



Research Paper

Major problems faced by the Elderly in Kerala- An Exploratory Factor Analysis

Dr Sindhu Pratap

Professor, SN College, Cherthala

Abstract

Old age presents its special and unique problems but these have been aggravated due to the unprecedented speed of socio economic transformation leading to a number of changes in different aspects of living conditions. The elderly face a lot of problems towards the fag end of their lives. Economic and social insecurity is one of the common phenomena confronting the elderly across the globe. As age advances, they suffer from a lot of problems ranging from economic problems like poverty and deprivation, health problems, social and psychological problems like social inferiority, isolation, loneliness, loss of social role, powerlessness, abuses and humiliation and lack of available opportunities for the creative use of free time etc.

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I. Introduction

Population Ageing, is unquestionably one among the important demographic phenomena of the present global human concerns. Population ageing is the process by which the older individuals (those who are 60 years and above) form a proportionately larger share of the total population. In India, the process of ageing occurs much faster in the south than in the northern states. Among the south Indian states, Kerala is unique as it is demographically ahead of the rest of the country and is in the final stages of the demographic transition. The ageing scenario of Kerala is much more prominent than in any other state of India. From 1961-2001, there has been a 200% increase in the old age population with a majority being women. However, due to the increasing life expectancy of more than 71 years and a lower fertility rate of 1.6, the proportion of population in the old age group (60 years and above) is showing an increasing trend from 6% in 1961 to 12.6% in 2011 and in terms of the proportion of the elderly, Kerala ranks number one among the states. According to 2011 Census, Kerala accommodates 4 million elderly people. Kerala has registered the highest median age (27.9 years), indicating its status as a forerunner in demographic transition.

Objective of the study

To identify the major problems faced by the elderly.

II. Methodology

The study is based on primary data collected from 400 elderly respondents aged 60 and above from both urban and rural areas of Kollam, Kottayam and Malappuram districts of Kerala using a structured interview schedule.

Data analysis was attempted to identify the major problems faced by the ageing population of Kerala using the multivariate technique, factor analysis with the extraction method being Principal Component Analysis. Factor analysis attempts to identify underlying variables, or *factors*, that explain the pattern of correlations within a set of observed variables. It is often used in data reduction to identify a small number of factors that explain most of the variance observed in a much large number of manifest variables.

The data for factor analysis should have a bi variate normal distribution for each pair of variables, and observation should be independent. The factor analysis model specifies that variables be determined by common factors (the factors estimated by the model) and unique factors (which do not overlap between observed variables); the computed estimates are based on the assumption that all unique factors are uncorrelated with each other and with the common factors. The usual factor analysis model expresses each variable as a function of factors common to several variables and a factor unique to the variable.

$Z_j = a_{j1}F_1 + a_{j2}F_2 + \dots + a_{jm}F_m + U_j$ where:
 Z_j = the j^{th} standardized variable
 F_i = the common factors
 m = the number of factors common to all the variables
 U_j = the factor unique to variable Z_j
 a_{ji} = the factor loadings

Ideally, the number of factors, m , will be small, and the contribution of the unique factors will also be small. The individual factor loadings, a_{ji} , for each variable should be either very large or very small so each variable is associated with a minimal number of factors. Thus, one wants to explain the observed correlations using as few factors as possible. The unique factors, U 's, are assumed to be uncorrelated with each other and with the common factors.

The most commonly used method of factor extraction is PCA. Principal components analysis finds out the first linear combination of variables accounts for the largest amount of variation in the sample; the second for the next largest amount of variance in a dimension independent of the first, and so on. Successive components explain smaller and smaller portions of the total variance and are independent of one another. In each solution, there are as many components as there are original variables. Ideally, for a data set, the few components should account for a large proportion of the variance of the original variables. The variances of the components are commonly known as eigen values (also called characteristic roots or latent roots). The size of the eigen values describes the dispersion or shape of the cloud of data points in a multivariate space that has one axis for each variable.

Usually the initial factor extraction does not give interpretable factors. Therefore we attempt for rotation of the factors. One of the purposes of rotation is to obtain factors that can be named and interpreted. That is, if you can make the large loadings larger than before and the smaller loadings smaller, then each variable is associated with a minimal number of factors. Hopefully, the variables that load strongly together on a particular factor will indicate a clear meaning with respect to the subject area at hand.

There are four main steps in a factor analysis:

- I. First step is data screening and testing for sampling adequacy. The correlation or covariance matrix is computed. If a variable has very small correlations with all the others, we may consider eliminating it.
- II. The factor loadings are estimated. Here, we decide whether the method of factor extraction is principal components or any other method of extraction.
- III. The loadings are rotated, if required, to make the loadings more interpretable. Rotation methods make the loadings for each factor large or small, not in-between.
- IV. For each case, scores can be computed for each factor and saved for use as input variables in other procedures.

III. Results of Factor Analysis

Step I

The first body of output concerns data screening and testing of sampling adequacy. The adequacy of data set was examined by correlation matrix (R-matrix), Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of sphericity.

The correlation matrix contains the Pearson's correlation coefficients between all pairs of variables and their significance levels. One knows that to do a factor analysis we need to have variables that correlate fairly well, but not perfectly. Also, any variables that correlate with no others should be eliminated. Therefore, we can use correlation matrix to check the pattern of relationships. The easiest way to do this is by scanning the significance values and looking for any variable for which the majority of values are greater than 0.05. Examination of R matrix in the present data set shows that it is appropriate for the analysis.

The KMO statistic can be calculated for individual and multiple variables and represents the ratio of the squared correlation between variables to be squared partial correlation between variables. The KMO statistic varies between 0 and 1. A value of 0 indicates that the sum of partial correlations is large relative to the sum of correlations, indicating diffusion in the pattern of correlations (hence, factor analysis is likely to be inappropriate). A value close to 1 indicates that pattern of correlation are relatively compact and so factor analysis should yield distinct and reliable factors. Kaiser (1974) recommends accepting values greater than 0.5 as acceptable. For the present data set, the value is 0.84, so we can be confident that factor analysis is appropriate for these data.

Table 1. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.843	
Bartlett's Test of Sphericity	Approx. Chi-Square	2556.008
	Df	105
	Sig.	.000

Bartlett’s measure tests the null hypothesis that the original correlation matrix is an identity matrix. For factor analysis to work we need some relationship between variables and if the R-matrix were an identity matrix then all correlation coefficients would be zero. Therefore, we want this test to be significant (i.e. to have a significance value less than 0.05). A significant test tells us that the R-matrix is not an identity matrix; therefore, there are some relationships between the variables we hope to include in the analysis. For these data, Bartlett’s test is significant at zero percent level, and therefore factor analysis is appropriate. (Table 1)

Step II

In the second step, factor loadings are estimated. For estimating them, Principal Component Analysis (PCA) was selected as the extracting method.

Step III

The results were rotated to get better results. The results were found relevant and reasonable for interpretation. The results of the rotated factor analysis contain the following tables.

The first (Table 2) shows communalities before and after extraction. Communalities are the proportions of common variance within a variable. Principal component analysis works on the initial assumption that all variance is common; therefore, before extraction the communalities are all 1. In effect, all of the variance associated with a variable is assumed to be common variance. Once factor have been extracted, we have a better idea of how much variance is, in reality, common. The communalities in the column labeled. Extraction reflects this common variance. So, we can say that 69.1 percent of the variance associated with variable 1 is common, or shared variance. Another way to look at these communalities is in terms of the proportion of variance explained by the underlying factors. Before extraction, there are as many factors as there are variables, so all variance is explained by the factors and communalities are all 1. However, after extraction some of the factors are discarded and so some information is lost. The retained factors cannot explain all of the variance present in the data, but they can explain some. The amount of variance in each variable that can be explained by the retained factors is represented by the communalities after extraction.

Table 2 Communalities in terms of the Proportion of variance

	Initial	Extraction
Insufficient money	1.000	.691
Poor housing	1.000	.614
Poor health	1.000	.655
Insufficient medical care	1.000	.621
Loss of faculties	1.000	.608
Loneliness	1.000	.781
Lack of companionship	1.000	.733
Departure of children	1.000	.765
Nothing to keep me busy	1.000	.545
Being dependent	1.000	.692
Loss of status/ respect	1.000	.566
Disappointments	1.000	.656
Feeling of redundancy	1.000	.734
Loss of confidence	1.000	.604
Fear of crime / violence	1.000	.446

The following Table 3 shows the Total Variance Explained. This table shows statistics for each factor before and after the components are extracted. For principal components, initial and extraction statistics are always the same. In the column labelled Total, the eigen values for the multivariate space of the original variables are ordered by size. Each value is the total variance explained by a factor. The percentage of the total variance attributable to each factor is displayed in the column labelled % of variance.

The first factor accounts for 19.87 % of the variance, the second accounts for 19.54%, the third accounts for 18.23% and the fourth accounts for 7.08%. Together, the first four factors account for 64.72% of the variability of the original 15 variables.

Table 3 Total Variance explained

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	5.287	35.249	35.249	5.287	35.249	35.249	2.981	19.874	19.874
2	1.897	12.645	47.893	1.897	12.645	47.893	2.931	19.541	39.415
3	1.521	10.140	58.034	1.521	10.140	58.034	2.735	18.234	57.649
4	1.004	6.692	64.725	1.004	6.692	64.725	1.061	7.077	64.725
5	.955	6.364	71.090						

6	.802	5.347	76.437						
7	.576	3.837	80.274						
8	.532	3.547	83.821						
9	.497	3.315	87.136						
10	.420	2.798	89.934						
11	.397	2.648	92.582						
12	.350	2.336	94.917						
13	.324	2.161	97.079						
14	.279	1.859	98.938						
15	.159	1.062	100.000						

Continuing with this analysis, we find the different variables correlated with the each factors. These different factors are named accordingly.

Table 4 Rotated Component Matrix^a

	Component			
	1	2	3	4
Loneliness	.850	.019	.189	.150
Lack of companionship	.830	.003	.194	.079
Fear of crime / violence	.642	.147	.106	.025
Nothing to keep me busy	.561	.151	-.167	-.424
Insufficient money	.026	.820	.125	-.042
Poor housing	-.022	.783	-.007	-.017
Insufficient medical care	.021	.692	.366	.084
Disappointments	.385	.647	.251	.162
Loss of status/ respect	.344	.631	.223	.025
Poor health	.068	.121	.796	-.038
Loss of faculties	-.006	.100	.736	.237
Feeling of redundancy	.385	.298	.702	-.061
Being dependent	.191	.196	.610	-.496
Loss of confidence	.451	.285	.565	-.025
Departure of children	.428	.268	.037	.713

In short, the major problems faced by the ageing population of Kerala can be identified as follows: The first factor identified is **solitude** reflected by the variables loneliness, lack of companionship, fear of crime/violence and nothing to keep me busy. The second factor is **insufficiencies** reflected by the variables insufficient money, poor housing ,insufficient medical care disappointments and loss of status/respect. The third factor is **feel of loss**, indicated by the variables poor health, loss of faculties, feeling of redundancy, being dependent and loss of confidence. The fourth factor may be named as **absence of children** indicated by the variable, departure of children.

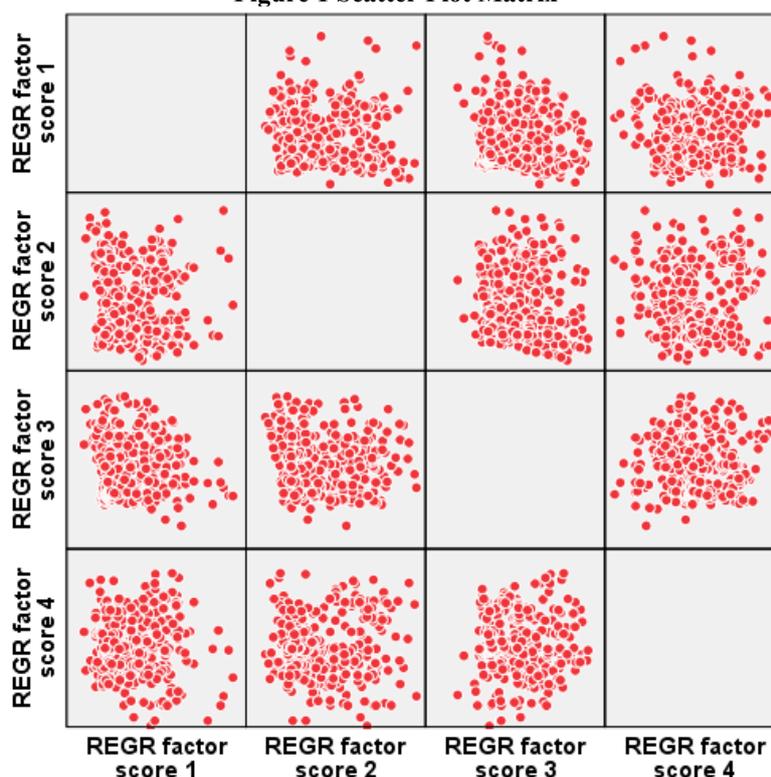
Step IV

The factor scores for each component were saved as variables in the data set. Although the linear correlation between the components is guaranteed to be 0, we should look at correlation matrix and plots of the component scores to check for outliers and nonlinear associations between the components. The factor score correlation matrix and scatter plot matrix given below assure the results are reliable since there are no linear or nonlinear correlations visible between the scores. (Table 5)

Table 5 Score Correlations Matrix

		REGR factor score 1	REGR factor score 2	REGR factor score 3	REGR factor score 4
REGR factor score 1	Pearson Correlation	1	.000	.000	.000
	Sig. (2-tailed)		1.000	1.000	1.000
	N	400	400	400	400
REGR factor score 2	Pearson Correlation	.000	1	.000	.000
	Sig. (2-tailed)	1.000		1.000	1.000
	N	400	400	400	400
REGR factor score 3	Pearson Correlation	.000	.000	1	.000
	Sig. (2-tailed)	1.000	1.000		1.000
	N	400	400	400	400
REGR factor score 4	Pearson Correlation	.000	.000	.000	1
	Sig. (2-tailed)	1.000	1.000	1.000	
	N	400	400	400	400

Figure 1 Scatter Plot Matrix



Scatter diagram is a good measure to know the association between variables. A crowded diagram or an indefinite pattern shows that there exists no association between variables. Both the diagram shows no definite pattern and as a result it satisfies the point that the components are non linearly associated and the results are reliable. (Figure 1)

IV. Conclusion

On the basis of factor analysis, it has been found that the first factor identified is **solitude** reflected by the variables loneliness, lack of companionship, fear of crime/violence and nothing to keep me busy. The second factor is **insufficiencies** reflected by the variables insufficient money, poor housing, insufficient medical care, disappointments and loss of status/respect. The third factor is **feel of loss**, indicated by the variables poor health, loss of faculties, feeling of redundancy, being dependent and loss of confidence. The fourth factor may be named as **absence of children** indicated by the variable, departure of children. Rapid modernization, national and international migration, high work participation rate of women, urbanization and disintegration of the joint family system and the changing social values has eroded the support base of the elderly. At the same time the institutional arrangements to support the elderly are fewer and their coverage limited. Thus there is a greater need to pay greater attention to the economic and social dimensions of ageing issues and promote policies and programmes for dealing with an ageing society.

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