A MULTIDIMENSIONAL ASSESSMENT OF WELL-BEING OF INDIAN WOMEN BASED ON AMARTYA SEN'S FUNCTIONING APPROACH[*]

Amlan Majumder[♣]

ABSTRACT

Empirical literature on Capability Approach in Indian context is less extensive and less known. The present paper makes an attempt to bridge the gap by doing a multidimensional assessment of well-being of Indian women within the framework of Amartya Sen's functioning approach. The study works out an wide range of indicators in seven evaluative spaces with the use of the fuzzy sets theory. The study also ranks the major Indian States according to non-income and income dimensions of well-being to check whether rankings in both the dimensions differ sharply. It also does binary-multivariate logistic regression analyses to locate variations in the achieved levels of functionings with respect to a set of possible explicative factors, which include individual and household characteristics as well as social and environmental factors. The study utilises data from the Indian National Family Health Survey-2.

1. INTRODUCTION

Amartya Sen's capability approach is a framework for the evaluation of individual welfare in terms of their functionings and capabilities, which are defined as an individual's actual and potential activities and states of being respectively (Kuklys, 2005). Thanks to Sen (1985, 1987, 1992, 1993, 1994) when we conceptualise welfare as standard of living or quality of life, our focus of attention shifts from merely income or consumption to a wide range of indicators, which reflect well-being in different dimensions of life. Such indicators may include knowledge and education, health and nutrition, housing, and others, subjective feelings of which are constitutive elements of human life and which should not be ignored while assessing people's standard of living (Chiappero-Martinetti, 2000). The theoretical reason in economics for measuring individual welfare as a multidimensional phenomenon has origin in the rich debate in recent philosophical literature. One can beautifully trace the trajectory of change of views from

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[♣] Lecturer in Economics, Dinhata College, P. O. Dinhata, Dt. Cooch Behar, Pin. 736135, West Bengal (India)
E-mail. amlan.majumder@gmail.com

utilitarianism (which sounds social policy aims at the maximisation of welfare ignoring distribution, and commands normative attention) to the Rawlsian concept of primary goods (Rawls, 1971) and from these concepts to something like opportunity (under the title 'capability'), which is not welfare, which Sen (1993) thought people should have the opportunity to achieve. Sen, therefore, proposed two large changes of view: from actual state to opportunity and from goods (and welfare) to what he sometimes called 'functionings' (see Sen, 1985; Cohen, 1993).

Functionings represents the part of the state of a person – in particular the various things that he or she manages to do or be in leading a life. The capability of a person reflects the alternative combinations of functioning the person can achieve, and from which he or she can choose one collection. The approach is based on a view of living as a combination of various 'doings and beings', with quality of life to be assessed in terms of the capability to achieve valuable functioning (Sen, 1993).

Sen's empirical observations, which are considered as the basic principles and ideas behind the development of capability approach, have also been affirmed by the leading commentators in this field (see Kuklys, 2005; Robeyns, 2005). Using data from 1980 to 1982, Sen (1985) found that while the (roughly equivalent) GNP per capita of Brazil and Mexico are more than seven times the GNP per capita of India, China and Sri Lanka, functionings performances in life expectancy at birth, infant mortality and child death rates were best in Sri Lanka, and better in China compared to India and in Mexico compared to Brazil. Another finding was that India performed badly regarding basic education but had considerably higher tertiary education rates than China and Sri Lanka. Sen concluded that the public policy of China and especially Sri Lanka towards distributing food, public health measures, medical services and school education have led to their remarkable achievements in the capabilities of survival and education. In another study, Sen (1985) examined sex bias in India. It showed that females have worse achievements than males for a number of functionings, like age-specific mortality rates, malnutrition and morbidity. The lessons from the above examples are that ranking of countries based on GNP per capita is quite different from a ranking based on the selected functionings, and growth in GNP per capita should not be equated with growth in living standards (Robeyns, 2005). Sen's studies, therefore, warrant a multidimensional assessment of individual welfare in the space of standard of living measures such as health, nutrition, education, or shelter. These basic ideas of capability approach opened up new avenues of research in the field of development studies leading to the computation of number indices of quality of life in different dimensions (see Fukuda-Parr, 2003; Kaul 2003). Since 1990, United Nations' Human

Development Report (HDR) also started to chronicle the condition and progress of nations, especially by evaluating how well they provide their citizens with the basic capabilities to participate in and to contribute to society. According to UNDP – the creator of Human Development Index – the factors to gauge in assessing such capabilities include the ability to live a long and healthy life, the ability to be knowledgeable, and the ability to have access to the resources needed for a decent standard of living (United Nations, 1996). Comparisons of rankings of these indices with GNP per capita show significant differences, which establish that income per capita is an imperfect indicator of human development (UNDP, 1990-2006; Robeyns, 2005). Although application of human development index has had the largest impact on policy making, using just a few functionings makes it somewhat crude (Robeyns, 2005), which again demands a reasonable exploration to make such measures rich incorporating functionings in other possible dimensions.

On the above background, we see that although Amartya Sen was influenced enough from the experiences of India (and other developing countries) while developing capability approach, empirical literature in this field in the context of India is less extensive and less known. In Robeyns' survey (2005), which provides a good interdisciplinary introduction to the approach, we find a very few studies based on micro-data and none of which are related to India. The main purpose of this paper is to focus on the use of rich Indian data towards empirical applications of capability approach, and minimise the major gaps associated with the existing quantitative applications, as reflected from the work of Ingrid Robeyns (2005). From this perspective, the present study would contribute some new knowledge and empirical evidence to the existing literature. The exercise will be carried out by doing a multidimensional assessment of well-being of Indian women within the framework of Amartya Sen's functioning approach.

Though a good number of techniques are available in literature for indexing with robustness and accuracy, the present study finds the use of fuzzy set theory suitable for evaluation of relevant functionings, which has been pioneered in this field by Enrica Chiappero Martinetti (1994, 2000, 2005). The use of fuzzy set theory has added advantage of applying of non-linear functions such as a sigmoid or logistic function in data processing (Kuklys, 2005). The study also ranks the major Indian States according to non-income and income dimensions of well-being to check whether rankings in both the dimensions differ sharply. It also does binary-multivariate logistic regression analyses to locate variations in the achieved levels of functionings with respect to a set of possible explicative factors, which may include individual and household characteristics as well as social and environmental factors. In standard literature such explicative factors are termed as conversion factors (Kuklys, 2005), and such an exercise

will give an idea how functionings achievements are related to conversion factors, knowing of which is very crucial for policy prescriptions.

2. DATA

The study utilises data from Indian National Family Health Survey-2 (NFHS-2). It covers a representative sample of about 95000 women in the 15-49 age group from 26 States and Union Territories of India, which comprise more than 99 percent of India's population. The survey provides State-level estimates of demographic and health parameters as well as data on various socio-economic and programmatic dimensions. The data collection was carried out in two phases, starting in November 1998 and March 1999 (IIPS and ORC Macro, 2000).

The data file that has been used in the present exercise (women's file) contains huge information on 90303 women with 977 variables. However, after filtering data according to present need we find 71162 cases suitable for analyses.

3. SELECTION OF FUNCTIONINGS

In most empirical studies, based on large-scale surveys, the selection of functionings is made according to availability of data (Chiappero-Martinetti, 2000) or done in an *ad hoc* way, in accordance with researchers' values (Kuklys, 2005). If we look at literature, we find that some functionings such as, education, health, and nutrition are very common in most of the studies with many other uncommon ones as shown in table 1.

(Insert table 1 about here)

From table 1 we see that according to the objectives, some studies considered income dimension of well-being, some others did not. Balestrino (1996) and Ruggeri Laderchi (1997) evaluated non-income dimensions of well-being and tried to test whether these are good supplement to that of income dimension. Chiappero Martinetti (2000) has purely focused on non-income dimensions of well-being and very wisely incorporated respondents' subjective judgments or perception on satisfaction about personal and household economic resources, and on comparison of the last year economic condition. She has also considered respondents' perception on many other aspects under the functioning of 'psychological conditions'. However, for not well-availability of appropriate data, and for good chances of biases in subjective judgments about material or psychic conditions because of wide-spread of illiteracy among (women) respondents in India, it will not be possible for the present study to consider any such functioning reflecting respondents' psychological conditions. Following Balestrino (1996), Ruggeri Laderchi (1997), and Mozaffar Qizilbash (2002) it is possible to examine whether non-income dimensions of well-being contradicts with income dimension in India at provincial level or to rank the major provinces of India according to functionings poverty and compare the

ranking with that based on per capita State Domestic Product (SDP) / Net National Product for India.

Kuklys (2005) have considered two fnctionings (health and housing) and computed the indicators following the procedure of factor analysis, and examined relationships of those with resources (income and education) and conversion factors (age, gender, marital status, job status, and whether the individual lives in London area) by estimating structural equation models. The present study is also designed to explore the relationship between achieved level of functionings in each evaluative space and conversion factors by doing logistic regression analysis. As we are mainly focusing on non-income dimensions of well-being, we are not considering income; also as we consider education as achieved level of functioning instead of one resource, we opt for a regression approach. Moreover, as most of our indicators are categorical (as shown in table 2), binary logit regression models seem to be more appropriate in our analyses.

As the present study is mainly focusing on well-being of women, it is needless to say that selection of reproductive health related functionings and those related to autonomy and freedom is obvious. It is to be noted that India is a signatory to the ICPD, Cairo (United Nations, 1994) which maintained that people have the ability to reproduce and regulate their fertility, mothers are able to go through pregnancy and child birth safely, the outcome of pregnancy is successful in terms of maternal and infant survival and well-being and couples are able to have sexual relations free of fear of pregnancy and contracting diseases. Considering the above-mentioned reproductive life related abilities, we look forward to incorporate some variables reflecting reproductive health: fertility (keeping in mind that high fertility is social evil in Indian context), abortions, children ever died, and reproductive freedom (difference between ideal number of children mentioned by the respondent and children ever born).

The present study would like to examine the degree of autonomy that Indian women enjoy to make effective choices and translate those into desired actions and outcomes. Amartya Sen's specific ideas in this direction on well-being, agency and freedom has been taken towards empirical reality by Sabina Alkire (2005). Human agency, according to Sen, is people's ability to act on behalf of goals that matter to them. Sen's idea on agency-freedom is confined to something that a person is free to do and achieve in pursuit of whatever goals or values he or she regards as important. And this aspect of freedom is a core element of positive social change. Well-being, on the other hand, refers to the person's own state and is attached to any one type of aim. Alkire (2005) feels that the agency aspect is important in assessing what a person can do in line with his or her conception of the good. On these points, she introduces large-scale cross-cultural psychological studies of self-direction, of autonomy, of self-efficacy, and of self-determination, and explains why the psychological measures of agency

may be relevant to those. However, she distinguished the agency measure based on the self-determination theory of Ryan and Deci (2000) as an accurate (as it is the closest to Sen's concept of agency) and robust indicator of autonomy in different domains.

The objective of this paper is to measure women's autonomy (in Indian context), which is one of the three basic psychological needs identified by Ryan and Deci (2000), the other two being competence and relatedness. In self-determination theory (Ryan and Dici, 2000), autonomy is seen as a tendency or propensity towards self-organisation and self-regulation. When autonomous, individuals' actions are self-organised with respect to their inner and outer circumstances, instead of being merely cued up or prompted by non-integrated processes or exogenous pressures. National Family Health Survey (NFHS-2) has one separate section on women's autonomy and we look forward to use relevant information in our study with the application of fuzzy set theory. It is to be noted that NFHS-2 data on women's autonomy is not suitable for psychological techniques followed or proposed by Chirkov et al. (2003) and Alkire (2005), as the survey did not collect any information on why women might have done a particular activity.

We have also incorporated one functioning: exposure to mass media and leisure, which will simultaneously reflect respondent's connection with the world beyond self, as well as leisure activities. The present study incorporates 'listening radio', 'watching TV', 'reading newspaper', and 'watching movie / cinema' under one functioning: 'Exposure to mass media and leisure'.

Keeping in mind the above-mentioned trend in literature, objective of the study, availability of data, and also the standard criteria mentioned by the leading commentators in this field (Chiappero Martinetti, 2000; Alkire, 2005; Kuklys, 2005; Robeyns, 2005) it has been decided to confine the present study in seven evaluative spaces as appear below and as shown in table 2: nutrition / consumption of food, reproductive life, health and morbidity, housing, education, autonomy, and exposure to mass media & leisure.

4. METHOD

4.1. Fuzzy sets theory

Fuzzy set theory substitutes the characteristic function of a crisp set that conventionally assigns a value of either 1 or 0 to each element in the universal set, with a generalised characteristic function (called membership function), which varies between 0 and 1. Larger values denote higher degrees of membership. In formal terms, if X denotes a universal set, then the membership function μ_A, by which a fuzzy set A is usually defined, has the form $\mu_A: X \to [0, 1]$ where [0,1] is the interval of real numbers from 0 to 1. Hence, $\mu_A(x) = 0$ if the element $x \in X$ does not belong to A, $\mu_A(x) = 1$ if x completely belongs to A and $0 < \mu_A(x) < 1$ if x partially belongs to A. Let us assume that the subset A defines the position of each individual according

to the degree of achievement of a given attainment or refers to one of the indicators considered for the functioning assessment. In this case, membership values equal to 1 identify a condition of full achievement with respect to a given functioning, whereas a value equal to 0 denotes the opposite situation of total failure. When we consider quantitative variables or qualitative variables measured on an ordinal scale or expressed with linguistic attributes (as in the case of health and physical condition or subjective opinions or perception on one's own conditions), intermediate values between 0 and 1 describe gradual positions within the arrangement (Chiappero Martinetti, 2000). It is, therefore, necessary: i) to define an appropriate arrangement of modalities (or values) on the basis of the different degrees of hardship / well-being; ii) to identify the two extreme conditions such that $\mu_A(x) = 1$ (full membership) and $\mu_A(x) = 0$ (non-membership); iii) to specify the membership functions for all the other intermediate positions (Chiappero Martinetti, 2000).

As mentioned in table 2, we have specified 3 types of membership functions for the functionings under study, which appear below.
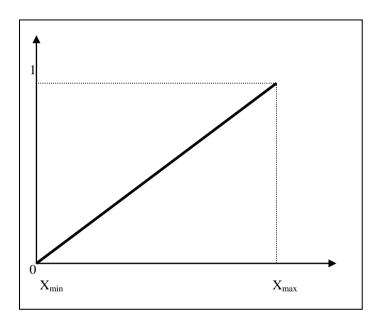
4.1.1. Linear function

Figure 1. Linear membership function (a)
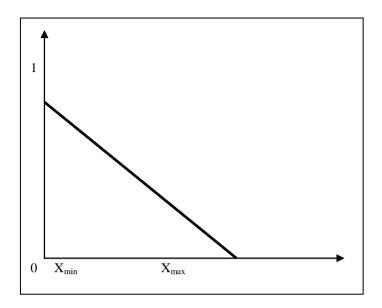
$$\mu(x) = \frac{x - x_{\min}}{x_{\max} - x_{\min}}.$$

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Figure 2. Linear membership function (b)

$$\mu(x) = \frac{x_{max} - x}{x_{max} - x_{min}} \ .$$

4.1.2. Trapezoidal function

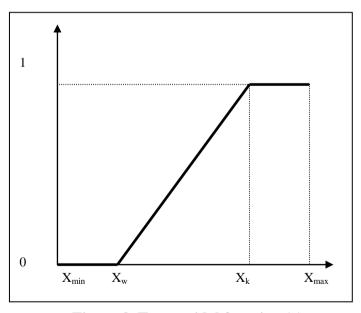**Figure 3. Trapezoidal function (a)**

$\mu(x) = 1,$ if $x_k \le x \le x_{max}$

$\mu(x) = 0,$ if $x_{min} \le x \le x_w.$

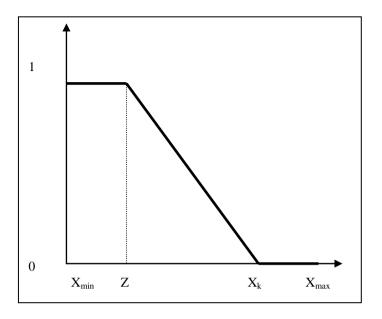$\mu(x) = \dfrac{x - x_w}{x_k - x_w}$ if $x_w \le x \le x_k.$

Figure 4. Trapezoidal function (b)

$\mu(x) = 1,$ if $x_{min} \le x \le Z$

$\mu(x) = 0,$ if $x_k \le x \le x_{max}.$

$\mu(x) = \dfrac{x_k - x}{x_k - Z}$ if $x_w \le x \le x_k.$
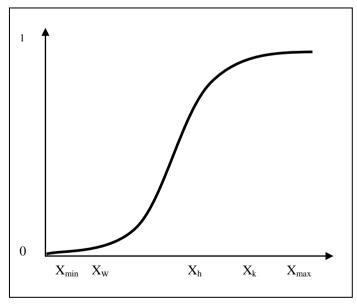
4.2.3. Sigmoid function

Figure 5. Sigmoid curve / function

$x_w = \mu(x) = 0$ $x_h = \mu(x) = 0.5$ $x_k = \mu(x) = 1$

$\mu(x) = 1,$ if $x_k \le x \le x_{max}$

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$$\mu\,(x) = 0, \qquad\qquad\qquad\qquad \text{if } x_{min} \leq x \leq x_w.$$

$$\mu(x) = \frac{1}{2}\left[\frac{x - x_w}{x_h - x_w}\right]^2 \qquad\qquad\qquad \text{if } x_w \leq x \leq x_h$$

$$\mu(x) = 1 - \frac{1}{2}\left[\frac{x_k - x}{x_h - x_k}\right]^2 \qquad\qquad \text{if } x_h \leq x \leq x_k.$$

In our multidimensional approach, each dimension of human well-being is considered as equally relevant, and we will have a neutral choice to assign an equal weight to all constitutive elements (see Chiappero Martinetti, 2000). It is to be noted that in the present exercise $X_{min} = X_w$.

4.2. Selected functionings and methods of evaluation

4.2.1. Nutrition (consumption of food)

NFHS-2 provides information about how often respondents consume milk or curd, pulses, green leafy vegetables, other vegetables, fruits, eggs, and fish / chicken / meat. According to frequency of intake, for each type of foodstuff, data is available in four categories: daily, weekly, rarely, or never. We have measured achievement in this functioning of nutrition in five different dimensions as shown in table 2.

4.2.2. Reproductive life

Quality of reproductive life has been measured by three achieved level of functionings: number of children ever born, number of spontaneous and induced abortions, and number of children ever died. In NFHS-2, number of children varies from 0 (number of cases: 9431) to 18 (number of case: 1). However, in the present exercise, we have selected mothers with at least one child. We have also kept mothers with 5 and above children in one category. After such categorisation, data has been processed adopting a trapezoidal function. We have also incorporated information on numbers of spontaneous and induced abortions, and numbers of sons and daughters died.

4.2.3. Health and morbidity

Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (WHO, 1961). As the definition is so broad and wide, conventional demographic indicators such as, infant mortality rate, total fertility rate, life expectancy at birth, etc. are usually used to measure health status of a population. However, as the NFHS-2 provides information on anaemia or level of haemoglobin in blood of the respondents, the present study finds it suitable to consider it as an achieved level of functioning in the dimension of physical health (see IIPS and ORC Macro, 2000). Using such information we have adopted a trapezoidal function to process data for this functioning.

The term morbidity, meaning the state of illness or disability in a population, is a departure from the above ideal health condition. Though death is clearly a well-defined event, illness is not. But it is state somewhere between perfect health and death whose identification depends upon both the criteria used and type of observation applied to them. However, NFHS-2 does not provide information on all types of disease or disability. Rather, it focuses (separately) on whether respondents suffer from asthma, tuberculosis, malaria, and jaundice in last one year. We have clubbed the four variables together to imply if the respondent has suffered from any of the diseases.

4.2.4. Housing

NFHS-2 collects information about housing / housing area structure, amenities and durables available in the household. However, those information have been kept in a separate household level file. The data file, which we are using (women's file) consists information on type of toilet facility, source of drinking water in the housing area structure, and also whether the house has electricity connection, etc. We have considered information on these three to measure the quality of housing / shelter.

4.2.5. Education

Achievement in this category has been measured by completed years of education. While evaluating the functioning of education, we have selected 16 modalities beginning from 0 year of education to 15 years and above. Though all the modalities are equidistributed, we will in no way put equal importance to increase in one year of education at all levels. We assumed that well-being or good associated with the increase in one year of education follow a sigmoid pattern rather than a linear trend.

4.2.6. Autonomy

We have measured autonomy in six possible dimensions: who decides about what to cook, who decided on obtaining health care, permission needed to go to market, permission needed to visit friends or relatives, allowed to have money set aside, and reproductive freedom.

4.2.7. Exposure to mass media

We have also taken into account whether respondents read newspaper at least once a week and / or listen to radio every week and / or watch TV every week and / or go to cinema or watches one movie at least once a month.

Evaluative spaces / functionings, and membership degrees to the elementary subsets have been shown in table 2.

(Insert table 2 about here)

4.3. Explicative or conversion factors

4.3.1. Individual level factors

4.3.1.1. Age of the respondent: Though we are studying well-being of ever married women in the 15-49 age group, we have made three categories of age: 15-24, 25-34, 35-49, to examine whether level of well-being varies with age.

4.3.1.2.Relationship to the head of the household: There are four categories of relationship as shown in table 3. We get some respondents as head of the households; in those cases respondents are mostly widowed or separated or not living together. As intra-household distribution of resources or bargaining power associated with such matters are believed to depend largely on respondents' status in the familial hierarchy, this particular variable will reflect true picture prevailing in Indian societies.

4.3.1.3.Employment status: There are two categories considering the fact that respondents are engaged in paid activities or not.

4.3.2. Household level factors

4.3.2.1. Husbands' education: There are three categories as shown in table 3.

4.3.2.2. Husbands' / Partners' employment status: We have formed three broad categories as: skilled and unskilled manual (skilled manual, unskilled manual, did not work, household & domestic, and don't know), agriculture (self-employed in agricultural activities), and service (professor, technician, manager, clerical, sales, and services).

4.3.2.3. Size of family: There are two categories (≤ 5 and > 5) as shown in table 3.

4.3.3. Social factors

4.3.3.1. Religion: There are three categories as shown in table 3: Hindu, Muslim and other (Christian, Sikh, Buddhist/Neo Buddhist, Jain, Jewish, Zoroastian/Parsi, no religion, other).

4.3.3.2. Caste / ethnicity: There are three categories as shown in table 3. Scheduled categories are mentioned in one of the schedules of the Indian Constitution, which are considered to be weaker sections of society whose interests need to be safeguarded and promoted. Socially, these groups are seen as occupying the lower stratum of the local hierarchy.

4.3.4. Environmental factors

4.3.4.1. Natural environment: Altitude of the area from sea level.

4.3.4.2. Social and economic environment: We have decided to take one proxy variable, type of locality (rural / urban) to capture differences in socio-economic front and impact of those towards level of well-being.

4.3.4.3. Geographical region: Though there are various agro-climatic regions in India, we have formed three broad regions: North-Eastern hilly region (Arunachal Pradesh, Assam, Manipur,

Meghalaya, Mizoram, Nagaland, Sikkim, Tripura), Northern India (Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Madhya Pradesh, New Delhi, Punjab, Rajasthan, Uttar Pradesh, West Bengal), and Southern India (Andhra Pradesh, Goa, Karnataka, Kerala, Maharashtra, Orissa and Tamil Nadu). All the three regions have almost differentiable culture, demography, geography, etc. We are interested to examine whether women's well-being varies sharply in India across regions.

(Insert table 3 about here)

4.5. Multivariate analyses

As most of the variables are categorical, instead of a straight line, it seems preferable to fit some kind of sigmoid curve to the observed points. Though there are many ways to define a sigmoid curve mathematically, the logistic function tends to be preferred, partly because it leads to the logit regression model and partly because it is easy to interpret (Retherford and Choe, 1993). The standard form of an estimated logistic function is:

$$P = \frac{1}{1 + e^{-Z}} \qquad \dots \qquad \dots \qquad (i)$$

where z is the predictor variable, e is the base of the natural logarithm, and P is the estimated probability of occurrence of one point of the dependent variable. From equation (i) it follows that:

$$1 - P = 1 - \frac{1}{1 + e^{-Z}} = \frac{e^{-Z}}{1 + e^{-Z}}. \qquad \dots \qquad \dots \qquad (ii)$$

Dividing (i) by (ii) we get

$$\frac{P}{1 - P} = e^{Z}. \qquad \dots \qquad \dots \qquad (iii)$$

Or,

$$\Omega = \exp(Z) \qquad \dots \qquad \dots \qquad (iv)$$

where Ω (uppercase omega) $\equiv \dfrac{P}{1 - P}$ (is called the odds).

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Now, if we assume that Z, instead of being a single predictor variable, is linear function of a set of predictor variables:

$$Z \equiv \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k, \qquad ... \qquad ... \qquad (v)$$

substituting (v) in (iv) we get:

$$\Omega = \exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k). \qquad ... \qquad ... \qquad (vi)$$

For the present exercise, if P be the estimated probability of getting a high score (> the median value, except the dichotomous one – exposure to mass media & leisure), and if we assign the dependent variable 1 if the score is above the median value, 0 otherwise in each of the achieved levels of functionings, in odds form the model is:

$$\Omega = \exp\left(\beta_0 + \sum \beta_{1i} X_{1i} + \sum \beta_{2i} X_{2i} + \sum \beta_{3i} X_{3i} + \sum \beta_{4i} X_{4i}\right). \qquad ... \qquad ... \qquad (vii)$$

The equation includes individual- (X_{1i}), household- (X_{2i}), social- (X_{3i}), and environment- (X_{4i}) level conversion factors. Eight models will be estimated for each of the seven evaluative spaces (after aggregation in each space) as well as for overall achievement after aggregation of all the functionings in seven dimensions.

In order to be more specific about the models we are presenting median values of the membership degrees of the functionings as following: Model I: Nutrition / Consumption of food (median: 0.615); Model II: Reproductive life (median: 0.781); Model III: Health and morbidity (median: 0.989); Model IV: Housing (median: 0.581); Model V: Education (median: 0.185); Model VII: Exposure to mass media & Leisure (dichotomous variable with two possibilities, 0 and 1); Model VIII: Overall Well- being (median: 0.655). It is to be noted that as most of the variables are categorical, we could not divide the population / sample into exactly two equal halves in all cases.

In order to look at goodness of fit, we have also displayed a statistic, *Nagelkerke[2] R Square* that attempts to provide a logistic analogy to R Square in OLS regression.

$$\text{Nagelkerke } R^2 = \frac{1 - \exp\left[-\frac{2}{n}(L_2 - L_1)\right]}{1 - \exp[2(n^{-1})L_1]},$$

where the L_1= the likelihood of the first model; L_2= the likelihood of the second model; it is assumed that the second model has all the predictor variables included in the first model, plus at least one more i.e., the first model is nested in the second model (Retherford and Choe, 1993). *Nagelkerke R Square* varies between 0 and 1.

5. Results and discussion

5.1. Multidimensional assessment of well-being

Tables 4A and 4B show mean values of the membership degrees for the seven functionings and twenty-one elementary indicators included in our assessment exercise. We will incorporate results (ranking of the States) of tables 6A and 6B while interpreting our results. The first functioning is: 'nutrition / consumption of food' the first elementary subset of which is consumption of milk or curd. With respect to consumption of milk or curd (by women) we see the highest score in Haryana (0.923) and the lowest score in Orissa (0.386). If we look at consumption of other foodstuff such as pulses or beans, and fruits, scores are quite high for Haryana, Himachal Pradesh, Punjab, and Gujrat. With Orissa, scores are comparatively quite low in Rajasthan, Madhya Pradesh, Bihar, and West Bengal. These indicate that women in Haryana, Himachal Pradesh, Punjab, and Gujrat are well capable to fulfil their dietary requirements in terms of consumption of different foodstuff, and women in Rajasthan, Madhya Pradesh, Bihar, and West Bengal are not. However, as we know that, by and large, people in the Northern India and in some clusters of the South are vegetarian, women in these regions are seen to consume vegetarian foodstuff more and non-vegetarian foodstuff less or least. As a result we are not likely to see good scores simultaneously in all the elementary subsets by women from all parts of the country. For example, Haryana has the highest score in consumption of milk or curd, but the lowest in consumption of eggs / chicken / meat / fish. We may highlight the case of Kerala also. Women of Kerala are seen to consume non-vegetarian food very frequently (highest score of 0.827 in this category), but vegetarian food very occasionally. And from such instances simply we cannot say that women in Haryana and Kerala are deprived some how or other. Our concern is for women who could not consume any of the foodstuff adequately, as we have seen in Orissa, Rajasthan, Madhya Pradesh, and Bihar. We would say that women in these States are really deprived in terms of nutrition / consumption of food.

(Insert table 4A & 4B about here)

The second functioning is: 'reproductive health'. Three elementary subsets under this functioning are: children ever born, spontaneous and induced abortions, and children ever died. Among the three in two, women of Kerala are in the best position. We know that Kerala is demographically the most advanced State in India and our result is also supporting that. Bihar

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scores that highest with respect to spontaneous and induced abortions (score: 0.904). High score in this category indicates low reported spontaneous and induced abortions. It is to be noted that Bihar is one of the demographically backward States where growth rate of population is very high. However, average performance in reproductive health is good in Kerala, Himachal Pradesh, Goa, Punjab, Maharashtra, West Bengal, and Tamil Nadu. On the contrary, women on the question of reproductive health are deprived in Orrissa, Bihar, Jammu, Rajasthan, Madhya Pradesh, and Uttar Pradesh. Performance of women in the other States is close to the national average.

Under the third functioning of 'health and morbidity' we have assessed whether the respondents are anaemic considering concentration of haemoglobin in blood, and whether respondents have suffered from asthma / tuberculosis / malaria / jaundice in last one year. Our results show that women are in good health all over India as average scores of all the selected States and Union Territories are close to 1.000.

The fourth functioning is related to 'housing', which includes elementary sub-sets on source of drinking water, type of toilet facility, and whether the household has electricity connection. With respect to the first two points, condition of the women is the best in the National Capital Territory of Delhi. With respect to the comfort resulting from the availability of electricity connection, women are supposed to be the happiest in Himachal Pradesh. With respect to all the three points related to housing, women are likely to be very unhappy in Bihar. Poor (average) performance of some other States like Rajasthan, Madhya Pradesh, West Bengal, Assam, Uttar Pradesh, Orissa, and Bihar also draws our attention. However, it is to be noted that the over all picture with respect to the question of availability of toilet facility in the household is very distressful. Majority of the women in India reported that they do not have toilet facility in the housing area structures.

Our fifth functioning is related to completed years of education. Women of Kerala score the highest, 0.511 (which indicates slightly more than 7 years of education), and women of Bihar the lowest, 0.122 (which indicates less than one year of education).

The sixth functioning is related to autonomy. From table 4B we see that women in Punjab enjoy the highest level of autonomy on the question of decision about what to cook. Majority of the women in India have reported that they usually take the decision independently. The lowest score is seen for women in Jammu, 0.713. However, such a score is also not bad, as table 3 shows that a score value 0.750 means a decision taken jointly with husband. On the question of obtaining health care, women in Punjab, Kerala, and New Delhi are seen to enjoy good degrees of autonomy taking decision jointly with their husbands. On this question of obtaining health

care, women of Madhya Pradesh are likely to depend on husbands' decision or take decision jointly with other relatives (score: 0.435). The third question was whether respondents need permission to go to marketplaces. With respect to this question, Tamilian and Goanese women enjoy higher degrees of freedom. Women of these two States (Tamil Nadu and Goa) are likely to take decision independently to visit marketplaces. We observe similar results with respect to the question of visiting friends and relatives. On both the questions of visiting marketplaces, and friends and relatives, freedom of women in Orissa, and Uttar Pradesh, is very restricted. The fifth elementary sub-set is on autonomy with respect to have money set aside for personal interest. We see poor results in Assam, Madhya Pradesh, Orissa, and Rajasthan. In many other States women enjoy a good degree of freedom with respect to this question. On the question of reproductive freedom, women of Kerala and North-Eastern hilly States remain far ahead of others. Women of Rajasthan and Jammu are lagging far behind of others on this issue.

The seventh and final functioning is on exposure to mass media & leisure. From table 4B we see that women in New Delhi, Kerala, Goa, Himachal Pradesh, Punjab, and Tamil Nadu have good exposure to mass media and leisure activities. On the contrary, women in Orissa, Uttar Pradesh, Rajasthan, and Bihar are likely to be detached from the world beyond self and are also likely to remain far away from leisure activities.

If we look at the average performances of women in the major Indian States, we see that women of Himachal Pradesh is at the top in three functionings achievements, such as 'nutrition / consumption of food', 'health and morbidity', and 'housing'. Women of Kerala are in the best position in three functionings: 'reproductive life', 'education', and 'exposure to mass media & leisure'. In one functioning (autonomy) women of Tamil Nadu scored the highest. However, overall score (average well-being score in all dimensions) is the highest for women in Himachal Pradesh followed by Kerala and Punjab. Very poor performances are seen in Madhya Pradesh, Orissa, Bihar, Uttar Pradesh, and Rajasthan.

If we consider all the States and Union Territories of India covered by the Indian National Family Health Survey-2, women in the National Capital Territory of Delhi are in the best position followed by Goa, Himachal Pradesh, and so on. It is to be noted that in New Delhi, Goa, and Himachal Pradesh women are less educated than in Kerala. In Kerala, on an average, women have nearly seven years of education. On the contrary, women in New Delhi, Goa, and Himachal Pradesh have, on an average, 6, 5, and 4 years of education respectively. However, considering seven dimensions and twenty-one elementary indicators we have found that among the major States condition of the women is the best in the Northern Himalayan State of

Himachal Pradesh. If we consider all the States and Union Territories of India (under the study), condition of the women is the best in the National Capital Territory of Delhi.

(Insert table 5, 6A & 6B about here)

5.2. Non-income and income dimensions of well-being

As data on State Domestic Product is available for 16 major States, and Net National Product for India, we have displayed data and ranked those major States and the Country according to non-income and income dimensions of well-being in tables 5, 6A, and 6B. We have seen that among the States, level of well-being of women is the highest in Himachal Pradesh followed by Kerala. From table 6A we see that among the 17 available positions, the ranks of these two States are 12th and 7th respectively according to per capita SDP. Punjab is the richest State of India according to per capita SDP, but it is 3rd in terms of level of well-being of women. Maharashtra is the second richest State of India according to per capita SDP, but it is 5th in terms of level of well-being of women. So, we can postulate that higher per capita income does not always lead to higher levels of well-being. However, the opposite may not be the true. A careful observation would revel that lower levels of well-being are associated with lower per capita income. We may look at the ranks (rank in the level of well-being as well as rank in per capita income) of Assam, Bihar, Madhya Pradesh, Orissa, and Uttar Pradesh. Each of these States has almost similar ranks in both the non-income and income dimensions of well-being.

We have also displayed Spearman's rank correlation coefficients between a non-income dimension and income dimension (based on per capita State Domestic Product) of well-being in table 7. We may check that the rankings based on many of the elementary indicators under the functionings of 'housing' and 'autonomy' are strongly related to those based on per capita income.

(Insert table 7 about here)

5.3. Results of multivariate analyses

5.3.1. Nutrition / consumption of food

Table 8 shows results of logistic regression analyses. The columns display odds ratios interpretations of which are straightforward. The odds ratio of the age-group, 25-34 under the 'age of the respondent' is 1.152. It conveys that a change in the category of age from 15-24 (code: 0) to 25-34 (code: 1), holding other variables constant (henceforth we will not mention it), multiplies the odds by 1.152 (a 15.2 per cent increase). This effect is statistically significant at 0.01 level. Similarly, when category of age changes from 15-24 to 35-49, odds ratio is multiplied by 1.197 (a 19.7 per cent increase). It tells that, as compared to the younger ones (15-24 age-group), aged women are likely to have better achievements in 'nutrition / consumption of food'. The second predictor variable is 'relationship to head of the household', where we have

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three categories: head (mainly widowed, divorced or separated), wife, and other (daughter / mother / sister / granddaughter / daughter-in-law / mother-in-law / co-spouse / other relative / adopted / foster child / not related). We see that as compared to other family members, heads and wives are less likely to fulfil their dietary requirements. As compared to women who do not work or engaged in unpaid work, women engaged in paid work or self-employed are also less likely to fulfil their dietary requirements.

With husbands' education, level of nutrition increases; but the extent of increase is very high for women whose husbands are educated up to middle school. Husbands' education also affects level of nutrition of wives positively. Level of nutrition of women is likely to be high in those families where husbands are engaged in non-agricultural activities. Size of family affects level of nutrition negatively. In large families women are likely to have lower nutritional level relative to the same of women from small families.

Both the social factors have significant impact on level of nutrition. Women belonging to Muslim and other religious communities are likely to have better nutritional status than Hindu women. As compared to women belonging to the general caste category, women from the Scheduled Caste and Tribe communities (with Other Backward Class) are significantly less likely to fulfil nutritional requirements.

We have included three environmental factors: altitude of the locality from sea level, socio-economic environment (measured by type of locality: rural / urban), and geographical region (north-east, north, and south). We see that women in higher altitude are likely to perform better than women in lower altitude or in plain areas. Similarly, women in the urban areas remain ahead of their rural counterparts. As compared to women of the south, women of the north-east are less, and women of the north are significantly less likely to attain high score in this functioning of 'nutrition / consumption of food'.

5.3.2. Reproductive life

Variations in the reproductive performance are almost similar to those of nutrition / consumption of food. There are two dissimilarities. One is that – impacts of age are not the same in both the cases. In the present case, as age increases reproductive performance deteriorates sharply. The other one is that – Muslim women are significantly less likely to have better reproductive life as compared to the Hindu women. The effect of size of family is also too strong in the second model.

5.3.3. Health and morbidity

Results are similar as in section 5.3.1.

5.3.4. Housing

We see good achievement in the housing conditions is associated with husbands' education (up to middle school), type of locality – living in urban areas as well as in the higher altitudes.

5.3.5. Education

Husbands' education up to middle school is very strongly associated with women's education. However, from this result we cannot say that education of husband causes higher achievement in the education of wife. Rather, we can say that educated men (up to middle school) are likely to marry women with similar levels of education. As compared to Hindu women, Muslim women are significantly less likely to have good achievement in education. Women from other religious communities are seen to perform better than the Hindus. Women of the north-eastern hilly region are also likely to have good achievement than relative to women of the south.

5.3.6. Autonomy

Aged women are probable to enjoy higher degrees of autonomy relative to younger ones. When women are household heads, they are likely to enjoy exorbitantly high degree of autonomy than others. At the same time, when we see women as wives, they are likely to enjoy less autonomy than others. Women in the large families are also seen to have very restricted freedom than women from small families. Muslim women are also seen to have less autonomy than Hindu women. Women from other religious communities are in better position than Hindu women do.

5.3.7. Exposure to mass media & leisure

Women in the young age-group are likely to be less exposed to mass media, and are less likely to be engaged in leisure activities. However, other family members of a household are likely to be exposed more to mass media and leisure than household heads and wives. Other results are similar to those of section 5.3.6.

5.3.8. Overall well-being

Overall well-being is nothing but the simple average of the well-being scores in seven different dimensions. So, results of this section will summarise findings of previous sections also. We see that aged women are likely to have lower levels of well-being as compared to younger ones. Ass odds ratios decrease with age, we get some sort of negative relationship between age and level of well-being. In other words, can say that level of well-being decreases with age. As compared to other female members, household heads (women) are likely to have better achievements. Women engaged in paid job are seen to have lower levels of well-being as compared to housewives or compared to women who are engaged in unpaid activities. We see some sort of inverted U-shaped relationship with education of husbands and level of well-being of wives. Level of well-being is likely to increase tremendously up to husbands' medium level of education, and then it tends to decrease. When husbands' occupation changes from agricultural

to skilled and unskilled work or to service, level of well-being of wives increases. Level of well-being of women decreases very sharply as we shift our focus from small to large families. Muslim women as compared to the Hindus, and Scheduled Caste (with Other Backward Class) and Tribes as compared to general caste are less likely to have better achievements. Women in the hilly areas, and in urban areas are seen to have higher levels of well-being. Level of well-being also varies sharply across geographical regions. We have formed three broad geographical regions ignoring political boundaries with some prior information on climate, culture, demography, etc. So, ignoring political boundaries, when we consider the southern India as a whole, women of that region remain far ahead of women of the rest of India. Particularly, the gap between the levels of well-being in the southern and northern regions are too high than the same between the southern and north-eastern hilly region.

(Insert table 8 about here)

6. CONCLUSION

The study, as above, provided us with very useful and meaningful results. We know that according to other measures of well-being, such as Human Development Index (HDI), condition of Kerala is the best among the major States and Union Territories in India. In the present exercise, though we have considered well-being of women only, we have seen that Kerala could not come at the top of the list. HDI includes very basic indicators, such as education, life expectancy at birth, and income. We know that in the first two indicators, Kerala remains far ahead of other States. However, in the present assessment, among these three, we have included education only. And in order to measure status of health, we have considered some indicators, which reflect the present condition of the respondents very clearly. We have not considered life expectancy at birth, which is quite inert and lethargic. However, considering a number of functionings in different dimensions of life, we have found that among the major States and Union Territories of India, level of well-being of women is the best in the National Capital Territory of Delhi (New Delhi) followed by Goa (former Portuguese colony), the northern Himalayan State of Himachal Pradesh, the southern State of Kerala (the most demographically advanced State of India), and so on.

Following Balestrino (1996) and Ruggeri Laderchi (1997) we have also ranked the major Indian States according to non-come and income dimensions of well-being. The exercise revealed very interesting results. We have found that rankings based on some indicators under the functionings of 'housing' and 'autonomy' are strongly related to those based on per capita income. From the rankings based on average functionings achievements as well as per capita income, we observed that the States, which performed very well in the non-income dimension of

well-being, have poor ranks according to per capita income. From this fact we can say that higher income does not always lead to higher levels of well-being of women in the non-income dimensions (as both Himachal Pradesh and Kerala are lagging far behind of other States in terms of per capita income). However, the States, which are poor in terms of functionings achievements, are also poor in terms of per capita income (Assam, Bihar, Madhya Pradesh, Orissa, and Uttar Pradesh).

From the regression analyses we see that level of well-being of women in India varies sharply according to individual and household characteristics as well as social and environmental factors. Among the individual characteristics, we have seen that level of well-being is negatively related with age. Now, we have to understand clearly how age of the respondent interacts with the indicators in different dimensions. We have considered one cross-sectional data where one aged woman (at the time of survey) might have finished education and other practical aspects of life long back, and might have poor performance in those for many practical reasons. This may be one of many reasons behind getting negative relationship between well-being and age. However, we must be careful while interpreting such results, and we should not comprehend the term 'age' as 'time'.

One important point of concern with the individual characteristics is that – wives are deprived as compared to other female family members. Such matters with the familial hierarchy should be addressed in a proper manner.

Among the household characteristics, the size of a family very badly affects the condition of women (when other variables including standard of living are held constant). However, we hope such problems will be over with demographic transition and / or with small family norms in near future.

We have included social factors, such as ethnicity and religion (without evaluating goals of different communities) just to revel relevant pictures of the Indian societies. We are not in a position to prescribe use of any instrument to bring any change in these characteristics, which would again bring change in our desired goals – level of well-being of women. We have seen that women belonging to Scheduled Caste and Tribe communities (with Other Backward Class) are really deprived than others. Similarly, Muslim women are also seen as deprived than Hindu women. One may think that by bringing some change in the individual level characteristics, it will be possible to bring some change in the goals of the societies or communities. However, this may not be the true. Though individuals are elements of a community, characteristics or goals of a community is independent of those of individuals. So, before formulating any such

policy towards solution of these problems we must be very clear about how or whether an individual (element) of a community (an object) lead to objectivity of it.

The impact of the environmental factors on women's well-being draws our attention. Though, it is commonly understood that women of the hilly areas live with many difficulties as compared to women of the plain areas, they enjoy higher levels of well-being than the latter. The second factor in this category is socio-economic environment measured by type of locality (rural / urban). We have seen that results in all the dimensions are significantly affected by this factor. It seems that the condition of being an urban dweller may change the way of life. Probably such a perception is one of the many reasons behind the growth of the urban areas without prosperity in Indian context. However, as level of well-being of women is found positively related with the condition of living in an urban area, we should extract useful instruments or clues from urbanisation as well as urbanism to bring some positive changes in the levels of women's well-being in the rural areas. Similarly, the experience of the south many also be made a lesson for the rest of India.

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Table 1. Functionings in some of the existing quantitative studies

Author (Year)	Subject / Country	Functionings
Schokkaert and Van Ootegem (1990)	Belgian unemployed	Income loss, gender, age and family composition
Balestrino (1996)	Poor people, Italy	Education, nutrition or health failure
Ruggeri Laderchi (1997)	Common people, Chile	Education, health and child nutrition
Brandolini and D'Alessio (1998)	Common people, Italy	Health, education, employment, housing, social relationships and economic resources
Chiappero-Martinetti (2000)	Common people, Italy	Health (chronic illnesses); education and knowledge (level of education, knowledge1: books, knowledge2: newspapers); Social interaction (friends, passive participation, active participation, political interest); and psychological conditions (economic resources, personal/social relations, health, working, leisure time)
Klasen (2000)	Common people, South Africa	Education, income, wealth, housing, water, sanitation, energy, employment, transport, financial services, nutrition, health care, safety, perceived well-being
Kuklys (2005)	Common people, U. K.	Health (visits to doctor, physical illness affects daily activity, self-assessed health status); and housing (problems with condensation, rot in windows or floor, heating, space)

Table 2. Evaluative spaces / functionings, and membership degrees to the elementary subsets

Functionings	Elementary Subsets		Membership degrees		Membership function
Nutrition (μ_1) (Consumption of food)	Milk or curd	μ_{11}	0 0.333 0.667 1	Never Rarely Weekly Daily	Linear function
	Pulses or beans	μ_{12}	0 0.333 0.667 1	Never Rarely Weekly Daily	Linear function
	Vegetables	μ_{13}	0 0.333 0.667 1	Never Rarely Weekly Daily	Linear function
	Fruits	μ_{14}	0 0.333 0.667 1	Never Rarely Weekly Daily	Linear function
	Eggs / Chicken / meat / fish	μ_{15}	0 0.333 0.667 1	Never Rarely Weekly Daily	Linear function
Reproductive life (μ_2)	Children ever born	μ_{21}	0 0.333 0.667 1	Five and above Four Three Up to two	Trapezoidal function
	Spontaneous and induced abortions	μ_{22}	0 1	Yes No	Dichotomous
	Children ever died	μ_{23}	0 1	Yes No	Dichotomous

Health and morbidity (μ_3)	Level of haemoglobin in the blood / Anaemia	μ_{31}	0	Severe anaemia ($\leq$ 7 g/dl) Intermediate positions (7.1-11.9 g/dl): moderate $\rightarrow$ mild anaemia	Trapezoidal function
			1	No anaemia ($\geq$ 12.0 g/dl)	
	Suffered from Asthma, Tuberculosis, malaria, jaundice in last one year	μ_{32}	0	Yes	Dichotomous
			1	No	
Housing (μ_4)	Source of drinking water	μ_{41}	0	Surface water / other	Linear function
(Basic amenities available in the housing area)			0.500	Hand pump / well	
			1	Piped water	
	Type of toilet facility	μ_{42}	0	No toilet facility / field	Linear function
			0.333	Shared any type	
			0.667	Own pit toilet	
			1	Own flush toilet	
	Has electricity	μ_{43}	0	No	Dichotomous
			1	Yes	
Education[a] (μ_5)	Completed years of education	μ_5	0	No education Intermediate positions: 1 $\rightarrow$ 14 years of education.	Sigmoid curve / function
			1	Fifteen years and above	
Autonomy (μ_6)	Who decides about what to cook	μ_{61}	0	Others	Linear function
			0.250	Husband	
			0.500	Jointly with others	
			0.750	Jointly with husband	
			1	Respondent	
	Who decided on obtaining health care	μ_{62}	0	Others	Linear function
			0.250	Husband	
			0.500	Jointly with others	
			0.750	Jointly with husband	
			1	Respondent	
	Permission needed to go to market	μ_{63}	0	Not allowed to go	Linear function
			0.500	Yes	
			1	No	
	Permission needed to visit friends or relatives	μ_{64}	0	Not allowed to go	Linear function
			0.500	Yes	
			0	No	
	Allowed to have money set aside	μ_{65}	1	Yes	Dichotomous
			1	No	
	Reproductive freedom (Difference between respondent's perception on ideal number of children and children ever born)	μ_{66}	0	No freedom (negative value)	Dichotomous
			1	Yes (0 & positive value)	
	Reads newspaper at least	μ_7	0	No	Dichotomous

Exposure to mass media & Leisure (μ_7)	once a week and / or listens to radio every week and / or watches TV every week and / or goes to cinema or watches one movie at least once a month		1	Yes

[a] Different points on the sigmoid curve corresponding to each level in between 0 and 15+ years of education: 0.189   0.267   0.327   0.378   0.423 0.463 0.500 0.535 0.537 0.577   0.622   0.673 0.733 0.811 1.000

Table 3. Explicative or conversion factors

Level	*Factors*			*Categories*
Individual level factors	Age of the respondent	β_{11}	1	Young, 15-24 years
			2	Middle, 25-34 years
			3	Old, 35-49 years
	Relationship to household head	β_{12}	1	Head
			2	Wife
			3	Daughter / mother / sister / grand-daughter / daughter-in-law / mother-in- law / co-spouse / other relative / adopted / foster child / not related
	Employment status (Engaged in paid activities)	β_{13}	0	No
			1	Yes
Household level factors	Husband's education	β_{21}	0	Illiterate
			1	Literate & < middle school, Middle school complete
			2	High school complete & above
	Husband's employment status	β_{22}	1	Service
			2	Skilled & unskilled workers
			3	Agriculture and allied activities
	Family size	β_{23}	1	Small, ≤ 5
			2	Large, 6+
Social factors	Religion	β_{31}	1	Hindu
			2	Muslim
			3	Other (Christian, Sikh, Buddhist/Neo Buddhist, Jain, Jewish, Zoroastian/Parsi, no religion, other)
	Caste / ethnicity	β_{32}	1	Scheduled caste, Other backward castes
			2	Scheduled tribe
			3	General
Environment level factors	Natural environment (Altitude of the area from sea level)	β_{41}	1	Low, < 1000 metres
			2	High, > 1000 metres
	Social and economic environment (Type of locality)	β_{42}	1	Urban
			2	Rural
	Geographical region	β_{43}	1	North-Eastern hilly region
			2	Northern India
			3	Southern India

Table 4A. Membership degrees to the elementary subsets: mean values for India and selected States and Union Territories (UTs)

States/UTs	n	μ_{11}	μ_{12}	μ_{13}	μ_{14}	μ_{15}	$[\mu_1]$	μ_{21}	μ_{22}	μ_{23}	$[\mu_2]$	μ_{31}	μ_{32}	$[\mu_3]$
Andhra Pradesh	3395	0.743	0.758	0.925	0.525	0.565	0.703	0.649	0.887	0.732	0.756	0.912	0.901	0.907
Arunachal Pradesh[a]	6296	0.465	0.624	0.968	0.483	0.594	0.627	0.579	0.812	0.769	0.720	0.933	0.855	0.894
Assam	2404	0.511	0.800	0.955	0.470	0.631	0.673	0.603	0.755	0.803	0.721	0.893	0.940	0.917
Bihar	5402	0.529	0.791	0.977	0.381	0.388	0.613	0.501	0.904	0.707	0.704	0.900	0.914	0.907
Goa	1025	0.674	0.643	0.756	0.636	0.753	0.693	0.732	0.765	0.845	0.781	0.946	0.943	0.945
Gujarat	3115	0.761	0.839	0.945	0.504	0.173	0.644	0.622	0.820	0.732	0.724	0.915	0.919	0.917
Haryana	2523	0.923	0.929	0.991	0.560	0.098	0.700	0.600	0.838	0.772	0.737	0.921	0.943	0.932
Himachal Pradesh	2705	0.857	0.975	0.982	0.700	0.252	0.753	0.683	0.838	0.856	0.793	0.961	0.983	0.972
Jammu	2368	0.718	0.671	0.875	0.524	0.399	0.637	0.527	0.767	0.758	0.684	0.926	0.967	0.946
Karnataka	3644	0.772	0.906	0.840	0.557	0.408	0.696	0.651	0.879	0.752	0.760	0.918	0.976	0.947
Kerala	2450	0.530	0.622	0.829	0.573	0.827	0.676	0.796	0.829	0.902	0.842	0.976	0.953	0.964
Madhya Pradesh	5774	0.467	0.747	0.871	0.405	0.226	0.543	0.500	0.866	0.595	0.654	0.921	0.855	0.888
Maharashtra	4441	0.540	0.892	0.846	0.532	0.445	0.651	0.660	0.844	0.803	0.769	0.925	0.911	0.918
New Delhi	1939	0.757	0.851	0.953	0.609	0.296	0.693	0.664	0.760	0.837	0.753	0.938	0.974	0.956
Orissa	3792	0.386	0.742	0.954	0.379	0.437	0.580	0.615	0.826	0.698	0.713	0.909	0.901	0.905
Punjab	2385	0.898	0.940	0.994	0.568	0.154	0.711	0.660	0.828	0.823	0.770	0.937	0.963	0.950
Rajasthan	5364	0.706	0.663	0.814	0.378	0.128	0.538	0.506	0.842	0.647	0.665	0.919	0.909	0.914
Tamil Nadu	4027	0.720	0.791	0.907	0.544	0.576	0.708	0.741	0.754	0.792	0.762	0.905	0.970	0.938
Uttar Pradesh	4701	0.644	0.778	0.938	0.403	0.222	0.597	0.470	0.819	0.611	0.633	0.923	0.923	0.923
West Bengal	3412	0.416	0.721	0.986	0.361	0.679	0.633	0.686	0.831	0.785	0.767	0.911	0.959	0.935
India	**71162**	**0.623**	**0.776**	**0.917**	**0.481**	**0.397**	**0.639**	**0.603**	**0.831**	**0.740**	**0.725**	**0.922**	**0.923**	**0.922**

Nutrition / Food (μ_1)> μ_{11}: milk or curd; μ_{12}: pulses or beans; μ_{13}: vegetables; μ_{14}: fruits; μ_{15}: eggs / chicken / meat / fish
Reproductive life (μ_2)> μ_{21}: children ever born; μ_{22}: spontaneous and induced abortions; μ_{23}: children ever died
Health and morbidity (μ_3)> μ_{31}: anaemia; μ_{32}: suffered from asthma / tuberculosis / malaria / jaundice in last one year
$[\mu_i]$: simple average of the functionings *in each* evaluative space
[a] Includes Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura

Table 4B. Membership degrees to the elementary subsets: mean values for India and selected States and Union Territories (UTs)

States/UTs	μ_{41}	μ_{42}	μ_{43}	$[\mu_4]$	μ_5	μ_{61}	μ_{62}	μ_{63}	μ_{64}	μ_{65}	μ_{66}	$[\mu_6]$	μ_7	$[\mu]$
Andhra Pradesh	0.746	0.235	0.776	0.586	0.200	0.859	0.581	0.586	0.571	0.588	0.696	0.647	0.768	0.676
Arunachal Pradesh[a]	0.639	0.546	0.696	0.627	0.308	0.883	0.590	0.688	0.695	0.656	0.704	0.703	0.716	0.676
Assam	0.536	0.506	0.354	0.465	0.273	0.864	0.699	0.569	0.579	0.398	0.629	0.623	0.591	0.636
Bihar	0.525	0.146	0.178	0.283	0.122	0.799	0.499	0.582	0.589	0.700	0.631	0.633	0.267	0.573
Goa	0.781	0.438	0.936	0.718	0.411	0.845	0.629	0.828	0.795	0.831	0.660	0.765	0.880	0.749
Gujarat	0.832	0.382	0.867	0.694	0.297	0.827	0.674	0.783	0.760	0.738	0.561	0.724	0.669	0.696
Haryana	0.724	0.337	0.900	0.654	0.247	0.875	0.639	0.689	0.607	0.707	0.564	0.680	0.659	0.692
Himachal Pradesh	0.843	0.348	0.980	0.724	0.375	0.806	0.672	0.684	0.675	0.823	0.535	0.699	0.862	0.747
Jammu	0.723	0.446	0.921	0.697	0.195	0.713	0.552	0.567	0.542	0.595	0.478	0.574	0.758	0.649
Karnataka	0.837	0.276	0.827	0.647	0.265	0.896	0.548	0.666	0.663	0.680	0.519	0.662	0.786	0.696
Kerala	0.589	0.628	0.740	0.652	0.511	0.743	0.729	0.734	0.697	0.668	0.834	0.734	0.891	0.743
Madhya Pradesh	0.630	0.216	0.723	0.523	0.182	0.794	0.435	0.563	0.594	0.499	0.523	0.568	0.537	0.579
Maharashtra	0.870	0.353	0.887	0.703	0.351	0.871	0.608	0.749	0.674	0.678	0.536	0.686	0.770	0.702
New Delhi	0.930	0.823	0.979	0.911	0.460	0.790	0.721	0.762	0.670	0.835	0.599	0.729	0.927	0.768
Orissa	0.529	0.158	0.415	0.367	0.216	0.827	0.441	0.550	0.569	0.484	0.604	0.579	0.473	0.577
Punjab	0.685	0.500	0.967	0.718	0.359	0.914	0.733	0.763	0.646	0.788	0.546	0.732	0.824	0.738
Rajasthan	0.680	0.231	0.657	0.523	0.128	0.801	0.446	0.581	0.578	0.409	0.508	0.554	0.362	0.566
Tamil Nadu	0.823	0.328	0.827	0.659	0.342	0.890	0.654	0.891	0.790	0.809	0.567	0.767	0.812	0.735
Uttar Pradesh	0.557	0.192	0.400	0.383	0.183	0.758	0.507	0.549	0.556	0.530	0.583	0.581	0.469	0.572
West Bengal	0.648	0.418	0.472	0.513	0.294	0.830	0.509	0.595	0.577	0.570	0.628	0.618	0.677	0.645
India	**0.690**	**0.342**	**0.684**	**0.572**	**0.263**	**0.830**	**0.569**	**0.654**	**0.634**	**0.628**	**0.592**	**0.651**	**0.641**	**0.654**

Housing (μ_4)> μ_{41}: source of drinking water; μ_{42}: type of toilet facility; μ_{43}: has electricity

Education (μ_5)> completed years of education

Autonomy (μ_6)> μ_{61}: who decides about what to cook; μ_{62}: who decided on obtaining health care; μ_{63}: permission needed to go to market; μ_{64}: permission needed to visit friends or relatives;
μ_{65}: Allowed to have money set aside; μ_{66}: reproductive freedom

Exposure to mass media & Leisure (μ_7)> reads newspaper at least once a week / listens to radio every week / watches TV every week / goes to cinema or watches one movie at least once a month

$[\mu_i]$: simple average of the functionings *in each* evaluative space

$[\mu]$: simple average of all the functionings *in all* evaluative spaces

[a] Includes Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura

Table 5. Average scores in evaluative spaces with per capita income in selected states of India

States	$[\mu_1]$	$[\mu_2]$	$[\mu_3]$	$[\mu_4]$	μ_5	$[\mu_6]$	μ_7	$[\mu]$	SDP[a] Rupees	SDP[a] US$[b]
Andhra Pradesh	0.703	0.756	0.907	0.586	0.200	0.647	0.768	0.676	10590	235
Assam	0.673	0.721	0.917	0.465	0.273	0.623	0.591	0.636	7335	163
Bihar	0.613	0.704	0.907	0.283	0.122	0.633	0.267	0.573	4654	103
Gujarat	0.644	0.724	0.917	0.694	0.297	0.724	0.669	0.696	16251	361
Haryana	0.700	0.737	0.932	0.654	0.247	0.680	0.659	0.692	17626	392
Himachal Pradesh [c]	0.753	0.793	0.972	0.724	0.375	0.699	0.862	0.747	8747	194
Karnataka	0.696	0.760	0.947	0.647	0.265	0.662	0.786	0.696	11693	260
Kerala	0.676	0.842	0.964	0.652	0.511	0.734	0.891	0.743	11936	265
Madhya Pradesh	0.543	0.654	0.888	0.523	0.182	0.568	0.537	0.579	8114	180
Maharashtra	0.651	0.769	0.918	0.703	0.351	0.686	0.770	0.702	18365	408
Orissa	0.580	0.713	0.905	0.367	0.216	0.579	0.473	0.577	6767	150
Punjab	0.711	0.770	0.950	0.718	0.359	0.732	0.824	0.738	19500	433
Rajasthan	0.538	0.665	0.914	0.523	0.128	0.554	0.362	0.566	9356	208
Tamil Nadu	0.708	0.762	0.938	0.659	0.342	0.767	0.812	0.735	12989	289
Uttar Pradesh	0.597	0.633	0.923	0.383	0.183	0.581	0.469	0.572	7263	161
West Bengal	0.633	0.767	0.935	0.513	0.294	0.618	0.677	0.645	10636	236
India	**0.639**	**0.725**	**0.922**	**0.572**	**0.263**	**0.651**	**0.641**	**0.654**	**12729**	**283**

μ_1: Nutrition / Food; μ_2: Reproductive life; μ_3: Health and morbidity; μ_4: Housing; μ_5: Education; μ_6: Autonomy; μ_7: Exposure to mass media & Leisure
$[\mu_i]$: simple average of the functionings *in each* evaluative space; $[\mu]$: simple average of all the functionings *in all* evaluative spaces
[a] Per capita State Domestic Product (in Rupees; US$ 1 = 45 Rupees approximately according to current exchange rate) for States and Net National Product for India at current prices (1997-1998)
[b] Unadjusted rough estimates based on current exchange rates
[c] SDP refers to the year 1995-1996 (Source: Economic Survey)

Table 6A. Ranking of the states according to non-income and income dimensions of well-being

States	Rank according to $[\mu_1]$	$[\mu_2]$	$[\mu_3]$	$[\mu_4]$	μ_5	$[\mu_6]$	μ_7	$[\mu]$	SDP[a]
Andhra Pradesh	4	8	14	9	13	10	7	9	10
Assam	8	12	11	14	8	12	12	12	14
Bihar	13	14	15	17	17	11	17	15	17
Gujarat	10	11	12	4	6	4	9	6	4
Haryana	5	9	7	7	11	7	10	8	3
Himachal Pradesh [b]	1	2	1	1	2	5	2	1	12
Karnataka	6	7	4	8	9	8	5	7	8
Kerala	7	1	2	7	1	2	1	2	7
Madhya Pradesh	16	16	17	11	15	16	13	13	13
Maharashtra	9	4	10	3	4	6	6	5	2
Orissa	15	13	16	16	12	15	14	14	16
Punjab	2	3	3	2	3	3	3	3	1
Rajasthan	17	15	13	12	16	17	16	17	11
Tamil Nadu	3	6	5	5	5	1	4	4	5
Uttar Pradesh	14	17	8	15	14	14	15	16	15
West Bengal	12	5	6	13	7	13	8	11	9
India	**11**	**10**	**9**	**10**	**10**	**9**	**11**	**10**	**6**

μ_1: Nutrition / Food; μ_2: Reproductive life; μ_3: Health and morbidity; μ_4: Housing; μ_5: Education; μ_6: Autonomy; μ_7: Exposure to mass media & Leisure
$[\mu_i]$: simple average of the functionings *in each* evaluative space; $[\mu]$: simple average of all the functionings *in all* evaluative spaces
[a] Per capita State Domestic Product for States and Net National Product for India at current prices (1997-1998)
[b] SDP refers to the year 1995-1996 (Source: Economic Survey)

Table 6B. Ranking of the states according to non-income and income dimensions of well-being

States	μ_{11}	μ_{12}	μ_{13}	μ_{14}	μ_{15}	μ_{21}	μ_{22}	μ_{23}	μ_{31}	μ_{32}	μ_{41}	μ_{42}	μ_{43}	μ_{61}	μ_{62}	μ_{63}	μ_{64}	μ_{65}	μ_{66}	SDP^a
Andhra Pradesh	6	12	10	8	5	8	2	11	12	15	6	12	8	7	9	11	15	11	2	10
Assam	14	7	6	11	3	11	16	5	17	8	15	2	16	6	3	14	12	17	4	14
Bihar	13	9	5	14	10	15	1	13	16	12	17	17	17	14	14	12	11	6	3	17
Gujarat	5	6	8	9	14	9	14	12	11	11	4	5	5	10	4	2	2	4	11	4
Haryana	1	3	2	4	17	13	8	8	7	7	7	9	3	4	7	6	9	5	10	3
Himachal Pradesh[b]	3	1	4	1	11	4	7	2	2	1	2	7	1	12	5	7	4	1	14	12
Karnataka	4	4	15	5	8	7	3	9	10	2	3	11	7	2	11	8	6	7	16	8
Kerala	12	17	16	2	1	1	11	1	1	6	13	1	9	17	2	5	3	9	1	7
Madhya Pradesh	15	13	13	12	12	16	4	17	8	17	12	14	10	15	17	15	10	14	15	13
Maharashtra	11	5	14	7	6	5	5	4	4	13	1	6	4	5	8	4	5	8	13	2
Orissa	17	14	7	15	7	10	13	14	14	16	16	16	14	11	16	16	16	15	6	16
Punjab	2	2	1	3	15	6	12	3	3	4	9	3	2	1	1	3	7	3	12	1
Rajasthan	8	16	17	16	16	14	6	15	9	14	10	13	12	13	15	13	13	16	17	11
Tamil Nadu	7	8	12	6	4	2	17	6	15	3	5	10	6	3	6	1	1	2	9	5
Uttar Pradesh	9	10	9	13	13	17	15	16	5	9	14	15	15	16	13	17	17	13	8	9
West Bengal	16	15	3	17	2	3	9	7	13	5	11	4	13	9	12	10	14	12	5	15
India	10	11	11	10	9	12	10	10	6	10	8	8	11	8	10	9	8	10	7	6

Nutrition / Food (μ_1)> μ_{11}: milk or curd; μ_{12}: pulses or beans; μ_{13}: vegetables; μ_{14}: fruits; μ_{15}: eggs / chicken / meat / fish
Reproductive life (μ_2)> μ_{21}: children ever born; μ_{22}: spontaneous and induced abortions; μ_{23}: children ever died
Health and morbidity (μ_3)> μ_{31}: anaemia; μ_{32}: suffered from asthma / tuberculosis / malaria / jaundice in last one year
Housing (μ_4)> μ_{41}: source of drinking water; μ_{42}: type of toilet facility; μ_{43}: has electricity
Education (μ_5)> completed years of education
Autonomy (μ_6)> μ_{61}: who decides about what to cook; μ_{62}: who decided on obtaining health care; μ_{63}: permission needed to go to market; μ_{64}: permission needed to visit friends or relatives; μ_{65}: Allowed to have money set aside; μ_{66}: reproductive freedom
Exposure to mass media & Leisure (μ_7)> reads newspaper at least once a week / listens to radio every week / watches TV every week / goes to cinema or watches one movie at least once a month
[μ_i]: simple average of the functionings *in each* evaluative space; [μ]: simple average of all the functionings *in all* evaluative spaces
[a] Per capita State Domestic Product for States and Net National Product for India at current prices (1997-1998) (Source: Economic Survey)
[b] SDP of Himachal Pradesh refers to the year 1995-1996

Table 7. Spearman's rank correlation coefficients between a non- income and the income dimension of well-being

	μ_{11}	μ_{12}	μ_{13}	μ_{14}	μ_{15}	[μ_1]	μ_{21}	μ_{22}	μ_{23}
SDP[a, b]	0.559	0.397	-0.012	0.578	-0.115	0.525	0.490	-0.127	0.522
Sig. (2-tailed)	0.020	0.115	0.963	0.015	0.660	0.031	0.046	0.626	0.032
-	[μ_2]	μ_{31}	μ_{32}	[μ_3]	μ_{41}	μ_{42}	μ_{43}	[μ_4]	μ_5
SDP[a, b]	0.610	0.417	0.343	0.478	0.669	0.591	0.760	0.787	0.603
Sig. (2-tailed)	0.009	0.096	0.178	0.052	0.003	0.013	0.000	0.000	0.010
-	μ_{61}	μ_{62}	μ_{63}	μ_{64}	μ_{65}	μ_{66}	[μ_6]	μ_7	[μ]
SDP[a, b]	0.625	0.598	0.860	0.637	0.551	-0.257	0.708	0.623	0.681
Sig. (2-tailed)	0.007	0.011	0.000	0.006	0.022	0.319	0.001	0.008	0.003

Footnote as in table 6

Table 8. Results of regression analyses: odds ratios [exp (β)] of attaining high score[a] in all dimensions of well-being

Predictor variables	$[\mu_1]$	$[\mu_2]$	$[\mu_3]$	$[\mu_4]$	μ_5	$[\mu_6]$	μ_7	$[\mu]$
Age of the respondent (rc: 15-24)								
25-34	1.152[1]	0.341[1]	1.296[1]	1.296[1]	0.922[1]	ns	1.074[1]	0.869[1]
35-49	1.197[1]	0.153[1]	1.362[1]	1.627[1]	0.701[1]	1.079[1]	1.112[1]	0.734[1]
Relationship to head of the household (rc: other)								
Head	0.699[1]	0.351[1]	0.917[2]	0.713[1]	0.543[1]	7.250[1]	0.616[1]	1.178[1]
Wife	0.792[1]	0.343[1]	0.942[1]	0.827[1]	0.602[1]	0.956[2]	0.758[1]	0.614[1]
Employment status (rc: no or unpaid work)								
Paid work or self employed	0.728[1]	0.946[1]	0.949[1]	0.848[1]	0.755[1]	1.338[1]	0.931[1]	0.893[1]
Husband's education (rc: low)								
Medium	2.977[1]	2.007[1]	1.502[1]	4.262[1]	16.391[1]	1.590[1]	5.762[1]	6.047[1]
High	1.436[1]	1.305[1]	1.207[1]	1.879[1]	4.984[1]	1.073[1]	2.304[1]	2.153[1]
Husband's occupation (rc: agricultural)								
Skilled & unskilled work	1.518[1]	ns	ns	1.895[1]	1.554[1]	1.091[2]	1.987[1]	1.654[1]
Service	1.409[1]	1.149[1]	1.172[1]	1.589[1]	1.775[1]	1.256[1]	1.860[1]	1.576[1]
Size of family (rc: small, $\leq$ 5)								
Large (> 5)	0.868[1]	0.287[1]	ns	0.877[1]	0.674[1]	0.481[1]	0.829[1]	0.474[1]
Religion (rc: Hindu)								
Muslim	1.081[1]	0.759[1]	ns	1.295[1]	0.681[1]	0.816[1]	0.735[1]	0.798[1]
Other religion	1.196[1]	1.089[2]	1.581[1]	1.569[1]	3.614[1]	1.555[1]	1.709[1]	1.783[1]
Caste / ethnicity (rc: general)								
Scheduled Caste & backward class	0.838[1]	0.782[1]	0.863[1]	0.685[1]	0.533[1]	0.870[1]	0.748[1]	0.677[1]
Scheduled Tribe	0.360[1]	0.817[1]	0.632[1]	0.446[1]	0.394[1]	0.921[1]	0.421[1]	0.437[1]
Altitude from sea level (rc: < 1000 metre)								
> 1000 metre	1.739[1]	1.290[1]	1.727[1]	3.624[1]	1.023[1]	1.176[1]	2.177[1]	2.459[1]
Type of locality (rc: rural)								
Urban	1.988[1]	1.240[1]	1.184[1]	12.768[1]	2.848[1]	1.858[1]	5.192[1]	5.434[1]
Region (rc: South)								
North-East	0.905[1]	0.774[1]	0.673[1]	0.688[1]	1.193[1]	ns	0.749[1]	0.743[1]
North	0.547[1]	0.656[1]	0.871[1]	0.486[1]	0.372[1]	0.772[1]	0.391[1]	0.391[1]
Constant	0.940[3]	10.728[1]	0.712[1]	0.348[1]	0.658[1]	1.181[1]	1.314[1]	1.163[1]
Nagelkerke R Square	0.195	0.280	0.042	0.455	0.452	0.155	0.351	0.404

[a] Above the median values (except the dichotomous one, μ_7); μ_1: Nutrition / Food; μ_2: Reproductive life; μ_3: Health and morbidity; μ_4: Housing; μ_5: Education; μ_6: Autonomy; μ_7: Exposure to mass media & Leisure; $[\mu_i]$: simple average of the functionings *in each* evaluative space; $[\mu]$: simple average of all the functionings *in all* evaluative spaces

rc: reference category; ns: not significant; [1]p<0.01, [2]p<0.05, [3]p<0.10