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vulnerability analysis and mapping

Technical Guidance Sheet

FOOD CONSUMPTION ANALYSIS

Calculation and use of the food consumption score in food security analysis

Food consumption analysis
Calculation and use of the food consumption score in food security analysis.

Prepared by VAM unit HQ Rome.

Version 1
February 2008

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1. Introduction

There is no single way to measure food security, the concept itself being rather elusive. Analysis of food security by WFP generally uses food consumption as the entry point. Food consumption measured in kilocalories is the gold standard for measuring consumption, and often considered to be one of the gold standards for food security- but the collection of detailed food intake data is difficult and time consuming.

WFP's goal is to have a standard food consumption data collection instrument and analysis approach that is flexible enough for different needs and contexts, while standard enough to have equally applicable analysis techniques and equally interpretable results, and also one that can be implemented in the field in a reasonable data collection and analysis timeframe. There are several alternative ways to collect and analyze food consumption information using indicators that are proxy for actual caloric intake and diet quality.

Such proxies generally include information on dietary diversity, sometimes with the addition of food frequency. WFP has adopted this data collection tool- measuring dietary diversity and food frequency - because several different indicators built on this sort of data have proven to be strong proxies for food intake and food security.

Analysis of dietary diversity and food frequency can be done in several ways, each with its own specific aims - looking at consumption from different angles, and with different strengths and weaknesses. Building composite scores which measure food frequency and/or dietary diversity is one of the more explored and tested methodologies. Well defined examples include the FANTA dietary diversity score and the DHS Food groups indicator. There are several other indicators found throughout the literature.

WFP has taken a direction of food consumption measurement tailored to its own information needs. To further harmonize WFP's data analysis, standard methodologies have been introduced to analyze this food consumption data.

2. Background

Some important definitions to consider include:

Dietary diversity is defined as the number of different foods or food groups eaten over a reference time period, not regarding the frequency of consumption.

Food frequency, in this context, is defined as the frequency (in terms of days of consumption over a reference period) that a specific food item or food group is eaten at the household level.

Food group is defined as a grouping of food items that have similar caloric and nutrient content.

Food item cannot be further split into separate foods. However, generic terms such as 'fish' or 'poultry' are generally considered to be a food items for the purpose of this analysis.

Condiment, is this context, refers to a food that is generally eaten in a very small quantity, often just for flavor. An example would be a 'pinch' of fish powder, a teaspoon of milk in tea, spices, etc.

2.1 Past analyses of food consumption

Most CFSVAs and in-depth EFSAs conducted in the past have used Principle Component Analysis (PCA) and Cluster analysis to analyze and interpret the 7-day food frequency and diversity data (see the VAM Household Food Security Guidelines[1]).

Advantages of the PCA and Cluster Analysis methodology include:

- The ability to perform a context specific and in-depth analysis of food consumption.
- The option to include other non-consumption indicators into the PCA and cluster analysis.
- The ability of cluster analysis to identify households with similar specific consumption patterns.
- Cluster analysis is able to capture both Dietary Diversity and Food Frequency.

However, the drawbacks include:

- The analysis on a single dataset cannot be re-produced, even by the same analyst. The use of randomly selected 'centers' in the cluster analysis prevent the exact reproduction of clusters between analyses.
- A certain level of subjectivity is inherent in the creation (cluster analysis parameters, final number of clusters) and interpretation of the clusters (both a strength and weakness of the analysis).
- Due to the fact that part of this analysis is based on the interpretation of the analyst of the clusters, the comparability of results between surveys is difficult and not statistically valid.
- The analysis of the data, to the non-statistician, is somewhat of a 'black box'.

2.2 New standard methodology

In response to these problems, an additional level of analysis of food consumption has been introduced in recent CFSVA and other food consumption related data analysis. An indicator, called the Food Consumption Score (FCS) has been developed. The FCS is a composite score based on dietary diversity, food frequency, and relative nutritional importance (see section 9.6) of different food groups. The construction of this score is outlined in section 5.

Advantages of this methodology include:

- A standardized and more transparent methodology.
- A repeatable data analysis within a dataset (one analyst can easily reproduce the FCS on a dataset identical to that created on the same dataset by another analyst).
- A comparable analysis between datasets (this does not imply that the score has the same meaning for all households in all contexts- see discussion below).
- The FCS is also able to capture both Dietary Diversity and Food frequency.

[1] http://vam.wfp.org/MATERIAL/MATERIAL-GUIDELINES/Household%20FS%20Guidelines.pdf

The disadvantages of this methodology include:

- The assumption of the applicability of the analysis across time, context, location, population, etc.
- The food group weights and food consumption group thresholds, although standardized, are based on certain inherently subjective choices.
- The analysis can mask important differing dietary patterns (for example, manioc consumers vs. maize consumers) that have an equal FCS.

The FCS is the core indicator of consumption recommended by VAM.

3. Purpose of this document

The purpose of this guidance is:

1. To present the standard use of the Food Consumption Score as part of VAM or VAM-supported food consumption and food security analysis.
    - This key indicator will be included as part of the forthcoming CFSVA: Household Data Analysis Guidelines. A consensus between several users was reached in the CFSVA Methodology Workshop (April, 2007) in many aspects of its use. This consensus is reported here.
    - Due to increased informal use of this key and central indicator, there is a need for standardization and dissemination of this methodology before final guidelines are created.
2. To provide some background information and explanation of the creation of the methodology.
    - In response to questions from the field, from partners, and from other users of the FCS, a deeper explanation and justification of the FCS, its calculation, and its analysis is presented here.

4. Current use of the FCS

The FCS was first created in Southern Africa in 1996, and has been in use there as part of the CHS (Community Household Surveillance) for 4 years and several rounds of data collection. Extensive testing and application of the FCS has validated its use in this region and context. Additionally, the FCS is now being tested and applied in other countries and regions.

Reports/analyses[2] where the FCS has been used (or is currently being used) include:

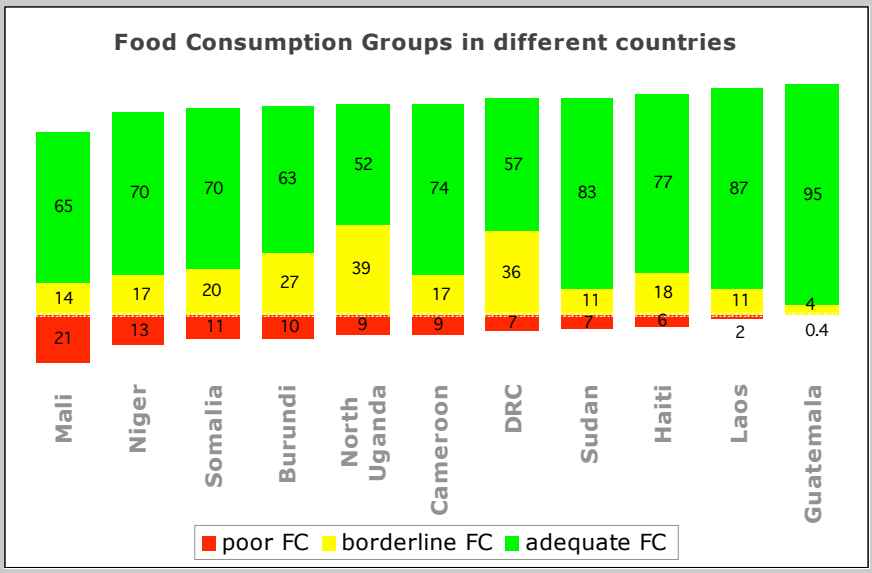
- **Lesotho, Malawi, Mozambique, Swaziland, Zambia, Zimbabwe** CHS October 2005, March 2006, October 2006, March 2007, October 2007– (formal analysis of trends)
- **Malawi** JAM February 2006 (formal analysis)
- **Namibia** JAM April 2006 (formal analysis)
- **Mozambique** JAM April 2006 (formal analysis)
- **Zimbabwe** VAC assessment: April/May 2006 (formal analysis)
- **Mozambique** VAC baseline survey: September 2006 – (formal analysis compared with 24 hour recall by FANTA)

[2] *'Formal analysis'* refers to official published reports.
'Not yet published' refers to planned official published reports (as of August 2007).
'Exploratory analysis' refers to unofficial, unpublished analysis. This includes cases of just simple experimentation with the data, as well as cases where the informal results played a more important role in decision making.

- **Swaziland** VAC assessment: June 2007 (formal analysis)
- **Namibia** CHS: July 2006 and May 2007 (formal analysis)
- **Lesotho, Swaziland and Zimbabwe** CFSAM reports: March 2007 (CHS findings on consumption were used in the WFP sections)
- **Zambia** JAM: June 2007 (formal analysis)
- **Zambia** VAC Assessment: September 2002 (formal analysis)
- **Zambia** Food Security, Health and Nutrition Information System, Urban Report, FAO/Central Statistical Office (Bi-annual Reports): 1996-1998 (formal analysis).
- **SADC VAC** Towards identifying impacts of HIV/AIDS on Food Security in Southern Africa: 2003 (formal analysis).
- **Chad** Food Security Survey: June 2007 (formal analysis)
- **Sudan** CFSVA 2007 (formal analysis)
- **Burundi** FSMS 2006-present (formal analysis)
- **Cote d'Ivoire** EFSA 2006 (formal analysis)
- **Cote d'Ivoire** FSMS 2006-present (formal analysis)
- **Laos** CFSVA 2007 (formal analysis)
- **Armenia** Food Security Survey: 2000 (formal analysis)
- **Haiti** FSMS 2006-present (formal analysis)
- **DRC** CFSVA Phase I (2007) (formal analysis)
- **Afghanistan** FSMS 2006-present (formal analysis)
- **Madagascar** EFSA: June 2007 (not yet published). Note: The 2005 CFSVA for Madagascar did not use it but we will create the FCS from that data and compare the EFSA to it.
- **Mali** CFSVA 2006 (exploratory analysis)
- **OPT** Livelihood Baseline 2007 (not yet published)
- **OPT** PPP 2007 (not yet published)
- **Haiti** CFSVA 2007 (not yet published)
- **Colombia** WFP/ICRC IDP in Urban Areas 2007 (not yet published)
- **Guatemala** CFSVA 2007 (not yet published)
- **Angola** FFE survey: October 2006 (exploratory analysis)
- **Uganda** EFSA 2007 (exploratory analysis)
- **Burundi** CFSVA 2005 (exploratory analysis)
- **Cameroon** CFSVA 2007 (not yet published)

FCS and FCGs across countries and situations

The graph below presents the observed prevalences of FCGs in several countries and situations, from refugee camps to national surveys. The FCS is meant to approach an indicator of food consumption that can be used to make comparisons between different countries and situations.



5. Calculation of the Food Consumption Score (FCS) and Food Consumption Groups (FCGs)[3]

The rationale, areas for modification, justifications, and other explanations behind this calculation are presented in Section 9.

Definition: The frequency weighted diet diversity score or "Food consumption score" is a score calculated using the frequency of consumption of different food groups consumed by a household during the 7 days before the survey.

Calculation steps:

I. Using standard VAM 7-day food frequency data (see section 9.1), group all the food items into specific food groups (see groups in table below).

II. Sum all the consumption frequencies[4] of food items of the same group, and recode the value of each group above 7 as 7.

III. Multiply the value obtained for each food group by its weight (see food group weights in table below) and create new weighted food group scores.

IV. Sum the weighed food group scores, thus creating the food consumption score (FCS).

V. Using the appropriate thresholds (see below), recode the variable food consumption score, from a continuous variable to a categorical variable.

These are the standard Food Groups and current standard weights[5] used in all analyses. The food items listed are an example from the ODJ region.

	FOOD ITEMS (*examples*)	**Food groups (definitive)**	**Weight (definitive)**
1	Maize , maize porridge, rice, sorghum, millet pasta, bread and other cereals	Main staples	2
	Cassava, potatoes and sweet potatoes, other tubers, plantains		
2	Beans. Peas, groundnuts and cashew nuts	Pulses	3
3	Vegetables, leaves	Vegetables	1
4	Fruits	Fruit	1
5	Beef, goat, poultry, pork, eggs and fish	Meat and fish	4
6	Milk yogurt and other diary	Milk	4
7	Sugar and sugar products, honey	Sugar	0.5
8	Oils, fats and butter	Oil	0.5
9	spices, tea, coffee, salt, fish power, small amounts of milk for tea.	Condiments	0

[3] Modified from draft 'CFSVA Guidelines'.
[4] Missing data for individual food items could be interpreted as 0 consumptions days, or as missing. The food consumption data should be properly cleaned to change missing values to 0 where appropriate. Where the data are truly missing, it is recommended not to calculate the FCS for that household.
[5] see section 9.6 for explanation of these weights.

Once the food consumption score is calculated, the thresholds for the FCGs should be determined based on the frequency of the scores and the knowledge of the consumption behavior in that country/region.

The typical thresholds are:

FCS	Profiles
0-21	Poor
21.5-35	Borderline
> 35	Acceptable

However, as discussed in this paper, these thresholds need to be tested and possibly modified based on the context and dietary patterns of the population in question.

6. Analysis of food consumption

To analyze food consumption and incorporate the FCS into this overall analysis, the following steps are suggested:

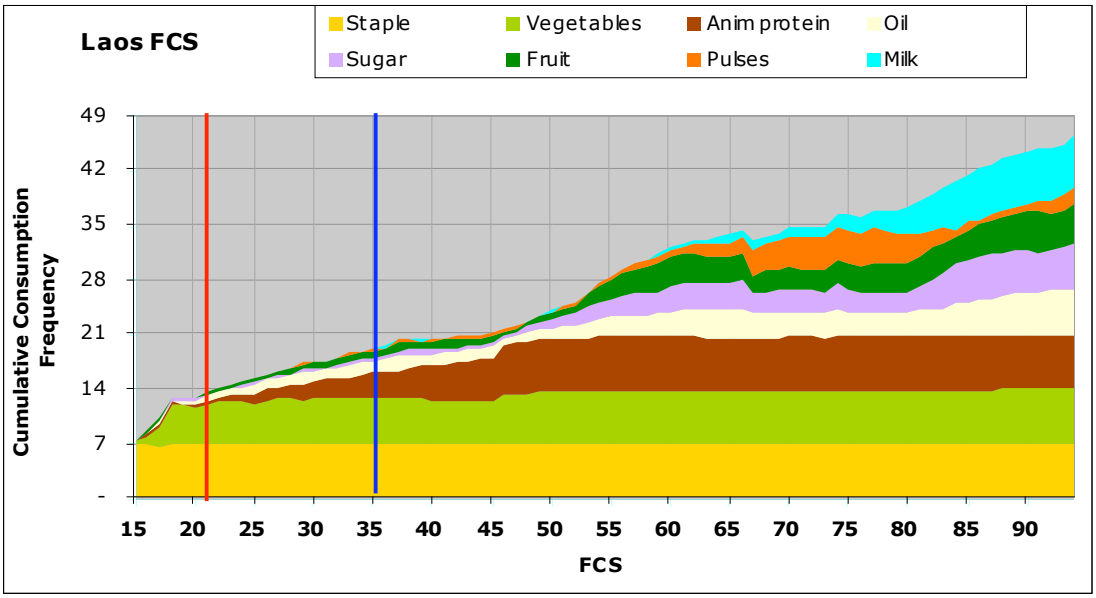
Calculate and explore the Food Consumption Score (FCS):

Step 1. Create the FCS (see the calculation guidance in section 5)

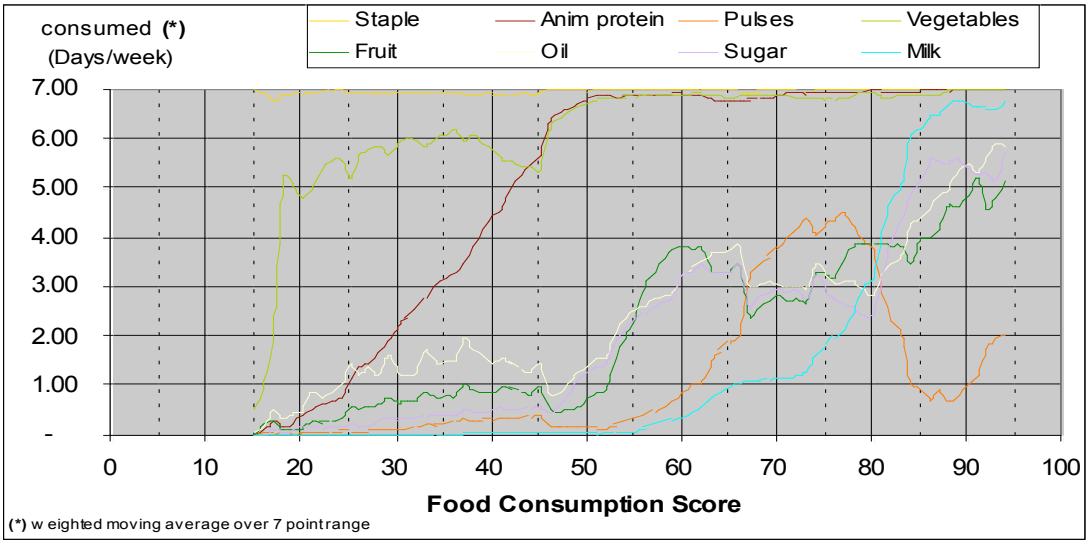
Step 2. Create the following graph(s) (or a similar graph) using the FCS. These graphs aid in the interpretation[6] and description of both dietary habits and in determining cut-offs for food consumption groups (FCGs).

This graph presents a stacked food frequency of the food groups as it evolves with an increasing FCS. For each FCS value, a running average of the surrounding values for that food group (in this case, 6) and the value in question was used to smooth the graph. Additionally, here the cut-offs (see steps 5 and 6) where highlighted (red and blue lines) to help in interpretation.

[6] These graphs are primarily for use in the interpretation of the FCS by the analyst, and may be reported as an annex to document the justification of the FCS and FCGs. However, they are not recommended as a standard reporting tool.



An alternative way to graph this same data is show below. This shows the consumption frequencies of the different food groups by FCS graphed independently, and not stacked as in the above graph. Again, a running average was used.



Running simple frequencies of the days of consumption of each food group can also help interpret general food consumption patterns. For example, this could show that the entire population in general eats oil 7 days per week.

Step 3. Run a PCA and cluster analysis[7] using the unweighted 7 day recall data for the appropriate food items/groups, according to the standard VAM methodology[8].

[7] PCA and cluster analysis require advanced data analysis skills. This step, while very important, may be skipped in certain contexts, particularly as described in section 8. ADDATI software is recommended for cluster analysis.

[8] http://vam.wfp.org/MATERIAL/MATERIAL-GUIDELINES/Household%20FS%20Guidelines.pdf

Step 4. Look at the mean FCS and the mean number of days different food items/groups are eaten in the food consumption clusters. The analyst should rank or categorize the clusters based on their interpretation of the composition of the diet (for example, poor diet clusters, borderline diet clusters, acceptable diet clusters as seen in the example below) for ease of interpretation.

One common problem (see section 9.8) is the frequent consumption of sugar and oil: see if there are clusters that are considered by the analyst to have a poor diet but still regularly consume oil and sugar. Other atypical diet patterns may arise that could bias the FCS and FCGs - for example, households that consume milk frequently in the absence of any frequent consumption of other food groups.

The example below, from Mali, uses a cluster analysis based on the food groups. Note that almost all clusters consume sugar 6-7 days per week, and oil 5-7 days per week. Note that cluster three is considered to be a poor diet by the analyst, but still has frequent (7 days) consumption of both oil and sugar and a mean FCS of 30.

Cluster	Prevalence	FCS	mean number of days food group consumed by cluster								Classification by the analyst based on the cluster description
			Cereal tubers	pulses	Meat & fish	vegeta bles	fruit	oil	sugar	milk	
1	8%	23	7	0	1	0	0	1	1	1	Poor diet clusters
2	10%	24	7	0	1	0	0	1	7	1	
3	9%	30	7	0	1	0	0	7	7	1	
4	2%	37	4	1	2	1	1	5	6	3	Borderline diet clusters
5	6%	41	7	1	2	7	0	5	6	1	
6	15%	55	7	0	2	0	0	4	7	7	
7	5%	40	7	0	4	0	0	5	3	1	Acceptable diet clusters
8	9%	54	7	0	6	0	1	7	7	1	
9	4%	57	7	3	4	0	0	6	7	3	
10	6%	62	7	1	5	2	7	5	7	3	
11	8%	75	7	0	5	7	0	7	7	6	
12	14%	77	7	0	7	0	0	7	7	7	
13	4%	76	7	7	4	4	1	5	6	4	
all	100%	51	7	1	3	1	1	5	6	3	

Create Food Consumption Groups (FCGs):

Step 5. Create the three Food Consumption Groups (FCGs), using the titles 'poor', 'borderline', and 'acceptable', based on the recommended standard cut-offs of 21 and 35. However, in populations that have high frequency of consumption of sugar and oil the alternate cut-offs of 28 and 42 may be more appropriate (see further discussion in section 9.7 on the cut-off selection). This step is informed primarily by the information/graphs from steps 2 and 4.

Step 6. Categorize the clusters into poor, borderline, and acceptable[9] consumption (based on the judgment of the analyst, as done in step 4 above). Cross-tab these three with the three FCGs. Look to see if an appropriate relationship is achieved (see example below). If a poor relationship is observed, look for the cause (for example, determine if one or both of the analysis methodologies has failed, if the assigning of clusters into the three groups affects the relationship with the FCGs).

[9] Three groupings of food consumption clusters are suggested to facilitate comparison with the three FCGs. However, there creating 2, 4, 5 groups of food consumption clusters, or even all food consumption clusters, could also show interesting results.

Example from Haiti

Percent of cases		Food Consumption Clusters (grouped by analyst)			
		Poor diet clusters	Borderline diet	Acceptable diet	TOTAL
FCGs	Poor	2%	3%	1%	6%
	Borderline	3%	9%	8%	19%
	Acceptable	1%	7%	68%	75%
	TOTAL	5%	18%	77%	100%

Good match	78%
Close match	20%
Poor match	2%

Ideally, a large percentage of households will be a 'good match', as illustrated in the example above and a very small percent (ideally zero) will be a 'poor match'. In this example, 20% of households fall into a 'close match'. The differences in prevalences of the groups between the two methodologies do not necessarily mean that one or the other is incorrect, but in this case simply means that the analyst's subjective judgment differed slightly than the FCGs.

Some household that achieve an acceptable FCS may have a combination of foods that the analyst would still consider borderline. Very often, the FCS is a more conservative indicator (it is less likely to classify households as having poor or borderline diets- a hh has to eat very poorly to achieve a score below the thresholds).

This example can be considered as a validation of the FCS, with the acknowledgement that the cutoffs (for the FCGs and the clusters) are somewhat subjective. **The FCS/FCGs should be used as the core indicator of consumption in this case**, as they also have the advantage of being more transparent, repeatable by other analysts and in other surveys, and based on a standardized reasoning.

Use the FCS, the FCGs, and the Clusters as part of dietary analysis:

Step 7. The three groups (poor, borderline, acceptable) are then considered proxy measures of food consumption, using these descriptive names.

Step 8. The clusters may be used to further describe dietary patterns (for example, maize vs. manioc consumers, or fish vs. red meat vs. milk consumers).

Example from Laos

In Laos, a mix of food items and food groups was used in the cluster analysis. The preference for glutinous rice is clear, with one group that eats white rice, which is an important economic indicator in Laos. Other key dietary patterns come out. For example, most of the population consumes wild fish semi-regularly, as well as domestic meat. Wild meat is commonly eaten by only one cluster.

cluster	% Pre-valence	Glutinous rice	White rice	Non-rice staple	Pulses	Oil	Sugar	Dairy	Wild fish	Domestic meat	Wild meat	Domestic vegs	Wild vegs	Fruit	FCS
2	12.1	7	0	1	0	1	1	0	3	2	0	2	2	1	39
4	8.9	0	7	1	1	4	1	0	2	3	1	3	6	1	44
1	17.3	7	0	1	0	0	0	0	4	2	1	1	7	1	44
3	10.9	7	0	1	0	1	1	0	4	2	0	6	7	1	45
11	8.6	7	0	0	0	5	1	0	2	5	0	5	7	3	52
6	9.3	7	2	6	0	1	2	0	6	5	1	5	7	2	53
5	13.8	7	1	1	0	2	3	0	6	5	0	5	6	1	55
9	4.7	7	1	2	1	2	2	0	5	4	6	5	6	3	57
7	6.1	7	2	3	1	4	6	0	6	6	0	6	7	5	62
8	4	6	2	2	7	2	1	0	4	4	1	4	7	3	67
10	4.2	7	1	2	1	4	5	7	5	5	1	5	6	3	87
TOTAL	**100**	**6**	**1**	**2**	**1**	**2**	**2**	**0**	**4**	**4**	**1**	**4**	**6**	**2**	

7. Validation of the FCS and FCGs as a proxy indicator of Food Security.

In the initial creation and testing of the FCS and FCG indicators, analyses were run on many datasets from a wide variety of situations to validate the FCS against other indicators of food consumption and food security. It was consistently found that the FCS well correlated with other indicators of food consumption and food security.

This analysis can be run in order to provide an internal validation of the FCS and the FCGs. These steps are not *required* in food consumption analysis, but they are recommended, where possible, to provide further support of the indicator. The steps proposed are only one way of providing a validation but other validation techniques are also possible.

If the validation is positive, the FCGs are considered proxies for Food Security groups. However, this proxy is only based on CURRENT consumption, and does not account for seasonality or vulnerability to future shocks which could threaten future consumption and food security status. Additionally, it does not account for the sustainability of the sources of food. Other indicators should also be considered to put the results of the food consumption analysis into context.

Validate the FCS and the FCGs:

Step 9. Run verifications of the FCS and FCGs by comparing them to other proxy indicators of food consumption, food access, and food security (Cash expenditures, % expenditures on food, food sources, CSI, wealth index, asset index, number of meals eaten per day, harvest and production indicators, etc.). The continuous FCS and the categorical FCGs should be explored.

Examples from Burundi and Mali

In this example, simple correlations were run comparing the FCS and other food consumption and food security proxies. The strength of the relationship, the direction, and the significance are all considered. The correlations presented here are considered typical, although they vary greatly by country and context.

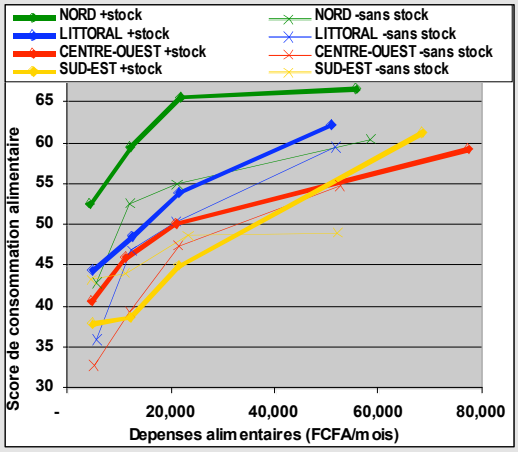
Correlations with FCS comparing FCS to other food security proxies		
Burundi		
kcal/capita/day	Pearson Correlation	**0.31**
	Sig. (2-tailed)	<0.01
CSI score	Pearson Correlation	**-0.27**
	Sig. (2-tailed)	<0.01
% total cash expenditures on food	Pearson Correlation	**-0.11**
	Sig. (2-tailed)	<0.01
asset index	Pearson Correlation	**0.24**
	Sig. (2-tailed)	<0.01
total cash monthly expenditures (LOG)	Pearson Correlation	**0.28**
	Sig. (2-tailed)	<0.01
Malawi		
CSI score	Pearson Correlation	**-0.30**
	Sig. (2-tailed)	<0.01
No. of assets	Pearson Correlation	**0.40**
	Sig. (2-tailed)	<0.01
No. of means (adults)	Pearson Correlation	**0.33**
	Sig. (2-tailed)	<0.01
Total per cap. Cash exp. (LOG)	Pearson Correlation	**0.31**
	Sig. (2-tailed)	<0.01

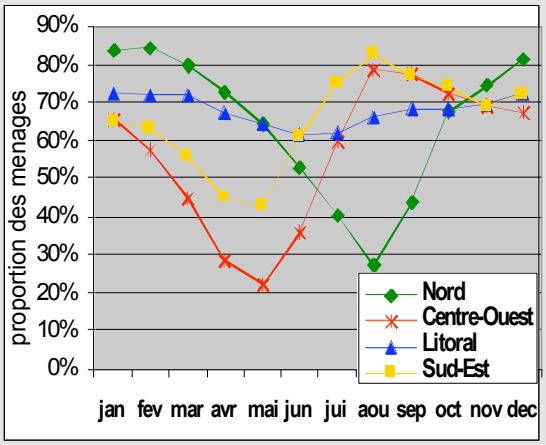
Step 10. If the above step does not provide a strong validation, additional factors should be explored. For instance, do different seasonal patterns within a country affect the FCS? Does the combination of different wealth groups or livelihood groups cloud the relationship with the FCS? This step can use a variety of techniques, from simple graphing or splitting the data file to observe groups separately, to complex multiple regression analyses. This step also continues beyond simple validation, and into the further analysis of the underlying factors of diet quality and food insecurity.

Step 11. Answer the question: when accounting for seasonality, is the FCS/FCGs a comprehensive and usable proxy indicator for food security? The acceptance of the FCS in a specific dataset is a subjective choice based on all preceding steps. A positive validation can be used to justify the use of the indicator with partners. If the results of this validation negate the FCS, other proxy indicators of food security should be used- however, this situation has yet to be observed.

Example from Cameroon

The Cameroon CFSVA initially found poor correlations between the FCS and other food security proxy indicators (such as wealth and expenditure indicators). Before rejecting the FCS as not working as a proxy for Food Security, further analysis was undertaken. To better compare the FCS to total cash expenditures, the households were split up by region and by whether or not they had stock available. This data was then graphed.





It can be seen in this graph that for these 8 groups, the relationship between cash expenditures and FCS is strong, and that a similar slope is observed in each group. However, the y-intercept for the groups varies widely, which diluted the observed relationship when looking at the population as a whole.

The FCS indicator identified the North and the Litoral, regions typically thought to be more food insecure than other parts of the country, as better off in terms of consumption. To explain this, the differing seasonal cycles between the regions were explored. The graph above shows the percent of households reporting having stock by month of the year. The Survey took place in the month of May. During this month, the Centre-Ouest and the Sud-Est both are observed to be in a lean season, where as the other areas appear to be in a better situation with regards to stock availability.

Once these factors were accounted for, the FCS could then be validated. It accurately captured the 'current' food security status. It is also likely that it is capturing these differing seasonal trends, and so must be interpreted in this light.

8. Considerations when using the FCS/FCGs in non CFSVA contexts

The FCS/FCGs may be used in contexts other than CFSVAs, such as EFSAs or FSMS, or other follow up surveys where the in-depth analysis characteristic of a CFSVA may not be appropriate or possible.

When conducting an Emergency Food Security Assessment (EFSA), or a Food Security Monitoring System, there may be limited time and resources available for data analysis and exploration. Additionally, there may be pre-existing work (a CFSVA, previous FSMS, or an earlier EFSA) that can inform the data collection and analysis exercise in question. Ideally, this pre-existing CFSVA can also inform the EFSA or FSMS on interpretation of the score, typical dietary patterns, cut-offs to use to create the FCGs, and applicability of the score to the population in question. This will also allow for comparison of the FCS and FCG prevalences as compared to a baseline. When this information is not available to inform the EFSA or FSMS analysis, the judgment of the analyst, using locally available knowledge, will have to be relied upon.

When conducting an EFSA of FSMS survey, there are only two key steps absolutely required in the analysis:

1. Create the FCS (see the calculation guidance in section 5)
2. Create the FCG based on the FCS and the appropriate cut-offs, creating three groups (poor, borderline, and acceptable)

In an EFSA, where time and expertise is available, the additional steps as proposed for a CFSVA should be included to allow for a more in-depth analysis of the data.

In a FSMS, information that allows the tracking of the quality and make-up of the diet may be used in addition to the FCS and FCGs to track changes over time.

9. Discussion on key points of the FCS/FCG

Below are some key points of the FCS/FCG described in more detail, including certain justifications why certain choices were made in developing the methodology, and areas where the standard is less fixed or less clear.

9.1 Food consumption data collection module

The following table presents an EXAMPLE of the Food Consumption module, which should be adapted to each context.

The question should be phrased like the following[10]:

*I would like to ask you about all the different foods that your household members have eaten in the **last 7 days**. Could you please tell me **how many days** in the past week your household has eaten the following foods?*
(for each food, ask what the primary source of each food item eaten that week was, as well as the second main source of food, if any)

Food item	DAYS eaten in past week (0-7 days)	Sources of food (see codes below)	
		primary	secondary
#.1 – Maize			
#.2 – Rice			
#.3 – Bread/wheat			
#.4 – Tubers			
#.5 – Groundnuts & Pulses			
#.6 – Fish (eaten as a main food)			
#.7 – Fish powder (used for flavor only)			
#.8 – Red meat (sheep/goat/beef)			
#.9 – White meat (poultry)			
#.10 – Vegetable oil, fats			
#.11 – Eggs			
#.12 – Milk and dairy products (main food)			
#.13 – Milk in tea in small amounts			
#.14 – Vegetables (including leaves)			
#.15 – Fruits			
#.16 – Sweets, sugar			

Food source codes:

Purchase =1	Own production =2	Traded goods/services, barter =3
Borrowed = 4	Received as gift= 5	Food aid =6
Other (specify) =7		

[10] This example is not final, and will be updated and further detailed in the forthcoming VAM Questionnaire Design guidance.

Sources of food are gathered in order to obtain a more comprehensive understanding of the HH food availability and access[11]. Most of the time households complement their main access to a particular food through a secondary source. Listing 2 sources does not take much extra time to the enumerator and provide important additional information (especially in case of food aid). Emphasizing the difference between the primary source and the secondary source will allow analysis of either just the primary source, or of both sources. The module is designed to collect food sources linked directly to the different food items/groups. However, the analysis of the food source data is not presented here.

9.2 Food items and food groups

The food items/groups listed in the questionnaire can be categorized into 9 main food groups (see section 4): cereals, starchy tubers and roots; legumes and nuts; meat, fish, poultry and eggs; vegetables (including green leaves); fruit; oils and fats; milk and dairy products; and sugar/sweets. Condiments are considered separately (see 9.9).

VAM collects information on some single food items within these groups because there might be interesting economic or well-being information coming from the consumption of certain items compared to consuming other ones.

In this sense, the list should be detailed enough to distinguish between items with different economic meaning (beside the nutrition information). On the other hand, too many foods would confuse the respondent because detailed recall is difficult over a 7-day recall period.

Generally, the list of food items/groups surveyed is between 10 and 25.

The food item list should be customized paying particular attention to cereals/grains, cereal-made food like bread or couscous, or other staples which have important different economic meaning. Knowledge of the local food habits as well as nutritional considerations must inform the creation of the list of foods.

The list of food items chosen is somewhat flexible. Although the analysis is not meant to allow specific statements on micronutrient consumption, it does not prevent this from being considered. For example, the DHS has a module for collecting information on Vitamin A and Iron rich foods eaten the previous day. Although the VAM food consumption module does not collect a 1-day recall (typically), it can be modified to collect information that might be more compatible with the DHS food groups. Another example is the FAO dietary diversity scale, which is based on slightly different food groups. If this indicator is desired additionally, these food groups can be respected. However, analysis of these indicators is not presented here.

When modifying the list of food items/groups, one should consider the potential compromise in certain contexts, for example, if these groups are not culturally appropriate or understood, it could lead to misidentification or double counting of certain foods, or confusing the respondent with the inclusion of foods that are not consumed in that area.

Additional biases are inherent in the tool. For example, a survey instrument that gathers the consumption of maize and manioc separately will double count the frequency of starch consumption in cases where these foods are eaten in combination. An increase in the number of food items/groups used (and later collapsed into the food groups for the FCS calculation) will thus bias the score upwards. This is somewhat controlled for by limiting the number of food items/groups in the questionnaire (see section 9.2), and by limiting the upper

[11] this data will be triangulated with other food access/sources data, as the 7-day recall data does not account for seasonal variation.

limit of the food frequency of any single to group to a maximum of 7. It could be argued that, in certain situations, eating 3 types of meat in a week (for example) resulting in a consumption frequency of 3 for meat (regardless if the 3 types of meat were eaten during 1, 2, or 3 days) is generally better than eating only 1 type of meat during 3 days of the week. However, this remains an inherent weakness of the tool.

9.3 Measuring and estimating actual quantities of food eaten

VAM does not recommended gathering information on actual quantities eaten in this module, for several reasons:

- The inclusion of food groups in the list (vegetables, fruit, etc.) will prevent the accurate calculation of caloric contribution of that group.
- The time and skill required to ask the questions on actual amounts consumed, while providing useful data, is too demanding of time and enumerator capacity for most surveys.
- The bias in recalling the actual amounts eaten is generally accepted to be much greater than recalling the number of days the food/food group is eaten.

In general, measures of food consumption diversity and frequency are correlated with caloric intake as well as micronutrient intake[12]. Initial results indicate the same to be true for the FCS, and additional studies are exploring this further to better quantify the relationship between these indicators (see section 10).

This addition of a separate module to measure quantities of food consumed may be of interest in some contexts, however.

9.4 Recall period for food frequency and diversity

VAM advises a recall of 7 days to ensure both good time coverage and "reliability" of respondent's memory. According to practical data collection experience (WFP and others), 7-day seems to be the most appropriate recall period to capture information about household's habitual diet, taking into account the limits given by possible seasonal consumption.

A recall period longer than 7 days has proved to be problematic as difficulties in remembering what was prepared appear to increase.

A shorter recall period would risk missing foods served habitually but infrequently at the household level, for example on market days, Fridays (in Muslim areas), or Sundays (in Christian areas); or it would overestimate the consumption if the survey is done over those special days. The solution of introducing a control question "Was yesterday a celebration or feast day where you ate special foods?" is not appropriate in term of analysis for two main reasons. The first is statistical: that control question would divide the sampled households into 2 categories reducing the valid number of households for the statistical estimate and thus increasing the confidence interval of that estimate. Second, if the solution to exclude special days and instead to ask the household to describe a recent 'normal' day, then this affects conflicts with the definition of what we aim to measure, i.e. household's current habitual diet. The argument that special days are to be excluded from the estimate of the household consumption has to be rejected. Special days and weekly or normal days are both part of the normal household consumption, required to estimate habitual diet. Not including special days into the analysis would result in an underestimation of household food consumption.

[12] IFPRI Food Consumption Score Validation (forthcoming), TUFTS Dietary Diversity Report.

Of course, long periods of special diet days like Ramadan, other fasting periods or special long festivities must be avoided because the 7-day recall would represent household dietary habits for that exceptional period only.

An additional benefit of increasing the recall period (assuming little increase in recall bias) is a decrease in inclusion/exclusion error when categorizing households into FCGs. While at the population level, inclusion and exclusion errors are assumed to equal out, some descriptive power may be lost with a decreased recall period. For example, a household that eats meat 2 times per week may have only 0 or 1 for consumption yesterday. If meat consumption is randomly distributed throughout the week, then 2/7 of households eating meat twice a week will have a response of 'yes' for a 1-day recall, and 5/7 of households will have a 'no' for a one day recall. A decrease in inclusion/exclusion error will also strengthen the statistical relationship between the FCS and FCGs and other indicators.

9.5 Food frequency- Number of days vs. number of times

The dietary diversity & food frequency approach aims to estimate whether the household manages to access items from the basic food groups in their habitual diet. Number of days of consumption out of the reference last 7 days (week) is intended to track potential regularities in the consumption habit.

The number of *times* would mask or confuse regularities because eating meat 3 times a week could mean: 3 days consuming once per day, 2 days of which 1 day consuming once per day and 1 day consuming twice per day, or 1 day consuming 3 times. The fact that 1 unique piece of information collected could result in different possible interpretations is not appropriate for the aim for the module: detecting regularities of consumption. Of course, the fact that households might consume a particular food item just once within a day or more frequently cannot be estimated through this module.

9.6 How the weights were determined

When creating a composite scoring system for dietary diversity (with or without the added dimension of food frequency), the choice of weights is obligatory and subjective. Weights are typically constant across analyses in order to have a better degree of standardization of the tool. For example, in the HDDS (Household Dietary Diversity Score) described by FANTA[13], the weight of each of the food groups is 1, giving equal importance in the calculation of the HDDS to the sugar/honey group and meat/poultry/offal group.

The determination of the food group weights as described in the calculation of the FCS is based on an interpretation by a team of analysts of 'nutrient density'[14]. This concept has been applied in other dietary diversity indicators, such as that used by SADC[15], C-SAFE, as well as researchers in Zambia[16]. Although subjective, this weighting attempts to give greater importance to foods such as meat and fish, usually considered to have greater 'nutrient density' and lesser importance to foods such as sugar. It is not yet known if these weights are appropriate universally. However, at this time it is recommended that the weights remain constant to provide a more standardized methodology. As research continues, further support may be lent to these weights, or it may be found best to modify them in either a universal or context specific manner.

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[13] Household Dietary Diversity Indicator Guide for Measurement of Household Food Access, v.2, FANTA 2006

[14] 'nutrient density' is a term used to subjectively describe a food group's quality in terms of caloric density, macro and micro nutrient content, and actual quantities typically eaten.

[15] Southern African Development Community

[16] FHANIS/CSO (Food, Health and Nutrition Information system/Central Statistical Office). 1998. FHANIS Urban Report: Monitoring of the Household Food Security, Health, and Nutrition in Urban Areas, Lusaka, Zambia: Central Statistical Office.

The guiding principle for determining the weights is the nutrient density of the food groups. The highest weight was attached to foods with relatively high energy, good quality protein and a wide range of micro-nutrients that can be easily absorbed. Currently, the weights recommended by VAM are calculated based on the following logic:

Food groups	Weight	Justification
Main staples	2	Energy dense/usually eaten in larger quantities, protein content lower and poorer quality (PER[17] less) than legumes, micro-nutrients (bound by phytates).
Pulses	3	Energy dense, high amounts of protein but of lower quality (PER less) than meats, micro-nutrients (inhibited by phytates), low fat.
Vegetables	1	Low energy, low protein, no fat, micro-nutrients
Fruit	1	Low energy, low protein, no fat, micro-nutrients
Meat and fish	4	Highest quality protein, easily absorbable micro-nutrients (no phytates), energy dense, fat. Even when consumed in small quantities, improvements to the quality of diet are large.
Milk	4	Highest quality protein, micro-nutrients, vitamin A, energy. However, milk could be consumed only in very small amounts and should then be treated as condiment and therefore re-classification in such cases is needed.
Sugar	0.5	Empty calories. Usually consumed in small quantities.
Oil	0.5	Energy dense but usually no other micro-nutrients. Usually consumed in small quantities
Condiments	0	These foods are by definition eaten in very small quantities and not considered to have an important impact on overall diet.

An additional benefit of the weights is that the score is 'stretched', allowing for a more truly continuous score, which gives greater flexibility in analysis. The unweighted score would have a possible range of 0 to 56. The weighted score has a range of 0 to 112.

9.7 How the FCG cut-offs were selected, and what it means to change them

Two standard thresholds have been identified to distinguish different food consumption level.

A score of 21 was set as barely minimum, scoring below 21, a household is expected NOT to eat at least staple and vegetables on a daily base and therefore considered to have poor food consumption.

- The value 21 comes from an expected daily consumption of staple (frequency * weight, 7 * 2 = 14) and vegetables (7 * 1 = 7).

[17] PER Protein Efficiency Ratio, a measure of protein quality of food proteins.

The second threshold was set at 35. Between 21 and 35, households are assessed having borderline food consumption, while households that score above 35 are estimated having acceptable food consumption.

- The value 35 comes from an expected daily consumption of staple and vegetables complemented by a frequent (4 day/week) consumption of oil and pulses (staple*weight + vegetables*weight + oil*weight + pulses*weight = 7*2+7*1+4*0.5+4*3=35).

FCS	**Profiles**
0-21	Poor
21.5-35	Borderline
> 35	Acceptable

A perhaps more relevant concern deals with the theoretical expected food consumption patterns at the two thresholds and the actual measured ones in a given population. The graph in section 6 shows an example from Laos of food frequency of the different food groups.

The threshold of 21 was selected based on one assumption of dietary patterns.

However, in this example, staple and vegetable consumption was found to be the base of the diet across all the households- but the progressive increase of the FCS was not due to oil (fats) and pulses (vegetable proteins) consumption as assumed in the original creation of the 21 threshold, but to a somewhat linear increase in the consumption of animal protein items (in terms of days per week, up to a FCS of 50).

A more extreme (and theoretical) example would be a population who eats milk and starches as a base diet, introducing vegetables, fats, and other foods only when milk and starch consumption is already frequent. The question then arises- is 7 days of milk and 4 days of starch consumption (giving a score of 36) in the absence of other food groups truly an acceptable diet?

A score of 21 or 35 can be achieved through several different dietary patterns, but no matter what the dietary patterns of a population, an increase in the FCS of a household means an increase in the dietary diversity and/or frequency of consumption of one or more food groups- particularly those groups with larger weights. Those with very low scores tend to be heavily affected by an increase in food frequency only. Once the base diet is achieved, an increase in diversity allows for an increased score. In other words, new food groups must be introduced to the diet to have an increase score.

VAM recommends the consistent use of these suggested cut-offs, but recognizes the caveat that scores may not be universal. Populations such as pastoralists or others with specific diets should be carefully studied when creating the FCS to see whether the cut-offs are appropriate. Much of this data exploration will be achieved using the cluster analysis.

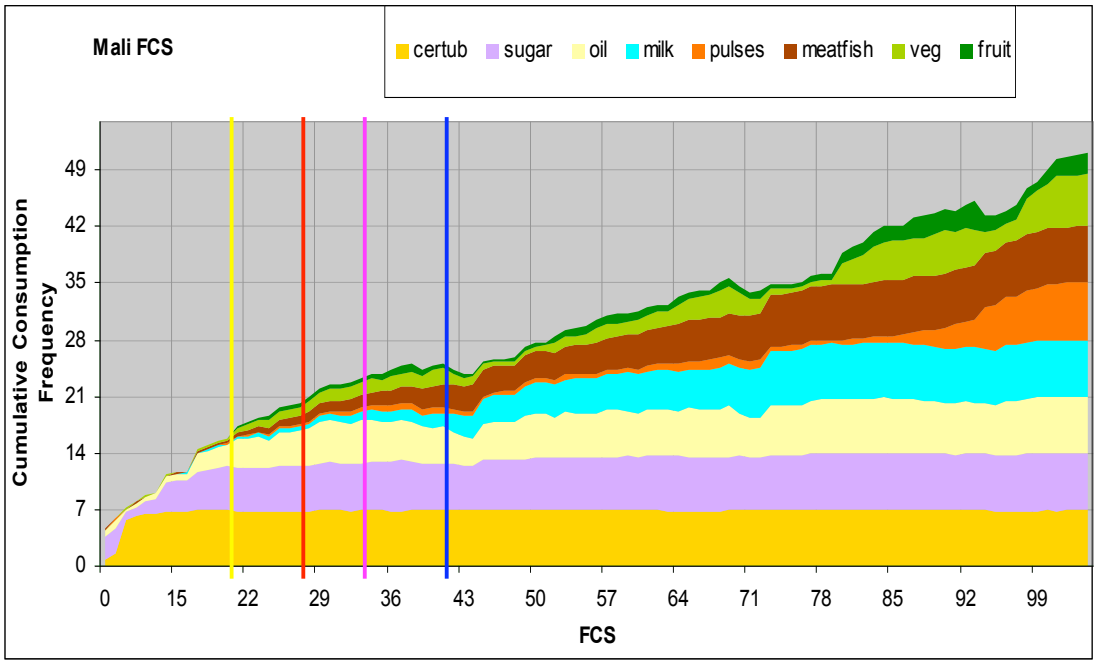
9.8 Issues with sugar and oil and changing the thresholds.

A commonly encountered complication is found in populations where consumption of sugar and/or oil is frequent among nearly all households surveyed, even when the consumption of other food groups is rare and the food score is otherwise low. In the example show in the graph below, from Mali, we see that the consumption of oil and sugar reaches 7 days per week before any other food group except for

starches. Although both oil and sugar are weighted 0.5, combined this has the effect of giving all households a base FCS of 7. If this base diet of oil and sugar is combined only with frequent (7 days) consumption of starch base, the score already arrives at 21. However, this clearly cannot be classified as even a borderline diet.

To deal with this possible situation, several options exist. If through the cluster analysis, the population is found to homogeneously consume oil and sugar nearly daily, the thresholds for the three consumption groups can be raised from 21 and 35 to 28 and 42 (by adding 7 to each threshold, this accounts for the daily consumption of oil and sugar which gives 7 points to the FCS). These new thresholds should then be compared again to the cluster analysis to see if this better categorizes the different observed diet patterns.

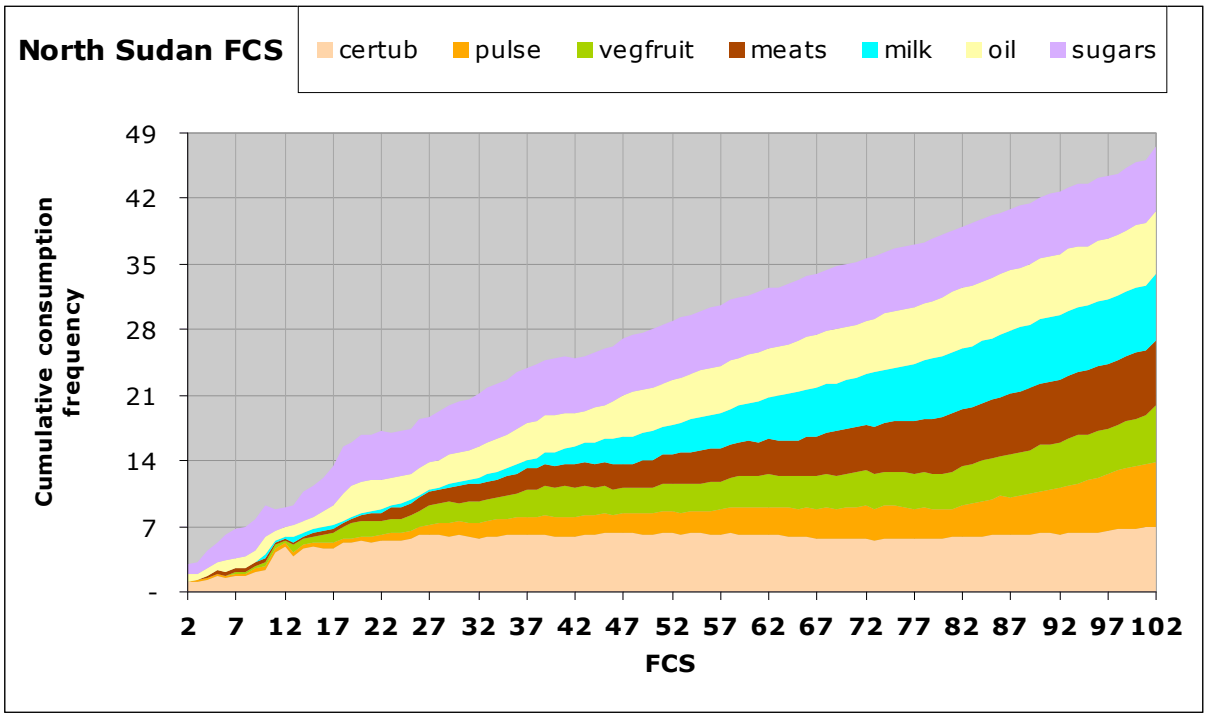
In this example from Mali, graphed below, the 2 sets of alternate thresholds are presented.

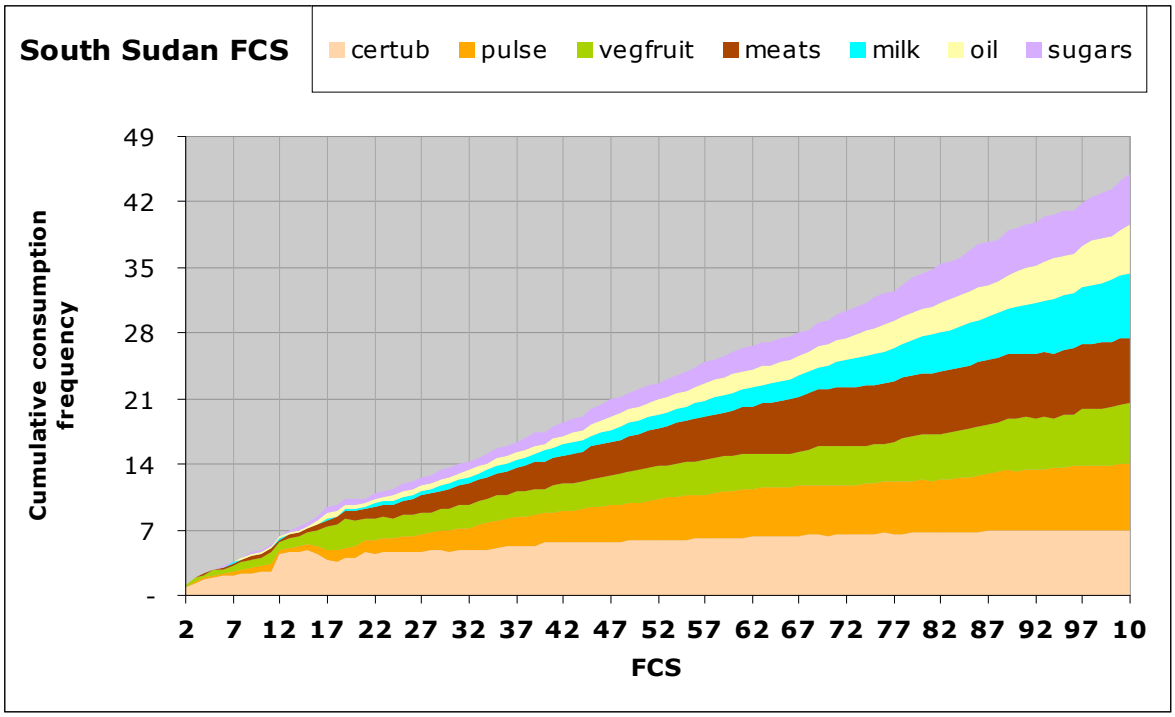


It is clear here that a score of 21 reflects an average consumption of only starches, oil, and sugar- with very few other foods. The alternate cut-off of 28 still reflects this frequent consumption of oil, sugar, and starches- but there is a slightly higher average consumption of other food groups.

The approach of changing the thresholds will not work in populations which display a heterogeneous pattern of oil and sugar consumption. For example, in the Sudan CFSVA, it was found that the households in the north eat sugar and oil on a near daily basis even when the remainder of their diet is very poor. However, in the south the consumption of oil and sugar was correlated with increased consumption of other food groups (see graphs below). In this case, it was decided to eliminate the consumption of oil and sugar in the calculation of the FCS and to use the cut-offs of 21 and 35. This clearly introduces a downward bias in the score and disregards the importance of oil in the diet. However, it allows a smoother comparison between the FCS of these populations.

Dietary patterns by Food score: North and South Sudan





These choices in the modification of the thresholds, particularly in the case of sugar and oil, should be made only in extreme and well justified circumstances. The change of cut-off can otherwise be viewed as subjective, and potentially as an incorrect attempt to increase (or decrease) the reported prevalence of poor food consumption in a population.

9.9 Effect and how to handle condiments in data collection and in analysis

The questionnaire should properly account for food items that are consumed in very small quantities- here referred to as condiments. For instance, if a pinch of fish powder is added to the pot, this should be treated as a condiment rather than as a day's consumption of fish. The same logic would be used for a teaspoon of milk in the tea, a shred of bush meat used for flavor in a stew, etc.

To address this in data collection, the items known to be eaten as condiments should be identified during questionnaire design. These condiments should be listed as separate food items. For example 'fish eaten as part of a meal' and a separate item 'fish used in small amounts for flavor'. The enumerators should then be clearly trained to distinguish between the two. Weight cut-offs to distinguish between use of a food as a condiment or as a main food are not used during data collection with the interviewees, however, a weight cut-off may be appropriate when providing instructions to enumerators.

In analysis, these condiments are NOT included in the calculation of the FCS (they have a weight of 0). However, the data may be of use in the description of the diets, or as an indication of relative wealth or a corollary of better diet (for example, a drop of milk in tea may not contribute greatly to the diet- but it may only be consumed by those with more cash availability or those with generally better diets).

10. Papers on the FCS and Upcoming validation studies.

WFP is currently undertaking (or has contracted out) studies to validate this FCS. These include:

- Tufts University is working with ODA (VAM and ODAN) undertaking an analysis of several datasets to compare kcal consumption with different measures of dietary diversity.
- IFPRI is conducting data collection and analysis in two countries to compare true food consumption (measured in detail using actual weights/amounts of foods) to the 7-day recall data.
- VAM is working on a re-analysis of several datasets to compare the 7-day recall data to estimated kcal consumption values.
- VAM is assisting FAO in analysis comparing of 1-day and 7-day dietary diversity scores and the FCS.
- VAM ODK is finalizing a secondary data review to provide better guidance in the collection and analysis of consumption data of pastoralist populations.