Development of Multifactor Index for Assessing Quality of Life of a Tribal Population of India: Multilevel Analysis Approach

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Research article

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Abstract

Background

The main objective of this study is to develop multilevel multi-factor index to assess the quality of life of Malayali tribal population of India at the individual and village levels based on nine domains, namely, Demography, Economy, Health, Human Development, Infrastructure Development, Work Participation, Recreation, Social Capital and Self Perception. Also, an attempt is made to classify the individuals as well as villages on the basis of the overall scores of multifactor index within a community which will help policy makers to develop concrete policy recommendations for the improvement of quality of life of this tribal group.

Method

Multilevel factor analysis is utilized to determine uncorrelated meaningful factors and their respective weights using Mplus software from the nested dataset consists of values of nine domains of 1096 individuals collected from 19 villages. Multilevel multifactor index is constructed using the weights of these factors. The qualities of lives of different households and of different villages are assessed using the scores of this index.

Results

Three different factors are identified at household as well as village levels. The quality of life at Households and at villages levels are classified as poor, low, moderate, good and excellent based on five quintiles of the scores of the multifactor index and the contribution of each domain in this classification is ascertained.

Discussion

This study finds that at household as well as at village levels, the quality of life of the individuals of this tribal population increases with increase in education, income and occupation status which make them to lead a healthy life and also make them to find time and money to spend on recreation. Infrastructure does not play a significant role at the house hold level whereas it is a matter at village level.

Conclusion

The main purpose of developing this kind of multifactor index at different levels is to provide a tool for tribal development based on realistic data which can be used to monitor the key factors that encompass the social, health, environmental and economic dimensions of quality of lives at the individual/household and community levels of this tribal people.

1. Background

Quality of life describes well-being of human's life. The concept of quality of life varies from individual's feelings of wellbeing to mental, social, occupational, spiritual, marital and physical functioning [1]. Dissart and Deller (2000) argued that an individual's quality of life depends on the objective facts of life as well as the subjective perceptions of these factors. Over the years the concept of quality of life has given image makeover from health related factors to non-health related issues like standard of living, subjective wellbeing, happiness, human development, gender development, education, recreation and leisure [3-4]. Main idea of assessing quality of life is to create an opportunity for individuals to live longer with healthy, creative and satisfied lives in good environment. Measuring quality of life of a society will help the development authorities to identify the problematic areas and provide effective management suggestions for the improvement in the well-being of individuals of that society [5].

The number of research papers on quality of life has been increasing steadily. Research Scholars say that the concept of quality of life depends on the area of research and the type of problem to be discussed [6-7[. Kane (2001) identified that factors like sense of safety, security and order, physical comfort, enjoyment, meaningful activity, relationships, functional competence, dignity, privacy, autonomy, individuality and spiritual well-being define quality of life. Noronha and Nairy (2005) have defined quality of life as satisfaction of needs, feeling of well- being, and working conditions. Phillips (2006) defined quality of life as the autonomy to choose to enjoy life, to flourish and to participate as citizens in a society with high levels of civic integration, social connectivity, trust and other integrative norms. According to International Society for quality of life studies (2007), quality of life is the degree to which a person's life is desirable, often with an emphasis on internal component such as environment and income. Quality of life is defined as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns [12].

The quality of life index is a composite criterion consists of certain social, physical, economic and psychological factors to measure the well-being of groups of individuals or communities and is considered as tool in policy analysis and public health administration [13]. Initially, objective factors based indices like GDP, Human Development Index and Wealth Index have been developed and of late more subjective factors based indices such as subjective wellbeing index, emotional wellbeing index, happiness index etc are being increasingly included in the measurement of quality of life along with objective indices [14]. Quality of life index encompasses different objective and subjective dimensions and if these dimensions are aggregated properly then an overall value of quality of life of individuals or communities can be derived.

Nowadays enough literature is available on choice of indicators to be used to measure quality of life. These indicators represent individual, interpersonal and contextual aspects of quality of life. Discussions on developing indices for assessing the quality of life have led to numerous important initiatives

undertaken by different scholars worldwide for decades [15]. These exercises led to a growing consensus on the need for a comprehensive wide-ranging data driven approach for developing indices which encompass all aspects of life to define and measure the quality of life of different societies and finally applicable for both analytical and policy making purposes [16]. These indices are periodically used in measuring the progress of communities and their well-being and in developing methodologies for sustaining quality of life for the future [17].

Saharnaz Nedjat's (2011) study on Iran population indicates that factors like age, sex, and education and employment status play major roles in determine quality of life. A systematic review study on quality of life of general population reveals that large proportions of population are satisfied with their lives in 'general' terms and the ratings of quality of life are frequently highest in family and lowest in finances; personal characteristics and objective circumstances are not a major influence on subjective evaluations of quality of life in general [19]. Victoria Cramer et al (2004) find that good somatic health, living with a stable partner in a less densely populated area, having good education and good income determine the global quality of life. Population density, psychological, relational and environmental factors influence quality of life of citizen Northern Italy people [21]. Fiona Y Wong et al, (2018) by determining association between quality of life and neighborhood environment satisfaction of residents of Hong Kong city concluded that this type of study provides policymakers and health administrators with evidence-based information on how physical and built environment can influence the quality of life of the residents which facilitates the environment interventions and policy recommendations.

This study makes an attempt to assess the quality of life of Malayali tribal population of Tamil Nadu State which is situated in the southern part of India. This group is the largest tribal population of this state. Mostly they live in hilly regions and they live in condition of isolation with their own socio-cultural system [23].

Studies on the assessment of quality of life of Indian tribal populations are limited but increasing steadily. Quality of life of tribal population of Kerala State, India was assessed using deprivation index and inferred that the level of deprivation in terms of housing, basic facilities and economic status is very high compared to general population of the same state [24]. Jana and Prasanta Kumar Ghosh (2015) have analyzed various socioeconomic indicators to assess the quality of life of tribal population of Mayurbhanj District of Odisha State of India and inferred that the quality of life of this population have remarkably improved over the years but there exists economic disparities in terms gender and caste. A secondary data analysis of different elderly tribal populations assessed the security index on the basis of both financial and social security status and identified that security becomes poorer as age increases, moderate index values decreases as age increases and better security is also found among the oldest old [26].

The main objective of this study is to develop multilevel multi-factor index to assess the quality of life of Malayali tribal population at the individual and village levels to determine the roles of different indices defined at multiple levels in shaping the quality of life of this tribal population. Also, it will attempt to classify the individuals and villages on the basis of this overall performance of multifactor index within a community which will help policy -makers to develop concrete policy recommendations for the improvement of quality of life of this tribal group. Demography, Health, Economic condition, Infrastructure Development, Recreation, Work Participation, Human Development (Wealth Status and Literacy Rate), Social Capital and Perceived Quality of life are the nine domains considered for this study. This tool can be expanded and tested on various other tribal communities by making adjustments to suit their locally available conditions.

2. Method

The Table.1 provides the details regarding the domains, indicators and their variables used for this quality assessment process.

2.1 Multi-Factor Index

The most common and simplest way to construct a multi-factor index is to take a weighted average of two or more single factor indices and such indices are constructed by combining together several such indicators for evidence-based decision making [27]. Quality of life can be considered as components of different domains and if they are aggregated scientifically then an overall value or score for quality of life can be derived [28]. Researchers have been developing different multi-factor indices based on the choice of indicators that suits to measure various aspects of quality of life in such a way that each indicator supposed to reflect the magnitude of a specific domain of quality of life [28]. Nowadays, many international institutions are trying to define quality of life as component of various aspects such as income, jobs, cost of living, education, environment and safety to assess the individual and social well-being [29]. A multi-factor/composite indicator generally provides better results than a single indicator for a specified subject [30]. Saisana et al (2005) have opined that multi-factor index can be used to measure multidimensional issues and facilitates ranking of communities or countries. A composite index based on geometric mean was developed by Chakrabarty (2005) to measure the efficiency of different ports. The well known composite index is Human Development Index developed United Nations Development Programme which combines education, health and income [33]. Hospital performance index comprises of bed occupancy rate, bed turnover and average length of stay [34]. Other examples are Physical quality of life index [35], Monetary condition index [36]. This study proposes to use multilevel factor analysis technique to construct multi-factor index based on the above said nine domains.

2.2 Construction of Multi-Factor Index

When the data are collected from different individuals within a group, then that data is said to be nested within that group and data are available at different levels. In our case household's (level1) data are nested within the village (level 2) they live and these observations need not be independent because all the households may use the same facilities available in that village. In this nested data, the total variance is split into variances due to within village and between villages. Moreover, among nine indicators of this study some are individual based and some are village based. For example, literacy

rate and wealth indicators are individuals based whereas Infrastructure is village based indicators. In such situation, it is not advisable to use commonly used analytical methods which might produce inaccurate readings of statistical significance. In such case multilevel analysis is suitable to analyze this kind of structured dataset and it can also provide scores to represent both within individual's differences and between-individual differences [37].

Factor analysis is the commonly used multivariate technique to construct multi-Factor index. The major disadvantage of this method is that it extracts components from total correlation matrix ignoring dependency factor present in the data. In such case the standard errors of parameter estimates and the model fit statistics may be misleading and the component structure may not be correct because it is contaminated by two sources of variance [38]. In such situation multilevel factor analysis is recommended because it not only produces unbiased estimates of the parameters but also allows discussing village characteristics in the factor structure of individual outcomes [39-42].This analysis breaks down the total variance-covariance matrix of variables measured at individual level into within village (level 1) and at village level between village matrices and provides factor structure at each level [42-44].

Multilevel factor analysis (MFLA) develops one of the two types of latent constructs based on these indicators such as individual level constructs that capture individual quality of life and (2) aggregated scores that capture quality of life at village level. This analysis provides two different latent factor structures at two levels, which help us to understand the variation in structure, and meaning that exists between individuals within a village, as well as between villages, rather than assuming that the factor structure is the same at both levels [45].

This paper proposes to indentify the domains which play vital role in assessing quality of life at individual level and at the village level. This paper proposes to use MLFA [46-47] to assess the quality of life based on nine domains described earlier. Just like simple factor analysis, MLFA also tries to capture the shared variance among an observed set of variables in terms of a potentially smaller number of unobserved constructs or latent factors [48, 49]. However, MLFA splits the total sample variance-covariance matrix into within-group (i.e., individual level, within a village) and between-group (i.e., village level) matrices and also identifies distinct latent factor structures at each of these levels [42].This analysis helps the researchers to understand the variations in structures between individuals within a village, as well as between villages.

2.3 Tool Development

After identifying the main domains for assessing quality of life, the various indicators used to define each domain and the variables used to define each indicator were identified. Two different questionnaires, namely, household questionnaire and village questionnaire were developed to quantify the variables and then the indicators of this study to assess the quality of life of this tribal population at individual level and then at the village. Experts from different fields such as public health, sociology, anthropology and statistics were reviewed the questionnaires based on various aspects such as appropriateness, relevance, representativeness, difficulty and comprehensibility of the items. They were further refined based on the comments of these experts. The tool was then translated to Tamil, the local language and back translated to English to check the validity of translation. This tool was initially pilot tested on a small sample of 50 households of another tribal population. The time taken to administer the tools and the ease of administration were assessed. The tool was further refined based on the findings of pilot test.

2.4 Sample Size

Sample size was calculated using Epi Info software version 3.2.5 assuming the following parameters: 1) Tribal population in Tamil Nadu 651,321 [23], 2) Literacy rate among tribal – 41.5%, 3) Absolute precision of estimate 5% and 4) Confidence levels – 95%

The sample size was 2151 adults. An oversampling of 5% was added to account for absence or non-response. The overall sample size was 2259 adult tribal individuals. Assuming on an average 2 adult members per household this sample size can be achieved by visiting 1130 households.

Sampling Methodology

A systematic, Multi-stage sampling design was adopted. The selection process of the sample was as follows:

i. At the first stage, in order to capture the uniqueness of tribes; villages where more than 80% of Malayali tribe live were selected on the basis of the information available with the 2011 census. At the second stage, nineteen villages were selected using probability proportion to size.
ii. Number of respondents per village was determined on the basis of population available in the village.
iii. At the third stage, the Circular Systematic Random Sampling (CSRS) was adopted to achieve the sample size in each village. The survey was started at the north-west corner of each village, at first one household was selected at random, and then the other households were selected subsequently using CSRS method. No replacement was made if selected household was locked or empty during data collection.

2.4 Data Collection

A team of investigators were recruited and given rigorous one week training on House Listing Activities, Sampling Methodology, and Questionnaires, Types of Respondents, Investigation Ethics, Interview Techniques and Data Collection Instruments. The data were collected on palm top computers using Epi Info version 3.2.5 data sheets. Two teams were formed and each team comprised of one supervisor and four investigators. It was decided to interview one individual either husband or wife in each household. All the eight investigators were involved in data collection and the supervisors were responsible for online and offline data quality checking. The data cleaning process reduced the sample size from 1130 to 1096.

Ethical Considerations

The study protocol was presented to the Institutional Review Board and Ethical Committee of the School of Public Health, SRM University. It was approved after a thorough review. Special considerations such as investigations on indigenous populations and requirements of good quality of informed consent were discussed. A fully informed consent was obtained from all the participants before the interview. In case of respondents who couldn't read and write, left thumb impression was obtained after the informed consent. An impartial witness also signed the consent forms. The interviews were conducted in the privacy of the homes of the respondents. Strict confidentiality was assured for the information collected from the respondents. Only the investigators, the data analysis teams and the research team had access to the collected information. The investigators respected the cultures and traditions of the tribal populations during the data collection visits.

3. Analysis And Results

3.1 Index Calculation

If the variables of a study are expressed in different units, it is better if they are made unit-free. One of the important formulae to be used for such purpose is

$$\text{X-index} = (X - \text{Min}(X))/(\text{Max}(X) - \text{Min}(X))$$

Where Max(X) and Min(X) are the respective maximum and minimum values of the variable X. The values of this unit-free index will be ranging from zero and unity. Then, the value of the combined index of such unit-free indices can be obtained as the average value of the values of these indices. Combined index value closer to unity indicates better the performance of that index. The above mentioned nine indices are made unit-free and have been used for assessing quality of life.

3.2 Development of Multilevel Multifactor Index

The Mplus software [50] which consists of four-step procedure developed by Muthen was used for developing multilevel multifactor index based on nine domains. The specialty of this powerful package is that it estimates statistical models for observed as well as unobserved (latent) variables separately [43, 44]. At first, ordinary factor analysis was conducted on total correlation matrix of nine domains to get rough idea about the underlying factor structure assuming all the observations are independent. Intra correlation coefficient (ICC) for each index was obtained in the second step. Main idea of calculating ICC is that it will help us to determine whether our data need multilevel factor analysis. The third and fourth steps, respectively, involves in getting estimates for within-correlations and between-correlation matrices and conduct factor analysis for each matrix separately.

Exploratory factor analysis was made on total correlation matrix (Table.2) using SPSS (Trial Version) software and the result of this analysis indicates the existence of four factors. This analysis is technically incorrect because this analysis assumes that the between-correlation matrix is a zero matrix. That is, the analysis of the total correlation matrix assumes that there exist no reliable between-individual differences present in the data. To explore the extent to which this is true or false, computed the intra correlation coefficients were computed for each of the nine indices. The intra correlation coefficients are given in Table-3.

The ICC is the proportion of variance in the observed domain that is due to differences across villages. For example, ICC value for social capital is 0.134 which indicates the variation for this domain is due to the differences across villages. This ICC value justifies that grouping of households within the villages, showing that 13% of the total individual differences in social capital occurred at the village level and is due to composition of villages [51]. Appreciable variation in ICC values among the domains shows that village-level source of variation do not operate uniformly across domains. These differences in household and village level variations also exhibits at possible differences in the relationship between these domains at two levels of analysis. These results justify the need for MFLA to extract the prevalent factor structure for this nested dataset. MFLA with varimax rotation was made on within and between correlation matrices separately to obtain factors and their respective scores at the household and at the village levels.

The mean and standard deviation values of nine domains at household and village levels are is given in Table 4. The average values of nine domains do not vary much between levels whereas variations at the household level are on the higher but not so at village level.

The test statistics of Table 5 show the model fit for this data is good. The averages and standard deviation of these scores of nine domains at household and at village levels are given in Table. 4. These averages and standard deviations are statistically significant at household level (Table.5). This significance indicates that both averages and standard deviations play significant roles in assessing the quality of life of this tribal population based on nine domains at the household level. The significant variances indicate that the scores of all the nine domains vary significantly from household to household. But at the village level, all average scores of nine domains are significantly different from zero and some variances are not significantly different from zero. The variances of scores of self perception, social capital, and demography and work participation are statistically insignificant which indicates that these four domains do not vary much from village to village.

3.3. Factor Analysis at household level

The total correlation coefficient is partitioned into a household (within) and village (between) components. It is known that the sample correlation coefficient is a consistent estimator to the population within-correlation matrix and hence this within correlation matrix was submitted for exploratory, principal axis, factor analysis using M-plus software. The total variance (eigen values) explained by factors are given in Table 6.

The first three eigen values are above unity and they are 2.403, 1.474 and 1.168 and the factor loadings of these three factors are given in Table 7 and visualized in Figure.1.

All the nine domains are highly loaded in the first three factors. These three factors are positively correlated among themselves (Figure.1). The health domain is highly loaded in the first factor and hence this factor is referred to as Health factor and this factor carries the maximum weight. Health domain is a composite index of Morbidity and Maternal and Reproductive Health indicators. Better health indicates lesser morbidity and also reasonably good ante and post natal care. The average normalized value of this index is about 0.5. That is, fifty percent of household members of this study keep good health.

Substantively, the second factor appears to be a Socio-Demographic factor with very high positive loadings from four factors, namely, Demography, Social capital, Self Perceived quality of life and Recreation. Positive loading indicates that these four factors behave alike. This factor refers to the complex interaction of family size, family type, the family social relationships, the household's level of recreation and leisure and its overall perceived quality of life. In this tribal area the family type and family size seems to be strongly related to the social connectedness of the family and self-perceived quality of life.

Economic condition, work participation, human development and infrastructure development domains are loaded highly in the third factor. The first three domains are positively loaded whereas the last one is negatively loaded in the third factor and it is a contrast factor. Three out four domains which are highly loaded in third factor are economy related domains and hence this factor may be called economic factor. Good Economic domain means less dependency ratio and good education, occupation and income status. Higher Work participation means more members in the household are employed. Human development domain consists of wealth status and literacy level. This combination of three domains in general indicates that in a household if most of the members have good education and employed with good income then wealth status of that household increases. But surprisingly infrastructure domain is negatively related with this combination of domains which establishes that this tribal population tend to work hard to improve their economic status even if the surrounding infrastructure is in poor condition.

3.4 Factor Analysis at Village Level

The between village correlation matrix is not a consistent estimator of the between matrix in the population and some adjustments have to be made to extract factors from them. Factor analysis of between (Village) correlation matrixes yields three factors. The eigen values of these three factors are 4.281, 2.555 and 1.083 as shown in Table 6. The first factor contains high positive loading for self-perceived quality of life domain and a stronger negative loading for infrastructure development domain. This result indicates that even when infrastructure facility decreases, the perceived quality of life of this tribal population increases.. This implies that these people as a group lead a content life with whatever infrastructure facility available for them at their villages. The second factor is marked by three strong positive loadings on Demography, Work Participation and Social Capital. These positive loadings imply that at the village level the jointly increasing values of the demographic and work participation domains sees increase in social capital domain also. This joint positive association between these domains shows that most of these people take employment regularly and also they become members of some social groups and intern participate in the deliberation of these groups. Recreation, health, economic and development domains are all positively and highly loaded in the third factor. That is, at the village level the increase in the education, occupation and income status makes these people to lead a healthy life and they also find time and to spend money on recreation and thereby there will be overall development in the community.

3.5 Assessment of Quality of Life

The scores of this multilevel multifactor index can be used to assess the quality of life people at different levels under the assumption that higher the score better the quality of life. The quality of life of tribal people at the household and village levels is assessed separately as the scores of this multilevel multifactor index. Then these scores are normalized as described earlier. These normalized scores generally range from zero to unity and they also expressed in percentages. To put these scores in the frequency distribution form, the five quintile values of the score were made which can be classified as followed as less than 20% is denoted as poor, 20% to 40% as low, 40% to 60% as average, 60% to 80% as good and more than 80% as excellent.

The scores of the 1096 households indicate that the quality of life in 327(29.8%) households is poor, in 278 (28.4%) households is low, in 210 (19.2%) households is average, in 232(21.8%) households as good and in 48(4.4%) households it is excellent. This is shown in Table 7.

At the village level, the quality of life in two villages is marked as low, in four villages as poor, in seven villages as average, in three villages as good and finally in three villages as excellent. This is shown in Table 8.

From the cross classification Table 9 we see that within each category of villages, the quality of life of different households vary from poor to excellent. The quality of life of 327 households is marked as poor category because the average values of the following domains, self-perception, recreation, infrastructure, health and economy is the least when compare to the average values of these domains of the households of other categories. This indicates that since the economic condition of these households is very poor, the members of these households do not have enough financial facility to contribute for the infrastructure of their villages, they are not able to maintain their health and also do not have enough money to spend on recreation. The self-perception of the members of these households is the lowest because of these deficiencies. The average scores of the domains like demography, work participation and Human Development are the maximum for the household which are classified as low. It seems that the households of this category have more members in their houses and most of them are earning members and hence their Human Development Index is on the higher. These positive aspects have elevated this category of these households from poor to low. It can be seen that the members of the households which are

marked as moderate work hard and earn more money and spend most of the earned money on recreation. The average score of the social capital domain of the households which classified as good is the maximum. This result shows that the most of the members of the households of this category become members of the societies functioning in their villages and also participate actively in the deliberations of these societies. It seems that the economic condition and infrastructure status of the households which marked as excellent are very good and the health condition and self-perception of the members of these households are very impressive. The family size of this group of households is the smallest so also the human development and the members confine themselves with their household activities only. These details are shown in Tables 9 and 11.

Lack of infrastructure and recreation facilities makes some villages as poor category. Villages with good recreation facility but very poor health status are classified as low. Good health condition makes some villages to be classified as moderate. Villages with poor economic condition and Human Development Index are de-promoted from excellent to good status. Impressive economic and infrastructure conditions and good Human Development Index make some villages to be marked as excellent as shown in Tables 10 and 12.

4. Conclusion

The main aim of this study was to assess the quality of life of Malayali tribal population of Tamil Nadu State at the household and at the village levels using nine domains, namely, Demography, Economy, Health, Human Development , Infrastructure development, Work Participation, Recreation, Social Capital and Self Perception. To accomplish this task, multilevel factor analysis was performed to extract uncorrelated meaningful factors and their factor scores from the nested structure dataset using Mplus software. Multilevel multifactor index was constructed using these factors and their respective weights. The quality of lives of different households and different villages were assessed using the scores of this index. Thus this study proposes a step-by-step procedure to develop an index and to assess the quality of life of individuals and communities based on this index. The main purpose of developing such index is to provide a tool for tribal development based on realistic data which can be used to monitor the key factors that encompass the social, health, environmental and economic dimensions of quality of lives at the individual, household and community levels of these tribal people.

Declarations

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Competing Interest: Being single author no question of competing interest

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Availability of data and materials: The details of variables, descriptive and multilevel analyses are available from the author on reasonable request. We developed and tested the questionnaire for this study and it is attached herewith as supplementary copy.

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Tables

Table 1: The details of Domains, Indicators and Variables considered for this study

Domains	Indicators with their variables
Demography	Family size, Type of Family, Mortality Rate and Sex Ratio
Health	Morbidity Rate, Anti Natal Care, Delivery Care and Post Natal Care, Breast Feeding Pattern and Vaccination Coverage
Economic Status	Education, Occupation and Income of Individuals
Infrastructure Development	Availability of the following facilities in the village- Sanitation, Electricity, Communication and Transport
Work Participation	Employment and Self-employment Rates- Working Population at the specific age group
Social Capital	Membership- Membership in various Social Groups; Participation- Their Roles and Responsibilities in Social Groups; Reciprocity- Mutual Exchange of Commercial or other Privileges
Recreation	Participation in Recreation and Leisure Activities
Human Development- Wealth Status	Ownership of the house; 2. Number of rooms; 3. Type of house; 4. Fuel used for cooking; 5. Source of lightning; 6. Availability of kitchen; 7. Radio; 8. Television (colour); 9. Landline; 10. Mobile phone; 11. Ceiling Fan; 12. Table fan; 13. Chair; 14. Cot/Bed; 15. Mattress; 16. Sewing machine; 17. Pressure Cooker; 18. Grinder; 19. Mixie; 20. DVD/VCD Player; 21. DTH; 22. Table; 23. Wall Clock; 24. Wardrobe; 25. Bicycle; 26. Water Pump; 27. Motorcycle or Scooter; 28. Lands (Wet & Dry); 29. Cows/Buffalos/Bulls; 30. Goats; 31. Sheep; 32. Chickens/Ducks; 33. Pigs; 34. Source of water; 35. Toilet facilities; 36. Drainage Type;
Human Development Literacy Rate	Can Read and Write with specific age Group in each household
Self Perception Rate	Self Perception about quality of life

Table.2 Total, within and between correlation matrices

	Self-Perception	Recreation	Social Capital	Infrastructure	Human Development	Demography	Health	Economic	Work Participation
Self-Perception	1								
Recreation	0.06	1							
Social Capital	0.11	0.198	1						
Infrastructure	-0.081	-0.125	-0.165	1					
Human Development	0.037	0.242	0.164	-0.313	1				
Demography	0.062	0.023	0.207	-0.381	0.245	1			
Health	0.413	0.018	0.064	-0.02	-0.051	0.061	1		
Economic	-0.015	0.086	0.011	-0.24	0.386	0.159	0.049	1	
Work Participation	0.004	0.03	0.051	-0.368	0.314	0.27	-0.022	0.449	1
Self-Perception	1								
Recreation	0.065	1							
Social Capital	0.098	0.221	1						
Infrastructure	-0.04	-0.156	-0.14	1					
Human Development	0.032	0.218	0.169	-0.345	1				
Demography	0.062	0.047	0.198	-0.385	0.274	1			
Health	0.418	0.005	0.072	-0.016	-0.062	0.065	1		
Economic	-0.013	0.073	0.022	-0.263	0.384	0.172	0.039	1	
Work Participation	-0.003	0.032	0.038	-0.366	0.318	0.249	-0.023	0.46	1
Self-Perception	1								
Recreation	0.065	1							
Social Capital	0.098	0.221	1						
Infrastructure	-0.04	-0.156	-0.14	1					
Human Development	0.032	0.218	0.169	-0.345	1				
Demography	0.062	0.047	0.198	-0.385	0.274	1			
Health	0.418	0.005	0.072	-0.016	-0.062	0.065	1		
Economic	-0.013	0.073	0.022	-0.263	0.384	0.172	0.039	1	
Work Participation	-0.003	0.032	0.038	-0.366	0.318	0.249	-0.023	0.46	1
Self-Perception	1								
Recreation	-0.248	1							
Social Capital	0.691	-0.599	1						
Infrastructure	-0.904	0.381	-0.782	1					

Human Development	0.093	0.586	-0.026	0.036	1				
Demography	0.243	-0.392	0.712	-0.585	-0.07	1			
Health	0.06	0.676	-0.422	-0.084	0.418	-0.068	1		
Economic	-0.149	0.651	-0.599	0.209	0.62	-0.357	0.834	1	
Work Participation	0.355	-0.166	0.716	-0.634	0.218	0.945	0.08	-0.189	1

Table 3: Interclass Correlation Coefficients of Different Domains

Domains	Values
Self-Perception	0.120
Recreation	0.087
Social Capital	0.134
Infrastructure	0.155
Human Development	0.080
Demography	0.122
Health	0.072
Economic	0.088
Work Participation	0.060

Table 4: Mean and Standard Deviation of nine domains at household and Village levels

Domains	Household Level (n = 1096)		Village Level (n = 19)	
	Mean	SD	Mean	SD
Self-Perception	0.376	0.390	0.367	0.088
Recreation	0.106	0.123	0.115	0.046
Social Capital	0.138	0.213	0.123	0.055
Infrastructure	0.450	0.170	0.460	0.077
Human Development	0.289	0.205	0.280	0.067
Demography	0.494	0.151	0.482	0.071
Health	0.437	0.246	0.446	0.040
Economic	0.221	0.143	0.225	0.025
Work Participation	0.476	0.140	0.464	0.047

Table 5: Model Fit characteristics of the Multi Level Model of Quality of Life

		Estimate	S.E.	Est./S.E.	P-Value (Two-Tailed)
	Variances of Nine Domains				
	Self-Perception	0.149	0.004	38.252	0.000
	Recreation	0.014	0.003	5.652	0.000
Within Level	Social Capital	0.045	0.003	13.335	0.000
	Infrastructure	0.025	0.002	12.236	0.000
	Human Development	0.039	0.002	17.781	0.000
	Demography	0.022	0.002	13.180	0.000
	Health	0.060	0.001	53.525	0.000
	Economic	0.020	0.001	14.453	0.000
	Work Participation	0.019	0.002	8.699	0.000
	Means of Nine Domains				
	Self-Perception	0.373	0.017	21.395	0.000
	Recreation	0.113	0.010	11.391	0.000
	Social Capital	0.131	0.011	12.132	0.000
	Infrastructure	0.457	0.017	27.579	0.000
	Human Development	0.280	0.015	18.731	0.000
	Demography	0.486	0.016	30.105	0.000
	Health	0.440	0.011	41.362	0.000
Between Level	Economic	0.222	0.006	36.598	0.000
	Work Participation	0.472	0.013	37.243	0.000
	Variances of nine Domains				
	Self-Perception	0.003	0.003	1.008	0.314
	Recreation	0.001	0.001	2.541	0.011
	Social Capital	0.001	0.001	1.180	0.238
	Infrastructure	0.004	0.002	2.399	0.016
	Human Development	0.003	0.001	3.104	0.002
	Demography	0.003	0.003	0.803	0.422
	Health	0.000	0.000	0.773	0.440
	Economic	0.000	0.000	2.076	0.038
	Work Participation	0.000	0.001	0.304	0.761
Chi-Square Test of Model Fit	Value			2299.101	
	D.F			72.000	
	P-Value			0.000	
	Scaling Correction Factor for MLR			0.615	
	Standardized Root Mean Square Residual				
	Value for Within			0.184	
	Value for Between			0.443	

Table 6: Total variance explained (Eigen values) in the multi factor model

Components	Eigen Values	
	Within	Between
1	2.403	4.281
2	1.474	2.555
3	1.168	1.083
4	0.938	0.710
5	0.747	0.339
6	0.649	0.028
7	0.604	0.002
8	0.550	0.001
9	0.467	0.001

Table 7: The household level quality of life in the surveyed villages

QoL	Frequency	Percentage
Poor	327	29.8
Low	278	25.4
Moderate	210	19.2
Good	233	21.3
Excellent	48	4.4
Total	1096	100.0

Table 8: The village level quality of life in the surveyed villages

QoL	Frequency	Percentage
Poor	2	10.5
Low	4	21.1
Moderate	7	36.8
Good	3	15.8
Excellent	3	15.8
Total	19	100.0

Table 9: Factor loadings of the various domains at household and village level by multilevel factor analysis

	Within (Household Level)			Between (Village Level)		
Index		**Component**			**Component**	
	Factor 1	**Factor 2**	**Factor 3**	**Factor 1**	**Factor 2**	**Factor 3**
Self Perception	0.089	**0.176**	-0.044	**1.091**	-0.002	0.100
Recreation	-0.004	**0.371**	0.022	-0.030	-0.252	**0.727**
Social Capital	0.004	**0.485**	-0.042	0.456	**0.608**	-0.167
Infra. Development	-0.002	-0.357	**-0.435**	**-0.629**	-0.440	-0.003
Human Development	-0.015	0.330	**0.460**	0.067	0.048	**0.680**
Demographic	0.010	**0.364**	0.295	-0.144	**1.037**	0.006
Health	**4.495**	0.000	0.000	0.294	0.000	**0.925**
Economic	0.018	-0.020	**0.655**	0.005	-0.330	**0.871**
Work Participation	0.001	0.002	**0.698**	0.001	**1.026**	0.202

Table 10: This table provides omparison of the quality of life at village and household levels.

			Village Level Quality of Life					Total
			Poor	Low	Moderate	Good	Excellent	
Household Level Quality of Life	Poor	Count	29	105	116	34	43	327
		%	8.9	32.1	35.5	10.4	13.1	100.0
	Low	Count	20	82	95	25	56	278
		%	7.2	29.5	34.2	9.0	20.1	100.0
	Moderate	Count	10	49	86	24	41	210
		%	4.8	23.3	41.0	11.4	19.5	100.0
	Good	Count	15	62	93	25	38	233
		%	6.5	26.6	39.9	10.7	16.3	100.0
	Excellent	Count	2	10	18	5	13	48
		%	4.2	20.8	37.5	10.4	27.1	100.0
Total		Count	76	308	408	113	191	1096
		%	7.0	28.1	37.2	10.3	17.4	100.0

Table 11: Household level quality of life in the various domains

Quality of Life	Poor (N = 327)	Low (N = 278)	Moderate (N = 210)	Good (N = 233)
	μ ± S.E (μ)	μ ± S.E (μ)	μ ± S.E (μ)	μ ± S.E (μ)
Self-Perception	0.078 ± 0.012	0.374 ± 0.024	0.413 ± 0.025	0.674 ± 0.019
Recreation	0.093 ± 0.005	0.114 ± 0.008	**0.115 ± 0.008**	0.109 ± 0.009
Social Capital	0.108 ± 0.010	0.148 ± 0.014	0.155 ± 0.016	**0.167 ± 0.015**
Infrastructure	0.441 ± 0.009	0.449 ± 0.010	0.441 ± 0.013	0.464 ± 0.010
Human Development	0.273 ± 0.011	**0.318 ± 0.013**	0.292 ± 0.014	0.282 ± 0.013
Demography	0.456 ± 0.006	**0.528 ± 0.009**	0.494 ± 0.012	0.514 ± 0.010
Health	0.202 ± 0.001	0.280 ± 0.005	0.584 ± 0.008	0.728 ± 0.006
Economic	0.203 ± 0.007	0.233 ± 0.009	0.227 ± 0.010	0.215 ± 0.009
Work Participation	0.478 ± 0.007	**0.489 ± 0.008**	0.464 ± 0.011	0.470 ± 0.009

Table 12: Village level quality of life in the various domains

Quality of Life	Poor (N=2)	Low (N=4)	Moderate (N=7)	Good (N=3)
	μ ± S.E (μ)	μ ± S.E (μ)	μ ± S.E (μ)	μ ± S.E (μ)
Self-Perception	0.292 ± 0.043	0.400 ± 0.023	**0.404 ± 0.019**	0.372 ± 0.037
Recreation	0.066 ± 0.009	**0.115 ± 0.007**	0.104 ± 0.005	0.104 ± 0.011
Social Capital	0.120 ± 0.022	**0.153 ± 0.013**	0.147 ± 0.011	0.141 ± 0.018
Infrastructure	0.401 ± 0.017	0.410 ± 0.008	0.438 ± 0.008	0.498 ± 0.015
Human Development	0.263 ± 0.023	0.303 ± 0.011	0.277 ± 0.01	0.233 ± 0.018
Demography	**0.504 ± 0.014**	0.498 ± 0.008	0.494 ± 0.008	0.501 ± 0.015
Health	0.425 ± 0.028	0.411 ± 0.014	**0.453 ± 0.012**	0.440 ± 0.023
Economic	0.226 ± 0.015	0.218 ± 0.008	0.214 ± 0.007	0.198 ± 0.011
Work Participation	0.475 ± 0.015	**0.485 ± 0.007**	0.478 ± 0.007	0.459 ± 0.015

Figures

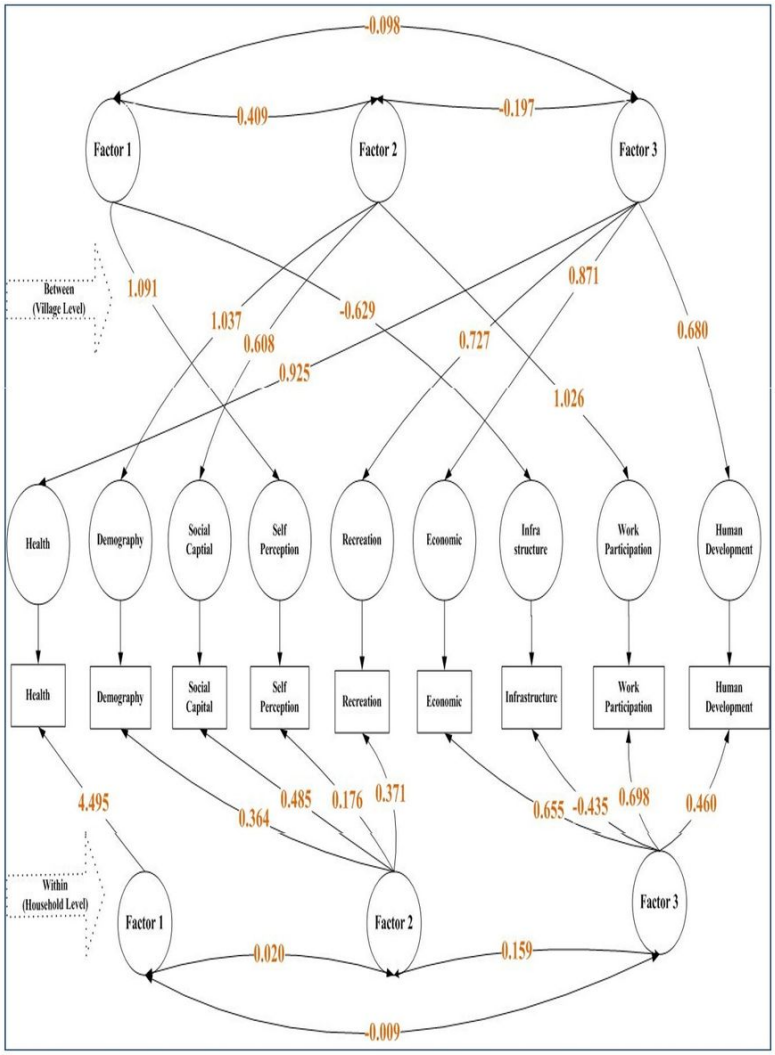

Figure 1

Multi level exploratory factor analysis of the multi factor quality of life index

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- finalizedHouseholdQuestionnaire1.pdf