Household Choice of Healthcare Utilisation: Logit Estimation of Inpatient, Outpatient and Child Delivery Services

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Abstract: This paper analyses the household choice of public and private health facilities for inpatient and outpatient care and child delivery in India using the 71st round NSSO data applying the binary logit and multinomial logistic regression estimation methods. The estimated results reveal that private healthcare services dominate inpatient and outpatient healthcare in India. The availability of government or employer financial support or insurance is the major factors that influence the choice of public healthcare services. As public hospitals are the only viable health facility in rural and remote areas, for people belonging to low-income and deprived communities and in rural areas, public healthcare is the main source not only for healthcare but also for child delivery. Education improves the behaviour of people in seeking the services of healthcare providers. The availability of ANMs in public health facilities decreases the odds of child delivery at home and increases the probability of institutional child delivery. Improving the quantity and quality as well as accessibility and affordability of public healthcare services and providing health insurance cover is important for the healthcare choice of peopleand a healthy India.

JEL classification: B23, C25, D91, I12, J13

Keywords: Healthcare, child delivery, service providers, choice, logit estimation

INTRODUCTION

Health care is the largest and fastest-growing sector in terms of services, revenue and employment in India because of its expanding coverage and services as well as rising public and private expenditures. Healthcare in India consists of both

public and private sectors. The public or government healthcare system includes primary and community health centers in rural areas, as well as district hospitals, medical colleges, and specialized hospitals that provide specialized health care.The Private healthcare system includes institutional and non-institutional sources. With the emergence of significant private sector healthcare services industry, people's choice of healthcare service providers has become a crucial issue. Better quality and efficiency given by the private sector healthcare services is the major reason for the private sector to be able to penetrate among the common mass for catering their healthcare needs. But at the same time the high cost of healthcare services provided by the private sector deter people's choice for going to private healthcare services.

Table 1 shows the percentage of hospitalized cases of ailments treated by government and private institutions in India's rural and urban areas, as reported in the three NSSO rounds (52ndround - July 1995 to June1996, 60thround - January to June 2004 and 71stround - January to June 2014). It is worth noting that, over time, there has been a decrease in the use of public sources and an increase in the use of private sources. Table 2 demonstrates the growing importance of private healthcare providers, as nearly 70% of a single source of treatment in both areas is provided by private sector providers. Table 3 shows that the share of hospitalized treatment in the public sector varies greatly by income class, as measured by consumption expenditure, ranging from 29 percent to 58 percent in rural areas and 19 percent to 48 percent in urban areas. Over expenditure classes, there has been a steady decline in reliance on the public provider for hospitalized treatment. Overall, poorer households rely on the public sector for hospitalized treatment more than better-off sections of the population in both rural and urban areas. The high cost of private hospitalized treatment is the primary reason why the poor in rural and urban areas seek private healthcare.

Table 1: Distribution of Hospitalisation Cases in India (percent)

Type	Rural			Urban		
	1995-96	*2004*	*2014*	*1995-96*	*2004*	*2014*
Public	43.8	41.7	41.9	43.1	38.2	32.0
Private	56.2	58.3	58.1	56.9	61.8	68.0

Source: NSSO (2014): Key Indicators of Social Consumption in India, NSSO 71stround, 2014.

Table 2: Distribution of Ailment Treatmentby Healthcare Providers in India (percent)

Care provider	Rural			Urban		
	Male	*Female*	*Persons*	*Male*	*Female*	*Persons*
PHC*	10.6	12.3	11.5	3.5	4.2	3.9
Public hospital	15.9	17.5	16.8	17.4	17.3	17.3
Private clinic	52.7	48.9	50.7	48.9	50.8	50.0
Private hospital	20.8	21.3	21.0	30.2	27.7	28.8

Note: * includes ANM, ASHA, AWW, CHC, MMU and dispensary services.
Source: Key Indicators of Social Consumption in India, NSS 71stround, 2014.

Table 3 Distribution of Hospitalisation by Expenditure Quintiles in India (percent)

UMPCE quintile*	Rural		Urban	
	Public	*Private*	*Public*	*Private*
<800	57.5	42.4	48.0	52.0
801-1000	52.9	47.1	43.5	56.5
1001-1264	47.1	52.9	32.7	67.3
1265-1667	42.8	57.2	28.3	71.7
>1667	28.9	71.1	18.7	81.3
All	41.9	58.1	32.0	68.0

Note: UMPCE - Usual Monthly Per Capita Consumption Expenditure.
Source: Key Indicators of Social Consumption in India, NSS 71stround, 2014.

Given the importance of healthcare and the wide disparity in healthcare provision between the public and private sectors in India, it is critical to comprehend the patterns of utilization of various healthcare providers' services. Furthermore, it is critical to comprehend the various factors that influence the demand for healthcare services as well as the selection of a healthcare provider. As a result, the primary goals of this paper are to examine the trends and patterns of utilization of public and private healthcare services in India, as well as to identify the factors that influence the decision to use public or private healthcare services for inpatient care, outpatient care, and childbirth. This paper is based on data from the 2014 NSSO 71st round survey. Empirically, the use of healthcare services for inpatient and outpatient care by public or private services is estimated using the logistic regression method, and multinomial logistic regression estimation is used to analyze the choice of healthcare service provider for child delivery among public, private, or home care.

REVIEW OF LITERATURE

Purohit and Siddiqui (1994) used the 1986-87 NSSO and 1990 NCAER surveys to examine the utilization of health services in India. The study reveals an increase in the popularity of indigenous non-allopathic systems as well as an increase in private sector involvement in costly tertiary care. There is a strong preference for allopathic healthcare; in both rural and urban areas, approximately 98 percent of hospitalized cases and 96 percent of treatment are allopathic. Homoeopathy and Ayurveda, two Indian systems of medicine, are used at a very low level. In terms of inpatient healthcare, public hospitals are used by 55 percent of rural residents and 59 percent of urban residents, while private hospitals are used by 32 percent and 29 percent of total hospitalized cases in rural and urban areas, respectively. Private doctors are used by approximately 53% and 52% of people in rural and urban areas, respectively, for non-hospitalized cases. A visit to a government hospital costs Rs.320 in rural areas and Rs.385 in urban areas. Healthcare in private hospitals is more expensive than healthcare in government hospitals in both rural and urban areas, though private hospitals in rural areas are less expensive than those in urban areas. Rural residents pay two and a half times more in private hospitals than in government hospitals, and in urban areas, it is nearly four times more. Furthermore, regional disparities in health-care utilization among different spending groups in states, as well as rural-urban disparities, persist. It is noted that, despite the inadequacy of health services and the prevalence of disparities in utilization, no serious governmental initiative has been launched to encourage appropriate utilization through the development of health insurance and other cost recovery mechanisms.

Sen, Iyer, and George (2002) examine access to health services in India using morbidity and healthcare utilization data from two NSSO surveys conducted in the 1980s and 1990s. The study finds that class-based disparities in access to health care are worsening for both men and women. Even though men are better off than poor women in absolute terms, poor men have less access to health care. Gender disparities are especially pronounced in untreated morbidity. While patients are increasingly turning to the private sector for outpatient services, public hospitals continue to be the dominant providers of inpatient care, particularly for the poor, at significantly lower cost. More than 70% of outpatient care in both rural and urban areas is provided by the private sector, with private doctors providing the majority of it. The public sector continues to provide 60% of all inpatient care, with public hospitals providing the majority of it. The average expenditure on inpatient care in private hospitals is

much higher than in public hospitals, at 129 percent and 213 percent in rural and urban areas, respectively..

Sundar and Sharma(2002) examine healthcare utilisation decisions, using a 2000 NCAER household survey of Delhi and Chennai, from the point of the relative magnitudes of costs and bene?ts.The study notes that for people with higher education and certain cultural settings like community, the perceived bene?ts from effective treatment and/or preventive care is higher. While in Delhi, low-income households seek treatment from a government source for 55 percent of illness episodes, in Chennai, for 76 percent of illness episodes treatment is sought by low-income households from a government facility. The high-income households seek treatment from government health facilities for only 45 percent of the illness episodes. In Delhi, more than three-fourths of those belonging to SC/ST and OBCs seek treatment from a government hospital, this percentage is low compared with those belonging to non-SC/ST and non-OBC communities. On the other hand, in Chennai, the percentage of hospitalised cases among SC/ST and OBC/MBC for which treatment is sought from a government hospital is higher compared with others. With an increase in the educational level, the utilisation of private hospital healthcare services increases and that of public hospitals decreases in both cities.

Majumder (2006a; 2006b) use primary data from rural and urban areas in North Bengal's Cooch Behar and Jalpaiguri districts to examine the use of healthcare services as a binary event, comparing modern vs traditional methods of health treatment. Treatment is classified into two broad categories: modern source (consultation with doctors and medical specialists) and traditional source (treatment from paramedical/ supporting staff or non-allopathy system of medicine or family/self-treatment). The logistic regression results show that, even when income and education are controlled for, the likelihood of using traditional care is higher in small families than in large families in both rural and urban areas. In rural areas, the likelihood of preferring homoeopathic treatment is very high. Rural residents' use of health care facilities is associated with low reported quality of care, whereas the opposite is true for city dwellers. In rural areas, the relationship between cost and utilization is positive, but in urban areas, it is quite negative. The study also discovers gender bias in both rural and urban areas, and children aged 5 to 14 are largely ignored when it comes to accessing healthcare services.

Majumder (2006c) examines the contribution of demand-side factors to the changing scenario of India's health sectors by using the 1998-1999 NFHS-2 data to examine the utilization rates of public and private healthcare service providers. On

the demand side, logit estimates show that older women are more likely than younger women to use public health facilities. Though educated people are more likely to use public health facilities than illiterates, higher education significantly reduces the likelihood of using public health facilities. Ethnic minorities, who tend to be at the bottom of the local social hierarchy, are more likely to demand more public healthcare. The odds ratios for using public health facilities decrease sharply as household income increases. For immunization, family planning, and maternal health care services, the likelihood of using a public health facility is significantly higher. Private health facilities are strongly preferred for sick child treatment and general healthcare services. On the supply side, the availability and quality of healthcare facilities have a significant impact on the healthcare provider's choice. Private health facilities are preferred in urban areas where both public and private health facilities are easily accessible. In terms of healthcare quality, the choice is once again in favor of private health facilities.

Borah (2006) investigates the determinants of outpatient healthcare provider choice using NSSO data and the multinomial logit method to address the persistent problems of healthcare access and delivery in rural India.

When a sick person does not visit a healthcare facility, the paper imputes the missing provider prices. According to the study, the price and distance to a health facility play important roles in the decision to choose a healthcare provider. When an adult's health is poor, distance plays a less important role in his or her provider selection decision. The price elasticity of demand for outpatient care varies with income, with lower-income groups more price sensitive than higher-income groups. Furthermore, outpatient care for children is more price elastic than care for adults, reflecting the socioeconomic structure of a typical rural Indian household, where an adult's health is more important than a child's for the household's economic sustenance.

Selvaraj and Karan (2009), using the evidence from NSSO morbidity and health surveys (1986-87 to 2004) and consumer expenditure surveys (1993-94 to 2004-05), argue that public provision of healthcare in India has dwindled to new lows. Public outpatient and hospitalisation care in India have declined drastically leading to the emergence of private care players predominant way.While healthcare costs have shot up manifold in private provisioning, government health facilities are increasingly compelling patients to look for private outlets for procuring drugs and diagnostics.

Baruet.al. (2010) assess the utilisation of health services and the associated expenditure using three rounds of NSSO (42ndround of 1986-87, 52ndround of 1995-96 and 60thround of 2004) data and three rounds of NFHS (1992-93, 1995-

96, 2005-06) data to understand the utilisation of maternal and child health services, antenatal care and immunisation coverage in India. The study finds that historical inequities, socio-economic inequities and inequities in provision and access to health services are largely responsible for the persistent and widening differentials in health outcomes. The availability, accessibility and affordability of health services are important determinants for improving population health. The study reports pervasive inequalities in infrastructure, human resources, supplies, bed-population ratios, spatial distribution and healthcare expenditure between rural and urban areas and across states.

Prinja *et al.* (2013) analyzed the use of public and private sector hospital services by economic class, the relationship between utilisation and public spending on health services and assess the reported out-of-pocket payments using 2004-05NSSO data. In tune with the general view, the study finds that hospital services in the private sector are signi?cantly pro-rich. Surprisingly, in contrast to previous studies, a significant finding is that India's poor report using hospital services in the public sector at a higher rate than the wealthy, particularly in urban areas. However, this varies across states.High out-of-pocket expenditure is correlated with higher degrees of inequity and is a barrier to access healthcare by the poor.

Iles (2018) analysesthe preferences for unquali?ed 'doctors'for treatment of mild to severe fever in three districts in Uttar Pradesh, using 2012 primary survey data. The study notes that India's dynamic primary healthcare market is dominated by the private sector that operates alongside a weak government system. The market consists of private quali?ed, private unquali?ed 'doctors' and government doctors. In theory, the healthcare market offers several systems of medicine, a variety of provider quali?cations and incorporates both formal and informal provider markets.However, in practice in rural north India consumers have limited effective choice. The study finds that unquali?ed 'doctor' services are normal goods in north India.

DATA AND METHODOLOGY

The empirical analysis of this paper is based on the NSSO 71stround survey (January 1st -June 30th2014) data on health in the social consumption survey. The NSSO collected the details of inpatient care for hospitalisation cases during the last 365days and outpatient care for spells of ailments during 15 days of the date of the survey. Besides health, details of pregnant women in the age group 15-49 years any time during the last 365 days are also collected. In total, the sample of the 71stround survey consists of 36480 rural and 29452 urban households of India.The data for

the total number of auxiliary nurse midwives (ANMs) at government sub centers and primary health centres (PHCs), and state-wise projectedpopulation, health expenditure and grossstate domestic product (GSDP) are taken from the 2015 Ministry of Health and Family Welfare Statistics.

LOGISTIC REGRESSION METHOD

The logistic regression is used in the estimation when the dependent variable is qualitative. In binary or dichotomous choice, the variable takes two values only. When the qualitative dependent variable takes more than two values but represent a choice among multiple unordered alternatives, the multinomial logistic regression method is applied for estimation. As the dependent variable is not continuous, the standard OLS estimation of the expected mean is biased. Therefore, the limited dependent qualitative response models estimate the probability of choice between the alternatives. The estimating model can be specified as:

$$y_i = \beta_0 + \beta_1 x_i + u_i \tag{1}$$

The conditional probability of a choice, given x, is given by $\Pr(y_i = 1 \mid x_i)$. Assuming that $E(u_i = 0)$, the unbiased estimates of βs are obtained as:

$$E(y_i \mid x_i) = \beta_0 + \beta_1 x_i \tag{2}$$

If P_i is the probability that $y_i = 1$ and $(1 - P_i)$ is the alternative probability that $y_i = 0$, the variable y follows the Bernoulli probability distribution. By definition, the mathematical expectationof y is given by:

$$E(y_i) = 0(1 - P_i) + 1(P_i) = P_i \Rightarrow E(y_i \mid x_i) = \beta_0 + \beta_1 x_i \tag{3}$$

Therefore, the conditional expectation is, in fact, theconditional probability of y_i. Then, the logistic regression model can be derived as:

$$P_i = E(y_i = 1 \mid x_i) = \beta_0 + \beta_1 x_i \tag{4}$$

$$P_i = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_i)}} = \frac{1}{1 + e^{-(z_i)}} = \frac{e^z}{1 + e^{-(z_i)}} \tag{5}$$

In this cumulative logistic distribution function, with $-\infty < z < +\infty$, $0 < P < 1$, P isnon-linearly related not only to z but also to β. The logistic distribution function can be linearised as:

$$1 - P_i = \frac{1}{1 + e^{(z_i)}} \tag{6}$$

$$\frac{P_i}{1-P_i} = \frac{1+e^{(z_i))}}{1+e^{-(z_i)}} = e^{z_i} \tag{7}$$

$$\ln\left[\frac{P_i}{1-P_i}\right] = lne^{z_i} \tag{8}$$

$$L_i = \ln\left[\frac{P_i}{1-P_i}\right] = z_i = \beta_0 + \beta_1 x_i \tag{9}$$

where L_i is the logit and is linear not only in x but also in the parameters. If $L > 0$, when thevalue of regressors increases, the odds that the regressand equals 1 increases, while $L < 0$, the odds that the regressand equals 1 decrease as the value of x increases. Taking the antilog of L, the likelihood that $Pr(y_i = 1)$ orthe odds ratio (OR, $0 < OR < \infty$) is obtained as:

$$OR + \left[\frac{P_i}{1-P_i}\right] = (1-P_i) = P_i \Rightarrow OR - OR(P_i) = P_i \tag{10}$$

$$\Rightarrow OR = P_i + OR(P_i) = P_i(1+OR)$$

$$\Rightarrow P_i = \frac{OR}{(1+OR)}$$

Using the odds ratio, the probability of binary choice is obtained.

The multinomial logistic regression model is derived for choice among multiple alternatives. If there are J alternatives, then all the probabilities must sum to one:

$$Pr(y_i = J) = 1 - \Sigma_{j=1}^{J-1} e^{\beta_j x_i} = 1/(1+\Sigma_{j=1}^{J-1}e^{\beta_j x_i}) \tag{11}$$

The individual probabilities are then calculated as:

$$Pr(y_i = 1) = \frac{e^{\beta_1 x_i}}{1+\Sigma_{j=1}^{J-1} e^{\beta_j x_i}}$$

$$Pr(y_i = 2) = \frac{e^{\beta_2 x_i}}{1+\Sigma_{j=1}^{J-1} e^{\beta_j x_i}}$$

$$\cdots\cdots\cdots\cdots \tag{12}$$

$$\cdots\cdots\cdots\cdots$$

$$\Pr(y_i = J - 1) = \frac{e^{\beta_{J-1}x_i}}{1 + \Sigma_{j=1}^{J-1} e^{\beta_j x_i}}$$

The model implies the log-odds ratio:

$$\ln\left[\frac{P_{ij}}{P_{iJ}}\right] = \frac{P_{ij}}{1 + \Sigma_{j=1}^{J-1} P_{ij}} = (\beta_j - \beta_k)x_i \tag{13}$$

$$\ln\left[\frac{P_{ij}}{P_{iJ}}\right] = \Sigma_{k=0}^{K} \beta_{kj} x_{ki} \tag{14}$$

Solving for the probabilities:

$$P_{ij} = \frac{e^{\Sigma_{k=0}^{K} \beta_{kj} x_{ki}}}{1 + \Sigma_{j=1}^{J-1} e^{\Sigma_{k=0}^{K} \beta_{kj} x_{ki}}} \tag{15}$$

$$P_{iJ} = \frac{1}{1 + \Sigma_{j=1}^{J-1} e^{\Sigma_{k=0}^{K} \beta_{kj} x_{ki}}} \tag{16}$$

The relative risk ratio (RRR) is the odds ratio for the multinomial logistic regression model.

The joint probability density function is given by:

$$f(y \mid \beta) = \prod_{i=1}^{N}\left[\frac{n_i!}{\Pi_{j=1}^{J} y_{ij}!} \Pi_{j=1}^{J} \pi_{ij}^{y_{ij}}\right] \tag{17}$$

The log-likelihood function of the multinomial logistic regression model is specified as:

$$L(\beta) = \Sigma_{i=1}^{N} \Sigma_{j=1}^{J-1} (y_{ij} \Sigma_{k=1}^{K} \beta_{jk} x_{ik}) - n_i \log\left(\frac{1}{1 + \Sigma_{j=1}^{J-1} e^{\Sigma_{k=0}^{K} \beta_{jk} x_{ik}}}\right) \tag{18}$$

which is to be maximised by the maximum likelihood estimation method to obtain the unbiased estimates of β coefficients. The odds ratio (OR) in the logistic regression and the relative risk ratio (RRR) in the multinomial logistic regression measure the association between an exposure and anoutcome. They represent the odds that an outcome will occur given a particular exposure,compared to the odds of the outcome occurring in the absence of that exposure. The regression coefficient β is the estimatedincrease in the log odds of the outcome per unit increase in the value of the exposure. In otherwords, the exponential function of the regression coefficient (e^{β}) is the odds ratio associatedwith a one-unit increase in the exposure.

EMPIRICAL ANALYSIS

In the empirical analysis, utilisation of healthcare services for inpatient and outpatient cares are estimated by logistic regression method as the choice is binary - public healthcare services or private healthcare services. The utilisation of healthcare services for child delivery is estimated by multinomial logistic regression as the choice comprises three categories -childbirth at a public or private facility or home delivery.The estimating equations for the choice of healthcare service providers inpatient care, outpatient care, and child delivery are specified respectively as:

Pr (Inpatient care in public health services)=
$\beta_0 + \beta_1$ *Age* $+ \beta_2$ *Sex* $+ \beta_3$ *Education* $+ \beta_4$ *Community* $+ \beta_5$ *Religion*+
β_6 *Region* $+ \beta_7$ *Childage* $+ \beta_8$ *Health support* +
β_9 *Consumption expenditure* $+ \beta_{10}$ *State health expenditure* $+ u_i$ (19)

Pr (Outpatient care in public health services) =
$\beta_0 + \beta_1$ Age $+ \beta_2$ Sex $+ \beta_3$ Education $+ \beta_4$ Community $+ \beta_5$ Religion+
β_6 Region $+ \beta_7$ Childage $+ \beta_8$ Health support +
β_9 Consumption expenditure $+ \beta_{10}$ State health expenditure $+ u_i$ (20)

Pr (Child delivery in public health services) $= \beta_0 + \beta_1$ *Education* $+ \beta_2$ *Community* +
β_3 Religion $+ \beta_4$ Region $+ \beta_5$ Health support $+ \beta_6$ Consumption
expenditure $+ \beta_7$ ANM $+ u_i$ (21)

The descriptive statistics of variables used in the empirical analysis are presented in Table 4. About 48 percent of the respondents use public healthcare services for inpatient care, while only 26 percent use public healthcare services for outpatient care. More than half of child delivery takes place in a public healthcare centre. Higher educated people seek public healthcare facility less for inpatient care (19 percent) and private healthcare services more for outpatient care (43 percent). Nearly 80

percent are not covered by any of the healthcare schemes of government, employer or insurance. There is not much difference in seeking healthcare services for inpatient care outpatient care or child delivery from either public or private healthcare services among SC/ST and rural populations. However, there exist regional differences in the choice of healthcare services. The mean monthly consumption expenditure is about ?10,000 and the ratio of public expenditure on health to GDP is around 1.83. On average there are 6.65 persons per female health worker or auxiliary nurse midwives (ANM) in India.

Table 4: Descriptive Statistics of Variables

Variable	*Description*	*Inpatient care*	*Outpatient care*	*Child delivery*
Public healthcare	If utilised public healthcare services of HSC, ANM, ASHA, AWW, PHC, CHC, dispensary, mobile medical unit, public hospital=1, 0 otherwise	0.478 (0.499)	0.262 (0.439)	-
Child delivery	If child delivery private hospital=1, 0 otherwise	-	-	0.522 (0.501)
Age 56+	If the individual is aged 56 and above=1, 0 otherwise	0.203 (0.402)	0.328 (0.469)	-
Age < 18	If the individual is aged < 18 years=1, 0 otherwise	0.162 (0.368)	0.239 (0.427)	-
Male	If male=1, 0 otherwise	0.372 (0.483)	0.541 (0.498)	-
Higher education	If post-secondary education=1, 0 otherwise	0.189 (0.391)	0.432 (0.401)	0.777 (0.416)
Hindu	If Hindu religion=1, 0 otherwise	0.774 (0.418)	0.756 (0.429)	0.756 (0.429)
SC/ST	If scheduled caste/tribe community=1, 0 otherwise	0.246 (0.442)	0.239 (0.427)	0.299 (0.458)
East India	If belongs to eastern India=1, 0 otherwise	0.222 (0.415)	0.190 (0.392)	
Rural	If living in rural area =1, 0 otherwise	0.542 (0.498)	0.501 (0.500)	0.558 (0.497)
Health support	If not covered by any healthcare schemes of government, employer or insurance=1, 0 otherwise	0.815 (0.388)	0.762 (0.426)	0.839 (0.367)
Consumption expenditure	Household consumption expenditure (?/month)	9551.253 (7363.309)	10361.08 (7537.562)	9690.925 (7287.686)
State health expenditure	Ratio of state health expenditure to GSDP	1.830 (6.760)	1.421 (7.079)	-
ANM	Number of persons per female health worker or auxiliary nurse midwives	-	-	6.650 (7.344)
N	No. of observations	55008	26670	18055

Note: Standard deviations in parentheses.

Table 5 presents the logistic regression estimates of the choice ofhealthcare service providers for inpatient and outpatient cares. As regards inpatient care, the variables community, location, region, availability of health expenditure support and state healthexpenditure have positive effects, while age, religion, education, household's usual monthlyconsumption expenditure and sex have negative impacts on the choice of public healthcareservices over private healthcare services. The odds ratio is lower by 0.711 for aged people relative to younger age people in seeking healthcare services from public healthcare services for inpatient care. For higher educated people the probability of utilising private health facilities is higher, the odds ratio is 0.570 for higher education relative to school-level education. Males have higher odds for private healthcare services relative to females and the odds ratio is 0.743. Similarly, Hindus prefer private healthcare services for inpatient care, the odds ratio being0.863 compared to other religious groups.

The availability of financial support for healthcare by way of government or employer assistance or insurance increases the choice of public healthcare services, obviously for reimbursement reasons. However, an increase in household monthly consumption expenditure, a proxy for income, decreases the probability of using public healthcare services as higher-income people prefer private healthcare. For people belonging to the SC/ST community, the probability of choosing public healthcare services over public healthcare services is higher and the odds ratio is1.680. Similarly, for people from eastern India, the probability of going for public healthcare services is higher. The scenario is the same for rural people. The odds of choosing public healthcare facilities are higher in rural areas as public hospitals is the commonly available service facility and private hospitals are costly and inaccessible for rural households. The same is confirmed by the higher odds ratio of the ratio of government health expenditure to GSDP shows. As the public health expenditure increases, the probability of choosing public healthcare services over private healthcare services increases.

The logit estimates of the choice of healthcare services for outpatient care shows that variables religion, household monthly consumption expenditure, health expenditure support and sex have a negative impact, while age, community, region,location and the state health expenditure have a positive impact on the choice of public healthcare services over private healthcare services. As age increasest he probability of choosing public healthcare services over private healthcare services increases, the odds ratio being 1.281.Males have higher odds of choosing private healthcare services for outpatient care. The Hindus have a probability of choosing

Table 5: Logit and Multinomial Logit Regression Estimates of Utilisation of Health Services for Care and Child Delivery

Variable	Logistic regression		Multinomial logit regression	
			Child delivery	
	Inpatient care	Outpatient care	Private health service	home
Age 56+	0.711** (0.018) [-13.26]	1.281* (0.042) [7.48]	-	-
Male	0.743** (0.015) [-14.53]	0.948*** (0.028) [-1.83]	-	-
Higher education	0.570** (0.015) [-20.82]	0.673** (0.024) [-22.67]	2.547** (0.108) [22.03]	0.661** (0.060) [-4.59]
Hindu	0.864** (0.020) [-6.31]	0.789** (0.027) [-6.98]	1.165** (0.051) [3.52]	0.542** (0.029) [-11.57]
SC/ST	1.680** (0.036) [24.14]	1.644** (0.056) [14.69]	0.466** (0.020) [-17.80]	1.242** (0.063) [4.27]
East India	3.343** (0.086) [46.83]	1.348** (0.050) [8.04]	-	-
Rural	1.147** (0.023) [6.93]	1.163** (0.035) [5.00]	0.712** (0.004) [-8.83]	1.213** (0.069) [3.38]
Health support	1.100** (0.027) [3.86]	0.753** (0.025) [-8.48]	0.866** (0.045) [-2.77]	1.234** (0.097) [2.66]
Household consumption expenditure	0.999** (1.9e-06) [-34.84]	0.999** (2.63e-06) [-17.91]	1.000** (3.68e-06) [23.39]	0.999** (6.63e06) [-2.45]
State health expenditure	1.055** (0.003) [17.74]	1.093** (0.007) [13.86]	-	-
ANM	-	-	1.051** (0.004) [13.11]	0.730** (0.016) [-14.81]
Constant	1.402* (0.059) [8.65]	0.570** (0.032) [-10.04]	0.188** (0.017) [-18.47]	2.963** (0.500) [6.44]
Log-likelihood	-32893.035	-14392.463	-14727.224	
LR Chi²	10358.28	1931.13	5044.20	
Pro.> Chi²	0.00	0.00	0.00	
N	55008	26670	18055	

Note: Standard errors in parentheses. z-statistics in brackets. *, **, *** significant at 1, 5 and 10 percent levels.

public healthcare services over private healthcare services with the odds of 0.789. The SC/ST community persons have a probability of choosing public healthcare services for outpatient care, 1.6 times more than those belonging to non-SC/ST communities. For people from the rural and eastern region of India, the odds of choosing public healthcare services over private healthcare services are higher. The household income, measured by the monthly consumption expenditure, increases, the probability of the choice of public healthcare services for outpatient care decreases. The availability of insurance or financial help from the government or employer decreases the odds of choosing public healthcare services relative to private health care services decrease by 0.753. As the public health expenditure as a percentage of GDP increases, the probability of choosing public healthcare services decreases with the odds ratio being 1.093.

The multinomial logistic regression estimates of the choice of public healthcare service for child delivery as against the private healthcare provider or home delivery is also presented in Table 5. The variables community, location and schemes of health expenditure support have a negative impact, while the variables education, religion, household income and population per ANM ratio in government healthcare services havea positive impact on the choice of private healthcare services over public healthcare services forchild delivery. Hindu households and higher educated have a higher preference for private hospitals to have child delivery. The odds of child delivery in private hospitals is also high in rural areas. An increase in household income increases the choice of private nursing home delivery relative to public hospital services. The government or employer financial assistance for health or insurance decreases the probability of choosing a private hospital for child delivery. The probability of using private hospital services for child delivery is less for the socially deprived community. The availability of more ANMs in government healthcare centres decreases the probability to choose private healthcare services for child delivery.

The estimated results also show that still some child delivery takes place in the home, despite the availability of public facilities for anti and post-natal cares in primary health centres and the nursing or ASHA assistance to the pregnant woman. The variables community, location and health expenditure support schemes have a positive impactwhile education, religion, household income and ANM availability have a negative effect on the choice of child delivery at home relative to public healthcare services for child delivery.SC/ST households and rural households have a higher probability of child delivery at home than at a public facility. Hindu

households have lesser odds of child delivery at home. Higher education also decreases the probability of home child delivery. An increase in household income increases decreases the probability of child delivery at home relative to public healthcare services. However, the unavailability of financial support for health by government or employer or insurance coverage increases the odds of having child delivery at home. The presence of more ANMs encourages more institutional child delivery.

CONCLUSION

This paper analyses the utilisation patterns of healthcare services for inpatient and outpatient care and child delivery provided by public and private health facilities in India. Using the 2014 71st round of the NSSO data on health, this paper estimates the effects of factors that influence the choice of healthcare services by the binary logit and multinomial logistic regression methods. The estimated results reveal that private healthcare services dominate inpatient and outpatient healthcare in India. The availability of government or employer financial support or insurance is the major factors that influence the choice of public healthcare services. As public hospitals are the only viable health facility in rural and remote areas, for people belonging to low-income and deprived communities and in rural areas, public healthcare is the main source for not only healthcare but also child delivery. Education improves the healthcare behaviour of people and they seek the services of healthcare providers. An increase in household income also increases health awareness and the choice of private over public services. The availability of more ANMs in public health facilities decreases the odds of child delivery at home and increases the probability of institutional child delivery. Overall, improving the quantity and quality as well as accessibility and affordability of public healthcare services in Indiais important for the healthcare choice of people. Importantly, the expansion of government or employer healthcare schemes and wider health insurance coverage is essential for a healthy India.

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