Multidimensional Poverty Index of the Refugee Population in Turkey

Background: What is a Multidimensional Poverty Index?

Poverty is usually measured based on the money-metric concept which considers someone as poor if they do not have enough economic resources. This implies that the indicators used to measure poverty are only related to prices and expenditures on goods and services (UNICEF, 2014). However, since the 1990s, multiple methods have been developed to measure poverty. In this paper the focus will be on the Alkire-Foster (AF) Method, developed by Sabina Alkire and James Foster at Oxford Poverty & Human Development Initiative (OPHI). The AF method is a flexible technique for measuring poverty or well-being, (OPHI, 2015). It can incorporate different dimensions and indicators to create measures specific to particular contexts.

Within the AF method, there are several steps required to construct a Multidimensional Poverty Index (MPI) which vary based on the exact methodology used for the creation of the MPI:

- Choice of purpose for the index (monitor, target, etc)
- Choice of Unit of Analysis (individual, household etc)
- Choice of Dimensions
- Choice of Variables/Indicator(s) for dimensions
- Choice of Poverty Lines / thresholds for each indicator/dimension
- Choice of Weights for indicators within dimensions
- Choice of Weights across dimensions

Within the Comprehensive Vulnerability Monitoring Exercise (CVME)[1], MPI have been developed following the AF method, which is used to assess the poverty levels of different groups of households. The CVME data was collected from March to August 2018. It includes responses from 1,301 households; the sampling methodology ensures the data is representative of all refugees living in Turkey. The methodology used to develop and validate the MPI is an iterative process, requiring multiple edits and re-running of various analytical steps. Below is a description of the steps taken to develop the MPI and a summary of the results. For clarity, the description is as linear as possible, but it should be noted that the process is less straightforward than described below.

Methodology

Step 1: Choice of purpose and unit of analysis

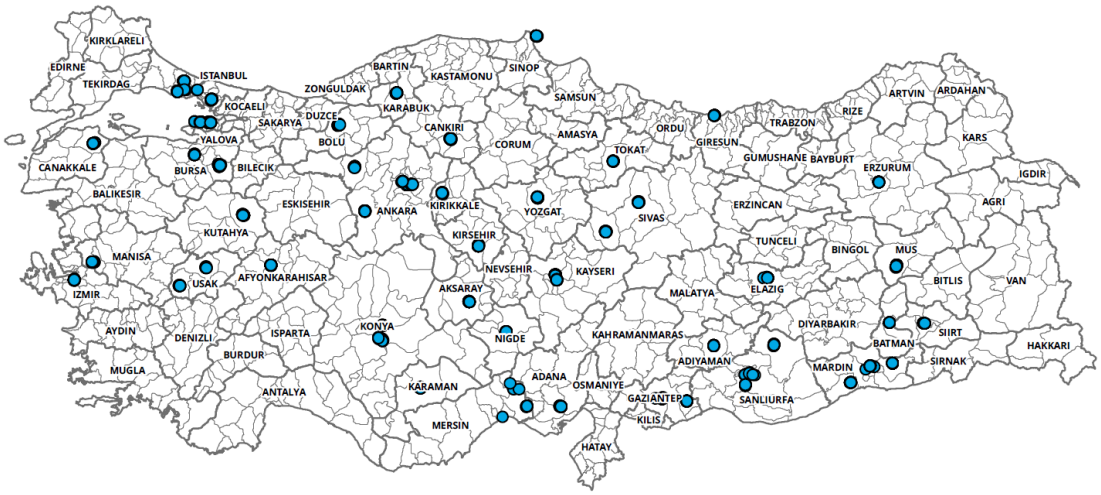
The CVME is an exercise which takes place within the scope of the Emergency Social Safety Net programme, which provides basic needs assistance to refugees across Turkey.[2] The main purpose of the development of the CVME MPI is to understand the vulnerability across the refugee population among

[1] CVME data is collected by WFP Turkey CO periodically for vulnerability assessment purposes.
[2] For more details on the ESSN, refer to https://www.essncard.com/

certain groups. The MPI supports better targeted interventions, as it includes various dimensions of poverty, rather than monetary measures alone.

The CVME is a household level survey – all data is collected at household level. As a result, the the unit of analysis for the MPI is households.

Map. 1. CVME Data Collection Locations



Step 2: Choice of dimensions, variables and cut-off points

***Dimensions*:** The options of dimension to be included in the MPI were constrained by the data availability within the CVME. Most established MPIs tend to include education, health and standard of living as key dimensions. These are fundamental concepts of household wellbeing and are all available within the CVME data, so were therefore included. As food security is also critical to household welfare, this was included as an additional dimension. Finally, as income plays a central role in ability to meet needs among refugee households in Turkey, income resources was included as a fifth dimension. Table 1 lists the dimensions included in the CVME MPI.

Table 1. List of Dimensions

1	Education
2	Health
3	Standard of living
4	Food Security
5	Income Resources

Variables and Cut-off Points: As with other elements of the PCA, the selection of variables and cut-off points is an iterative process. First, all available and relevant indicators within the CVME are listed. All binary variables are kept as is, while continuous variables must be transformed into binary categories. The setting of the cut-off points is a key step, as these serve as the poverty line for each indicator. These dimension-specific deprivation cut-offs serve to identify whether a household is deprived with respect to that dimension (Alkire & Foster, 2011).

Wherever possible, meaningful thresholds are established. For example, an rCSI(Reduced Consumption Coping Strategy Index) value of 18 equates to using every consumption coping strategy

at least three times per week. Another key factor is ensuring that the variable serves to differentiate between the population in a useful way. For example, the crowding threshold of two logically would not make sense, as it means two people sharing a room, which is common between husband and wife. To determine whether to use a threshold of 'above two' or 'above three', the frequencies of both are examined, in order to identify which would be more useful in differentiating between the population.

Frequencies are a key factor in deciding which variables to keep or drop, and which thresholds to establish. If the frequency was above 50 percent, meaning that more than half of the refugee population is deprived, the concerned variable was excluded (or the threshold was increased). One exception was allowed – 61 percent of refugees had a bad quality apartment. This was kept within the list, as it was considered to be a key indicator for measuring living standard poverty.

After the selection of variables for each dimension, a correlation matrix is used to examine the relationships between each variable. Those with too high or too low correlation are removed. Based on these results, indicators were changed or regrouped. This updated list of indicators is then used for the Principal Component Analysis.

Step 3: Principal Component Analysis

Principal Component Analysis (PCA) was used in order to verify the selection of variables within each dimension, thereby validating the internal consistency of the dimension. PCA was used to ensure the variables within a dimension all come together to measure one latent concept (in this case, the given dimension). PCA helps to drop the 'least important' variables while retaining the variables with most explanatory power. The PCA was an iterative process; when some variables were identified as less important, the revised dimensions are then re-checked through PCA until the results are deemed satisfactory.

PCA Results:

- ✓ The PCA results group the variables into multiple components based on their correlation. These component groupings are used to check the dimensions as designed in the MPI. Some variables appeared grouped in their dimension (thereby validating the assumption of including them together, within a single dimension), whereas some variables did not hang together well.
- ✓ The PCA output provides a value to the indicators within each dimension, which provides further insight into the validity of the grouping of those indicators.
- ✓ The PCA results showed the correlation within each dimension and the importance of each variable within the index.

Table 2 below illustrates how the indicators within each dimension were changed through the iterative process and the results of the PCA. Table 3 presents all final indicators with the frequency of deprivation.

Table 2. Indicators before and after PCA

Red text: removed indicator; Green text: added indicator; Orange text: edited indicator

	Before PCA	After PCA
Dimensions	**Indicators**	
Education	Household head with no formal education Absence from school more than a semester	Absence from school because children need to work and/or assist family Absence from school more than a semester Absence because family cannot afford education costs
Health	More than half of the household reported sick Any member not treated when sick	More than half of the household reported sick Any member not treated when sick
Food Security	Household with unacceptable food consumption Household with CSI>18	Household with unacceptable food consumption Household with CSI>18 DDS <6
Income Resources	No skilled or reliable work No household member worked within last 30 days	No income source other than ESSN/other assistance or no income at all Begged Accepted high risk, illegal, socially degrading or exploitative temporary jobs No household member worked within last 30 days
Living Conditions	Crowding above 2 No kitchen in the house No toilet in the house Bad quality apartment No washing machine Insufficient access to any of the items below; water, hygiene items, cooking fuel for cooking	Crowding above 3 No kitchen in the house No toilet in the house Bad quality apartment No sufficient winter clothes Insufficient access to any of the items below; water, hygiene items, cooking fuel for cooking

Table 3. Indicators and Frequencies

Dimension	Indicator	Frequencies
Education	Absence from school because children need to work and/or assist family	**15.22%**
	Absence because family cannot afford to send children to school	**2.91%**
	Absence from school more than a semester	**36.14%**
Health	More than half of the household reported sick	**5.74%**
	Any member not treated when sick	**10.59%**
Food Security	Household with unacceptable food consumption	**11.21%**
	Household with CSI>18	**29.67%**
	DDS <6	**16.36%**
Income Resources	No income source other than ESSN/other assistance or no income at all	**15.67%**
	Begged	**7.48%**
	Accepted high risk, illegal, socially degrading or exploitative temporary jobs	**6.26%**

	No household member worked within last 30 days	**22.73%**
Standard of living	Crowding above 3	**19.13%**
	No kitchen in the house	**8.10%**
	No toilet in the house	**16.38%**
	Bad quality apartment	**60.26%**
	No sufficient winter clothes	**31.20%**
	Insufficient access to any of the items below; water, hygiene items, cooking fuel for cooking	**23.44%**

Table 4 below shows the results of the final PCA. It should be noted that this analysis was run numerous times on different combinations of indicators, but the table below shows only the final results. The table shows the seven components identified by the PCA. The table is then colour coded to show the five MPI dimensions as designed, in comparison with the PCA components. In two cases, the indicators assumed to be within one dimension are split across two components (income resources and living conditions). In one case, an indicator assumed to be in one dimension (CSI within food security) falls under a different dimension (living conditions). However, overall, these results were determined to be acceptable statistical validation that the indicators are grouped in coherent manner.

Table 4. Results of Final Principal Component Analysis

Indicators	**Principal Component Analysis**						
	1.Income Resources	2.Living Conditions	3.Income Resources	4.Education	5.Living Conditions	6.Food Security	7.Health
Engage in risky work	.903						
Begged	.901						
No kitchen		.773					
No toilet		.766					
Crowding index above 3		.546					
No working members in the household			.906				
No income resources			.905				
Absence from school				.839			
Absence from school because children need to work				.738			
Absence from school because they cannot afford				.552			
Lack of access to resources					.686		
CSI above 18					.620		
No winter clothes					.560		
Bad quality apartment		.382			.549		
Unacceptable food consumption						.830	
DDS above 5						.796	
Half of the household got sick							.759
At least one member without medical treatment when sick							.706

In addition to using the PCA to validate the consistency within each dimension, the Cronbach's alpha is used to measure the internal consistency of the overall index. It is considered to be a measure of scale reliability (UCLA, 2019). Essentially, do all the indicators measure one key concept (multidimensional poverty)? According to literature, the acceptable value for Cronbach's alpha is .6 (Taber, 2018). The MPI result had a Cronbach's alpha of .609, indicating acceptable internal consistency of the MPI.

Step 4: Choice of weights for indicators within dimensions

The results of MPI (presented in Table 4) include 'component loadings' for each variable, which are the correlation coefficients between the variables. This value shows that certain variables explain more variance than others. These component loadings are used to inform the MPI weights, to ensure that each indicator is given appropriate consideration in the analysis. The formula below is used to construct weights for each indicator. The formula used to derive the weights includes the component loading, the standard deviation and the frequency of the indicator.

The index is derived is based on the use of principal component analysis (PCA), which summarises inequalities in dotation of assets in the household by assigning a weight to each original variable. This methodology follows the same lines of the World Bank Wealth Index. In order to prevent one variable having an undue influence in the final index, it is common to standardise the variables to have zero means and unit variances. (Vyas & Kumaranayake, 2006). Firstly, the mean, standard deviation and rotated component matrix results for each variable are calculated. Then the formula below is applied to all variables, where x is the yes/no deprivation for the household, W is the component loading estimated with the PCA, sd is the standard deviation and $\bar{x}$ is the mean for the given indicator. The weights applied are a reformulation of this standardisation, with which the prediction of the index reflects the methodology used in the creation of weights. [3]

Formula:

$$\boldsymbol{Index} = \sum_i x * \frac{W}{sd} - \bar{x} * \frac{W}{sd}$$

Table 5. Final Weights

Indicator	Weights
Engage in risky work	3.103312
Begged	3.223474
No kitchen	3.128777
No toilet	2.074711

[3] For additional guidance, refer to page 63 of the OECD Handbook on Constructing Composite Indicators: http://www.oecd.org/sdd/42495745.pdf

Crowding index above 3	1.127008
No working members in the household	1.978666
No income resources	2.302682
Absence from school	1.108287
Absence from school because children need to work	2.055762
Absence from school because they cannot afford	2.729151
Lack of access to resources	1.495609
CSI above 18	1.019044
No winter clothes	0.753059
Bad quality apartment	0.417835
Unacceptable food consumption	2.854307
DDS above 5	2.153084
Half of the household got sick	2.784627
At least one member without medical treatment when sick	2.418447
TOTAL	**34.309395**

A common step in setting the MPI is also setting the dimension weights. In this process, for simplicity, it was decided to use the sum of the indicator weights as the dimension weight.

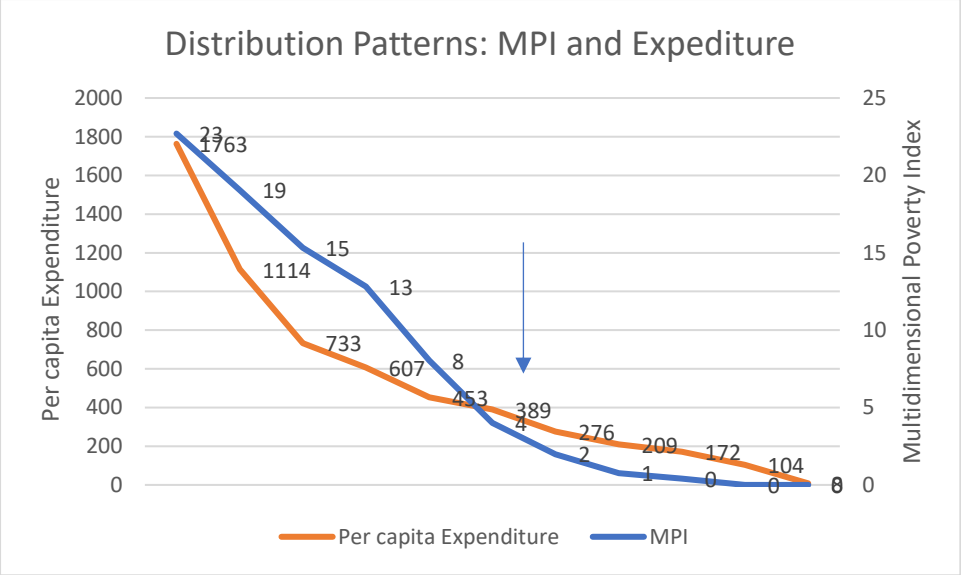
Step 5: MPI Threshold

A final threshold must be set in order to combine the dimensions and determine if a household is considered poor by the overall MPI results. The purpose of the MPI within the CVME is to differentiate between different groups of the refugee population. As such, the distribution of the MPI score within the population is examined to ensure the final threshold is useful for this purpose, allowing for different results and comparison across groups.

There is limited guidance related to setting of thresholds within the MPI, and at times it can feel like a somewhat arbitrary decision. In an effort to validate a proposed threshold of four (i.e. a household with MPI score four or above is considered poor), the distribution of the MPI is compared with the distribution of per capita expenditure. While monetary poverty is different from multidimensional poverty, it seems logical that the two should roughly align. The 2018 poverty threshold was 372 Turkish Lira.[4] An MPI score of four aligns with approximately 389 Turkish Lira. This similarity in poverty classification helps to validate an MPI threshold of four; below this score, a household is considered poor.

Figure 1. MPI distribution among refugee population

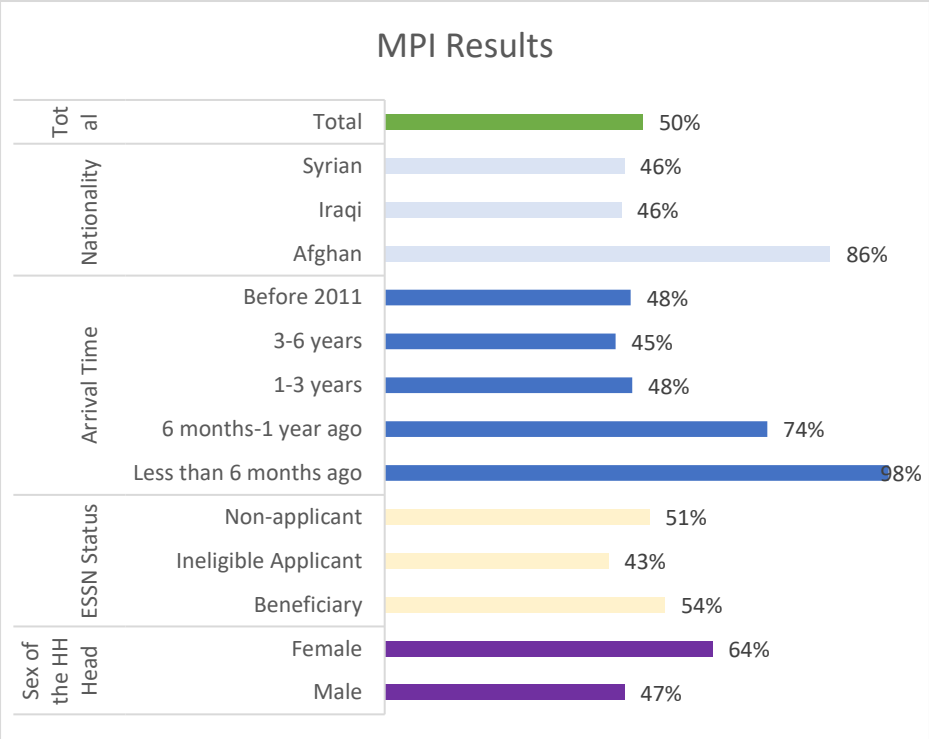
[4] World Bank "Income-Class Poverty Lines" (ICPL) equal to $5.5/day in 2011 purchasing power parity. This figure is converted to Turkish Lira and updated for inflation annually, using data from the Turkish Statistical Institute.



Results

The results of the MPI illustrate the utility of the index in differentiating between groups. As an example Figure 2 shows different stratifications within the refugee population, including nationality, arrival time in Turkey, status within the ESSN programme and the sex of household head. The data clearly demonstrates that some groups are poorer than others, such as Afghans, new arrivals and female headed households. These results can be used in conjunction with other analysis to identify vulnerable groups and make programmatic adjustments.

Figure 2. MPI results among different population groups



In order to measure deprivation from each dimension for certain groups, each dimension is calculated as one. Then, if a household is deprived from at least one indicator, it meant that, the household is

deprived from that dimension. The results below illustrate that living standards dimension is the one where almost all households are deprived from with 86%.

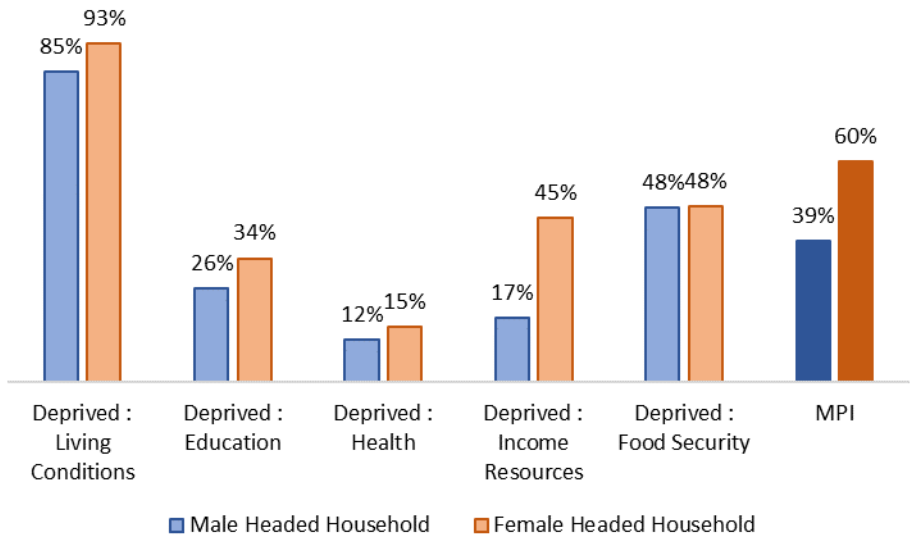
Table 6. Deprivations for each dimension

Deprivations	% of Households
Education	37.2%
Health	14.2%
Income Resources	36.9%
Living Standards	86.9%
Food Security	44.0%

MPI also helps to compare vulnerability of different groups. Below is the example of comparison of male headed households versus female headed households. Results indicate that overall 60% of the female headed households considered as multidimensionally poor compared to 39% male headed households[5].

When all poverty dimensions are looked separately, female headed households are deprived from income resources, health, education and living conditions more compared to the male headed households. Particularly, this indicates the difficulties on finding income resources for female headed households which resulted in absence from school for children, worse living conditions and lack of health services.

Figure 3. MPI by Sex of the Household Head



Discussion & Lessons

[5] These results are from the CVME4 dataset where the data collection took place from August to December 2018.

This paper serves to document one example of establishing and attempting to validate an MPI using data from the refugee population Turkey. In this method, Alkire-Foster method is roughly followed of establishing an MPI and attempt to validate it using factor analysis. Establishing an MPI is part science and part art; it is an iterative process which requires reviewing results and rerunning analyses until the final results are deemed satisfactory. As there is no established methodology for many steps within the process, we have documented our lessons here in order for others to improve in future.

First, there appears to be some conflict between the two methodologies used. The AF method recommends establishing a parsimonious index, avoiding inclusion of indicators with high correlation. However, PCA and Cronbach's alpha check the internal coherence and reliability of the indicators and give higher scores for higher correlation. In the end, we compromised and used recommended components of both methods, however this may require more research in future.

Secondly, some key lessons from this process are documented here. The variables included should be sensitive to change, particularly if the MPI will be used for monitoring purposes. For example, the education level of the head of the household is very unlikely to change, therefore this was excluded from MPI.

For any variable included, it is preferable that all households have the potential to be deprived. For example, inclusion of any livelihoods specific indicators or rural/urban specific indicators should be avoided. As another example, indicators related to children are only relevant to households who have children. Despite this, child-related indicators are kept, however others may choose differently.

It is recommended to avoid using variables with high correlation, essentially to avoid double-counting similar concepts. In our case, a few variables in the final MPI (no working members in the households and having no income resource) still had relatively high correlation, however when removed, the dimensions fell apart within the PCA. As such, these variables were kept. This is also a lesson for the PCA process; small changes can have a large effect on the overall consistency of the dimensions, therefore the PCA should be re-run after any changes, however small.

Overall, the MPI provides a useful indicator to measure household wellbeing across sectors, to identify specific needs, and to compare groups. This paper serves to document lessons learned from development of the MPI among refugees in Turkey, which can be adapted for future MPIs in other contexts.

References

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