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Inequalities in Health Outcomes: Evidence from NSS Data

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INEQUALITIES IN HEALTH OUTCOMES: EVIDENCE FROM NSS DATA

Anushree K N[*] and S Madheswaran[**]

Abstract

The purpose of this study is to assess the socioeconomic inequalities in health outcomes by gender and place of residence and to explain the contribution of different factors to the overall inequality. The study used data of NSSO 60th (2004) and 71st (2014) rounds. The health outcome of interest was self-reported morbidity captured in the survey with fifteen days' recall period. Socioeconomic status was measured by per capita monthly expenditure and the concentration index is used as a measure of socioeconomic health inequalities and is decomposed into its contributing factors. Our findings show that high level inequalities in self-reported morbidity were largely concentrated among wealthier groups in India. Though the inequalities in self-reported morbidity were more among the wealthier groups for Karnataka, yet the magnitude of inequalities in reported morbidity was low for both the years. Decomposition analysis shows that inequalities in reported morbidity are particularly associated with demographic, economic and geographical factors.

Keywords: Self-reported morbidities, socio economic factors, health inequalities, concentration index, decomposition analysis.

Introduction

Health is a multidimensional entity whose enhancement and sustenance among population is considered as an important objective of any health system (WHO, 2000). In this context, several studies have examined the relationship between age, gender, socioeconomic status and its association to health. However, in the last few decades, the issue of socioeconomic inequalities and their subsequent relationship to differences in several health outcomes among various sub groups of the population has gained importance in the policy documents at sub national, national and international levels (Acheson, 2011; GOK, 2001; Murray & Frenk, 2000). In this context, the existence of a clear socioeconomic status [SES] gradient in health is well documented in the industrialised world (Dalstra *et al.,* 2005; Heidi Ullmann, Buttenheim, Goldman, Pebley, & Wong, 2011; Kunst *et al.,* 2005; Kunst, Geurts, & Van Den Berg, 1995; Vasquez, Paraje, & Estay, 2013). Such gradients shows consistency across different health outcomes. For instance, improvements in reported health has been observed for every successive increase in socioeconomic hierarchy (Vasquez *et al.,* 2013). In addition, there are some evidences that the magnitude of SES inequalities in health outcomes differ between gender and subgroups of population within males and females and by geographical areas i.e. rural and urban areas (Patra & Bhise, 2016; Bora & Saikia, 2015; Matthews, Manor, & Power, 1999; MacIntyre & Hunt, 1997). Further, even in low and middle income countries, such socioeconomic gradient in health outcomes is observed (Rahman, Mohammad Hifzur, 2011; S Vellakkal *et al.,* 2015; Sukumar Vellakkal *et al.,* 2013; Xu & Xie, 2017). For instance, a study in Thailand found that inequality gradients were disadvantageous to the

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poor for both self-reported morbidity and self-assessed health (Yiengprugsawan, Lim, Carmichael, Sidorenko, & Sleigh, 2007). Other studies in India also confirmed that inequality gradients were disproportionately biased towards the poor for self-assessed health (Brinda, Attermann, Gerdtham, & Enemark, 2016; Goli, Singh, Jain, & Pou, 2014); while, the inequality gradients were more concentrated among the rich for self-reported morbidity (Jain, Goli, & Arokiasamy, 2012; Prinja, Jeyashree, Rana, Sharma, & Kumar, 2015). Thus, the observed gradients are not consistent between and within the countries and also vary with change in health outcomes. Moreover, only a few evidences are found in terms of accounting for gender or spatial differences while analysing the magnitude of SES inequalities in self-reported morbidity (Hosseinpoor *et al.,* 2012). Therefore, given the varying levels of availability of health infrastructure and varying levels of people's awareness about their own health, an inaccurate picture regarding the concentration of certain health outcomes may lead to major public health challenges in terms of effective targeting of the health programmes in LIMCS especially, in a country like India which is experiencing different levels of demographic transition reflected by an aging population and epidemiological transition indicated by changes in the leading causes of death and burden of disease. Within this context, the paper tries to understand the SES health inequalities in self-reported morbidity after accounting for gender i.e. male and female and spatial differences i.e. rural and urban areas.

Since health is a state subject in India and many policy interventions identified and implemented are state specific in nature, the exploration of the above-mentioned issues are analysed in this paper for Karnataka, one of the South Indian states, vis-à-vis India. The main reason for choosing a South Indian state is that despite the remarkable achievements of all South Indian states in reducing MMR and IMR targets as set by the Government of India to achieve MDGs, morbidity levels across the South Indian states have increased and are high in different age groups compared to all-India levels (Paul & Singh, 2017). One of the main arguments put forth in the literature for high levels of morbidity with lower levels of mortality in Kerala, one of the South Indian states, is that the poor health status is associated with low levels of income and low levels of nutritional intake (Suryanarayana, 2008).Thus, the current paper addresses three questions: First, does the magnitude of reported morbidity as defined by SES differ after taking into account gender and spatial differences? Second, if so, what are the major factors associated in explaining those differences? Third, do the SES inequalities in self-reported morbidity after taking into account gender and spatial differences vary over time? The rest of the paper is organised as follows: Section two provides information on data and methodology; Section three presents the empirical results of the study findings, followed by the discussion in Section four and conclusion in Section five.

Data and Methods

In order to assess health inequality over time, we made use of unit level nationally representative cross-sectional household survey data titled "Morbidity Health Care and Condition of the Aged" and "Social Consumption: Health", which was collected by the National Sample Survey Organisation, India for 2004 and 2014.

Sampling

The sampling design was stratified into two stages, with urban blocks and census villages as the First Stage Units [FSUs] for urban and rural areas respectively, and households as the Second Stage Units [SSUs]. These surveys were conducted during the period of January to June during 2004 and 2014 respectively in line with 35th, 42nd and 52nd rounds of NSS. The main purpose of these surveys is to collect information on morbidity and death profile of the population, individual and socioeconomic background, extent of utilisation of outpatient, inpatient and preventive health care services, related expenditure incurred for the treatment and lastly, the conditions and problems of the aged persons. The present study makes use of the self-morbidity information with a 15-day reference period captured by the survey to assess the magnitude of inequality in health across income groups. The conceptualisation of illness in the 60th round (NSS, 2004) with the 15-day reference period includes (i) Cases of visual, hearing, speech, loco motor and mental disabilities (ii) Injuries such as cuts, wounds, haemorrhage, fractures and burns caused due to accident, including bites to any part of the body (iii) Cases of spontaneous abortion – natural or accidental. Whereas the NSS 71st round of definition of illness with 15-day reference period includes (i) All types of injuries, such as cuts, wounds, haemorrhage, fractures and burns caused by accident, including bites to any part of the body (ii) Cases of abortion – natural or accidental. Further, in the 71st round (NSS, 2014) all pre-existing disabilities which were considered as chronic ailments provided they were under treatment for a month or more during the reference period. Disabilities acquired during the reference period i.e. whose onset was within the reference period were recorded as ailment. NSSO, 2004 and NSSO, 2014 reports provide an elaborate sampling strategy and definitions adopted for collecting information of various indicators. Table 1 shows the total number of households sampled during 2004 and 2014, which were 73,868 and 65,932 respectively, thus constituting 383,338 indivduals in 2004 and 333,104 in 2014 respectively. In the present analysis, individuals aged less than 14 years were excluded because the reporting of the health of children was mostly by proxy by some member of the household. Thus, the study analysis comprised 257,503 and 234,546 individuals aged 15 years and above in 2004 and 2014 respectively.

Table 1: Sample Size

India						
Year	2004			2014		
	Rural	Urban	Total	Rural	Urban	Total
Household	47,302	26,566	73,868	36,480	29,452	65,932
Individuals	2,50,775	1,32,563	3,83,338	1,89,573	1,43,531	3,33,104
Individuals >15	1,63,425	94,094	2,57,519	1,30,311	1,04,237	2,34,548

Source: Unit records from NSS, Using 71st (2014) and 60th (2004) Round Data.

Variables

In quantifying health inequality, we utilize two groups of variables: Health outcome variables, and control variables.

Health outcome Variable [Dependent Variable]

The health outcome variable is measured in the following perspective: The probability of an individual reporting some illness in the last 15 days is analysed, which is based on the question "Were you were suffering from any aliment during the last 15 days?" The information is captured as binary Yes = 1 if an individual reported an aliment; otherwise = 0. In the present analysis, the reported morbidity is examined for male and female, rural and urban separately. Table 2 reports that around 10 % in rural and 11% in urban areas were reported to have some ailment in the last 15 days' reference period in 2004 which increased to 13 % in urban areas and remained constant in rural areas in 2014.

Explanatory Variables

Various studies suggest in the literature that four broad factors affect the health of an individual, which includes demographic factors, social factors, economic factors and environmental factors. Based on the availability of information, the following set of variables are included in the study.

Demographic factors: Among the demographic factors, age, sex and marital status are the three most important factors that influence health. Age was captured as a continuous variable in the survey. However, in the present analysis, we created 5 age dummies [15-29, 30-44, 45-59, 60-69 and 70 plus] with 15-29 years as a base category.

Information on marital status is originally captured in four categories. However, in the current analysis, by merging divorced category into never married, 3 marital status dummies [never married, currently married, widow] were created. Separate dummies were created with currently married as a base category.

Economic Factors: Among economic factors, level of education, income levels, and occupation status are said to influence an individual's health condition. However, due to the non-availability of information on occupation status in both the time periods, the variable is not included in the study.

NSS data does not capture information on household income. However, the survey captures information on the usual monthly consumption expenditure of each household. This variable has been divided by household size in order to obtain monthly per capita consumption expenditure. Later, the MPCE is ranked (in ascending order after taking into account the state and rural-urban variations) and divided into five equal parts, with the first quintile representing the poorest group and the fifth (last) quintile representing the richest group in the order of consumption. Separate dummies were created with the richest (fifth quintile) as a base category.

Information on the general educational level of individuals was collected in 13 categories in the 60^{th} round and 15 categories in the 71^{st} round. However, for the analyses, the 13 and 15 categories were further classified into three broad categories: Illiterate, Primary, and Secondary and Above with Secondary and Above level of education as a base category.

Social Factors: Among other social factors, caste and religion are two factors which indirectly and directly are said to influence health. The information on the caste of the individuals was collected in 4 categories in both the surveys: Scheduled Tribe, Scheduled Caste, OBC and Forward Caste. Separate dummies were created with Forward Caste as a base category**.** On the other hand, the information on religion of the household was collected in 8 categories in both the surveys. However, for the analyses, 8 categories were further classified into four broad categories: Hindus, Muslims, Christians, and Other Religions with Hindus as a base category.

Household Factors: The availability of certain amenities at household level such as proper sanitation facilities, clean drinking water, proper drainage system and cooking facilities are said to influence an individual's health at various levels. Hence, two main indicators, proper sanitation and proper drainage system, are considered in the present analysis. The information on sanitation facilities and drainage facilities was collected in 5 categories in both the surveys. However, for the present study, the information is further construed as a binary variable (Yes/No). The statistics of these variables are summarized in Table 2.

Table 2: Description of Variables in the Year of 2004 and 2014 (means)

Variables	India			
	2004		2014	
	Rural	Urban	Rural	Urban
Self-Reported Morbidity Prevalence	0.1	0.11	0.1	0.13
Age				
15-29	0.4	0.41	0.39	0.37
30-44	0.3	0.31	0.3	0.32
45-59	0.19	0.18	0.21	0.2
60-69	0.07	0.06	0.07	0.07
70+	0.04	0.03	0.04	0.04
Sex				
Male	0.5	0.52	0.5	0.52
Female	0.5	0.48	0.5	0.48
Marital Status				
Never Married	0.21	0.28	0.23	0.27
Currently Married	0.71	0.65	0.69	0.66
Widow	0.08	0.07	0.07	0.07
Caste				
Scheduled Tribe	0.1	0.02	0.12	0.03
Scheduled Caste	0.21	0.15	0.2	0.14
Other Backward Caste	0.42	0.35	0.44	0.42
Forward Caste	0.28	0.47	0.24	0.41

Religion				
Hindus	0.85	0.79	0.83	0.78
Muslims	0.1	0.15	0.12	0.16
Christians	0.02	0.03	0.02	0.03
Other Religions	0.03	0.03	0.03	0.03
Education				
Illiterate	0.56	0.27	0.44	0.23
Primary	0.3	0.32	0.3	0.26
Secondary	0.14	0.41	0.26	0.51
Income Class				
Poorest	0.26	0.04	0.25	0.07
Poor	0.25	0.08	0.26	0.12
Middle	0.22	0.14	0.21	0.15
Rich	0.18	0.25	0.19	0.22
Richest	0.09	0.49	0.09	0.44
Household Characteristics				
Open Defecation	0.73	0.19	0.54	0.1
Non Availability of Drainage Facility	0.58	0.14	0.44	0.1

Source: Authors' Calculation from NSS, Using 71st (2014) and 60th (2004) Round Data.

Methods

Morbidity prevalence was calculated per 1000 population. The morbidity prevalence was defined as:

$$\boldsymbol{M_i = \frac{A_i}{P_i} * 1000\ (i)}$$

Where,

$\boldsymbol{A_i}$ **=** Number of ailing persons

$\boldsymbol{P_i}$ **=** Total number of persons alive in the sample households.

We carried out bivariate analysis between the background characteristics and the outcome variable i.e. self-reported morbidity. In the second part of analysis, we used ratios to measure gender differentials in health and further extended the analysis by incorporating the health concentration curves and health concentration index to measure the extent of deviation in the ill-health of the people irrespective of their income (Wagstaff, Paci, & van Doorslaer, 1991). We used concentration curves to graphically present the cumulative distribution of ill-health (self-reported morbidity) on the y-axis against the cumulative distribution of the population [based on monthly per capita expenditure (MPCE)] from the poorest to the richest on the x-axis. The concentration curve above the line of equality (below) suggests that inequality in ill-health is more concentrated among the advantaged (disadvantaged) groups. If the curve coincides with the line of equality, it reflects that there is perfect equality in terms of health among the groups. Further, we estimated the concentration index to quantify the magnitude of socioeconomic inequality in self-reported morbidity. The concentration index is represented as twice the covariance of the health variable (ill health; self-reported morbidity in the present study) and an

individual's relative rank in terms of economic status (MPCE in the present study), divided by the variable mean, as defined by the equation below(O'Donnell & Doorslaer, 2008) where $\boldsymbol{h_i}$ is the ill-health of the ith individual,$\boldsymbol{R_i}$ is the fractional rank of the ith individual in terms of the monthly per capita expenditure, $\boldsymbol{n}$ is the sample size, $\boldsymbol{\mu}$ is the (weighted) mean of the ill-health.

$$\boldsymbol{C = 1 - \frac{2}{n.\mu}\sum_{i=1}^{n} h_i(1 - R_i)} \ \boldsymbol{(ii)}$$

The value of the concentration index can vary between -1 and +1. A positive value indicates that the health variable of interest is concentrated among the higher socioeconomic groups while the opposite is true for negative values. The concentration index will be zero when there is perfect equality. Since the variable of health whose inequality is measured is binary in nature, therefore, the minimum and maximum possible values of the concentration index as showed (by (Wagstaff, 2005) will be equal to $\boldsymbol{\mu - 1}$ **and** $\boldsymbol{1 - \mu}$ respectively.

After obtaining the estimates of health inequality, it is interesting to probe further into the association of such inequalities with key socioeconomic correlates. For this purpose, the computed health concentration index is decomposed to know the contributions of key socioeconomic factors (Wagstaff, Van Doorslaer, & Watanabe, 2003). The decomposition method was first introduced to use with a linear, additively separable model as shown in equation (iii) (O'Donnell *et al.*, 2008). Since the health variables are in general binary in nature, an appropriate statistical technique for non-linear settings is needed. To elaborate, we first estimated determinants of self-reported morbidity for finding the coefficients of the explanatory variables using probit regression analysis and obtained the marginal effects of the coefficients.

$$\boldsymbol{Y_i = \alpha + \sum_k \beta_k X_{ki} + \varepsilon_i \ (iii)}$$

Thus, given the relationship between Y_i and X_{ki} the health concentration index for Y 'C' can be written as

$$C = \sum_k \left(\frac{\beta_k \bar{X}_k}{\mu}\right) C_k + \frac{GC_\varepsilon}{\mu} \ (iv)$$

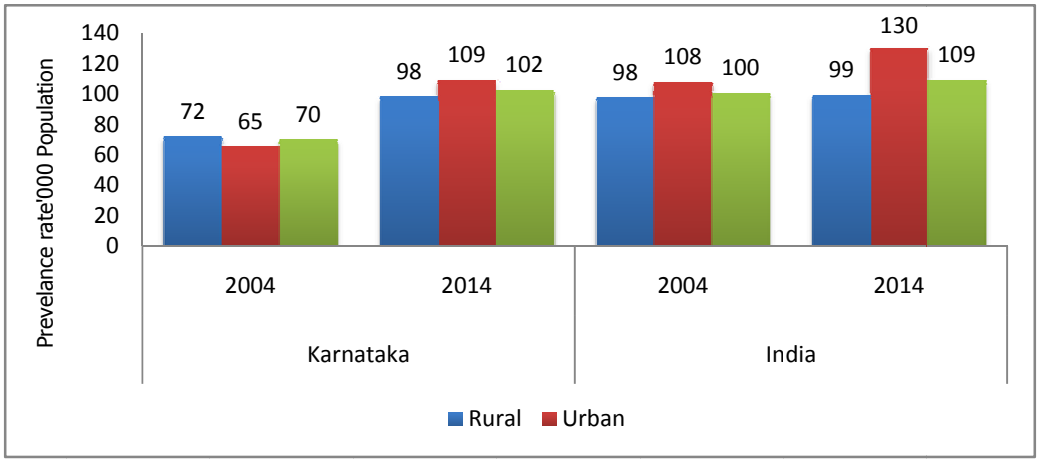
Where β_k is the coefficient from a regression of health outcome on determinant k, $\bar{X}_k$ is the mean of determinant k, μ is the mean of the health outcome, and C_k is the concentration index for determinant k. In the latter component, GC_ε is the generalised concentration index for the error term. Thus, equation 4 shows that the overall inequality in self-reported morbidity decomposed has two components, a deterministic component and an unexplained component, which cannot be explained by systematic variation in determinants across income groups. Thus, the deterministic component, the decomposition analysis focuses on two main elements. That is the impact of each determinant on health outcome$\left(\frac{\beta_k \bar{X}_k}{\mu}\right)$, and the magnitude of unequal distribution of each determinant across the income groupsC_k.

Results

Trends in self –reported morbidity

The prevalence of self-reported morbidity at all-India level has increased from 100 to 130 per 1000 population during 2004-2014. In Karnataka, it increased from 70 to 120 per 1000 population for the same time period (Fig.1). Further, variations in reported morbidity are observed between rural and urban areas. For instance, at national level, higher levels of reported morbidity is observed in urban areas compared to rural areas (108 v/s 98; 130 v/s 99) between 2004 and 2014 respectively. Similar, a trend is also observed in Karnataka except for the year 2004. Self- reported morbidity prevalence has gradually increased in both male and female population (Table 3). Higher reported morbidity prevalence was observed with increase in age for both the genders in both time periods. However, the reported morbidity was higher across the age group among females as compared to males both in rural and urban areas. Interestingly, no difference was found in reported morbidity in Karnataka between rural and urban areas among females for 2004. A similar pattern is observed in Karnataka among the male population for the year 2014.

Figure 1: Trends in Self-reported Morbidity Prevelance Rate by Place of Residence in Karnataka and India, 2004-2014



Tables in the Appendix (A1 and A2) illustrate bivariate association between self-reported morbidity and key socioeconomic and demographic factors by place of residence for Karnataka and India for two time periods. It shows that a considerable proportion of the older population of 70 years and above reported more illness (around 40 per cent) as compared to the younger population of 15-59 years. There exist statistically significant differences in the prevalence of reported illness among gender and marital status with more illness reported among females. The gender differentials as defined by morbidity ratios suggest that in general, females have a higher illness burden compared to males across age groups for both the time periods in rural and urban areas for Karnataka and India. However, an interesting point observed in both rural and urban areas for India is that in 2014, the illness burden reverses and more morbidity burden is among the males (Fig.2 (a-b)). Further, marital status also has

considerable influence on the prevalence of self-reported morbidity. In 2014, those who reported being widows reported more illness (22 v/s 10 and 5; 33 v/s 14) when compared to currently and never married individuals in rural and urban areas respectively. Similarly, the prevalence of reported morbidity by social class suggests that backward communities have a higher prevalence of morbidity compared to their counterparts. In 2014 for Karnataka, the difference in reported morbidity was almost double among the illiterate (14 per cent and 17 per cent) in comparison to those with secondary and above (4 per cent and 8 per cent) in rural and urban areas respectively. A clear economic gradient with richer quintiles reporting higher morbidity was observed in both rural and urban areas for Karnataka and India in 2004 and 2014. Both in Karnataka and India, self-reported morbidity rate were higher for each income quintile in 2014 than 2004 for urban areas, while it was almost stagnant for rural areas. However, for both rural and urban areas, the reported morbidity increased with each income quintile.

Figure 2(a): Gender Differentials in Morbidity by Age Groups and Place of Residence, India 2004-2014

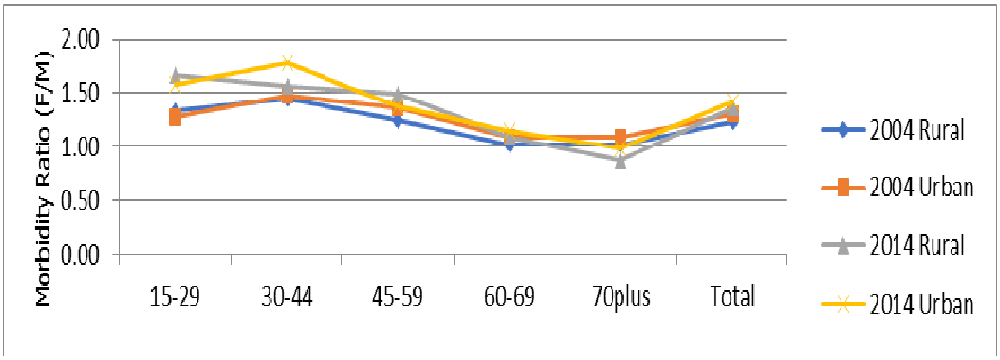


Figure 2(b): Gender Differentials in Morbidity by Age Groups and Place of Residence, Karnataka 2004-2014

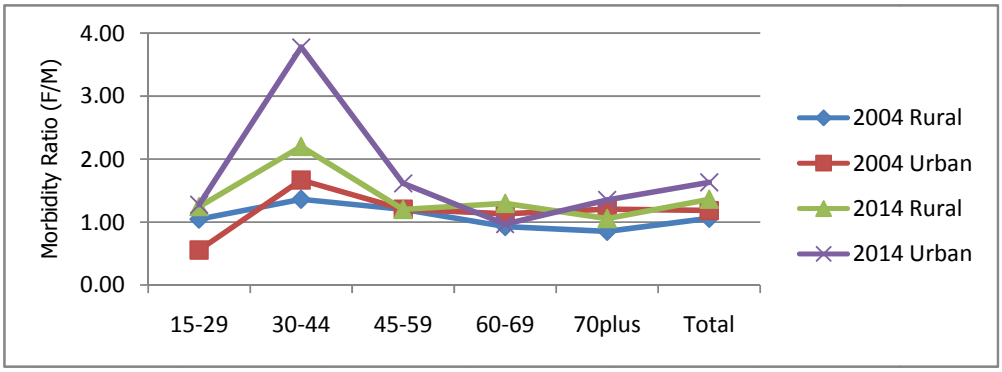


Table 3: Trends of Self-reported Morbidity Prevalence Rate by Gender and Place of Residence in Karnataka and India, 2004-2014

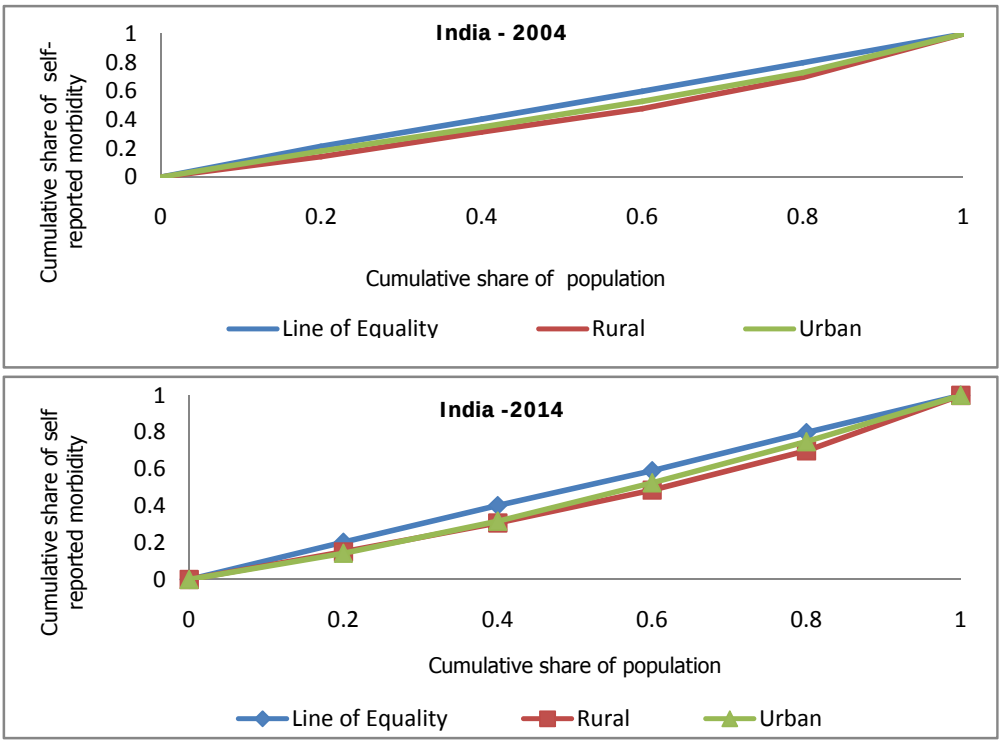
Age Distribution	India							
	2004				2014			
	Rural		Urban		Rural		Urban	
	M	F	M	F	M	F	M	F
15-29	42	56	44	56	35	58	38	60
30-44	64	93	64	95	60	94	71	126
45-59	114	143	128	174	109	163	173	239
60-69	273	278	325	354	247	270	331	379
70 plus	372	378	419	455	327	286	376	371
Total	90	111	94	123	84	115	108	154
Age Distribution	**Karnataka**							
	2004				2014			
	Rural		Urban		Rural		Urban	
	M	F	M	F	M	F	M	F
15-29	22	23	27	15	37	46	40	51
30-44	36	49	33	55	40	88	31	117
45-59	85	102	74	89	115	138	119	192
60-69	251	233	220	249	246	319	330	319
70 plus	508	433	487	587	308	325	359	485
Total	68	72	60	71	83	113	84	137

Source: Authors' Calculation from NSS, Using 71st (2014) and 60th (2004) Round Data.

Inequality in Self-reported Morbidity

We use Concentration Curve [CC] and Concentration Index [CI] to examine whether or not reported morbidity was associated with the socio-economic status of the individuals. As shown in figure 3, for both the years in rural and urban areas, the CCs for self-reported morbidity lie below the diagonal, indicating that morbidity prevalence is higher among the richer income groups. The CC for self-reported morbidity of urban Karnataka in 20014 overlaps with the diagonal for the poorer sections, but it deviates from the diagonal for the middle and higher income sections. The shape of the CC suggests there is differential in the morbidity prevalence between middle and higher income classes with relatively greater concentration observed among higher income class (figure 4). However, whether or not the deviation from the diagonal is statistically significant needs to be confirmed based on the CI. Table 4 shows that the CI value for self-reported morbidity is positive and significant in Karnataka (CI: 0.069; CI: 0.055; CI: 0.040; CI: 0.064) for the year 2004 and 2014 between rural and urban areas respectively. Further, even at the national level, the CI for self-reported morbidity in rural and urban areas are positive and significant (CI: 0.154; CI: 0.095; CI: 0.153; CI: 0.116) for the year 2004 and 2014 respectively, indicating pro rich inequalities in reported ill-health.

Figure 3: Concentration Curves for Self-reported Morbidity in India, 2004-2014



Similarly, Table A3 in the appendix also confirms significant inequalities manifesting along the dimension of gender. For instance, at the national level, the socioeconomic inequalities in self-reported morbidity among males (CI: 0.107) was constant for the two time periods, whereas the socioeconomic inequalities within females increased from (CI: 0.146; CI: 0.156) during 2004-2014. For the state of Karnataka, socioeconomic inequalities in self-reported morbidity showed that there were no systematic differences in reporting of ill-health among males in 2004 while positive and significant variations (CI:0.11) were found during 2014.

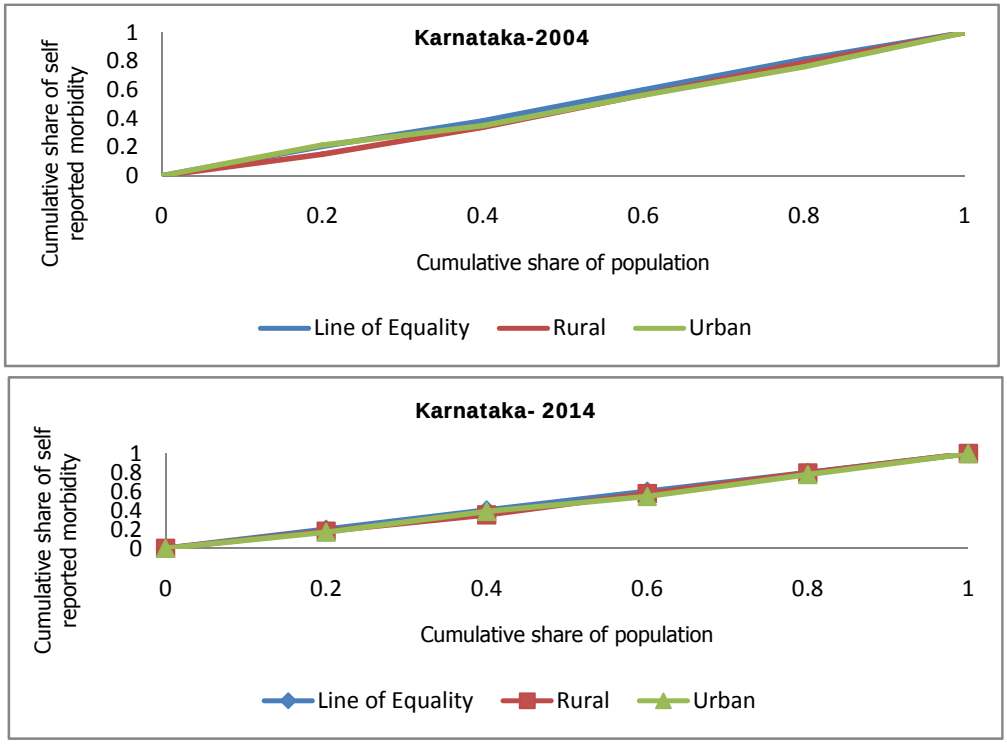
Table 4: Concentration Indices for Self-reported Morbidity by Place of Residence, 2004-2014

Year	2004					
	CI for Rural (se)		CI for Urban (se)		CI Total (se)	
Karnataka	0.069**	*(0.026)*	0.055*	*(0.029)*	0.042**	*(0.019)*
All India	0.154***	*(0.004)*	0.095***	*(0.005)*	0.133***	*(0.003)*
Year	**2014**					
	CI for Rural (se)		**CI for Urban (se)**		**CI Total (se)**	
Karnataka	0.040*	*(0.023)*	0.064**	*(0.023)*	0.060**	*(0.016)*
All India	0.153***	*(0.005)*	0.116***	*(0.005)*	0.163***	*(0.003)*

Source: Authors' Calculation from NSS, Using 71st (2014) and 60th (2004) Round Data.

Note: Standard error of the CI in parenthesis; Denotes significance at ***1% level, **5% level, * 10 % level.

Figure 4: Concentration Curves for Self-reported Morbidity in Karnataka, 2004-2014



Levels of Inequality Contribution for Self-reported Morbidity

Finally, we decompose the concentration index for self-reported morbidity in Karnataka and India. The decomposition allows us to understand the relative importance of each variable and its distribution in magnifying health inequality. Given the nature of the data, we have estimated the probability of reported morbidity using a probit model. In this case, we made a linear approximation to the model using the partial effects evaluated at sample means. The marginal effects estimated at sample means bear the expected signs. For instance, the demographic (age) variable shows that reported morbidity increases with age. Similarly, females and widows had 2 per cent and 0.4 per cent higher probability of reporting morbidity as compared to their counterparts respectively. Further, income has a negative impact on reporting morbidity with lesser marginal effects associated with poorer and middle income quintiles. Similarly, individuals belonging to backward and disadvantaged social groups are more likely to report lower levels of health. Table 5 [a-b] presents the detailed decomposition results. It shows that at national level, the largest contribution to inequality in self-reported morbidity comes from income, followed by the individual's age and access to sanitation facilities. For instance, in 2004, per capita income contributed to around 49% of the self-reported morbidity CI in rural areas and around 50% of the self-reported morbidity CI in urban areas. Further, the contribution of age to the self-reported morbidity is 14% and 37% respectively. Inequalities in access to sanitation facilities contributed to 6% and 5% of self-reported morbidity in rural and urban areas respectively. Similarly, (Table 5b) in 2014, inequality in per capita income contributed to 67% of the self-reported morbidity CI in rural areas and

87% of the self-reported morbidity CI in urban areas. The individual's age contributed 19% and 31% respectively. Overall, the socioeconomic determinants included in our model explain between 60% and 85% of self-reported morbidity in rural and urban areas. Table 6[a] shows that in 2004, the actual contributions of per capita income are higher in both rural and urban areas of Karnataka for self-reported morbidity, and Table 6b shows the same for 2014.

Table 5 [a]: Contributions of Inequalities in Determinants to Inequalities in Self-reported Morbidity, India 2004

Self-Reported Morbidity 2004								
Variables	**CI**		**Rural**			**Urban**		
	Rural	**Urban**	**Elast.**	**Cont.**	**% Cont.**	**Elast.**	**Cont.**	**% Cont.**
Age 30-44	-0.03	-0.02	0.12	0.00	-3	0.10	0.00	-2
Age 45-59	0.04	0.09	0.18	0.01	5	0.22	0.02	21
Age 60-69	0.04	0.05	0.18	0.01	5	0.17	0.01	9
Age 70 years and above	0.08	0.06	0.14	0.01	7	0.13	0.01	9
Female	-0.01	-0.01	0.06	0.00	0	0.08	0.00	-1
Never Married	0.07	0.00	-0.01	0.00	0	-0.02	0.00	0
Widow	0.01	-0.06	0.01	0.00	0	0.00	0.00	0
Scheduled Tribe	-0.26	-0.14	-0.04	0.01	6	-0.01	0.00	2
Scheduled Caste	-0.12	-0.26	0.03	0.00	-3	0.01	0.00	-2
Other Backward Caste	-0.01	-0.14	0.02	0.00	0	0.01	0.00	-1
Muslims	-0.05	-0.25	0.02	0.00	-1	0.02	0.00	-5
Christians	0.28	0.24	0.00	0.00	0	0.00	0.00	0
Other Religion	0.31	0.06	0.00	0.00	0	0.00	0.00	0
Illiterate	-0.12	-0.32	0.09	-0.01	-7	0.03	-0.01	-11
Primary	0.09	-0.10	0.07	0.01	4	0.05	-0.01	-5
Poorest MPCE	-0.70	-0.78	-0.14	0.10	66	-0.01	0.01	9
Poor MPCE	-0.24	-0.78	-0.12	0.03	18	-0.02	0.01	13
Middle MPCE	0.25	-0.64	-0.09	-0.02	-14	-0.03	0.02	18
Rich MPCE	0.63	-0.21	-0.05	-0.03	-21	-0.05	0.01	10
Open Defecation	-0.12	-0.40	-0.08	0.01	6	-0.01	0.00	5
No Drainage Facility	-0.08	-0.35	0.06	0.00	-3	0.02	-0.01	-8
Total Observed				**0.10**	**67**		**0.06**	**60**
Residual				0.05	33		0.04	40
Total				0.15	100		**0.095**	100

Source: Authors' Calculation from NSS, Using 60th (2004) Round Data.

Table 5 [b]: Contributions of Inequalities in Determinants to Inequalities in Self-reported Morbidity, India 2014.

Self-Reported Morbidity 2014								
Variables	CI		Rural			Urban		
	Rural	Urban	Elast.	Cont.	% Cont.	Elast.	Cont.	% Cont.
Age 30-44	-0.03	-0.01	0.13	0.00	-3	-0.05	0.00	-1
Age 45-59	0.06	0.07	0.25	0.01	9	-0.57	0.02	15
Age 60-69	0.06	0.06	0.18	0.01	7	-0.31	0.01	9
Age 70 years and above	0.07	0.08	0.13	0.01	6	-0.26	0.01	8
Female	0.00	-0.01	0.10	0.00	0	0.00	0.00	-1
Never Married	0.01	0.00	0.00	0.00	0	0.00	0.00	0
Widow	0.04	-0.01	0.00	0.00	0	0.00	0.00	0
Scheduled Tribe	-0.22	-0.21	-0.04	0.01	6	-0.23	0.00	2
Scheduled Caste	-0.10	-0.21	0.02	0.00	-1	-0.01	0.00	-2
Other Backward Caste	0.01	-0.08	0.00	0.00	0	0.00	0.00	-3
Muslims	-0.06	-0.24	0.02	0.00	-1	-0.01	0.00	-3
Christians	0.12	0.20	0.00	0.00	0	0.00	0.00	0
Other Religion	0.31	0.22	0.01	0.00	2	-0.02	0.00	0
Illiterate	-0.10	-0.29	0.06	-0.01	-4	-0.10	-0.01	-12
Primary	-0.01	-0.14	0.05	0.00	0	0.00	-0.01	-9
Poorest MPCE	-0.75	-0.93	-0.18	0.13	86	-53.43	0.03	30
Poor MPCE	-0.24	-0.73	-0.16	0.04	25	-4.60	0.04	31
Middle MPCE	0.24	-0.47	-0.11	-0.03	-17	-2.14	0.03	22
Rich MPCE	0.63	-0.10	-0.07	-0.04	-27	-5.40	0.01	4
Open Defecation	-0.17	-0.49	0.01	0.00	-1	-0.02	0.00	-1
No Drainage Facility	-0.10	-0.34	0.08	-0.01	-5	-0.18	-0.01	-7
Total Observed				**0.12**	**80**		**0.10**	**84**
Residual				0.03	20		0.02	16
Total				0.15	100		0.12	100

Source: Authors' Calculation from NSS, Using 71st (2014) Round Data.

Table 6 [a]: Contributions of Inequalities in Determinants to Inequalities in Self-reported Morbidity, Karnataka 2004.

Karnataka Self-Reported Morbidity 2004								
Variables	**CI**		**Rural**			**Urban**		
	Rural	**Urban**	**Elast.**	**Cont.**	**% Cont.**	**Elast.**	**Cont.**	**% Cont.**
Age 30-44	-0.02	0.00	0.14	0.00	-3	0.02	0.00	0
Age 45-59	0.02	0.08	0.33	0.01	7	0.07	0.01	10
Age 60-69	0.03	0.01	0.32	0.01	8	0.07	0.00	2
Age 70 years and above	0.12	0.08	0.20	0.02	21	0.06	0.00	8
Female	-0.01	-0.01	-0.06	0.00	1	0.01	0.00	0
Never Married	0.10	0.00	0.04	0.00	4	-0.02	0.00	0
Widow	0.02	-0.14	0.01	0.00	0	-0.01	0.00	2
Scheduled Tribe	-0.17	-0.41	0.00	0.00	1	0.00	0.00	-3
Scheduled Caste	-0.14	-0.29	0.04	-0.01	-5	0.00	0.00	2
Other Backward Caste	0.00	-0.11	0.03	0.00	0	0.02	0.00	-4
Muslims	-0.02	-0.25	0.03	0.00	-1	0.02	0.00	-9
Christians	0.46	0.28	0.01	0.01	6	0.00	0.00	1
Other Religion	-0.18	-0.07	0.00	0.00	0	0.00	0.00	0
Illiterate	-0.13	-0.32	0.11	-0.01	-14	0.00	0.00	2
Primary	0.10	-0.03	0.06	0.01	6	-0.02	0.00	1
Poorest MPCE	-0.72	-0.77	-0.13	0.09	86	0.00	0.00	-1
Poor MPCE	-0.20	-0.77	-0.05	0.01	10	-0.01	0.00	8
Middle MPCE	0.28	-0.64	-0.04	-0.01	-9	-0.02	0.01	19
Rich MPCE	0.69	-0.16	-0.05	-0.03	-31	-0.01	0.00	2
Open Defecation	-0.10	-0.49	-0.22	0.02	20	0.01	0.00	-5
No Drainage Facility	-0.05	-0.39	0.17	-0.01	-7	-0.01	0.00	5
Total Observed				**0.11**	**100**		**0.021**	**39**
Residual				-0.04			0.03	61
Total				0.069	100		0.055	100

Source: Authors' Calculation from NSS, Using 60th (2004) Round Data.

Table 6 [b]: Contributions of Inequalities in Determinants to Inequalities in Self-reported Morbidity, Karnataka 2014

Karnataka Self-Reported Morbidity 2014								
Variables	CI		Rural			Urban		
	Rural	Urban	Elast.	Cont.	% Cont.	Elast.	Cont.	% Cont.
Age 30-44	-0.05	0.01	0.10	-0.01	4	0.23	0.00	1
Age 45-59	0.04	0.04	0.23	0.01	-6	0.33	0.01	15
Age 60-69	0.00	0.00	0.21	0.00	0	0.30	0.00	0
Age 70 years and above	0.06	-0.03	0.17	0.01	-6	0.14	0.00	-5
Female	-0.02	-0.03	0.14	0.00	2	0.09	0.00	-3
Never Married	0.05	0.03	-0.10	-0.01	3	-0.11	0.00	-3
Widow	0.08	-0.08	0.01	0.00	0	0.02	0.00	-2
Scheduled Tribe	-0.30	-0.36	0.00	0.00	1	0.00	0.00	1
Scheduled Caste	-0.10	-0.30	0.04	0.00	3	0.01	0.00	-4
Other Backward Caste	0.00	-0.02	0.11	0.00	0	-0.01	0.00	0
Muslims	0.03	-0.25	0.01	0.00	0	0.03	-0.01	-8
Christians	0.03	0.08	0.01	0.00	0	0.00	0.00	0
Other Religion	0.65	-0.04	0.00	0.00	-1	0.00	0.00	0
Illiterate	-0.06	-0.33	0.06	0.00	2	0.03	-0.01	-11
Primary	0.01	-0.15	0.02	0.00	0	0.09	-0.01	-14
Poorest MPCE	-0.80	-0.94	-0.10	0.08	-53	-0.04	0.03	35
Poor MPCE	-0.31	-0.78	-0.28	0.08	-56	-0.06	0.05	52
Middle MPCE	0.29	-0.49	-0.16	-0.05	31	-0.09	0.04	45
Rich MPCE	0.78	-0.06	-0.09	-0.07	45	-0.09	0.01	6
Open Defecation	-0.09	-0.60	-0.09	-0.09	60	0.02	-0.01	-12
No Drainage Facility	-0.12	-0.43	0.01	-0.11	72	-0.02	0.01	7
Total Observed				**-0.15**	**100**		**0.10**	**100**
Residual				0.19			-0.03	
Total				0.04	100		0.064	100

Source: Authors' Calculation from NSS, Using 71st (2014) Round Data.

Discussion

Given due consideration to the existing literature, we have largely examined the trends, patterns in self-reported morbidity at aggregate and sub-national levels (Ghosh & Arokiasamy, 2010; Mutharayappa, 2008; Paul & Singh, 2017; G. Sen, 2003). Further, studies that have examined differentials in self-reported morbidity have either concentrated only on gender differentials in health, ignoring health (Dhak & R, 2009) or have only focused on SES inequalities in self-reported health without considering the gender aspect (Jain *et al.,* 2012; Prinja *et al.,* 2015).There, however, have been some exceptions in which gender, SES and health have been examined mostly using self-assessed health or disease specific health vignettes (Hosseinpoor *et al.,* 2012; S Vellakkal *et al.,* 2015). Our investigation is a further attempt to readdress the issue, especially in respect of whether gender and spatial differences exist in

the magnitude of SES inequalities in self-reported morbidity among populations aged 15 years and above and further, whether after taking into account gender and spatial differences, the explanations for SES inequalities in self-reported morbidity vary over time. Thus, we have extended the previous analysis of inequalities in self-reported morbidity by considering gender and place of residence variables.

Our findings show that self-reported morbidities have been on the rise over the last decade (2004-2014) in India and also for the state of Karnataka. The Global Burden of Disease Study shows that the total disease burden measured as the disability-adjusted life years lost in India has increased for the older population from 67 million in 1990 to 110 million in 2013 (Global Burden of Disease Study 2013, 2014). Thus, the rise in morbidity prevalence in the last decade may be partly attributed to the increasing disease burden of the country with an ageing population and higher levels of morbidity prevalence at older ages. Further, it is evident that in Karnataka, the morbidity prevalence is slightly higher in rural areas than in urban areas, while the reverse pattern was observed at the all-India level in 2004. On the other hand, in 2014, as compared to rural areas, morbidity prevalence was slightly higher in urban areas for Karnataka and also for India. Further, findings suggest economic status is a strong independent determinant of self-reported morbidity in Karnataka and India. Inequality in self-reported morbidity favoured the rich. However, there is a difference in the degree to which inequalities in self-reported morbidity occurred over two time periods in Karnataka and India. Four prominent findings related to inequality emerge from this study. First, both at state and national level, the overall inequality reported morbidity has increased between 2004 and 2014 and continued to favour the rich. However, during the same period, such inequalities remained constant in rural India, while increasing levels of inequality were observed in urban India. On the other hand, declining of such inequalities was observed for rural Karnataka. Second, both at the state and national level, irrespective of the age groups, females had a higher morbidity burden. Further, for both the time periods, statistically significant inequalities in reported morbidity were observed within both males and females. However, no such inequalities were observed for males in 2004 and for females in 2014 at the state level for Karnataka.

Third, for both the time periods, the socioeconomic inequalities in self-reported morbidity are low for both the genders and between rural and urban areas in Karnataka compared to the all-India level. This may be due to the fact that Karnataka has higher levels of health care utilisation as compared to all-India levels, and thus more people tend to report morbidity across the socioeconomic strata (Rudra, Kalra, Kumar, & Joe, 2017). Fourth, the decomposition findings suggest that income, age and access to sanitation facilities were the major contributors to inequality in self-reported morbidity.

Socioeconomic inequality in self-reported morbidity with a wealthier population having higher levels of reporting illness is not a persistent phenomenon in low and middle income countries. A previous study in Thailand found that lower income groups had both higher levels of reporting illness on self-reported morbidity measure and poorer health on self-assessed health (Yiengprugsawan, Lim, Carmichael, Seubsman, & Sleigh, 2009).However, pro-rich inequality in self-reported morbidity is consistent with evidence from other studies in India and Ghana (J, 1993; Jain *et al.,* 2012; S Vellakkal *et al.,* 2015; Sukumar Vellakkal *et al.,* 2013).The latter unexpected results are in general to be attributed to perception bias (A. Sen, 2002).That is a tendency among the deprived to underestimate

their health problems which may be due to prevailing differentials in access to health services, customs and traditions etc. Another explanation for results is attributed to differential rates of epidemiological transition between socioeconomic strata leading to higher levels of morbidity reported among the rich (Bhojani *et al.,* 2013; Prinja *et al.,* 2015).

Although this study provides a snapshot of the emerging patterns of inequalities in self-reported morbidity, covering a span for the last decade from a national representative population-based sample, the findings need to be taken in the light of a few limitations. In general, self-reported morbidity suffers from both under-reporting and over-reporting among the population sub groups (Sundararaman & Muraleedharan, 2015). Thus, the absence of any objective measure of health in the NSS surveys makes it difficult to detach the real increase in disease burden and enhanced subjective perception of illness from increasing levels of morbidity prevalence. The overall sample size from the 60th round of NSS (2004) to the most recent round (2014) has considerably declined, and as a result it is likely that the prevalence estimates across various rounds of NSS is affected. Further, there is a slight variation in the definition adopted in both the rounds. That is, in 2014, persons suffering from chronic illness were also considered to be ailing in the last fifteen days if they were under treatment for one month or more. However, such inclusions were not there in the earlier round which may underestimate the true morbidity prevalence for the year 2004. Moreover, factors life-style, occupational status etc. which may have a significant bearing on morbidity have not been examined in this study (Prentice, 2006).

Conclusion

In conclusion, this study provides evidence of a higher burden of self-reported morbidity and greater inequalities in self-reported morbidity in India and Karnataka. Further, studies for the understanding of the socio-economic determinants of each disease are required instead of considering all morbidities in one basket. Policy initiatives aiming to reduce these inequalities in health must focus on reorienting programmes by including diseases associated with poverty and are impoverishing through increasing public investment in health, providing preventive care facilities for early prevention of diseases and improving the provision of curative services both in rural and urban areas as needed by the community in Karnataka and India.

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Appendix

Table A1: Bivariate Association between Socioeconomic Status and Self-Reported Morbidity Prevalence (per 100) States, India 2004-2014.

Covariates		India -2004		India -2014	
		Rural	Urban	Rural	Urban
Age	15-29	5	5	5	5
	30-44	8	8	8	10
	45-59	12	15	14	21
	60-69	26	34	26	36
	70+	35	44	31	37
Sex	Male	9	9	8	11
	Female	11	12	11	15
Marital Status	Never Married	5	5	5	6
	Currently Married	10	11	10	14
	Widow	23	29	22	33
Caste	Scheduled Tribe	6	5	7	6
	Scheduled Caste	10	10	10	12
	Other Backward Caste	10	10	10	14
	Forward Caste	11	12	12	13
Religion	Hindus	9	11	10	13
	Muslims	12	10	10	11
	Christians	17	14	17	20
	Other Religion	13	11	15	12
Education	Illiterate	11	14	13	18
	Primary	9	10	9	15
	Secondary and Above	7	9	7	10
Income	Poorest	7	8	7	7
	Poor	8	10	9	10
	Middle	10	9	9	11
	Rich	12	10	12	13
	Richest	17	12	17	15
Sanitation	Open Defecation	9	9	8	12
Drainage Facility	No Drainage	10	11	10	13

Source: Authors' Calculation from NSS, Using 71st (2014) and 60th (2004) Round Data.

Table A2: Bivariate Association between Socio-economic Status and Self-Reported Morbidity Prevalence (per 100) States, Karnataka 2004-2014.

Covariates		Karnataka -2004		Karnataka -2014	
		Rural	Urban	Rural	Urban
Age	15-29	2	2	4	4
	30-44	4	4	6	7
	45-59	10	8	13	15
	60-69	25	23	28	32
	70+	44	54	32	42
Sex	Male	7	6	8	8
	Female	7	7	11	14
Marital Status	Never Married	3	2	3	4
	Currently Married	7	7	10	12
	Widow	20	18	25	27
Caste	Scheduled Tribe	6	6	6	6
	Scheduled Caste	7	5	12	9
	Other Backward Caste	8	6	11	10
	Forward Caste	7	7	9	13
Religion	Hindus	7	6	10	11
	Muslims	7	7	12	10
	Christians	20	7	25	14
	Other Religion	7	22	0	27
Education	Illiterate	9	10	14	17
	Primary	6	4	9	12
	Secondary and Above	4	6	4	8
Income	Poorest	5	9	9	9
	Poor	8	6	10	10
	Middle	8	5	11	8
	Rich	7	7	8	11
	Richest	10	7	15	12
Sanitation	Open Defecation	7	5	8	9
Drainage Facility	No Drainage	7	7	9	5

Source: Authors' Calculation from NSS, Using 71st (2014) and 60th (2004) Round Data.

Table A3: Concentration Indices for Self-reported Morbidity, Gender, 2004-2014

Year	2004				2014			
States	CI for Male (se)		CI for Female (se)		CI for Male (se)		CI for Female (se)	
Karnataka	0.002	*(0.028)*	0.079**	*(0.027)*	0.113***	*(0.026)*	0.032	*(0.021)*
All India	0.107***	*(0.005)*	0.146***	*(0.004)*	0.174***	*(0.005)*	0.156***	*(0.004)*

Source: Authors' Calculation from NSS, Using 71st (2014) and 60th (2004) Round Data. \

Note: Standard error of the CI in parenthesis; Denotes significance at ***1% level, **5% level.

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