Wealth Index

- To define the wealth index
- To explain how to identify the appropriate variables to include in the wealth index
- To present how to create the wealth index
- To show how to present the wealth index
- To describe the use of the wealth index in the food security analysis

1. Definition of wealth index
2. Selection of the variables
   - Analysis of the available variables
   - Creation of new variables
3. Creation of the index - PCA
4. Creation of 'ntiles' of wealth index
5. Graph the wealth index

Wealth is the value of all natural, physical and financial assets owned by a household, reduced by its liabilities.

The wealth index (WI) is a composite index composed of key asset ownership variables; it is used as a proxy indicator of household level wealth.

To construct the wealth index we need all the indicators that allow us to understand the level of wealth of the household.

Productive assets	Non productive assets	Households amenities	Other
Handmill Sickle Axe Livestock Hoe Tractor Plough Etc..	Radio Refrigerator TV Bicycle Motorbike Phone/cell phone Chair Table Bed Etc..	Types of: – Water supply –Toilet – Flooring – Walls/house – Roof – Electricity –Cooking fuel –Light source	Persons per sleeping room Number of rooms Land ownership Livestock

The indicators selected should all be proxies capable of distinguishing relatively "<u>rich</u>" and relatively "<u>poor</u>".

➢ Run and exploratory analysis on the variables that you have collected:
  ➢ Rules of thumbs: variables with a prevalence below 3-5% or higher than 95-97% should be excluded from the analysis;

➢ Recode the household amenities variable into improved / not improved
  ➢ For sanitation facilities and source of water use the UNICEF/WHO standards

IMPROVED	UNIMPROVED
Drinking water sources	**Drinking water sources**
Household connection Public standpipe Borehole Protected dug well Protected spring Rainwater collection	Unprotected well Unprotected spring Rivers or ponds Vendor-provided water Bottled water* Tanker truck water
Sanitation facilities	**Sanitation facilities**
Connection to a public sewer Connection to a septic system Pour-flush latrine Simple pit latrine** Ventilated improved pit latrine	Public or shared latrine Open pit latrine Bucket latrine
*Bottled water is not considered improved due to limitations in the potential quantity, not quality, of the water. **Only a portion of poorly defined categories of latrines are included in sanitation coverage estimates.	

The recoding between improved/ not improved is just one possibility.

The analyst can include only a certain variable/category (only households that have a 'household water connection' y/n) in order to extract/highlight households with a very good water source.

- All the yes/no variables should be recoded in **binary variables**;
  - ➢ 0=no 1=yes

- The variables with more than one category can be:
  - ➢ recode in improved '1' or not improved '0' (when possible);
  - ➢ Recode in binary categories that clearly distinguish 'wealthier' from "poorer".

    Do NOT focus on "intermediate" categories.

Quality of floor

3 possible categories: earth, cement, tiles.

Possible recoding:

      a. earth (0) vs cement or tiles (1)

      b. earth or cement (0) vs. tiles (1)

      c. <u>Don't do</u>: Cement (1) vs other (0).

- The wealth index varies from country to country based on the choice of the variables to include in;

- The construction of the index requires several iterations before the final results are obtained;

- Once the index is created, graph it;

  The graph of the results helps the analyst to determine if the variables chosen are appropriate.

1. To create the Wealth index the Principal Component Analysis (PCA) is used.

2. A PCA is run with all the selected variables;

3. For constructing the wealth index, the principal component (first factor) is taken to represent the household's wealth.

For example:

'When many different measures have been taken on the same person, it is possible to determine if some of these are actually reflections of a smaller number of underlying factors. Factor analysis (PCA) explores the interrelationships among these variables to discover these factors'.

PCA is a 'data reduction' procedure. It involves replacing a set of correlated variables with a set of uncorrelated 'principal components' which represent unobserved characteristics of the population.

The principal components are linear combinations of the original variables; the weights are derived from the correlation matrix of the data.

The first principal component explains the largest proportion of the total variance.

- We include in the PCA all the variables (assets, housing etc) that we think will be appropriate to explain the wealth of the household.

- We run the PCA (in SPSS data reduction – factor)

- The output will show us which are the original variables that contributed to explain/create the first factor.

- The first component is used as wealth index.

vam
wfp food security analysis

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cu
1	3.205	20.028	20.028	3.205	20.028	
2	1.241	7.755	27.783			
3	1.190	7.438	35.221			
4	1.075	6.720	41.941			
5	1.010	6.310	48.251			
6	.961	6.005	54.256			
7	.913	5.705	59.960			
8	.864	5.400	65.360			
9	.817	5.103	70.463			
10	.797	4.983	75.446			
11	.778	4.865	80.311			
12	.716	4.477	84.789			
13	.693	4.330	89.118			
14	.658	4.113	93.232			
15	.571	3.566	96.798			
16	.512	3.202	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

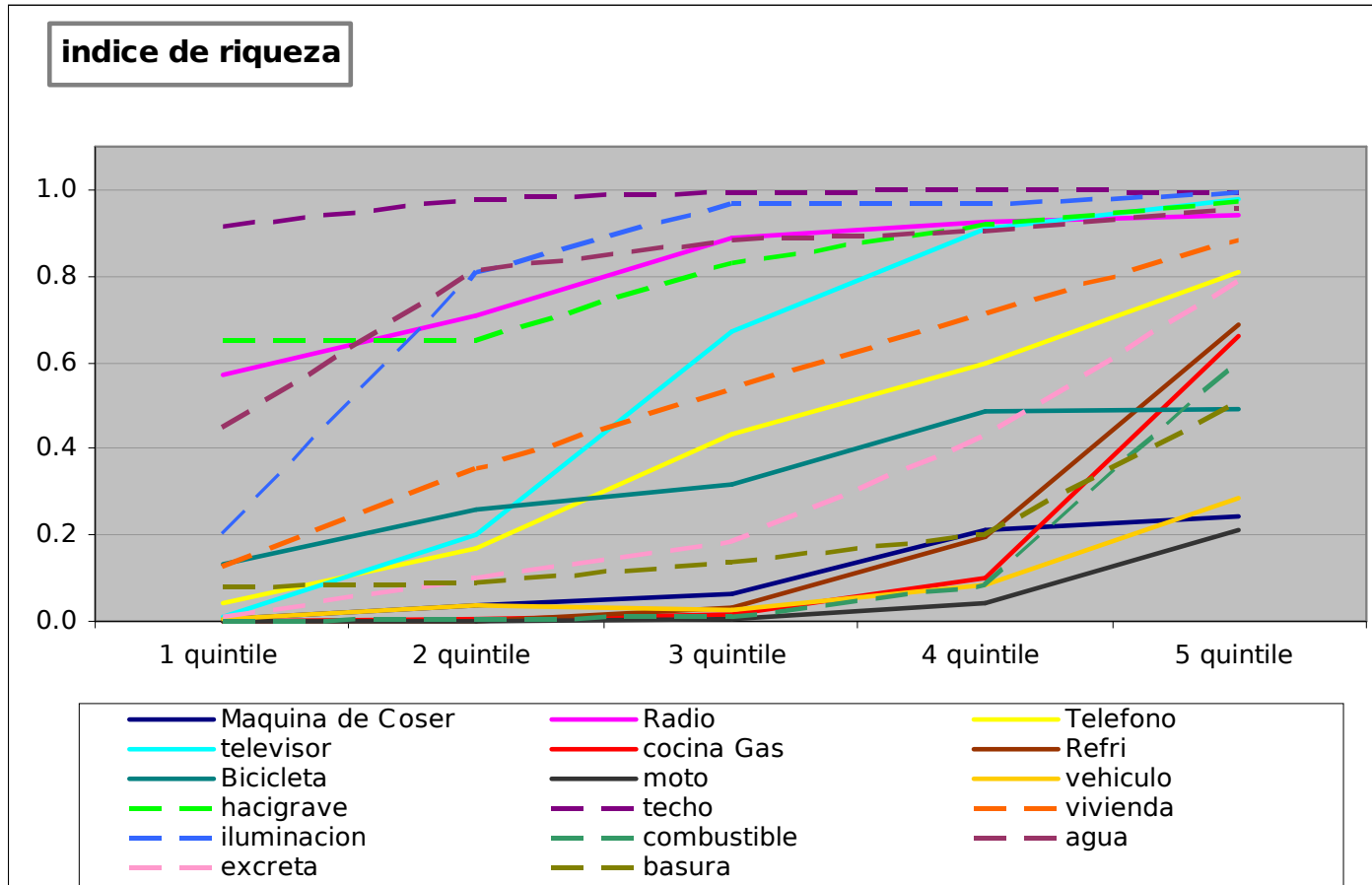|	Component
	1
Armoire Buffet/Bibliothèque	.434
Téléphone Cellulaire	.593
Radio(Récepteur)	.480
Inverter / génératrice	.203
Fer a repasser	.523
Bicyclette	.420
Mobylette /Moto	.159
Voiture/auto/Camion	.192
Lit (matelas, box, sommier)	.299
Table/Chaise	.250
bloc de ciment	.676
clissage et terre	-.485
terre	-.696
toilet.biv	.588
crowding	-.155
eau.biv	.429

Extraction Method: Principal Component Analysis.

a. 1 components extracted.
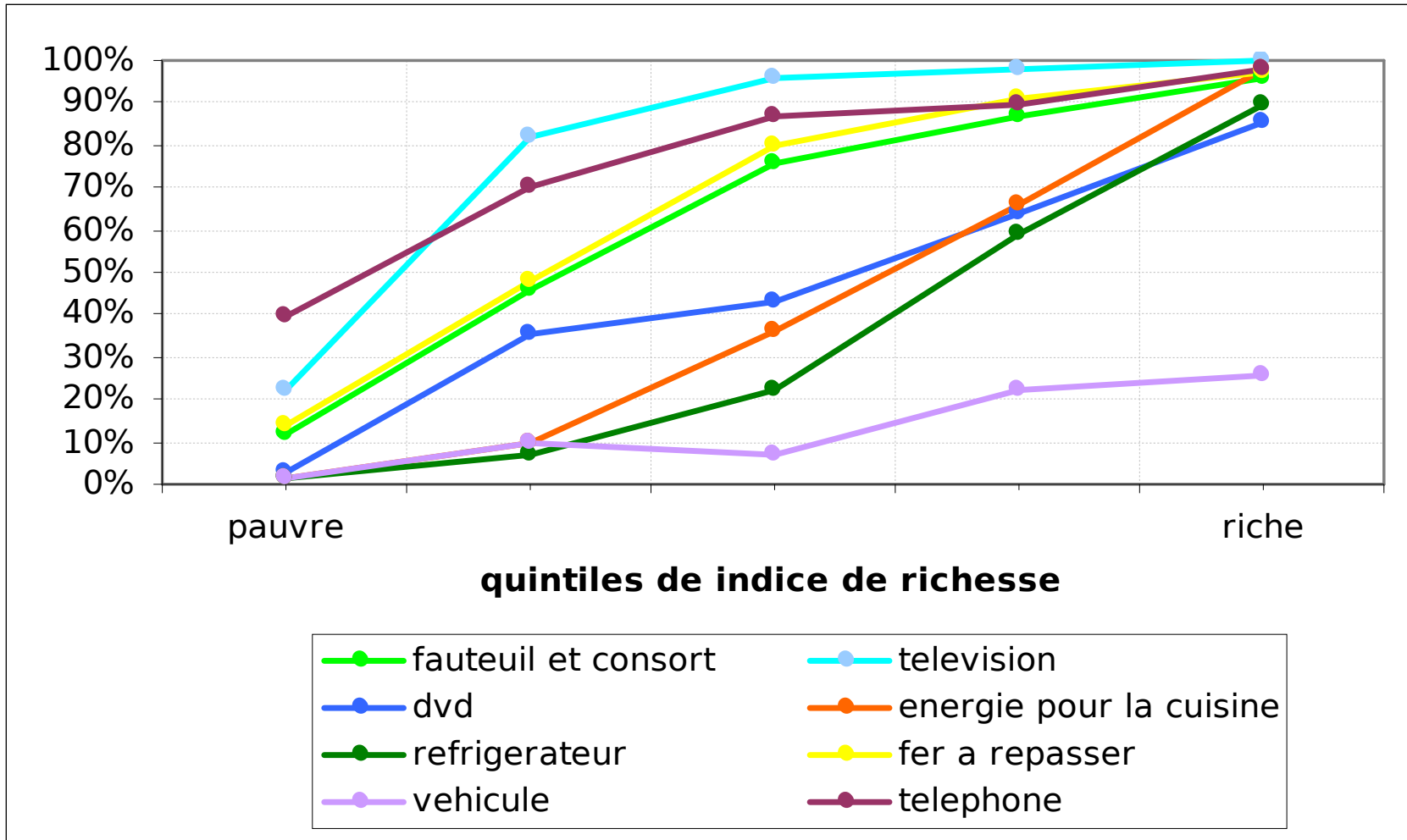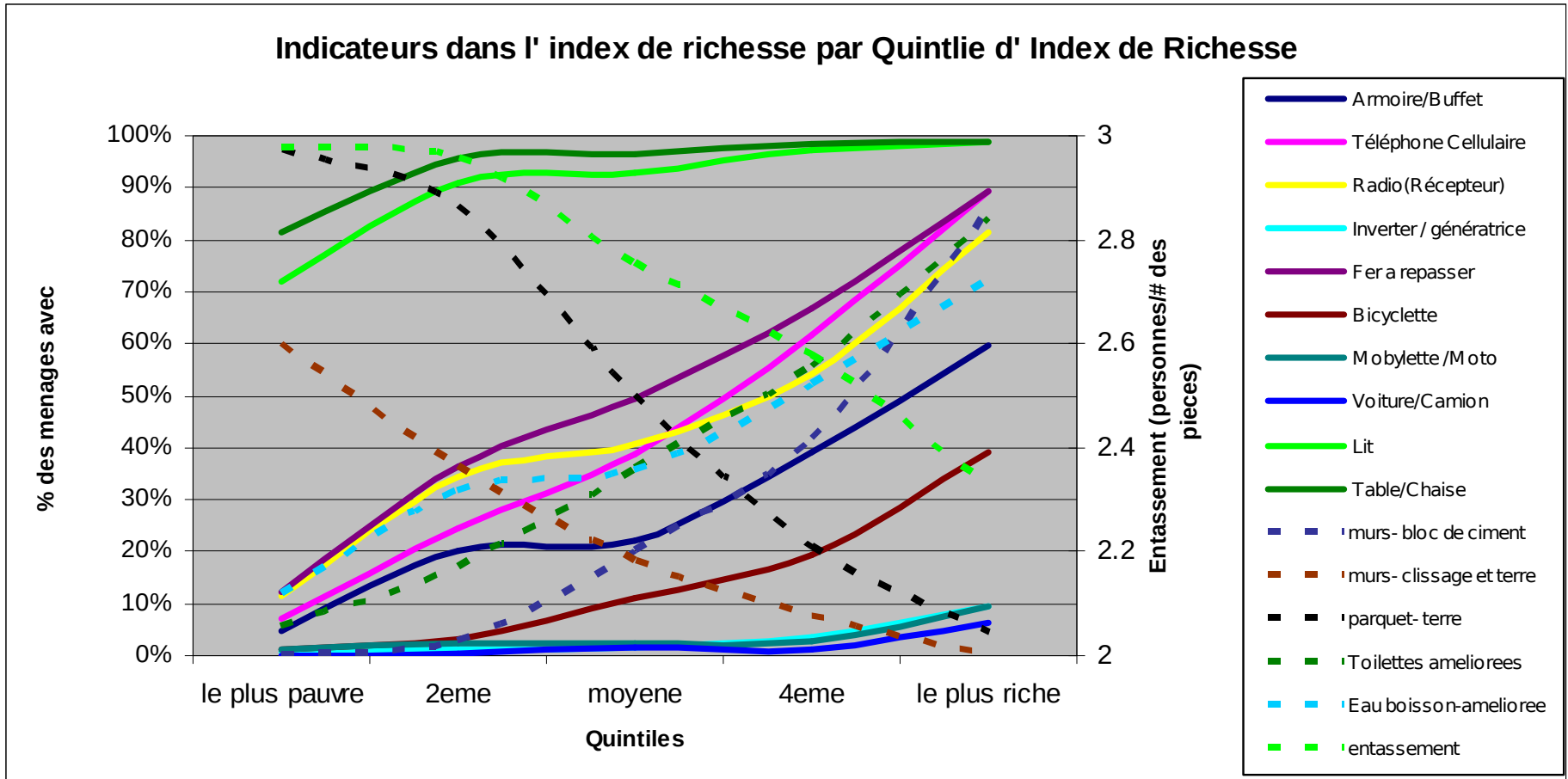
- The wealth index is a continuous variable, in order to graph and understand the index it is useful to recode the continuous variable into a categorical one.
- The best way to do it is to rank the WI into deciles or quintiles or quartiles or terciles.
  In SPSS:
  - Transform
    - Rank cases
      » Rank types – ntiles (specify the number)
  - Be sure your sampling weight is on

1. Graphing the 'ntiles' by the variables included in the PCA will help the analyst to understand if those variables are appropriate for the construction of the wealth index or if it is better to exclude/include other variables.

2. To create the graph run a cross tab between the 'ntiles' and the variables used in the analysis.

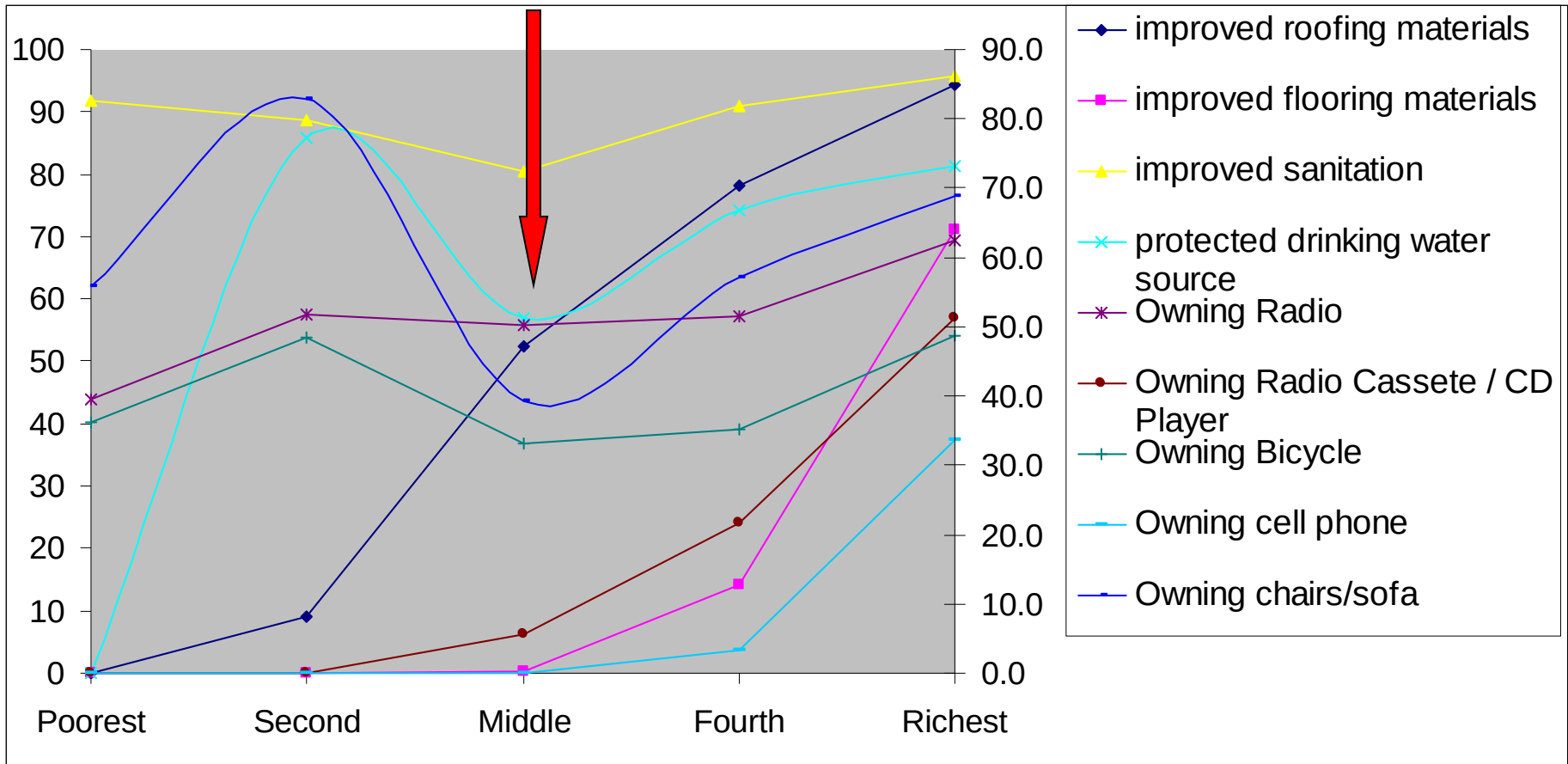3. This graph used is often called the 'spaghetti graph'.

Example from Guatemala CFSVA

vam
wfp food security analysis

quintiles de indice de richesse

- fauteuil et consort
- television
- dvd
- energie pour la cuisine
- refrigerateur
- fer a repasser
- vehicule
- telephone

Indicateurs dans l' index de richesse par Quintlie d' Index de Richesse

Example from Haiti CFSVA

Outputs

- The variables included in the PCA should be always reported in the report (or in the annexes) in order to inform the reader which are the variables used and how they were transformed.

Name of the variable		
Material of the house	1 = concrete or wood	0 = mud or thatch
Roof material	1 = tiles or galvanized iron or concrete	0 = mud or thatch or plastic
Crowding	1 = 5 or less people per room	0 = 6 o more people per room
Type of lighting	1 = electricity or gas	0 = candle or wood
Source of water	1 = piped into dwelling or borehole with pump or protected dug well	0 = pond or unprotected well or
Toilet facilities	1 = flush or ventilated improved latrine	0 = open pit or none (bush field)
Has a sewing machine	1 = yes	0 = no
Has a radio	1 = yes	0 = no
Has a TV	1 = yes	0 = no
Has a stove	1 = yes	0 = no
Has a fridge	1 = yes	0 = no
Has a mobile phone	1 = yes	0 = no
Has a bicycle	1 = yes	0 = no
Has a motorbike	1 = yes	0 = no
Has a car	1 = yes	0 = no

The construction of the index requires several **iterations** before final results are obtained.

- – A rule of thumb to understand if the index created is appropriate is running a correlation between the two latest first factors (of 2 different principal component analyses);
- – If their correlation coefficient is close to 1 (0.998/0.999) that means that the two indicators are very similar and that the wealth indices are very similar.

Correlations

			w ith crow ding	REGR factor score 1 for analysis 1
Spearman's rho	w ith crow ding	Correlation Coefficient	1.000	.989**
		Sig. (2-tailed)	.	.000
		N	2663	2663
	REGR factor score 1 for analysis 1	Correlation Coefficient	.989**	1.000
		Sig. (2-tailed)	.000	.
		N	2663	2663

**. Correlation is significant at the 0.01 level (2-tailed).

Component Matrixa

	Compone nt
	1
Number of poeple per room	-.203
type of floor bivariate	.715
sanitation bivariate	.294
water source bivariate	.288
Owning Radio	.386
Owning Radio Cassete / CD Player	.575
Owning chairs/sofa	.355
Owning cell phone	.583
type of roofing- bivariate	.682

Extraction Method: Principal Component Ana

a. 1 components extracted.

Wealth Index
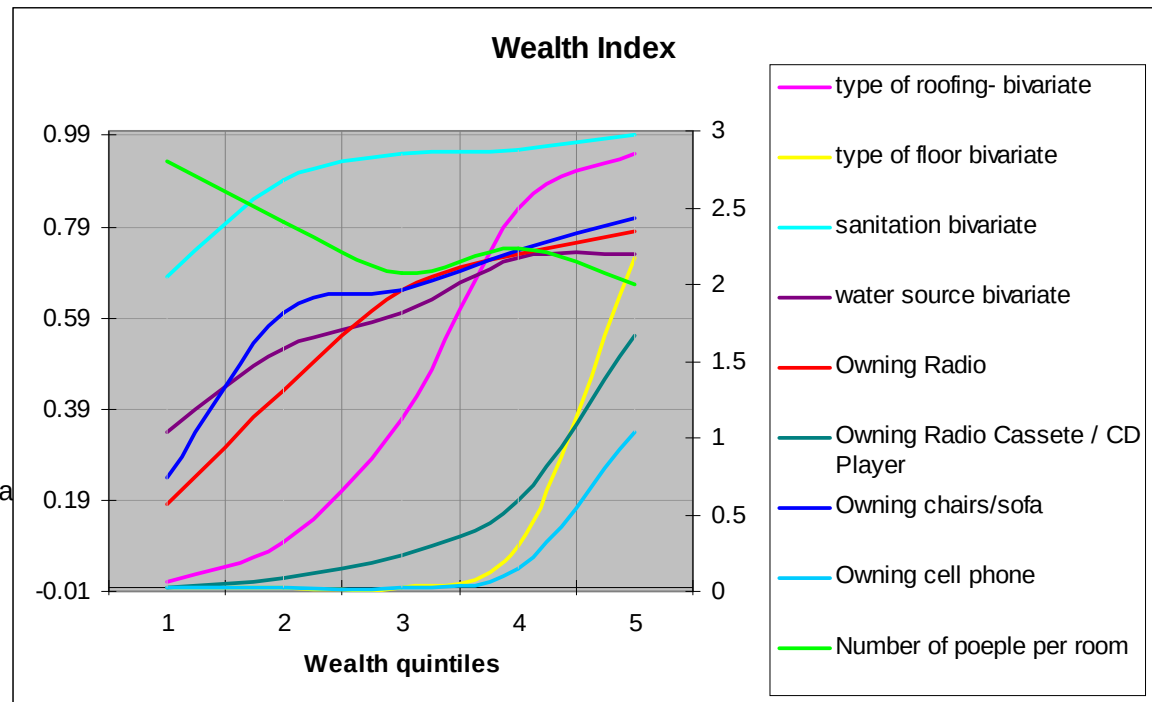
Descriptive analysis: WI is part of household endowments, physical assets.

Food consumption: WI is used to validate the FCS, correlation.

Food access: the WI can be use as proxy for food access.

Targeting criteria: the assets can be used as target criteria to identified the 'poor' households.

Any questions or comments???