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Explaining Caste-Based Disparities in Enrollment for National Health Insurance Program in India: a Decomposition Analysis

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Abstract

Background Caste plays a significant role in individual healthcare access and health outcomes in India. Discrimination against low-caste communities contributes to their poverty and poor health outcomes. The Rashtriya Swasthya Bima Yojana (RSBY), a national health insurance program, was created to improve healthcare access for the poor. This study accounts for caste-based disparities in RSBY enrollment in India by decomposing the contributions of relevant factors.

Methods Using the data from the 2015–2016 round of the National Family Health Survey, we compare RSBY enrollment rates of low-caste and high-caste households. We use a non-linear extension of Oaxaca-Blinder decomposition and estimate two models by pooling coefficients across the comparison groups and all caste groups. Enrollment differentials are decomposed into individual- and household-level characteristics, media access, and state-level fixed effects, allowing 2000 replications and random ordering of variables.

Results The analysis of 480,766 households show that scheduled tribe households have the highest enrollment (18.85%), followed by 14.13% for scheduled caste, 10.67% for other backward caste, and 9.33% for high caste. Household factors, family head's characteristics, media access, and state-level fixed effects account for a 32% to 52% gap in enrollment. More specifically, the enrollment gaps are attributable to differences in wealth status, educational attainment, residence, family size, dependency ratio, media access, and occupational activities of the households.

Conclusions Weaker socio-economic status of low-caste households explains their high RSBY enrollments.

Keywords Caste · RSBY · Health Disparities · Decomposition · India

Background

Problem Statement

Health insurance is a critical tool to provide financial protection against rising healthcare costs, especially for the poor. However, insurance as a healthcare financing option was not available to India's poor until 2000s. The history of health insurance programs in India dates back to 1948 when Employee State Insurance Scheme (ESIS) was initiated for the factory workers [1]. Subsequently, the Central Government Health Scheme (CGHS), a health insurance program for central government employees, was launched in 1954 [2]. Private health insurance was introduced [3] in the 1980s and was opened to foreign investments in 1999 [4]. However, the private health insurance plans reached only 5% of the population by 2010 [3]. Community-based health insurance (CBHI) programs were launched in 2000s, covering only 5–6 million individuals [5].

In India, health expenditure is largely out-of-pocket (OOPE). In 2004–2005, the OOPE on health accounted for 71.73% of the annual health expenditure in India [6], one of the highest in the world [7–9]. During this time, about 14% of rural and 12% of urban households spent more than 10% of their total annual expenditure on health [3], contributing to approximately 39 million people

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being pushed into poverty [10]. The increasing public pressure to curb healthcare costs prompted central and state governments to experiment with healthcare financing [3]. Several federal and state health insurance programs targeting the poor were introduced in 2000s, which resulted in a significant increase in insurance coverage, from 4.9% in 2005–2006 [11] to 28.7% in 2015–2016 [12]. Approximately one-third of the total households insured in 2015–2016, primarily the poor, were enrolled under a federal program, Rashtriya Swasthya Bima Yojana (RSBY).

In India, socio-economic disadvantages of people have strong caste dimensions. The caste system[1] plays a critical role in creating graded inequality as not all castes are regarded as equals [13]. A person's low-caste status amplifies poverty's impacts, further aggravating the health inequities. For instance, the malnutrition rates are higher among the lower caste and tribal children [14, 15]. The rates of stunting among the Scheduled Castes (SCs) and Scheduled Tribes (STs) (40%), and Other Backward Castes (OBCs) (36%) children in India are worse than in the sub-Saharan African countries (31%) [15]. Moreover, social discrimination accounts for approximately 3 and 4 years of lower life expectancy for the SCs and STs, respectively [16]. A SC woman's life expectancy is 14.6 years shorter than an upper-caste woman [17]. The infant mortality rates are also higher among the SCs and STs [18].

The caste-based health disparities are more salient in the rural areas. Lower caste and tribal women from rural India are less likely to avail maternity care services [19, 20]. SCs face discrimination in accessing healthcare services [21–23]. Moreover, the rural areas dominated by SCs and Muslims are less likely to receive attention during the state-level allocation of medical services [24]. The impact of income diminishes once an individual reaches a healthcare facility, but the effect of caste may persist [25].

RSBY coverage has been relatively limited in districts (equivalent to counties in the USA) with a higher concentration of lower castes [26]. Also, the program coverage varies significantly by castes. For example, 36.3% of SCs, 51.7% of STs, 27% of OBC, and 37.1% of the General category households were enrolled under RSBY in 2015–2016 [12]. The caste-based network at the village level [27], along with power structure and patriarchy, affects lower castes' access and utilization of any government program in India, including RSBY [28]. Other factors that may affect a household's RSBY enrollment include other individual and household demographics, access to media, and state-level institutional factors [29].

The RSBY was rebranded as Pradhan Mantri Jan Aarogya Yojana (PM-JAY) in 2018, and it extended medical coverage up to INR 5 lakh (~ 6666 USD[2]) [30, 31]. The program is envisaged as a milestone intervention reaching approximately 110 million poor households [32], a step towards attaining India's goal of universal healthcare (UHC). However, researchers are skeptical of using insurance as an instrument to achieve UHC rather than strengthening the public health system [33]. Socio-economic and health disparities are linked [34], and growing inequalities can thwart India's progress towards UHC. Therefore, it is important to understand the socio-economic inequalities in the existing healthcare programs in India, especially RSBY since it targets poor households.

In this paper, we account for caste-based disparities in RSBY enrollment. We use nationally representative data from the National Family Health Survey (NFHS)-4 (2015–2016). To the best of our knowledge, this is the first study to account for the caste-based disparities in RSBY enrollment.

[1] The caste system in India is centuries-old social stratification system enshrined in the Hindu religion and legitimized by old scriptures. It constitutes castes (or Jatis) ranked on the scale of ritual purity. Certain castes have higher status, while others are at the lowest ranks of the hierarchy. The caste status is transferred by birth from one generation to another. Upward or downward mobility in the hierarchy is restricted by prohibiting and punishing inter-caste marriages and other social interactions. From higher to lower status, the Hindu scriptures have grouped castes into four broader categories (or varnas): Brahmin (priests), Kshatriya (warriors and rulers), Vaishya (business communities), and Shudras (peasantry and laborers). The castes that do not fall into these categories and who are at the bottom of the hierarchy are Ati-Shudras, the untouchables. For centuries, the Ati-Shudras have performed jobs, such as cleaning toilets, skinning dead animal, harvesting leather, removing dead animal carcasses, and manual labor on the farm, among other occupations. The lower castes have been historically deprived of their socio-economic, cultural, and educational rights. The imprints of the caste system can be seen in among non-Hindus in India. The lower castes continue to face discrimination even after they embrace other religions.

While untouchability was abolished by the Indian constitution, it is still practiced. For the administrative purposes, castes are classified as follows: (1) General category, which comprises privileged caste groups including Brahmins, Kshatriya, and Vaishyas; (2) other backward castes (OBC), which comprises peasants, merchants, and working caste groups; (3) scheduled castes (SC), which are untouchable groups; and (4) scheduled tribes (ST), which includes distinct indigenous tribal people. The OBCs constitute 46% of India's population, followed by SCs and STs (33%), and upper castes (14%). While the STs are not part of the original caste hierarchy, they face severe socio-economic disadvantages. The Indian constitution recognizes the caste-based historical disadvantages, which resulted in introduction of affirmative action policies for the lower caste communities.

[2] Considering 1 USD = 75 Indian rupees.

Related Studies

The literature on health insurance in India falls into two broad categories: enrollment [26, 28, 35–50] and healthcare expenditure (out-of-pocket expenditure) and health outcomes related [7, 9, 36, 48, 51–57]. We highlight studies on RSBY enrollment that are directly relevant to our study.

Ambade et al. [41] find a wealth gradient in enrollments for public health insurance even among the lower castes. Nandi et al. [26] explore the socio-economic and institutional determinants of participation in RSBY. They find that the districts with a higher population of SC, ST, OBC, and Christian households are less likely to participate in the RSBY program [26]. Ghosh and Mladovsky [37] and Thakur [43] study the determinants of RBSY enrollment in the western state of India, Maharashtra. Ghosh and Mladovsky [37] show that the female-headed households, rural residence, religious minority groups, household head's educational attainment, and social network are significant predictors of the program enrollment. Thakur [43] finds that the awareness about the RSBY, prior hospitalization, and household head's characteristics are determinants of the program enrollment.

Sen and Gupta [44] explore the factors behind low RSBY enrollment among low-income women in India's northeastern state, West Bengal. Women perceive the RSBY enrollment process as complex. In their view, the enrollment required a good relationship with the influential upper-caste individuals in the village, which highlights the complexity in establishing one's eligibility for RSBY, which is especially true for socially disadvantaged households. Ghosh and Datta-Gupta [48] and Seshadri et al. [28] document low enrollment rates for SCs and STs. Other studies have also examined household-level determinants of RSBY enrollment [38, 45], but they are about a specific town or geographical region of India.

From these studies, it is clear that caste is a strong predictor of RSBY enrollment. However, an evaluation of the factors of caste-based disparities in the RSBY enrollment is equally important. Decomposition analysis is a widely used technique for determining and measuring factors contributing to the gap in outcomes for any two groups. By employing various decomposition approaches, studies have shown that caste-based inequality exists in wage earnings [58–61], employment [62, 63], poverty status [64–67], living standards [68], education [69, 70], and health indicators [18, 19, 71–78]. A decomposition analysis of factors explaining the caste-based disparities in the RSBY enrollment can inform the program in its strategies to enhance enrollment and effective targeting.

Methods

Data

We use data from the latest available NFHS-4 (2015–2016) survey. The NFHS collects nationally representative data [12], which comes under the Demographic and Health Surveys (DHS) administered by the United States Agency for International Development (USAID). It collects information on health and family welfare from all states and union territories of India. The NFHS-4[3] contains data on 601,509 households; 699,686 eligible women[4]; and 112,122 men[5] respondents. We utilize data of 480,766 households for which caste and RSBY enrollment information are available. Data on household-level characteristics and household head's characteristics come from the household-level module. Data on media access, occupation, and chronic disease ailments are from the eligible women's module. We follow the original definitions of the included variables from the dataset, while few are modified as per the study's need. Our sample size is smaller than the actual NFHS sample size because, following the Guide to DHS statistics-7 [79], we exclude any "do not know" values on any variable from analysis. We use the sample weights for our analysis, which are provided with the dataset.

Our dependent variable is RSBY enrollment at the household level. It is a binary variable that takes the value of 1 if a household had at least one member enrolled in RSBY; otherwise, it takes the value of 0. Households that have another type of health insurance are not included in our analysis. That is, our sample consists of households that are enrolled in RSBY and the households that are not enrolled in any other health insurance program. Our main predictor variable is caste identification of households (i.e., SC, ST, OBC) against the General (high) caste. Thus, we have three corresponding caste indicators that are defined as binary variables. The other predictor variables have been selected based on existing literature on RSBY [29, 48]. These variables fall into four categories: (1) household head's characteristics, (2) household-level factors, (3) health status of the female respondent, and (4) media exposure. We include state dummies to control for any state-level factors influencing the enrollment. The variable description is provided in Online Resource 1.

[3] The survey maintained a very high response rate (more than ninety percent) for all its modules. The datasets are publicly available for download from International Institute for Population Sciences (IIPS) and DHS websites.

[4] Women aged between 15 and 49 years and men aged between 15 and 54 years are considered as eligible for individual interview schedule under NFHS-4.

[5] Please see footnote 4.

Determinants of RSBY Enrollment and Decomposition Analysis

We first perform descriptive statistics and determine chi-square statistics to check if the proportion of the predictor variable significantly differs across the caste groups. We then estimate multivariate logistic regression for each caste group comparison to check the significance of explanatory variables as the predictors of RSBY enrollment. Finally, we account for caste disparities in RSBY enrollment by using Fairlie's [80] non-linear extension of Oaxaca-Blinder decomposition. This method has been widely used to understand the underlying mechanism for health-related inequities [78, 81–98]. We estimate three model specifications corresponding to three caste categories of SC, ST, and OBC and compare them with the General category. The details are provided in Online Resource 2. The decomposition results can vary based on the coefficient weights used in the analysis, commonly known as the index problem (more discussed in Online Resource 2) [99]. To avoid this issue in each specification, we use coefficient estimates from a pooled sample of the two comparison groups (main specification) or the entire population (alternate specification).

We first estimate the predicted probabilities of enrollments for each SC (or ST or OBC) and General category observation and further calculate the group averages. The difference in average probabilities for the comparison groups gives the total contribution of predictor variables in explaining the caste gap in enrollment. To determine the contribution of each predictor, we perform a detailed decomposition analysis as well. In such model specification, the contribution of each independent variable explaining the gap is calculated by taking the difference in average predicted probability by replacing the low-caste group's distribution with the General category's distribution. During this step, other covariates are held constant at their respective values. Since this technique requires one-to-one matching of observations between comparison groups, a random subsample of size equal to the smaller group (low caste) is drawn from the larger group (General category). Then, each observation from the smaller group and randomly drawn subsample from the larger group is randomly matched.

As the results by using this method depend on a selected subsample from the larger group, we obtain 2000 randomly selected subsamples and average the estimates. We allow for 2000 repetitions, which are more than the minimum repetitions suggested by Fairlie [100] for a large sample. We present the mean values of these 2000 repetitions for each of the models in the result section. The standard errors for the estimates are calculated using the delta method. Models that use coefficient estimates from a pooled sample of all the comparison categories (all caste groups in our case) are increasingly becoming popular [100]. Therefore, we use a full sample of all caste categories to estimate the coefficients and use it further for the decomposition in an alternate model specification (results are shown in Online Resource 3). While using Fairlie's decomposition method, altering the sequence of the variables (i.e., path dependency) can give different estimates. Therefore, in all our model specifications, we use the random ordering of the variables. All the analysis is conducted using Stata 15 statistical package [101], and a priori is set to 0.05 for all the model specifications.

Results

Descriptive Statistics

Table 1 shows descriptive statistics. The enrollment rate is the highest in ST (18.85%), followed by SC (14.13%), OBC (10.67%), and General (9.33%) category households. The average age of the household head is higher for General category households (50.33 yrs.) followed by OBCs (48.43 yrs.), SCs (47.08 yrs.), and STs (46.48 yrs.). The marital status of household head does not vary much across all caste categories. The average dependency ratio[6] is highest among STs followed SCs, OBCs, and General castes. The percentage of female-headed households is slightly higher among the SC category (15.2%), while it hovers around 14% for the rest of the categories. The household heads of the ST and SC groups are generally less educated than those of the General caste category households. The latter category also has a higher proportion of educated household heads (18%). The majority of the households having Islamic faith either belong to the OBC or General category. The average household size ranges between 4.59 and 4.76 across the caste groups.

Compared to General caste households, most of the SC, ST, and OBC households live in rural areas. More SC, ST, and OBC households belong to the lowest three wealth quintiles (72.56%, 85.28%, and 58.77%, respectively) compared to the General category households (40.55%). For the ST category particularly, almost 46% of households belong to the bottom (poorest) wealth quintile. The SC-ST men and women are employed more in the agriculture sector than any other caste category. The prevalence of chronic diseases is the highest among upper-caste women (10.03%) and the lowest among tribal women (5.50%). The upper-caste women (89.32%) have

[6] A household's dependency ratio is defined as the ratio of the number of people in the non-working age group and the number of people in the working-age group. We consider individuals under the age of 14 years and individuals older than 65 years as dependents (non-working). The working age group is 15–64 years (see Online Resource 2 for more details).

Table 1 Descriptive statistics

Variables[1]	Caste Category[2]				Significance[4]
	SC[3] (%) *N*=108,434	ST[3] (%) *N*=114,100	OBC[3] (%) *N*=226,010	General[3] (%) *N*=125,251	
At least one member of household enrolled under RSBY	14.13	18.85	10.67	9.33	***
Average Age of Household Head	47.08	46.48	48.43	50.33	***
Female-headed household	15.21	14.53	14.72	14.02	***
Highest educational level attained by Household Head					***
No education, preschool	38.35	44.67	30.42	18.88	
Primary	19.21	20.13	18.86	15.45	
Secondary	36.33	30.27	41.68	47.48	
Higher	6.11	4.92	9.04	18.19	
Household Head is currently married	84.29	83.81	85.77	84.91	***
Muslim religion household	1.71	2.02	13.61	17.29	***
Household living in urban area	28.50	14.93	34.89	46.97	***
Avg. Household size	4.69	4.74	4.76	4.59	***
Avg. Dependency Ratio	0.67	0.69	0.66	0.58	***
Wealth Index					***
Poorest	26.56	45.90	18.34	8.94	
Poorer	24.17	24.83	19.28	13.99	
Middle	21.83	14.55	21.15	17.62	
Richer	16.56	9.18	22.42	23.19	
Richest	10.88	5.54	18.82	36.26	
Any married man in the household works in agriculture sector	36.32	53.82	33.83	26.42	***
Any woman (aged 15-49 years) in the household works in agriculture sector	21.98	34.90	18.35	9.95	***
Any woman (aged 15-49 years) in household has chronic disease	7.96	5.50	8.46	10.03	***
Any woman (aged 15-49 years) in household have access to at least one media (radio/tv/newspaper)	80.13	69.17	81.96	89.32	***

[1]Column-wise percentages are presented. State level fixed effects are not shown in the table due to space constraints

[2]*SC* Scheduled Caste, *ST* Scheduled Tribe, *OBC* Other Backward Castes, *General* Not belonging to SC/ST/OBC

[3]Total number of observations available for each caste category are shown. The number of responses for each variable may differ. However, it doesn't affect overall proportions across the caste groups

[4]The asterisks indicate *p*-value significance level of uncorrected Pearson Chi-square tests conducted for survey data considering the complex sampling structure. Here, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

better access to media, followed by OBC (81.96%), SC (80.13%), and ST (69.17%) category women.

Determinants of RSBY Enrollment

Table 2 presents the results from logistic regression for the determinants of RSBY enrollment. It shows that the comparisons between lower castes and the General caste category favors the lower castes and are statistically significant except for General vs. OBC model. The head's age, currently not-married status, and of being following the Muslim faith positively predicts the RSBY enrollment. Moreover, household size, female members' agricultural occupation, and access to media are also positively associated with RSBY enrollment. On the contrary, female-headed households have lower odds of enrolling under RSBY. However, the results are statistically significant only for General vs. SC and General vs. ST models. Further, the results show that with the increasing household head's education, the households are less likely to avail RSBY. Similarly, higher wealth status, urban residence, higher dependency ratio, and agricultural occupations of any married male member are linked with lower probabilities of RSBY enrollment. Among these variables, only dependency ratio does not show any statistically significant impact on RSBY enrollment across all models. A female household respondent suffering with a chronic disease shows contrasting association across the models. Lastly, as compared to the base category Chhattisgarh, residence in other states negatively predicts the RSBY enrollment.

Table 2 Determinants of RSBY enrollment

Variables	Logit Coefficients		
	General-SC[1,2,3]	General-ST[1,2,3]	General-OBC[1,2,3]
Caste of Household (Base category: General Caste)	0.33***	0.31***	0.10
	(0.09)	(0.10)	(0.07)
Age of Household Head	0.005	0.007**	0.01***
	(0.003)	(0.003)	(0.002)
Female-Headed Households (Base category: Male)	–0.18*	–0.29**	–0.11
	(0.11)	(0.12)	(0.09)
Highest educational level attained by Household Head (Base category: No education, preschool)			
Primary	–0.04	–0.07	0.004
	(0.10)	(0.12)	(0.09)
Secondary	–0.23**	–0.13	–0.08
	(0.09)	(0.11)	(0.08)
Higher	–0.53***	–0.29*	–0.48***
	(0.17)	(0.17)	(0.13)
Household head: Never Married/Widowed/Divorced/Not together (Base category: Currently Married)	0.13	0.32**	0.13
	(0.12)	(0.12)	(0.09)
Muslim religion household (Base category: non-Muslim)	0.19	0.35**	–0.001
	(0.12)	(0.14)	(0.08)
Household living in urban area (Base category: Rural)	–0.44***	–0.44***	–0.20**
	(0.13)	(0.14)	(0.09)
Household size	0.03**	0.04**	0.03**
	(0.01)	(0.02)	(0.01)
Dependency Ratio	–0.04	–0.07	–0.04
	(0.04)	(0.05)	(0.04)
Wealth Index (Base category: Poorest)			
Poorer	0.03	0.05	0.06
	(0.10)	(0.11)	(0.09)
Middle	–0.16	–0.18	–0.13
	(0.10)	(0.13)	(0.09)
Richer	–0.69***	–0.74***	–0.46***
	(0.13)	(0.16)	(0.11)
Richest	–1.09***	–1.17***	–1.02***
	(0.18)	(0.21)	(0.14)
Any married man in the household works in agriculture sector	–0.15**	–0.15**	–0.06
(Base category: not employed in agriculture)	(0.07)	(0.07)	(0.06)
Any woman (aged 15-49 years) in the household works in agriculture sector	0.26***	0.06	0.22***
(Base category: not employed in agriculture)	(0.09)	(0.09)	(0.07)
Any woman (aged 15-49 years) in household has chronic disease	0.21*	0.20	–0.01
(Base category: No chronic disease)	(0.12)	(0.13)	(0.10)
Any woman (aged 15-49 years) in household have access to at least one media (radio/tv/newspaper)	0.30***	0.19**	0.01
(Base category: No access to any media)	(0.10)	(0.10)	(0.09)
States and Union Territories (Base category: Chhattisgarh)			
Andaman and Nicobar Islands	--	–6.20***	--
		(1.00)	
Andhra Pradesh	–3.80***	–2.87***	–3.54***
	(0.76)	(0.61)	(0.39)

Table 2 (continued)

Variables	Logit Coefficients		
	General-SC[1,2,3]	General-ST[1,2,3]	General-OBC[1,2,3]
Arunachal Pradesh	–4.59***	–3.80***	–4.47***
	(1.04)	(0.37)	(1.07)
Assam	–3.45***	–3.42***	–3.28***
	(0.24)	(0.22)	(0.18)
Bihar	–2.60***	–2.70***	–2.67***
	(0.21)	(0.21)	(0.13)
Chandigarh	--	--	--
Dadra and Nagar Haveli	–0.15	–3.34***	–0.47
	(0.46)	(0.55)	(0.50)
Daman and Diu	--	--	–2.82***
			(0.64)
Goa	–4.89***	–5.49***	–5.14***
	(0.68)	(1.01)	(0.74)
Gujarat	–2.24***	–1.93***	–2.30***
	(0.24)	(0.18)	(0.16)
Haryana	–3.26***	–3.40***	–4.10***
	(0.26)	(0.43)	(0.28)
Himachal Pradesh	–1.48***	–1.34***	–1.71***
	(0.20)	(0.19)	(0.17)
Jammu and Kashmir	–7.54***	–6.96***	–7.19***
	(1.02)	(0.73)	(1.01)
Jharkhand	–2.52***	–2.66***	–2.44***
	(0.21)	(0.17)	(0.15)
Karnataka	–1.59***	–1.17***	–1.16***
	(0.21)	(0.18)	(0.14)
Kerala	–0.09	–0.03	–0.13
	(0.20)	(0.20)	(0.14)
Lakshadweep	--	–4.73***	–3.65***
		(1.08)	(0.16)
Madhya Pradesh	–3.44***	–3.44***	–3.39***
	(0.22)	(0.18)	(0.18)
Maharashtra	–3.25***	–3.07***	–3.54***
	(0.23)	(0.21)	(0.29)
Manipur	–4.04***	–4.32***	–3.54***
	(0.39)	(0.35)	(0.29)
Meghalaya	–1.70***	–1.23***	–0.92
	(0.59)	(0.24)	(0.95)
Mizoram	–1.32	0.08	–2.16***
	(0.87)	(0.18)	(0.52)
Nagaland	--	–3.31***	--
		(0.29)	
Delhi	–4.00***	–3.32***	–4.26***
	(0.78)	(0.78)	(0.77)
Odisha	–0.99***	–0.80***	–0.88***
	(0.19)	(0.15)	(0.13)
Puducherry	–6.44***	--	--
	(1.04)		

Table 2 (continued)

Variables	Logit Coefficients		
	General-SC[1,2,3]	General-ST[1,2,3]	General-OBC[1,2,3]
Punjab	–4.00***	–4.30***	–4.42***
	(0.35)	(0.59)	(0.55)
Rajasthan	–4.07***	–3.42***	–3.91***
	(0.30)	(0.22)	(0.20)
Sikkim	--	--	–4.97***
			(0.99)
Tamil Nadu	--	--	–6.43***
			(0.77)
Tripura	–0.22	0.21	–0.49***
	(0.24)	(0.21)	(0.18)
Uttar Pradesh	–3.75***	–3.36***	–3.73***
	(0.20)	(0.22)	(0.15)
Uttarakhand	–2.36***	–2.00***	–2.34***
	(0.22)	(0.21)	(0.18)
West Bengal	–1.19***	–1.15***	–1.27***
	(0.20)	(0.17)	(0.15)
Telangana	–4.58***	–3.92***	–4.59***
	(1.06)	(1.06)	(0.49)
Constant	0.08	–0.14	0.09
	(0.26)	(0.24)	(0.18)
Observations	24,387	25,114	37,420

[1]Standard errors in parentheses

[2]*** $p<0.01$, ** $p<0.05$, * $p<0.1$

[3]*SC* Scheduled Caste, *ST* Scheduled Tribe, *OBC* Other Backward Castes, *General* Not Belonging To SC/ST/OBC

Decomposition Results

Tables 3 and 4 show the grouped and individual contributions of the explanatory variables from the main model, respectively. For our model comparing enrollment rates for General and SC category households, the observed gap in RSBY enrollments is – 0.051, meaning SCs have a higher enrollment rate by 5.1% points. The covariates explain nearly 47.92% of this difference. For the General vs. ST comparison, the observed difference in RSBY enrollment rate is – 0.097, which means the enrollment rate for ST households is higher by 9.7%. Our model explains 32.24% of the total gap in enrollment. We observe a difference of – 0.010, which means the gap is 1% favoring the OBCs. The predictors explain 52.19% of the total gap in enrollment.

As the low-caste groups have higher enrollment rates than the General category, the negative coefficient (positive contribution in terms of % of total explained gap) for a particular variable in decomposition implies that the endowments are favorable for enrollment among lower caste groups (i.e., they are socio-economically backward) than the General category. Conversely, a positive coefficient (negative contribution in terms of % of total explained gap) for a particular variable implies that the endowments favor the General category.

Characteristics of the Household Head

The grouped contribution of the household head's characteristics favors the General category (indicated by a positive sign) but it is statistically significant only for General vs. OBC model. The results in Table 4 show the contribution of individual variables. Age and religious status (being Muslim) favor the General category. Both the predictors have higher negative contribution (49 % and 35%, respectively) in explaining the enrollment gap for General-OBC model. Their contribution in other models ranges between -9.56% and -17.52%. Except for religion in the General-ST comparison, these results are statistically significant. The lower educational attainment aids the lower castes in their RSBY enrollment (statistically significant contribution of 18.33 %

Table 3 Variable contribution (grouped) in caste group-based disparities in RSBY enrollment

Differences Attributable To	General-SC[1,2,3]	General-ST[1,2,3]	General-OBC[1,2,3]
Characteristics of household head	0.0038	0.0030	0.0037***
	(0.0032)	(0.0037)	(0.0011)
Household level factors	–0.0353***	–0.0499***	–0.0109***
	(0.0030)	(0.0051)	(0.0014)
Chronic disease condition of female respondent	0.0018***	0.0024***	0.0008**
	(0.0006)	(0.0009)	(0.0003)
Access to media	0.0063***	0.0102***	0.0039***
	(0.0011)	(0.0018)	(0.0007)
State level fixed effect[4]	–0.0009**	0.0033***	–0.0028***
	(0.0004)	(0.0011)	(0.0004)
Total observations	25,198	25,535	37,935

[1]*SC* Scheduled Caste, *ST* Scheduled Tribe, *OBC* Other Backward Castes, *General* Not Belonging To SC/ST/OBC

[2]Standard errors in parentheses

[3]*** $p<0.01$, ** $p<0.05$, * $p<0.1$

[4]State of Chhattisgarh is considered as a base category for State-level Fixed Effects

in General vs. SC model). The proportion of female-headed households is higher among the lower castes; however, its contribution is statistically not significant in the decomposition. In fact, the lower proportion of female headed household significantly favors the General caste in the General-OBC model. The contribution of household head's marital status in explaining the gap is negligible and show contrasting results across the models.

Household-Level Factors

The household-level factors significantly explain the enrollment gaps favoring the lower castes at the group level. The most significant positive contributors are rural residence (33.34% to 54.56%) and wealth index(124% to 208%). In fact, the household's wealth status has the largest contribution in explaining the gap. On the contrary, contributions of dependency ratio (− 3.05 to − 16.53%) and any married male member's and female respondent's agricultural employment (male: − 4.27 to − 13.61% and female: − 5.46 to − 14.41%, respectively) favor the general category households across all models. Contrasting results are obtained for household size; however, its contribution is statistically significant only for general vs. OBC model (− 15.65%), favoring the former caste category. It is clear from the Table 4 that the lower caste households disproportionately live in rural areas and have a high dependency ratio with a poor asset profile. As a result, they are more vulnerable to health shocks and are more eligible for RSBY.

Other Factors

We also examine whether differences in health status and media access contribute to enrollment gaps. Capturing the state-level differences is also important. The results show that the proportions of women with chronic diseases and media access are higher among the General category, and both the predictors significantly explain the enrollment gap favoring the higher castes. The state fixed effects also contribute significantly explaining the gap in enrollment favoring lower castes in General vs. SC (3.86 %) and General vs. OBC (52.78 %) models. Opposite results are obtained for General-ST comparison (-10.34 %).

The results' directionality is maintained in our alternate model specification (Online Resource 3), which uses coefficient estimates from the pooled sample of all caste categories. However, with this specification, our models explain only 20.26% and 25.40% of the total gap for SCs and STs against the General category. For our General vs. OBC model, the explained difference due to group characteristics is highest at 60.76 %.

Discussion

We account for the caste effect from other determinants as the RSBY enrollment varies across the caste groups, and lower caste households face various barriers in accessing the program. We used coefficients that are derived from the pooled data thus applying outcomes of the average

Table 4 Individual variable contribution in caste-group based disparities in RSBY enrollment

Differences Attributable To	General-SC[1,2]		General-ST[1,2]		General-OBC[1,2]	
	Coefficient[3,4]	Percentage of the total explained (%)	Coefficient[3,4]	Percentage of the total explained (%)	Coefficient[3,4]	Percentage of the total explained (%)
A. Characteristics of household head						
Age	0.0043***	–17.52	0.0038***	–12.20	0.0027 ***	–49.39
	(0.0010)		(0.0010)		(0.0005)	
Sex	–0.00002	0.09	–0.0001	0.39	0.00001	–0.23
	(0.0002)		(0.0003)		(0.0001)	
Highest educational level attained	–0.0044***	18.33	–0.0035	11.37	–0.0008	13.99
	(0.0015)		(0.0024)		(0.0007)	
Marital Status	0.00002	–0.09	–0.0002	0.52	0.00003	–0.48
	(0.0001)		(0.0003)		(0.0001)	
Religion	0.0041*	–16.72	0.0030	–9.56	0.0019***	–35.32
	(0.0025)		(0.0024)		(0.0005)	
B. Household level factors						
Place of Residence	–0.0081***	33.34	–0.0119***	38.32	–0.0029***	54.56
	(0.0012)		(0.0022)		(0.0006)	
Household Size	–0.0001	0.38	–0.0002	0.63	0.0008***	–15.65
	(0.0003)		(0.0003)		(0.0003)	
Dependency Ratio	0.0009**	–3.81	0.0010*	–3.05	0.0009***	–16.53
	(0.0005)		(0.0005)		(0.0003)	
Wealth Index	–0.0301***	124.14	–0.0477***	152.99	–0.0112***	208.45
	(0.0032)		(0.0057)		(0.0015)	
Any married man in the household works in agriculture sector	0.0010**	–4.27	0.0042**	–13.61	0.0007**	–13.31
	(0.0005)		(0.0018)		(0.0003)	
Any woman (aged 15−49 years) in the household works in agriculture sector	0.0013	–5.46	0.0045**	–14.41	0.0006	–10.27
	(0.0008)		(0.0018)		(0.0004)	
C. Any woman (aged 15−49 years) in household has chronic disease	0.0018***	–7.30	0.0025***	–7.93	0.0008**	–14.05
	(0.0006)		(0.0009)		(0.0003)	
D. Any woman (aged 15−49 years) in household have access to any of the media (radio/tv/newspaper)	0.0061***	–24.98	0.0103***	–33.13	0.0040***	–74.53
	(0.0010)		(0.0018)		(0.0007)	
E. State level fixed effect[5]	–0.0009**	3.86	0.0032***	–10.34	–0.0028***	52.78
	(0.0004)		(0.0011)		(0.0004)	
Total Contribution	–0.024	100.00	–0.031	100.00	–0.005	100.00
Decomposition Results						
Overall						
Total estimated difference	–0.051		–0.097		–0.010	
Total explained difference by observed characteristics	–0.024		–0.031		–0.005	
Explained[6], %	47.92		32.24		52.19	
Unexplained[6], %	52.08		67.76		47.81	
Total observations	25,198		25,535		37,935	

[1] *SC* Scheduled Caste, *ST* Scheduled Tribe, *OBC* Other Backward Castes, *General* Not Belonging To SC/ST/OBC

[2] The difference in predicted probabilities for each caste group comparison was statistically significant at $p<0.01$. Results are available on request

[3] Standard errors in parentheses

[4] *** $p<0.01$, ** $p<0.05$, * $p<0.1$

[5] State of Chhattisgarh is considered as a base category for State-level Fixed Effects

[6] Proportion of caste-based disparities in the RSBY enrollment explained and unexplained by the decomposition model

population to the characteristics of each group assuming there is no discrimination in program enrollment. Even with this assumption, the differences in socio-economic status (SES) variables could explain only 32 % to 52 % of enrollment gap. Since RSBY targets poor households, the explained portion captures the differences in SES backwardness that contribute to the enrollment. We document that the lower caste households have a much weaker socio-economic status compared with the General caste households. The SCs, STs, and OBCs have higher proportions of households in the lowest three wealth quintiles than the general castes. They also have lower educational attainment and are mostly engaged in agricultural activities living in rural areas with relatively lower access to the media. All these factors make them more susceptible to health shocks, thus attracting them to RSBY.

The significantly larger unexplained proportion (particularly for general vs. ST comparison) of the gap suggests that unobserved structural factors are also at a play determining the high RSBY enrollments among the lower castes and tribals. However, the higher enrollment rates for these groups might have stemmed from different reasons that are not captured by the predictor variables. The STs are distinct groups not falling under the traditional caste order and are less likely to face social discrimination as the SCs. However, they do face socioeconomic deprivation due to geographical and cultural barriers. Other decomposition analyses suggest that the reasons for disparities for SCs and STs against the General category could differ. For example, STs face locational constraints as they mostly live in resource-poor areas, while SCs suffer from societal constraints while accessing the job market [64]. Nevertheless, both groups face barriers affecting their access to employment. In our case, the systemic differences make lower castes and tribal communities more eligible than the General category for the RSBY program.

Betancourt and Gleason [24] suggest that the state functionaries disfavor districts with significant proportions of SC and Muslim rural populations while allocating the medical services. George [102] points out the lack of representation of lower caste and tribal communities in rural health services and discriminatory practices employed by higher caste health professionals against the lower caste individuals. As discriminatory practices are more pronounced in the rural region [103], it is possible that the rural SC and ST individuals might have enrolled under the program hoping to gain access to (non-discriminatory) tertiary healthcare facilities in the nearby urban area. We find that the gap in access to media is not favorable to the lower caste households, yet higher enrollment rates are observed. It suggests that the participants might be having an alternate way of getting information on publicly funded programs. Previous reports have noted that the overall awareness about the public programs is higher among the lower caste women when compared with their upper-caste counterparts [104]. Word of mouth and peer influence have likely played an important role in increasing their awareness of publicly funded programs. These unobserved structural factors might have a correlation with the lower caste status as the explanatory portion is reduced when we apply returns of the endowments of all castes to the SES characteristics of SCs and STs in our alternate specification.

On the contrary, the explained portion has increased for the general vs. OBC comparison in our secondary model. The OBC group comprises castes that are more heterogeneous in terms of their SES characteristics. Thus, the within-group SES disparity is more prominent among them [105]. It is possible that this heterogeneity is masked in our main model but is revealed by adding SC-STs' endowments in the alternate model.

Given each state's role in deciding whether to implement the program, it is not surprising that the state dummies contribute significantly to explaining the differentials in enrollment. Previous studies show that for rural households in India, the state-level characteristics are important in the provision of public services [24]. Indian states embraced the RSBY in its initial years, keeping aside their political patronage [106]. A state's decision on participation thus had a significant impact on enrollment. Alternatively, as suggested by Wagstaff et al. [107], the states might have had characteristics in terms of population composition and other factors, increasing the likelihood of enrollment for both comparison groups.

However, in our analysis, the state-fixed effect does not show consistent results across all comparisons and model specifications. The contribution of state-fixed effects favor(disfavor) SC (ST) households when we make them more similar to the General caste households. Opposite results are obtained when we apply endowments of all castes to them. Therefore, we can't tell with certainty the state characteristics boost enrollments for SCs and STs. On the contrary, for the General vs. OBC comparison, the state characteristics might have helped OBCs as we obtain consistent results across both model specifications.

It is important to note that higher RSBY enrollments of lower castes do not automatically imply better health outcomes for them. Evidence suggests an increase in hospital admissions among the RSBY beneficiaries [7, 48, 51]. However, the program has no significant effect on the OOPE on health [7, 48, 51–53] largely because it covers only the inpatient care, as opposed to the outpatient care, which is the most significant contributor to the OOPE [108, 109]. Researchers argue that health insurance programs are ineffective in reducing health inequities and should not be a tool to achieve universal health coverage. Instead, countries like India should strengthen the government healthcare system and provide universal access [48, 53].

The Indian government is currently focused on achieving the UHC via the health insurance model. The World Bank had lauded RSBY's program design [110], and the current PMJAY is built on the same structure. Even though the increased monetary coverage and inclusion of outpatient services may attract more households under the PMJAY, it may not remediate the challenges of managing the health insurance business, including but not limited to the regulation of private hospitals, quality assurance, supplier-induced demands, cream-skimming, denial of services, and unchecked discrimination. Since RSBY has higher lower castes enrollments but is ineffective in reducing OOPE on health, it will be prudent to increase the program coverage to include outpatient services and medicines to provide financial respite to the poor lower caste families. Also, efforts to enroll more low-income SC, ST, and OBC households may continue.

The link between caste and development in India is a well-established result [27, 111]. However, class and caste confound with each other [112]. In the early years of post-independence India, efforts were targeted towards reducing class-based inequalities. According to one systematic review, only 12.9% of studies related to health inequalities used caste as a measure of equity in India [113]. However, the distinction between the caste and class is clear as Dr. Ambedkar—the chief architect of India's constitution—argued that a class gradient could be observed within the same caste, and a class awareness is different from caste awareness [114]. Further, prejudice and discrimination are still the reality for lower castes [115]. Subramanian et al. [116] argue that unless we pay attention to caste-based social stratification efforts to reduce health inequalities, mere focusing on wealth or educational disparities will not be successful in India. In the backdrop of addressing social determinants of health [117], our study supports this assertion.

Limitations

There are three important limitations of our study. First, we do not examine disparities in RSBY enrollment by subcastes within a caste group due to data limitations. Studies have shown that income varies even within the same caste group, and some subcastes might be at a more significant disadvantage than others [118]. Second, unlike some studies due to data limitation, we do not consider households' social participation, political contacts, and distance from health care facilities [43, 28]. Third, RSBY enrollment could be influenced by a household's perception of risk, health-seeking behavior, trust, and previous experience with state institutions [119, 120]. The unexplained portion of the decomposition may have captured the effect of these unobserved endowments along with the discrimination effect.

Conclusions

Using nationally representative data from NFHS-4, we decompose caste-based disparities in the RSBY enrollments. We find that lower caste households have higher RSBY enrollment rates than the General category, which are attributable to differences in their wealth status, educational attainment, rural residence, family size, dependency ratio, media access, and occupations. Our results suggest that low-caste households are more likely to enroll in government-funded health insurance programs such as RSBY because of their poor socio-economic status.

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Data Availability The data is available on the DHS website (https://dhsprogram.com/data/). With prior approval, the data was downloaded from the DHS website for analysis.

Declarations

Ethics Approval and Consent to Participate This study uses a secondary dataset collected by International Institute for Population Sciences (IIPS) and Demographic and Health Survey (DHS). We got approval from the DHS program for utilizing the NFHS-4 dataset for this study. The University of Arizona Institutional Review Board gave additional approval to conduct the study (protocol number 1811113846).

Consent to Publish Not applicable

Competing Interests The authors declare no competing interests.

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