors that can affect food access in each country, according to the report Baseline Research in the South Caucasus (Oxfam, 2015) are: agriculture development and stability of food prices.

Table 4 shows the HDDS in each country, indicating the percentages of women achieving a low, medium or high food access level. Armenia had the highest food access (median HDDS= 9 ± 1.5) compared with Azerbaijan (HDDS=7 ± 1.3) and Georgia (HDDS=6 ± 1.4). Armenia was the only country which reached the highest HDDS of 12; 6.3 % of the Armenian population had a score of 11 and 12. Figure 3 shows the HDDS distribution in each country in the South Caucasus.

Table 4. Household Dietary Diversity classified by country

Household Dietary Diversity Score (HDDS)								
	n	Median	Std. Deviation	Minimum	Maximum	Low HDDS (min-max)	Medium HDDS (min-max)	High HDDS (min-max)
Georgia	1000	7	1.4	2	11	6 (2-7) n= 657 66%	8 (8-8) n=220 22%	9 (9-11) n=123 12%
Azerbaijan	1000	7	1.3	1	10	7 (1-7) n= 618 62%	8 (8-8) n=245 24%	9 (9-10) n=137 14%
Armenia	1600	9	1.5	2	12	7 (2-7) n= 313 20%	8 (8-8) n=326 20%	10 (9-12) n=961 60%



	1	2	3	4	5	6	7	8	9	10	11	12
Georgia	.1	.2	3.8	10.5	22.0	29.1	22.0	9.9	2.3	.1		
Azerbaijan	.1	.5	.9	1.0	5.8	19.1	34.4	24.5	11.8	1.9		
Armenia	.0	.1	.3	.6	1.9	5.8	10.8	20.4	29.3	24.0	6.3	.6

Figure 3. Comparative analysis of HDDS in Georgia, Azerbaijan and Armenia

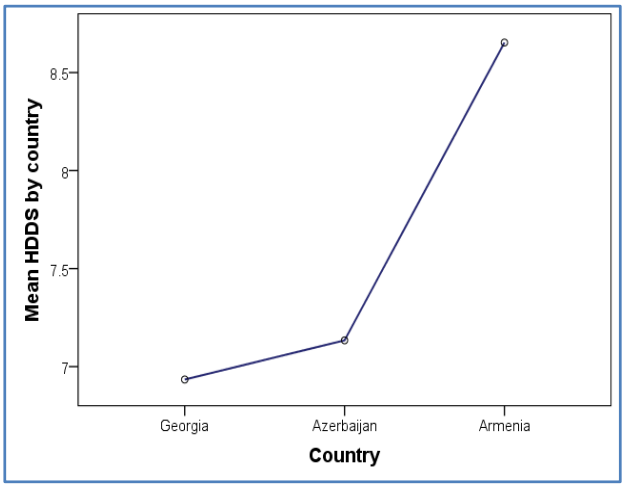


Figure 4. Mean Household Dietary Diversity across Georgia, Azerbaijan and Armenia

The analysis of variance one-way ANOVA has shown that there was a significant difference in the HDDS reported in Georgia, Azerbaijan and Armenia. Difference between the groups showed a constant F (2, 3597)=595, $p<0.001$ (F (degrees of freedom between groups, degrees of freedom within groups)). Tukey analysis showed that the differences between and within each country were significant.

The results in Figure 4, clearly show that Armenia reported the highest HDDS followed by Azerbaijan and Georgia. In section 4 the socio-economic and –demographic characteristics that may affect dietary diversity and food access are presented and described, where it was found that the household income in Armenia was higher compared with the household income in Georgia and Azerbaijan, this would certainly affect the ability of households to purchase diverse food groups. However, it is important to take into consideration that the distribution of the sample between rural areas was not equal. As it is shown in Table 10, the survey in Armenia had the higher percentage of households located in urban areas (64%), compared to Georgia (44%) and Azerbaijan (43%). In addition, it needs to be addressed that the household income in urban areas in Armenia was almost 100 USD (77%) more than in rural areas. These two facts

were relevant for the results. It is highly recommended that for future surveys, to take equal distribution of households in rural and urban areas.

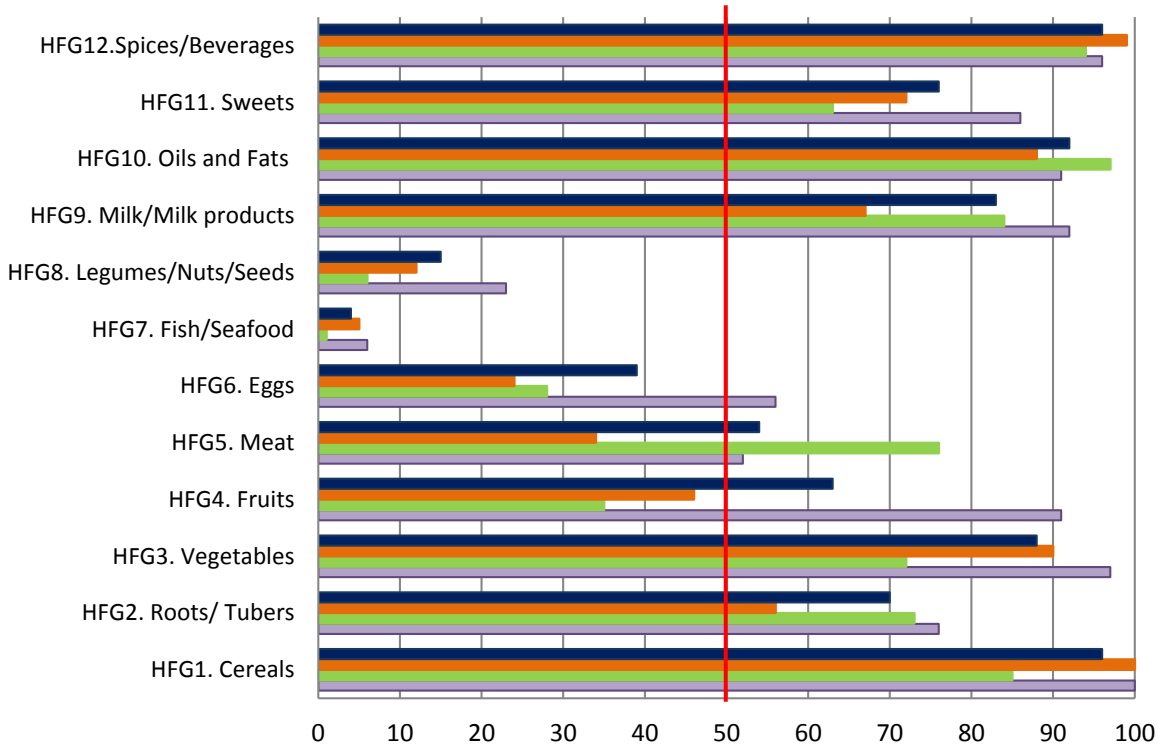
Other factors, mentioned in the report *Baseline Research: Food security in the Caucasus* (Oxfam, 2015), that may contribute to the difference on food access in Armenia, Georgia and Azerbaijan are mention below:

- Agriculture: *Azerbaijan* saw its agriculture production drop by around 50% from 1990-1997. However, following oil and gas deals in the mid-1990s the economy started to grow very quickly, allowing Azerbaijan to increase investment in agricultural development. The *Armenian* economy, under the Soviet system, had been heavily dependent on livestock, and this had, in turn, been reliant on imported fodder. Nonetheless, from 1995-2010 there was a fairly good aggregate increase in grain (28%), potatoes (13%), vegetables (57%) and grapes (44%), with declines only in berries (12%) and forage crops (40%). However, in the broadest possible terms, it seems clear that *Georgia* was hit hardest by the Soviet collapse and agriculture in particular has taken a long time to start to recover. Agriculture in Georgia did not become a public policy focus until 2012, and while there had been several projects to work on the problem, they have achieved little improvement.
- On economic accessibility, the key indicator is 'food price level'. This is calculated to show how expensive food is relative to other purchases, so that a higher number suggests that food is relatively expensive. As the food price index is so important, it is worth noting the dynamic of this number. In Armenia it has gone up by about 4% over the last decade. In Azerbaijan it went up 6% between 2004 and 2010 and in Georgia, it went up by 10% between 2004 and 2008. Of course, this is only a relative measure and to gain a true measure of food price changes one would have to add information on inflation for the general economy.

3.2. Dietary patterns at household level

- ✓ Households with low food access (low HDDS) reported equal or less than 7 food groups (i.e. cereals, tubers, vegetables, milk products, oils and fats, sweets and spices/beverages).
- ✓ Households with medium food access, reported access to the basic 7 food groups plus two nutrient rich groups such as fruits and meats.
- ✓ Households of high dietary diversity, reported access to 9 or more food groups including eggs (a nutrient rich food).
- ✓ Azerbaijan showed the higher access to meat products in about 75% of the households, as compared with the other two countries where the reported access was between 35 50 %.
- ✓ However, other nutrient rich foods such as legumes/nuts/seeds and fish/seafood were not reported by more than 50% of the households, which indicates that there might be limited accessibility to these food items, due to prices being too high.
- ✓ Activities to improve the accessibility to these food products and to encourage their consumption should be promoted in the South Caucasus.

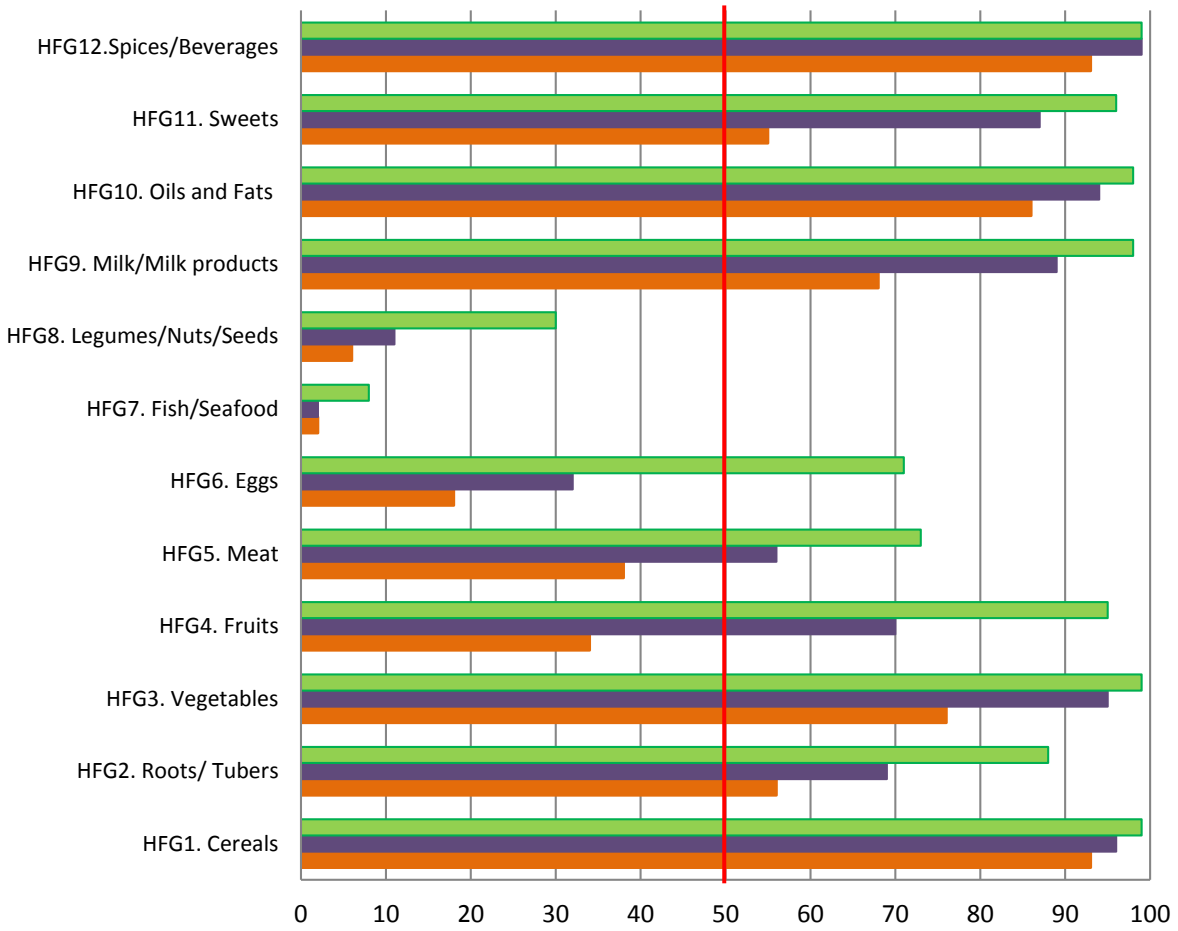
Figure 5 shows the dietary patterns of households in the South Caucasus and by country. The households reported to have access mainly to cereals, vegetables, spices, beverages, sweets and fats. However, food groups such as legumes, seeds and fish were consumed by less than 20 % of the interviewed households. Azerbaijan showed the higher access to meat products in about 75% of the households, as compared with the other two countries where the reported access was between 35-50 %.



	HFG1. Cereals	HFG2. Roots/ Tubers	HFG3. Vegetables	HFG4. Fruits	HFG5. Meat	HFG6. Eggs	HFG7. Fish/Seafood	HFG8. Legumes/Nuts/Seeds	HFG9. Milk/Milk products	HFG10. Oils and Fats	HFG11. Sweets	HFG12. Spices/ Beverages
South Caucasus	96	70	88	63	54	39	4	15	83	92	76	96
Georgia	100	56	90	46	34	24	5	12	67	88	72	99
Azerbaijan	85	73	72	35	76	28	1	6	84	97	63	94
Armenia	100	76	97	91	52	56	6	23	92	91	86	96

Figure 5. Food groups consumed at household level in the South Caucasus

In general, the respondents that reported low household income and HDDS in the lower tertile (≤7) also reported less consumption of meat products and eggs. These findings are consistent with another food security study, in which households classified by the indicator as moderately and severely food insecure consumed significantly less meat, eggs, and fruit than households classified as food secure (Melgar-Quinonez *et al.*, 2006). Similar results were also found in Bangladesh (Thorne-Lyman *et al.*, 2010). The results also corroborate findings from a multi-country study that showed a significant positive associations between dietary diversity and per capita purchases of both foods and non-foods (Hoddinott *et al.*, 2002).



	HFG1. Cereals	HFG2. Roots/ Tubers	HFG3. Vegetables	HFG4. Fruits	HFG5. Meat	HFG6. Eggs	HFG7. Fish/Seafood	HFG8. Legumes/Nuts/Seeds	HFG9. Milk/Milk products	HFG10. Oils and Fats	HFG11. Sweets	HFG12.Spices/Beverages
High HDDS	99	88	99	95	73	71	8	30	98	98	96	99
Medium HDDS	96	69	95	70	56	32	2	11	89	94	87	99
Low HDDS	93	56	76	34	38	18	2	6	68	86	55	93

Figure 6. Food groups consumed at household level and according to the household food access in the South Caucasus

Dietary patterns at household level were also investigated according to the level of household food access (low, medium, high). Figure 6 shows the dietary patterns for households with low, medium and high food access, the findings were summarized in Table 5. Households with low food access (low HDDS) reported equal or less than 7 food groups (i.e. cereals, tubers, vegetables, milk products, oils and fats, sweets and spices/beverages). Households with medium food access, reported access to the basic 7 food groups plus two nutrient-rich groups such as fruits and meats. As for the households of high dietary diversity (equal or more than 9 food groups), eggs that are nutrient-rich were also reported. However, it should be mentioned that other nutrient-rich food consumption such as legumes/nuts/seeds and fish/seafood was reported by less than 50% of the households, which indicates that there might be limited accessibility to these food items, due to high prices.

Table 5. Food groups consumed by ≥ 50% of households by dietary diversity tertile in the South Caucasus

Low HH dietary diversity/food access (≤7 food groups)	Medium HH dietary diversity/food access (=8 food groups)	High HH dietary diversity/food access (≥9 food groups)
Cereals	Cereals	Cereals
Tubers	Tubers	Tubers
Vegetables	Vegetables	Vegetables
Milk products	**Fruits**	**Fruits**
Oils and Fats	**Meat**	**Meat**
Sweets	Milk products	**Eggs**
Spices/beverages	Oils and Fats	Milk products
	Sweets	Oils and Fats
	Spices/beverages	Sweets
		Spices/beverages

4. Comparative analysis of women's and men's Dietary Diversity in the South Caucasus

- ✓ Women of low dietary diversity (WDDS ≤3 food groups) accounts for the 23% (n=572) of women in the South Caucasus area: With the higher percentage in Georgia 32% (n=237), followed by Azerbaijan 30% (n=189) and Armenia 13% (n=146). Women with low dietary diversity are at risk of micronutrient deficiencies (i.e. iron and vitamin A) and they are at risk of diet related diseases and higher mortality than women of high dietary diversity.
- ✓ A significant difference was found between women's dietary diversity (WDDS=4) and men's dietary diversity (IDDS men=5).
- ✓ Men's dietary diversity was shown to be slightly but significantly higher than women's.
- ✓ Regarding the dietary patterns of women and men, the differences were found mainly in the consumption of meat products and fish and seafood, which was higher for men than for women.

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- ✓ The reasons behind the differences between dietary diversity and meat consumption of women and men could be due to food habits. Women tend to serve the meals first to other family members in the household, trying to provide the best food items to them. Women often forget the importance of eating well in order to keep a healthy life.
- ✓ Low dietary diversity can result in low diet quality and the probability of micronutrient deficiencies. In particular, increasing the risk of iron and vitamin A deficiencies due to the low consumption of meat products and vitamin A rich fruits and vegetables.
- ✓ Attention and action should be devoted to improving women's dietary diversity, it is known that insufficient nutrient intakes before and during pregnancy and lactation can impact the nutrition and health of both women and their infants.
- ✓ Dietary strategies to increase diet diversity of women with low and medium dietary diversity (low and medium WDDS) are needed in this population. In particular, it is desirable to develop strategies to increase the intake of meat products meat/fish, eggs and legumes and seeds.

Efforts to improve maternal and child nutrition, as well as childhood growth during the first 1000 days can sustain health benefits throughout the children's life and increase adult's productivity. Maternal under-nutrition contributes to fetal growth restriction, increasing the risks of neonatal death and stunting for the survivors (Black *et al.*, 2013) Insufficient nutrient intakes before and during pregnancy and lactation can impact the nutrition and health of both women and their infants. Yet, in many resource poor environments, the diet quality of women during their reproductive age is very low, and gaps exist between intakes and requirements for a range of micronutrients. Furthermore, in many countries there are gaps in disaggregated gender nutrition data, which would be invaluable for decision makers. The Women's Dietary Diversity Score is also a proxy for nutrient adequacy of the diet of individuals and can help to fill this gap. Individual surveys of dietary diversity were conducted. The total sample was composed of 2715 (75.4 %) women and 885 (24.6 %) men. IDDS was calculated, the results are presented in Table 6.

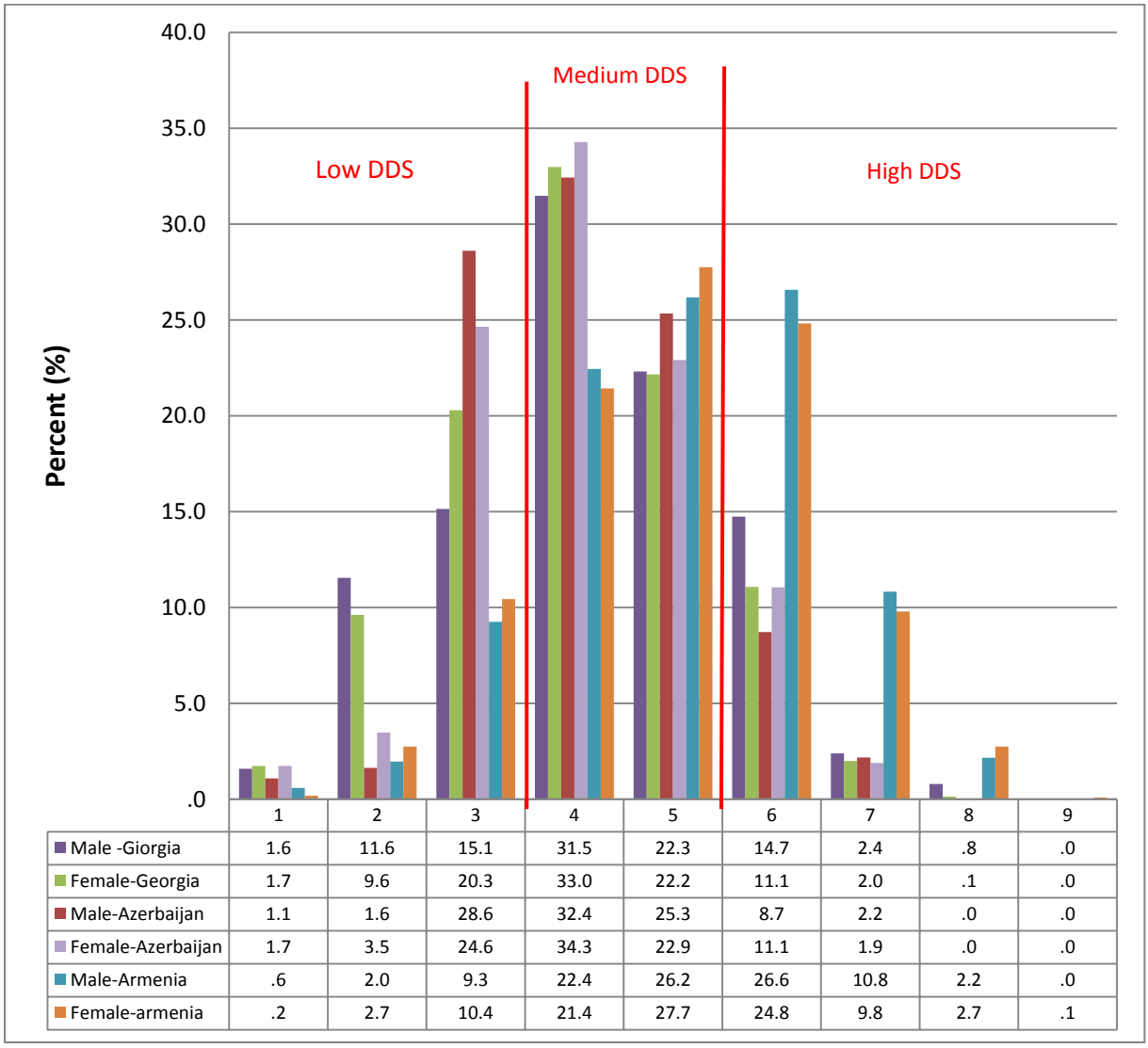
Table 6. Women's and men's Dietary Diversity in the South Caucasus

Women's Dietary Diversity Score in the South Caucasus								
	N	Median	Std. Deviation	Minimum	Maximum	Low WDDS median (min-max)	Medium WDDS median (min-max)	High WDDS median (min-max)
South Caucasus	2474	4	1.4	1	9	3 (1 -3) n=572 23 %	4 (4 - 5) n=1312 53%	6 (6 -9) n=590 24%
Georgia	749	4	1.3	1	8	3 (1 -3) n=237 32 %	4 (4 - 5) n=413 55%	6 (6 -8) n=99 13%
Azerbaijan	633	4	1.2	1	7	3 (1 -3) n=189 30 %	4 (4 - 5) n=362 57%	6 (6 -7) n=82 13%
Armenia	1092	5	1.3	1	9	3 (1 -3) n=146 13 %	5 (4 - 5) n=537 49%	6 (6 -9) n=409 38%
Men's Dietary Diversity Score in the South Caucasus								
	N	Median	Std. Deviation	Minimum	Maximum	Low WDDS median (min-max)	Medium WDDS median (min-max)	High WDDS median (min-max)
South Caucasus	1126	5	1.4	1	8	3 (1-3) n= 246 21%	4 (4-5) n= 594 53%	6 (6-8) n=286 25%
Georgia	251	4	0.1	1	8	3 (1-3) n= 71 28%	4 (4-5) n= 135 54%	6 (6-8) n=45 18%
Azerbaijan	367	4	0.1	1	7	3 (1-3) n= 115 31%	4 (4-5) n= 212 58%	6 (6-7) n=40 11%
Armenia	508	5	0.1	1	8	3 (1-3) n= 12 21%	5 (4-5) n= 49 53%	6 (6-8) n=40 25%

To our knowledge, this is the first study to report on the dietary diversity at the household level and in particular at individual level amongst women and men in the South Caucasus. Table 6 shows the descriptive statistics of women's dietary diversity score, the population of women in the South Caucasus, had a median dietary diversity of 4 ±1.4 with a minimum consumption of 1 food group and a maximum consumption of 9 food groups. The men population in the south Caucasus had a median dietary diversity of 5 ±1.4 with a minimum consumption of 1 food group and a maximum of 8 food groups.

The women's dietary scores were then divided into tertiles in order to distinguish diets of 'high', 'medium' and 'low' quality, in terms of diversity. Figure 7 shows that women with low dietary diversity (WDDS ≤3 food groups) accounts for the 23% (n=572) of women in the South Caucasus area: With the higher percentage in Georgia 32% (n=237), followed by Azerbaijan 30% (n=189) and Armenia 13% (n=146). These women with low dietary diversity are at risk of micronutrient deficiencies (i.e. iron and vitamin A) and they could potentially present higher risk of diet related diseases and higher mortality than women with high dietary diversity. This is valuable information regarding the probability of food insecurity and impaired nutritional status particularly in women who reported low dietary diversity. As for the medium dietary

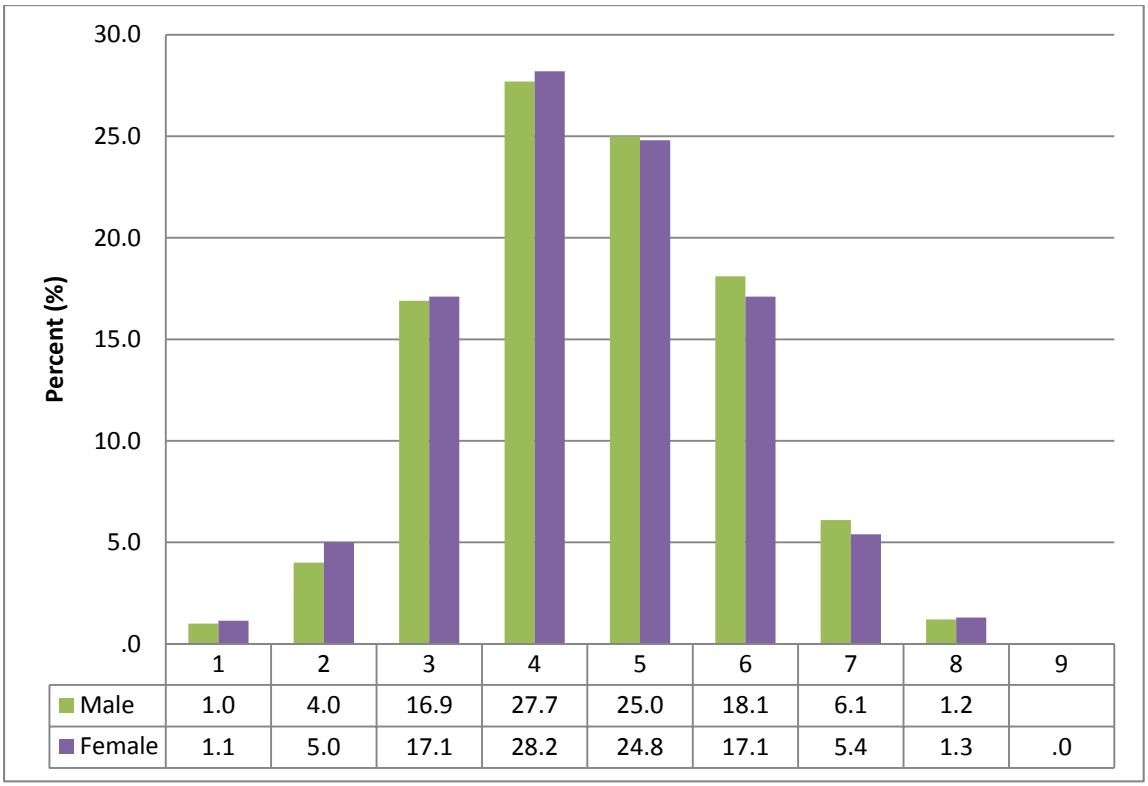
diversity (WDDS= 4- 5), 53% of the women in the south Caucasus reported WDDS of 4 or 5 and only 24% of women reported a high dietary diversity (WDDS ≥ 6), indicating that women with high dietary diversity had a higher probability of having an adequate diet.. In studies conducted in low-resource countries, it was found that low dietary diversity scores (low and medium tertile) were significantly and negatively associated with food security in children (Onyango, 2003), adolescents (Belachew *et al.*, 2013) and women of reproductive age (Harris-Fry *et al.*, 2015). Furthermore, it was reported that there is a strong association between dietary diversity and nutritional status in women of reproductive age having a low dietary diversity (low tertile) (Savy *et al.*, 2005).



	1	2	3	4	5	6	7	8	9
Male -Giorgia	1.6	11.6	15.1	31.5	22.3	14.7	2.4	.8	.0
Female-Georgia	1.7	9.6	20.3	33.0	22.2	11.1	2.0	.1	.0
Male-Azerbaijan	1.1	1.6	28.6	32.4	25.3	8.7	2.2	.0	.0
Female-Azerbaijan	1.7	3.5	24.6	34.3	22.9	11.1	1.9	.0	.0
Male-Armenia	.6	2.0	9.3	22.4	26.2	26.6	10.8	2.2	.0
Female-armenia	.2	2.7	10.4	21.4	27.7	24.8	9.8	2.7	.1

Figure 7. Distribution of Women's and men's Dietary Diversity in the South Caucasus and by country

Table 6 shows that the median values of the dietary diversity score of women and men in the South Caucasus are very similar. The age range of the respondents was for men from 18 to 88 years with an average of 46 years. For women the age range was 17 to 93 years with an average of 46 years old. Figure 8 shows the distribution of dietary diversity of men and women in the South Caucasus region.



	1	2	3	4	5	6	7	8	9
Male	1.0	4.0	16.9	27.7	25.0	18.1	6.1	1.2	
Female	1.1	5.0	17.1	28.2	24.8	17.1	5.4	1.3	.0

Figure 8. Individual dietary diversity of women and men in the South Caucasus

A comparison analysis through the use of the Chi Square test showed that there was not significant association between the dietary diversity of women and men X^2 (8) = 3.48, (P<0.901). Therefore, there is a significant difference between these groups in terms of dietary diversity; men's dietary diversity was shown to be slightly but significantly higher than the women's as can be seen in the cross-tabulation table (Table 7). There is a higher percentage of men having higher dietary diversity than women. The majority of men have a dietary diversity characterized by the consumption of 5 food groups compared with that a median of 4 food groups consumed by women. Many research studies have reported the importance of focusing on women's diet, not only because they are a vulnerable group but also because it is reported that low diet quality of women is highly associated with mortality (Kant *et al.*, 2000; Nube *et al.*, 1987). It was suggested that women reporting dietary patterns that included fruits, vegetables, whole grains, low-fat dairy, and lean meats, as recommended by current dietary guidelines, have a lower risk of mortality. Women in the highest intake level of recommended foods had 30% lower risk of multivariate-adjusted all-cause mortality compared with those in the lowest level. These types of results increase awareness on the importance of diet in decreasing the risk of chronic disease. In the first National Health and Nutrition Examination Survey (NHANES) Epidemiologic, researchers found diets characterized by a low diet diversity score based on evaluation of whether each of the major food groups were consumed (fruit, vegetable, grain, meat, and dairy) were reported to be associated with an increased risk of all-cause mortality in both men and women (Kant *et al.*, 1995). Women consuming 2 or fewer food groups daily compared with those who consume 5 had a 40% higher risk of mortality while it was reported a 13% decrease in risk of mortality in men with healthy diet patterns (Huijbregts

et al., 1997). In the present paper women of low dietary diversity, consuming 3 or less food groups accounts for the 23% of women in the South Caucasus area. Disaggregated data showed that the percentage of women of low dietary diversity diet is higher in Georgia 32%, followed by Azerbaijan 30% and Armenia 13% (Table 6). These women with low dietary diversity are at risk of micronutrient deficiencies (i.e. iron and vitamin A) and they could potentially present risks of diet related diseases and higher mortality than women of high dietary diversity. Please find further explanation of food groups consumed by women of low dietary diversity, as well as their dietary patterns in the section 4.2 consumption of nutrient-rich food groups .

Table 7. Differences between Individual dietary diversity in the South Caucasus

Cross-tabulation IDDS men vs women			
	Frequency (%)		Total
IDDS	Male	Female	
1	11 (1.0)	26 (1.1)	37
2	45 (4.0)	124 (5.0)	169
3	190 (16.9)	422 (17.1)	612
4	312 (27.7)	698 (28.2)	1010
5	282 (25.0)	614 (24.8)	896
6	204 (18.1)	424 (17.1)	628
7	69 (6.1)	134 (5.4)	203
8	13 (1.2)	31 (1.3)	44
9	0 (0)	1 (0.1)	1
Total	1126	2474	3600

4.1. Comparative analysis of the Women's Dietary diversity in Georgia, Azerbaijan and Armenia

- ✓ Median dietary diversity of women in Armenia (WDDS=5) was higher than dietary diversity reported in Georgia (WDDS=4) and Azerbaijan (WDDS=4)
- ✓ Women with the lowest dietary diversity have a low quality diet, and they may be at risk of micronutrient deficiencies. In particular, deficiencies of iron due to low consumption of meat products and deficiencies of vitamin A due to low consumption of vitamin A rich fruits and vegetables.
- ✓ The differences on women's dietary diversity across the three countries can be due to the household income and residence area of the women (urban/rural).
- ✓ The mean household income in Armenia (USD 315) is 1.6 times higher than that in Georgia (USD 192) and 1.3 times higher than the average in Azerbaijan (USD 247).
- ✓ It is important to note that the survey in Armenia had the higher percentage of households located in urban areas (64%), compared to Georgia (44%) and Azerbaijan (43%), this might be one of the reasons why Armenia presented the higher average household income.

WDDS reported in each country presented some differences (Figure 9). Analysis of variance one-way ANOVA has shown that there was a significant difference in the WDDS reported in Georgia, Azerbaijan and Armenia.

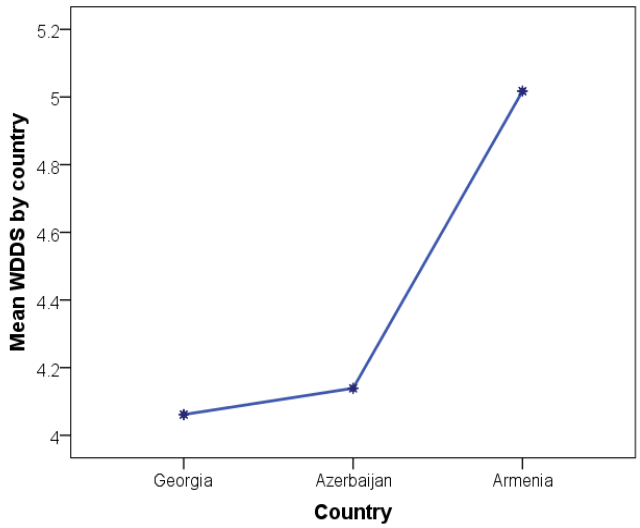


Figure 8. Differences between mean WDDS across Georgia, Azerbaijan and Armenia

Significant differences between the groups are shown by the constant F (2, 2471)=159, p <0.000. Tukey analysis presented in the Figure 7, indicates that the difference between WDDS reported in Georgia and Azerbaijan was not significant (p=0.453). However, the WDDS reported in these countries was significantly lower, with an average 4, to that reported in Armenia 5.0 (p<0.05).

The figure clearly shows that the dietary diversity of women in Armenia is higher compared to that in the other countries. It is very likely that the reason behind this higher WDDS is that the majority of the interviewed population in Armenia was from urban areas (64%) while the urban areas in Georgia and Azerbaijan were 56 and 57% respectively. Table10 shows the mean values of the household income in the countries; the mean household income, reported in the present research, in Armenia (USD 315) is 1.6 times higher than that in Georgia (USD 192) and 1.3 times higher than the average in Azerbaijan (USD 247). Household income affects the dietary diversity of the households and individuals and may have a negative effect on the nutrition status of the South Caucasian population.

It was previously reported that the major issues in Armenia, Azerbaijan and Georgia are no longer undernourishment, but rather malnourishment (i.e. micronutrient deficiencies, obesity, overweight) (FAO, 2015). The more vulnerable groups of the population (lowest quintile of poverty rate) still struggles for adequate food access, and the majority of the population experience lack of proper food, leading to a diet with low nutritional diversity. In Armenia, the percentage of the population suffering from some form of food deprivation (32% in 2004) (FAO, 2007) or malnourishment (5.3% in 2005-07) (FAO, 2014) is reducing over the time. It was reported that food scarcity mainly affected the lower income quintiles. In the case of Azerbaijan, the country has consistently shown progress in lowering the number of the malnourished in the population, but there is still inequity of caloric intake between groups, with poorer families, as well as those living in cities presented a lower caloric intake compared to wealthier families and those living in rural areas (AzStat, 2015). As for Georgia, its population no longer faces widespread hunger. However, the two main nutrition issues in Georgia are

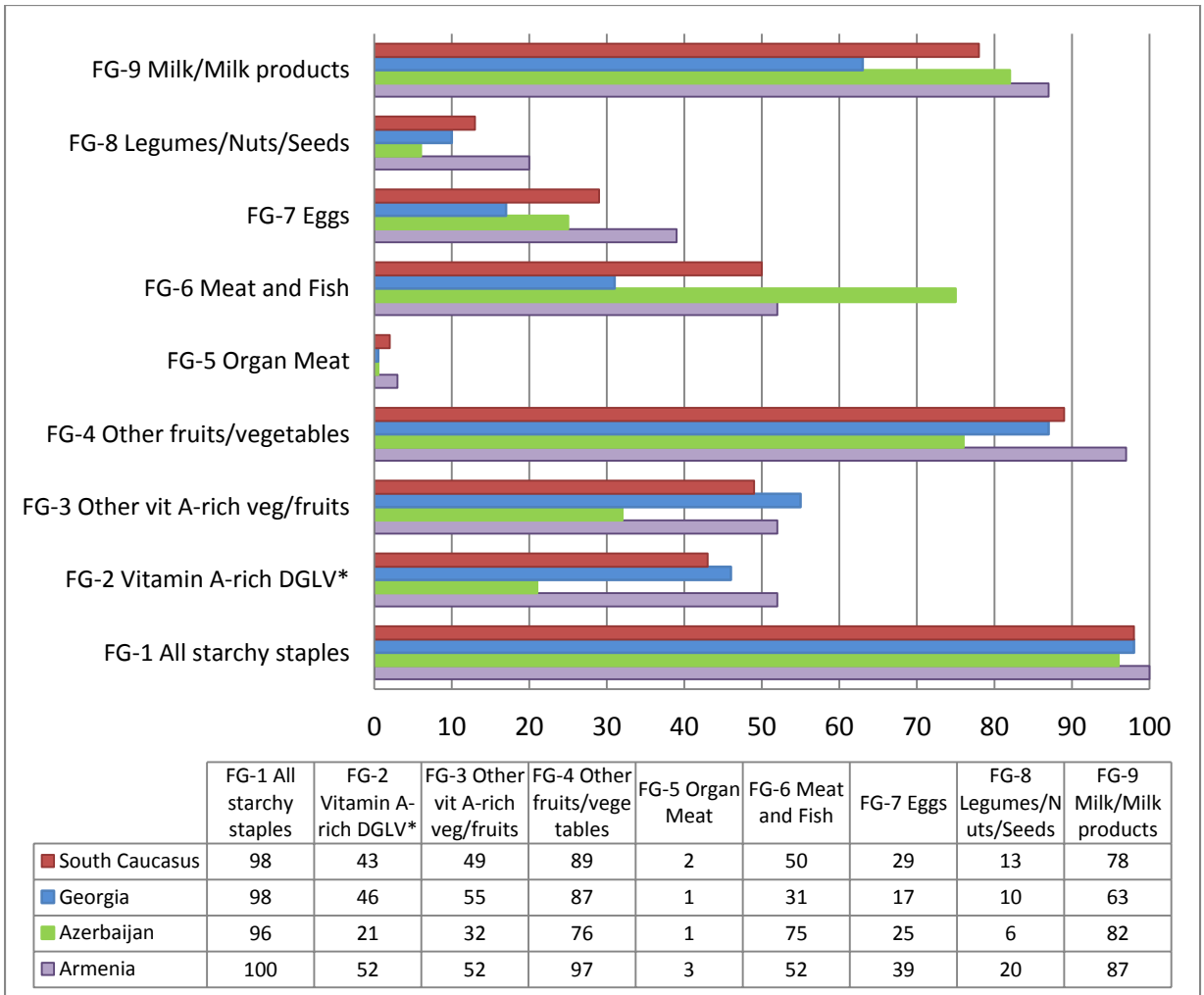
imbalances in diet for the general population and inadequate economic access to food by vulnerable groups (Asatiani, 2009).

4.2. Nutrient-rich food groups consumed by women and men in the South Caucasus

- ✓ Dietary patterns of women and men of low dietary diversity basically consists of three food groups: starchy staples, other food and vegetables and milk and milk products
- ✓ It was found that only about half of the interviewed women in the South Caucasus region –43% in Georgia, 49% in Azerbaijan and 50% in Armenia– had consumed at least one food item from the groups FG2 dark green leafy vegetables, FG3 other vitamin A rich fruits/vegetables and FG6 Meat/fish respectively.
- ✓ These results may imply that (the other half) about 50 to 60% of the women were likely to have an inadequate consumption of vitamin A and iron rich foods.
- ✓ Men and women with medium dietary diversity have a diet characterized of four food groups: food groups consumed by women with low dietary diversity plus meat and fish. However, it should be highlighted that only men had reached more than 50% on the prevalence of consumption of meat and fish, women of medium dietary diversity had still limited consumption of this food group
- ✓ The diet of men and women with high dietary diversity, their diets were characterized by a minimum of 7 food groups. The four food groups consumed in the medium tertile (medium dietary diversity) plus the consumption of vitamin A rich DGLV, other vitamin A rich fruits and vegetables and eggs.
- ✓ For both women and men, there was a low consumption of organ meat (max 6% of the individuals consumed this food group) and legumes/nuts/seeds (max 32% of the individuals consumed this food group). These are food groups that are high in nutrient content, however they were consumed by very low percentage of men and women. Thus, their low consumption may lead to micronutrient deficiencies.
- ✓ Promotion of diverse diets is one of several approaches to improving micronutrient adequacy and reducing deficiencies. In particular for this population the consumption of organ meat, nuts/legumes/seeds and eggs should be encouraged.

Figure 10 shows the group of starchy staples and nutrient-rich food groups that were consumed by women in the South Caucasus the day before the interview. In the present project, it was found that only half of the interviewed women in the South Caucasus region −43% in Georgia, 49% in Azerbaijan and 50% in Armenia− had consumed at least one food item from the groups FG2-dark green leafy vegetables, FG3-other vitamin A-rich fruits/vegetables and FG6-Meat/fish respectively. These results may imply that about 50% to 60% of the women were likely to have an inadequate consumption level of vitamin A and/or iron-rich foods. However, caution must be taken while interpreting these results due to the lack of validation studies to evaluate micronutrient intakes and adequacy in the countries of the South Caucasus region. Similar eating patterns were found across all countries (Georgia, Azerbaijan and Armenia). The main difference was the significantly lower consumption of vitamin A-rich dark green leafy vegetables, fruits and other vegetables in Azerbaijan compared with those reported in Georgia and Armenia. These results may call attention to the probability of vitamin A deficiencies in the population of Azerbaijan. It is common in low-resource countries that FG1-starchy staple foods are the most generally consumed foods. Almost the total group of women in the South Caucasus (98%) have consumed at least one food item of this food group whereas FG6-meat/fish (50%), FG7-eggs (29%) and FG8-legumes/nuts/seeds (13%) were less consumed. Similar dietary trends were found in Bangladesh (Arsenault *et al.*, 2013), Sri Lanka(Jayawardena *et al.*, 2013), Burkina Faso (Becquey *et al.*, 2010; Savy *et al.*, 2005), Mali (Torheim *et al.*, 2003) and Ethiopia (Herrador *et al.*, 2015).

Women in the low tertile (WDDS ≤ 3) had less varied diet and consumed only one to four food groups, in most cases these 4-food group resembles a diet based on starchy staples, other fruits and vegetables, other vitamin A-rich fruits/vegetables and milk/milk products. Women in the medium tertile (WDDS from 4 to 5) had consumed in average four to five food groups and their diets could be characterized by the consumption of dark green leafy vegetables in addition to the food groups consumed in the low tertile. Women who reported in the high tertile (WDDS ≥ 6) had a median consumption of six food groups, they showed a more varied diet including one or two more groups of meat/fish and, legumes/nuts/seeds and/or eggs in addition to the food groups consumed in the medium tertile. Women, in the overall sample, hardly ever consumed foods corresponding to organ meat, only 2% of them consumed any organ meat during the previous day, most of these women were positioned in the high WDDS tertile (Figure 10).



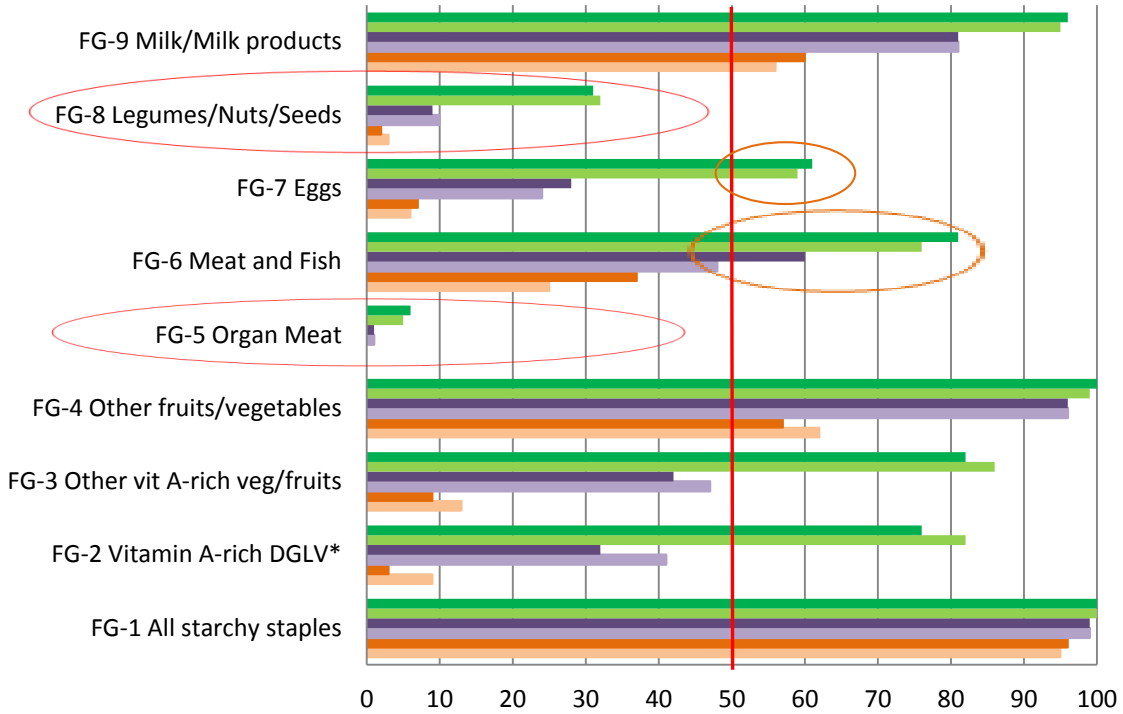
	FG-1 All starchy staples	FG-2 Vitamin A-rich DGLV*	FG-3 Other vit A-rich veg/fruits	FG-4 Other fruits/vegetables	FG-5 Organ Meat	FG-6 Meat and Fish	FG-7 Eggs	FG-8 Legumes/Nuts/Seeds	FG-9 Milk/Milk products
South Caucasus	98	43	49	89	2	50	29	13	78
Georgia	98	46	55	87	1	31	17	10	63
Azerbaijan	96	21	32	76	1	75	25	6	82
Armenia	100	52	52	97	3	52	39	20	87

Figure 9. Nutrient rich food groups consumed by women in the South Caucasus

Previous studies (Arimond *et al.*, 2010; Fujita *et al.*, 2012; Henjum *et al.*, 2015) have shown that WDDS is a useful tool in predicting the probability of micronutrient adequacy. Researchers have found that the dietary diversity score was possitively associated with the probability of adequacy for 11 micronutrients (thiamin, riboflavin, niacin, folate,vitamin B-6, B-12, A, C, calcium, iron and zinc). It was suggested that the intake of dark green leafy vegetables and vitamin A-rich fruits and vegetables were positive predictors of vitamin A adequacy, and the food group-meat/fish was a good predictor of the probability of iron adequacy (Arimond *et al.*, 2010; Henjum *et al.*, 2015). It was also reported that the consumption of FG2-dark green leafy vegetables showed a positive association between the FG2 consumption and the low household income tertile. The result illustrated that the choice of consuming dark green leafy vegetables is not necessary associated with a higher income. This might be explained due to the nutrition transition effect, which implies that households with higher incomes tend to diversify their diet by increasing the consumption of popular and processed (non-staple/non-simple) foods (Hoddinott *et al.*, 2002).

Therefore, dietary strategies to increase diet diversity in women in the low and medium WDDS tertiles are needed in this population. In particular, it is desirable to develop strategies to

increase the intake of meat products, fish, eggs, legumes and seeds. The majority of women with high dietary diversity had consumed at least one meat product, significantly different to women with low dietary diversity where only few women had consumed at least one meat product during the past 24-hours. Other nutrient-rich groups such as eggs and legumes/nuts/seeds followed the same trend. Having said that, there is a clear potential to increase the dietary diversity and the probability of nutrient adequacy in this population by promoting the consumption of eggs, legumes and nuts because these foods are rich sources of protein and micronutrients with lower prices than meat products.



	FG-1 All starchy staples	FG-2 Vitamin A-rich DGLV*	FG-3 Other vit A-rich veg/fruits	FG-4 Other fruits/vegetables	FG-5 Organ Meat	FG-6 Meat and Fish	FG-7 Eggs	FG-8 Legumes/Nuts/Seeds	FG-9 Milk/Milk products
High men DD	100	76	82	100	6	81	61	31	96
High WDDS	100	82	86	99	5	76	59	32	95
Medium men DD	99	32	42	96	1	60	28	9	81
Medium WDDS	99	41	47	96	1	48	24	10	81
Low men DD	96	3	9	57	0	37	7	2	60
Low WDDS	95	9	13	62	0	25	6	3	56

Figure 10. Nutrient rich food groups consumed by individuals (gender disaggregated) with different dietary diversity in the South Caucasus

Table 8. Food groups consumed by ≥ 50% of the interviewed men and women in the South Caucasus. Data divided by dietary diversity tertile.

Low dietary diversity (≤3 food groups)	Medium dietary diversity (4 - 5 food groups)	High Dietary diversity (≥9 food groups)
Starchy staple	Starchy staple	Starchy staple
Other fruits and vegetables	Other fruits and vegetables	**Vitamin A-rich DGLV**
Milk and milk products	**Meat and fish (only men)**	**Other vitamin A-rich fruits and vegetables**
	Milk and milk products	Other fruits and vegetables
		Meat and fish
		Eggs
		Milk and milk products

As shown in the results in Figure 11 and Table 8, the dietary patterns of women and men of low dietary diversity basically consists of three food products: starchy staples, other food and vegetables and milk and milk products. Individuals of medium dietary diversity had a diet characterized of four food groups: food groups consumed by individuals of low dietary diversity plus meat and fish. However, it should be highlighted that, in this group, only men had reached more than 50% on the prevalence of consumption of meat and fish, women of medium dietary diversity had limited consumption of meat products and fish. As for the group of individuals of high dietary diversity, their diets were characterized by a minimum of 7 food groups. Those four food groups consumed in the medium tertile (medium dietary diversity) plus the consumption of vitamin A-rich DGLV, other vitamin A rich fruits and vegetables and eggs. A point that needs to be addressed is the low consumption of organ meat (max 6% of the individuals consumed this food) and legumes/nuts/seeds (max 32% of the individuals consumed this food group). These are food groups that have high nutrient content, however they were consumed by very low percentage of men and women. It should be highlighted once more that the consumption of nutrient-rich food groups (those highlighted in Table 9 plus organ meat and nuts/legumes/seeds) was low in men and women with low dietary diversity score. The consumption of these nutrient-rich food groups is extremely important to ensure diet quality and nutrient adequacy, and thus avoid micronutrient deficiencies.

Promotion of diverse diets is one of several approaches to improving micronutrient adequacy and reducing deficiencies (other strategies are fortification, biofortification and/or supplementation). Moreover, diet quality is multidimensional, in addition to micronutrient adequacy, high-quality diets are characterised by balance in intake of protein (meat products, fish, organ meat), slow carbohydrates (fruits and vegetables) and fat (meat products, fish) and moderation in consumption of nutrient-low foods such as starchy staples, which in high quantities have been associated with increased risks for chronic disease such as obesity.

5. Socio-economic and -demographic characteristics that can affect food access and dietary diversity in the South Caucasus

- ✓ Socio-demographic characteristics and dietary diversity information were collected from the households where women participated in the dietary diversity surveys.
- ✓ The association analysis between socio-economic and demographic characteristics of the women and their dietary diversity showed that the dietary diversity of the women was significantly associated with the residence area (rural/urban), household income and ability to afford food items but not with the level of education.
- ✓ The consumption of green leafy vegetables and vitamin A-rich fruits/vegetables, which was previously reported as an indicator-food group of vitamin A-rich plant-based sources, was significantly associated with the household income and the ability to afford food items during the entire year.
- ✓ The consumption of meat/fish which was previously defined as an indicator-food group of iron-rich foods was significantly associated with household income and the ability to afford food items the whole year around.
- ✓ Women of lower household income (lower tertile in red colour) had lower consumption of nutrient-rich foods (more expensive foods) such as meat/fish, eggs, nuts and seeds. Consumption of starchy staples (i.e. cereals and tubers) and vegetables were more or less the same in all the tertiles of household income.
- ✓ Economic access to food remains a problem in the South Caucasus as shown by approximately 40% of the households that were interviewed.
- ✓ Women of low household income, having problems to afford enough food and living in the rural areas were shown to be more likely to have a low dietary diversity score than their peers in better conditions.

The socioeconomic and demographic characteristics that were taken into consideration as possible factors that may affect the dietary diversity of women were: residence area (urban or rural), education level, household income, and capacity to afford food items throughout the year.

5.1. Residence area Rural/Urban

From the total number of households, 40 % of the total interviewed households were located in rural areas and 60% were in urban areas including capital cities of the countries. Figure 9 presents how the dietary diversity of women in rural and urban areas differ. Table 9 shows household income according to rural and urban areas in the different countries.

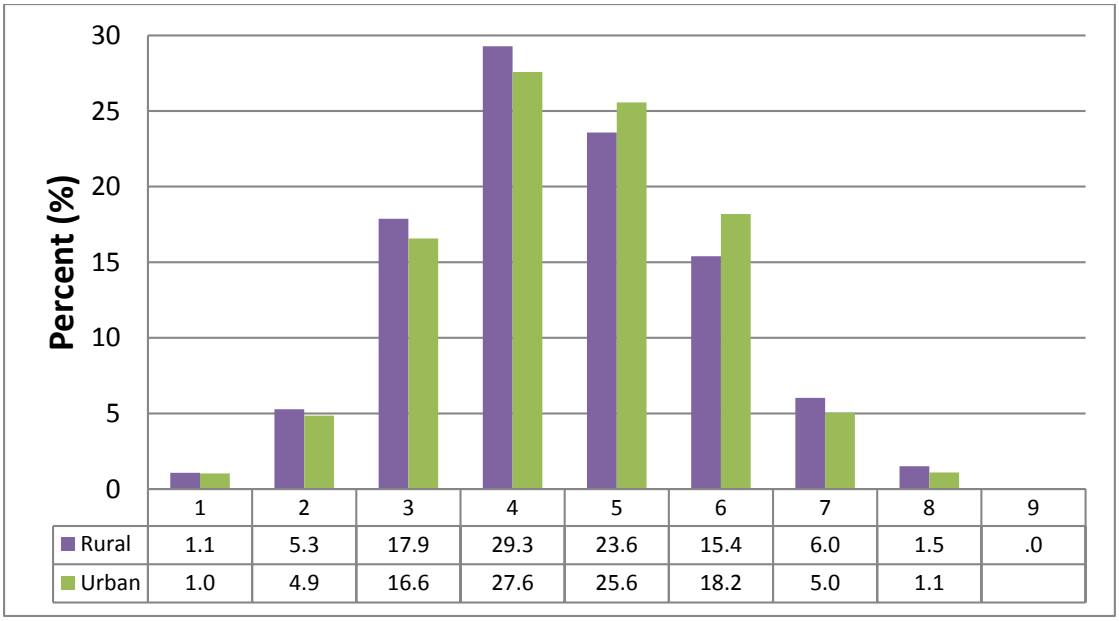


Figure 11. Distribution of WDDS according the residence area rural/urban in the South Caucasus

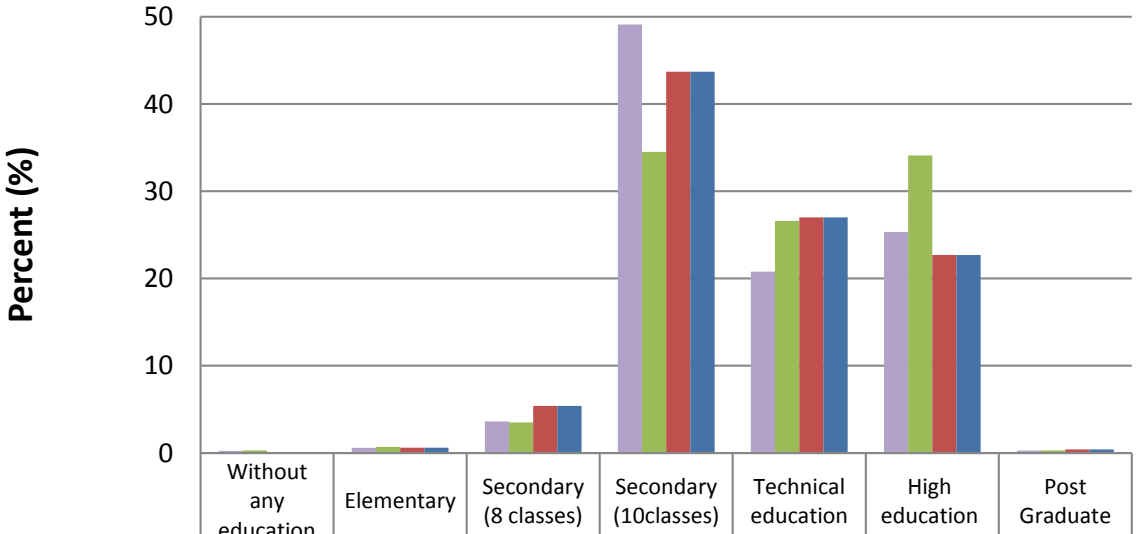
A comparison analysis between rural and urban areas showed a weak association (Chi square) between HDDS and residence area X^2 (11) = 20.08, p=0.044 (at level p<0.05). Therefore, residence area may significantly affect the dietary diversity at household level. The association between dietary diversity and residence area was less significant than at household level X^2 (7) = 7.35, p=0.499. These small differences did not affect the dietary patterns of women in rural areas compared to those in urban areas. A Figure of nutrient-rich food groups consumed by women in the urban and rural areas of the South Caucasus is presented in Annex 1. A analysis of the dietary patterns in each country in rural and urban areas is presented in Annex 2. Further discussion of the findings is provided at the end of this section.

Table 9. Distribution of urban and rural areas per country and household income

Country	Rural frequency (%)	HH Income in Rural (USD mean ±SD)	Urban frequency (%)	HH Income in Urban (USD mean ±SD)
Georgia	440 (44)	260 ± 10	560 (56)	237 ± 10
Azerbaijan	430 (43)	248 ± 8	570 (57)	300 ± 8
Armenia	576 (36)	267 ± 9	1024 (64)	347 ± 8

5.2. Education level in the South Caucasus

Figure 13 shows the distribution of the education level of the interviewed women in the South Caucasus and by country. The majority of the women had secondary level education (10 classes) and above. The number of women without education were very low, 0.3% that accounts for a total of 9 women; 3 in each country. It can be seen that the education level is similar across the different countries. As for the effect of education level on the women's dietary diversity, the association analysis (Chi square) between women's dietary diversity and education level showed to be not significant (X^2 (48)=50.6, p=0.371). Therefore, is not likely that education level will affect the dietary diversity of women in the South Caucasus region. However, it should be noted that 'level of education' is different to 'nutrition education'. It has been see that nutrition education can help to improve the dietary diversity of populations, and dietary diversity can be different for populations of different levels of knowledge of nutrition education (Kilaru *et al.*, 2005). Details on women's dietary diversity across different levels of education can be found in Annex 3. In other research papers, authors found significant associations, however these associations usually happen when the sample size includes people without education (e.g. in very low income countries in Africa) (Clausen *et al.*, 2005; Herrador *et al.*, 2015). In the South Caucasus region all of the respondents had at least a secondary level education.



	Without any education	Elementary	Secondary (8 classes)	Secondary (10classes)	Technical education	High education	Post Graduate
South Caucasus	.3	.6	3.6	49.1	20.8	25.3	.3
Georgia	0.3	0.7	3.5	34.5	26.6	34.1	0.3
Azerbaijan	0.1	0.6	5.4	43.7	27	22.7	0.4
Armenia	0.1	0.6	5.4	43.7	27	22.7	0.4

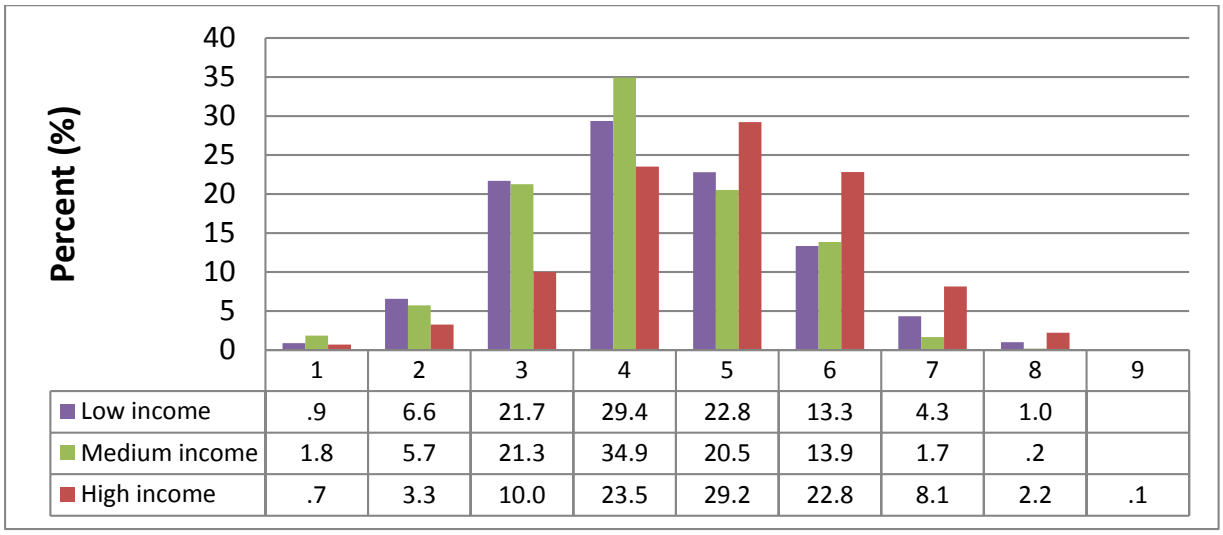
Figure 12. Education level in the South Caucasus area and by country

5.3. Household income

Information on the average household income in USD in the South Caucasus and by country is presented in Table 10

Table 10. Household income (USD) in the South Caucasus

	Household Income USD					
	Median	Min	Max	Low tertile	Medium tertile	High tertile
South Caucasus (n=3337)	247	21	3324	158 (n=1263)	247 (n=791)	315 (n=1283)
Georgia (n=944)	192	21	3324	128 (n=401)	192 (n=300)	342 (n=243)
Azerbaijan (n=940)	247	37	2469	185 (n=210)	247 (n=491)	340 (n=239)
Armenia (n=1453)	315	113	2101	158 (n=652)	-	315 (n=801)



	1	2	3	4	5	6	7	8	9
Low income	.9	6.6	21.7	29.4	22.8	13.3	4.3	1.0	
Medium income	1.8	5.7	21.3	34.9	20.5	13.9	1.7	.2	
High income	.7	3.3	10.0	23.5	29.2	22.8	8.1	2.2	.1

Figure 13. Women's Dietary Diversity Score and household Income

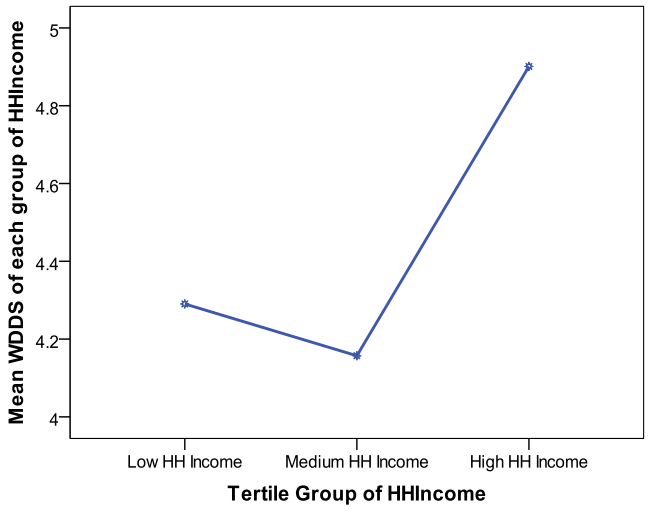
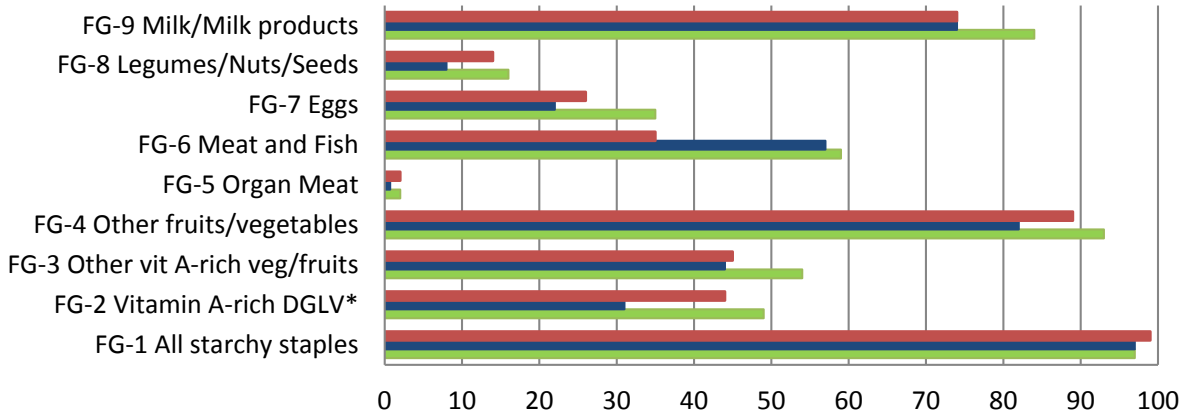


Figure 14. Differences between mean WDDS across different tertiles of HH Income

It was shown that Armenia has the highest average household income USD 315, compared with Azerbaijan USD 247, and Georgia USD 192. Data on household income was divided in tertiles for the association analysis. Figure 14 shows the distribution of dietary diversity across different levels of household income.

When looking at the dietary patterns across different levels of household income (Figure 16), it can be seen that women with a higher household income consumed more nutrient rich foods, such as eggs, legumes, nuts and milk products. In fact, women of lower household income (lower tertile in red colour) had lower consumption of nutrient-rich foods (i.e. more expensive foods) such as meat/fish, eggs, nuts and seed and milk products. Consumption of starchy staples (i.e. cereals and tubers) and vegetables was more or less the same in all the tertiles of household income.



	FG-1 All starchy staples	FG-2 Vitamin A-rich DGLV*	FG-3 Other vit A-rich veg/fruits	FG-4 Other fruits/vegetables	FG-5 Organ Meat	FG-6 Meat and Fish	FG-7 Eggs	FG-8 Legumes/Nuts/Seeds	FG-9 Milk/Milk products
Low tertile HHIncome	99	44	45	89	2	35	26	14	74
Medium tertile HHIncome	97	31	44	82	1	57	22	8	74
High tertile HHIncome	97	49	54	93	2	59	35	16	84

Figure 15. Nutrient rich food groups consumed by women according to the household income in the South Caucasus

5.4. Food affordability in the South Caucasus

The survey also evaluated how the respondents describe their actual economic situation. The question and frequencies are presented in Table 11. The most relevant question for food security was if the respondents experienced a situation where money was not enough to buy food items. In this regards, 26% (n=946) of all respondents stated that they did not have enough money to afford food all the time during the past 12 months. The higher percentage of respondents experiencing a lack of money to afford food was in Georgia where 35% of respondents fell in this category (n=946), followed by Armenia, with 28.4% of respondents (n=455) and Azerbaijan, with13% of respondents (n= 134). The respondents were also asked if during the past year they experienced months in which they did not have enough food to meet their family's needs. Almost 50% of all interviewees responded positive to the question, indicating that there definitely are households that do not have the means to afford food during all months

of the year. Figure 17 shows that approximately 700 households did not have enough food to meet their families' needs during December, and the food shortages continue for about 200 households during the months of January, February and March. These results were consistent and similar across the different countries.

Table 11. Economic situation of the households

Describe the economic situation of your household		
	Frequency	Percent
In South Caucasus (n=3600)		
The money is not enough even for food	946	26.3
The money is enough for food, but not for clothes	1429	39.7
The money is enough for food and clothes, but not for buying long-term use goods, such as home appliances, etc.	938	26.1
We can afford to buy some long-term use goods, such as home appliances	154	4.3
We can afford to buy not only home appliances, but also some furniture, an inexpensive car	46	1.3
We can afford an expensive car, an apartment and more	12	0.3
Don't know / Difficult to answer	76	2.2
Households that reported that money is not enough is not enough even for food		
In south Caucasus (n=3600)	946	26.3
In Georgia (n=1000)	357	35.7
In Azerbaijan (n=1000)	134	13.4
In Armenia (n=1600)	455	28.4
In the past 12 months, were there months in which you did not have enough food to meet your family's needs? –Answered YES		
South Caucasus (n=3600)	1762	48.9
Georgia (1000)	581	58.1
Azerbaijan (1000)	439	43.9
Armenia (1600)	742	46.4

Regarding the association between the experience of not having enough money to buy food for the household and women's dietary diversity, there was a significant association between the lack of money to buy food and the WDDS reported by women in the interviewed households (X^2 (7) = 78.3, p<0.001). Therefore, it is likely that women in households where there was not enough money would have a lower dietary diversity. The distribution, frequency and percentage of respondents that experienced food shortage in every specific month are also presented in a cross-tabulation table in Annex 4. In regards to the association between experiencing that there is not enough money to buy food for the household and the dietary diversity during the past 12 months, there was a significant association between the lack of money to buy food and the dietary diversity reported by women in the interviewed households (X^2 (7) = 105.7, p<0.001). Therefore, it is likely that women in households where there was not enough money would have a low dietary diversity.

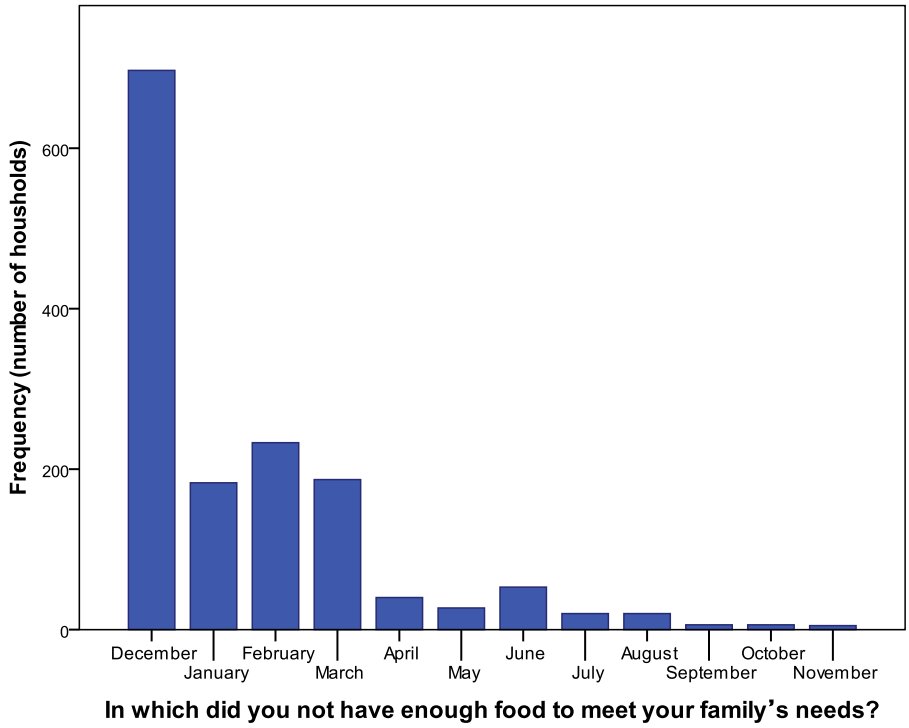


Figure 16. Months that respondents experienced food shortages along the year

Socio-demographic characteristics and dietary diversity information were collected from the households where women participated in dietary diversity interviews. The association analysis between socio-economic and demographic characteristics of the respondents and their dietary diversity showed that the dietary diversity of the women was significantly associated with the residence area (rural/urban), household income but not with the level of education.

It was found that the consumption of dark green leafy vegetables, which was previously reported as an indicator-food group of vitamin A-rich plant-based sources, was significantly associated with the household income (X^2 (2)=45.6, P<0.001). The consumption of other vitamin A-rich fruits/vegetables, which is another indicator of vitamin A-rich plant-based sources, was found to be significantly associated with the household income (X^2 (2)=15.4, P<0.001) and the ability to afford food items during the entire year (X^2 (1)=18.3, P<0.001). The meat/fish food group was previously defined as an indicator-food group of iron-rich foods, in this study significant associations were found between the consumption of meat/fish and household income (X^2 (2)=116, P<0.001) and the ability to afford food items the whole year around (X^2 (1)=125, P<0.001).

The findings are in agreement with multi-country analyses of data from various low-resource countries: Burkina Faso, Bolivia, Philippines, Bolivia, Bangladesh, India, Ghana, Mozambique, Kenya, Malawi, Mali, Mexico and Egypt, where they evaluated the association of dietary diversity with household income. The authors of these papers mentioned above also reported positive associations between dietary diversity and household income in both urban and rural areas (Hoddinott *et al.*, 2002; Melgar-Quinonez *et al.*, 2006; Thorne-Lyman *et al.*, 2010).

Findings from these studies including the present project suggest that a higher income enhances the capacity to purchase food items, thereby increases access to a more diverse diets. In the current project, after adjusting WDDS for various socio-economic and demographic characteristics, women of low household income, having problems to afford enough food during the whole year and living in the rural areas were shown to be more likely to have a low dietary diversity score than their peers in better conditions.

6. Conclusions on the comparative analysis of dietary diversity in the South Caucasus

- ✓ The project is highly relevant as it may contribute to strengthening food security and nutrition information systems in Georgia, Azerbaijan and Armenia. The findings on socioeconomic and demographic factors affecting women's dietary diversity and information on food access would encourage and inspire policy makers to plan and implement national initiatives to improve the food security and nutrition environment for the people in the South Caucasus

- ✓ In the current project, data were collected at the end of harvesting season (July-August 2015). The following findings can be highlighted:

    - The comparative analysis between the food access measured by HDDS in Georgia, Azerbaijan and Armenia shows that the highest food access was reported in Armenia with a HDDS of 9 ± 1.5 compared with Azerbaijan (7 ± 1.3) and Georgia (7 ± 1.4).

    - Median dietary diversity of women in Armenia (WDDS=5) was higher than dietary diversity reported in Georgia (WDDS=4) and Azerbaijan (WDDS=4).

    - Women with the lowest dietary diversity have a low quality diet, and they may be at risk of micronutrient deficiencies. In particular, deficiencies of iron due to low consumption of meat products and deficiencies of vitamin A due to low consumption of vitamin A rich groups. The differences found between food access and women's dietary diversity across the three countries can be due to the household income and residence area (urban/rural) of the women. The mean household income in Armenia (USD 315) is 1.6 times higher than that in Georgia (USD 192) and 1.3 times higher than the average household income in Azerbaijan (USD 247). It is important to note that the survey in Armenia showed the highest percentage of households located in urban areas (64%), when compared to Georgia (44%) and Azerbaijan (43%).

    - The dietary patterns of the population in the South Caucasus was characterized by the consumption of starchy staples and vegetables, however the consumption

of some nutrient-rich foods, such as meat, legumes, nuts and eggs, was the lowest in Georgia.

- Women of low household income, having problems to afford enough food during the whole year and living in the rural areas were shown to be more likely to have a low dietary diversity score than their peers in better conditions.

- Residence area (rural/urban), ability to afford food the whole year around and household income were the main socio-economic and demographic characteristics that predicted the probability of having an adequate consumption of Vitamin A and iron-rich food (i.e. egg, legumes, nuts, meat and milk products).

- A significant difference between women's dietary diversity (WDDS=4) and men's dietary diversity (IDDS men=5) was found. Men's dietary diversity was shown to be slightly but significantly higher than the women's dietary diversity. The differences were found mainly in the consumption of meat products and fish and seafood, which was higher for men than for women.

- Economic access to food remains a problem in the South Caucasus as shown by approximately 40% of the households that were interviewed.

- The respondents also reported that there were some months during the past year, that they could not afford enough food to meet their families' needs, these months were winter months (December, January and February).

7. Rrecommendations and policy implications for improving women's dietary diversity in the South Caucasus

Specific recommendations according to the project findings:

- ✓ Engagement of the governments of Georgia, Azerbaijan and Armenia to integrate dietary diversity into the country's food security and nutrition information system could potentially help to implement a sustainable system for monitoring and evaluation of WDDS data collection at national and regional level. These steps are highly relevant to track progress of nutrition and agriculture programmes and interventions in the countries and in the region.

- ✓ In order to obtain a more realistic picture of dietary diversity in the South Caucasus region and capture seasonal variations in food availability, it is highly recommended to repeat data collection during the lean season. In particular, during December, which was the month that ma In order to obtain a more realistic picture of dietary diversity in the South Caucasus region and capture seasonal variations in food availability, it is

recommended to repeat data collection during the lean season. In particular, during the month of December, many households reported having problems getting enough food to cover their families' needs. The number of women who participated in the survey was not equally distributed in rural and urban areas, therefore, it is recommended to have a more even distribution of participants between these areas. Furthermore, taking into consideration seasonality, geographic distribution and socio-economic groups would make it possible to obtain invaluable food security and nutrition information for identifying nutritional targets and devising programmes to improve food security and nutrition in the South Caucasus. Future work could also look into the relationships between dietary diversity score and indicators of nutritional status.

- ✓ Simple indicators such as the dietary diversity score at household level (HDDS) useful for assessing food security status and Women's dietary diversity WDDS useful for measuring a key element of diet quality as it is the dietary diversity and provides an indication of the micronutrient adequacy of women are can serve as a useful tools for tracking nutrition and agriculture impact of project and programmes. Project managers, decision-makers and nutrition-agriculture researchers are encouraged to integrate the tools in their plans of monitoring and evaluation nutrition and agriculture.

- ✓ If budget allows, quantitative research (i.e. detailed 24-h recalls, biochemical indicators) on identifying and evaluating nutrient deficiencies is recommended to take place in populations that reported a low household and individual dietary diversity. Populations with low dietary diversity are at risk of micronutrient deficiencies.

- ✓ Focussing on gender is also very relevant. In the South Caucasus context women are at the heart of agricultural production, food processing and domestic food purchasing and preparation. Thus, any food security campaign, nutrition programme and/or interventions must be sensitive to the challenges of improving nutritional status of women. Furthermore long term projects working on food production (i.e. agriculture, food processing and food safety) should campaign to change gender attitudes so that women are able to work in a variety of areas and be more involved in food production programmes in order to gain knowledge of the needs of diverse diets and consumption of nutrient-rich foods. In addition, agricultural development projects should encourage the participation of women to ensure that they are the main benefitted stakeholders.

- ✓ It is recommended to raise awareness on health problems that could be related to food, including under-nutrition but also over-nutrition and non-communicable diseases (i.e. obesity, heart disease, diabetes), which are very common in countries like Georgia, Azerbaijan and Armenia that are undergoing a nutrition transition era. Furthermore, it is recommended to introduce nutrition education in the curricula of the schools and promote healthy nutrition and physical activity in the health centres. The government and NGOs could also organize campaigns regarding healthy lifestyle and healthy food, and limit the wide accessibility of unhealthy food and drinks. Increasing the nutrition

knowledge of the population can help to avoid malnutrition as well as to prevent diseases.

General recommendations and policy implications

- ✓ Decision-makers in food security and nutrition need to focus on ensuring that vulnerable populations have enough diverse foods available and accessible all year round. The most vulnerable populations are households of low-income, in particular women and children living in rural areas. Economic growth is essential to the fight against hunger; countries that become richer are less susceptible to food insecurity and are able to improve the nutrition of their country. Georgia, Azerbaijan and Armenia are growing economies, the economic growth should be inclusive, meaning an economic growth that promotes equitable access to food, assets and resources, particularly for poor people and women.

- ✓ Food prices and food price stability are huge problems in all three countries according to the evidence presented in the Oxfam report *'Baseline Research: Food insecurity in the South Caucasus'*. Volatility in food prices may be connected to huge volatility in production, so protecting against production variation should be a priority for decision makers. In order to achieve price stability, the following issues can be taken into consideration: irrigation systems (to successfully overcome droughts); animal health and veterinary services and improvement of the food and agriculture systems for a sustainable production. Another important factor to maintain stability of prices is the linkages between food security and international trade, which are complex but necessary to take into account. Policies that affect exports and imports of food contribute to determining relative prices, wages and incomes in the domestic market, and hence shape the ability of poor people to access food.

- ✓ In order to improve food security and nutrition, the governments of Georgia, Azerbaijan and Armenia should focus on policies aimed at enhancing agricultural productivity and increasing food availability. In particular encouraging smallholder production to, achieve hunger reduction even in areas where poverty is widespread. Moreover, when agriculture is linked with social protection and other measures that increase the incomes of poor families, they can have an even more positive effect and prompt rural development by creating accessible markets and employment opportunities. Public policies should provide incentives for the adoption of sustainable agricultural intensification practices and techniques such as sustainable land management, soil conservation, improved water management, diversified agricultural systems and agroforestry. In the long term, all these actions could lead to sustainable economic growth and the improvement of the nutritional status of the population.

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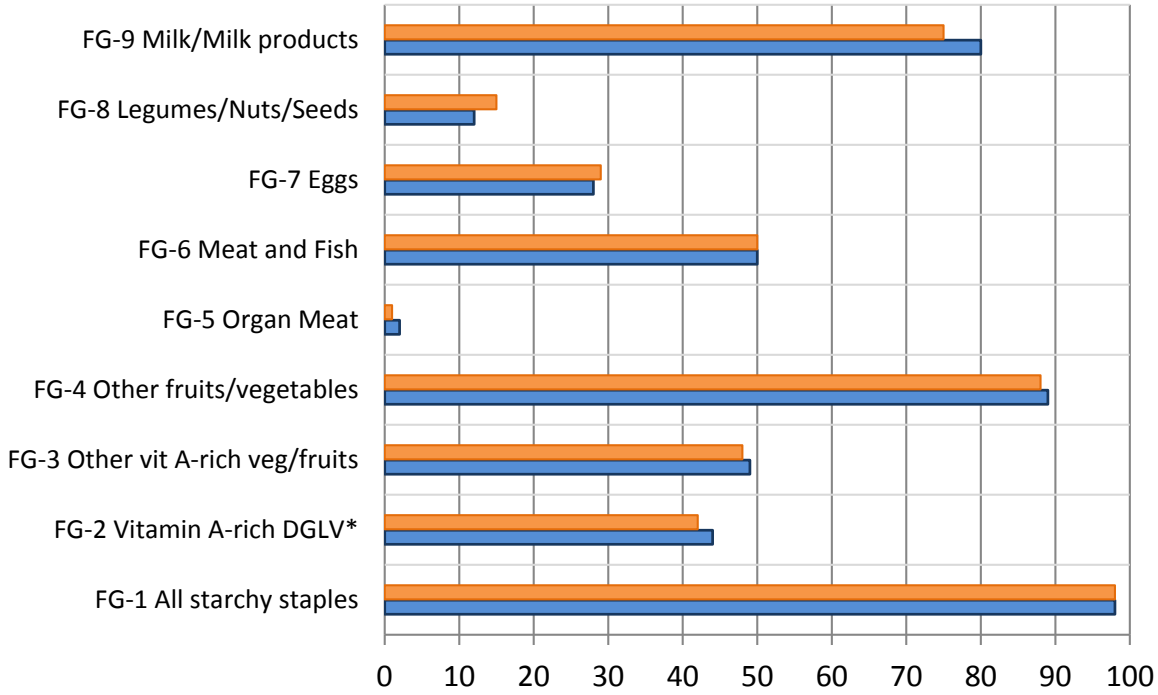
Annex 1. Nutrient-rich food groups consumed by women in the urban and rural areas of the South Caucasus



	FG-1 All starchy staples	FG-2 Vitamin A-rich DGLV*	FG-3 Other vit A-rich veg/fruits	FG-4 Other fruits/vegetables	FG-5 Organ Meat	FG-6 Meat and Fish	FG-7 Eggs	FG-8 Legumes/Nuts/Seeds	FG-9 Milk/Milk products
Rural	98	42	48	88	1	50	29	15	75
Urban	98	44	49	89	2	50	28	12	80

Fig. Nutrient rich food groups consumed by women in the urban and rural areas of the South Caucasus

Annex 2. Comparative analysis of the HDDS and IDDS in rural and urban areas of Georgia, Azerbaijan and Armenia.

HDDS_Household Dietary Diversity Score * Area Crosstabulation

Count

Country			Area		
			Rural	Urban	Total
Georgia	HDDS_Household Dietary Diversity Score	2	1	0	1
		3	2	0	2
		4	19	19	38
		5	44	61	105
		6	111	109	220
		7	126	165	291
		8	85	135	220
		9	38	61	99
		10	13	10	23
		11	1	0	1
	Total		440	560	1000
Azerbaijan	HDDS_Household Dietary Diversity Score	1	0	1	1
		2	1	4	5
		3	2	7	9
		4	4	6	10
		5	23	35	58
		6	73	118	191
		7	173	171	344
		8	101	144	245
		9	49	69	118
		10	4	15	19
	Total		430	570	1000
Armenia	HDDS_Household Dietary Diversity Score	2	1	1	2
		3	1	4	5
		4	2	8	10
		5	7	24	31
		6	16	76	92
		7	52	121	173
		8	110	216	326
		9	168	300	468
		10	163	221	384
		11	49	51	100
		12	7	2	9
	Total		576	1024	1600

Chi-Square Tests

Country		Value	df	Asymp. Sig. (2-sided)
Georgia	Pearson Chi-Square	14.910[a]	9	.093
	Likelihood Ratio	16.384	9	.059
	Linear-by-Linear Association	2.798	1	.094
	N of Valid Cases	1000		
Azerbaijan	Pearson Chi-Square	17.115[b]	9	.047
	Likelihood Ratio	17.984	9	.035
	Linear-by-Linear Association	.212	1	.645
	N of Valid Cases	1000		
Armenia	Pearson Chi-Square	42.544[c]	10	.000
	Likelihood Ratio	43.949	10	.000
	Linear-by-Linear Association	34.889	1	.000
	N of Valid Cases	1600		

IDDS_Individual Dietary Diversity Score * Area Crosstabulation

Count

Country			Area		Total
			Rural	Urban	
Georgia	IDDS_Individual Dietary Diversity Score	1	9	8	17
		2	48	53	101
		3	74	116	190
		4	151	175	326
		5	94	128	222
		6	52	68	120
		7	10	11	21
		8	2	1	3
	Total		440	560	1000
Azerbaijan	IDDS_Individual Dietary Diversity Score	1	3	12	15
		2	12	16	28
		3	118	143	261
		4	149	187	336
		5	101	137	238
		6	38	64	102
		7	9	11	20
	Total		430	570	1000
Armenia	IDDS_Individual Dietary Diversity Score	1	1	4	5
		2	10	30	40
		3	55	106	161

	4	117	231	348
	5	158	278	436
	6	145	261	406
	7	72	90	162
	8	18	23	41
	9	0	1	1
	Total	576	1024	1600

Chi-Square Tests

Country		Value	df	Asymp. Sig. (2-sided)
Georgia	Pearson Chi-Square	4.747[a]	7	.691
	Likelihood Ratio	4.756	7	.690
	Linear-by-Linear Association	.013	1	.908
	N of Valid Cases	1000		
Azerbaijan	Pearson Chi-Square	5.443[b]	6	.488
	Likelihood Ratio	5.764	6	.450
	Linear-by-Linear Association	.161	1	.688
	N of Valid Cases	1000		
Armenia	Pearson Chi-Square	10.460[c]	8	.234
	Likelihood Ratio	10.808	8	.213
	Linear-by-Linear Association	6.402	1	.011
	N of Valid Cases	1600		

Differences were not significant in any of the three countries

WDDS

IDDS_Individual Dietary Diversity Score * Area Crosstabulation

Count

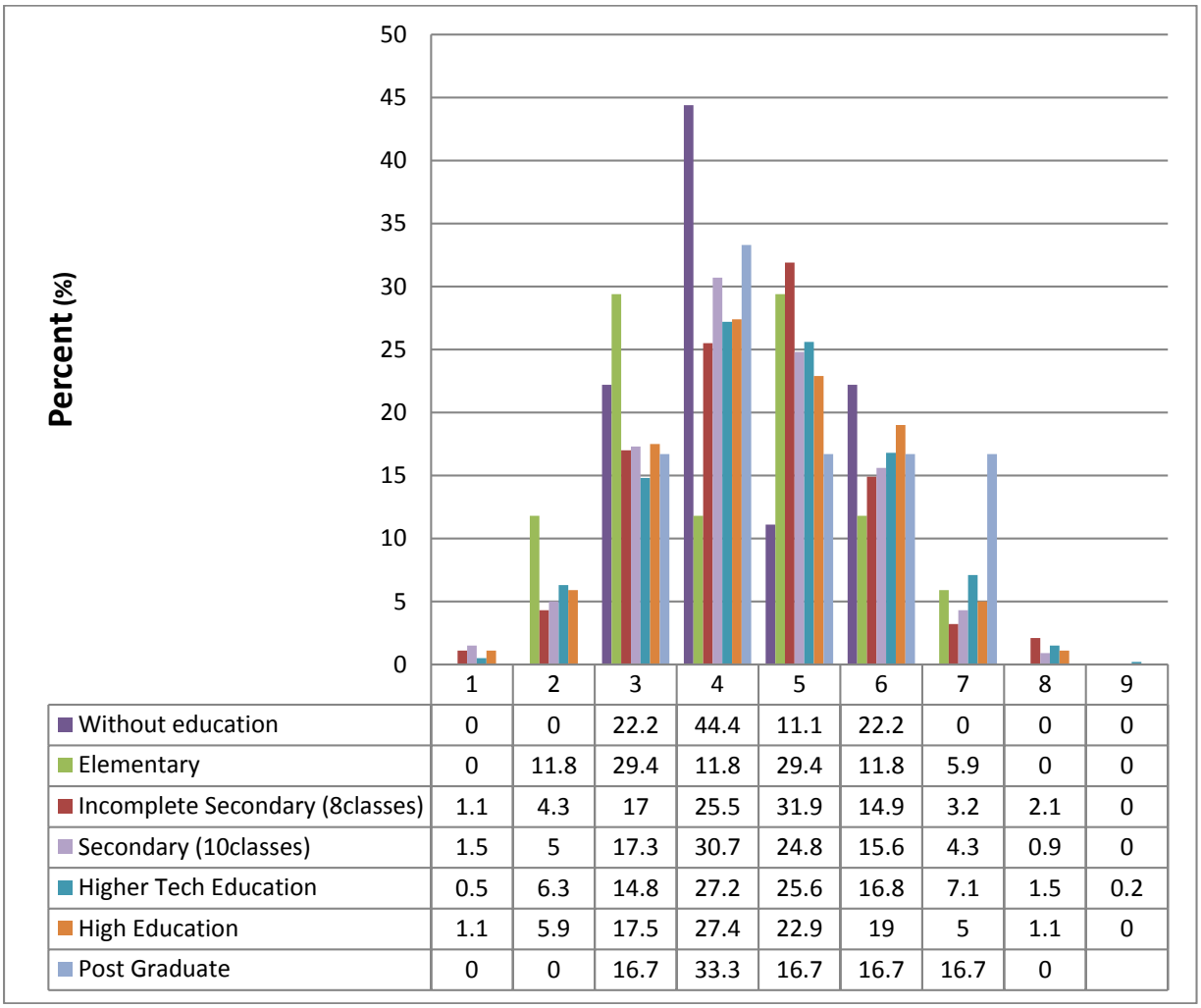
Country	Sex of repondents IDDS			Area		Total
				Rural	Urban	
Georgia	Female	IDDS_Individual Dietary Diversity Score	1	7	6	13
			2	35	37	72
			3	56	96	152
			4	116	131	247
			5	69	97	166
			6	32	51	83
			7	6	9	15
			8	0	1	1
		Total		321	428	749
Azerbaijan	Female	IDDS_Individual Dietary Diversity Score	1	2	9	11
			2	8	14	22
			3	71	85	156
			4	85	132	217
			5	53	92	145
			6	22	48	70
			7	5	7	12
		Total		246	387	633
Armenia	Female	IDDS_Individual Dietary Diversity Score	1	1	1	2
			2	6	24	30
			3	39	75	114
			4	71	163	234
			5	97	206	303
			6	89	182	271
			7	45	62	107
			8	14	16	30
			9	0	1	1
		Total		362	730	1092

Chi-Square Tests

Country	Sex of repondents IDDS		Value	df	Asymp. Sig. (2-sided)
Georgia	Female	Pearson Chi-Square	7.101	7	.418
		Likelihood Ratio	7.481	7	.381
		Linear-by-Linear Association	.837	1	.360
		N of Valid Cases	749		
Azerbaijan	Female	Pearson Chi-Square	6.944	6	.326
		Likelihood Ratio	7.169	6	.305
		Linear-by-Linear Association	1.124	1	.289
		N of Valid Cases	633		
Armenia	Female	Pearson Chi-Square	10.475	8	.233
		Likelihood Ratio	10.729	8	.218
		Linear-by-Linear Association	4.356	1	.037
		N of Valid Cases	1092		

The differences on WDDS of women in rural and urban areas were not significant in Georgia, Azerbaijan and Armenia

Annex 3. Distribution of education level on WDDS



	1	2	3	4	5	6	7	8	9
Without education	0	0	22.2	44.4	11.1	22.2	0	0	0
Elementary	0	11.8	29.4	11.8	29.4	11.8	5.9	0	0
Incomplete Secondary (8classes)	1.1	4.3	17	25.5	31.9	14.9	3.2	2.1	0
Secondary (10classes)	1.5	5	17.3	30.7	24.8	15.6	4.3	0.9	0
Higher Tech Education	0.5	6.3	14.8	27.2	25.6	16.8	7.1	1.5	0.2
High Education	1.1	5.9	17.5	27.4	22.9	19	5	1.1	0
Post Graduate	0	0	16.7	33.3	16.7	16.7	16.7	0	

Fig. Distribution of women's dietary diversity across different levels of education.

Annex 4 Cross-tabulation, frequency and percentage, of respondents that experienced food shortage in every specific month

Months (in the past 12 months) in which you did not have enough food to meet your family's needs?				
	Frequency (Percentage of the total)			
	South Caucasus (n=3600)	Georgia (n=1000)	Azerbaijan (n=1000)	Armenia (n=1600)
December	697 (19.4)	187 (18.7)	184 (18.4)	326 (20.4)
January	183 (5.1)	18 (1.8)	41 (4.1)	124 (7.8)
February	233 (6.5)	47 (4.7)	20 (2.0)	166 (10.4)
March	187 (5.2)	89 (8.9)	53 (5.3)	45 (2.8)
April	40 (1.1)	15 (1.5)	4 (0.4)	21(1.3)
May	27 (0.8)	10 (1.0)	5 (0.5)	12 (0.8)
June	53 (1.5)	14 (1.4)	32 (3.2)	7 (0.4)
July	20 (0.6)	3 (0.3)	3 (0.3)	14 (0.9)
August	20 (0.6)	2 (0.2)	7 (0.7)	11 (0.7)
September	6 (0.2)	1 (0.1)	3 (0.3)	2 (0.1)
October	6 (0.2)		3 (0.3)	3 (0.2)
November	5 (0.1)		4 (0.4)	1 (0.1)
Total sample who answered	1478 (41.1)	386 (38.6)	359 (35.9)	732 (45.8)
Household who did not experience l	2122 (58.9)	614 (61.4)	641 (64.1)	868 (54.3)

Crosstabulation lack money to buy food during the past 12 months and WDDS			
	Frequency		
WDDS	Yes	No	Total
1	16	10	26
2	85	39	124
3	260	162	422
4	352	346	698
5	267	347	614
6	168	256	424
7	36	98	134
8	7	24	31
9	0	1	1
Total	1191	1283	2474

It is likely that women in households where there was not enough money would have a lower WDDS.

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