

# The public-private differential in health care and health-care costs in India: the case of inpatients

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## Abstract

**Aim** In India the public health-care system is unable to keep pace with the growing need, and the country has witnessed unprecedented growth in the number of private health-care institutions. However, the pattern of utilization of public and private health-care facilities and the cost of treatment in these hospitals remains unclear; thus, this is the main objective of this study.

**Subjects and methods** The study explores the data of 6,726 inpatients hospitalized for treatment of diarrheal diseases, heart disease, tuberculosis, urological diseases and gynecological disorders from a nationally representative survey on health care conducted by the National Sample Survey Organization (NSSO 2006) in its 60th round in 2004. A multilevel model, with patients (first level) nested in states (second level), was used to unearth the adjusted costs of hospitalization for people of different backgrounds. Logistic regression was used to obtain the adjusted odds of choosing public facilities compared to private facilities by ailment type, hospital characteristics and patient backgrounds.

**Results** The analysis revealed that more than 58 percent of the patients have utilized private health-care facilities in India. As expected, the mean cost of treatment in private hospitals is Rs. 5,019 after adjusting for confounders compared to Rs. 1,307 for public hospitals. The mean adjusted cost of treatment of heart diseases is Rs. 5,981, followed by Rs. 5,402, Rs. 4,616, Rs. 2,478 and Rs. 891 for

urological diseases, gynecological disorders, tuberculosis and diarrheal diseases, respectively. Better off patients incurred the highest out-of-pocket costs, in the range of Rs. 4,967 to Rs. 8,457. It is evident that for the diseases considered in the study, the private sector plays an important role in providing health facilities.

**Conclusion** The cost of hospitalization in private health facilities is considerably higher compared to that of public facilities as far as the five ailments are concerned. Among the ailments, chronic conditions were seen to consume higher costs of treatment. However, more people opted for the unregulated private facilities.

**Keywords** Cost of treatment · Inpatients · Multilevel model · Public-private

## Introduction

India's health-care system is characterized by the co-existence of public and private sectors. Despite having a widespread infrastructure, due to the poor quality of service, the public health system is unable to attract health-care seekers, particularly for secondary and tertiary inpatient care (Kamat 2001; Uplekar et al. 2001). Survey findings on health-care utilization indicate a high dependence on the private sector (Duggal and Amin 1989; Yesudian 1990). It is a common belief that the private sector is more efficient in terms of meeting demands and service delivery with personal care (Yesudian 1990). However, private health care affects both the cost and quality of services available (Bhat 1993). At the same time, in India an understanding of the nature of the clinical care offered by the public and private sector practitioners is lacking (Bhatia and Cleland 2004).

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The increasing demand for private sector health care and near absence of public-funded health insurance cause serious concern when it comes to health-care expenditure. Private households' contribution to health care is 75 percent, and most of these costs are in the form of out-of-pocket expenditures (Bhat and Jain 2006). Their estimation indicates that for the remaining 25 percent, state governments contribute 15.2, the central government 5.2 and third parties and employers 3.3 percent. Local governments and foreign donors contribute 1.3 percent (World Bank 1993). From 2001–2003, households contributed 68.8 percent of total health spending in India. According to consumer expenditure data of the National Sample Survey Organization (55th round, 1999–2000), households spend 5–6 percent of their total expenditures and 11 percent of non-food consumption expenditure on health care (NSSO 2000). The data also show an increasing growth rate of 14 percent per annum in household health spending (MoHFW 2005).

From the public health point of view, in light of the foregoing discussion, this study seeks to answer the following questions: Who utilizes private hospitals for treatment? How expensive is the inpatient treatment in private hospitals compared to public hospitals? To address these questions we took up five diseases from the ten top disease burdens in India, namely, diarrhea, heart disease, tuberculosis, urological and gynecological diseases, as a case study. In 2005, nearly 3.8 million suffered from heart disease in India, and this number is projected to reach 6.4 million in 2015. The prevalence rate of cardiovascular (heart) disease will reach roughly 13.5 percent of the rural population in the age group 60–69 years by 2015. Among adults, tuberculosis is the most deadly disease, affecting the working age groups disproportionately more than others. In 2000 according to the Tuberculosis Research Center, 380,000 bacillary cases and 390,000 abacillary cases were the estimated number of persons suffering from tuberculosis. An estimated 400,000 persons die of this disease each year, which makes it the single most important cause of death in India at present. Diarrhea affects mostly children. In India an estimated number of deaths in 2002 due to diarrhea was 454,758 for all ages, 158,209 for 0–6 year olds and 296,549 for 6+ year olds (MoHFW 2005). Many of these illnesses and deaths can be prevented and/or treated cost-effectively with primary health-care services provided by public health systems.

The cost for treating any type of ailment varies by different socio-demographic factors and also by the type of provider concerned (McLughlin et al. 1989; Bertakis et al. 1999). In a study of pneumonia, it was revealed that private hospitals are more expensive than their counterpart government hospitals (Liu et al. 2005).

Few studies have attempted to investigate the difference in utilization of the public and private sectors, and determinants of hospitalization cost for cases relating to non-communicable diseases, particularly in the context of India. There is little scientifically based evidence in regard to public and private health-care differentials in terms of out of pocket expenditures and length of treatment (Ruger and Kim 2007). This study provides much needed background on improving the public health-care system and the regulations that private health-care providers should follow for the accessibility and affordability of health care for patients of all socio-economic strata.

### Statistical methods

The objective of this section is to differentiate hospitalization costs between public and private health-care providers and to find the main correlates rather than to estimate the cost itself as in other studies (Bhat and Jain 2006). Few studies have used a standard regression technique to model inpatient costs (Benzaquen et al. 1998; Smith et al. 1994). However, particularly considering the pattern of health-care utilization in India, depending on accessibility and affordability causes clustering of patients who use treatment from the public and private sectors by states in India. Secondly, the two-stage sampling design adopted for data collection has imparted a dependence structure on the cost of hospitalization. Before looking for potential confounders for hospitalization costs, a logit model was adopted to study the characteristics of patients who utilized public hospitals for inpatient treatment:

$$\logit(p) = \sum_{i=1}^m \beta_i x_i + e_i \quad (1)$$

where  $p$  = the probability that patients utilized public hospitals for inpatient treatment,  $\logit(p) = \ln(p/(1-p))$  is the odds of utilizing public hospitals, and  $i = 1, 2, \dots, m$  are the covariates that are patient characteristics, treatment history or type of ailment.

The cost of hospitalization considered in this study is the total expenditure incurred for medical treatment as an inpatient in the hospital including bed charges, fees incurred for the services of medical and para-medical personal, medicine costs, charges for diagnostic tests, operations and therapies, oxygen, blood, bandages, plaster, ambulances, etc. Thus, the whole analysis is based on a total of 6,726 patients who were hospitalized because of five different types of ailments, namely, diarrheal diseases, heart disease, tuberculosis, urological diseases and gynecological disorders.

Considering these view points, the hospitalization cost transformed onto a logarithmic scale is the dependent variable, and this model in a multilevel framework is

$$y_{ij} = \beta_{oj} + \sum_i \beta_{ij}X_{ij} + e_{ij} \tag{2}$$

where,

$$\beta_{oj} = \gamma_{oo} + u_{oj} \tag{3}$$

$$e_{ij} \sim N(0, \sigma_e^2), u_{oj} \sim N(0, \sigma_u^2) \tag{4}$$

$y_{ij} = \ln(C_{ij})$ ,  $C_{ij}$  is the hospitalization cost of  $i$ th patient in the  $j$ th state and the error terms  $e_{ij}$  and  $u_{oj}$  are independent. This random intercept two-level model assumes that the average hospitalization cost varies randomly across states.

The patient characteristics considered in the exploration of hospitalization costs are age, sex, residence background and household economic status measured by monthly per capita expenditure (MPCE). Concerning treatment history, we have included the status of using treatment before hospitalization and also the status of treatment continuation after discharge from the hospital. Hospital-related covariates considered in the analysis are public or private hospital and category of inpatient ward, i.e., paying for a general ward, using a free ward and paying for special ward.

## Results

### Bivariate analysis for the choice of facilities

Inadequate public investment in health care to keep pace with the growing need is coincidental with the emergence of communicable and non-communicable diseases and the gradual corporatization of medical care ever since the economic liberalization in the early 1990s. The penetration of the private sector into India’s health-care system is evident from the public-private utilization pattern for inpatient treatment of diarrheal diseases, heart disease, tuberculosis, urological diseases and gynecological disorders, which are shown in Table 1.

For three of the five ailments considered, namely, heart disease, urological and gynecology ailments, more than 60 percent of the patients used inpatient treatment from private hospitals. Except for gynecological disorders, more males were hospitalized for the other conditions, heart disease, diarrheal disease, tuberculosis and urological diseases; hospitalization of females for the five ailments is also high

as they constitute more than 50 percent of the total hospitalized cases. The rural-urban differential in hospitalization cases for treatment of these five ailments is evident from the fact that more rural residents are treated for diarrheal diseases, tuberculosis, urological diseases and gynecological disorders in hospitals. Seventy-nine percent of those treated as inpatients for tuberculosis are from rural areas. Concerning the treatment history in the case of patients suffering from diarrheal diseases, heart disease, tuberculosis, urological diseases and gynecological disorders, more than 58 percent of them had had some form of treatment before hospitalization. Looking at the educational background of patients admitted to health institutions for treatment of any of the five diseases, it is evident that the majority of the patients were either illiterate or educated up to middle school. The cross classification also showed that a smaller number of patients hospitalized for tuberculosis treatment were from high-income households, while the largest number of patients with heart disease are from the high-income household category measured by MPCE.

### Multivariate analysis for the choice of facilities

We now attempt to complement the foregoing discussion by multivariate analysis of differentials in the utilization of public versus private hospitals for inpatient treatment. For this we have adopted the logit model described in Eq. 1. The results are shown in Table 2. Odds of utilization of public hospitals are higher for patients of a particular background in comparison to patients taken as reference category when all other backgrounds are adjusted, in case the value of the odds ratio is numerically greater than one; if not, the interpretation is the other way round. Age of patients has a significant bearing on the choice of public or private hospitals for inpatient treatment. It is also noted that the odds of urban residents using public health services for inpatient treatment is 22.6 percent higher in comparison to rural residents when all other backgrounds are adjusted, and this differential is significant at  $p < 0.05$ . Those patients who had secondary school and above education have a 5 percent less chance of choosing a public facility than the reference category of non-literate patients after controlling for other covariates, but the effect is not significant, whereas those inpatients with at most middle education have a 22.8 percent more significant chance of being treated in public hospitals compared to illiterate inpatients. However, as far as a differential in the choice of public or private hospitals by treatment history is concerned, the apparently different value of the odds ratio does not reach statistical significance. As expected, patients from households having higher purchasing power expressed as proxy by MPCE

**Table 1** Utilization of public and private hospitals and backgrounds of inpatients admitted for treatment of diarrhea, heart diseases, tuberculosis, urological and gynecological disorders

Backgrounds	Ailments					Total
	Diarrhea	Heart	Tuberculosis	Urological	Gynecology	
<b>Hospital sector</b>						
Public	981 (49.4)	505 (38.5)	395 (56.5)	406 (33.1)	486 (32.3)	2,773 (41.2)
Private	1,005 (50.6)	806 (61.5)	304 (43.5)	820 (66.9)	1,018 (67.7)	3,953 (58.8)
<b>Sex</b>						
Male	1,033 (52.0)	778 (59.3)	464 (66.4)	866 (70.6)	22 (1.5)	3,163 (47.0)
Female	953 (48.0)	533 (40.7)	235 (33.6)	360 (29.3)	1,482 (98.5)	3,563 (53.0)
<b>Residence</b>						
Rural	1,328 (66.9)	632 (48.2)	552 (79.0)	734 (59.9)	964 (64.1)	4,210 (62.6)
Urban	658 (33.1)	679 (51.8)	147 (21.0)	492 (40.1)	540 (35.9)	2,516 (37.4)
<b>Educational attainment</b>						
Illiterate	1,097 (55.2)	416 (31.7)	357 (51.0)	405 (33.0)	640 (42.6)	2,915 (43.3)
At most middle	718 (36.1)	544 (41.5)	289 (41.3)	534 (43.6)	509 (33.8)	2,594 (38.6)
Secondary and above	171 (8.6)	351 (26.8)	53 (7.6)	287 (23.4)	355 (23.6)	1,217 (18.1)
<b>Treatment history</b>						
Treated in the past	710 (35.8)	801 (61.1)	552 (79.0)	843 (68.8)	1,010 (67.1)	3,916 (58.2)
No. of past treatments	1,276 (64.3)	510 (38.9)	147 (21.0)	383 (31.2)	494 (32.9)	2,810 (41.8)
<b>MPCE<sup>#</sup> quintile</b>						
Lowest	891 (44.9)	276 (21.0)	338 (48.4)	355 (29.0)	499 (33.2)	2,359 (35.1)
Middle	631 (31.8)	369 (28.2)	245 (35.1)	344 (28.1)	483 (32.1)	2,072 (30.8)
Highest	464 (23.4)	666 (50.8)	116 (16.6)	527 (43.0)	522 (34.7)	2,295 (34.1)

MPCE<sup>#</sup>: Monthly per capita expenditure

have less chance of utilizing inexpensive public facilities, which is evident by lower odds of 21.1 and 39.3 percent, respectively, for the medium and high MPCE strata, which are statistically significant at  $p < 0.01$ . The incidence of paying for a special ward in public hospitals is significantly lowered by 1.1 percent in comparison to paying for a general ward in private hospitals. When it comes to the preferential choice between public and private hospitals for illnesses, the odds of going to a public compared to private hospital for heart disease inpatient treatment is significantly lower by 15.8 percent at  $p < 0.05$ ; the same pattern is found for the gynecological and urological diseases where the lesser odds of choosing a public hospital are 40.2 and 43.5 percent compared to diarrheal diseases, and both the effects are statistically significant at  $p < 0.01$ . However, the preference for public hospitals for treatment of tuberculosis is 27.9 percent significantly higher than for treatment of diarrhea at  $p < 0.05$ .

In brief, patients who can afford more, as measured by MPCE, prefer to be treated by paying for special wards, and those suffering from heart disease, urological and gynecological problems would prefer private hospitals for inpatient

treatment, while urban patients are more likely to utilize public hospitals.

#### Multilevel analysis for hospitalization cost

The multilevel model introduced in Eqs. (2) through (4) was applied in this study to assess the differential in the cost of hospitalization by patient-related characteristics, hospital sector and ailment type. For deciding the model of best fit for the data, four versions of the model were examined and evaluated using deviance statistics, and we have considered here the best model with the smallest deviance statistical value of 20,993. Table 3 presents the mean adjusted costs of hospitalization for the best fit together with the corresponding unadjusted costs. The mean cost of inpatient treatment ranges from Rs. 891 for treatment of diarrheal diseases to Rs. 8,457 for patients treated in special wards, after adjusting for other confounders. The mean cost of hospitalization for male patients is Rs. 2,841 compared to Rs. 2,919 for females, and it is Rs. 891 for diarrheal diseases compared to Rs. 5,981 for heart disease, Rs. 2,478 for tuberculosis, Rs. 5,402 for urological

**Table 2** Odds of utilization of public hospitals for inpatient treatment by patient background and ailment type

Patient, hospital and ailment background	Odds ratio	95% CI of OR	Significance
Age <sup>+</sup>	1.003	(0.999 , 1.006)	0.053
Sex			
Male <sup>R</sup>			
Female	0.988	(0.876 , 1.114)	0.844
Residence			
Rural <sup>R</sup>			
Urban	1.226	(1.084 , 1.386)*	0.001
Educational attainment			
Illiterate <sup>R</sup>			
At most middle	1.228	(1.094 , 1.377)*	0.000
Secondary and above	0.946	(0.800 , 1.120)	0.522
Treatment history			
No past treatment <sup>R</sup>			
Treatment in the past	0.903	(0.809 , 1.007)	0.066
MPCE			
Lowest <sup>R</sup>			
Middle	0.789	(0.695 , 0.895)*	0.000
Highest	0.607	(0.523 , 0.705)*	0.000
Type of hospital ward			
Paying general <sup>R</sup>			
Paying special	0.099	(0.075 , 0.130)*	0.000
Ailment type			
Diarrheal diseases <sup>R</sup>			
Heart diseases	0.842	(0.710 , 0.999)**	0.048
Tuberculosis	1.279	(1.056 , 1.548)**	0.012
Urological diseases	0.598	(0.505 , 0.706)*	0.000
Gynecological disorders	0.565	(0.480 , 0.665)*	0.000

<sup>R</sup> Reference category, \*significant at  $p < 0.01$ , \*\*significant at  $p < 0.05$ , +deviation from the mean

diseases and Rs. 4,616 for gynecological disorders. The mean adjusted costs of hospitalization among patients who are non-literate and educated up to the middle school level are Rs. 2,223 and Rs. 2,718 compared to Rs. 6,074 for patients educated beyond the secondary level. The adjusted mean cost of hospitalization also varies by purchasing power expressed in terms of MPCE, and these are Rs. 1,799, Rs. 2,697 and Rs. 4,967, respectively, for patients belonging to lowest, middle and highest strata of MPCE. Patients who have a past treatment history spend Rs. 3,936 on average compared to Rs. 1,866 for patients who have no such precedent. The adjusted mean cost of hospitalization for patients opting for paying for special wards is Rs. 8,457 compared to Rs. 2,459 for patients paying for the general ward. The differential in the different categories of patient characteristics, hospital sector and ailment type in mean cost of hospitalization highlighted in the present discussion are all statistically significant except for sex. The patient-level variation and state variation in cost of hospitalization are statistically significant at  $p < 0.05$  after controlling for

background characteristics of patients, hospital-related factors and ailment types. As measured by the intra-class correlation coefficient, there is no significant correlation in cost of hospitalization between any two randomly drawn inpatients in a randomly selected state.

## Conclusion

This paper makes an attempt to ascertain the background of patients who utilize public health facilities for inpatient care, to differentiate costs of treatment by public and private health sectors and patient-related characteristics.

It is evident from the analysis that for all five diseases, more than 58 percent of the patients received inpatient treatment from private hospitals, apparently because of quality concerns. Poor quality of services in public hospitals has also been noted in other studies in the context of maternity care (Kamat 2001; Uplekar et al. 2001). Urban patients have higher odds of utilizing public health facilities for inpatient treatment

**Table 3** Differential in hospitalization cost in rupees (Rs.) by patient characteristics, hospital sector and ailment type

Patient, hospital and ailment background	Mean cost of hospitalization (Rs)	
	Unadjusted	Adjusted
Sex		
Male	3,031	2,841
Female	2,756	2,919
Educational attainment*		
Illiterate	2,762	2,223
At most middle school	2,720	2,718
Secondary school and above	3,608	6,074
Residence*		
Rural	3,100	2,626
Urban	2,551	3,367
MPCE <sup>#</sup> quintile*		
Lowest	2,328	1,799
Middle	2,855	2,697
Highest	3,618	4,967
Hospital type*		
Public	1,568	1,307
Private	4,417	5,019
Past treatment history*		
No past treatment	2,391	1,866
Treatment in the past	3,295	3,936
Hospital ward*		
Paying general	2,756	2,459
Paying special	3,904	8,457
Ailment type*		
Diarrheal diseases	1,162	891
Heart diseases	4,998	5,981
Tuberculosis	2,901	2,478
Urological diseases	4,372	5,402
Gynecological disorders	4,199	4,616
Random effect*		
$\sigma_u^2$ = State level variance	–	1.093
$\sigma_e^2$ = Patient level variance	–	3.655
$\rho = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_e^2}$	–	0.064
Deviance*	–	20,993

\* $p < 0.05$ ; <sup>#</sup>MPCE: Monthly per capita expenditure

compared to their rural counterparts. This can be attributed to the availability of all levels of public health facilities from hospitals down to health sub-centers in urban areas, whereas in rural areas public health-care facilities are limited. Patients who need frequent inpatient care as measured by history of past treatment also depend more on public health facilities. However, more educated patients and those who belong to affluent households are opting for private hospitals for inpatient treatment. Patients with diarrheal diseases equally preferred public and private health-care facilities.

When it comes to cost of treatment, as expected, it is much more expensive to be treated in private hospitals.

Significant differentials in the adjusted cost of treatment are found among types of diseases. Patients who pay for special hospital wards are more educated and from better off households, and belong to the category that incurred the highest out-of-pocket costs. It is evident that for diseases considered in the study, the private sector plays an important role in providing health facilities. Similar considerations also were found in other studies where the private sector played a large role in providing facilities for the treatment of ailments such as diarrhea, respiratory infections and tuberculosis (Bhat 1993). In summary, in India there is no proper regulation of private

health care concerning treatment charges and diagnosis standardization.

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