Palestine Economic Policy Research Institute (MAS)

Cash Versus In-Kind Assistance:

Statistical Study of a Household Survey in Palestine

Suleiman Rabadi
Awad Mataria

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FOREWORD

The pros and cons of food aid and cash aid are heavily debated in development circles. One area where this debate has significant implications is the adoption of either a 'food-for-work' or 'cash-for-work' system in employment generation programs in distressed areas. The overall goal of the debate is to identify the most efficient form of assistance for helping the poor, vulnerable and food-insecure.

The comparison between food aid and cash aid typically highlights that food aid, unlike cash aid, has potentially negative effects on local production and incentive structures. As a form of humanitarian assistance, food aid has had rather bad publicity as well. It has been seen as a tool to serve the political and commercial interests of donors, and a way to dispose of surplus production from rich countries rather than a genuine response to the needs of the poor in underdeveloped ones.

Yet, although the literature generally favors cash-for-work programs over food-for-work schemes, there are some valid arguments for paying food wages. For example, it was suggested that spending cash wages may lead to higher prices of food products in local markets. This would reflect negatively on the standards of living for the poor who are not involved in the program.

The aim of this study is to help donors identify which of the two forms of assistance best supports the poor and food insecure within the prevailing socio-economic conditions in the Palestinian Territories and the structure of households and poverty profiles in WBGS. To address this topic, the study applies various statistical methods to data from a household survey conducted by the Palestine Central Bureau of Statistics (PCBS). The survey (Palestine Poverty Perception, PPP Survey) covered 2087 Palestinian households and was conducted in 2006.

The study attempts to provide an answer to the 'cash aid-versus-food aid' question using the responses and perceptions of poor families themselves, and by studying the coping strategies adopted by these families when confronted with severe economic and political turmoil. The analysis also provides a good opportunity to focus on the effect family structure and family assets have on coping strategies.

Perhaps the most important message from this study is that there is no single optimal form of support, there is no "one-size fits all". The appropriate mode of assistance may in fact vary at the household level since the welfare of some families could well increase more when they receive in-kind aid rather than cash aid, while the situation for other families maybe the opposite.

On behalf of MAS, I would like to express our gratitude to the Spanish Cooperation (AECID) who funded this study through the Asamblea de Cooperación Por la Paz (ACPP) and for their support of the Food Security Unit in MAS.

Numan Kanafani
General Director

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ABBREVIATIONS

ACCP	Asamblea de Cooperación por la Paz
CAP	Consolidated Appeals Process
CFSVA	Comprehensive Food Security and Vulnerability Analysis
CFW	Cash for Work
FAO	Food and Agriculture Organization
FFW	Food for Work
KMO	Kaiser-Meyer-Olkin test
MAS	Palestine Economic Policy Research Institute
OCHA	Office for the Coordination of Humanitarian Affairs
oPt	Occupied Palestinian territory
PA	Palestinian Authority
PPP	Palestinian Poverty Perception Survey
PCBS	Palestinian Central Bureau of Statistics
PPP	Palestinian Public Perceptions
UNRWA	United Nations Relief and Works Agency for Palestine Refugees in the Near East
WBGS	West Bank and Gaza Strip
WFP	World Food Programme

EXECUTIVE SUMMARY

Introduction

Since the beginning of the second Palestinian Intifada in the year 2000, poverty and food insecurity are on the rise. This is mainly attributed to the complex political emergency, and the dire economic situation, from which the occupied Palestinian territory suffers. Consequently, the part of the population already receiving assistance (76%) is currently heading more and more toward the international community for further assistance. Previous experiences showed that both cash and in-kind relief assistance are essential to alleviating food insecurity and poverty in societies suffering from political and economic hardship. However, aid institutions continue to face the crucial question of whether they should focus their aid programs on cash or in-kind assistance policies – or a combination of the two. Using various multivariate analyses techniques (factor, cluster and discriminate analyses), the present study attempts to develop a tool that would help indicate the best policy to be used in order to maximize the welfare of aid recipients.

Methodology

Factor analysis is used to reduce the number of variables describing a certain phenomenon into a small group of manageable ones; cluster analysis is used to divide the households into determinate groups; and discriminate analysis is used to confirm the classification of households and verify the variables that discriminate and separate the groups. The study uses a household survey conducted in the year 2006, aiming to assess the social and food security status of 2087 households residing in the occupied Palestinian territory.

Results

Factor Analysis

Preliminary testing using the Kaiser-Meyer-Olkin (KMO) measure and the Bartlett's test reveals that the variable list included in the analysis is adequate for factor analysis. Consequently, principle component analysis is used to extract a six-factor solution based on the eigenvalues of the extracted factors (eigenvalue ≥ 1). The results explained more than 70% of the total variance. Varimax rotation was then used to estimate the factors scores and the variables loadings. The analysis led to the selection of the following factors: coping strategies; consumption behavior; household poverty status; type of food consumed; employment/education; and unemployment/place of residence.

Cluster analysis

Results from cluster analysis indicate that the households could be distributed in 5 clusters. Cluster 1 consists of households that are using coping strategies due to political and economic turmoil; and who have changed their behavior of eating because of living in poverty with big families. These households however still depend on their own means to get their wants. With regard to this cluster, public and donor policies should be directed towards both in-kind and cash assistance. Cluster 2 has better values with regard to coping strategies. Households belonging to this cluster did not change their behavior vis-à-vis eating practices. They also live above the poverty line and depend on their own resources for living. This cluster does not seem to need any relief assistance. Households in Cluster 3 are heavily using coping strategies due to the political and economic situation, especially in reducing the quantity and diversity of food consumed. Households in this cluster also suffer from poverty and have big families and they depend on aid and credit a lot. Households belonging to this cluster should benefit from cash and mainly in-kind assistances to support them. Cluster 4 has problems with the first factor (coping strategies). It is similar to the situation of Cluster 3 yet the incidence of poverty is less acute. This is to say, households in this cluster are heavily using coping strategies due to political and economic turmoil, especially buying on credit. Donors are recommended to use cash assistances to support those households. Cluster 5 has problems with the first factor (similar to Clusters 1, 3, and 4). Donors can use both in kind and cash assistances to support the households in this cluster.

Conclusions

Through the analysis, a number of latent problems related to food security were pointed out and the analysis shows a strong relationship between poverty, income and food insecurity. A tool to separate households into different clusters and to design relief policies is possible using multivariate analysis. Households' needs are specified and assistance programs are recommended accordingly. However, details about the exact quantity and the kind of assistance needs more work.

Recommendations:

Further research work is still needed to assess the reasons and consequences of food insecurity in occupied Palestinian territory; to include other potential detrimental factors beside poverty. This shall help inform better assistance policies. Such venture can only be possible with extensive cooperative programs involving all stakeholders at the national level. Creation of aid relief platforms could assist in managing food

insecurity for the benefit of all Palestinians; and help design policies that address food security and development needs at the national level. Further efforts are also needed to localize and adapt the suggested tool on basis of the daily work of donors and local Palestinian partners. Special attention is now needed to take account of the situation of crisis in the Gaza Strip, following the Israeli assault of December 2008.

1. Introduction

Since the beginning of the second Palestinian Intifada in the year 2000, poverty and food insecurity levels have been on the rise. Indeed, the complex political emergency and the dire economic situation of the occupied Palestinian territory (oPt) have largely contributed to increasing rates of poverty and malnutrition across a wide spectrum of Palestinian households (UNRWA, 2009) and (Halabi *et al.* 2008). In April 2008, a Rapid Food Security survey conducted by the World Food Program (WFP), the Food and Agriculture Organization (FAO) and the United Nations for Relief and Works Agency (UNRWA) estimated that around 38% of Palestinian households are food-insecure and that an additional 14% are at risk of becoming food-insecure (WFP/UNRWA/FAO, 2008). Considering some of the characteristics of those who are food insecure, the survey results revealed that camp dwellers are more susceptible than others to be food insecure (while around 44% of camp dwellers are found to be food insecure, "only" one-third (33%) of those living outside the camps revealed to be so). More alarming is the result from some time trend data, where the percentage of Palestinian food insecure households was 34% in 2006 (FAO/WFP, 2007). This means that food insecurity levels have increased by more than 10% over the past two years.

In 2006, the Palestinian Central Bureau of Statistics (PCBS) estimated poverty rates in the oPt at about 57% (PCBS, 2007a), threatening by this the capacity of a wide range of individuals and households to fulfill their daily need of safe and nutritious aliments. This has culminated into a situation where the part of the population already receiving assistance (76%) is now looking more and more toward the international community for further help (OCHA, 2008a). Since then, relief agencies took a leading role in administering food relief programs – providing more than 223 thousands tons food aid in 2007 compared with 56 thousands tons in 2000 (Interfais database). While the many causes of food insecurity in the Palestinian context are easy to sum up, there is a need to probe the different factors that influence and accompany the harsh socioeconomic situation in the oPt. Currently, many public and non-governmental institutions are concerned with studying the phenomenon of poverty and food insecurity in the oPt, its reasons and consequences, in order to adequately offer the policies to alleviate them.

Previous experiences showed that both cash and in-kind relief assistance are essential to alleviating food insecurity and poverty in societies suffering from political and economic hardship. However, aid institutions continue to face a crucial question concerning whether they should focus their aid programs on cash or in-kind policies, or a combination of the two. This is mainly because while the aim of choosing one mode of assistance over the other is to maximize the benefits for the recipient, many funds are distributed without knowing the efficiency and impact of one mode of assistance over the other – the oPt being no exception.

A number of studies have attempted to analyze relief programs and examine their effects on Palestinian households and the Palestinian economy in general. In summary, most of those argued for or against one policy or another, through developing different models, conducting empirical analysis, or just describing the current situation, which is also essential to understand the volume and effectiveness of these programs[1]. United Nations' agencies are among the most productive institutions in this aspect. The European Union, World Bank and a number of local NGOs also tackled these programs and have their own publications[2]. In this study, among the different existing studies, one empirical study will be addressed in some details for its close relation to the aim of the present study.

Misaaglia *et al.* (2004) designed a computable general equilibrium model to measure the effects of food-for-work programmes relative to cash-for-work programmes in the West Bank and Gaza. The study compares the potential economic effects of spending a hypothetical amount of $ 375 million either in form of food or cash. The study concludes that direct distribution of food leads to a greater increase in welfare (rise in consumption), but this comes at the expense of domestic production (of food, other agricultural produces and public services) and long-term growth. The article therefore argues that direct cash support for labour-intensive projects will lead to better economic outcomes on the long run than food distribution programs.

While the reasons behind food insecurity are different, there is no doubt that poverty and food availability are two main factors behind food insecurity. In the current political and economic situation of the oPt, poor

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1 For more details see Gentilini (2007), Gentilini (2006), Coate (1989), Faminow (1995), WFP (2007).

2 See OCHA's reports. HU http://www.ochaoPt.org

people are unable to satisfy their needs of food. Therefore, assistance is needed to cover their basic requirements and maintain an acceptable level of welfare. Much can be found on food security updates, with the aim to serve the audience and donors by offering the needed information about the food security situation. This study differs in its approach and analysis techniques, where it tries to build a useful model to be used locally in allocating cash and in-kind assistance.

The study is the result of many meetings held between the Palestine Economic Policy Research Institute (MAS), the Asamblea de Cooperación por la Paz (ACCP), and the Food and Agriculture Organization (FAO) trying to find out a model/ a tool to indicate the best aid program to be used in the oPt. Taking in consideration the lack of data specifically designed and collected to fulfill this aim, attempts were made to make the best use of available secondary data and pre-conducted surveys to provide some elements of response to the above question, hoping that the results from our study would help enhance the value-added of food security related programs in the oPt. Given the current emergency and conflict situation, this paper tries to advise policymakers on best aid program policies to implement in the oPt. Using various multivariate analyses techniques, a tool is built to indicate the best policy in use, or to be used, in order to maximize the welfare of aid recipients. Consequently, the present study attempts to respond to the following two research questions:

1. Which assistance policy would be most useful in the Palestinian context: i.e., in kind assistance, food assistance, or a combination of both?
2. What are the potential target groups for relief programs? and which category of households would benefit most from the different types of assistance programs?

The study is based on conducting a factor analysis on 17 variables, representing the economic, social and food security status of 2087 households residing in the oPt who participated in a household survey conducted in the year 2006. The factor analysis aimed to reduce the group of variables into a smaller number of manageable components, which are then utilized in subsequent cluster and discriminate analyses to group the examined households into different clusters, each with special intrinsic characteristics suitable to define the preferences and needs of the household.

The study is organized as following. After the introduction with the presentation of the two main research questions of the study, chapter two is designed to synthesis some of the literature related to the study, spotlighting the relation between poverty, food security, and aid assistance as related to the oPt. The last section in the chapter presents the methodology of the study. Chapter three focuses on the logic, usefulness and technical aspects of Factor Analysis, Cluster Analysis and Discriminate Analysis. These methods of analysis are then applied on a Palestinian household survey (2006). Chapter four presents the characteristics of the five household clusters deduced from the statistical analysis and presents the main results from the various hypotheses testing exercise. The study concludes with a series of recommendations for policy makers in chapter five.

2. Background and Methodology

Since the outbreak of the *Intifada* in September of 2000, the political and economic situation of Palestinians living in the oPt has steadily eroded by Israeli policies. This drove the economy of the country into its worse level since the war of 1967 and the beginning of the occupation. Moreover, in January of 2006, the adverse reaction of the international community to the formation of a Hamas-led government in the oPt brought further deterioration to the economic situation, when international assistance to the Palestinian Authority was almost completely interrupted. As a result, incidence of poverty and food insecurity increased. Accordingly, due to the drop in income, 66.8% of Palestinian families declared that they reduced spending on food and clothes. The reduction in spending included the quantity and quality of the food consumed: 95.4% of people reduced the quality of food they consumed and 81.8% reduced the quantity. A similar situation applied to other areas such as housing, health and education (PCBS, 2006). This section of the report discusses the interrelation between poverty, food security and aid assistance, with an example of a recent study that share some commonalities with the object of the study in hand.

2.1 Poverty

In the years 2007-2008, the United Nations Development Programme (UNDP) classified oPt among nations enjoying an average (or middle) human development attainments, measured by the Human Development Index (HDI = 0.731); i.e., in better position than neighboring countries. While such a measure remains important in setting the differences between countries, it does not fully reflect the internal socioeconomic conditions of the oPt. Indeed, harsh Israeli policies have affected the development of social and economic aspects of the territory, and undermined Palestinians' state of welfare. The lack of job opportunities, confiscation of land, the separation wall and the hundreds of checkpoints, all caused a sharp decline in economic activities and increased unemployment and poverty.

Accordingly, in 2007, poverty rate based on income levels was 57.2% (45.7% in the West Bank and 79.4% in the Gaza Strip). Deep household poverty using the income measure was estimated at 46.3% (34.1% in the West Bank and 69.9% in the Gaza Strip) (PCBS, 2007b). In addition to the lack of income, which deprives people of their basic human needs, there are also social consequences to poverty. The most obvious are those related to household welfare. Poverty undermines the ability of households

to provide its members, especially children, with adequate housing, food, education and health. For poor households, the priority is usually providing the basic needs of their members such as food. Other priorities including education and health care are therefore impossible to meet due to lack of income.

Under the current political situation, Palestinians are unable to exchange their labor or assets for food through market exchanging rules. In 2008, unemployment in the oPt reached 31.5% (23.2% in the West Bank and 49.1% in the Gaza Strip) (PCBS,2008). With the sharp cut in income, due to high unemployment rates, most families have been economically affected and the consumption of basic needs like food has deteriorated. Sources of additional income from friends, distant relatives and banks among other sources also declined due to the deteriorating situation. Many modest income households started selling household items and jewelry, private property, reduced spending, delayed enrolling in higher education along with delaying the payment of bills among other measures. It is foreseen that further alarming deteriorations would be felt more acutely once such methods of coping begin to diminish.

Therefore, today in the local context, poverty is becoming one of the main reasons behind people's misery. Consequently, by addressing its causes, one would be able to shed the light on one of the reasons behind food insecurity. In this investigation, poverty is considered a serious reason behind people's inability to get their needs and wants, and an important reason for not satisfying their daily intake of food.

2.2 Food Security and Relief Assistance

Food security refers to the situation where all people have adequate means to obtain secure and nutritive food to live a healthy and active life. This refers to a fundamental human right of different dimensions which include; availability, stability, access and safety of food (World Food Summit, 1996). Unfortunately, in the Palestinian context these conditions are not met. The resources to provide or fulfill the food needs of a nation should be diverse. Those remain essential to ascertain food security. On the national level, the availability of sufficient food for all population means: a state of sufficient production of food on the national level, sufficient importation, and enough food stocked to satisfy the consumption necessities of the entire population – at least for a short period of time. Otherwise, food could be inadequate and would lead to the phenomenon of food insecurity.

In 2006, a Comprehensive Food Security and Vulnerability Analysis (CFSVA) concluded that only 34% of the population of the oPt are food secure, 20% marginally secure, 12% vulnerable to becoming food insecure, and 34% are food insecure (FAO/WFP, 2007). Moreover, food insecurity levels have risen from 34% in 2006 to 38% in 2008 as stated earlier. The common factors behind food insecurity on the personal level include: poverty, which influences the means of obtaining sufficient food; and unemployment, which reduces the income of households and hence their ability to consume. Furthermore, there is the existence of political or economic turmoil that hinders the production and distribution of food, and which, also hinders the process of supply and demand that the market administers. The latter remains very valid to what goes on in the case of the oPt.

Table (1) shows the difference in food security between different governorates in the West Bank and the Gaza Strip. In the West bank, governorates in the North are the one that suffer the most. Nablus and Tubas show the highest food insecurity levels, mostly due to the closure regime. The rest of the governorates have quarter of the population vulnerable and food insecure. On the other side, the Gaza Strip has an alarming indicator with half of the population being food insecure (FAO/WFP, 2007).

Table 1: Percentage of Food Security Groups by Governorate, 2006

District	Food Insecure	Vulnerable	Marginality	Food Secure	Total
Jenin	22.01	11.52	25.83	40.65	100
Tubas	38.19	9.63	22.69	29.49	100
Tulkarm	29.14	9.82	31.13	29.91	100
Nablus	37.38	11.24	21.24	30.14	100
Qalqilya	28.85	12.52	24.42	34.21	100
Salfit	28.45	7.19	14.38	49.97	100
Ramallah	21.06	11.04	24.76	43.14	100
Jericho	11.83	10.10	38.13	39.94	100
Jerusalem	23.90	8.99	17.98	49.13	100
East Jerusalem	1.50	0.00	2.81	95.69	100
Bethlehem	22.09	14.19	19.24	44.48	100
Hebron	28.46	18.19	27.24	26.05	100
N. Gaza	63.51	12.76	12.64	11.09	100
Gaza	51.46	11.76	15.37	21.40	100
Dir El Balah	48.20	13.36	21.22	17.22	100
Khan Younes	53.38	11.12	12.94	22.56	100
Rafah	52.82	14.58	14.30	18.31	100
Total	**34.30**	**11.65**	**19.63**	**34.44**	**100**

Source: FAO/WFP, 2007.

Moreover, a recent report indicates that Palestinian children are suffering high malnutrition incidence in the Gaza Strip. The report says that the heavy restrictions on all major sectors of Gaza's economy, compounded by a cost of living increase of at least 40 percent, is causing "progressive deterioration in food security for up to 70 percent of Gaza's population". The same report adds that "Chronic malnutrition is on a steadily rising trend and micronutrient deficiencies are of great concern" (Red Cross, 2008).

Accordingly, Palestinians are dependent on international agencies to obtain their needed food in many areas of the oPt. In 2008, donors provided more than $ 172 million for food security programs alone, to ease incidences of malnutrition (CAP, 2009). Moreover, data indicates that the external assistance reduced overall official household poverty from 34.1% to 30.3% of all households in the oPt – a decline of 11.6 percent in relative terms (PCBS, 2007).

2.3 Methodology

The present study applies various analysis methods; factor analysis is used to reduce the number of variables into a group of manageable ones; cluster analysis is used to divide the households into determinate groups; and discriminate analysis is used to confirm the classification of households and verify the variables that discriminate and separate each group. Technical information on the particularities of each of the mentioned multivariate analysis techniques is provided in the Annex.

Factor analysis is a multivariate statistical method whose primary purpose is to define the underlying structure in a data matrix. It is used to identify a relatively small number of factors that can be used to represent relationships among sets of many interrelated variables. Factor analysis is an interdependent technique in which all variables are simultaneously considered, each related to all others, using a linear composite. In factor analysis, there are no dependent variables; all are considered independent variables. Hence, using this technique does not aim to predict the cause-effect relationship within variables. The aim of factor analysis is to simplify multiple and complex relations that could exist between a set of observed variables $X_1, X_2, X_3 \ldots, X_p$ through finding common dimensions or factors that combine the apparent unrelated variables. Mainly, the analysis tries to find a group of factors that are not directly observed F_1, F_2, $F_3, \ldots, F_k$ and which can sufficiently explain the observed variables, with

the minimum amount of lost information. This is conducted in the simplest possible manner, which could be easily interpreted by a small number of K (Hair 1999). The factor analysis consists of four main stages – calculation of the correlation matrix of all variables to be used in the analysis; the extraction of factors; the rotation of factors in order to obtain a more understandable factor structure; and finally, the interpretation of the results.

The current study will use data from a household survey; namely, the Palestinian Public Perceptions (PPP) conducted in the year 2006 and covered 2087 Palestinian households selected from all over the West Bank and the Gaza Strip (PCBS 2006). To conduct the empirical analysis, 17 variables were chosen for their close relationship with the incidence of food security and for their availability in the household survey – those are listed below:

Variables Determining Food Insecurity

1. Family income
2. Educational level
3. Level of poverty
4. Household poverty line
5. Number of people in the household, including children
6. In the past 30 days: Worry that your household would not have enough food
7. In the past 30 days: One or more household member eating a limited variety of foods due to a lack of resources
8. In the past 30 days: Any household member eating food they preferred not to eat because of a lack of resources to obtain other types of food
9. Coping Strategies: Buying on credit
10. Coping Strategies: Reducing the quantity of food
11. Consumption of food item: Red meat - sheep/goat/beef (main source of food)
12. Consumption of food item: Vegetables (main source of food)
13. Consumption of food item: Fruits (main source of food)
14. Unemployment duration of main breadwinner
15. Place of residence
16. Coping Strategies: Not paying some bills (water, electricity, etc.)
17. Coping Strategies: Reducing expenses

3. Analysis and Results

3.1 Factor Analysis

The stages of factor analysis consist of the following

3.1.1 Calculation of the correlation matrix of the variables used in the analysis

The Kaiser-Meyer-Olkin (KMO) test and Bartlett's test are the two statistical tests commonly used to assess the presence of correlations among the introduced variables. The Bartlett's test provides the statistical probability that the correlation matrix has significant correlations among at least some variables. A significant result ($p<0.05$) indicates that the null hypothesis H_0 of the correlation matrix being an identity matrix (that is, all diagonal terms are 1 and all off-diagonal terms are 0, which indicates the absence of any correlation) would be rejected; and the alternate hypothesis H_1, which signifies that the correlation matrix is not an identity matrix would be accepted. The Kaiser-Meyer-Olkin (KMO) test consists of an index that compares the magnitudes of the observed correlation coefficients to the magnitudes of the partial correlation coefficients. Small values for the KMO measure indicate that a factor analysis of the variables may not be a good idea, since correlation between pairs of variables cannot be explained by the other variables. Kaiser (1974) characterizes measures in 0.90's as marvelous, in the 0.80's as meritorious, in the 0.70's as middling, in the 0.60's as mediocre, in the 0.50's as miserable, and below 0.5 as unacceptable. Results from the two tests are presented in Table 2 below. A KMO value of 0.765 indicates that the matrix of correlation is adequate to continue with the factor analysis.

Table 2: KMO and Bartlett Test on the 17 variables selected for analysis

Test		Results
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.765
Bartlett's Test of Sphericity	Approx. Chi-Square	11817.53
	Df	136
	Sig.	0

3.1.2 Extraction of Factors

After deriving the correlation matrix, it is important to identify the underlying structure of relation. To do so, the principle component analysis method is used to extract the factors, where linear combinations of the observed variables are formed. Linear combinations of variables are useful for maximizing the distance between group means in a multivariate space. It is also useful for characterizing or accounting for the variation (spread) of each dimension in a multivariate space. The first principle component (linear combination) is the combination that accounts for the largest amount of variance in the sample and the second principle component accounts for the next largest amount of variance and is uncorrelated with the first. Successive components explain progressively smaller and smaller portions of the total sample variance and are independent of one another.

Table 3: **The total variance among variables included in the analysis**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.630	27.236	27.236	4.630	27.236	27.236	2.986	17.567	17.567
2	1.846	10.857	38.093	1.846	10.857	38.093	2.661	15.652	33.219
3	1.662	9.774	47.867	1.662	9.774	47.867	1.992	11.716	44.935
4	1.613	9.488	57.355	1.613	9.488	57.355	1.836	10.800	55.734
5	1.248	7.340	64.695	1.248	7.340	64.685	1.391	8.180	63.914
6	1.152	6.774	71.470	1.152	6.774	71.470	1.284	7.555	71.470
7	0.756	4.447	75.917						
8	0.723	4.251	80.168						
9	0.666	3.915	84.083						
10	0.568	3.342	87.426						
11	0.484	2.849	90.275						
12	0.477	2.804	93.079						
13	0.433	2.544	95.624						
14	0.360	2.117	97.741						
15	0.267	1.570	99.310						
16	0.104	0.614	99.924						
17	0.013	0.076	100.000						

Extraction Method: Principal Component Analysis.

In Table 3, the total variance is presented. The first column presents the components or the factors, the second is the initial eigenvalues, the third represents the variance of the factor without rotation, and finally, the fourth is the variance of rotated factors. The Table shows the initial statistics for each factor. Several procedures have been proposed to determine the number of factors to be used in the model. One criterion suggests that only factors that account for variances greater than 1 (where the eigenvalue is greater than 1) should be included.

The total variance explained by each factor is listed in the column labeled Initial Eigenvalues. Eigenvalues column is the sum of squared loading for a factor – also referred to as the latent root. It represents the amount of variance accounted for by the factor. The first column of the initial eigenvalues (the total column) contains the percentage of the total variance attributed to each factor. For example, the linear combination formed by the first factor has a variance of 4.630, which is 27.236% of the total variance (see the second column). The third column is the accumulative variance, which shows the percentage of variance attributed to that factor and those that precede it. For instance, 71.47% of the total variance is attributable to the first six factors and the remaining factors together account for 28.530% of the variance.

In conclusion, a six-factor model attributes to a value of 71.47% of the total variance. This means that we are able to explain 71.47% of the total variance of the 17 variables. The six factors are able to minimize the previous 17 variables and create a new set of factors, which are small in number (6) and without losing a great deal of information. The resulting factors can consequently be used to replace the original set of variables for inclusion in subsequent techniques, ranging from the dependence methods of regression, correlation and discriminate analysis, to cluster analysis. In this study, the six factors will be used to conduct a cluster analysis.

3.1.3 Rotation of Factors

As shown in Table 3, almost all variables are loading high in the first factor, leaving the other variables without many loadings. That is to say, while the un-rotated factor solution reduced the variables into six factors, the interpretation of the information presented in the matrix is not easy since the presented information is insufficient. A way to solve this problem is to rotate the factors (the previous factor matrix is called the un-rotated factors). Rotation will help in simplifying the structure of the factors and make their interpretation easier and meaningful. One way to achieve the

rotation is by applying the VARIMAX rotated factor solution. The VARIMAX rotated factor solution is shown in the last column in Table 3. Note that the total amount of variance extracted is the same in the rotated solution as in the un-rotated one (71.47%). Nevertheless, there are two major differences. First, the rotated factors can be easily interpreted. Second, the variance has been redistributed so that the factor-loading pattern is different, and the percentage of variance for each of the factors is different as well.

Table 4 shows the new distribution of variables after rotation, with loadings above (0.500) and as distributed between the factors in a way that makes the analysis easier. The next step after completing this distribution is to name and interpret the factors, which depends on the group of variables and their loadings. Usually the high loading of variables contributes most to the explanation of the factor; and their interactions or common significance should help in assigning the name of the factor.

Table 4: Rotated component matrix

	Coping Strategies	Consumption behavior	Household poverty	Food consumption	Employment education	Un-employment residence
Coping Strategies: Reducing expenses	0.813					
Coping Strategies: Do not pay some bills (water, electricity, etc.)	0.761					
Coping Strategies: Reducing the quantity of food	0.757					
Coping Strategies: Buying on credit	0.727					
Family income	-0.525					
In the past 30 days: were not able to eat the kinds of foods		0.916				
In the past 30 days: eat a limited variety of foods due to a lack of resources		0.882				
In the past 30 days: You worry that your household would not have enough food		0.874				
Household poverty line			0.979			

	Coping Strategies	Consumption behavior	Household poverty	Food consumption	Employment education	Un-employment residence
No. of people in household including children			0.972			
Consumption of food item: Fruits (main source of food)				0.814		
Consumption of food item: Vegetables (main source of food)				0.782		
Consumption of food item: Red meat - sheep/goat/beef (main source of food)				0.707		
Employment Situation					0.813	
Educational level					-0.710	
Unemployment duration of main breadwinner						-0.801
Place of residence						0.739

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 5 iterations.

3.1.4 Interpretation of factors

In Table 4, variables loading high in the first factor are related to coping strategies, which will have the name Coping Strategies Factor. Therefore, studying the variables concentrated in this factor indicates that high coping strategies values are an indication of low use of these strategies[3]. Coping Strategies: Reducing expenses (0.813), Do not pay some bills (0.761), Reducing the quantity of food (0.757), Buying on credit (0.727), and at the same time it is related to low Family income values (-0.525)[4]. Therefore, this factor indicates that coping strategies are high when family income is low and vice versa.

The second factor has the following variables: In the past 30 days: were not able to eat the usual kind of food (0.916), eat a limited variety of food

[3] Looking into the database reveals that variables have values between 1 and 7. Values around 1 means that household uses these strategies regularly, while data around 7 means that household do not use this strategy.

[4] The variable "Family income" has values between 1 (for income above NIS 5000) and 9 (less than NIS1000).

(0.882), and worry about not having enough food (0.874). These variables measure consumption behavior due to the current political and economic situation; and hence will be named the Consumption behavior[5]. As most variables load positive in this factor, the interpretation could follow this way: households that were not able to eat the usual kind of food are eating a limited variety of food, and are worried about not having enough food.

The third factor contains the following variables; Household poverty line (0.979) and Number of people in the household including children (0.972). Household income is above the poverty mean (Table 5) and is associated with large sized families. Taking into consideration that large families will have one or more members working, big families have a higher income than smaller ones. As the two variables are related to the level of poverty, this factor will be called Household poverty.

Table 5: Descriptive Statistics of household poverty line

	N	Minimum	Maximum	Mean	Std. Deviation
Household poverty line	2087	445.95	5886.49	1776.0034	734.32170
Valid N (listwise)	2087				

The fourth factor includes three variables that represent the source or manner of obtaining food: fruits (0.814), vegetables (0.782), and meat (0.707). As the variables have high positive values, this indicates that people purchase their food on cash (see Table 6).

Table 6: Consumption of food item:
Red Meat-sheep/goat/beef (main source of food)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Purchased in Cash	1459	69.9	91.6	91.6
	Own production	16	0.8	1.0	92.6
	Borrowed from family neighbors	19	0.9	1.2	93.8
	Received as a gift	15	0.7	0.9	94.8
	Received as food aid	10	0.5	0.6	95.4
	Purchased on credit	68	3.3	4.3	99.7
	Other	5	0.2	0.3	100.0
	Total	1593	76.3	100.0	
Missing	system	494	23.7		
Total		2087	100.0		

[5] Variables in this factor have the following values; 0 for no changes in their consumption behavior and 3 for yes there was a change.

The fifth factor includes two variables: Employment situation (0.813) and Educational level (-0.710). Since it reflects the state of employment in relation to education, this will be called the Employment Education Factor. The two variables in this factor are inversely related. That to say, full employment is associated with a high level of education and unemployment is related to a low level of education.

The last factor includes two variables; Unemployment duration (-0.801) and place of residence (0.739)[6]. Since the variables are not very well classified in the data base, attention should be given during the interpretation of the last factor.

3.2 Cluster analysis

The next step of the empirical analysis is to conduct a cluster analysis. The latter is a multivariate procedure for detecting groupings in data, based on the characteristics they possess. Cluster analysis helps in classifying cases into different groups so that each case is very similar to others in the cluster with respect to some predetermined selection criterion. The resulting clusters of objects should then exhibit high internal (within cluster) homogeneity and high external (between cluster) heterogeneity (Hair 1999). In this study, cluster analysis will be used to group the different households in different clusters based on certain characteristics regarding the number of youth and children. By applying a factor analysis, it was possible to categorize 17 variables into 6 factors. The following step entails grouping together cases that possess the same characteristics in regards to the number of youth and children in the household, in order to facilitate the formulation of development policies that will reduce the level of food insecurity[7].

3.2.1 Results of Cluster Analysis

After applying SPSS hierarchical analysis on the factor scores, and using the Square Euclidean Distance as the similarity distance measure, the following Tables and results were achieved:

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[6] Values of the variable place of residence vary from (10- West Bank, 40- Gaza) and The Unemployment duration (1- never unemployed, 5 more than 12 months)

[7] The main stages of cluster analysis can be found in appendix 1

Table 7: Case Processing Summary (a,b)

Cases					
Valid		Missing		Total	
N	Percent	N	Percent	N	Percent
2087	100.0	0	.0	2087	100.0

a Squared Euclidean Distance used
b Complete Linkage

Table (7) indicates that all of the 2087 households were included in the cluster analysis. Moreover, the note at the bottom of the table indicates the agglomerative procedures used, in this case the complete linkage procedure (the furthest neighbor approach). The results of the cluster analysis application indicate that households could be distributed in 5 clusters.

Table 8. Frequency of households in each cluster
Complete Linkage

		Frequency	Percent	Valid Percent	Cumulative Percent
cluster	1	1131	54.2	54.2	54.2
	2	760	36.4	36.4	90.6
	3	122	5.9	5.9	96.4
	4	33	1.6	1.6	98.0
	5	41	2.0	2.0	100.0
	Total	2087	100.0	100.0	

The distribution of households in the different clusters reflects the current situation of households concerning the variables utilized in the analysis. As shown in table (8) cluster 1 represent 54.2% of the total households included in the analysis. Nevertheless, to examine the validity of household classification according to the six- factors, another test is conducted on the factors known as ANOVA.

The results of applying the ANOVA analysis on the six- factors are presented in Table 9. This analysis indicates the significance of each factor in the classification of households. The results of the analysis indicate that the factors are suitable to separate households with a significance level less than 0.05 (last column), with the 95% confidence intervals.

Table 9 gives a summary of the ANOVA test. In the results, the ratio of the between-group mean and the within-group mean square is the usual

ANOVA F statistics and should be used for descriptive reasons only (in the cluster case). The F statistic is used to test the difference between the means across factors, and to reject the hypothesis null of no difference in means across factors. What is important here is the value of F which should not be small and preferably far from 1, with significant results less that (0.05) so that the factors are effective in identifying or separating the clusters.

The between-groups mean square tells how much individual observations should vary if the null hypothesis is true. This is computed from the variability of the sample means. The within-groups mean square tells how much the observations with groups really do differ. To calculate the F statistic, the between-groups mean square is divided by within-groups mean square. A large value of the F ratio provides evidence against the null hypothesis.

Table 9: ANOVA test

		Sum of Squares	df	Mean Square	F	Sig.
Coping	Between Groups	222.384	4	55.596	62.081	0.000
	Within Groups	1863.616	2081	0.896		
	Total	2086.000	2085			
Consumption behavior	Between Groups	82.024	4	20.506	21.294	0.000
	Within Groups	2003.976	2081	0.963		
	Total	2086.000	2085			
Household poverty	Between Groups	690.964	4	172.741	257.681	0.000
	Within Groups	1395.036	2081	0.670		
	Total	2086.000	2085			
Food consumption	Between Groups	1486.321	4	371.580	1289.454	0.000
	Within Groups	599.679	2081	0.288		
	Total	2086.000	2085			
Employment education	Between Groups	13.291	4	3.323	3.336	0.010
	Within Groups	2072.709	2081	0.996		
	Total	2086.000	2085			
Unemployment residence	Between Groups	177.973	4	44.493	48.527	0.000
	Within Groups	1908.027	2081	0.917		
	Total	2086.000	2085			

3.2.2 Classification of households

To test the validity of the households' classification, which we concluded after applying the cluster analysis, another statistical test is applied to justify this result known as the Discriminant analysis. Linear discriminant analysis is a statistical technique used to examine whether two or more mutually exclusive groups can be distinguished from each other and how correctly the cases of these groups are classified.

Table 10: Discriminant analysis

		Complete Linkage	Predicted Group Membership					Total
			1	2	3	4	5	
Original	Count	1	875	212	33	0	11	1131
		2	136	540	31	0	53	760
		3	11	1	96	15	0	122
		4	0	0	4	29	0	33
		5	0	0	3	0	39	41
	%	1	77.4	18.7	2.9	0.0	1.0	100.00
		2	17.8	71.1	4.1	0.0	7.0	100.00
		3	8.8	0.8	78.5	11.9	0.0	100.00
		4	0.0	0.0	12.9	87.1	0.0	100.00
		5	0.0	0.0	6.3	0.0	93.7	100.00
Cross-validated(a)	Count	1	871	213	35	0	11	1131
		2	137	537	31	0	55	760
		3	11	1	96	15	0	122
		4	0	0	4	29	0	33
		5	0	0	3	0	39	41
	%	1	77.0	18.9	3.1	0.0	1.0	100
		2	18.0	70.7	4.1	0.0	7.2	100
		3	8.8	0.8	78.5	11.9	0.0	100
		4	0.0	0.0	12.9	87.1	0.0	100
		5	0.0	0.0	6.3	0.0	93.7	100

Notes: Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.
75.6% of original grouped cases correctly classified.
75.3% of cross-validated grouped cases correctly classified.

The results in Table 10 show that 75.6% (Note b down the table) of the households' classification in the cluster analysis is correctly classified. The results are obtained from the summing of the principle diagonal (875+540+96+29+39) =1579/ /2087= 0.756.

The application of discriminate analysis is aimed at justifying the classification of households in different clusters. By applying a cross-validated classification, the results show that distribution of households in the 5 clusters is 75.3% correct (note c down the table). This is to say that 7.5 out of 10 households are well classified, a result similar to that which we obtained in the original classification through clustering. The results show that the use of the cluster analysis to classify households will lead to 75.6% of well classified cases, which means that out of 10 households 7.66 are well classified. The two results of the two analyses indicate that the classification of households was nearly similar with minimal differences, which validates the sound results obtained by the cluster analysis.

4. Characteristics of household clusters

After classifying households into different clusters, the characteristic of each cluster is studied in relation to the different variables being used in the empirical analysis. This study intends to reveal the different aspects of each cluster in regards to the six factors being used at the beginning of the analysis.

4.1 First Cluster

The first cluster consists of households that have similar characteristics in relation to the different variables used to obtain this grouping. In order to interpret the characteristic of this cluster, a table of variables in the six factors is created (Table 11).

Table 11: Cluster 1

Cluster 1	Coping Strategies	Consumption behavior	Household poverty	Food consumption	Employment education	Unemployment residence	Variables
Coping Strategies: Reducing expenses	-0.1761						1-high, 7-never
Coping Strategies: Do not pay some bills (water, electricity, etc.)	-0.1513						1-high, 7-never
Coping Strategies: Reducing the quantity of food	-0.1321						1-high, 7-never
Coping Strategies: Buying on credit	-0.1737						1-high, 7-never
Family income	0.1092						1>5000, 9<1000
In the past 30 days: were not able to eat the kinds of foods		0.0272					0-never, 3-often
In the past 30 days: eat a limited variety of foods due to a lack of resources		0.0645					0-never, 3-often
In the past 30 days: You worry that your household would not have enough food		0.0755					0-never, 3-often
Household poverty line			-0.4127				

Cluster 1	Coping Strategies	Consumption behavior	Household poverty	Food consumption	Employment education	Unemployment residence	Variables
No. of people in household including children			-0.4099				From1 to 21 members
Consumption of food item: Fruits (main source of food)				-0.2143			1-cash, 6-aid,credit
Consumption of food item: Vegetables (main source of food)				-0.1839			1-cash, 6-aid,credit
Consumption of food item: Red meat - sheep/goat/beef (main source of food)				-0.2071			1-cash, 6-aid,credit
Employment Situation					0.0614		1-full-time, 7-unemp.
Educational level					0.0513		1-low, 3-high
Unemployment duration of main breadwinner						-0.1110	1-never, 5->12 m
Place of residence						0.1149	10-WB, 40 GAZA

The above table (Table 11) shows the mean of variables (standardized) in each factor. As shown, cluster 1 has problems in the first factor, Coping Strategies, since variables that constitute this factor have negative values below the mean 0; Coping Strategies: Reducing expenses (-0.1761), Do not pay some bills (-0.1513), Reducing the quantity of food (-0.1321), Buying on credit (-0.1737), and lower Family income (0.1092). This is to say, households in this cluster are using coping strategies due to political and economic turmoil. Moreover, in the first factor, family income is above the mean of the sample. Since the variables are filled in the database inversely; 1 for above NIS 5000 and 9 less than NIS1000, then whenever it is positive this doesn't indicate that they are better off. It could mean they are worse off as is the case in this cluster.

According to the descriptive Table (12), the minimum values are for high income families and maximum values for low income households. The last column in Table 8, shows the way the data was entered in the database file.

Table 12: Descriptive Statistics of family income

	N	Minimum	Maximum	Mean	Std. Deviation
Zscore: Family income	2017	-2.43279	1.09634	.0000000	1.00000000
Valid N (listwise)	2017				

Moreover, variables in the second factor, the Consumption behavior, have values above the mean. The factor indicates that in this cluster households changed their behavior of eating and reduced the diversity and quantity of their foods. The results indicate that households will be facing nutrition and health problems due to lack of sufficient food. Furthermore, the third factor Household poverty has two negative variables; Household poverty line (-0.4127), and Number of people in household (-0.4099) indicating that households are living in poverty and have big families.

The fourth factor, Food consumption, shows the way that households get their food - fruits, vegetables and meat. Even though the households are relatively poor, the variables show that they depend on personal means to spend on these items more than receiving assistance or donations from aid agencies.

The last two factors are related to employment, education and place of residence. Households in this cluster are not employed full time, they have a moderate level of education and they are spread out throughout the West Bank and Gaza.

4.1.1 Policy Options for Cluster 1

As households in this cluster are using coping strategies to adapt to the current situation (first factor), and since their income is low, public and donor policies should be directed towards; first, inducing more economic growth to generate more income for households on the long run, and second, providing more funds for households to help their coping strategies. Donors can use vouchers and in cash assistances to support those households in this cluster.

Variables of the second factor, the Consumption behavior factor, have values which indicate a decrease in nutrient intake[8]. Households in this cluster might face intrinsic health problems related to nutrition which includes low birth weight and underweight children, all which express the state of malnutrition among children, lack of proper nutrition and hunger, among other problems.

[8] Nutrient intakes include physical consumption of macronutrients (calories and protein) and micronutrients (minerals and vitamins).

In the third factor, Household poverty, households are clearly poor and have big families. This means they will need developing policies to rescue them from poverty. However, the fourth factor Food consumption indicates that households obtain their food through their own means depending on cash and home made products. Donors can use in kind assistance to lessen the despair of households in this cluster

This cluster has latent problems related to poverty and food insecurity. Adequate development policies should be used to improve their well being in the long run. However, in-kind and cash assistance is needed for this cluster.

4.2 Second Cluster

The second cluster of households is shown in Table (13). It presents the mean of variables (standardized) in the 6 factors. However in order to understand the cluster we should interpret the results of each factor belonging to this cluster.

Table 13: Cluster 2

Cluster 2	Coping Strategies	Consumption behavior	Household poverty	Food consumption	Employment education	Unemployment residence
Coping Strategies: Reducing expenses	0.3834					
Coping Strategies: Do not pay some bills (water, electricity, etc.)	0.3343					
Coping Strategies: Reducing the quantity of food	0.3425					
Coping Strategies: Buying on credit	0.3158					
Family income	-0.2681					
In the past 30 days: were not able to eat the kinds of foods		-0.1718				
In the past 30 days: eat a limited variety of foods due to a lack of resources		-0.2428				
In the past 30 days: You worry that your household would not have enough food		-0.2508				
Household poverty line			0.4949			

Cluster 2	Coping Strategies	Consumption behavior	Household poverty	Food consumption	Employment education	Unemployment residence
No. of people in household including children			0.4834			
Consumption of food item: Fruits (main source of food)				-0.1820		
Consumption of food item: Vegetables (main source of food)				-0.2465		
Consumption of food item: Red meat - sheep/goat/beef (main source of food)				-0.1328		
Employment Situation					-0.1198	
Educational level					-0.0065	
Unemployment duration of main breadwinner						0.1696
Place of residence						-0.2088

Table (13) shows the mean of variables (standardized) in each factor. As shown, Cluster 2 has better values in the first factor, Coping Strategies, since variables that constitute this factor have positive values above the mean 0; Coping Strategies: Reducing expenses (0.3834), Do not pay some bills (0.3343), Reducing the quantity of food (0.3425), Buying on credit (0.3158), and negative value for Family income (-0.2681). The values of variables in this factor indicate that households in this cluster are not using coping strategies since their family income is higher than the mean.

Moreover, variables in the second factor, the Consumption behavior, have values below the mean. The factor indicates that in this cluster households did not change their behavior of eating and did not reduce the diversity and quantity of food. Furthermore, the third factor Household poverty has two positive variables; Household poverty line (0.4949), and Number of people in household (0.4834) indicating that households are living above the poverty line.

The fourth factor, the Food consumption, shows the way that households get their food - fruits, vegetables and meat. Households depend on personal means to spend on these items more than receiving assistance or donations from aid agencies.

The last two factors are related to employment, education and place of residence. Households in this cluster are employed part time or full time (-0.1198), they have a moderate to level of high education (-0.0065) and they mainly live in the West Bank (-0.2088). This cluster does not need relief assistance.

4.2.1 Policy options for cluster 2

Cluster 2 has better values with regard to coping strategies. Households belonging to this cluster did not change their behavior vis-à-vis eating practices. They also live above the poverty line and depend on their own resources for living. This cluster does not seem to need any relief assistance.

4.3 Third Cluster

The third cluster under study is shown in Table 14, which illustrates the mean values of standardized variables for a group of households.

Table 14: Cluster 3

Cluster 3	Coping Strategies	Consumption behavior	Household poverty	Food consumption	Employment education	Unemployment residence
Coping Strategies: Reducing expenses	-0.4100					
Coping Strategies: Do not pay some bills (water, electricity, etc.)	-0.4020					
Coping Strategies: Reducing the quantity of food	-0.5740					
Coping Strategies: Buying on credit	-0.1652					
Family income	0.5790					
In the past 30 days: were not able to eat the kinds of foods		0.4533				
In the past 30 days: eat a limited variety of foods due to a lack of resources		0.4846				
In the past 30 days: You worry that your household would not have enough food		0.4372				

Cluster 3	Coping Strategies	Consumption behavior	Household poverty	Food consumption	Employment education	Unemployment residence
Household poverty line			-0.1687			
No. of people in household including children			-0.1273			
Consumption of food item: Fruits (main source of food)				2.3708		
Consumption of food item: Vegetables (main source of food)				2.2351		
Consumption of food item: Red meat - sheep/goat/beef (main source of food)				1.7667		
Employment Situation					0.0633	
Educational level					-0.3900	
Unemployment duration of main breadwinner						0.4232
Place of residence						-0.0883

The above table (Table 14) shows the mean of variables (standardized) in each factor. As shown, Cluster 3 has problems in the first factor, Coping Strategies, since variables that constitute this factor have negative values below the mean 0; Coping Strategies: Reducing expenses (-0.4100), Do not pay some bills (-0.4020), Reducing the quantity of food (-0.5740), Buying on credit (-0.1652), and lower Family income (0.5790). This is to say, households in this cluster are heavily using coping strategies due to the political and economic situation, especially reducing the quantity of food consumed. Moreover, in the first factor, family income is very low (lower than households in Cluster 1).

Furthermore, variables in the second factor, the Consumption behavior, have values above the mean. The factor indicates that in this cluster households changed their behavior of eating and reduced the diversity and quantity of their foods substantially. The results indicate that households will be facing nutrition and health problems due to a lack of sufficient food. Furthermore, the third factor Household poverty has two negative variables; Household poverty line (-0.1687), and Number of people in household (-0.1273) indicating that households are living in poverty and have big families.

The fourth factor, the Food consumption, shows the way that households get their food - fruits, vegetables and meat. Since they are poor, the variables show that they depend on aid and credits as means to spend on these items.

The last two factors are related to employment (0.0633), education (-0.3900) and place of residence (-0.0883). Households in this cluster face unemployment, long durations of unemployment, they have lower levels of education and they are spread out through the West Bank and Gaza.

4.3.1 Policy Options for Cluster 3

As households in this cluster are using coping strategies to adapt to the current situation, and as their income is low, public and donor policies should be directed towards inducing more economic growth to generate more income and employment in the long run, and second, providing more funds for households to help their coping strategies. Donors can use vouchers and in cash assistances to support those households in this cluster.

Variables of the second factor, the Consumption behavior factor, have values which indicate a decrease in nutrient intake. Households in this cluster might face health problems related to malnutrition without receiving sufficient food.

In the third factor, Household poverty, households are clearly poor and have big families. This means that will need developing policies to rescue them from poverty. However, the fourth factor Food consumption indicates that households obtain their food through assistance. Donors can use in kind and cash assistance to lessen the poverty of households in this cluster

This cluster has serious problems related to poverty and food insecurity. Adequate development policies should be used to improve their well being in the long run. However, cash assistance and especially in-kind assistance are needed for this cluster.

4.4 Fourth Cluster

The below table (Table15) shows the mean of variables (standardized) in each factor. As shown, Cluster 4 has problems in the first factor, Coping Strategies, It is similar to the situation of Cluster 3 since variables that constitute this factor have negative values below the mean 0; yet the incidence of poverty is less acute.

Table 15: Cluster 4

Cluster 4	Coping Strategies	Consumption behavior	Household poverty	Food consumption	Employment education	Unemployment residence
Coping Strategies: Reducing expenses	-0.4709					
Coping Strategies: Do not pay some bills (water, electricity, etc.)	-0.3896					
Coping Strategies: Reducing the quantity of food	-0.5281					
Coping Strategies: Buying on credit	-0.6971					
Family income	0.2501					
In the past 30 days: were not able to eat the kinds of foods		0.1410				
In the past 30 days: eat a limited variety of foods due to a lack of resources		0.1093				
In the past 30 days: You worry that your household would not have enough food		0.0639				
Household poverty line			0.6697			
No. of people in household including children			0.7426			
Consumption of food item: Fruits (main source of food)				3.9324		
Consumption of food item: Vegetables (main source of food)				3.9097		
Consumption of food item: Red meat - sheep/goat/beef (main source of food)				3.3195		
Employment Situation					-0.0850	
Educational level					0.1042	
Unemployment duration of main breadwinner						0.0264
Place of residence						-0.5269

Coping Strategies: Reducing expenses (-0.4709), Do not pay some bills (-0.3896), Reducing the quantity of food (-0.5281), Buying on credit (-0.6971), and lower Family income (0.2501). This is to say, households in this cluster are heavily using coping strategies due to political and economic turmoil, especially buying on credit. Moreover, in the first factor, family income is low, yet better than households in Cluster 3.

Moreover, variables in the second factor, the Consumption behavior, have values above the mean. The factor indicates that in this cluster, households changed their behavior of eating and reduced the diversity and quantity of their foods substantially. The results indicate that households will be facing nutrition and health problems due to a lack of sufficient food. Furthermore, the third factor Household poverty has two positive variables; Household poverty line (0.6697), and Number of people in household (0.7426) indicating that households are living above the poverty line and have big families. One explanation to this situation is that income is higher than the mean but cannot cover the needs of all household members. However, the number of households in this cluster does not exceed 33.

The fourth factor, the Food consumption, shows the way that households get their food - fruits, vegetables and meat. Since income is not sufficient, the variables show that they depend on aid and credits as means to spend on these items.

The last two factors are related to employment (-0.0850), education (0.1042) and place of residence (-0.5269). Households in this cluster face unemployment, medium durations of unemployment, they have above average education and they are spread out throughout the West Bank.

4.4.1 Policy options for Cluster 4

As households in this cluster are using coping strategies to adapt to the current situation (first factor), and as their income is low, public and donor policies should be directed towards reducing their misery through generating employment and more income for households, and second, providing more funds for households to help their coping strategies. Donors can use in cash assistances to support those households in this cluster.

Variables of the second factor, the Consumption behavior factor, have values which indicate a decrease in nutrient intake. In the third factor, Household poverty, households have a value above the mean of NIS 1776 (see below table 16) income and have big families. This means that developing policies are needed to rescue them from poverty. However, the fourth factor Food consumption indicates that households obtain their food through assistance. Donors can use in kind and cash assistance to lessen the poverty of households in this cluster especially cash assistance.

Table 16: Descriptive Statistics

	N	Range	Minimum	Maximum	Sum	Mean	Std. Deviation
Household poverty line	2087	5440.54	445.95	5886.49	3706519.02	1776.0034	734.32170
Valid N (listwise)	2087						

This cluster has serious problems related to poverty and food insecurity. Adequate development policies should be used to improve their well being in the long run. However, in-kind and cash assistance is needed for this cluster.

4.5 Fifth Cluster

Table 17 shows the mean of variables (standardized) in each factor. This cluster has problems in the first factor, Coping Strategies; it is similar to the situation of Clusters 1, 3, 4 and 5.

Table 17: Cluster 5

Cluster 5	Coping Strategies	Consumption behavior	Household poverty	Food consumption	Employ-ment education	Unemploy ment residence
Coping Strategies: Reducing expenses	-0.6654					
Coping Strategies: Do not pay some bills (water, electricity, etc.)	-0.3382					
Coping Strategies: Reducing the quantity of food	-0.6135					
Coping Strategies: Buying on credit	-0.3066					
Family income	0.1501					
In the past 30 days: were not able to eat the kinds of foods		0.8922				
In the past 30 days: eat a limited variety of foods due to a lack of resources		1.1076				
In the past 30 days: You worry that your household would not have enough food		1.1008				

Cluster 5	Coping Strategies	Consumption behavior	Household poverty	Food consumption	Employ-ment education	Unemployment residence
Household poverty line			2.1486			
No. of people in household including children			2.1037			
Consumption of food item: Fruits (main source of food)				0.2590		
Consumption of food item: Vegetables (main source of food)				0.8289		
Consumption of food item: Red meat - sheep/goat/beef (main source of food)				0.2797		
Employment Situation					0.3999	
Educational level					-0.2404	
Unemployment duration of main breadwinner						-1.1242
Place of residence						1.3751

Variables that constitute this factor have negative values below the mean 0; Coping Strategies: Reducing expenses (-0.6654), Do not pay some bills (-0.3382), Reducing the quantity of food (-0.6135), Buying on credit (-0.3066), and lower Family income (0.1501). This is to say, households in this cluster are heavily using coping strategies due the current situation, especially reducing expenses and quantity of food. Moreover, in the first factor, family income is low, yet better than households in Clusters 3 and 4.

Moreover, variables in the second factor, the Consumption behavior, have values above the mean. The factor indicates that in this cluster households changed their behavior of eating and largely reduced the diversity and quantity of their foods more than all other clusters. The results indicate that households will be facing nutrition and health problems due to a lack of sufficient food. Furthermore, the third factor Household poverty has two positive variables; Household poverty line (2.1486), and Number of people in household (2.1037) indicating that households are living above the poverty line and have big families. One explanation to this situation is that

income is higher than the mean but cannot cover the needs of all household members. However, the number of households in this cluster does not exceed 41.

The fourth factor, the Food consumption, shows the way that households get their food - fruits, vegetables and meat. Since income is not sufficient, the variables show that they depend on means other than cash to get these items.

The last two factors are related to employment 0.3999), education (0.1042) and place of residence (-0.2404). Households in this cluster face unemployment, short periods of unemployment, they have a low level of education and are spread out throughout the West bank and Gaza Strip.

4.5.1 Policy options for Cluster 5

As households in this cluster are using coping strategies to adapt to the current situation, and as their income is low, public and donor policies should be concerned about economic growth to generate more income for households in the long run, and second, providing more funds for households to help their coping strategies. Donors can use both in kind and cash assistances to support those households in this cluster.

Variables of the second factor, the Consumption behavior factor, have values which indicate a decrease in nutrient intake. Nutritional status is threatened by household poverty and poor quality foodstuffs. Households in this cluster might face health problems related to malnutrition.

In the third factor, Household poverty, households have high value above the mean (NIS 1776) and have big families. This means that developing policies are needed to alleviate their poverty. However, the fourth factor Food consumption indicates that households obtain their food through assistance. Donors can use in kind and cash assistance to lessen the poverty of households in this cluster especially cash assistance.

5. Recommendations and study conclusion

The aim of the present study is to design a tool to help donors assess and implement population needs in terms of relief aid assistance. Factor, Cluster and Discriminate Analyses were utilized to help identify the nature of relief program that would reveal to be the most favorable, and hence suitable, for different categories of households. A number of latent problems related to food security were pointed out, and the analyses demonstrate the strong interrelation between poverty and food insecurity – however, depending on households' own characteristics.

A tool aiming to classify the households into discrete clusters, to help inform relief policies, would be possible using the results from the present study. This would allow to specifying the needs of the households before providing them with the most appropriate form of assistance. Recommendations on the policy to be followed for the various groups of households are illustrated above. What remain is to identify the cluster to which belong the household in question. The latter would depend on various objective measures and subjective assessments related to the household and its experience. The current analysis could constitute the starting point for such tool development. However, the perception nature of the data in hand calls for further work, to allow decision-makers identifying the exact quantity and relative share of different forms of assistance.

A macroeconomic food policy is needed to focus on the production of certain types, quantities and quality of food, with the aim to decrease dependency on Israel – especially during crisis situations. Short-term job provision should not be seen as the only goal for relief programs. While those provide quick resources to overcome poverty in times of crisis, the provision of sustainable job opportunities remains the best policy to enhance food security. Indeed, providing effective employment opportunities is the unique guarantee for long-term poverty eradication policies. It is also worth noting that food insecurity, and its devastating consequences, should be addressed as part and parcel of a wider framework aiming at limiting the risks to all sorts of threatening factors to sustainable developmental. These would essentially include risks of threats to health and education.

Consideration should be given to equity at all levels, by developing gender-sensitive policies and attempting to progressively distribute aid to

the different areas and regions of the West Bank and the Gaza Strip. Other than covering basic needs, programs should concentrate on providing beneficiaries with: training, education, skills and income that will support household in the long run.

Further research work is still needed to assess the reasons and consequences of food insecurity in occupied Palestinian territory; to include other potential detrimental factors beside poverty. This shall help inform better assistance policies. Such venture can only be possible with extensive cooperative programs involving all stakeholders at the national level. Creation of aid relief platforms could assist in managing food insecurity for the benefit of all Palestinians; and help design policies that address food security and development needs at the national level. Further efforts are also needed to localize and adapt the suggested tool on basis of the daily work of donors and local Palestinian partners. Special attention is now needed to take account of the situation of crisis in the Gaza Strip, following the Israeli assault of December 2008.

Fighting against poverty and food insecurity by providing cash and/or in-kind assistance helps soften the direct and spontaneous effects of the dire political and economic situation of the occupied Palestinian territory. This however should not undermine the need for developmental interventions, which constitute the only means to permanently limit poverty and hence limit the root causes of food insecurity. Relief agencies should have emergency plans to manage crises situations, which would also contribute to long-term development programs, beside their values of sudden and immediate rescue provision. It is therefore important that while public institutions should aim to reduce the number of poor, and provide the food needed to the affected areas, long-run development policies should be devised to encourage sustainable growth. These interventions should take into account the political constrains of the local Palestinian context and hence plan ahead to counteract potential delays and unexpected increase in needed quantities.

Finally, traditional relief constraints such as: the provision of emergency food, medical supplies and budget supports are essential but not enough to empower any development strategy. Donors and the Palestinians alike should be committed, and work together, to solve the main source of threats to Palestinian individuals. Those are related to Israel's restrictive and destructive policies. Those indeed are proven to have hampered the Palestinian economy making it close to collapse. Without solving the root cause of all problems of human insecurity, which is occupation, the sustainability of all remedies, regardless how innovative those might be, shall constantly be compromised.

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Appendices

Appendix 1: Cluster Analysis

The next step of the empirical analysis is to conduct a cluster analysis. The latter is a multivariate procedure for detecting groupings in data, based on the characteristics they possess. Cluster analysis helps in classifying cases into different groups so that each case is very similar to others in the cluster with respect to some predetermined selection criterion. The resulting clusters of objects should then exhibit high internal (within cluster) homogeneity and high external (between clusters) heterogeneity (Hair 1999).

In this paper, cluster analysis will be used to group the different households in different clusters based on certain characteristics regarding number of youth and children. By applying a factor analysis, it was possible to categorize 17 variables into six factors. The following step entails grouping together cases that possess the same characteristics in regards to the abovementioned factors, in order to facilitate the formulation of development policies that will reduce the level of food insecurity.

After specifying the reason for conducting a cluster analysis, the next step is to select the variables to be included in the cluster variate which must be carried out with regards to both theoretical and practical considerations[1]. The variables selected should be rationally chosen and closely related to the cases being clustered.

Stage One: Case Selections

In this analysis, the variables to be used in the cluster analysis are the six factors which were extracted in the factor analysis and which are represented by their factor scores. These factors are standardized values and represent certain characteristics of households. We also know in advance that they serve to explain part of the phenomenon of poverty and food security.

Stage Two: Research Design in Cluster Analysis

After defining the objectives and selecting the variables, we must address three points before starting the analysis:

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[1] A cluster variate is the set of variables representing the characteristics used to compare objects - in our case “households”- in the cluster analysis.

Detecting Outliers:

As the inclusion of irrelevant variables is sensitive, it is also true that it is sensitive to outliers (objects very different from all others). The outliers alter the true structure and make the derived clusters unrepresentative of the true population. For this reason, a preliminary screening for outliers is always necessary. This screening is more recommendable for a large number of objects. However, in our case where there are only three objects, this is not necessary.

Similarity Measures:
Inter-object similarity is a measure of correspondence or resemblance between objects to be clustered. It can be measured in a variety of ways. However, there are three dominate methods by which applications of cluster analysis are measured: correlation measures, distance measures, and association measures.

Correlation Measures:
Correlation measures better represent patterns across the variables rather than the magnitude themselves. This is rarely used in cluster analysis since the emphasis is more on magnitude of the objects rather than on the patterns.

Association Measures:
Association measures of similarity are used to compare objects whose characteristics are measured only in non-metric terms (nominal or ordinal measurement).

Distance Measures of Similarity:
This represents similarity in the proximity of observations to one another across the variables in the cluster variate and is the most often used measure of similarity in cluster analysis (Hair 1999). Distance measures focus on the magnitude of the values and are described as similar cases that are close together but may have very different patterns across the variables.

Several distance measures are available:
Simple Euclidean distance is the length of the hypotenuse of a right triangle between two points (the most commonly used distance measure).

$$D_{aa'} = \sqrt{\sum_j (X_{aj} - X_{a'j})}$$

Where X refers to the punctuations for the case (a) and (a') taking into consideration that (a≠a') in each one of the j=1, 2, …p variables that are included in the analysis.

Squared Euclidean distance Where the distance value is the sum of the squared differences without taking the square root. It is the recommended distance measure for the centroid and Ward's methods of clustering.

City-block approach is also widely used and it replaces the squared differences by the sum of the absolute differences of the variables.

Mahalanobis distance is a commonly used measure of Euclidean distance that directly incorporates a standardization procedure and sums the pooled within-group variance-covariance, which adjusts the inter-correlations among the variables. It computes a distance measure between objects comparable to the R^2 in regression analysis (Hair 1999).

Standardizing the Data

As previously mentioned, in order to apply this analysis the data should be standardized for reliable results with a mean of 0 and standard deviation of 1. Most distance measures are quite sensitive to differing scales or magnitude among the variables. In general, variables with a large dispersion (larger standard deviation) have more impact on the final similarity value. Thus, one solution to avoid bias between variables -due to the differences in the scales- is to convert each variable to standard scores; subtracting the mean and dividing it by the standard deviation for each variable.

In order to check if the factors are standardized with a zero mean and a unit standard deviation, conducting a descriptive analysis on the factor scores could be a significant test

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Coping	2087	-1.76429	2.62913	.0000000	1.00000000
Consumption-behavior	2087	-1.68167	2.52471	.0000000	1.00000000
Household-poverty	2087	-2.08298	5.44494	.0000000	1.00000000
Food-consumption	2087	-.72775	6.65669	.0000000	1.00000000
Employment-education	2087	-2.67846	3.03452	.0000000	1.00000000
Unempl-residence	2087	-1.86663	2.41260	.0000000	1.00000000
Valid N (listwise)	2087				

Stage Three: Deriving Clusters & Assessing Overall Fit

We must first select the clustering algorithm used for forming clusters and then make the decision on the number of clusters to be formed.

There are different algorithms available to place similar objects into groups or clusters. The essential criterion of all algorithms is that they attempt to maximize the differences between clusters relative to the variation within the clusters. The ratio of the between-cluster variation to the average within-cluster variation is then comparable to the *F* ratio in analysis of variance. The most used clustering are the hierarchical and nonhierarchical procedures.

Hierarchical Cluster Procedures

This involves the construction of a hierarchy of a treelike structure. There are two types of hierarchical clustering procedures: agglomerative and divisive. In the agglomerative method each object or observation starts out as its own cluster. It is a buildup method where in each step the two closest clusters are combined into a new aggregate cluster, reducing the number of clusters by one with each step until all individuals are grouped into one large cluster. When the clustering process proceeds in the opposite direction to agglomerative methods, it is referred to as a divisive method. There are five popular agglomerative procedures used to develop clusters: Single linkage, complete linkage, average linkage, Ward's method, and the centroid method. Their rules differ on how the distance between clusters is computed.

The Single Linkage procedure (the nearest neighbor approach) is based on minimum distance. It finds the two individuals (objects) separated by the shortest distance and places them in the first cluster. Then the next shortest distance is found, and either a third individual joins the first two to form a cluster or a new two-individual cluster is formed. The process continues until all individuals are in one cluster. The distance (d_{AB}) between the two objects A and B is calculated as:

$$\mathbf{d_{AB} = min\ (dij)}$$

Where dij is the distance between the elements i and j (i is an element of the conglomerate A and j is an element belonging to the conglomerate B).

The complete linkage procedure (the furthest neighbor approach) is similar to single linkage except that the cluster criterion is based on maximum

distance. Here all objects in a cluster are linked to each other at some maximum distance or by minimum similarity. *In this paper my approach will be used to develop the clusters*. The distance between the two conglomerates A and B is calculated as:

$$\mathbf{d_{AB} = max\ (dij)}$$

The Average linkage procedure starts out the same as a single linkage and complete linkage, but the cluster criterion is the average distance from all individuals in one cluster to all individuals in another.

$$\mathbf{d_{AB} = 1/n_A n_B \sum_{i \epsilon A} \sum_{j \epsilon B} d_{ij}}$$

This method was proposed by Ward (1963). He argues that when two elements are merged, the conglomerate should be shaped in a way that will minimize, as much as possible, the loss of the information. The Ward's method is the sum of squares between the two clusters summed over all variables (Hair 1999). At each stage in the clustering procedure, the within-cluster sum of squares is minimized over all partitions obtainable by combining two clusters from the previous stage.

$$\mathbf{SCE = \sum_{j=1}^{k} [\sum_{I=1}^{nj} X_{ij}^{\ 2} - 1/n_j (\sum_{I=1}^{nj} X_{ij})^2]}$$

In the Centroid method, the distance between two clusters is the distance between their centroids. The distance between the clusters AB and the element C is calculated as:

$$\mathbf{d_{(AB)C} = (n_A/n_A+n_B)d_{AC} + (n_B/n_A+n_B)d_{BC} - [n_A n_B / (n_A+n_B)^2]\ d_{AB}}$$

Nonhierarchical Clustering Procedures

The nonhierarchical clustering procedures (*K*- means clustering) do not involve a treelike construction process as in the hierarchical clustering procedures. Instead, cluster seeds are used to group objects within a pre-specified distance between the seeds. There are several different approaches for selecting cluster seeds and assigning objects.

The Sequential threshold method in the nonhierarchical procedure, which begins by selecting one cluster seed. All objects within a pre-specified distance are then included in that cluster. Subsequent cluster seeds are selected until all objects are grouped in a cluster.

The Parallel threshold method in the nonhierarchical clustering procedure selects several cluster seeds simultaneously in the beginning. Objects within the threshold distances are assigned to the nearest seed. Threshold distances can be adjusted to include fewer or more objects in the clusters.

The Optimizing method is part of the nonhierarchical clustering procedure, which allows for the reassignment of objects to another cluster from the original one on the basis of certain overall oPtimizing criterion.

Appendix 2: Group Statistics

		Mean	Std. Deviation	Valid N (listwise) Unweighted	Weighted
1.	Coping	.2472612	.84775754	1106	1130.515
	Consumption-behavior	.0667446	1.02296962	1106	1130.515
	Household-poverty	.4575500	.75825218	1106	1130.515
	Food-consumption	.2575849	.41347309	1106	1130.515
	Employment-education	.0023471	1.12258353	1106	1130.515
	Unempl-residence	.1341257	1.05593563	1106	1130.515
2.	Coping	.4301879	1.13115592	775	759.969
	Consumption-behavior	.1894171	.92034893	775	759.969
	Household-poverty	.5905649	.88378895	775	759.969
	Food-consumption	.1892352	.44552137	775	759.969
	Employment-education	.0288536	.81502534	775	759.969
	Unempl-residence	.2386634	.84122505	775	759.969
3.	Coping	.3012960	.70345878	138	122.103
	Consumption-behavior	.3498392	1.10227243	138	122.103
	Household-poverty	.2866864	.71891166	138	122.103
	Food-consumption	.0496385	1.24658486	138	122.103
	Employment-education	.1713508	.79285523	138	122.103
	Unempl-residence	.2641834	.69821755	138	122.103
4.	Coping	.1645476	.55532262	44	33.027
	Consumption-behavior	.3133161	.76842966	44	33.027
	Household-poverty	.6187349	1.09119278	44	33.027
	Food-consumption	.1182339	1.09784988	44	33.027
	Employment-education	.3376981	.95785446	44	33.027
	Unempl-residence	.1218471	1.10777584	44	33.027
5.	Coping	.1250002	.52014320	24	41.388
	Consumption-behavior	.8728888	.56837022	24	41.388
	Household-poverty	.0060723	1.13560967	24	41.388
	Food-consumption	.3796289	.84940210	24	41.388
	Employment-education	.3578831	.99061068	24	41.388
	Unempl-residence	.5953366	.57138553	24	41.388
Total	Coping	.0000000	1.00000000	2087	2087.000
	Consumption-behavior	.0000000	1.00000000	2087	2087.000
	Household-poverty	.0000000	1.00000000	2087	2087.000
	Food-consumption	.0000000	1.00000000	2087	2087.000
	Employment-education	.0000000	1.00000000	2087	2087.000
	Unempl-residence	.0000000	1.00000000	2087	2087.000