

# **Inequality in healthcare utilization by need and non-need factors associated with chronic NCDs among older adults in India: Evidence from Longitudinal Ageing Study India**

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## **Abstract**

People with chronic non-communicable diseases (NCDs) are more vulnerable to socioeconomic inequality over access to health services and health outcome. Using the first ever micro level data with a total of 70,663 individuals from Longitudinal Ageing Study India (LASI, 2017-18), this paper aims to understand the inequity in healthcare utilization by need and non-need factors associated with chronic NCDs among older adults in India. Bivariate analysis, Probit regression model and concentration index were used in the analysis. In India, due to chronic NCDs about 28% using inpatient care, 45.5% using outpatient care, 38.8% using both inpatient and outpatient care and 47.9% using either inpatient and outpatient care. The higher probability of using inpatient care due to chronic NCDs was found among older adults with aged 75 and above, male, having difficulty in daily living activities, reside in urban area, belong to richest MPCE quintile, widowed and not covered with health insurance. Further, there was a pro-rich inequality observed for utilization of actual use, need-predicted use and need-standardised use of either inpatient or outpatient care due to chronic NCDs. Inequality in health services due to chronic NCDs remains largely by the richest quintile and it indicates a need of pro-poor welfare.

. **Key Words:** Inpatient; Outpatient; chronic NCDs; LASI; India

## **Background**

Since the Alma Ata declaration of 1978, equity in access to healthcare services has become an important policy concern for all nation-states. The goal has been to promote and protect the health of all individuals and focus on universal access to healthcare (WHO, 1978). Following Alma Ata, most of the international declarations; the ICPD, MDG and SDG focus on increasing access to health services across population and geographies.

Health care utilization is a proximate determinant of health. Along with nutrition, lifestyle, individual behaviour, living environment, genetic factors, the use of health services determine individual health. The socioeconomic factors exert a major influence over access to health services and health outcome. Demand for health care is based on individual or household characteristics such as distance to the health care facility, user fees, educational status of the household, quality of service and severity of illness are the key factors for the demand for health care services. The supply of health care is determined by health infrastructures such as physicians, inpatient care beds, capacity in residential nursing homes/homes for elderly, health equipment and testing facilities (Wellay *et al.*, 2018). Despite several measures, access to health care is highly unequal within and among countries, across health care services and socioeconomic characteristics. Recently, universal health coverage (UHC) shows a dismal picture across countries. The UHC service coverage index (SCI), measuring the average coverage of indicators of four essential health service areas of reproductive, maternal, newborn and child health, infectious diseases, noncommunicable diseases and service capacity and access had a global average of 45 in 2000 to 66 in 2017 (WHO, 2017).

Utilization of health services is directly associated with health outcome such as mortality, morbidity and disease burden (Dou *et al.*, 2015; Yang *et al.*, 2014; Lee *et al.*, 2015). Rising health care cost and widening disparity in access to healthcare services have adversely affected mostly to the elderly (Yamada *et al.*, 2015). Access to healthcare is very much asymmetric between rural and urban India, while urban residents have a choice of public or private providers, but the rural residents are more centric on primary health centres (PHC) and community health centres (CHC) (Barik and Thorat, 2015).

Studies suggest that the socioeconomic factors such as age, education, marital status and household economic status are significant predictors and had inequality in seeking inpatient care services as well as outpatient care services across the socioeconomic class (Abouie *et al.*, 2018)

## **Data and Methods**

### **Data**

India's first ever micro level data of the Longitudinal Aging Study in India (LASI) was used in the analysis. The LASI is the world's largest and India's first longitudinal and national level survey of scientific investigation of the health, economic, and social determinants and consequences of population ageing in India. The LASI has successfully collected the information of 42,949 households' and 72,250 individuals aged 45+, and their spouses across all the states and union territories of the country except Sikkim. LASI was adopted multistage stratified area probability cluster sampling technique, where a three-stage sampling design in rural areas and four-stage sampling in urban areas was used. After cleaning of data from 72,250 individuals a total of 70,663 individuals was used for the analysis. For this study, respondents of 45 years and above, a total of 26,070 or 36.9% reported any chronic NCD.

### **Dependent variable**

Use of inpatient care, outpatient care, any care (either inpatient or outpatient) and both care (inpatient and outpatient) associated with the NCDs are the outcome variables used in the analysis. All the outcome variables are dichotomous in nature (yes=1, no=0). In LASI data, respondents were asked direct question on hospitalization over the last 12 months and question on outpatient visit over last 30 days. The reasons for seeking hospitalization or outpatient visit were categorized as chronic NCDs and non-chronic NCDs. In this study, the chronic NCDs was included the diabetes, hypertension, cancer, asthma or chronic obstructive pulmonary disease and stroke. All these chronic NCDs were accounted 36% of all disease categories.

### **Independent variables**

A set of independent variables are used in the analysis, which are categorized as need variables and non-need variables. The age (<44/45-49/50-54/55-59/60-64/65-69/70-74/75+), sex (male/female), any difficulty in daily living activities (yes/no), self-rated health (SRH) (excellent/very good/good/fair/poor) were considered as need factors and the other socioeconomic variables, such as place of residence (rural/urban), MPCE quintile (poorest/poorer/middle/richer/richest), level of education (no education/primary/secondary/higher), religion (Hindu/Muslim/Christian/others), caste (SC/ST/OBC/others), marital status (currently married/ widowed/others), working status (currently working/not currently working/never worked), living arrangement (living alone/living with spouses and others/living with spouse and children/living with children and others) and coverage of health insurance (yes/no) were considered as the nob-need factors for the utilization of health care services.

### **Statistical methods**

For the adjustment of differential need, an equality is considering as inequity. In health care utilization, the equity is interpreted as, the allocation of health care according to health need rather than the characteristics of non-need variables. The literatures are based on equity in health care utilization distinguished as horizontal and vertical equity. In respect of equity concern, we have calculated the distribution of actual use of health care services often called as realized health care utilization, need-expected or need-predicted use of health care services, and need-standardized use of health services. Here, the need-predicted healthcare utilization was used to find out the variation in health care utilization predicted only by the need factors. The need-standardized use of health care services was used to capture the gap between actual use of health services and need-predicted use of health services.

Here the inequity in health care utilization was measured in two step. First, the Probit regression model was used to estimate the need-predicted healthcare utilization, which was used in estimating the need-standardized healthcare utilization by indirect method of standardization. Second, the concentration index was used to measure the socioeconomic inequality in use of healthcare services.

### ***Indirect standardization of healthcare utilization***

The healthcare utilization variables associated with chronic NCDs are in dichotomous, so Probit regression model was used with the probability of inpatient care, probability of outpatient care, probability of both the care and probability of any care as the dependent variables to indirectly standardized the healthcare utilization. As the standardization of health care utilization holds a linear form to the Probit model which was made by estimating the partial effects at the means. The Probit regression model is specified as,

$$y_i = G(\alpha + \sum \beta_j x_{ji} + \sum \gamma_k z_{ki}) + \varepsilon_i \text{ ----- (1)}$$

Where, G is a functional transformation,  $y_i$  is dependent variables,  $x_{ji}$  are need variables and  $z_{ki}$  are non-need variables.

First, we have estimated the need-based predicted use of healthcare utilization. Need-predicted healthcare utilization is only evaluating the variation of needs of healthcare by keeping all non-need variables constant at the level of means. The need-predicted healthcare utilization equation was given as follows,

$$\hat{y}_i^x = G(\hat{\alpha} + \sum_j \beta_j x_{ji} + \sum_k \hat{\gamma}_k z_{ki}) + \varepsilon_i \text{ ----- (2)}$$

The gap between the actual use of healthcare utilization and need-predicted healthcare utilization with addition of mean of predicted healthcare utilization is the measurement of inequity in healthcare utilization. The standardized healthcare utilization is given by the following equation,

$$\hat{y}_i^s = y_i - \hat{y}_i^x + \frac{1}{n} \sum_{i=1}^n G(\hat{\alpha} + \sum_j \beta_j x_{ji} + \sum_k \hat{\gamma}_k z_{ki}) \text{ ----- (3)}$$

We have demonstrated the concentration curve to understand the inequality in use of healthcare services. It plots the cumulative percentage of use of healthcare services against the cumulative percentage of individuals ranked by monthly per capita consumption expenditure (MPCE quintile). We have calculated the concentration index (CI) by using covariance method given by,

$$CI = \frac{2}{\mu} \text{cov}_w(y_i, r_i) \text{ ----- (4)}$$

Where, C is the concentration index,  $y_i$  is the actual use of healthcare services,  $r_i$  is the relative fractional rank of  $i^{\text{th}}$  individual.  $\mu$  is the mean of use of healthcare services and  $\text{cov}_w$  denoted the weighted covariance. The CI is ranged between -1 to +1. The negative index value indicates the inequality in favor of lower income group (pro-poor) and with a positive index value indicate the inequality in favor of higher income groups (pro-rich) and '0' value indicate there is no inequality.

## Results

**Table 1** shows the utilization of healthcare services (inpatient care, outpatient care, both care and any care) due to chronic NCDs by need and non-need factors among older adults in India. In India, due to chronic NCDs about 28% using inpatient care, 45.5% using outpatient care, 38.8% using both inpatient and outpatient care and 47.9% using either inpatient and outpatient care. Older adults with age 75+ are using higher percentage of inpatient care (38.1%), outpatient care (61%), both care (54.5%) and any care (61.7%). Higher percentage of utilization of health services were observed among male older adults rather than female. The older adults with difficulty in daily activities were more prone to utilizing the healthcare services. The older adults belong to urban area (inpatient-32.9%; outpatient-61.5%; both care-49.8% and any care-65.2%) was using higher percentage of health care services than rural areas (inpatient-25.2%; outpatient-36.7%; both care-33.0% and any care-38.6%). The increasing pattern of utilization of healthcare services was observed in accordance with the level of MPCE quintile. Muslim older adults were using more inpatient service (34.5%), whereas more than half of Christians older adults were using outpatient visit (58.4%). The older adults were living with children and others were more utilizing the healthcare services (inpatient care-34%; outpatient care-51.2%; both care-46.6% and any care-54.0%). The older adults were not secured by health insurance were more prone to utilizing the all type of healthcare services (inpatient care-28.5%; outpatient care-46.0%; both care-40.6% and any care-48.9%). Overall, it concludes that higher percentage share of older adults were using the outpatient services rather than inpatient care due to chronic NCDs.

**Table 1: Socioeconomic utilization of healthcare services among older adult by need and non-need factors in India, 2017-18**

| <b>Socioeconomic variables</b>                 | <b>Total sample of chronic NCDs</b> | <b>% use of inpatient care due to chronic NCDs</b> | <b>% use of outpatient care due to chronic NCDs</b> | <b>% use of both care due to chronic NCDs</b> | <b>% use of any care due to chronic NCDs</b> |
|--|-------------------------------------|--|---|---|--|
| <b><i>Need variables</i></b>                   |                                     |  |   |   |  |
| <b><i>Age</i></b>                              |                                     |  |   |   |  |
| <44  | 1,367                               | 12.5   | 22.9  | 18.8  | 25.0   |
| 45-49  | 3,408                               | 20.2   | 32.5  | 34.2  | 35.2   |
| 50-54  | 3,552                               | 23.5   | 39.8  | 31.9  | 43.4   |
| 55-59  | 3,702                               | 28.3   | 46.4  | 44.2  | 48.8   |
| 60-64  | 4,116                               | 29.5   | 51.9  | 38.7  | 53.4   |
| 65-69  | 4,066                               | 31.6   | 54.8  | 38.6  | 55.8   |
| 70-74  | 2,721                               | 35.5   | 57.6  | 42.1  | 58.6   |
| 75+  | 3,138                               | 38.1   | 61.0  | 54.5  | 61.7   |
| <b><i>Sex</i></b>                              |                                     |  |   |   |  |
| Male   | 10,791                              | 30.5   | 48.9  | 41.9  | 52.0   |
| Female   | 15,279                              | 25.8   | 43.2  | 36.4  | 45.1   |
| <b><i>Difficulty with Daily activities</i></b> |                                     |  |   |   |  |
| No   | 15,319                              | 25.1   | 43.6  | 37.3  | 47.4   |
| Yes  | 10,751                              | 31.2   | 48.3  | 40.2  | 48.5   |
| <b><i>Self-rated health (SRH)</i></b>          |                                     |  |   |   |  |
| Excellent                                      | 649                                 | 15.4   | 29.7  | 26.3  | 40.9   |
| Very good                                      | 3,585                               | 19.6   | 34.5  | 24.2  | 41.5   |
| Good   | 8,878                               | 22.1   | 43.3  | 33.9  | 46.9   |
| Fair   | 8,719                               | 28.7   | 49.6  | 40.3  | 48.9   |
| Poor   | 4,239                               | 39.2   | 54.0  | 45.2  | 53.0   |
| <b><i>Non-need variables</i></b>               |                                     |  |   |   |  |
| <b><i>Place of residence</i></b>               |                                     |  |   |   |  |
| Rural  | 14,390                              | 25.2   | 36.7  | 33.0  | 38.6   |
| Urban  | 11,680                              | 32.9   | 61.5  | 49.8  | 65.2   |
| <b><i>MPCE quintile</i></b>                    |                                     |  |   |   |  |
| Poorest  | 3,943                               | 23.8   | 41.3  | 31.8  | 45.9   |
| poorer   | 4,693                               | 27.9   | 42.8  | 41.0  | 46.2   |
| Middle   | 5,255                               | 28.2   | 44.3  | 40.8  | 46.7   |
| Richer   | 5,807                               | 26.9   | 46.2  | 35.6  | 47.9   |
| Richest  | 6,372                               | 30.3   | 51.0  | 41.1  | 51.4   |
| <b><i>Level of education</i></b>               |                                     |  |   |   |  |
| No education                                   | 10,606                              | 25.9   | 38.0  | 33.9  | 40.4   |
| Primary  | 3,020                               | 29.3   | 45.1  | 36.5  | 45.7   |
| Secondary                                      | 6,447                               | 30.6   | 48.8  | 44.0  | 50.7   |
| Higher secondary                               | 5,997                               | 28.4   | 59.7  | 46.2  | 64.7   |
| <b><i>Religion</i></b>                         |                                     |  |   |   |  |
| Hindu  | 18,527                              | 26.9   | 42.6  | 36.0  | 45.0   |
| Muslim   | 3,816                               | 34.5   | 55.4  | 42.7  | 57.6   |
| Christian                                      | 2,228                               | 26.5   | 58.4  | 69.4  | 61.5   |
| Others   | 1,499                               | 30.9   | 46.9  | 38.8  | 49.1   |
| <b><i>Caste</i></b>                            |                                     |  |   |   |  |
| SC   | 4,115                               | 27.8   | 37.1  | 36.3  | 38.8   |
| ST   | 3,084                               | 26.5   | 42.7  | 47.5  | 47.7   |
| OBC  | 10,011                              | 26.2   | 44.8  | 32.4  | 46.8   |
| Others   | 8,860                               | 31.0   | 52.6  | 45.9  | 55.3   |
| <b><i>Marital status</i></b>                   |                                     |  |   |   |  |

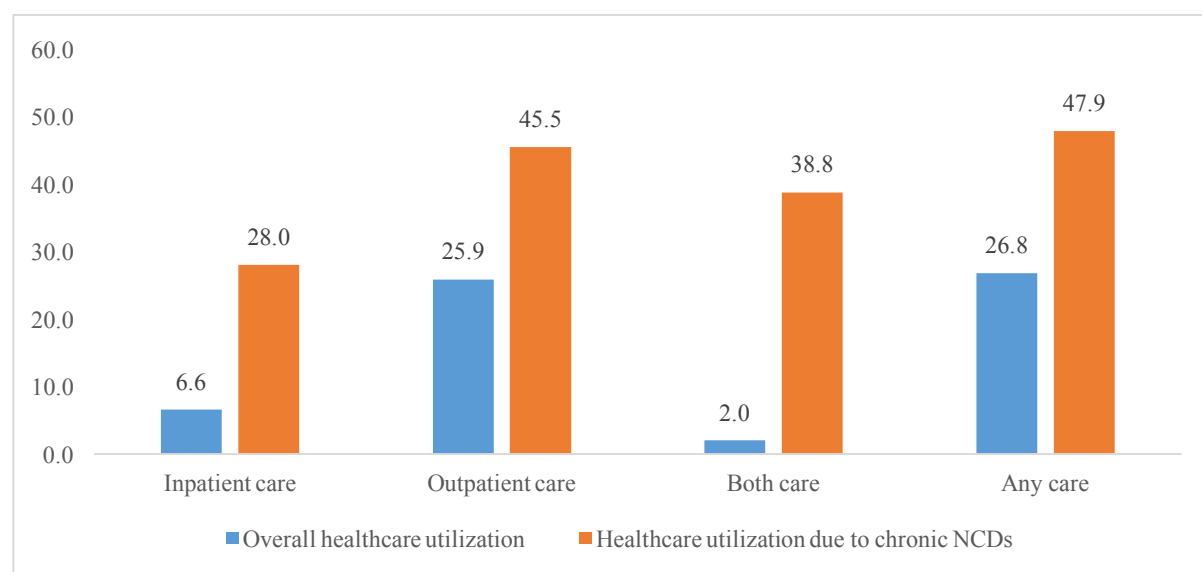
|   |               |             |             |             |             |
|---|---------------|-------------|-------------|-------------|-------------|
| Currently married                       | 18,955        | 26.2        | 43.7        | 36.5        | 46.1        |
| Widowed                                 | 6,368         | 33.9        | 51.9        | 47.5        | 53.6        |
| Others                                  | 747           | 29.2        | 44.2        | 32.4        | 51.1        |
| <b>Working status</b>                   |               |             |             |             |             |
| Currently working                       | 8,827         | 21.1        | 34.5        | 32.0        | 37.8        |
| Not currently working                   | 8,445         | 34.9        | 55.6        | 42.1        | 55.4        |
| Never worked                            | 8,798         | 27.3        | 51.3        | 42.3        | 53.8        |
| <b>Living arrangement</b>               |               |             |             |             |             |
| Living alone                            | 902           | 27.1        | 44.9        | 35.2        | 46.2        |
| Living with spouse and others           | 4,115         | 28.0        | 49.9        | 40.1        | 51.6        |
| Living with spouse and children         | 14,546        | 25.8        | 42.3        | 35.7        | 44.7        |
| Living with children and others         | 6,507         | 34.0        | 51.2        | 46.6        | 54.0        |
| <b>Covered health insurance schemes</b> |               |             |             |             |             |
| No                                      | 20,191        | 28.5        | 46.0        | 40.6        | 48.9        |
| Yes                                     | 5,879         | 26.6        | 43.7        | 34.4        | 44.7        |
| <b>Total</b>                            | <b>26,070</b> | <b>28.0</b> | <b>45.5</b> | <b>38.8</b> | <b>47.9</b> |

**Source:** Longitudinal Study of Ageing in India (LASI) wave-1, 2017-18;

**Note:** **Any care**- use of either inpatient or outpatient service; **Both care**- use of both inpatient and outpatient services

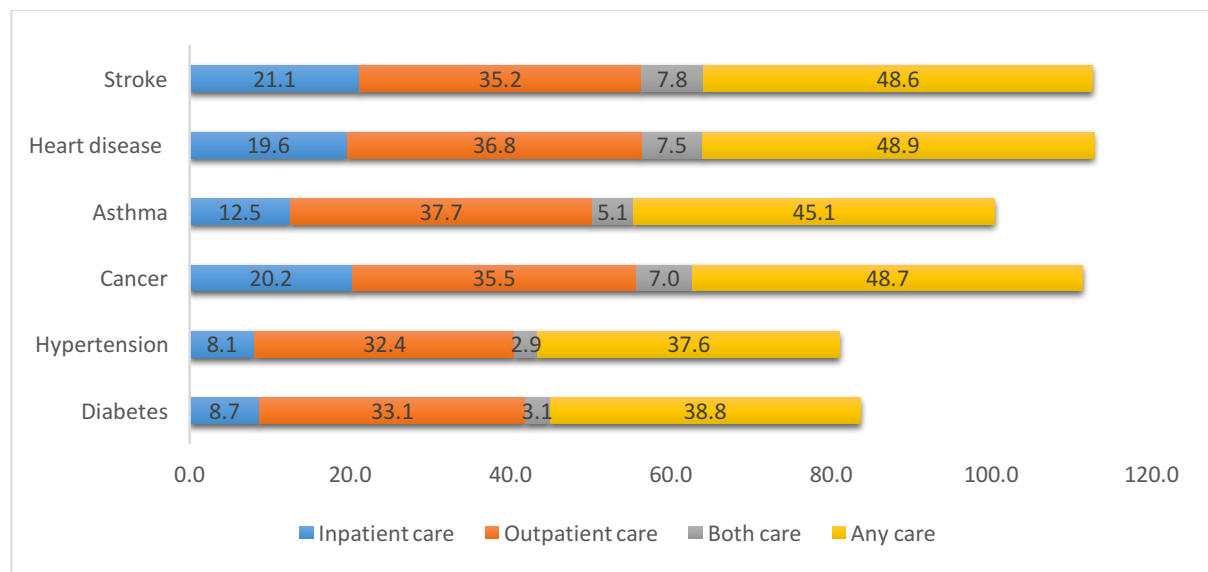
**Figure 1** shows the percentage share of utilization of inpatient care (last 365 days), outpatient care (last 30 days), both care (inpatient and outpatient care) and any care (either inpatient care or outpatient care) due to chronic NCDs among older adults. Higher percentage share of outpatient visit (45.5%) due to chronic NCDs was observed than the inpatient care (28%). About 38.8% of older adults utilizing both inpatient and outpatient services due to chronic NCDs. Half of the older adults using either inpatient or outpatient services.

**Figure 1: Percentage share of overall healthcare utilization and utilization due to chronic NCDs among older adult in India, 2017-18**



**Figure 2** shows the percentage use of healthcare services by the type of chronic NCDs among older adults in India. Higher percentage of older adults were using inpatient care due to stroke (21.1%) followed by heart disease (19.6%), cancer (20.2%), asthma (12.5%), diabetes (8.7%) and hypertension (8.1%). The older adults were more utilizing the outpatient services due to asthma (37.7%) followed by heart disease (36.8%), cancer (35.5%), stroke (35.2%), diabetes (33.1%) and hypertension (32.4%). The higher percentage of older adults were using both the inpatient and outpatient services due to stroke (7.8%) and only 2.9% were used due to hypertension. Equal percentage of older adults were used any of the inpatient or outpatient services due to stroke, heart disease and asthma.

**Figure 2: Percentage use of healthcare services by type of chronic NCDs among older adults in India, 2017-18**



### ***Distribution of healthcare services***

Table 2 (a) show the distribution of actual, need-expected and need-standardised use of inpatient care and outpatient care at 95% confidence interval. There was a pro-rich inequality in actual use (Ca-0.034), need-expected use (Cne- 0.015) and need-standardise use (HI-0.019) of inpatient care. In case of outpatient services, there was pro-rich inequality in actual use (Ca-0.639) and need-expected use (Cne-0.645) was observed, but the pro-poor inequality was found in need-standardised use outpatient service (HI: -0.007) and it indicate the greater need of outpatient service for chronic NCDs patients. The pro-rich inequality indicates that the chronic NCDs patients with higher income group used higher service compared to lower income group.

**Table 2 (b)** shows the distribution of actual, need-expected and need-standardised use of both care (inpatient and outpatient care) and any care (either inpatient care or outpatient care). It was found that the pro-poor inequality in actual and need-standardised use of both inpatient and outpatient care, indicate the greater need of both the care for chronic NCDs patients. There was a pro-rich inequality observed for utilization of actual use, need-predicted use and need-standardised use of either inpatient o outpatient care due to chronic NCDs.

**Table 2(a): Distribution of actual, need-expected and need-standardised use of inpatient care (last 365 days) and outpatient care (last 30 days) due to chronic NCDs among older adults across the MPCE quintile in India, 2017-18**

| MPCE quintile | Use of Inpatient care due to chronic NCDs |  |   | Use of Outpatient care due to chronic NCDs |  |   |
|---------------|---|--|---|--|--|---|
|               | Actual (y <sub>i</sub> )                  | Need-expected (y <sub>i</sub> <sup>x</sup> ) | Need-standardised (y <sub>i</sub> <sup>IS</sup> ) | Actual (y <sub>i</sub> )                   | Need-expected (y <sub>i</sub> <sup>x</sup> ) | Need-standardised (y <sub>i</sub> <sup>IS</sup> ) |
| Poorest       | 0.237                                     | 0.237  | 0.279   | 0.180                                      | 0.174  | 0.230   |
| Poorer        | 0.279                                     | 0.273  | 0.285   | 0.207                                      | 0.205  | 0.226   |
| Middle        | 0.281                                     | 0.286  | 0.274   | 0.230                                      | 0.231  | 0.222   |
| Richer        | 0.267                                     | 0.270  | 0.276   | 0.227                                      | 0.229  | 0.222   |
| Richest       | 0.302                                     | 0.300  | 0.281   | 0.259                                      | 0.263  | 0.220   |
| Ca/Cne/HI     | 0.034                                     | 0.015  | 0.019   | <b>0.639</b>                               | <b>0.645</b>                                 | <b>-0.007</b>                                     |

**Source:** Longitudinal Study of Ageing in India (LASI) wave-1, 2017-18

**Note:** Bold values are indicating statistically significant at 95% CI; **Ca**- Concentration index for actual utilization of services; **C<sub>ne</sub>** – Concentration index for need expected services; **HI**- Horizontal inequity for need-standardized services

**Table 2 (b): Distribution of actual, need-expected and need-standardised use of both care and any care due to chronic NCDs among older adults across the MPCE quintile in India, 2017-18**

| MPCE quintile | Use of Both care due to chronic NCDs |  |                   | Use of Any care due to chronic NCDs |  |                   |
|---------------|--------------------------------------|--|-------------------|-------------------------------------|--|-------------------|
|               | Actual (y <sub>i</sub> )             | Need-expected (y <sub>i</sub> <sup>x</sup> ) | Need-standardised | Actual (y <sub>i</sub> )            | Need-expected (y <sub>i</sub> <sup>x</sup> ) | Need-standardised |
| Poorest       | 0.159                                | 0.158  | 0.197             | 0.197                               | 0.192  | 0.250             |
| Poorer        | 0.201                                | 0.203  | 0.194             | 0.226                               | 0.223  | 0.247             |
| Middle        | 0.193                                | 0.196  | 0.193             | 0.247                               | 0.249  | 0.242             |
| Richer        | 0.181                                | 0.179  | 0.198             | 0.246                               | 0.249  | 0.242             |
| Richest       | 0.217                                | 0.216  | 0.197             | 0.285                               | 0.287  | 0.242             |
| Ca/Cne/HI     | -0.007                               | <b>0.046</b>                                 | <b>-0.053</b>     | <b>0.074</b>                        | <b>0.061</b>                                 | <b>0.013</b>      |

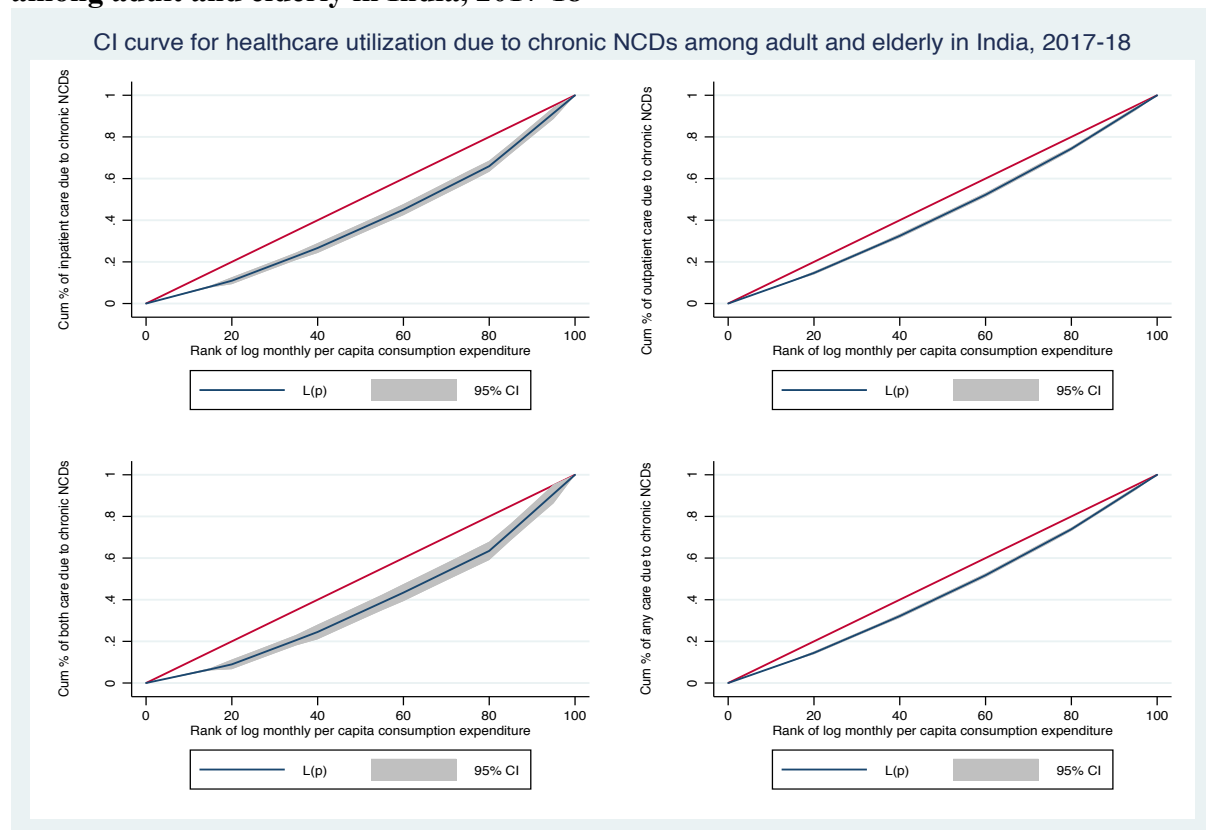
**Source:** Longitudinal Study of Ageing in India (LASI) wave-1, 2017-18

**Note:** **Any care**- use of either inpatient or outpatient service; **Both care**- use of both inpatient and outpatient services; Bold values are indicating statistically significant at 95% CI; **Ca**- Concentration index for actual utilization of services; **C<sub>ne</sub>** – Concentration index for need expected services; **HI**-Horizontal inequity for need-standardized services

**Figure 3** shows the concentration index curve of utilization of inpatient care, outpatient care, both the care and any of the care due to chronic NCDs in India. The concentration curve indicates the pro-rich inequality in use of inpatient care (CI-0.034; SE- 0.051). It indicates that the richer MPCE quintile were using higher inpatient services due to chronic NCDs. Similar pro-rich pattern was observed in utilization of outpatient service (CI- 0.064; SE-0.015 ), and either inpatient or outpatient services (CI-0.074 ; SE-0.020 ), but pro-poor inequality was found for both inpatient and outpatient service (CI: -0.007 ; SE: 0.043 ).



**Figure 3: Concentration Index (CI) curve of healthcare utilization due to chronic NCDs among adult and elderly in India, 2017-18**



**Table 3** shows the predicted probability of utilization of inpatient care, outpatient care, both care and any care due to chronic NCDs among older adults in India. The higher probability of using inpatient care (32.9%, CI- 0.288-0.370), outpatient care (26.8%, CI-0.246-0.290), both inpatient and outpatient care (23%, CI-0.166-0.293) and any of the inpatient or outpatient care (29.3%, 0.272-0.313) was observed among the older adults due to chronic NCDs with age 75 and above. The higher chance of using all type of healthcare services were found among the male older adults compared to female. Similarly, the adults having any difficulty in daily living activities and poor self-rated health were higher chance of using inpatient care, outpatient care, both the care and any of the care. In urban area, there was a higher probability of utilizing the all type of health services compared to older adults reside in rural areas. The increasing probability of using all type of health services with increasing pattern of MPCE quintile (i.e. from poorest to richest MPCE quintile). The older adults with secondary level of education were more chance of utilization of inpatient care (31.3%, CI-0.287-0.340), outpatient care (25.1%, CI-0.238-0.263), both care (23%, CI- 0.187-0.273) and any care (27.3%, CI-0.261-0.285). Further the results indicate that, older adults belong to Muslim, ST, widowed, not currently working, living with spouse and children and not covered with any health insurance were higher probability of using inpatient services due to chronic NCDs. In other hand, the adults belong to OBC category, widowed, never worked, living with spouse and others and covered with a health insurance were more prone to utilizing the outpatient services. Similar pattern was observed in both the care and any of care as of outpatient care.

**Table 3: Predicted probability of utilizing healthcare services due to chronic NCDs among older adults in India, 2017-18**

| Socioeconomic variables                 | Inpatient care |             | Outpatient care |             | Both care      |              | Any care       |             |
|---|----------------|-------------|-----------------|-------------|----------------|--------------|----------------|-------------|
|   | predicted prob | 95% CI      | predicted prob  | 95% CI      | predicted prob | 95% CI       | predicted prob | 95% CI      |
| <i>Need variables</i>                   |                |             |                 |             |                |              |                |             |
| <i>Age</i>                              |                |             |                 |             |                |              |                |             |
| <44                                     | 0.155***       | 0.111-0.199 | 0.132***        | 0.114-0.151 | 0.132***       | 0.063-0.202  | 0.144***       | 0.126-0.162 |
| 45-49                                   | 0.229***       | 0.196-0.262 | 0.171***        | 0.157-0.186 | 0.178***       | 0.123-0.234  | 0.189***       | 0.176-0.203 |
| 50-54                                   | 0.250***       | 0.214-0.285 | 0.205***        | 0.189-0.22  | 0.168***       | 0.115-0.22   | 0.224***       | 0.209-0.239 |
| 55-59                                   | 0.297***       | 0.262-0.332 | 0.232***        | 0.216-0.249 | 0.238***       | 0.178-0.297  | 0.253***       | 0.237-0.268 |
| 60-64                                   | 0.289***       | 0.257-0.321 | 0.250***        | 0.234-0.266 | 0.204***       | 0.154-0.253  | 0.268***       | 0.253-0.283 |
| 65-69                                   | 0.298***       | 0.264-0.332 | 0.256***        | 0.239-0.273 | 0.175***       | 0.125-0.224  | 0.277***       | 0.261-0.293 |
| 70-74                                   | 0.324***       | 0.283-0.366 | 0.265***        | 0.244-0.286 | 0.209***       | 0.149-0.269  | 0.290***       | 0.270-0.31  |
| 75+                                     | 0.329***       | 0.288-0.37  | 0.268***        | 0.246-0.29  | 0.230***       | 0.166-0.293  | 0.293***       | 0.272-0.313 |
| <i>Sex</i>                              |                |             |                 |             |                |              |                |             |
| Male                                    | 0.298***       | 0.275-0.321 | 0.234***        | 0.223-0.245 | 0.195***       | 0.159-0.23   | 0.258***       | 0.247-0.269 |
| Female                                  | 0.262***       | 0.243-0.282 | 0.217***        | 0.208-0.225 | 0.195***       | 0.166-0.225  | 0.235***       | 0.226-0.243 |
| <i>Difficulty with Daily activities</i> |                |             |                 |             |                |              |                |             |
| No                                      | 0.277***       | 0.259-0.296 | 0.219***        | 0.211-0.227 | 0.194***       | 0.164-0.225  | 0.239***       | 0.232-0.247 |
| Yes                                     | 0.280***       | 0.261-0.299 | 0.230***        | 0.220-0.239 | 0.196***       | 0.169-0.223  | 0.251***       | 0.242-0.26  |
| <i>Self-rated health (SRH)</i>          |                |             |                 |             |                |              |                |             |
| Excellent                               | 0.178***       | 0.098-0.259 | 0.114***        | 0.085-0.142 | 0.112***       | -0.027-0.252 | 0.130***       | 0.101-0.158 |
| Very good                               | 0.215***       | 0.180-0.249 | 0.147***        | 0.133-0.16  | 0.136***       | 0.078-0.194  | 0.166***       | 0.153-0.18  |
| Good                                    | 0.234***       | 0.210-0.257 | 0.199***        | 0.189-0.209 | 0.149***       | 0.111-0.187  | 0.214***       | 0.205-0.224 |
| Fair                                    | 0.280***       | 0.259-0.301 | 0.253***        | 0.243-0.264 | 0.197***       | 0.165-0.229  | 0.270***       | 0.260-0.28  |
| Poor                                    | 0.366***       | 0.337-0.394 | 0.293***        | 0.277-0.31  | 0.245***       | 0.206-0.284  | 0.328***       | 0.313-0.343 |
| <i>Non-need variables</i>               |                |             |                 |             |                |              |                |             |
| <i>Place of residence</i>               |                |             |                 |             |                |              |                |             |
| Rural                                   | 0.255***       | 0.240-0.271 | 0.193***        | 0.185-0.2   | 0.179***       | 0.155-0.203  | 0.212***       | 0.205-0.219 |
| Urban                                   | 0.319***       | 0.297-0.342 | 0.279***        | 0.268-0.29  | 0.225***       | 0.189-0.262  | 0.301***       | 0.291-0.312 |
| <i>MPCE quintile</i>                    |                |             |                 |             |                |              |                |             |
| Poorest                                 | 0.231***       | 0.198-0.265 | 0.181***        | 0.167-0.195 | 0.153***       | 0.099-0.206  | 0.196***       | 0.183-0.21  |
| poorer                                  | 0.267***       | 0.236-0.298 | 0.210***        | 0.197-0.224 | 0.199***       | 0.148-0.25   | 0.226***       | 0.214-0.239 |
| Middle                                  | 0.287***       | 0.257-0.316 | 0.232***        | 0.218-0.245 | 0.197***       | 0.151-0.244  | 0.250***       | 0.237-0.262 |
| Richer                                  | 0.268***       | 0.242-0.295 | 0.227***        | 0.214-0.239 | 0.178***       | 0.138-0.218  | 0.247***       | 0.236-0.259 |
| Richest                                 | 0.307***       | 0.283-0.33  | 0.253***        | 0.240-0.266 | 0.218***       | 0.182-0.255  | 0.281***       | 0.268-0.293 |
| <i>Level of education</i>               |                |             |                 |             |                |              |                |             |
| No education                            | 0.260***       | 0.240-0.28  | 0.196***        | 0.187-0.205 | 0.197***       | 0.164-0.229  | 0.216***       | 0.207-0.224 |

|   |          |             |          |             |          |             |          |             |
|---|----------|-------------|----------|-------------|----------|-------------|----------|-------------|
| Primary                                 | 0.288*** | 0.253-0.322 | 0.224*** | 0.207-0.241 | 0.183*** | 0.134-0.233 | 0.250*** | 0.233-0.266 |
| Secondary                               | 0.313*** | 0.287-0.34  | 0.251*** | 0.238-0.263 | 0.230*** | 0.187-0.273 | 0.273*** | 0.261-0.285 |
| Higher secondary                        | 0.271*** | 0.239-0.303 | 0.255*** | 0.240-0.271 | 0.152*** | 0.106-0.198 | 0.272*** | 0.257-0.287 |
| <b>Religion</b>                         |          |             |          |             |          |             |          |             |
| Hindu                                   | 0.271*** | 0.257-0.286 | 0.210*** | 0.204-0.217 | 0.186*** | 0.163-0.208 | 0.231*** | 0.225-0.238 |
| Muslim                                  | 0.323*** | 0.285-0.361 | 0.245*** | 0.228-0.262 | 0.218*** | 0.163-0.274 | 0.274*** | 0.258-0.29  |
| Christian                               | 0.265*** | 0.219-0.311 | 0.261*** | 0.233-0.29  | 0.249*** | 0.151-0.348 | 0.266*** | 0.241-0.291 |
| Others                                  | 0.301*** | 0.240-0.362 | 0.293*** | 0.268-0.318 | 0.210*** | 0.125-0.296 | 0.307*** | 0.283-0.331 |
| <b>Caste</b>                            |          |             |          |             |          |             |          |             |
| SC                                      | 0.299*** | 0.267-0.331 | 0.221*** | 0.207-0.236 | 0.206*** | 0.156-0.255 | 0.246*** | 0.232-0.259 |
| ST                                      | 0.292*** | 0.255-0.33  | 0.198*** | 0.179-0.217 | 0.209*** | 0.142-0.275 | 0.231*** | 0.213-0.249 |
| OBC                                     | 0.259*** | 0.239-0.279 | 0.236*** | 0.226-0.246 | 0.172*** | 0.142-0.202 | 0.252*** | 0.243-0.262 |
| Others                                  | 0.286*** | 0.262-0.309 | 0.218*** | 0.207-0.228 | 0.214*** | 0.177-0.25  | 0.238*** | 0.228-0.248 |
| <b>Marital status</b>                   |          |             |          |             |          |             |          |             |
| Currently married                       | 0.263*** | 0.228-0.299 | 0.216*** | 0.201-0.231 | 0.160*** | 0.119-0.202 | 0.238*** | 0.223-0.253 |
| Widowed                                 | 0.328*** | 0.214-0.442 | 0.248*** | 0.204-0.292 | 0.345*** | 0.074-0.617 | 0.266*** | 0.224-0.307 |
| Others                                  | 0.305*** | 0.167-0.444 | 0.219*** | 0.167-0.271 | 0.380*** | 0.062-0.698 | 0.233*** | 0.183-0.283 |
| <b>Working status</b>                   |          |             |          |             |          |             |          |             |
| Currently working                       | 0.240*** | 0.218-0.263 | 0.184*** | 0.174-0.194 | 0.170*** | 0.134-0.206 | 0.202*** | 0.193-0.212 |
| Not currently working                   | 0.314*** | 0.292-0.336 | 0.244*** | 0.232-0.256 | 0.205*** | 0.172-0.237 | 0.273*** | 0.262-0.284 |
| Never worked                            | 0.274*** | 0.246-0.302 | 0.254*** | 0.241-0.267 | 0.209*** | 0.164-0.254 | 0.268*** | 0.255-0.28  |
| <b>Living arrangement</b>               |          |             |          |             |          |             |          |             |
| Living alone                            | 0.208*** | 0.113-0.303 | 0.205*** | 0.161-0.249 | 0.077*** | -0.007-0.16 | 0.220*** | 0.177-0.262 |
| Living with spouse and others           | 0.273*** | 0.224-0.321 | 0.238*** | 0.216-0.261 | 0.255*** | 0.150-0.359 | 0.250*** | 0.230-0.271 |
| Living with spouse and children         | 0.288*** | 0.247-0.33  | 0.230*** | 0.213-0.248 | 0.241*** | 0.147-0.335 | 0.250*** | 0.234-0.266 |
| Living with children and others         | 0.273*** | 0.175-0.372 | 0.203*** | 0.167-0.24  | 0.118*** | 0.014-0.222 | 0.231*** | 0.194-0.268 |
| <b>Covered health insurance schemes</b> |          |             |          |             |          |             |          |             |
| No                                      | 0.281*** | 0.267-0.296 | 0.221    | 0.214-0.227 | 0.197*** | 0.174-0.219 | 0.241*** | 0.235-0.248 |
| Yes                                     | 0.272*** | 0.247-0.296 | 0.235    | 0.222-0.247 | 0.191*** | 0.153-0.229 | 0.254*** | 0.242-0.266 |

**Source:** Longitudinal Study of Ageing in India (LASI) wave-1, 2017-18

**Note:** Any care- use of either inpatient or outpatient service; **Both care-** use of both inpatient and outpatient services

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

All predictors at their mean value

## **Discussion and conclusion**

The significant inequality in use of health services was observed among the older adults with chronic NCDs. The outpatient service was found much significant in actual utilization compared to inpatient services. The adults having chronic NCDs were found more utilization of any of inpatient or outpatient service rather than both services. With the above robust analysis in utilization of type of health services, the followings are silent findings,

**First**, In India, due to chronic NCDs about 28% using inpatient care, 45.5% using outpatient care, 38.8% using both inpatient and outpatient care and 47.9% using either inpatient and outpatient care. **Second**, the male older adults with aged 75 and above, difficulty in daily living activities, resided in urban areas, richest MPCE quintile, not currently working, Muslim not covered with any health insurance were higher percentage of using all type of health care services due to chronic NCDs. **Third**, higher percentage of older adults were using inpatient care due to stroke (21.1%), whereas utilizing the outpatient services due to asthma (37.7%), and higher percentage of older adults were using both the inpatient and outpatient services due to stroke (7.8%). **Fourth**, the pro-rich inequality indicates that the chronic NCDs patients with higher income group used higher service compared to lower income group and it was found that the greater need of outpatient service for chronic NCDs patients. Further, there was a pro-rich inequality observed for utilization of actual use, need-predicted use and need-standardised use of either inpatient or outpatient care due to chronic NCDs. **Fifth**, the concentration curve indicates the pro-rich inequality in use of all type of healthcare services due to chronic NCDs. **Sixth**, the higher probability of using inpatient care due to chronic NCDs was found among older adults with aged 75 and above, male, having difficulty in daily living activities, reside in urban area, belong to richest MPCE quintile, widowed and not covered with health insurance. Further a similar pattern of higher chance of using outpatient services, both inpatient and outpatient care and any of the care was observed.

There is a strong pro-rich inequality of use of health service in Indian people with chronic NCDs. As the population ageing, the elderly is more vulnerable in terms of morbidity, seeking healthcare services, and health outcomes. The health insurance schemes are inadequate by the individuals. So it should be strengthening the healthcare insurance sector and also the reduce the poverty level, as it is a financial barrier to any individuals for seeking good treatment and spending more on health.

**List of Abbreviation:**

NCDs- Non-communicable disease

LASI- Longitudinal ageing study in India

MPCE- Monthly per capita consumption expenditure

ICPD- International conference on population development

MDG- Millennium development goals

SDG- Sustainable development goal

UHC- Universal health coverage

PHC- Primary health centres

CHC- Community health centres

WHO- World health organization

CI- Concentration index

CI- confidence interval

SC- Schedule caste

ST- Schedule tribe

OBC- Other backward class

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