# Health at Old Ages in India: Statistical Exposition of Its Socio-Cultural and Gender Dimensions

Bakshi, Sanjeev and Pathak, Prasanta

Indian Statistical Institute, Kolkata

2009

**Health at Old Ages in India: Statistical Exposition of Its Socio-Cultural and Gender Dimensions**

Sanjeev Bakshi[*] and Prasanta Pathak[†]

Abstract

This work attempts to develop a conceptual framework to model health of older adults (OA) in India in association with various socio-economic and cultural (SEC) factors. For this purpose, four different populations of OAs are considered namely rural male (RM), rural female (RF), urban male (UM) and urban female (UF). The data from the 60th Round of the National Sample Survey (NSS) (2004) has been used for the purpose. Diseases and disabilities are two aspects of the health of OAs. These aspects are measured by the count of diseases and the count of disabilities suffered by an OA. Empirical evidence indicates that models based on the Poisson distribution and the Negative Binomial distribution are appropriate respectively to model these aspects of health. The association between these two aspects is not found to be strong in all the four populations. But these aspects are found to be significantly associated with various SEC factors. The effects of age, marital status and number of children are significant in case of diseases. Education has effect in rural areas alone and the effect of caste differentials is visible in case of female populations only. Religion has significant effect in rural areas only. The effects of household economic status and economic dependency are also significant. The type of economic activity of a household also affects disease prevalence among the male populations. The amount of land possessed by a household affects the disease prevalence among rural OA only. In the case of disabilities, age and economic dependency of the OAs have significant effect in all the OA populations. Marital status has significant effect only for disabilities among RF, UM and UF

[*]Senior Research Fellow, Population Studies Unit, Indian Statistical Institute, Kolkata, India

[†]Faculty Member, Population Studies Unit, Indian Statistical Institute, Kolkata, India

populations. Disabilities among UM and RM are associated with education and caste respectively. Religion plays a significant role in the cases of disabilities among rural population.

**1. Introduction**

Ageing of a population not only enhances life expectancies in the population but also poses a challenge for maintaining the Quality of Life (QoL) in the years that are added to the latter domain of life. Health is an indispensable integrant of the QoL (Deeg, 2007). The salience of sound health increases with age as it is pivotal to all the day to day activities. Hence, the health related quality of life (HRQoL) plays a significant role in dictating the overall QoL of older adults (OA). At the macro level, the phenomenon of ageing of populations has raised concerns regarding the state of public health of the OA population (Sherlock, 2000). The state of HRQoL is more acute in societies where the social security systems are under developed. Further, the problem is aggravated if the public health systems are not sensitive to the health concerns of the OA. Ageing of Population and concerns for HRQoL blend together in the ageing experience of India. The OA constituted to about 7.10 per cent of the total population of India in 2001.

The prevalence of morbidities and disabilities show an increasing trend with rise in the age. HRQoL of OA in a population can be gauged by the disease/disability free life expectancies. The higher the value of these quantities the healthier the population is. However, in all populations there are OA who suffer from one or more chronic diseases/disabilities. The HRQoL of these OA needs to be improved by creating an environment that is conductive to the enhancement of HRQoL. This environment consists of socio-economic and cultural (SEC) factors. The association of these factors with the HRQoL needs investigation.

Although, biological processes are responsible for the state of health of OA; nevertheless studies conducted in various parts of the world confirm the association between socio-economic factors and health of OA (Adama, Hurd, McFadden, Merrill & Riberio., 2003; Adda, Chandola &l Marmot, 2003; Baker, Ofstedal, Zimmer, Tang & Chuang, 2005; Beydoun & Poplin., 2005; Cambois, Robine & Hayward, 2001; Kaneda, Zimmer & Tang.,

3

2004; Mansyur, Amick, Harrist & Franzini.l, 2008; Matthews,. Smith, Hamock., Jagger & Spiers, 2005; Matthews, Jogger & Harcock. 2006; Ravito, Heikkinen & Ebrahim., 2005; Smith, & Kington l, 1997; Zimmer, Martin & Li, 2003; Zimmer, Chayovan, Lin & Natividad, 2003; Zimmer , 2006).

These factors can be viewed as various kinds of exposures that an OA is subjected to during his/her lifetime. The health at older ages is the effect of these exposures. These exposures include economic status, occupation, marital status, number of children born during reproductive phase (for females) and education to name a few. Moreover, the population of OA is heterogeneous with respect to SEC aspects. This heterogeneity may be associated with differentials in health of OA. Albeit, health is not a well defined concept (Deeg, 2007) and any quantitative analysis of health requires an operational definition subjected to the nature of available data.

Micro studies conducted in different parts of India (Audinarayana, 2005; Alam, 2006; Chattopadhyay & Roy; 2005) also substantiate these findings. At present country wide studies on this aspect are lacking. There is a need to investigate this association based upon a nation wide sample. The present study based on a nationally representative sample of about 29102 OA is an attempt to fill this gap. Further, due to large sample a lot more variable could be incorporated into the model to investigate their effectiveness. Another distinct feature of this study is that rural males, rural females, urban males and urban females are treated as four populations and each has been separately analysed for the purpose. The logic behind this treatment is that factors may play varying role in different populations to influence the health of OA.

The present study peruses the following objectives:

i. To define health and to examine the empirical distribution of health and the properties of this distribution in different populations of OA.

ii.To investigate the association between diseases and disabilities

iii.  To develop a conceptual framework to model the association of health with SEC factors

## 2. Data and Methods

### 2.1. Source of Data

The 60th round of the National Sample Survey provides rich information on diseases, disabilities, self-rated heath and health seeking behaviour of OA. It also provides rich details about the SEC aspects of the OA. The data provides information on 38 diseases and 4 disabilities. An OA is asked to list at most five diseases or disabilities in the decreasing order of severity. Table 1 shows the frequency distribution of the count of diseases and the count disabilities.

**Table 1: The Frequency Distribution of the Count of Diseases and the Count of Disabilities**

| Count | Diseases | | Disabilities | |
|---|---|---|---|---|
| | Frequency | Cumulative Frequency | Frequency | Cumulative Frequency |
| 0 | 21317 | 73.249 | 24480 | 84.117 |
| 1 | 6524 | 95.701 | 4181 | 98.482 |
| 2 | 1084 | 99.427 | 394 | 99.836 |
| 3 | 151 | 99.944 | 41 | 99.976 |
| 4 | 15 | 99.994 | 7 | 100.000 |
| 5 | 2 | 100.000 | 0 | 100.000 |

From the tables it is evident that instances of suffering from more than 5 diseases/disabilities are rare and the data can be used to count the number of diseases for all practical purposes. The four populations of OA namely, RM, RF, UM and UF were segregated and each was weighted to make it representative of the respective population.

## 2.2. Health

Health is defined as 'a state of complete physical, mental and social well being and not merely the absence of disease and infirmities' by the WHO. Morbidity, disability, self-rated health and mental health are different aspects of health. At older ages the states of morbidity and disability are self evident. In any study on health it is most appropriate to study the prevalence of each disease and disability separately in a population. However, there are a large number of diseases that can affect the HRQoL of an OA. Existence of co-morbidities makes any quantitative manipulation complex. Therefore, simultaneous consideration of all the diseases/disabilities requires a simplification of the matter.

A simple measure of health status of an OA is the count of diseases and the count of disabilities. These two can serve as operational definitions of the corresponding aspects of the health of an OA. These definitions are based on the assumption that all the diseases considered in the study are equally severe. A count of $c$ means a state of severity 'c' irrespective of what these $c$ diseases are. Further, it is assumed that all the diseases occur independently of each other. Thus, the difference in severity of the counts $c$ and $c+1$ is same as the difference in severity of the counts $c+1$ and $c+2$.

Generation of a disease in an OA is a random event that takes place in response to various SEC exposures. Thus, the count of diseases and disabilities are random variables that may or may not be associated. The distribution of these counts can be inferred and the corresponding

parameters can be interpreted and estimated. Further, the effect of various exposures on these parameters can be estimated by applying appropriate models.

## 2.3. Distribution of the Count of Diseases and the Count of Disabilities

Letting $D = \{D1, D2, ..., Di, ...\}$ denote the set of all diseases possible in an OA where $Di$ denote the $i^{th}$ disease. There is a non-zero probability $p_i$ that an OA suffers from the $i^{th}$ disease. This probability depends upon the SEC exposure of the OA. A random variable $X_i$ is defined as follows:

$$P(X_i = 1) = p_i \tag{1}$$

$$P(X_i = 0) = 1 - p_i \tag{2}$$

Define

$$Y = \sum_i X_i \tag{3}$$

Then, Y denotes the count of diseases on an OA. Assuming independence of $X_i$ s the moment generating function of Y is

$$M_Y(t) = \prod_i \left(1 - p_i\left(1 - e^t\right)\right) \tag{4}$$

The expression on the r.h.s can be expanded as follows,

$$1 - \left(\sum_i p_i\right)\left(1 - e^t\right) + \left(\sum_i \sum_{\substack{j \\ i \neq j}} p_i p_j\right)\left(1 - e^t\right)^2 - \left(\sum_i \sum_{\substack{j \\ i \neq j \neq l}} \sum_l p_i p_j p_l\right)\left(1 - e^t\right)^3 + .... + (-1)^k p_i p_j ... p_k \tag{5}$$

For low values of $p_i$'s, the product terms in the above expression can be ignored. Thus, (4) can be approximately written as,

$$M_X(t) \approx 1 - \left(\sum_i p_i\right)\left(1 - e^t\right) \tag{6}$$

Since, for small values of x $e^x \approx 1+x$ the above expression can be written as

$$M_X(t) \approx e^{(\lambda)(e^t-1)}$$ (7)

Where, $\lambda = \sum_i p_i$ .

This resembles the m.g.f of a random variable having Poisson distribution with parameter λ.

Where, $\lambda = \sum_i p_i$ . Hence, under the assumptions discussed earlier the distribution of the count of diseases/disabilities can be approximated as Poisson distribution.

### 2.4. Association between the Count of Diseases and the Count of Disabilities

The variables count of diseases and the count of disabilities vary within a small range (0 - 5). Hence, they can be viewed as ordinal variables and gamma can serve as a measure of association between these two variables. The values near to 0 depict weak association between the two variables and the values near +1 and -1 indicate strong positive and negative association respectively. In what follows the conceptual framework consisting of various SEC factors is developed that may have association with the HRQoL of OA. It consists of three broad groups of factors namely characteristics of individuals, characteristics of household and socio-cultural characteristics.

## 2.5. Conceptual Framework

### 2.5.1. Characteristics of the Individuals

#### 2.5.1.1. Age

The natural process of ageing is inevitable and has a bearing on the health of an OA. This process coincides with the increasing age of an OA. Hence, age can be considered as a proxy to the natural process of ageing. The effect of age on health indicates the net effect of the process of ageing on health. Correct reporting of age is marred with high degree of digit preference error. Therefore, the present study includes age as a categorical variable with young-old (includes ages 60 to less than 69), old (includes ages 69 to less than 79) and old-old (includes ages 79 years and above) as categories. The category young-old can serve as a reference to compare the state of health in rest of the categories.

#### 2.5.1.2. Marital Status

Risk of widowhood/widowerhood looms large at older ages. In the Indian society remarriage/marriage at older ages is rare. Therefore, at older ages transition in marital status happens only from being married to being widow/widower. Therefore, the state of being widow/widower can be seen as the future transition state of married OA. Further, there may be OA who never got married, who are divorced or live life as a separated couple. But, this is a minority as the population of OA mostly comprise of married OA and widow/widower OA. In the present study the marital status of this minority shall be called 'others'. The other two categories of marital status are 'currently married' and 'widowed/widowers'. Widowhood/widowerhood may push an OA into ignorance and social neglect. This may affect his/her overall health. Therefore, in the present study the interest lies in comparing the effect of widowhood/widowerhood with the effect of being married on health.

It should be borne in mind that transition to widowhood and the on set of diseases in an OA does not coincide. It only means that widowhood/widowerhood may worsen the health condition. If health worsens, the extent of worsening of health has to be estimated from the statistical analysis that shall follow.

### 2.5.1.3. Level of Education

Health seeking behaviour of an OA is guided by his/her level of awareness regarding health. Awareness regarding health may be associated with the level of education. It is opined that more the level of education more is the awareness regarding health. Therefore, the present study includes education as a categorical variable with three categories namely, 'illiterate', 'literate but below matriculation' and 'matriculation and above' in the increasing order of the level of education. The last category may be considered as a reference to compare the health status in rest of the categories.

### 2.5.1.4. Dependence

In the present study, dependence means economic dependence of an OA. Dependence can be categorised into four discrete states. When an OA is completely dependent on others for his day to day needs the state of dependence is called 'complete dependence'. It may happen that an OA is partially dependent on others. This state of dependence is called 'partial dependence'. A state where no economic support is required by an OA is called 'non-dependence'. Such OA may have to support dependents like spouse, children or other relatives. Such a state is called 'non-dependence and supporting'. Finally, the OA who are not dependent and do not have dependents to support are said to be in a state of 'non-dependence and non-supporting'. Out of the four states of dependence it is the last one where an OA is

least constrained. This state can serve as a reference for comparing the health in rest of the states.

### 2.5.1.5. Number of Children

Female's reproductive phase spans from the age of 15 years to the age of 49 years. During this span she may give birth to off springs. The effect of this biological process may have repercussions on health at older ages. The number of children indicates the extent to which a woman goes through such biological process. The effect of a unit increase in number of children on health needs investigation. Though the interpretation of the effect of number of children on the health of females is direct, similar interpretation is not sound in case of males.

### 2.5.2. Characteristics of the Households

### 2.5.2.1. Economic Condition of Households

Economic well being of a household is reflected in per capita monthly expenditure (PCME) of the household. The households are divided into five equal parts using quintiles for the PCME. These are called first, second, third, fourth and fifth quintiles. The first through fifth quintiles represent the positioning of economic strata in descending order. The lowest economic stratum shall be considered as reference for comparing the health status in rest of the strata. The quintiles are formed separately for rural and urban areas.

### 2.5.2.2. Classification of Households Based on Major Economic Activity

Net income of a household, during a reference period (past one year), may depend on a single economic activity or a host of economic activities. The activity that

contributes the maximum to the net household income is called the major economic activity. This characteristic can be assumed to be more or less unvarying with time. For example, for a household reporting to be self-employed in agriculture in the reference period is likely to have remained so for the past also. The present study intends to compare the relative state of health of OA in households involved in different major economic activities. The broad groups for major economic activities, for rural and urban areas, are shown in Table 2.

**Table 2: The Broad Groups of Households Based on Major Economic Activities in Rural and Urban Areas**

| Major Economic Activity | Rural | Urban |
| --- | --- | --- |
| Type I | self-employed in non-agriculture | self-employed |
| Type II | agricultural labour | regular wage/salary earning |
| Type III | other labour | casual labour |
| Type IV | self-employed in agriculture | others |
| Type V | others | |

The group 'others' can be set as a reference to compare the health status of the OA in rest of the categories.

**2.5.2.3. Living Arrangements of OA (LA) and Size of Household**

LA and size of the household determine indicate how OA live and how many members share the space. LA of the OA are of two types namely, alone and co-residence. Staying alone or with spouse only is called 'alone'; otherwise it is called 'co-residence'. In addition to LA the size of the household may have effect on the health of OA as increasing number of household members may mount pressure on the resources available for the OA.

**2.5.2.4. Land Owned by the Household**

Like PCME amount of land owned by a household is a measure of economic condition of the household. This may be more prominent in case of rural areas. The categories considered here are in increasing order of the amount of land starting from less than 0.005 hectares to more than 8 hectares. The last category can be taken as a reference category for comparing the health status in rest of the categories.

**2.5.3. Socio-cultural characteristics**

Caste, religion and region constitute the socio-cultural factors. Social groups classifies as 'scheduled castes (SC)', 'scheduled tribes (ST)' and the rest of the population called 'others' constitute the three categories of caste. Due to socially disadvantageous position of SC and ST the study intends to compare the health status of OA belonging to these categories with respect to those belonging to the category 'others'. The religious categories considered in the present study are Christians, Muslims and the rest of the religious groups that serve as a reference. The country is divided into eight geographical regions namely north-eastern, eastern, northern I, northern II, western, peninsular, southern and south-western.

## 2.6. The Model

The data on the count of diseases/disabilities is tested for having a Poisson distribution for each population. The findings are as shown in the following tables.

**Table 3: Empirical Distribution of the Count of Diseases and the Count of Disabilities for Various Populations of Older Adults**

| Count | Count of Diseases | | | | Count of Disabilities | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural Male | Rural Female | Urban Male | Urban Female | Rural Male | Rural Female | Urban Male | Urban Female |
| 0 | 7129 | 6638 | 3416 | 3442 | 8105 | 7252 | 4489 | 4258 |
| 1 | 2061 | 1810 | 1409 | 1438 | 1294 | 1367 | 607 | 866 |
| 2 | 307 | 281 | 280 | 271 | 125 | 135 | 63 | 58 |
| 3 | 39 | 36 | 51 | 38 | 15 | 11 | 2 | 12 |
| 4 | 5 | 2 | 6 | 3 | 4 | 2 | × | × |
| 5 | 1 | × | × | 1 | × | × | × | × |
| mean | 0.30 | 0.28 | 0.42 | 0.41 | 0.17 | 0.19 | 0.14 | 0.20 |
| variance | 0.31 | 0.29 | 0.42 | 0.40 | 0.18 | 0.20 | 0.15 | 0.19 |
| Sample size | 9543 | 8767 | 5161 | 5193 | 9543 | 8767 | 5161 | 5193 |
| p-value | 0.278 | 0.083 | 0.259 | 0.776 | 0.005 | 0.550 | 0.031 | 0.001 |

**The p-values are indicative of the test of the hypothesis that that the count of the diseases and the count of the disabilities follow a Poisson distribution for respective populations**

The results show that generally in a population the count of diseases adhere to a Poisson model. Whereas, the count of disabilities adhere to a model where over dispersion is taken into account. Hence, the study proposes Poisson regression model for diseases and Negative binomial regression model for disabilities. The models are described as follows:

$$\ln(\lambda_d) = \alpha + A_1 + A_2 + ... + A_n \text{ for diseases} \tag{8}$$

$$\ln(\lambda_{disabiklities}) = \alpha + A_1 + A_2 + ... + A_n + \varepsilon, \text{ for disabilities} \tag{9}$$

where, ε is distributes as a gamma variable and $A_1, A_2, ..., A_k$ are the effects of various socio-cultural and economic factors.

## 3. Findings and Analyses

### 3.1. Association between the Count of Diseases and the count of Disabilities

There exists a very low positive association between these two variables. The values of gamma are found to be 0.10, 0.11, 0.05 and 0.14 in RM, RF, UM and UF populations respectively. In UM the value of gamma does not significantly differ from 0 (p-value 0.264). In the rest of the populations the value is small but significant.

### 3.2. Rates for Diseases

The rates are higher for old and old-old age groups when compared to young-old age group. For RM the rates are higher by 1.198 and 1.250 times for old and old-old age groups respectively. The corresponding figures for RF, UM and UF are 1.350 and 1.260, 1.322 and 1.182 and 1.236 and 1.094 (not significantly differing from young olds) respectively.

The marital status of an OA makes a significant difference in their health status. Consider the female populations. When compared to currently married females, the rates are higher for widowed ones by 1.311 and 1.186 times in RF and UF populations respectively. On the other hand the rates do not differ significantly between currently married females and category others that comprising of never married/divorced/separated females.

Education is found to be a significant factor in the model in case of rural populations only. For RM the rates for the groups 'illiterate' and 'below matriculation' are lesser by 0.658 times

15

and 0.868 times when compared to the reference group (above matriculation). But in case of RF, the two groups mentioned above do not differ significantly from the reference group.

Dependence is not found to be a significant factor in the model for UF. However, for RF the females who are completely dependent have rate higher by 1.303 times when compared to the reference group (non-dependent non-supporting). In case of RM the partially dependent and completely dependent males have rates higher by 1.477 and 2.132 times when compared to the reference group. The non-dependent and supporting UM have rates lesser by 0.728 times when compared to the reference group. Further, economic well being of the household and health of OA are associated. Irrespective of the population, the rates are lower in all the higher economic strata when compared to the lowest economic strata.

LA and size of the household are not significant factor in the model except for the UM. The rates for UM who are living alone are 1.142 times more than those who are co-residing.

Possession of land is a significant factor in rural populations only. The effects do not show any monotonic trend. For RM the households having land with ranges (0-0.005 ha), (0.005-0.01 ha), (2-3 ha), (3-4 ha) and (4-6 ha) differ from the reference (more than 8 ha). All these households show lesser rate of diseases when compared to the reference. Similarly the households having land with ranges (1-2 ha), (2-3 ha), (4-6 ha) and (6-8 ha) show lesser rate of diseases when compared to the reference.

The rates for scheduled tribes differ significantly from the other castes (reference) in all the populations. The rates are 0.851, 0.697, 0.619 and 0.703 times lesser in RM, RF, UM and UF respectively for scheduled tribes when compared to the reference.

The rate of diseases for OA belonging to religious groups namely Muslim and Christians differ significantly from the rest in case of rural populations only. When compared to the

reference group, the rates are higher by 1.252 and 1.302 times in case of Christians and Muslims respectively for RM. Similarly, for RF the corresponding rates are 1.732 and 1.438 times higher in Christians and Muslims respectively.

### 3.3. Rates for Disabilities

The rate of disabilities is higher in old and old-old age groups when compared to the young-old age group. For example, in RM the rate are higher by 1.418 and 2.303 times in old and old-old age groups respectively. The corresponding figures for RF, UM and UF are 1.696 and 2.392, 1.573 and 1.939 and 1.528 and 2.010 respectively.

Widowhood/widowerhood is a comparatively disadvantageous state with respect to disabilities as the rates of disabilities are higher in this state when compared to married state. For RM, the two states do not significantly differ with respect to the rate of disabilities. But the rates are higher in case of widows/widowers by 1.242, 1.487 and 1.283 times for RF, UM and UF respectively.

In the model for RM, RF and UF, the effects of the levels 'illiterate' and 'literate but below matriculation' are not found to be significantly different from the effect of the reference category 'matriculation and above'. However, in case of UM the rates are higher by 1.288 times and 1.592 times higher respectively when compared to the reference category.

Prevalence of disabilities and economic dependency are associated. The rates for completely dependent OA are higher by 1.846, 1.351, 1.508 and 1.674 times in RM, RF, UM and UF respectively when compared to the reference group (non-dependent and non-supporting). Rest of the groups ate not found to be significantly differing from the reference group except in case of UF. Here, the rates for partially dependent females are higher by 1.842 times higher than the reference group.

17

The association between the rate of disability and number of children is not significant in RF; but in UF the rates are reduced by 0.962 times with a unit increase in the number of children.

The household economic conditions and rate of disabilities are found to be associated in the RM, RF and UM populations. When compared to the lowest economic strata (reference group) the rates are lower by 0.780 and 0.787 times in second and fourth quintiles respectively for RF. Similarly, for RM the rates are lower by 0.761 times and 0.839 times in first and fourth quintiles respectively. However, in the fourth quintile, the rates are higher by 1.726 times in case of UM.

The analysis shows that the variable 'household type' is significant in the model for rural populations only. For RM, rates are higher by 1.379 times for households with major economic activity 'other labour' when compared to the reference. Whereas, for RF the rate among the households that are self-employed in non-agriculture are higher by 1.070 times when compared to the reference.

Living arrangements have significant effect for RM, UM and UF whereas size of the household has significant effect for RF. Higher rates of disability are observed in living alone when compared to co-residence. The rates are higher by 1.246, 1.435 and 1.388 times in RM, UM and UF respectively. On the other hand, for RF with each unit of increase in size of the household the rate falls by 0.972 times.

Ownership of land by a household and rate of disability are associated but the nature of association differs from one population to another. In the case of RF, when compared to the reference category the rates are found to be lesser in all the other categories. In case of RM the rates are higher by 1.782 times and 1.660 times for categories (2.01 – 3.0 ha) and (3.01 – 4.0 ha) respectively. For UM the rates are higher by 6.025 times and 6.404 times respectively

for categories (0.02 – 0.20 ha) and (1.01 – 2.0 ha). For UF, the rates are lower by 0.350 times and 0.223 times in categories (0.41 – 1.0 ha) and (4.01 – 6.0 ha) respectively.

Socio-cultural factors also have significant effects on the health of OA. Caste is a significant factor for RM. For this population the schedules castes have rates lesser by 0.755 times than the other castes where as the scheduled tribes did not significantly differ from the other castes in this respect. On the other hand the effect of religion is significant for rural populations only. Rates among Christians and Muslims are higher then the others by 1.733 times and 1.293 times respectively for RM. In case of RF, the corresponding rates are higher by 1.571 times and 1.343 times respectively. Regional variations in rates also exist. The rates in all the regions are lower when compared to the reference (south western).

## 4. Discussion

The existence SEC differential in the OA population is indicative of the inherent heterogeneity of this population. Further, these differentials enhance the differentials in the HRQoL of OA.

It is evident from the analysis carried out in the present study that HRQoL of OA is conditioned by the SEC factors. Furthermore, the relevance of these factors varies from one population of OA to other. Therefore, SEC factors cannot be ignored in any planning of policies for the well being of OA. These factors are constituents of the environment that surrounds an OA. Hence, any attempt to enhance the HRQoL needs initiating effective policies to control and regulate these factors. The dependency of OA and economic condition of the households are such factors. Economic dependency of OA is associated with lower health status. Further, household economic conditions play a significant role in determining health status of an OA. In a nut shell, lower the economic strata worse the health of OA. Health care needs to reach the economically disadvantaged households that have OA

19

members. These factors can be controlled by ensuring that dependency of OA is minimised and the households are given adequate assistance and encouragement to care for the OA. Alone kind of living arrangement is conductive to higher rates of diseases when compared to co-residence. This indicates a policy approach towards encouraging co-residence.

There are other factors for example, the age and widowhood that cannot be controlled. The population belonging to these strata needs priority in policy matters. The old-old group is most vulnerable among the OA. Widowhood in females is associated with poor HRQoL. The reasons for this association may lie in the fall in the social status that accompanies widowhood. These groups need priority consideration in health policies. Even regional variations in health status of OA exist pointing to a need for localised approach to HRQoL.

The present study touches upon the physical aspects of health i.e. diseases and disabilities. Other important aspects of health namely, emotional well being and the self-rated health also need to be studied for a comprehensive exposition of the HRQoL of OA. In addition to this the data gives information only on the self-reported diseases. Data on self-reporting may have the lacuna of under reporting as certain diseases like heart disease that need diagnosis for being detected might go undocumented. Information on the time of the onset of a disease is also missing. Barring these limitations of the data the models fit into the data reasonably well.

# References

Adama, Peter., Hurd, Michael D., McFadden, Daniel., Merrill, Angela., & Riberio, Tiago. (2003). Healthy, wealthy, and wise? Tests for direct casual paths between health and socioeconomic status. *Journal of Econometrics*, 112, 57-63.

Alam, Moneer. (2006). *Ageing in India: Socio-Economic and Health Dimensions*. New Delhi: Academic Foundation.

Adda, Jèrôme., Chandola, Tarani., & Marmot, Michael. (2003). Socio-economic status and health: causality and pathways. *Journal of Econometrics*, 112, 3-56.

Agresti, Alan. (1996). *An Introduction to Categorical Data Analysis*. NJ: John Wiley & Sons, INC.

Audinarayana, N. (2005). Self-Reported Chronic Morbidity and Perceived Health Status Among the Elderly in Tamil Nadu: Patterns, Differentials and Determinants. In Samad Abedin (Eds), *The Elderly: Emerging Issues* (pp.145-170). Dhaka, Bangladesh: Bangladesh Association of Gerontology.

Baker, Kristine R., Ofstedal, Mary, Beth., Zimmer, Zachary., Tang, Zhe., & Chuang, Yi-Li. (2005). Reciprocal Effects of Health and Economic Well-Being among Older Adults in Taiwan and Beijing. *Population Council*, Policy Research Division Working Paper ISSN: 1554-8538.

Barbotte, Eric., Guillemin, Francis., Chau, Nearkasen. & the Lorhandicap Group. (2001). Prevalence of Impairments, disabilities, handicaps and Quality of Life in the General Population: A Review of Recent Literature. *Bulletin of the World Health Organization*, 79 (11).

Beydoun, May A., & Poplin, Barry M. (2005). The Impact of Socio-economic Factors on Functional Status Decline among Community-dwelling Older Adults in China. *Social Science and Medicine*, 60, 2045-2057.

Cambois, Emmanuelle., Robine, Jean-Marie., & Hayward, Mark D. (2001). Social Inequalities in Disability Free Life expectancy in the French Male Population, 1980-1991. *Demography*, 38, 513-524.

Chattopadhyay, Aparajita., & Roy, T K. (2005). Does Retirement Affect Healthy Ageing? A Study of Two Groups of Pensioners in Mumbai, India. *Asia-Pacific Population Journal*, 20, 89-113.

Deeg, Dorly J H. (2007). Health and Quality of Life. In Heidrun, Mollenkopf., & Alan, Walker (Eds.), *Quality of Life in Old Age: International and Multi-Disciplinary Perspectives*, (pp. 195-214). The Netherlands: Springer.

Hayward, Mark D., & Gorman, Bridget K. (2004). The long Arm of Childhood: The Influence of Early-Life Social Conditions on Men's Mortality. *Demography*, 41, 87-107.

Marmot, Michael. (2006). Health in an Unequal World. *Lancet*, 368, 2081-2094.

Kaneda, Toshiko., Zimmer, Zachary., & Tang, Zhe. (2004). Differentials in Life Expectancy and Active Life Expectancy by Socioeconomic Status among Older Adults in Beijing. *Population Council*, Policy Research Division Working Paper.

Levkoff, Sue E., Macarthur, Ian W., & Bucknall, Julia. (1995). Elderly Mental Health in the Developing World. Social Science and Medicine, 41, 983-1003.

Manor, Orly., Matthews, Sharon., & Power, Chris. (1997). Comparing Measures of Health Inequality. *Social Science & Medicine*, 45, 761-771.

Mansyur, Carol., Amick, Benjamin C., Harrist, Ronald B., & Franzini, Luisa. (2008). Social Capital, Income Inequality, and Self-rated Health in 45 Countries. Social Science and Medicine, 66, 43-56.

Matthews Ruth J., Smith, Lvey K., Hamock, Ruth M., Jagger, Carol., & . Spiers, Nicola A. (2005). *Socio-Economic Factors Associated with the onset of Disability in Older Age: A Longitudinal Study of People Aged 75 Years and Over,* Social Science and Medicine, Vol. 61, pp. 1567-1575.

Matthews, Ruth J., Jogger, Carol., & Harcock, Ruth M. (2006). Does Socio-Economic Advantage Lead to a Longer, Healthier Old Age?. *Social Science and Medicine*, 62, 2489-2499.

Walker, Alan., & Mollenkopf, Heidrum. (2007). International and Multidisciplinary Perspectives on Quality of Life in Old Age. In Heidrun, Mollenkopf., & Alan, Walker (Eds.), *Quality of Life in Old Age: International and Multi-Disciplinary Perspectives*, (pp. 3-13). The Netherlands: Springer.

Nayar, K R. (2007). Social Exclusion, Caste and Health A Review Based on the Social Determinants Framework. *Indian Journal of Med Res*, 126, 355-363.

Ravito, Nina., Heikkinen, Eino., & Ebrahim, Shah. (2005). Socio-Economic Position and its Relationship to Physical Capacity Among Elderly People Living in Jyvaskyla, Finland: Five and Ten-Year Follow-up Studies. *Social Science and Medicine*, 60, 2405-2416.

Sherlock, Peter Lloyd. (2000). Population Ageing in Developed and Developing Regions: Implications for Health Policy. *Social Science and Medicine* , 51, 887-895.

Smith, James P., & Kington, Raynard., (1997). Demographic and Economic Correlates of Health in Old Age. *Demography*, 34, 159-170.

Zimmer, Zachary., Martin, Linda G., & Li, Hui–Sheng. (2003). Determinants of Old Age Mortality in Taiwan. *Population Council*. Policy Research Division Working Paper.

Zimmer, Zachary., Chayovan, Napaporn., Lin, Hui-Sheng., & Josefina, Natividad. (2003). How Indicators of Socioeconomic Status Relate to Physical Functioning of Older Adults in Three Asian Societies. *Population Council*. Policy Research Division Working Paper No. 172.

Zimmer, Zachary. (2006). Poverty, Wealth Inequality, and Health among Older Adults in Rural Cambodia. Population Council. Policy Research Division Working Paper ISSN: 1554-8538.

**Table 4: Parameter Estimates for Poisson regression of the Count of Diseases in various Populations of Older Adults**

| Variables | Rural Male Effect b (p-value) | s.e. | Exp (b) | Rural Female Effect b (p-value) | s.e. | Exp (b) | Urban Male Effect b (p-value) | s.e. | Exp (b) | Urban Female Effect b (p-value) | s.e. | Exp (b) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intercept | -1.275 (0.000) | 0.2287 | | -1.377 (0.000) | 0.3180 | | -1.006 (0.001) | 0.3164 | | -0.866 (0.004) | 0.2971 | |
| **age groups** | | | | | | | | | | | | |
| old-old | 0.223 (0.001) | 0.0675 | 1.250 | 0.233 (0.003) | 0.0773 | 1.262 | 0.167 (0.027) | 0.0753 | 1.182 | 0.090 (0.240) | 0.0763 | 1.094 |
| old | 0.181 (0.000) | 0.0448 | 1.198 | 0.300 (0.000) | 0.0468 | 1.350 | 0.279 (0.000) | 0.0498 | 1.322 | 0.212 (0.000) | 0.0490 | 1.236 |
| young-old® | | | | | | | | | | | | |
| **marital status** | | | | | | | | | | | | |
| others | -0.637 (0.046) | 0.3190 | 0.529 | 0.217 (0.342) | 0.2283 | 1.242 | 0.104 (0.662) | 0.2382 | 1.110 | 0.219 (0.339) | 0.2291 | 1.245 |
| widowed | -0.101 (0.054) | 0.0524 | 0.904 | 0.271 (0.000) | 0.0486 | 1.311 | -0.256 (0.000) | 0.0697 | 0.774 | 0.171 (0.001) | 0.0512 | 1.186 |
| currently married® | | | | | | | | | | | | |
| **level of education** | | | | | | | | | | | | |
| illiterate | -0.418 (0.000) | 0.0811 | 0.658 | -0.309 (0.161) | 0.2204 | 0.734 | -0.055 (0.489) | 0.0800 | 0.946 | -0.086 (0.320) | 0.0862 | 0.918 |
| below matriculation | -0.145 (0.064 ) | 0.0783 | 0.865 | 0.184 (0.406) | 0.2218 | 1.202 | 0.029 (0.610) | 0.0571 | 1.029 | -0.005 (0.951) | 0.0808 | 0.995 |
| Matriculation and above® | | | | | | | | | | | | |
| **dependence** | | | | | | | | | | | | |
| completely dependent | 0.757 (0.000) | 0.1290 | 2.132 | 0.265 (0.022) | 0.1158 | 1.303 | -0.014 (0.886) | 0.0989 | 0.986 | 0.048 (0.631) | 0.0990 | 1.049 |
| partially dependent | 0.390 (0.004) | 0.1338 | 1.477 | 0.141 (0.266) | 0.1266 | 1.151 | -0.089 (0.339) | 0.1060 | 0.915 | 0.093 (0.427) | 0.1174 | 1.097 |
| not dependent: supporting | 0.136 (0.287) | 0.1279 | 1.146 | -0.107 (0.445) | 0.1404 | 0.899 | -0.317 (0.001) | 0.0950 | 0.728 | 0.066 (0.577) | 0.1180 | 1.068 |
| not dependent: not supporting® | | | | | | | | | | | | |
| no. of children | 0.028 | 0.0091 | 1.028 | 0.019 | 0.0065 | 1.019 | 0.048 | 0.124 | 1.049 | 0.033 | 0.0049 | 1.034 |

|  | (0.002) |  |  | (0.004) |  |  | (0.000) |  |  | (0.000) |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **household economic condition** |  |  |  |  |  |  |  |  |  |  |  |  |
| first | **-0.345** | **0.0720** | **0.708** | **-0.494** | **0.0746** | **0.610** | **-0.652** | **0.0885** | **0.521** | **-0.532** | **0.0860** | **0.587** |
|  | **(0.000)** |  |  | **(0.000)** |  |  | **(0.000)** |  |  | **(0.000)** |  |  |
| second | **-0.229** | **0.0659** | **0.795** | **-0.343** | **0.0691** | **0.710** | **-0.830** | **0.0822** | **0.436** | **-0.442** | **0.0758** | **0.656** |
|  | **(0.001)** |  |  | **(0.000)** |  |  | **(0.000)** |  |  | **(0.000)** |  |  |
| third | **-0.164** | **0.0600** | **0.849** | **-0.273** | **0.0624** | **0.761** | **-0.573** | **0.0724** | **0.564** | **-0.336** | **0.0701** | **0.715** |
|  | **(0.006)** |  |  | **(0.000)** |  |  | **(0.000)** |  |  | **(0.000)** |  |  |
| fourth | **-0.082** | **0.0591** | **0.921** | **-0.265** | **0.0635** | **0.767** | **-0.291** | **0.0684** | **0.748** | **-0.125** | **0.0719** | **0.882** |
|  | **(0.165)** |  |  | **(0.000)** |  |  | **(0.000)** |  |  | **(0.081)** |  |  |
| fifth |  |  |  |  |  |  |  |  |  |  |  |  |
| **household type** |  |  |  |  |  |  |  |  |  |  |  |  |
| type I | **0.101** | **0.0753** | **1.106** | **0.059** | **0.0734** | **1.061** | **-0.082** | **0.0736** | **0.921** | **0.016** | **0.0767** | **1.016** |
|  | **(0.180)** |  |  | **(0.423)** |  |  | **(0.264)** |  |  | **(0.837)** |  |  |
| type II | **0.008** | **0.0759** | **1.008** | **-0.040** | **0.0755** | **0.961** | **0.083** | **0.0752** | **1.087** | **-0.034** | **0.0788** | **0.967** |
|  | **(0.912)** |  |  | **(0.595)** |  |  | **(0.267)** |  |  | **(0.662)** |  |  |
| type III | **0.254** | **0.0868** | **1.289** | **0.145** | **0.0854** | **1.156** | **-0.321** | **0.1170** | **0.725** | **-0.029** | **0.1070** | **0.971** |
|  | **(0.003)** |  |  | **(0.090)** |  |  | **(0.006)** |  |  | **(0.787)** |  |  |
| type IV | **0.055** | **0.0720** | **1.057** | **0.019** | **0.0734** | **1.019** |  |  |  |  |  |  |
|  | **(0.444)** |  |  | **(0.792)** |  |  |  |  |  |  |  |  |
| type V |  |  |  |  |  |  |  |  |  |  |  |  |
| **living arrangements** |  |  |  |  |  |  |  |  |  |  |  |  |
| alone | **0.003** | **0.0665** | **1.003** | **-0.004** | **0.0776** | **0.996** | **0.133** | **0.0789** | **1.142** | **-0.090** | **0.0935** | **0.914** |
|  | **(0.965)** |  |  | **(0.964)** |  |  | **(0.093)** |  |  | **(0.336)** |  |  |
| co-residence |  |  |  |  |  |  |  |  |  |  |  |  |
| size of the household | **-0.003** | **0.0081** | **0.997** | **0.008** | **0.0091** | **1.008** | **0.037** | **0.0094** | **1.038** | **0.005** | **0.0093** | **1.005** |
|  | **(0.688)** |  |  | **(0.390)** |  |  | **(0.000)** |  |  | **(0.570)** |  |  |
| **land owned (hectares)** |  |  |  |  |  |  |  |  |  |  |  |  |
| less than 0.005 | **-0.520** | **0.1805** | **0.595** | **-0.196** | **0.1940** | **0.822** | **0.316** | **0.2817** | **1.372** | **-0.034** | **0.2651** | **0.967** |
|  | **(0.004)** |  |  | **(0.312)** |  |  | **(0.272)** |  |  | **(0.899)** |  |  |
| 0.005 – 0.01 | **-0.361** | **0.1756** | **0.697** | **-0.310** | **0.1935** | **0.733** | **0.357** | **0.2862** | **1.429** | **-0.038** | **0.2649** | **0.963** |
|  | **(0.040)** |  |  | **(0.109)** |  |  | **(0.212)** |  |  | **(0.886)** |  |  |
| 0.02 – 0.20 | **-0.204** | **0.1728** | **0.815** | **-0.225** | **0.1908** | **0.799** | **0.265** | **0.2878** | **1.303** | **0.067** | **0.2661** | **1.069** |
|  | **(0.238)** |  |  | **(0.238)** |  |  | **(0.358)** |  |  | **(0.800)** |  |  |
| 0.21 – 0.40 | **-0.178** | **0.1711** | **0.837** | **-0.226** | **0.1890** | **0.798** | **0.364** | **0.3052** | **1.439** | **0.031** | **0.2827** | **1.031** |
|  | **(0.299)** |  |  | **(0.232)** |  |  | **(0.233)** |  |  | **(0.914)** |  |  |

25

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.41 – 1.0 | -0.257 | 0.1640 | 0.773 | -0.282 | 0.1819 | 0.754 | 0.074 | 0.3146 | 1.077 | -0.224 | 0.3023 | 0.799 |
| | (0.118) | | | (0.121) | | | (0.813) | | | (0.459) | | |
| 1.01 – 2.0 | -0.163 | 0.1626 | 0.850 | -0.396 | 0.1828 | 0.673 | 0.135 | 0.3199 | 1.145 | -0.083 | 0.3013 | 0.920 |
| | (0.316) | | | (0.030) | | | (0.674) | | | (0.783) | | |
| 2.01– 3.0 | -0.551 | 0.1767 | 0.576 | -0.581 | 0.1999 | 0.559 | -0.525 | 0.4364 | 0.592 | -0.217 | 0.3513 | 0.805 |
| | (0.002) | | | (0.004) | | | (0.229) | | | (0.537) | | |
| 3.01– 4.0 | -0.326 | 0.1838 | 0.722 | -0.320 | 0.2084 | 0.726 | 0.213 | 0.4956 | 1.237 | 0.035 | 0.3560 | 1.036 |
| | (0.076) | | | (0.125) | | | (0.668) | | | (0.922) | | |
| 4.01– 6.0 | -0.860 | 0.2182 | 0.423 | -0.613 | 0.2294 | 0.542 | 0.382 | 0.3898 | 1.465 | -0.078 | 0.3819 | 0.925 |
| | (0.000) | | | (0.007) | | | (0.327) | | | (0.841) | | |
| 6.01– 8.0 | -0.218 | 0.2234 | 0.804 | -0.664 | 0.2957 | 0.515 | 0.491 | 0.4719 | 1.634 | -0.146 | 0.5642 | 0.864 |
| | (0.328) | | | (0.025) | | | (0.298) | | | (0.795) | | |
| more than 8.0 | | | | | | | | | | | | |
| **caste** | | | | | | | | | | | | |
| scheduled tribe | -0.161 | 0.0923 | 0.851 | -0.361 | 0.1106 | 0.697 | -0.479 | 0.2463 | 0.619 | -0.353 | 0.1529 | 0.703 |
| | (0.082) | | | (0.001) | | | (0.052) | | | (0.021) | | |
| scheduled caste | -0.049 | 0.0568 | 0.952 | 0.054 | 0.0591 | 1.055 | 0.009 | 0.0794 | 1.009 | 0.000 | 0.0775 | 1.000 |
| | (0.386) | | | (0.363) | | | (0.913) | | | (0.999) | | |
| other castes | | | | | | | | | | | | |
| **religious group** | | | | | | | | | | | | |
| christian | 0.225 | 0.1164 | 1.252 | 0.549 | 0.1005 | 1.732 | -0.165 | 0.1280 | 0.848 | 0.091 | 0.1080 | 1.095 |
| | (0.053) | | | (0.000) | | | (0.197) | | | (0.397) | | |
| muslim | 0.264 | 0.0659 | 1.302 | 0.363 | 0.0655 | 1.438 | 0.044 | 0.0739 | 1.045 | 0.032 | 0.0707 | 1.033 |
| | (0.000) | | | (0.000) | | | (0.553) | | | (0.655) | | |
| others | | | | | | | | | | | | |
| **regions** | | | | | | | | | | | | |
| north eastern | 0.324 | 0.1194 | 1.383 | 0.526 | 0.1409 | 1.692 | 0.241 | 0.2128 | 1.273 | -0.320 | 0.1256 | 0.726 |
| | (0.007) | | | (0.000) | | | (0.258) | | | (0.011) | | |
| eastern | 0.198 | 0.0683 | 1.219 | 0.471 | 0.0754 | 1.602 | 0.173 | 0.0701 | 1.189 | -0.003 | 0.0799 | 0.997 |
| | (0.004) | | | (0.000) | | | (0.014) | | | (0.969) | | |
| northern I | -0.023 | 0.1515 | 0.977 | -0.133 | 0.1823 | 0.875 | -0.151 | 0.2108 | 0.860 | -0.636 | 0.1658 | 0.529 |
| | (0.880) | | | (0.467) | | | (0.473) | | | (0.000) | | |
| northern II | 0.188 | 0.0716 | 1.207 | 0.300 | 0.0772 | 1.350 | -0.238 | 0.0750 | 0.788 | -0.169 | 0.0757 | 0.845 |
| | (0.009) | | | (0.000) | | | (0.002) | | | (0.026) | | |
| western | 0.015 | 0.0849 | 1.015 | -0.216 | 0.0994 | 0.806 | -0.202 | 0.0856 | 0.817 | -0.194 | 0.0891 | 0.824 |
| | (0.861) | | | (0.030) | | | (0.018) | | | (0.030) | | |
| peninsular | 0.170 | 0.0765 | 1.185 | 0.254 | 0.0824 | 1.289 | -0.009 | 0.0777 | 0.991 | 0.078 | 0.0755 | 1.081 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (0.026) | | | (0.002) | | | (0.912) | | | (0.300) | |
| southern | 0.155 | 0.0797 | 1.168 | 0.147 | 0.0857 | 1.158 | 0.009 | 0.0740 | 1.009 | -0.020 | 0.0750 | 0.980 |
| | (0.051) | | | (0.087) | | | (0.903) | | | (0.788) | |
| south western | | | | | | | | | | | |

Note: 1 the p-value indicative of the test of the hypothesis that the effect is zero against the alternative that the effect is not zero

**Table 5: Parameter Estimates for Poisson regression of the Count of Disabilities in various Populations of Older Adults**

| Variables | Rural Male Effect b (p-value) | s.e. | Exp (b) | Rural Female Effect b (p-value) | s.e. | Exp (b) | Urban Male Effect b (p-value) | s.e. | Exp (b) | Urban Female Effect b (p-value) | s.e. | Exp (b) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intercept | -1.601 (0.000) | 0.3525 | | -1.616 (0.001) | 0.5020 | | -4.415 (0.000) | 1.0701 | | -2.097 (0.000) | 0.5672 | |
| **age groups** | | | | | | | | | | | | |
| old-old | 0.834 (0.000) | 0.0900 | 2.303 | 0.872 (0.000) | 0.0950 | 2.392 | 0.662 (0.000) | 0.1257 | 1.939 | 0.698 (0.000) | 0.1120 | 2.010 |
| old | 0.349 (0.000) | 0.0666 | 1.418 | 0.0528 (0.000) | 0.0643 | 1.696 | 0.453 (0.000) | 0.0947 | 1.573 | 0.424 (0.000) | 0.0816 | 1.528 |
| young-old® | | | | | | | | | | | | |
| **marital status** | | | | | | | | | | | | |
| others | -0.904 (0.038) | 0.4369 | 0.405 | 0.365 (0.210) | 0.2916 | 1.441 | 0.432 (0.306) | 0.4217 | 1.540 | 0.046 (0.915) | 0.4279 | 1.047 |
| widowed | 0.039 (0.598) | 0.0733 | 1.040 | 0.217 (0.001) | 0.0663 | 1.242 | 0.397 (0.000) | 0.1054 | 1.487 | 0.249 (0.004) | 0.0854 | 1.283 |
| currently married® | | | | | | | | | | | | |
| **level of education** | | | | | | | | | | | | |
| illiterate | -0.009 (0.952) | 0.1399 | 0.991 | 0.432 (0.290) | 0.4085 | 1.540 | 0.253 (0.083) | 0.1461 | 1.288 | 0.119 (0.454) | 0.1582 | 1.126 |
| below matriculation | 0.102 (0.460) | 0.1382 | 1.107 | 0.219 (0.599) | 0.4160 | 1.245 | 0.465 (0.000) | 0.1141 | 1.592 | 0.114 (0.441) | 0.1476 | 1.121 |
| Matriculation and above® | | | | | | | | | | | | |
| **dependence** | | | | | | | | | | | | |
| completely dependent | 0.613 (0.000) | 0.1551 | 1.846 | 0.301 (0.046) | 0.1512 | 1.351 | 0.411 (0.049) | 0.2088 | 1.508 | 0.515 (0.002) | 0.1698 | 1.674 |
| partially dependent | 0.200 (0.224) | 0.1645 | 1.221 | 0.111 (0.508) | 0.1682 | 1.117 | 0.338 (0.127) | 0.2216 | 1.402 | 0.611 (0.002) | 0.1951 | 1.842 |
| not dependent: supporting | -0.227 (0.142) | 0.1547 | 0.797 | 0.001 (0.997) | 0.1800 | 1.001 | 0.078 (0.708) | 0.2073 | 1.081 | 0.162 (0.429) | 0.2051 | 1.176 |
| not dependent: not supporting® | | | | | | | | | | | | |
| no. of children | -0.039 | 0.0150 | 0.962 | 0.015 | 0.0099 | 1.015 | 0.004 | 0.0230 | 1.004 | -0.039 | 0.0189 | 0.962 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (0.009) | | | (0.128) | | | (0.866) | | | (0.037) | |
| **household economic condition** | | | | | | | | | | | |
| first | -0.273 | 0.1050 | 0.761 | -0.077 | 0.0951 | 0.926 | 0.082 | 0.1695 | 1.085 | -0.167 | 0.1368 | 0.846 |
| | (0.009) | | | (0.420) | | | (0.629) | | | (0.223) | |
| second | -0.004 | 0.0955 | 0.996 | -0.249 | 0.0954 | 0.780 | 0.139 | 0.1584 | 1.149 | -0.001 | 0.1269 | 0.999 |
| | (0.965) | | | (0.009) | | | (0.379) | | | (0.992) | |
| third | -0.057 | 0.0897 | 0.945 | -0.093 | 0.0871 | 0.911 | 0.042 | 0.1536 | 1.043 | -0.056 | 0.1207 | 0.946 |
| | (0.526) | | | (0.287) | | | (0.785) | | | (0.643) | |
| fourth | -0.175 | 0.0941 | 0.839 | -0.239 | 0.0922 | 0.787 | 0.546 | 0.1461 | 1.726 | -0.072 | 0.1326 | 0.931 |
| | (0.063) | | | | | | (0.000) | | | (0.589) | |
| fifth | | | | | | | | | | | |
| **household type** | | | | | | | | | | | |
| type I | 0.001 | 0.1136 | 1.001 | 0.216 | 0.1070 | 1.241 | -0.101 | 0.1374 | 0.904 | 0.201 | 0.1296 | 1.223 |
| | (0.996) | | | (0.043) | | | (0.463) | | | (0.122) | |
| type II | -0.062 | 0.1057 | 0.940 | -0.008 | 0.1033 | 0.992 | -0.140 | 0.1448 | 0.869 | 0.051 | 0.1352 | 1.052 |
| | (0.560) | | | (0.935) | | | (0.333) | | | (0.705) | |
| type III | 0.321 | 0.1288 | 1.379 | 0.158 | 0.1269 | 1.171 | 0.208 | 0.1841 | 1.231 | 0.151 | 0.1659 | 1.163 |
| | (0.013) | | | (0.212) | | | (0.259) | | | (0.363) | |
| type IV | -0.122 | 0.1039 | 0.885 | 0.000 | 0.1034 | 1.000 | | | | | | |
| | (0.241) | | | (0.998) | | | | | | | |
| type V | | | | | | | | | | | |
| **living arrangements** | | | | | | | | | | | |
| alone | 0.220 | 0.0951 | 1.246 | 0.070 | 0.1044 | 1.073 | 0.361 | 0.1463 | 1.435 | 0.328 | 0.1447 | 1.388 |
| | (0.021) | | | (0.502) | | | (0.013) | | | (0.023) | |
| co-residence | | | | | | | | | | | |
| size of the household | -0.017 | 0.0122 | 0.983 | -0.028 | 0.0125 | 0.972 | 0.010 | 0.0169 | 1.010 | -0.020 | 0.0166 | 0.980 |
| | (0.171) | | | (0.026) | | | (0.538) | | | (0.225) | |
| **land owned (hectares)** | | | | | | | | | | | |
| less than 0.005 | 0.055 | 0.2943 | 1.057 | -0.748 | 0.2484 | 0.473 | 1.432 | 1.0331 | 4.187 | 0.072 | 0.5050 | 1.075 |
| | (0.853) | | | (0.003) | | | (0.166) | | | (0.886) | |
| 0.005 – 0.01 | 0.038 | 0.2922 | 1.039 | -0.682 | 0.2470 | 0.506 | 1.692 | 1.0321 | 5.430 | -0.126 | 0.5046 | 0.882 |
| | (0.897) | | | (0.006) | | | (0.101) | | | (0.803) | |
| 0.02 – 0.20 | -0.078 | 0.2933 | 0.925 | -0.691 | 0.2458 | 0.501 | 1.796 | 1.0333 | 6.025 | -0.127 | 0.5072 | 0.881 |
| | (0.791) | | | (0.005) | | | (0.082) | | | (0.803) | |
| 0.21 – 0.40 | 0.133 | 0.2819 | 1.142 | -0.606 | 0.2417 | 0.546 | 1.435 | 1.0585 | 4.200 | -0.104 | 0.5384 | 0.901 |
| | (0.647) | | | (0.012) | | | (0.175) | | | (0.847) | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.41 – 1.0 | 0.267 (0.336) | 0.2779 | 1.306 | -0.494 (0.032) | 0.2299 | 0.610 | 1.414 (0.182) | 1.0599 | 4.112 | -1.051 (0.074) | 0.5883 | 0.350 |
| 1.01 – 2.0 | -0.008 (0.978) | 0.2786 | 0.992 | -0.465 (0.041) | 0.2277 | 0.628 | 1.857 (0.077) | 1.0517 | 6.404 | -0.744 (0.209) | 0.5925 | 0.475 |
| 2.01– 3.0 | 0.578 (0.041) | 0.2823 | 1.782 | -0.346 (0.147) | 0.2386 | 0.708 | 1.645 (0.130) | 1.0862 | 5.181 | -1.018 (0.192) | 0.7796 | 0.361 |
| 3.01– 4.0 | 0.507 (0.082) | 0.2918 | 1.660 | -0.499 (0.054) | 0.2595 | 0.607 | 1.563 (0.221) | 1.2768 | 4.773 | 0.265 (0.674) | 0.6290 | 1.303 |
| 4.01– 6.0 | 0.058 (0.858) | 0.3214 | 1.160 | -0.652 (0.019) | 0.2785 | 0.521 | -0.013 (0.993) | 1.4555 | 0.987 | -1.500 (0.089) | 0.8822 | 0.223 |
| 6.01– 8.0 | -0.620 (0.159) | 0.4404 | 0.538 | -2.614 (0.000) | 0.7483 | 0.073 | 0.659 (0.653) | 1.4658 | 1.933 | 0.235 (0.783) | 0.8538 | 1.265 |
| more than 8.0 | | | | | | | | | | | | |
| **caste** | | | | | | | | | | | | |
| **scheduled tribe** | -0.281 (0.025) | 0.1252 | 0.755 | 0.069 (0.531) | 0.1100 | 1.071 | -0.075 (0.825) | 0.3383 | 0.928 | -0.326 (0.282) | 0.3029 | 0.722 |
| **scheduled caste** | 0.111 (0.163) | 0.0799 | 1.117 | 0.076 (0.341) | 0.0802 | 1.079 | -0.032 (0.814) | 0.1363 | 0.969 | 0.009 (0.940) | 0.1183 | 1.009 |
| **other castes** | | | | | | | | | | | | |
| **religious group** | | | | | | | | | | | | |
| **christian** | 0.550 (0.003) | 0.1843 | 1.733 | 0.452 (0.010) | 0.1751 | 1.571 | 0.270 (0.260) | 0.2398 | 1.310 | -0.054 (0.787) | 0.2019 | 0.947 |
| **muslim** | 0.257 (0.015) | 0.1057 | 1.293 | 0.295 (0.003) | 0.1009 | 1.343 | 0.113 (0.391) | 0.1319 | 1.120 | 0.031 (0.784) | 0.1115 | 1.031 |
| **others** | | | | | | | | | | | | |
| **regions** | | | | | | | | | | | | |
| **north eastern** | -0.786 (0.000) | 0.2189 | 0.456 | -0.222 (0.279) | 0.2055 | 0.801 | -0.884 (0.048) | 0.4471 | 0.413 | -0.412 (0.449) | 0.5444 | 0.662 |
| **eastern** | -0.560 (0.000) | 0.0914 | 0.571 | -0.453 (0.000) | 0.0911 | 0.636 | -0.580 (0.000) | 0.1325 | 0.560 | -0.096 (0.429) | 0.1208 | 0.908 |
| **northern I** | -0.357 (0.066) | 0.1941 | 0.700 | -0.758 (0.001) | 0.2378 | 0.469 | -1.114 (0.035) | 0.5287 | 0.328 | -0.951 (0.030) | 0.4391 | 0.386 |
| **northern II** | -0.485 (0.000) | 0.0955 | 0.616 | -0.416 (0.000) | 0.0900 | 0.660 | -0.718 (0.000) | 0.1332 | 0.488 | -0.066 (0.548) | 0.1091 | 0.936 |
| **western** | -0.851 (0.000) | 0.1225 | 0.427 | -0.947 (0.000) | 0.1186 | 0.388 | -0.594 (0.000) | 0.1556 | 0.552 | -0.467 (0.001) | 0.1366 | 0.627 |
| **peninsular** | -0.319 | 0.0967 | 0.727 | -0.499 | 0.0985 | 0.607 | -0.201 | 0.1305 | 0.818 | -0.344 | 0.1254 | 0.709 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | (0.001) |  |  | (0.000) |  |  | (0.124) |  |  | (0.006) |  |  |
| southern | -0.958 | 0.1210 | 0.384 | -0.700 | 0.1126 | 0.497 | -1.240 | 0.1592 | 0.289 | -0.575 | 0.1233 | 0.563 |
|  | (0.000) |  |  | (0.000) |  |  | (0.000) |  |  | (0.000) |  |  |
| south western |  |  |  |  |  |  |  |  |  |  |  |  |

**Note: 2 the p-value indicative of the test of the hypothesis that the effect is zero against the alternative that the effect is not zero**