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# New Dimensions of Parameters of Poverty: An Analysis of the Jaffna Socioeconomic Health Study 1999 in Sri Lanka[*]

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**ABSTRACT**. *The study is based on a cross sectional survey conducted in 1999. A two-stage sampling technique was used and about 1200 families were surveyed. Multivariate statistical methods, in addition to classical approach, have been employed to analyse the data on more than 100 variables. The study reveals some new dimensions of poverty.*

## Introduction

Conventional definitions on poverty focus on the ability of people to command sufficient resources to satisfy their basic needs and specify an international poverty line in terms of a minimum level of real income.[1] However, Carey and Lisa add a new dimension to this approach and mention that

> Poverty is not only about shortage of money. It is about rights and relationships; about how people are treated and how they regard themselves; about powerlessness, exclusion and loss of dignity.[2]

Poverty experienced in the Tamil regions of Sri Lanka largely falls within this realm. It is, in addition to the usual parameters, also a function of the ongoing ethnic conflict. This paper proposes to examine its relevance in the Jaffna peninsula, the predominant Tamil region, based on a cross-sectional study named *Jaffna Socioeconomic Health Study 1999* (JSEHS).

[*] The authors gratefully acknowledge the guidance and assistance received from Prof. C Sivagnanasundaram (University of Jaffna) in the preparation of this paper. [+] Currently visiting research fellow, IIST, Massey University.

[1] For example, see Michael P Todaro, *Economic Development*, 7th edition (Reading: Addison –Wesley, 2000), p 165.
[2] O Carey and H Lisa, *Poverty: The Facts*, 3rd edition (London: Child Poverty Action Group, 1996), p 7.

The paper introduces the JSEHS and goes on to statistically measure poverty. The results on the dimensions of poverty are then discussed. Using the dimensions, a clustering of families has been undertaken and a multidimensional poverty line has been constructed.

**Jaffna Socioeconomic Health Study 1999 (JSEHS)**

The study was conducted during the period March to June 1999 by the first author covering the six Divisional Secretariat Divisions[3] constituting the Valikamam sector. It formed, in many ways, the epicentre of the conflict. A two stage cluster-random sample of 1172 families was drawn from 34 *Grama Sevaka* divisions.

A preliminary investigation conducted in January 1999 revealed that a total of 256,791 persons belonging to 73,302 families were living in the study area. A questionnaire based on Social, Economic, and Health concepts, was used. The response rate of the survey was 95.82%. The survey information is presented in Table 1.

**Table 1**
**Details of Population, Sample and Period**
**of Jaffna Socio-Economic Health Study 1999**

| Zone Code | Population (No. of Families) | Second Stage Sample (No. of Families) | Period of Survey (1999) | Not Responded (No. of Families) |
|---|---|---|---|---|
| JAFF | 12,303 | 173 | 16/05 to 09/06 | 6 |
| NALL | 16,102 | 238 | 13/05 to 14/06 | 14 |
| VASW | 10,691 | 164 | 16/03 to 01/06 | 7 |
| VAWE | 9,131 | 172 | 18/03 to 12/05 | 4 |
| VASO | 9,859 | 193 | 24/03 to 09/05 | 8 |
| VAEA | 15,216 | 232 | 24/03 to 13/05 | 10 |
| Total | 73,302 | 1,172 | | 49 |

The study is a multidimensional poverty analysis requiring data both at individual and family levels. Most social scientists base their poverty studies on individual and/or family income distribution. Some of the most useful data are derived from expenditure surveys. But data on household economy, with their income and expenditure details, prove more useful.[4] Poverty can be measured either directly in terms of consumption or indirectly in terms of income. The relative deprivation concept is a direct method where poverty is visibly demonstrated through a low standard of consumption. The income poverty line is, on the other hand, an indirect measure established by a low income. Mainstream poverty research usually combines both.[5]

[3] Every administrative district in SL is divided into a number of DS divisions and they are in turn subdivided into *Grama Sevaka* divisions, the smallest unit.
[4] David Cheal, *New Poverty: Families in Postmodern Society* (London: Greenwood Press, 1996), p 19.
[5] For example, see Stein Ringen, 'Toward a Third Stage in the Measurement of Poverty', *Acta Sociologica*, 28, 2, 1985, pp 99-113.

JSEHS explores material as well as social deprivations. Information was obtained under six sections: family composition, housing conditions, household amenities, food intake, and family expenditure, occupation and income. The sections with their classifications are given in Appendix A.

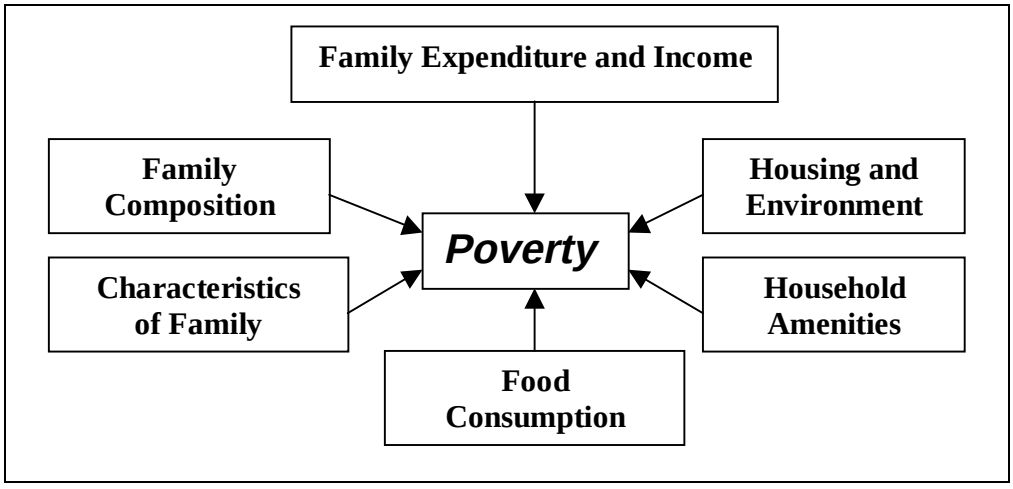
**Poverty Model and Statistical Methods**

While there has been considerable development in the concept of poverty during the last three decades, the method of measurement remains almost unchanged. On the theoretical side, in addition to or as an alternative to the conventional subsistence minimum concept, a relative deprivation concept has been developed. Whereas on the measurement side, irrespective of the concept applied, the most important tool is the income poverty line. The only difference is perhaps at what level the poverty line is set. Researchers have however recognised the limitations of using income alone as an indicator. Additional methods have therefore been developed for ascertaining actual living conditions.

Research on a 'poverty line' involves objective assessment. It is a proven fact that there is no correlation between income and the deprivation score. The best scientific criterion of poverty is a gradual withdrawal from fulfilling some of the social roles and from participating in social customs.[6] Several studies have using sophisticated statistical analysis such as canonical correlation, clustering, and discriminant analysis constructed poverty indices in multivariate contexts.

In this study poverty is explained as a dependent dimension that needs to be measured by a number of independent dimensions. The six independent dimensions may be interrelated, but they individually or collectively determine the common measure of poverty. The relationships and model are shown by a Figure 1.

**Figure 1: A Poverty Model Based on Various Dimensions.**




[6] P Townsend, *The International Analysis of Poverty* ( London: Harvester Wheatsheaf, 1993), pp 40-63.

The statistical methods employed originate from the model described above. The different dimensions of poverty are closely related to existing socioeconomic conditions. E*xploratory data analysis* extracts the basic features of the dimensions, which helps to reflect the individual effects on poverty. Subsequently, *principal components analysis* (PCA), *cluster analysis (CA),* and *canonical discriminant analysis* (CDA) were applied. In the process, some of the unimportant variables are deleted and the poverty model is revised. In the final stage, a suitable number of clusters are formed based on the revised list of variables. CA and CDA were again applied to separate the cluster of socio-economically-vulnerable families and construct a suitable poverty line.

**Analysis of the Results: Dimensions of Poverty**

The sample size has, taking into consideration a few limitations on the survey data, been adjusted to 1110 families.

*Family Information*

Five variables of 'family composition' and two variables of 'characteristics of family' have been considered. The educational level of a person is defined as the total number of years s/he spent on primary, secondary, and tertiary education. The average educational level of a family is computed as the arithmetic mean of the educational levels of all members of a family. Whereas the average occupational level is computed as the arithmetic mean of the occupational levels of the members of a family obtained from a 50-point occupation scale already prepared.[7]

The average educational level for the entire region is 7.5 years. Families reported that they had at least 1.5 years of average education. The average occupational level is 7.93. The occupational levels of families among the zones within the region did not show much variation signifying the homogeneous nature of conditions in the peninsula. A cross tabulation was performed on educational levels vis-à-vis occupational levels in order to determine the occupational performance in relation to education. The results showed higher educational levels having lower occupations indicating an acute unemployment and underemployment.

*Housing Information*

Five variables under 'housing and environment' and four variables under 'household amenities' were commonly measured. The scores on housing conditions were classified as 'poor' 'average' and 'good'. Of the total number of houses in the sample, 13.5% was 'poor', 26.6% 'average' and the balance was in a 'good' condition. The scores on latrine conditions were classified as 'very poor', 'poor', 'moderate', 'good', and 'very good'. Of the total, while 17.8% did not have proper facilities 13.8% had

[7] C.Elankumaran, *Socioeconomic Status and Health Conditions of the People of Jaffna Peninsula, Sri Lanka: A Quantitative Analysis* (Ph.D. Study under preparation).

only average facilities. It was also found that about 37% of the families did not have adequate kitchen facilities.

Average sleeping space per person is an important variable that measures poverty and also indicative of the health conditions under which a family lives. Average space was found to be 61 square feet. It needs to be however recognised that the survey region consists of dwellings with very little floor space, which can hardly be described as houses. These are in fact huts or cottages without proper flooring, roofing or fencing. Household amenities were measured by the values of furniture, electrical items, equipment, and vehicles in a given household. The average value for each of these worked out to be Rs14,520, Rs10,070, Rs8,100, and Rs31,260 respectively. High variations in values were registered suggesting household amenities along with housing facilities can be a discriminatory factor among families.

*Per Capita Food Consumption*

Per capita food consumption was computed from data on the food consumption of a family divided by the family size. The data consist of nutrient intakes related to energy, protein, and fat. Per capita consumption of nutrients can be compared with some standard requirements. The average per capita consumption of the three nutrients is 2597 calories, 72 grams, and 67 grams respectively. Table 2 presents the descriptive statistics of per capita nutrient consumption for the six zones.

**Table 2**
**Per capita nutrient intakes**

| Variable | | JAFF | NALL | VASW | VAWE | VASO | VAEA | Region |
|---|---|---|---|---|---|---|---|---|
| PCEnC | Mean | 2590.4 | 2508.8 | 2436.8 | 2879.3 | 2512.0 | 2665.2 | 2597.0 |
| | StErr | 45.0 | 35.8 | 53.8 | 57.0 | 46.0 | 52.9 | 20.2 |
| | Min | 1169.8 | 982.3 | 1230.2 | 1613.3 | 1184.0 | 1149.8 | 982.3 |
| | Max | 4888.2 | 4687.6 | 5420.8 | 6507.7 | 4946.6 | 6045.7 | 6507.7 |
| PCPrC | Mean | 76.60 | 69.25 | 68.25 | 77.66 | 69.82 | 72.63 | 72.21 |
| | StErr | 1.49 | 1.11 | 1.52 | 1.50 | 1.34 | 1.54 | 0.58 |
| | Min | 31.94 | 26.61 | 34.42 | 33.59 | 26.86 | 31.37 | 26.61 |
| | Max | 145.34 | 115.36 | 160.06 | 137.35 | 136.20 | 253.38 | 253.381 |
| PCFaC | Mean | 65.07 | 62.77 | 62.02 | 82.17 | 59.87 | 70.87 | 66.99 |
| | StErr | 2.07 | 1.20 | 3.37 | 2.95 | 2.17 | 3.45 | 1.10 |
| | Min | 22.31 | 26.16 | 23.70 | 39.51 | 21.70 | 22.39 | 21.70 |
| | Max | 287.67 | 127.81 | 301.84 | 422.57 | 317.91 | 412.55 | 422.57 |
| No of Families | | 166 | 222 | 156 | 164 | 183 | 219 | 1110 |

(StErr – Standard Error of mean, Max – Maximum, Min - Minimum)

*Per Capita Expenditure and Income*

The values are computed from the expenditures and incomes of families divided by the family size. The first four variables are related to expenditure, the fifth to savings, and the last four to income or revenue.

Monthly per capita expenditure on food, health, education, and miscellaneous for a family stood at Rs770, Rs42, Rs89, and Rs350 respectively. Per capita savings was Rs365. Comprehensively, for the entire region the monthly per capita expenditure is estimated as Rs1616.50 (US$21.50). Per capita income from salaried or waged occupations was Rs1275. Whereas, per capita revenue from agricultural and livestock production was Rs139. Per capita revenue from other sources was Rs229. There was a nationally supported food subsidy from the government and on per capita it amounted to Rs150. The comprehensive monthly per capita income/revenue for the region is Rs1792.70 (US$23.90). The relevant table B.1 can be found in Appendix B.

**Socioeconomic Groups of the Jaffna Peninsula**

Poverty has so far been measured using six inter-related socioeconomic dimensions with different characters. Now it needs to be approached in relative terms. To this end, some means to isolate certain families and compare their relative vulnerabilities with the rest have to be devised.

Firstly, a clustering of families based on the 9 expenditure-income variables is carried out and then it is extended to cover all the 28 variables. The Ward's linkage method with Euclidian distance on the standardised variables has been applied on a clustering procedure.

*Clustering by 'Per Capita Expenditure and Income'*

Before a multivariate approach is applied, quintiles (conventional measure) of per capita expenditure and income were calculated. Table 3 provides the results.

**Table 3**
**The Quintile Distribution of Per Capita Expenditure and Income**

| Measure \ Quintiles | First | Second | Third | Fourth |
|---|---|---|---|---|
| PC Expenditure | 0908.33 | 1167.50 | 1471.67 | 2097.14 |
| PC Income | 1099.47 | 1352.00 | 1648.07 | 2252.00 |

The table enables a comparison of the basic features of groupings. The first quintile, for example, reveals that the poorest 20% spends at most Rs908 as monthly expenditure and receives at most Rs1099 as income. The quintiles have been used to cluster families into five categories: lower, lower-middle, middle, upper-middle, and upper. The quintiles, by definition, equally distribute the 1110 families among the five categories.

The above approach is basically a univariate concept involving total expenditure and income. Due to its limitations in determining the extent of poverty, the use of a multivariate concept becomes necessary. As a prelude to this, a clustering on the basis of nine variables included in the above, revealed the existence of 3 or 4 clusters of families.

*Clustering by all the variables*

CA using the 28 variables was done on the 1110 families. However, an initial application of CDA showed that some of the variables are less important in discriminating the families. A careful comparison of the results of the CDA revealed that, as shown in Figure 1, a maximum of four mutually exclusive clusters could be identified.

**Figure 1**
**Dendrogram of Clustering**

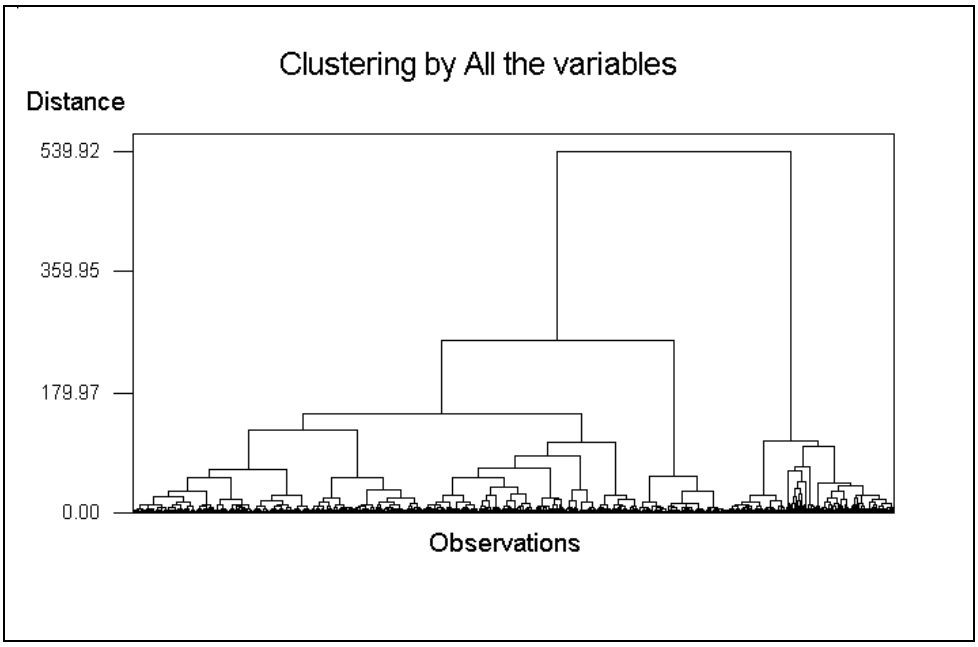


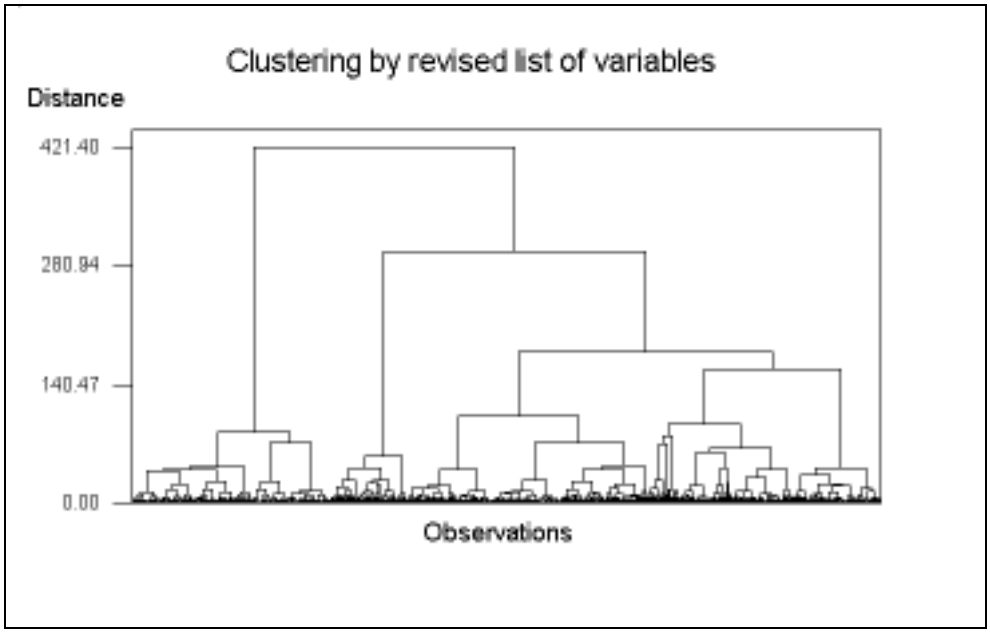

Table B.2 in Appendix B presents the *pooled within class standardized canonical coefficients of CDA* applied on the four groups. The coefficients reveal that the variables STKIT, FLSPH, PCREO, and PCEXM (refer Appendix A) to be least contributing and may be ignored in the construction of a poverty line. The reasons for their insignificance are remotely connected to the prevailing war conditions. A large number of families had been displaced and were living on borrowed facilities, especially houses vacated by owners who had migrated to other regions or overseas. In this milieu, the condition of the kitchen or the floor space did not influence living standards. With regard to the last two, again the existing war related difficulties made data less reliable.

The first canonical variate discriminating the two extreme clusters 'rich' and 'poor' families is positively influenced by AOCLF, HOUCO, PCFAC, and PCEXE, and negatively influenced by PRELD and PCFOS indicating the opposing influence of the two sets of variables. While the positives discriminate the 'rich' from the 'poor', the negatives the 'poor' from the 'rich'. The coefficients of the second canonical variate,

on the other hand, show that in terms of PRSTU these two clusters are similar and differ from the 'middle class' families.

The government funded PCFOS has influenced living standards of families and played a key role in their discrimination. It would however be interesting to delete it along with the other less significant variables and repeat the clustering. Figure 2 portrays the corresponding dendrogram.

**Figure 2**
**Revised Dendrogram of Clustering**




The revised model shows a similar pattern to earlier results. There are 3, 4, or 5 different clusters. It was further investigated by CDA and MANOVA and the results are given in Table B.3 Appendix B. The scatter plots for the first two canonical variates on the four-cluster grouping are presented in Appendix C Figure C.1.

The figure confirms that there are four different types of clusters with little or no intrusion. Descriptive statistics of the four clusters disclose that cluster 3 depicts 'poor' and cluster 1 'rich' families. The other two clusters refer to 'middle class' families. In the context of a poverty study obviously cluster 3 is important. Of the 23 variables used 19 (including money, education, occupational level, and food consumption) have shown least means divulging an incidence of poverty. Among the other four, PCRAL is high for the 'middle class' clusters and understandably low for the 'rich' cluster. Another underlining feature is that it generates the second smallest revenue for the 'poor' cluster. The balance three: PRSTU, PRUNE, and PRELD seem to be common for the entire society.

**Construction of a Multidimensional Poverty Line**

The revised poverty model found a vulnerable group of 292 families. The first two canonical variates explaining respectively 58.6% and 23.8% of the data helped to discriminate the group from other 'rich' and 'middle class' clusters. Table 4 represents their coefficients.

**Table 4**
***Pooled within class standardized canonical coefficients of CDA on four Clusters***

| | Four Clusters | |
|---|---|---|
| Variables | Can1 | Can2 |
| FSIZE | -.1400031181 | 0.2674639983 |
| PRPCI | -.2528885507 | 0.1170242973 |
| PRSTU | 0.0729295624 | 0.2597736975 |
| PRUNE | 0.2496401940 | -.5855399487 |
| PRELD | -.1188209818 | 0.2710770554 |
| AEDLF | 0.1166394177 | 0.0046857641 |
| AOCLF | 0.2070132917 | -.0135584634 |
| HOUCO | 0.1910272985 | 0.0143013213 |
| LATCO | 0.2034566993 | -.1651875920 |
| ASLSP | -.0870394114 | -.1900010452 |
| VAFUR | 0.1656979310 | 0.1497236300 |
| VAELE | 0.3003580777 | 0.3273482334 |
| VAEQU | -.0219670770 | -.1990890561 |
| VAVEH | -.1344654741 | -.3884860515 |
| PCENC | 0.0422527826 | -.0137240239 |
| PCPRC | 0.1209834977 | -.1755340762 |
| PCFAC | 0.0619299140 | -.3530735882 |
| PCEXF | 0.0664145835 | -.0365711713 |
| PCEXH | -.0056995354 | 0.0080644456 |
| PCEXE | 0.1552295993 | 0.2543700979 |
| PCSAF | 0.1478883146 | 0.0758345295 |
| PCOCI | 0.3719809380 | 0.1424239030 |
| PCRAL | 0.0552986295 | -.0547831630 |

A poverty line can be constructed combining the two canonical functions and the boundary points as observed in the corresponding scatter plot in figure C1 of Appendix C. CDF(1) and CDF(2) are defined by the *pooled within class standardised canonical coefficients* (Table 4) as

$$CDF(1) = \sum (Var \times Can1) \quad \text{and} \quad CDF(2) = \sum (Var \times Can2)$$

Where $Var$ is the values of the variables and Can1 and Can2 are the corresponding canonical coefficients listed in Table 4. That is

CDF(1) = - 0.140 x FSize - 0.253 x PrPCI + 0.073 x PrStu + 0.249 x PrUnE - 0.118 x PrElD
+ 0.116 x AedLF + 0.207 x AOcLF + 0.191 x HouCo + 0.203 x LatCo - 0.087 x AslSP
+ 0.165 x VaFur + 0.300 x VaEle - 0.022 x VaEqu - 0.134 x VaVeh + 0.042 x PCEnC
+ 0.121 x PCPrC + 0.062 x PCFaC + 0.066 x PCExF - 0.006 x PCExH + 0.155 x PCExE
+ 0.148 x PCSaF + 0.372 x PCOcI + 0.055 x PCRAL.

and

CDF(2) = 0.267 x FSize + 0.117 x PrPCI + 0.259 x PrStu - 0.585 x PrUnE + 0.271 x PrElD

+ 0.005 x ArdLF - 0.013 x AocLF + 0.014 x HouCo - 0.165 x LatCo - 0.190 x AslSP
+ 0.149 x ValFu + 0.327 x VaEle - 0.199 x VaEqu - 0.388 x VaVeh - 0.014 x PCEnC
- 0.175 x PCPrC - 0.353 x PCFaC - 0.036 x PCExF + 0.008 x PCExH + 0.254 x PCExE
+ 0.076 x PCSaF + 0.142 x PCOcI - 0.055 x PCRAL.

The poverty lines defining the discrimination of the four groups of families identified can now be derived. These are given in Table 5.

**Table 5**
**Poverty Lines by First Two Canonical Discriminant Functions on the Revised List of Variables of Poverty Model**

| Types of Groups | | CDF(2) | |
|---|---|---|---|
| | | CDF(2) > -0.5 | CDF(2) < -0.5 |
| CDF 1 | CDF(1) < - 0.5 | Poor (3) | -- |
| | -0.5 < CDF(1) < 2.5 | Lower Middle (2) | Upper Middle (4) |
| | 2.5 < CDF(1) | Rich (1) | -- |

(Socioeconomic group numbers are shown in the parenthesis)

A poverty measure called the *Head Count Index* (HCI) can be introduced in conjunction with the poverty lines for analytical purposes. HCI is the proportion of population whose living standard is below the prescribed poverty line. Thus, it serves as a good measure in assessing overall progress towards reducing poverty. HCI, in the context of this paper, can be used in terms of the 'poor' cluster to examine the impact of PCFOS. When families received food subsidy 129 of them came within the 'poor' cluster. But once the subsidy is removed the number increased to 292. The HCI with and without food subsidy worked out to be 11.62% and 26.31% respectively.

**Conclusion**

The study clearly identifies new dimensions of poverty in the Jaffna peninsula. A major finding is the role of the 'food subsidy' in reducing the poverty levels. Nevertheless, the scheme has several limitations and is prone to criticism.[8] Results of this study can perhaps be used as a discriminatory index to improve its performance.

## Appendix A

[8] A major drawback has been that it limited the maximum amount payable against a family size of five. Families with more members had to settle for the same amount dissipating its benefits and contributing to poverty.

## A. Family Composition

(1) Number of members in the family. (FSIZE)
(2) Proportion of Preschool Children and Infants in the family. (PRPCI)
(3) Proportion of Students in the family (PRSTU)
(4) Proportion of Unemployed Adults and Youths in the family (PRUNE)
(5) Proportion of Elders and Disabled persons in the family (PRELD)

## B. Characteristics of Family

(1) Average Educational Level of Family (AEDLF)
(2) Average Occupational Level of Family (AOCLF)

## C. Housing and Environment

(1) Housing condition (HOUCO)
(2) Latrine Conditions (LATCO)
(3) Kitchen Conditions (KITCO)
(5) Average sleeping space per person (ASLSP)
(6) Total Floor Space of House (TOFLS)

## D. Household Amenities

(1) Value of Furniture available (VAFUR)
(2) Value of Electrical Items available (VAELE)
(3) Value of Equipment available (VAEQU)
(4) Value of Vehicles available (VAVEH)

## E. Per Capita Food Consumption

(1) Energy Consumption (PCENC)
(2) Protein Consumption (PCPRC)
(3) Fat Consumption (PCFAC)

## F. Per Capita Expenditure and Income

(1) Expenditure on Food consumption (PCEXF)
(2) Expenditure on Health Care (PCEXH)
(3) Expenditure on Education (PCEXE)
(4) Miscellaneous Expenditure (PCEXM)
(5) Savings (PCSAF)
(6) Income due to Occupations (PCOCI)
(7) Revenue due to Crops and Livestock production (PCRAL)
(8) Revenue from All other Sources (PCREO)
(9) Food subsidy amount (Nivaranam) (PCFOS)

## Appendix B

Table B.1 : Descriptive statistics of per capita expenditure and per capita income.

| Variable | | JAFF | NALL | VASW | VAWE | VASO | VAEA | Region |
|---|---|---|---|---|---|---|---|---|
| PCExF | Mean | 893.8 | 829.4 | 705.6 | 717.7 | 767.0 | 707.9 | 770.89 |
| | StErr | 28.1 | 20.5 | 19.4 | 18.7 | 18.1 | 17.0 | 8.58 |
| | Min | 227.3 | 83.3 | 240.0 | 142.9 | 375.0 | 85.7 | 83.33 |
| | Max | 2500.0 | 2250.0 | 1500.0 | 1600.0 | 1666.7 | 2000.0 | 2500.00 |
| PCExH | Mean | 54.02 | 41.01 | 41.72 | 33.17 | 45.87 | 38.51 | 42.21 |
| | StErr | 6.18 | 2.98 | 3.58 | 2.30 | 3.41 | 2.37 | 1.46 |
| | Max | 750.00 | 375.00 | 250.00 | 187.50 | 375.00 | 250.00 | 750.00 |
| PCExE | Mean | 122.03 | 107.63 | 68.61 | 67.80 | 83.19 | 79.89 | 88.91 |
| | StErr | 8.75 | 7.37 | 5.93 | 6.66 | 8.54 | 5.87 | 3.03 |
| | Max | 800.00 | 750.00 | 428.57 | 600.00 | 1166.67 | 600.00 | 1166.67 |
| PCExM | Mean | 514.3 | 430.5 | 231.0 | 264.7 | 317.0 | 317.5 | 349.48 |
| | StErr | 28.2 | 24.1 | 14.0 | 11.5 | 17.8 | 13.9 | 8.46 |
| | Min | 50.0 | 50.0 | 18.7 | 44.4 | 43.7 | 40.0 | 18.75 |
| | Max | 2180.0 | 2550.0 | 1387.5 | 880.0 | 1537.5 | 1433.3 | 2550.00 |
| PCSaF | Mean | 561.4 | 444.6 | 284.7 | 246.7 | 358.8 | 289.0 | 365.50 |
| | StErr | 61.1 | 53.7 | 36.6 | 29.8 | 42.9 | 32.0 | 18.50 |
| | Max | 4600.0 | 6200.0 | 2833.3 | 2500.0 | 4200.0 | 5333.3 | 6200.00 |
| PCOcI | Mean | 1910.0 | 1565.7 | 988.0 | 1058.7 | 1048.8 | 1052.8 | 1274.70 |
| | StErr | 100 | 83.2 | 66.1 | 47.6 | 76.5 | 51.1 | 31.60 |
| | Min | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Max | 7000 | 8600.0 | 6500.0 | 4300.0 | 9001.4 | 5333.3 | 9001.4 |
| PCRAL | Mean | 10.9 | 45.6 | 124.2 | 142.2 | 288.4 | 214.8 | 139.10 |
| | StErr | 6.33 | 11.3 | 23.9 | 21.6 | 44.3 | 23.0 | 10.40 |
| | Max | 1000.0 | 1400.0 | 3083.3 | 2600.0 | 6250.0 | 2166.7 | 6250.00 |
| PCReO | Mean | 214.2 | 235.9 | 239.7 | 134.1 | 337.2 | 203.6 | 228.50 |
| | StErr | 25.0 | 27.8 | 33.0 | 20.0 | 66.6 | 21.5 | 14.70 |
| | Max | 1666.7 | 2750.0 | 2285.7 | 1400.0 | 10000.0 | 1666.7 | 10000.00 |
| PCFoS | Mean | 110.67 | 116.45 | 197.39 | 169.77 | 165.07 | 154.86 | 150.43 |
| | StErr | 9.12 | 7.72 | 7.30 | 7.75 | 7.65 | 7.41 | 3.33 |
| | Max | 420.00 | 302.40 | 358.40 | 315.00 | 322.00 | 315.00 | 420.00 |
| No of Families | | 166 | 222 | 156 | 164 | 183 | 219 | 1110 |

(StErr – Standard Error of mean, Max – Maximum, Min - Minimum is zero in the cases not shown)

Table B.3 : Results of MANOVA and CDA on four cluster grouping of revised list of twenty-three variables of the poverty model.

Multivariate Statistics and F Approximations

| Statistic | Value | F | Num DF | Den DF | Pr > F |
|---|---|---|---|---|---|
| Wilks' Lambda | 0.09563525 | 56.0494 | 69 | 3239.269 | 0.0001 |

Eigenvalues of INV(E)*H = CanRsq/(1-CanRsq)

| | Eigenvalue | Difference | Proportion | Cumulative |
|---|---|---|---|---|
| 1 | 2.2562 | 1.3387 | 0.5863 | 0.5863 |
| 2 | 0.9175 | 0.2427 | 0.2384 | 0.8247 |
| 3 | 0.6747 | . | 0.1753 | 1.0000 |

Table B.2 : The pooled within class standardised canonical coefficients of CDA

on four cluster groupings on twenty eight variables of the poverty model.

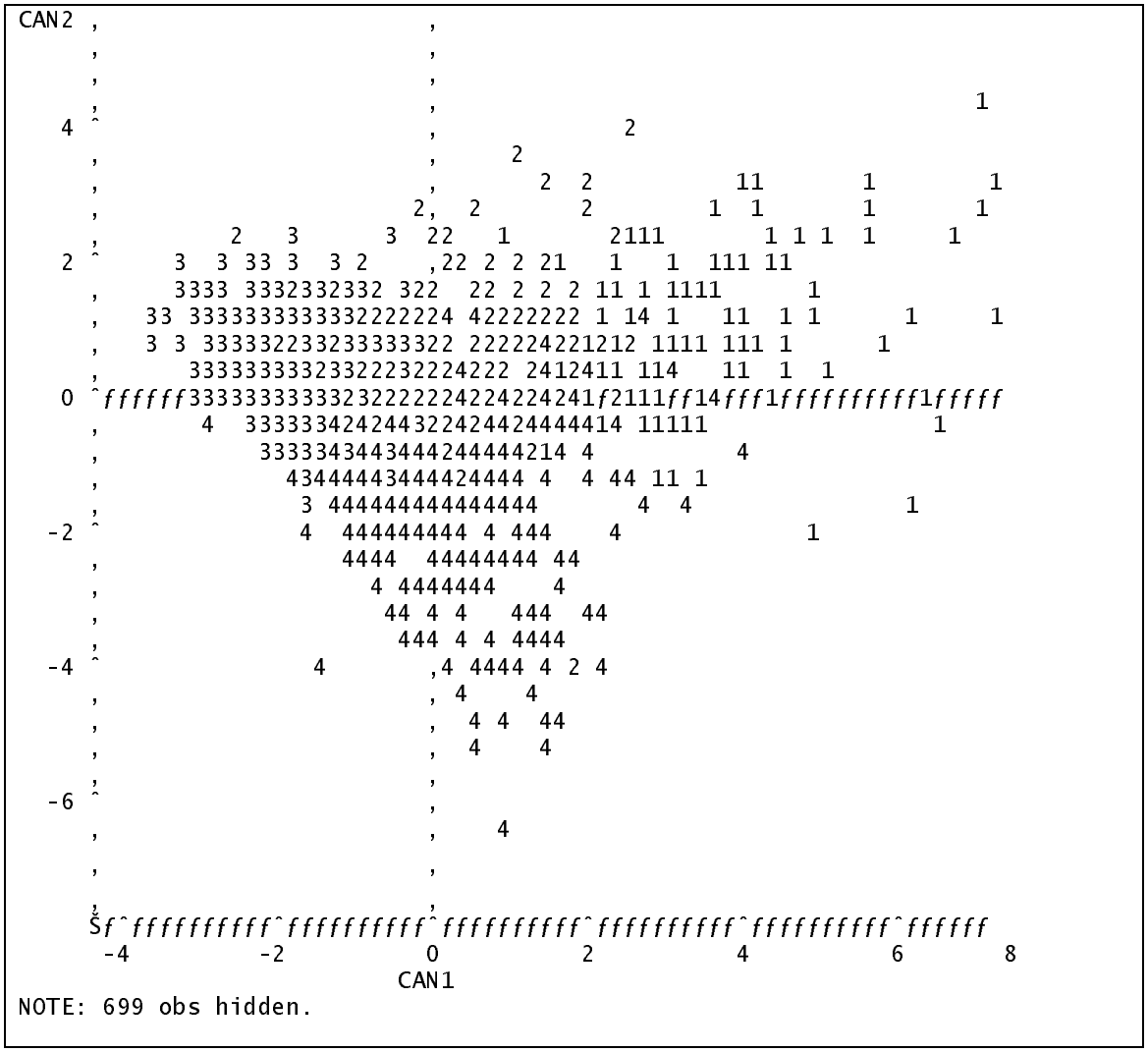
Pooled Within-Class Standardized Canonical Coefficients

| | CAN1 | CAN2 |
|---|---|---|
| FSIZE | -.0953287535 | 0.0584474651 |
| PRPCI | -.1184137526 | 0.2453651637 |
| PRSTU | -.0570423885 | 0.4640355444 |
| PRUNE | 0.0709898613 | -.3943753591 |
| PRELD | -.2690263353 | 0.1514461022 |
| AEDLF | 0.1120665752 | -.1002991736 |
| AOCLF | 0.2167746805 | 0.2198180381 |
| HOUCO | 0.3350109254 | -.4959667756 |
| LATCO | 0.1207492650 | -.3420229712 |
| STKIT | -.0041659891 | -.0087391787 |
| ASLSP | 0.0128440361 | 0.0104901303 |
| FLSPH | 0.0201787696 | -.0518083923 |
| VAFUR | 0.0620403361 | 0.0484451670 |
| VAELE | 0.1994314225 | 0.0466997172 |
| VAEQU | 0.1636290000 | 0.1247029803 |
| VAVEH | 0.1789995374 | 0.0606724434 |
| PCENC | 0.1799045526 | -.1876543955 |
| PCPRC | -.0666267985 | -.1194225825 |
| PCFAC | 0.2866062940 | 0.2036664951 |
| PCEXF | 0.0794701318 | 0.0356968428 |
| PCEXH | 0.0916624723 | 0.0881755133 |
| PCEXE | 0.2204378112 | 0.1961651531 |
| PCEXM | 0.0130961468 | 0.0677029325 |
| PCSAF | 0.0969038362 | 0.2330354512 |
| PCOCI | 0.0669449763 | -.0605836354 |
| PCRAL | -.0647715982 | -.2816450731 |
| PCREO | 0.0459032471 | 0.0054873349 |
| PCFOS | -.3128595276 | -.2297338984 |

## Appendix C

Figure C.1 : Scatter plot of the scores of the first two canonical variates of revised list of twenty-three variables of the model with five clusters.

Plot of CAN2 versus CAN1. Symbol (1,2,3,4) cluster membership




NOTE: 699 obs hidden.