



Catastrophic health spending among older adults in India: Role of multiple deprivation

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ABSTRACT

Background: Previous studies have assessed catastrophic health spending (CHS) is high among households with older member, but no studies have examined its association with multiple deprivation. The purpose of this study is to compare the incidence and determinants of CHS between multiple deprived and non-deprived households in India.

Methods: Data for this paper was obtained from the 75th round of the National Sample Survey (NSS), a cross-sectional household survey conducted in 2017-18. The multiple deprivation index was estimated using Alkire and Foster method while CHS was estimated using the capacity to pay approach. Logistic regression analysis was used to identify the determinants of CHS in both types of households.

Results: The study found 43% of households with an older member were deprived in multiple dimensions. We found the incidence of CHS was 19% among households with an older adults; 22% among multiple deprived and 16% among the multiple non-deprived older adult households. Regression analysis result suggest that the odds ratio of incurring CHS was 1.84 ($p < 0.001$) for the deprived older adult households than that of non-deprived households. Apart from multiple deprivation, any member being hospitalized or any member suffering from chronic diseases significantly associated with CHS in both type of households.

Conclusion: This study established the higher financial catastrophes among the deprived older adult households. Therefore, there is an utmost need for the government and policymakers to focus on multiple aspects of geriatric wellbeing at one hand and improving financial mechanisms to reduce the CHS at other hand.

1. Introduction

Deprivation among the aged population and its implication on households is a global concern due to the unprecedented rise in geriatric population. Old age is a period of many vulnerabilities, falling health, withdrawal/retirement from the workforce, no/reduced income, increasing health expenditure, and social isolation [1–4]. The older-adults are also vulnerable on alternative fronts such as social conditions, including compromised socioeconomic status, social support, social network, and engagement [5–7]. These emerging concerns in the course of developmental transition warrant policy attention. Hence, an assessment of deprivation among older population and its implication on household become more pertinent.

Health care expenditure also has a strong age gradient due to the deterioration of health status and the need for essential health services.

In many developing countries, these expenditures are mostly from households out of pocket due to lower financial risk management [8–11]. Given this reliance on out-of-pocket expenditure (OOPE) for health care cost, many households are experiencing catastrophic health spending (CHS) and impoverishment [12–15]. Recent global literature showed the evidence that, 810 million households were incurred CHS and 131 million of them were pushed into poverty. Out of these, 90% of households were from the developing nations [10].

Older population in India have increased their count in both absolute term as well as relative share. According to the 2011 census, the older adults accounted for 8% of the total population of India [16]. Rising share of older adults has put a challenge on morbidity, mortality, health care utilization, and health care spending [13,17–19]. Studies have established that the aged population in India have a high rate of non-communicable diseases (NCDs) and poor self-rated health that need

Abbreviations: OOPE, out of pocket expenditure; CHS, catastrophic health spending; CTP, capacity to pay; NCD, Non-communicable disease.

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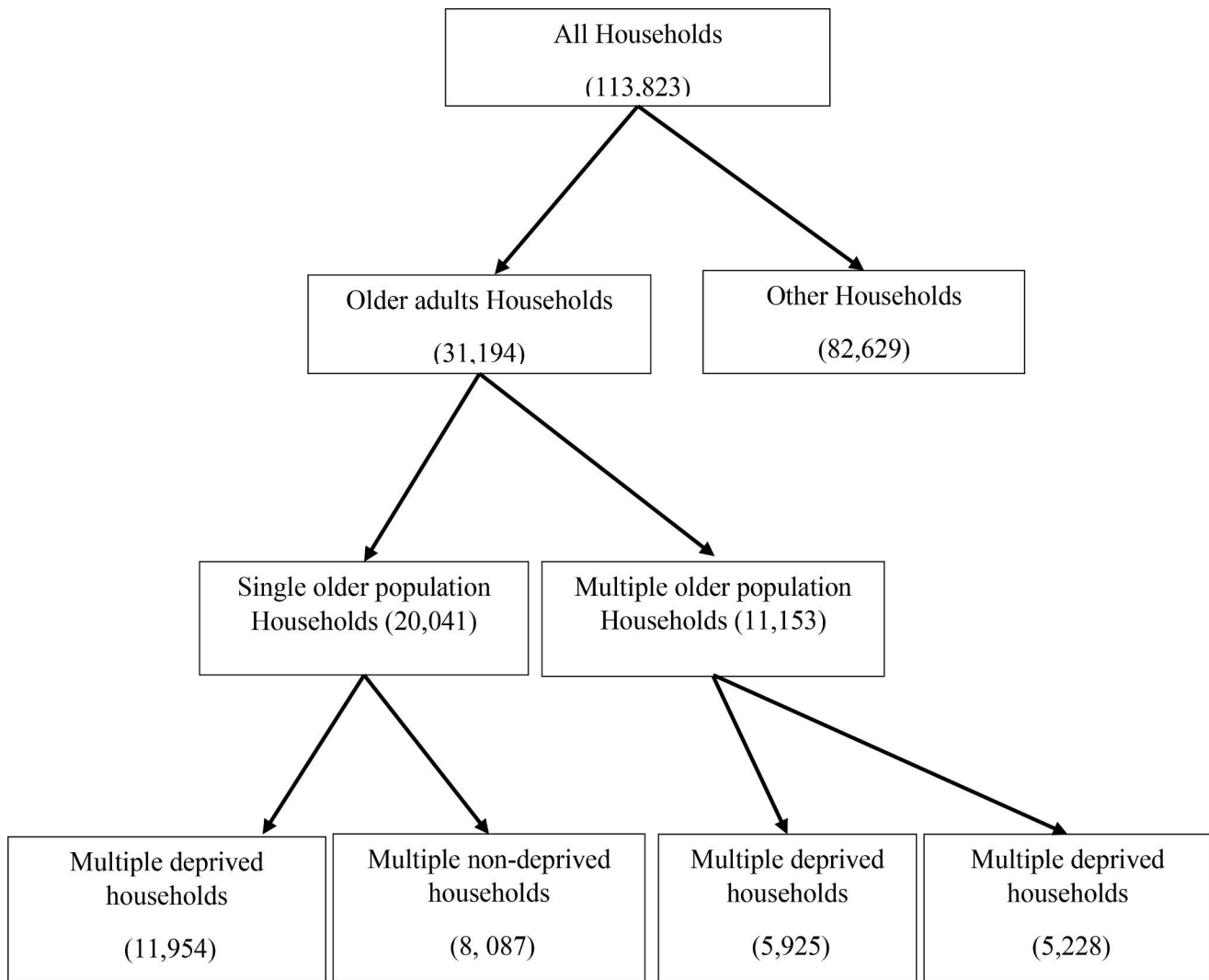


Fig. 1. Schematic presentation of multidimensional poor and non-poor older adults households in India, 2017-18.

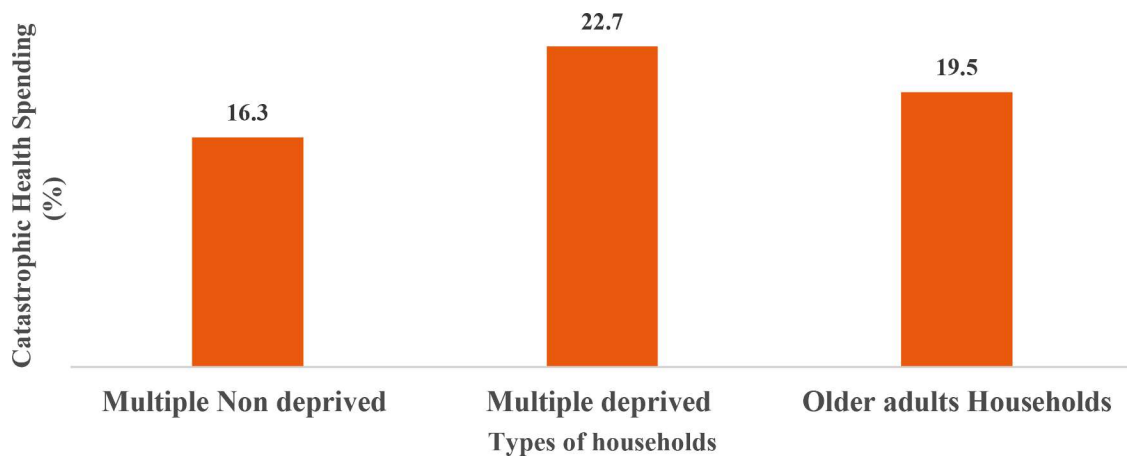


Fig. 2. Incidence of catastrophic health spending by multiple deprived and non-deprived older households in India.

more formal and informal care [17,18]. Two-thirds of aged population in India were suffered from at least one of NCDs and half of them experienced multiple morbidities [20]. Moreover a sizable share reported some or the other form of disability or functional limitation [17, 21]. Consequently, the rate of hospitalization and per capita health

spending remained high in older age group as compared to younger [22–24]. With the higher individual cost of health care with lower financial mechanisms, many households in India incurred CHS and were pushed into poverty [25,26]. It was also found that due to consequent economic inequality, poor families have a higher chance of CHS and

Table 1
Descriptive statistics of sample older adult households by multiple deprivations and socio-economic background characteristics in India.

Background Characteristics	Multiple Non-deprived households (%)	Multiple-deprived households (%)	Older adult Households (%)
Place of Residence			
Rural	51.9	82.6	67.1
Urban	48.1	17.5	32.9
MPCE Quintile			
Poorest	8.2	25.3	16.6
Poorer	17.4	20.6	19.0
Middle	19.3	17.1	18.2
Richer	22.7	17.6	20.2
Richest	32.5	19.3	26.0
Religion			
Hindu	82.3	84.2	83.3
Muslim	10.4	11.4	10.9
Other	7.3	4.4	5.9
Caste			
Scheduled Tribe	3.8	8.9	6.3
Scheduled Caste	13.7	21.6	17.6
Other Backward Class	41.9	44.0	43.0
Other	40.6	25.6	33.2
Any member of households have chronic diseases			
No	80.0	84.2	82.1
Yes	20.0	15.8	17.9
Any member of households hospitalized			
No	93.7	94.1	93.9
Yes	6.3	5.9	6.1
Mean household size	5.0	4.9	5.0
Total number of Households	17879	13315	31194

*MPCE: Monthly per capita consumption expenditure.

Table 2
Distribution of out-of-pocket expenditure and capacity to pay for healthcare across older adult households by multiple deprivations in India, 2017-18.

Indicators	Multiple Non-deprived households	Multiple-deprived households	Older adult Households
Average OPE* (in INR)			
Mean	2927	2458	2701
Median	1397	1010	1200
Average MPCE (in INR)			
Mean	3090	2010	2570
Median	2500	1600	2000
Average CTP (in INR)			
Mean	9247	4927	7166
Median	6828	3447	5085
OPE as a share of CTP	31.7	49.9	37.7

Note: MPCE: Monthly per capita consumption expenditure CTP: Capacity to pay OPE: out of pocket expenditure INR: Indian National Rupees 100 INR = 1.57 US\$ (according to the current exchange price on December 1, 2018). There is a statistically significant difference for the mean OOP cost of health across different types of older adults households ($F = 11.38, p < 0.001$).

impoverishment [13,24,27].

There were studies that, estimated OPE and CHS in Indian households, however, few of them were specific to aged households [22,28], and no attempt was made towards an assessment of CHS associating deprivation among the older population. This paper is based on two

Table 3
Incidence of catastrophic health spending for healthcare across multiple deprived and non-deprived older adult households by socioeconomic background characteristics in India,2017-18.

Background Characteristics	Multiple Non-deprived households (%)	Multiple deprived households (%)	Older adult Households (%)
Place of Residence			
Rural	17.2	22.0	20.1
Urban	15.3	26.1	18.1
MPCE Quintile			
Poorest	29.4	34.1	32.9
Poorer	20.5	22.4	21.5
Middle	18.2	19.8	19.0
Richer	14.1	15.4	14.7
Richest	11.1	17.6	13.5
Religion			
Hindu	15.9	22.0	19.0
Muslim	16.7	26.4	21.8
other	19.6	26.9	22.3
Caste			
Scheduled Tribe	11.7	22.2	19.0
Scheduled Caste	17.8	23.7	21.4
Other Backward Class	16.0	22.7	19.4
Other	16.4	22.1	18.6
Any member of households suffered from chronic diseases			
No	11.5	18.1	14.9
Yes	35.3	47.5	40.7
Any member of households hospitalized			
No	14.4	20.6	17.5
Yes	44.6	56.9	50.5

*MPCE: Monthly per capita consumption expenditure.

specific objectives. First, it compares CHS between multiple deprived and non-deprived older adult households in India. Secondly, it identifies the determinants for CHS and its association with multiple deprivations among households in India.

2. Methods

2.1. Data

The unit-level data from the social consumption on health survey (75th round) collected in 2017-18, was used for the analysis. The survey was conducted by National sample survey office (NSSO) in aegis of the Ministry of Statistics and Program Implementation (MoSPI), from July 2017 to June 2018, across all the states and union territories of India. The study collected information from 113,823 households and 555,115 individuals from representative samples from all districts of India. Households were selected using multistage random sample procedure from 8077 villages in rural areas and 6081 from urban areas. The survey provides the information on morbidity, aliment, expenditure on health care, the role of the public and private sector, health financing, insurance coverage, maternal care expenditure, immunization, and the information about the aged, etc. Information about the questionnaire, sample design, sample weight were found elsewhere [29].

2.2. Outcome variable

The outcome variable for the analysis is CHS, one of the widely used indicator of health financing [30]. Though there are various methods for estimation of CHS, we have used the capacity to pay (CTP) methods proposed by Ke Xu, in the current study. OPE of the household is the sum of OPE for inpatient care, outpatient care, childbirth and other health-related expenditures (i.e., Antenatal care, Postnatal care,

Table 4
Socioeconomic correlates of catastrophic health spending among older adult households in India, 2017-18.

Background Characteristics	Odds Ratio	95% Confidence interval	Odds Ratio	95% Confidence interval
Types of households				
Multiple non-deprived (Ref)				
Multiple deprived	1.71***	1.63-1.79	1.84***	1.75-1.94
Household Size				
Number of older persons in household				
Single (Ref)				
More than one			1.01	0.96-1.07
Sex of the household head				
Male (Ref)				
Female			0.99	0.92-1.07
Place of residence				
Rural (Ref)				
Urban			0.87***	0.82-0.92
Any member suffered from chronic disease				
No (Ref)				
Yes			3.70***	3.45-3.97
Any member hospitalized (in last 365 days)				
No (Ref)				
Yes			2.87***	2.73-3.03
Religion				
Hindu (Ref)				
Muslim			0.98	0.90-1.06
Other			0.83***	0.76-0.91
Caste				
Scheduled Tribe (Ref)				
Scheduled Caste			1.17***	1.05-1.31
Other Backward Class			1.38***	1.24-1.52
Other			1.10*	1.00-1.22
Constant	0.41***	0.40-0.43	0.10***	0.09-0.11

Ref: reference category *** if $p < 0.01$ ** if $p < 0.05$ * if $p < 0.10$ MPCE: Monthly per capita consumption expenditure

Immunization) for a reference period of 30 days. Many literatures used the equivalent food expenditure of the household as the subsistence expenditure. However due unavailability of the food expenditure, we used the state-specific poverty line, separately for rural and urban areas, estimated by the Rangarajan committee report and adjusted for the 2017-18 constant price. The adjusted poverty line multiplied with the equivalent size of the households is called subsistence expenditure for the current study. Capacity to pay of the h^{th} household is:

$$CTP_h = EXP_h - SE_h$$

$$(SE_h) = \text{povertyline} \times eqsize_h$$

$$\text{Where } eqsize_h = hsize_h^{0.56}$$

The CHS is defined as

$$CHS_h = OPE_h / (X_h - f(X)) = z$$

Where X_h is the consumption expenditure of h th household and $f(X)$ is the subsistence expenditure. CTP_h denotes capacity to pay of h th household, EXP_h is the total consumption expenditure of the h th household, SE_h represents the subsistence expenditure of the h th household, $eqsize_h$ is the equivalent size of the h th household. The cut-off point of z is normative and usually taken as 40% in the literature.

2.3. Independent variables

The set of covariates were deprivation of the households, place of

Table 5
Socioeconomic correlates of catastrophic health spending among deprived and non-deprived older adult households in India, 2017-18.

Background Characteristics	Multiple non-deprived households		Multiple deprived households	
	AOR	95% Confidence interval	AOR	95% Confidence interval
Household Size	0.95***	0.94-0.97	0.99	0.98-1.01
Number of older persons in households				
Single (Ref)				
More than one	0.99	0.92-1.07	1.03	0.95-1.12
Sex of the household head				
Male (Ref)				
Female	0.96	0.86-1.07	1.04	0.94-1.16
Place of residence				
Rural (Ref)				
Urban	0.76***	0.71-0.82	1.04	0.95-1.12
Any member suffered from chronic disease				
No (Ref)				
Yes	4.08***	3.67-4.52	3.40***	3.09-3.74
Any member hospitalized (in last 365 days)				
No (Ref)				
Yes	3.10***	2.89-3.33	2.58***	2.38-2.8
Religion				
Hindu (Ref)				
Muslim	1.02	0.91-1.14	0.95	0.85-1.06
other	0.80***	0.71-0.90	0.89	0.78-1.02
Caste				
Schedule Tribe (Ref)				
Scheduled Caste	1.34***	1.12-1.60	1.07	0.92-1.23
Other Backward Class	1.53***	1.31-1.80	1.27***	1.11-1.45
Others	1.28***	1.09-1.49	0.97	0.85-1.11
Constant	0.09		0.18	

(Ref) Reference category *** if $p < 0.01$ ** if $p < 0.05$ * if $p < 0.10$ MPCE: Monthly per capita consumption expenditure

residence, household size, sex of head of the household, religion, caste, any member of household suffering from chronic ailment, any member hospitalized in last 365 days. The inclusion of these variables in the analyses were based on the literature and the availability of data. The deprived and non-deprived households were generated from the individual multiple deprivation index (MDI) of the older adults. The MDI of the study respondents were calculated from the set of nine indicators from the four dimensions such as social, economic, health, and household environment. The study used the Alkire and Foster method to calculate the MDI. The detailed calculation, indicators used, and weight were presented in **Appendix 1**. As the unit of analysis for the estimation of CHS is the "household", we converted the individual information of the respondents to the household level. The study defined the households to be multiple deprived if at least one older adult in the household was multiple deprived. The detailed distribution of households was presented in **Fig. 1**. The religion of the household was categorized as Hindu, Muslim, Christian, and others. Two household-level variables such as any household member with chronic diseases, and any household member hospitalized in the last 365 days were created.

2.4. Logistic regression

The binary logistic regression analysis was applied to locate household-level correlates of CHS in India. The dependent variable is binary i.e., "1" for the older adult households who have experienced CHS and "0" for the older adult households who have not experienced CHS. To understand the impact of multiple deprivations on the CHS,

both adjusted and unadjusted effect was shown. A separate analysis was made for multiple deprived and non-deprived older adult households. The results of the logistic regression were presented as the adjusted odds ratio (AOR) as controlled for all other confounding variables. The Pearson chi-square, as well as *F*-adjusted test statistic, were used to test the goodness of fit of the model. The whole analyses were carried out using the STATA 15 software [31].

3. Results

Complete data were analysed for the 31,194 households with an older member, of which 43% were deprived households. The rural and urban share in non-deprived households were same, while 83% deprived households were from rural areas. Around 67% of households reported one or more members suffering from NCD, while 18% of older adult households had one or more members hospitalised in last 365 days.

Mean annual OOPE of household with an older member was INR 2701; INR 2927 among non-deprived households and INR 2458 among deprived households. Mean household OOPE was accounting for 38% of the mean household capacity to pay; (32%, non-deprived households and 50% in deprived households) (Table 2).

The incidence of CHS was higher among the multiple deprived households than that of multiple non-deprived households in India (Fig. 2). Some 19% of the older adult households incurred CHS; 22% among the multiple deprived households and 16% among the multiple non-deprived households. An assessment of CHS among the multiple deprived and non-deprived households are presented in Table 3. The socioeconomic inequality in CHS was observed, with higher proportion of poorest households incurring CHS compared to the richest households. However, the extent of CHS was higher in multiple deprived households compared to non-deprived households.

Table 4 presents the adjusted odds ratio and 95% confidence interval of CHS which provides a comprehensive understanding of the determinant of CHS among the study households =. It was found that, the households with at least one deprived older adults were 84% higher likely to incur CHS compared to non-deprived households (71% in unadjusted model). Any person in the household hospitalized in last 365 days and any person in a household suffering from NCDs in last 365 days showed significantly higher association with CHS. The pattern remained similar for the non-deprived and deprived households (Table 5). Any person in a household suffering from NCDs in last 365 days was 3.7 times higher likely to incur CHS compared to non-NCD households. Non-deprived households from urban areas were less likely to experience CHS compared to rural households. Among the caste category, the odds ratio of incurring CHS was found higher for the general and OBC, compared to the scheduled tribe population.

4. Discussion

This study is a unique attempt to understand the current state of deprivation among the older adults in India and its impact on the household's financial mechanism. Beyond an assessment of multidimensional deprivation among the older adults, this study offers detailed evidence on OOPE and the incidence of CHS in India. The observed magnitude of CHS on households with older member served as a basis for framing protection measures of health care costs during later ages. The detailed findings of the study and its potential implications are described below.

First, the study established slightly higher than one-fourth (28%) of households in India have an older adults, of which, 43% were multiple deprived. The magnitude of multiple deprived households in India is a matter of concern given the prospect of the rising intensity of older adult count in the future. With the unprecedented rise of the older population in India, there is pressure on the government for better care. Though there are some initiatives by the government to address the domain of geriatric health and its financing through various policies and programs,

that remained far from sufficient. However, the welfare of the older depends on a range of issues including health care, economic stability, living arrangement, and standard of living.

Second, the study found one in five (19%) households with aged member in India were incurred CHS in 2017-18. A recent study estimated that 30% of households with an older member incurred CHS in 2014. Another study using the data from study on global ageing and adult health survey found that 7% of households incurred CHS in 2007-08 in India [13]. But this study applied the ratio method to estimate CHS in India [28]. The difference in estimated value of CHS were due to the use of methodology and types of thresholds. The increase in CHS among the older adults, may be due to the increase in the burden of disease, higher use of private health care facilities, changes in health care cost, and lower insurance coverage [15,32-38].

Third, we found multiple deprived households were more likely to experience CHS than that of non-deprived households. This is not surprising because older members of deprived households were poorer in health, education, household environment, and economic dimensions. Previous studies have observed that the poor households, those living alone, higher economic dependency and poor self-reported health along were higher chance hospitalization [22,39,40]. As a composite of all these dimensions, the households with multiple deprived aged population were expected to live in poor health and experiencing CHS and impoverishment [28,32]. This reaffirms the vulnerability of the aged in one hand and its implication towards the consequential CHS, which might discourage health care utilization to a lot of extent among the aged. Similar with previous studies, our results also found that any member of the households suffering from NCDs or hospitalized in last 365 days were more likely to incur CHS [34,38,41,42]. However, the burden of NCDs, multi-morbidities and hospitalization were higher among the older adults as compared to other age groups [22,43]. So, it has an implication to understand the economic burden of the rising non-communicable disease and to provide better social and financial protection.

This study is subject to some potential limitations. First, data on expenditure and reimbursement, and household consumption expenditure were self-reported and may be subject to measurement errors, such as recall bias, etc. Second, the data for expenditure and reimbursement were provided for each spell of hospitalization or outpatient visit of the analysis which included the nature of ailment and the health care facility. As the level of analysis for the current study is the households, it is difficult to include disease or facility as a covariate. Third, the data used in this study was available from a cross-sectional survey, that cannot be used to conduct analyses of causality.

5. Conclusion

This study showed the incidence of CHS is high among multiple deprived households in India as compared to non-deprived households. This finding has two major implication. At one hand there is a need of reduction of deprivation and in other hand provision of financial assistance for the aged population. As multiple deprivation is the construct of many aspects, the government must provide multi-facet assistance for the reduction of multiple deprivations. Secondly, a financial mechanism system should be strengthened to reduce the CHS among vulnerable households. Lastly, countries across the world have committed to achieving universal health coverage by 2030 as a part of the sustainable development goals. To address the challenges facing older adults, it is imperative for the government, policymakers, households, and other stakeholders to take a population health approach and prepare the plan of health financing (Table 1).

Declarations

Ethics approval and consent to participate

As the survey is based on secondary data and available in the public domain. No formal ethics approval was required in this particular case.

Consent for publications

Not Applicable.

Availability of data and material

We have provided details of data in the methodology section. The corresponding authors have the original data used for research purposes.

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CRedit authorship contribution statement

Basant Kumar Panda: Visualization, Formal analysis, Writing – original draft, Writing – review & editing. **Sanjay K. Mohanty:** Conceptualization, Visualization, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary materials

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