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## Health Insurance Program for the Poor, Out-Of-Pocket Costs, and Catastrophic Health Expenditures in India

Shyamkumar Sriram

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HEALTH INSURANCE PROGRAM FOR THE POOR, OUT-OF-POCKET COSTS, AND  
CATASTROPHIC HEALTH EXPENDITURES IN INDIA

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## DEDICATION

I dedicate this work to my parents Dr. Sriram and Dr. Lakshmi for their enduring support during my PhD program at the University of South Carolina. I would not have made it to graduation without their support and encouragement during this program.

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## ABSTRACT

### **Background**

India is currently taking steps to provide Universal Health Coverage (UHC) as envisaged in its National Health Policy 2017. Financial protection is considered the backbone of UHC. In India, OOP expenses accounts for about 62.6% of total health expenditure - one of the highest in the world. Out of 1.324 billion people in India, around 12.4% of the population is below the poverty line. Lack of health insurance coverage and inadequate coverage are important reasons for high OOP health expenditures. High OOP health expenditures push many households into poverty. The objective of this research is to examine the effect of Public Health Insurance Programs for the Poor on hospitalizations and inpatient OOP health expenditures, and to investigate the effect of OOP health care payments on catastrophic health expenditures (CHE).

### **Methods**

Data from the recent national survey by the National Sample Survey Organization, Social Consumption in Health 2014 were used. A propensity score matching was used to match the people enrolled and not enrolled in health insurance programs. Binary logistic regression model, Tobit model, and a two-part model were used to study the effects of enrolment under Public Health Insurance Programs for the Poor on the incidence of hospitalizations, duration of hospitalization, and OOP payments for inpatient care respectively. Three different analytical approaches were used to investigate CHE: (i)

incidence and intensity of CHE, (ii) socioeconomic inequality in CHE, and (iii) factors affecting CHE.

## **Results**

Health insurance programs for the poor increase the incidence of hospitalization but has no effect on the duration of hospitalizations and inpatient OOP health expenditures. Presence of chronic illness, belonging to older age groups, women in the reproductive age group, and belonging to a small household have higher hospitalization. People who have higher duration of hospital stay, admitted to a private hospital, using allopathic treatment, having chronic illnesses, having higher level of education and belonging to the middle age group experienced higher OOP inpatient health expenditures. Presence of health insurance coverage reduced both the incidence and intensity of CHE. CHE incidence was 10.94% and the mean positive overshoot was 35.94%. Households with members at extremes of age, female member, utilized a private hospital, and small households have higher incidence of CHE. Households belonging to the poor socioeconomic status, and with members having higher duration of hospital stay, and chronic illness experienced both higher incidence and intensity of CHE.

## **Conclusions**

By identifying the groups most affected, this research aids the designers of the national insurance programs to design better benefit packages for those population groups. This investigation will serve as a basis for assessing India's policy options to reduce financial burden due to OOP health expenditure

**Keywords:** financial protection, out-of-pocket health expenditure, catastrophic health expenditures

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## LIST OF ABBREVIATIONS

AYUSH.....	Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homeopathy
BPL .....	Below Poverty Line
CGHS.....	Central Government Health Scheme
CHC .....	Community Health Center
CHE .....	Catastrophic Health Expenditures
CHIS.....	Community Health Insurance Scheme
CI.....	Concentration Index
CMCHIS.....	Chief Minister's Comprehensive Health Insurance Scheme
DALYs.....	Disability Adjusted Life Years
DID .....	Difference-in-Difference
EAG .....	Empowered Action Group
ESI.....	Employee State Insurance
FSU.....	First Stage Units
GDP .....	Gross Domestic Product
GOI .....	Government of India
IMR.....	Infant Mortality Rate
INR.....	Indian Rupee
IP.....	In-Patient
IPD.....	In-Patient Department
MDGs.....	Millennium Development Goals

MOHFW.....	Ministry of Health and Family Welfare
NCD.....	Non-Communicable Disease
NFHS.....	National Family Health Survey
NGOs.....	Non-Governmental Organizations
NHA.....	National Health Accounts
NHP.....	National Health Policy
NRHM .....	National Rural Health Mission
NSSO.....	National Sample Survey Organization
OECD.....	Organization for Economic Cooperation and Development
OOP .....	Out of Pocket
OP .....	Out Patient
OPD .....	Out Patient Department
PFHI .....	Publicly Funded Health Insurance
PHC .....	Primary Health Center
PPP.....	Public Private Partnership
RACHI.....	Rajiv Aarogyasri Community Health Insurance
RSBY .....	Rashtriya Swasthiya Bima Yojana
SDG .....	Sustainable Development Goals
UFS.....	Urban Frame Survey
USD.....	United States Dollar
USU.....	Ultimate Stage Units
UHC.....	Universal Health Coverage
VAS.....	Vajpayee Aarogyasri Scheme
WHO .....	World Health Organization

## CHAPTER 1: INTRODUCTION

### 1.1 INTRODUCTION TO THE STUDY

#### *Background*

United Nations' Sustainable Development agenda incorporates one goal (Goal 3) that is related to health and well-being of the population and one of the specific targets of the goal is to improve financial risk protection through universal health coverage (UHC). UHC includes securing access to quality healthcare and safe, affordable medicines and vaccines for everyone (Chapman, 2016). Resolution 58.33 of the World Health Assembly recommends that all WHO member states should provide universal health coverage to their entire population and protect households from catastrophic health expenditures (Obermann et al., 2018). Catastrophic health expenditures are defined as out-of-pocket (OOP) health spending that exceed a certain proportion of a household financial capability (Xu et al., 2003). More than 100 countries in the world have either started their reforms towards UHC or have already achieved it (Obama, 2008; Summers, 2015). Even though most countries are striving to enable their citizens to obtain the healthcare they need without financial barriers, 150 million people still experience catastrophic health expenditure each year (Kastor & Mohanty, 2018). The amount of financial protection rendered to population groups will depend on their degree of dependence on out-of-pocket expenditures for financing health care (Xu et al., 2003).

Out of the 1.324 billion people in India (2016), around 21.9% of the population is below the poverty line using the revised World Bank Poverty line of USD 1.90 (World

Bank 2019). In India, 35.1% (NHA 2017) of total health expenditure is due to hospital inpatient services and therefore, protecting households from OOP expense in hospital expenditures should significantly improve financial equity in health service delivery. Moreover, access to health care can be improved significantly if the health system can protect the poor households from significant out-of-pocket expenses. In order to improve access to health care by the poor, India initiated a national health insurance program for the poor in 2008. Although the insurance program is national in scope, majority of the health insurance programs for the poor cover only hospital expenses (Shahrawat & Rao 2012). It is not known to what extent the insurance program for the poor has effectively reduced OOP cost of inpatient services for the poor individuals. The objective of this research is to examine the effect of Public Health Insurance Programs for the Poor on hospitalizations and inpatient OOP health expenditures. The program should reduce the OOP expenses as well as should improve access to hospital services. A related objective of the study is to identify the characteristics of households, specific health conditions of individuals, and health delivery system issues that make people prone to catastrophic health expenditures. In particular, the study will examine the association of households' demographic characteristics, social structure, and healthcare utilization features that appear to be associated with relatively high level of expenditure and also quantify the burden of OOP health expenditures and impoverishment due to OOP health expenditures.

This research seeks to inform policy makers and health financing practitioners about the characteristics of beneficiaries and types of services to be considered for reducing likelihood of catastrophic expenditure in a system that intends to provide universal health



care coverage. Around 35% of the total national health expenditure is for inpatient care, and 31.96% of the total OOP health expenditures cost is spent for getting inpatient health services (NHA 2017). Studies have shown that hospitalizations caused 25% catastrophic health expenditures in different parts of India (Pandey et al., 2018). Previous studies used different datasets or the same dataset for previous years or conducted cross-sectional studies in different states to study the effect of public health insurance programs for the poor. This study aims to improve on existing studies by investigating the effect of Public Health Insurance Programs for the Poor using the specific dataset and the determinants of catastrophic health expenditures at the household level including the incidence and intensity of catastrophic health expenditures (CHE) in India. To this end, it is vital to begin by understanding the demographic and health system characteristics of India.

## **1.2 INDIAN HEALTH SYSTEM**

### ***India's Health System and Socioeconomic Snapshot***

India is a lower middle-income country with Gross Domestic Product (GDP) per capita \$7055.66 in terms of Purchasing Power Parity dollars and a population of 1.24 billion (World Bank 2018). The second most populous country in the world, India is home to over 17 percent of the world's population and experiences an annual population growth rate of 1.1% (James, 2011). The annual growth rate of the urban population is 3.18% (James, 2011). The populations of different states and union territories in India vary widely, from 120 million in Uttar Pradesh to 64,473 in Lakshadweep (James, 2011). More than two-thirds of Indian population live in rural areas. In terms of age, 41.1% of the population of India is under the age of 18, and 49.8% is between the ages of 19 and 64 (James, 2011). The largest employment sector in the country is agriculture, constituting 56.6% of

employment share. As of 2018, around 81% of the total workforce was employed in the informal sector including agriculture (ILO 2018). The literacy rate in India is 68.91% in rural areas and 84.98% in urban areas and varies widely by state, with Kerala's literacy rate at 94% and Bihar's at only 62% (GOI 2011). Though it represents the third largest national economy in the world (after the U.S. and China), India's public health expenditure constitutes approximately about 17% of total health expenditure (Harris, 2005). Health indicators in India have improved significantly since its independence from the British in 1947, but it still lags behind many developing countries. Life expectancy at birth in India is 68 years and varies widely based on region; for instance, life expectancy in the state of Kerala is 77 years yet only 61.50 years in the state of Madhya Pradesh (Singh et al., 2017). One-fifth of all maternal deaths and one-fourth of all child deaths of the world occur in India (UNICEF 2009). The maternal mortality ratio has seen an annual decline of 4.7%, and the availability of skilled birth attendants in India has increased annually by 3.5% since 1990 (WHO 2012). The infant mortality rate in India is 34 per 1000 live births, with a wide variation of 8 in the state of Goa to 47 in Madhya Pradesh (Narwal & Gram, 2013). India failed to achieve many of the Millennium Development Goals (MDGs) and targets (Nath, 2011).

Important indicators, such as infant mortality rate (IMR) and having an institutional delivery, highlight wide disparities between the rich and the poor. Among the poorest wealth quintile in India, the IMR is near 82 per 1,000 live births, whereas in the richest quintile it is only 34 per 1,000 live births (Balarajan et al., 2011). There are significant differences in access to healthcare in India based on socioeconomic factors. Pregnant women in the richest quintile are six times more likely to give birth in an

institution than poor women, and only 40% of Indian women have institutional deliveries (Balarajan et al., 2011; Sen et al., 2002). Only 44% of children in India are immunized, and coverage is 64% for children whose mothers have greater than 5 years of education; only 26% of children with mothers with no formal schooling receive vaccinations (Balarajan et al., 2011). The health information system is in its rudimentary stages in India, and currently there is no national health system architecture covering all states (Pandey et al., 2010).

The burden of disease in India is very high, accounting for 18% of the total deaths occurring worldwide and 20% of global disability-adjusted life years (DALYs). India is undergoing a period of epidemiological transition with 53% of deaths and 44% of DALYs lost attributable to non-communicable diseases, and 36% of deaths and 42% of DALYs lost due to communicable diseases, nutritional deficiencies, and maternal and child health diseases (Srinath Reddy et al., 2005).

### ***Service Delivery***

Health service delivery in India is characterized by a three-tier system, which is comprised of the central government, state governments, and private providers (Chokshi et al., 2016). The Ministry of Health and Family Welfare (MOHFW) is the principal ministry for health in India, and there are state ministries of health that look after the delivery of health services in the states. The health functions are divided between the central government and the states (Chokshi et al., 2016). Public health delivery is the responsibility of the state governments, whereas both the state and the central governments have the authority on actions related to health insurance (Lakshminarayanan, 2011).

The public health sector system of India is composed of primary health centers, sub-centers, hospitals/health centers, community health centers, rural hospitals, district hospitals, and teaching hospitals (Nair, 2015). In India, services in the public health sector hospitals are offered free of cost for almost all services; a small service fee is charged for advanced procedures (Prinja et al. 2017). The private sector consists of the private hospitals, general practitioners, specialists, and clinics. The principal source of revenue of private hospitals is the out-of-pocket payments (Nair, 2015). In the private sector, patients are free to consult the general practitioners or the specialists of their choice. Private insurance companies are run as “for-profit” businesses. Central government agencies, such as defense and railways, have their own hospitals, and the central government health scheme provides free service only to their employees (Prinja et al. 2017).

### ***Health Workforce***

India’s health human resources are scarce, with a national average of 0.59 doctors per thousand population compared to global norm of 2.25. The Indian health sector comprises only 1% of the total general workforce, approximately 2.5% of the service sector, and about 6.5% of the total segment of the workforce devoted to community, social, and personal services (Hazarika, 2013). The National Sample Survey of India indicated that all practitioners (approximately 2 million), across all areas of medicine and all types of medical establishments, are working in 1.3 million enterprises excluding the public sector (Government) (Karan et al., 2019). Primary Health Centers (PHCs) have an 8% deficit of doctors, and Community Health Centers (CHCs) have a 65% shortfall of specialists. Although the rural population comprises around 70% of the total Indian population, most of the infrastructure and health services are located in urban areas, which

contain almost two-thirds of India's doctors (Yadav et al., 2009). Only 24% of rural areas have a health facility, as compared to 88% of towns (Karan et al., 2019). Notably, sole practitioners run 90% of the healthcare facilities in rural areas (Karan et al., 2019).

### ***Public-Private Sector Divide***

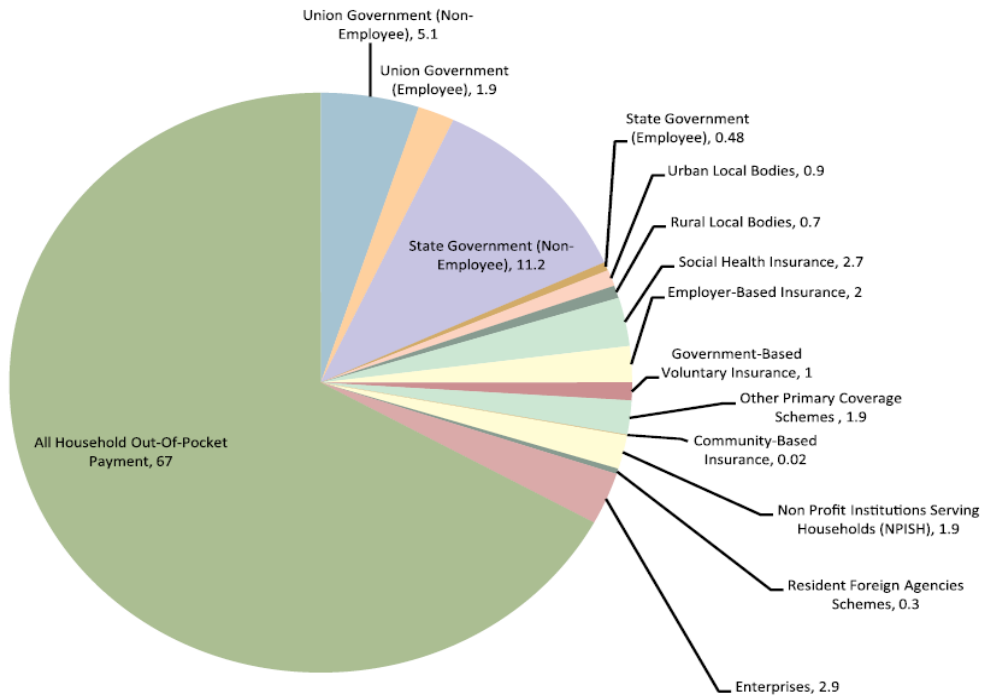
The private sector provides 58% of India's hospitals and 81% of doctors in India (Thadani, 2014). Even though 29% of the available hospital beds in India reside in the private sector, it only has an occupancy rate of 44%; in the public sector, the occupancy rate is 62%. Nearly 78% of the rural and 81% of the urban population is provided medical treatment by private healthcare players. In terms of outpatient department (OPD) cases in the private sector, 77% occur in rural areas and 80% take place in urban areas (Katyal et al., 2015). Healthcare services in India are trending toward more high cost and high-tech procedures, especially in the private sector (Thadani, 2014). Since the private sector currently dominates the healthcare system, India needs to achieve an effective public-private mix and better regulate the private sector in order to provide safe, comprehensive primary health care to everyone.

### ***Financing Health Care***

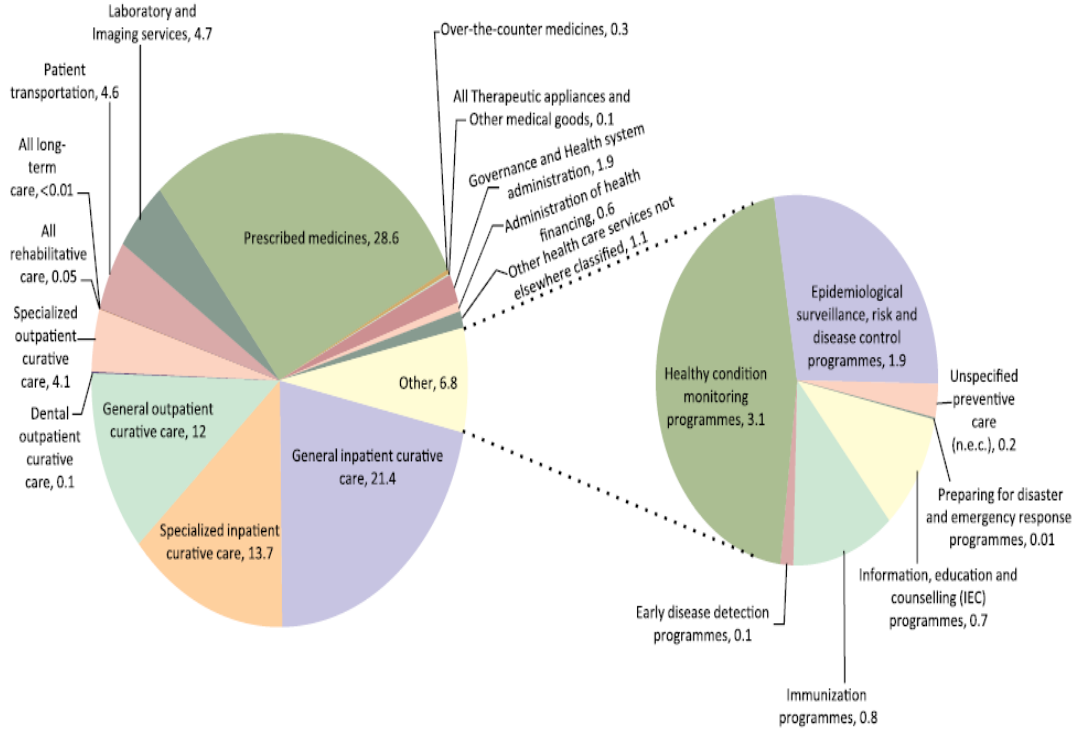
Evidence from the recent National Health Accounts of India shows that among the total health expenditure in India, only 29% is from government health expenditure, 5.7% is from Social Security Expenditure on health, 3.7% is from Private health insurance expenditure and the rest 62.6% is OOP health expenditure. Out of the 62.6% of OOP health expenditures, 59.1% are for outpatient and preventive health care, 31.96% for inpatient health care, 2.46% for medicines (not covered under inpatient and outpatient care), 6.24% for transportation, and 0.09% for laboratory and imaging services. India spends only 1%

of its GDP on publicly funded healthcare and 0.1% on medicines for its people (NHA 2017). By 2020, the Government of India intends to increase public spending on healthcare to 3% of its GDP (Hooda, 2013). This level of public health expenditure is extremely unfavorable, because the lower and middle-income countries spent, an average, 2.8% of their GDP on healthcare, and even impoverished sub-Saharan countries spent 1.7% of their GDP on public health (WHO 2019). The World Development Indicators (health systems) of the World Bank show that India spent 4.7% of its GDP on health care in 2014. Out of this only 29% was publicly funded, which means that the other 71% was funded from non-governmental sources consisting of both formal and informal care providers (World Bank 2014). Secondary and tertiary hospitals accounted for nearly three-fourths of the total formal curative care spending; these hospitals are mostly located in urban areas whereas 70% of the total Indian population is in rural areas (GOI 2011). The composition of health expenditures is such that a major chunk is spent to meet the recurrent costs of the public healthcare delivery system, with about 70% of the total health budget devoted to salaries and wages alone (NHA 2017). Figure 1.1 below highlights India's various sources of healthcare funds (NHA 2017).

Among the total health expenditure various components of health expenditures by function shown in Figure 1.2. Only 6.8% of India's spending goes toward preventative and promotive healthcare (NHA 2017); in China and Sri Lanka, this proportion is as high as two-thirds (Basu et al., 2012). States fully finance hospital services; on average, out of the total governmental healthcare spending, the states' share of primary healthcare costs is found to be above 85%, but the budgetary allocations at the state level are deplorably low with glaring interstate differentials (Purohit, 2004).



**Figure 1.1 Current Health Expenditures (2014-15) by Financing Schemes (National Health Accounts, 2017)**



**Figure 1.2 Current Health Expenditure (2014-15) by Healthcare Functions**

## 1.3 STATEMENT OF THE PROBLEM

### 1.3.1 OOP Health Expenditures in India

According to the World Health Organization's list of "countries with highest out of pocket (OOP) expenditure on health," India ranks third in the region of Southeast Asia. In India, OOP expenses accounts for about 71.1% of total health expenditure - one of the highest in the world (Balarajan et al., 2011; Hooda, 2017). Evidence shows that high OOP health expenditures push many households into poverty (Hooda, 2017). There has been a significant increase in out-of-pocket and catastrophic health expenditures in India because of declining importance of GOI funding in overall health expenditure (Hooda, 2013), a strong private healthcare system and weakening of the public healthcare system (Peters et al., 2002), the user fee in the public sector tertiary hospitals (Thakur et al., 2009), the liberalization of the pharmaceutical industry (Kumar, 2004), and the creation of the Drug Price Control Order, which led to an increase in drug prices (Hooda, 2017).

Nearly 39 million people in India become impoverished every year due to catastrophic health expenditures (Balarajan et al., 2011). Indeed, evidence shows that such expenditures can increase the incidence and depth of poverty; additionally, poverty has a negative impact on health (Braveman & Gruskin 2003; McHenga et al., 2017). Expected OOP spending acts as an important barrier to the utilization of health care services. Due to the lack of financial protection, approximately 20-28% of the people in India do not use healthcare and hence their illnesses remain untreated (Barik & Thorat 2015).

Since those with the greatest need often have the least access to health care, the unmet need for healthcare in India is very high (Gaudin & Yazbeck 2006; Sen et al., 2002; Singh & Ladusingh 2009). Nearly 12.4% of the population lives Below Poverty Line



(BPL), and expanding insurance coverage in the country has been a challenge because only about 7% of the workforce is employed in the organized sector (Chen & Ravallion 2010). A mere 11% of India's population is protected by any form of health insurance, because the health insurance system is rudimentary and only available to a few privileged individuals (Akash & Ranson, 2005; Ellis, 2000; Gupta & Mayur, 2006; Ranson et al., 2006). When health insurance is provided in a country, it has been associated with an increase in healthcare coverage and financial protection, which improves the health status of the population (Gaudin & Yazbeck 2006). In India, the Government Health Insurance Scheme consists of the Employees State Insurance and the Central Government Health Scheme, which are run by the agency of the government at a subsidized rate for the welfare of public sector employees.

### ***1.3.2 Out-of-Pocket Health Expenditures for Inpatient Healthcare***

Evidence shows that around 31.96% of OOP health spending in India goes toward inpatient care (Kumar et al., 2011). A study by Berman et al. showed that hospitalizations were the primary reason for catastrophic health expenditures in India (Berman et al., 2010). Evidence from National Health Account 2017 shows that OOP health expenditures for inpatient care constitutes around 31.96% of the total OOP health expenditures, even after coverage by various health insurance programs. Inadequate insurance coverage is considered to be the primary reason for high health expenditures and for pushing people into poverty (Shahrawat & Rao, 2012). A WHO study in 51 countries that aimed to estimate the occurrence of catastrophic health expenditures due to OOP health expenditures and to quantify the proportion of OOP health expenditures due to outpatient, inpatient, and medicine expenditures at the country level showed that around 2.2% of the population

experiences catastrophic health expenditures due to inpatient care every year (Saksena et al., 2010).

There are many Public Health Insurance Programs for the Poor offered by the Government of India and the individual states that cover the cost of hospitalization and inpatient care. Rashtriya Swasthya Bima Yojana (RSBY), started in 2008, is a central PFHI program offered by the GOI in all states that do not have their own state-sponsored health insurance program. Some of the states, like Andhra Pradesh, Karnataka and Tamil Nadu, have their own state health programs, such as Aarogyasri, Yashaswini, and Kalaingar health insurance schemes, which offer various levels of coverage of inpatient services for the below poverty line (BPL) population (Hooda, 2017). The range of financial coverage for the inpatient service costs varies from INR 30,000 under RSBY to INR 200,000 under Vajpayee Aarogyasri Scheme in Karnataka (Hooda, 2017). All the government-sponsored health insurance programs cover the cost of inpatient care for people below the poverty line, while people above the poverty line are excluded from the service coverage (Hooda, 2017). Despite the availability of health insurance programs for the poor under the national and state insurance programs for the poor, government employees under the Central Government Health Scheme and state government programs, all small business employees under the Employee's State Insurance Program and other workers in private sector under the Employment based insurance that cover inpatient health services, the OOP health expenditure due to inpatient healthcare is still about one-fourth of the total OOP health expenditure, suggesting that there are gaps in the coverage for inpatient services (Kumar et al., 2011). A study done in the Chhattisgarh state of India showed that 35.5% of people experienced catastrophic health expenditures when one member of their family was

hospitalized (Nandi et al., 2017). Another study showed that people who were enrolled in the Government health insurance programs including RSBY experienced a median OOP expenditure of INR 3550 compared to INR 5100 for individuals who were not covered (Sundararaman et al., 2016). Many studies show that people incur high OOP health expenditures despite being covered by the national health insurance program RSBY and the other state health insurance programs (Devadasan et al., 2013; Rent & Ghosh, 2015; Rao et al., 2014; Rajasekhar et al., 2011; Selvaraj & Karan, 2012). The Government of India is aware of the problem and trying to increase governmental expenditure on health care (GOI, 2017).

Evidence from literature has shown that increased health insurance coverage leads to increase in utilization of health services, but the effect of health insurance coverage on financial risk protection is less clear, especially for poor beneficiaries (Escobar et al., 2010). The health insurance for the poor people in India covers only inpatient services. This creates an incentive for the patients to visit hospitals and get hospitalized, instead of using basic primary health care services which usually cover only outpatient health services. Studies on hospitalization trends in India showed that an annual hospitalization rate increased from 16.6 per 1000 to 37.0 per 1000 from 1995 to 2014 (Pandey et al., 2017).

#### **1.4 SIGNIFICANCE OF THE STUDY**

India is currently taking measures to provide universal health coverage to its population. Providing financial protection is considered the backbone of UHC. A quarter of OOP expenditures are due to household payments for hospitalization and inpatient services. Although Health Insurance Programs for the Poor such as the RSBY and other state insurance programs do not cover OOP for outpatient treatments or the cost of drugs,

these programs do cover the cost of inpatient health services. Despite this, the burden of inpatient OOP health expenditure has been increasing raising questions about the effectiveness of the programs in providing financial protection for inpatient health expenditures. With the government currently planning to expand the health insurance for the poor (by a new National Health Insurance Program) in terms of coverage limits and services covered, it is vital to study the effect of currently available Public Health Insurance Programs for the Poor on hospitalizations and inpatient OOP health expenditures to help policy makers to address the gaps and design better health insurance programs. Also, identifying and quantifying the degree of catastrophic health expenditures experienced by the people and their effect on poverty is vital for framing adequate policies to address them.

### **1.5 PURPOSE OF THE STUDY AND RESEARCH QUESTIONS**

This study uses nationally representative dataset to understand the effects of Public Health Insurance Programs for the Poor. A number of studies have been published in Iran, China, Nepal, Turkey, Tanzania, Brazil, Thailand, Georgia, Vietnam, Portugal, Botswana, Lesotho, and South Korea analyzing the determinants of catastrophic health expenditures (Nandi et al., 2017; Fazaeli et al., 2015; Van Minh et al., 2013; Shi et al., 2011; Saito et al., 2014; Kronenberg & Barros, 2014; Yardim et al., 2010; Brinda et al., 2014; Akinkugbe et al., 2012; Barros et al., 2011; Choi et al., 2014). This study intends to do the same for India. The following research questions will be addressed in this research:

***What is the effect of Public Health Insurance Programs for the poor on the utilization of hospital services as well as out-of-pocket health expenditures for inpatient care in India?***

***More specific research questions would be:***

1. How do hospitalizations differ between the people enrolled and not-enrolled under Public Health Insurance Programs for the Poor?
2. How does OOP health expenditure for inpatient care differ among people enrolled and not-enrolled under Public Health Insurance Programs for the Poor?

***Hypothesis***

1. The incidence of hospitalization is higher among members enrolled under Public Health Insurance Programs for the Poor compared to non-enrolled members
2. The length of stay of hospitalization is higher among members enrolled under Public Health Insurance Programs for the Poor compared to non-enrolled members
3. Poor people enrolled under Public Health Insurance Programs for the Poor have lower OOP health expenditures for inpatient care compared to non-enrolled members

Increase in OOP health expenditure over a certain threshold of the household consumption expenditure makes it catastrophic. High OOP health expenditures and Catastrophic health expenditures have the potential to push households into poverty and push already poor households further deep into poverty. The Poor People's Health Insurance Program already has several problems and limitations on enrolment and coverage. If more people are pushed into poverty because of OOP and catastrophic health expenditures, it becomes difficult for the Poor People's Health Insurance Program to provide coverage to the newly poor households who are enrolled into the program because of their change in status from non-poor to poor.

*The second general question this research would address the burden and determinants of catastrophic health expenditures.*

***Research Questions***

1. What is the incidence of catastrophic healthcare payments among the people in India?
2. What is the intensity of catastrophic healthcare payments among the people in India?
3. What is the degree of inequality among households in terms of incidence and intensity of catastrophic health expenditures?
4. What are the factors affecting the incidence of catastrophic health payments in India?
5. What are the factors affecting the intensity of catastrophic health payments in India?

The structure of this research study is as follows: Chapter 1 provides the background information and research questions for the study; Chapter 2 is a review of relevant research on the topic; Chapter 3 provides the methodology for the study; Chapter 4 provides the results and discussions on the effect of public health insurance programs for the poor on hospitalizations and out-of-pocket inpatient care cost ; Chapter 5 provides the results and analysis of incidence, intensity, determinants of CHE and socioeconomic inequality in experiencing CHE in India; and Chapter 6 provides a conclusion of the two transcripts.

## **CHAPTER 2: LITERATURE REVIEW**

Out of the 1.324 billion people in India (2016), around 21.9% of the population is below the poverty line using the revised World Bank Poverty line of USD 1.90 (World Bank 2019). Majority of the health insurance programs in India cover only the hospital expenses (Shahrawat & Rao, 2012). Inadequate health insurance coverage is considered to be the primary reason for high OOP health expenditures and also for pushing people into poverty (Shahrawat & Rao, 2012). Although part of the hospitalization expenses for poor people are covered by the health insurance programs in India, there are significant gaps in the depth and breadth of coverage provided by the currently available health insurance programs. The various health insurance programs and mechanisms that provide protection from financial burden to the poor in India are discussed below.

### **2.1 PUBLIC HEALTH INSURANCE PROGRAM FOR THE POOR IN INDIA**

RSBY is a health insurance program started by the Ministry of Labor and Employment of the Government of India in April 2008 that provides a wide range of hospital-based healthcare services for BPL families (Kumar et al., 2011). There are a number of state public health insurance programs for the poor in three of the southern states in India which provide higher coverage compared to RSBY and are exempted from the national program. The programs are the Chief Minister's Comprehensive Health Insurance Scheme in Tamil Nadu State, Rajiv Aarogyasri Community Health Insurance (RACHI) in Andhra Pradesh State, and Vajpayee Aarogyasri Scheme (VAS) in Karnataka State.

Table 4 summarizes the important features of the RSBY program and the state health insurance programs for the poor in Andhra Pradesh, Karnataka, and Tamil Nadu.

**Table 2.1: Key Parameters under RSBY and State Health Insurance Programs**

Parameter	Rashtriya Swasthya Bima Yojana (RSBY)		State health insurance programs for the poor (Andhra Pradesh, Tamil Nadu and Karnataka)
	Description	Additional Caveats	Description
Benefits covered	Cost of hospitalization for 725+ procedures at empaneled hospitals up to INR 30,000 per annum per household; INR 100 per visit up to INR 1,000 per year for transport cost	Pre-existing conditions are covered; minimal exclusions; day surgeries covered; outpatient expenditure is not covered	Andhra Pradesh - Families are provided coverage for INR 200,000 per family per year, and there are no restrictions on the number of family members enrolled Karnataka - INR150,000 per year for 5 persons in a family Tamil Nadu - INR100,000 per family per year
Eligibility criteria	Must be on the official state BPL list; Limited to five members of the household including household head, spouse, and three dependents	All enrolled members must be present to be enrolled;	Must be on the official BPL list of the specific state. No restrictions on the number of family members enrolled in Andhra Pradesh, and Tamil Nadu. Covers five members of family in Karnataka.
Premium and fees	INR 30 registration fee per household per annum paid by household.		No specific enrolment fee in the three states of Andhra Pradesh, Karnataka, and Tamil Nadu
Financing	75%/ 25% Government of India/ State Government	The ratio is 90% /10% in Northeast states and Jammu & Kashmir	Completely funded by the respective states
Insurer	Both public and private insurance companies can bid to work in a district or more than a district recommended by state governments	In one district only one insurance company is finally selected	Both public and private insurance companies can bid to work at the state level



Service provider	Both public and private sector service providers can apply to join the network of providers empaneled under the scheme	Minimum eligibility criteria on quality of services to be provided have been laid down by the MoL & E	Both public and private sector service providers in the specific state can join the network of providers empaneled in the program. Minimum eligibility criteria laid down by the respective State Health Ministries
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Source: Ministry of Labor and Employment (MoL & E) and State Health Departments

### ***Enrolment under Public Health Insurance Programs for the Poor***

Around 41 million families are enrolled in RSBY, covering around 150 million poor people as of September 2016 (Karan et al., 2017). The enrolment under the program is increasing from just 55 districts in 2008-2009. Nationally, around 460 districts participate in the program, with 57% of the eligible households are currently enrolled (Karan et al., 2017). There is significant inter-district and inter-state variation in the percentage of eligible households enrolled in RSBY. Across states, the enrolment ratio varies from a low of 24% in Arunachal Pradesh and 36% in Haryana to more than 75% in Kerala. The degree of enrollment of households in each district varies significantly among the various districts across the country, with a low rate of enrollment of 3% in Kannauj district and 6% in Kanpur district in the Uttar Pradesh state to a high enrollment rate of 90% of the households in most of districts in the Chhattisgarh and Kerala states of India (Karan et al., 2017). Enrolment is not complete in many states, even a decade after the start of the program (Karan et al., 2017). Also, as of September 2016, the state of Rajasthan was still in its early stages for enrollment of households for RSBY (Karan et al., 2017). This shows that enrollment in the RSBY program has been slow in some parts of India. Not all states in India participate in RSBY.

The state of Andhra Pradesh has not adopted RSBY as it already has a substantially more generous state level health insurance program than RSBY which pre-dates RSBY and also has higher population coverage, covering nearly 80% of its population (Fan et al., 2012). Even the state of Tamil Nadu and Karnataka have their own health insurance programs with higher levels of coverage than RSBY. The three states, Andhra Pradesh, Karnataka and Tamil Nadu are running their state level health insurance programs. In Karnataka, Vajpayee Aarogyasri Scheme (VAS) program was started in February 2010 in the Gulbarga division covering 1.439 million BPL households, and then expanded to the Belgaum division by August 2010 covering 1.691 million BPL households. By June 2012 it had been extended to the Bangalore and Mysore divisions, thus covering the whole state of Karnataka (Sood et al., 2014). There are some problems associated with the RSBY program. Studies show that access is not available to around 50% of the people eligible for the RSBY program because they are currently not enrolled in RSBY due to the lack of availability of full lists of the eligible participants, and high migration rates (Karan et al., 2017). Beneficiary knowledge about the covered services under RSBY is also limited (Taneja & Taneja, 2016). There is no awareness creation component of the program. There also has been denial of treatment to smart card holders because of disputes between the hospital and the insurer, for which there are no proper mechanisms to resolve (Taneja & Taneja, 2016). RSBY leads to misuse of services, since both the physician and the patient have the incentive to convert an outpatient case into an inpatient admission, leading to unwanted increased utilization (Taneja & Taneja, 2016).

### ***Health Insurance Coverage, Hospitalization and OOP health expenditures***

The increase in health insurance coverage may lead to increase in health care utilization because of the change in behavior both by the insured and the provider. A study by Anderson et al. (2012) on the effect of health insurance coverage on the utilization of medical services in the US showed that there was a 61% reduction in inpatient hospital admissions and 40% reduction in emergency department visits among the uninsured population (Anderson et al., 2012). Evidence from literature has shown that increased health insurance coverage leads to increase in utilization of health services, but the effect of health insurance coverage on financial risk protection is less clear, especially for poor beneficiaries (Escobar et al., 2010). The health insurance for the poor people in India covers only inpatient services. This creates an incentive for the patients to visit hospitals and get hospitalized, instead of using basic primary health care services which usually cover only outpatient health services. Studies on hospitalization trends in India showed that an annual hospitalization rate increased from 16.6 per 37.0 per 1000 from 1995 to 2014 (Pandey et al., 2017). Under the Public Health Insurance Programs for the poor only the hospitalization services and expenses are covered. It is expected that these health insurance for the poor will increase utilization of hospitals by the households below poverty line who would usually be forced to postpone their non-urgent procedures for a later time because they cannot afford it. But there may be OOP payments for drugs, tests and post-treatment care which are not covered by the health insurance that may increase the OOP payments for total inpatient care. Hence the direction of association of the Poor People Health Insurance Programs on total inpatient OOP health expenditure is unclear. With health insurance coverage, it is expected that although there may be some increase in inpatient

health expenditures and healthcare utilization, but the number of individuals experiencing OOP health expenditures for inpatient care should decrease.

Globally studies on the effect of health insurance on hospitalization and OOP health expenditures show mixed evidence. A study by Aggarwal (2010) on Yeshasvini community-based health insurance program in Karnataka among 4109 households employed propensity score matching to identify suitable control households showed that the community-based health insurance program led to increase in utilization of health services and also a reduction in OOP healthcare spending with improved health outcomes (Aggarwal, 2010). Devadasan et al. (2010) evaluated the Community Based Health Insurance scheme, the ACCORD-AMSASHWINI scheme among 297 insured and matched them with 248 uninsured individuals and found that insured individuals had higher hospital admission rates compared to uninsured individuals (Devadasan et al., 2009). A study by Fan et al. (2012) to evaluate the impact of Arogyashri health insurance program of Andhra Pradesh found that the state health insurance program significantly reduced the OOP health expenditures for hospitalizations but did not have effect on reducing outpatient OOP health expenditures (Fan et al., 2012). Another study in Andhra Pradesh state by Rao et al. (2014) which used the NSSO data for 2004 and 2008, found that the RACHI program led to significant decreases in OOP health expenditures for inpatient care (Rao et al., 2014). In the neighboring state of Karnataka, a study by Sood et al. (2014) on another state health insurance program, Vajpayee Arogyashree (VAS) on hospital utilization and OOP health expenditures using primary data collected from 572 villages showed that the households under the program experienced reduced OOP health expenditures for hospitalizations (Sood et al., 2014).

Smaller cross-sectional studies were done in various states in India. A cross-sectional study conducted in two districts of Andhra Pradesh by Mitchell et al. (2011) showed that households with insurance had higher OOP health expenditures compared to households with no health insurance coverage (Mitchell et al., 2011). A cross sectional study conducted in Tamil Nadu state by Philip et al. (2012) showed that utilization of healthcare was significantly higher among the insured compared to the uninsured population and the mean OOP expenditure among the insured households was significantly higher than the uninsured households (Philip et al., 2016). Another primary cross-sectional survey conducted in Maharashtra by Ghosh (2014) showed that utilization of healthcare was higher among the insured compared to the uninsured families (Ghosh, 2014). Katyal et al. (2015) used a quasi-experimental design (Pre and post design with a DID based analysis) with a primary survey undertaken in the two states of Andhra Pradesh and Maharashtra and the results were compared with findings of NSSO data from 2004-05 round and the results of the study showed that the utilization of private hospitals increased in Andhra Pradesh, but decreased in Maharashtra, while the utilization of public hospitals decreased in both the states, and OOP increased in both the states with greater increase in Maharashtra compared to Andhra Pradesh (Katyal et al., 2015).

At the national level, Selvaraj and Karan (2012) used NSSO data to evaluate the impact of RSBY using the NSSO data for the pre and post intervention periods (2004-05 and 2009-10). They did not find any beneficial effects of the program (Selvaraj & Karan, 2012). Another study by Karan et al. (2017) on the impact evaluation of RSBY used the NSSO data for (1999, 2004 and 2011) and employed the 'difference-in-differences' methods to estimate the effects of RSBY on OOP health expenditures and found that the

likelihood of incurring OOP health expenditures increased by 30% due to RSBY program and the results showed that RSBY has not been effective in reducing the burden of OOP health expenditures for poor households (Karan et al., 2017).

## **2.2 CATASTROPHIC HEALTHCARE EXPENDITURES**

### *Defining Catastrophic Healthcare Expenditures*

Catastrophic health expenditure (CHE) occurs when the OOP health expenditures exceed a specific threshold value of the household expenditures. Different studies have used different methods to choose this threshold value. CHE has been used as a measure of financial protection in several studies in different countries (Saksena et al., 2010; WHO 2015; Xu et al., 2003). Numerous methodologies have been used to estimate whether OOP health expenditure is catastrophic. The most common method is to calculate the OOP healthcare expenditures are percent of the income (Xu et al., 2003; Berki, 1986; Skarbinski et al., 2002; Wyszewianski, 1986). A study by Forthofer et al. used five different definitions of CHE namely greater than USD 1,000, USD 2,500, USD 5,000, expenditure greater than 15% of the total family income, and expenditures greater than 50% of the per-capita income (Forthofer et al., 1982). The next approach is the WHO's methodology called the 'capacity to pay approach', in which health expenditure is said to be catastrophic if the OOP is more than 40% of a household's ability to pay (income remaining after non-discretionary expenditure) (Xu et al., 2003).

The next approach is the 'budget share approach', wherein a household OOP health expenditure of more than 25% of the total household expenditure is defined as catastrophic (WHO 2015). The other approach is the 'food expenditure approach', in which an expenditure is defined as catastrophic if the household OOP health expenditures are more

than 40% of the household's non-food expenses (WHO 2015). A study by Wagstaff and Doorslaer used two different approaches for measuring CHE (Wagstaff & van Doorslaer, 2003). They applied their methodologies to the OOP health expenditure data from Vietnam for 1993 to 1998. In the first approach, the OOP health expenditures is not expected to be higher than a pre-specified proportion of the income. The second approach is based on the principle that OOP health care payments should not force the households into poverty. Wagstaff and Doorslaer developed the indices for the measurement of intensity and incidence of CHE and the degree of CHE occurring across the income groups. They also developed the measures for the measurement of poverty-impact incidence and intensity.

Under the National Health Policy (NHP) of the Government of India, Catastrophic household healthcare expenditure is defined as health expenditure exceeding 10% of its total monthly consumption expenditure or 40% of its monthly non-food consumption expenditure (Rajpal & Joe, 2018; GOI, 2017). In this study, to examine the effects of CHE on the welfare of the households in India, two different methodologies will be used. The first one will be the measurement of incidence and intensity of CHE in the households and the next one is the measurement of the effect of OOP healthcare payments on poverty headcount and poverty gap measures. The two approaches measure different aspects of financial risk protection. The first approach measures the CHE, the degree to which the OOP payments exceed the different thresholds of household income and the number of people affected by it. The second approach measures the incidence and the depth of poverty that is caused by the healthcare payments (Bredenkamp et al., 2011).

### ***Measuring Catastrophic Health Expenditures***

Wagstaff and van Doorslaer defined OOP health expenditures as catastrophic if they exceed some fraction of household income or total expenditure in a given period. The reason provided they provided was that, if the household spends a higher proportion of its budget on healthcare; they will be forced to forgo expenditures on other goods and services that is essential for the well-being for the household (Wagstaff & van Doorslaer, 2003). Defining the threshold amount is important for calculating the incidence of CHE. Household consumption expenditures will be used as a proxy for income of the household. Households are expected not to spend more than a pre-identified portion of their household expenditures/income (Z) during a specified period for the procuring the health services. If the health expenditures of the household are higher than Z, then it is termed as catastrophic. The idea is that the households will need at least (1-Z) of their household income/expenditures for other necessities of the household such as food, clothing, housing, education, etc. Thus, if the households spend more than the catastrophic level, it may affect the standards of living of the household.

### ***India's National Health Policy 2017 and Catastrophic Health Expenditures***

Affordability is a key principle under the National Health Policy 2017 (NHP) of India. The National Health Policy states that “As costs of care increases, affordability, as distinct from equity, requires emphasis”. In the National Health Policy, Catastrophic household healthcare expenditure is defined as health expenditure exceeding 10% of its total monthly consumption expenditure or 40% of its monthly non-food consumption expenditure, are unacceptable (Rajpal & Joe, 2018; GOI, 2017). The recent National Health Policy (NHP), 2017 aims to increase the government health funding from the current level



of 1.15% to 2.5% of GDP by 2025. The policy report envisages “to attain the highest possible level of health and well-being for all at all ages and to provide affordable and universal access to good quality health care services without anyone facing financial catastrophe”. Further, the NHP report specifically mentions that the proportion of households incurring CHE should be reduced by 25% from the current level by 2025 (GOI, 2017). Catastrophic health expenditures affect the economy of the households and leading to poverty or push people further into poverty (Garg & Karan, 2009; Selvaraj & Karan, 2009). The current policy debate is about “health for all with financial protection” from the concept of “health for all” which was more common in the last decade (Hooda, 2015).

### ***Determinants of Catastrophic Health Expenditures***

A number of determinants affect OOP and catastrophic health expenditures. These determinants vary depending on the developed or developing nature of a country. Public sector health spending is higher in developed countries compared to that of developing countries due to various reasons, such as the stability of the governments, efficiency of the health system, and maintenance of quality (Liang & Mirelman, 2014). The literature on the determinants of OOP health expenditures from OECD countries may not be completely applicable to developing countries. Since the country of focus of this study is India, the focus of literature review will be primarily from India. Previous research on out-of-pocket health care expenditures and catastrophic health expenditures provide the framework for this research. The review of previous work helps in exploring the variables of interest for the analytical framework.

A study by Bhojan et al. (2012) examining the OOP health expenditures for chronic conditions in Bangalore city, Karnataka State of India among 9299 households showed that

small household size, low income households, and the use of referral hospitals as the place of consultation were associated with a greater likelihood for catastrophic health expenditures. The OOP payments increased as the place of consultation moved from primary health centers (primary level) to referral hospitals (secondary level) and super-specialty referral hospitals (tertiary level). Households borrowed money and sold or mortgaged assets in order to finance their OOP healthcare spending. OOP payments for chronic conditions, even if the care is only for outpatient care, push people into poverty. Additionally, OOP payments for the treatment of chronic conditions show that using private healthcare facilities led to higher OOP expenditures compared to public sector hospitals. The study also demonstrates that the OOP payments for health services were higher in the private sector, but the collective OOP payments for other items such as travel, food, and informal payments were greater when the government sector was the site of consultation. This may be due to the remote location of the government health facilities in many parts of the country and the rampant corruption in them. The study also showed that an increase in the number of female members in a household was associated with a decrease in the health expenditures of the household (Bhojani et al., 2012).

Mohanty et al. (2014) used the Consumption Expenditure Data, National Sample Survey 2009-2010 to study the OOP health expenditures among the elderly and non-elderly in India and found that households with elderly members had significantly higher OOP health expenditures compared to households with non-elderly members. The health expenditures increased with the economic status of the household and the age and educational attainment of the household head. The health expenditures are more likely to

become catastrophic for households with elderly members, poorer households, and households with casual laborers (Mohanty et al., 2014).

Also in India, Leone et al. (2012) studied maternal healthcare expenditures using the 2004 National Sample Survey Organization data, which showed that rural households had higher healthcare expenditures for maternal and neonatal care, irrespective of the socioeconomic status of the households or the state in which the household was located. Furthermore, the cost of maternal healthcare services in India was two to four times higher in private healthcare facilities compared to that of government facilities (Leone et al., 2013).

Drawing from 1000 participants, a study performed in Vellore, Tamil Nadu State of India examined the determinants of OOP health expenditures among the elderly aged above 65 years. The researchers found that male gender, lack of education, poor sanitation and lack of access to safe water, and the presence of diseases such as diabetes, tuberculosis, malaria, respiratory diseases, gastrointestinal diseases, dementia, depression, and disability were associated with higher OOP health expenditures. This study determined the important finding that elderly men have higher OOP health expenditures than elderly women (Brinda et al., 2012).

Srivastava et al. (2009) conducted a study in Lucknow, Uttar Pradesh State of India to study the OOP health expenditures for sick children among the urban poor. Their results revealed that the OOP health expenditures for neonatal illness were significantly lower in government healthcare facilities compared to non-governmental facilities, and OOP health expenditures were significantly higher for those hospitalized in private hospitals (Srivastava et al., 2009).

A study by Mondal et al. (2014) in the three districts of Malda, North 24 Parganas, and Bankura in the West Bengal State of India examined 748 urban and 2403 rural households. Their findings showed that the households with members suffering from chronic illness who had been hospitalized were three times more likely to experience catastrophic health expenditures compared to households with members suffering from chronic illnesses who had not been hospitalized. Thus, the main determinants of OOP health expenditures identified in the study were the prevalence of chronic illnesses among the members of the household, hospital admissions, and delivery expenses for childbirth (Mondal et al., 2014).

Daga et al. (2015) assessed the OOP non-medical expenses for the out-patient treatment of childhood illness in Pune district, Maharashtra State of India and discovered that households in rural areas experienced higher OOP expenditures because they visit private healthcare facilities instead of utilizing the government public health centers, even though they are nearer, because of the perceived lower quality of services (Daga et al., 2015).

Using the Consumer Expenditure Survey of India for 1999-2000, Karan and Garg (2009) showed that increases in the poverty head count and the deepening of poverty were higher in the poorer states of India and in the rural areas compared to the richer states and urban areas (Garg & Karan, 2009). A report from the World Bank by Gerard and Nagpal (2012) in India showed that hospitalizations are the major drivers of OOP health expenditures, which is the main reason why the government is trying to provide coverage for hospitalization expenses (La Forgia & Nagpal, 2012).

A community-based cross-sectional study in Uttar Pradesh State of India by Patel et al. (2014) demonstrated that there are many instances where a sick person does not seek medical advice for the treatment of their illness, but follow the advice given by family members, friends, and informal providers such as medical shop owners instead (Ahmad et al., 2014). This has the potential to complicate the illness and lead to higher health expenditures for the patient.

A study in Delhi, India by Dhar et al. (2009) on maternity care services showed that cesarean sections led to higher health expenditures compared to normal deliveries both in public and private sector hospitals. Also, women from higher income areas spent much more for maternal and neonatal care compared to women from lower income areas (Dhar et al., 2009).

Karan et al. (2014) used the three Consumer Expenditure Surveys (2000, 2005, and 2012) to assess the burden of OOP health expenditures among the social groups in India. Their findings revealed that Scheduled Castes/Scheduled Tribes, Muslims, and the poorest 20% of households experienced higher OOP health expenditures as a share of total household expenditures for outpatient care compared to other groups. Muslim households reported higher OOP health expenditures for inpatient care compared to non-Muslim households, but the poorest 20% of the households reported lower OOP health expenditures for inpatient care compared to the other groups, which may be due to the coverage of the poorest groups by the cashless public health insurance programs in India (Karan et al., 2014).

A study by Brinda et al. (2015) used the WHO's study on global aging and adult health to reveal that OOP health expenditures were higher among people with disabilities

and people with lower income levels. The presence of illnesses such as diabetes, heart disease, tuberculosis, hypertension, and chronic pulmonary disease led to higher OOP health expenditures. Older men and individuals with chronic diseases were at a higher risk of experiencing catastrophic health expenditures, and the coverage by health insurance reduced the risk of catastrophic health expenditures (Brinda et al., 2015).

Dwivedi and Pradhan (2017) used the Consumer Expenditure Survey for 2009-10 to demonstrate that people residing in urban areas, people with low income levels, non-Muslims, and non-Scheduled Tribes had higher healthcare expenditures (Dwivedi & Pradhan, 2017). Kumar et al. (2012) conducted a study in Hyderabad, Telangana State of India to estimate the OOP health expenditures for road traffic injuries in India and identified that admission to a private hospital and not having health insurance coverage increased the risk of experiencing catastrophic health expenditures (Kumar et al., 2012).

The sanitation coverage nationally in India is only about 34%, with around 66% of the population practicing open defecation. These unhygienic practices lead to high rates of infections, mortality, and morbidity in the community (Jha, 2003). This may lead to more physician visits and increased health expenditures. The WHO report on the costs and benefits of water and sanitation shows that the provision of safe drinking water will lead to a reduction in the number of diarrheal diseases and water-associated diseases and, in turn, will reduce the associated health expenditures. The cost of treating a single case of diarrhea including consultation expenses, medication, and other overheads such as transportation and food, may vary between US\$10 and US\$23, depending on the location. The transportation cost for a visit to a health facility is estimated to be US\$0.50 per visit, and 50% of patients use transportation to reach health facilities (Hutton & Haller, 2004).

In summation individuals make the decision to use health services in order to take advantage of the potential benefits, and they incur health expenditures as a result. There are many factors that affect the utilization of different types of health services and the OOP health expenditures they experience. Various individual factors such as age, gender, marital status, education, occupation, and religion/caste affect OOP healthcare expenditures. An individual's decision to use healthcare services and incur health expenditures is influenced by a number of household characteristics such as household size and composition, socioeconomic status, location, water and sanitation facilities, and the cooking fuel used in the household. A number of the characteristics of the health systems, financing, and disease status have been found to be important variables determining the degree of OOP health expenditures incurred by patients, such as the type of provider, level of care, type of ward, type of illness and severity, hospitalizations, presence of chronic illnesses, type of treatment received, coverage by health insurance, and source of financing for medical expenses.

**Table 2.2: Factors affecting Out-of-Pocket and Catastrophic Health Expenditures**

<b>Factors - Groups</b>	<b>Factors - Variables</b>
Individual Characteristics	Age (+/-)
	Gender (+/-)
	Marital Status (Married +/-)
	Education (+/-)
	Religion and Social Group (Minority group +/-)
	Socioeconomic status of individual (+/-)
Household Level Characteristics	Household size (+/-)
	Household head (Female +)
	Composition of household (Elderly +; Children +; Female: +/-)
	Socioeconomic status of household (+/-)
	Location of household (Rural/Urban) (+/-)
	WASH facilities of household (-)
	Cooking fuel of household (Clean fuel -)
	Illness and type (+)

Illness and Health Facility Characteristics	Chronic illness (+)
	Hospitalizations (+)
	Type of provider (Private +)
	Level of care (Primary +; Secondary ++; Tertiary +++)
	Nature of treatment (Allopathy/AYUSH) (+/-)
	Health insurance (-)

### *Incidence of Catastrophic Health Expenditures*

In India, OOP expenses account for about 71.1% of the total health expenditures—one of the highest levels in the world (Balarajan et al., 2011; Hooda, 2017). Nearly 39 million people in India become impoverished every year due to catastrophic health expenditures (Balarajan et al., 2011). A study by Mohanty et al. (2018) used the Consumer Expenditure Survey (68<sup>th</sup> round) to investigate the geographic variation and catastrophic health spending in India. The study showed that 23.4% of the households experienced catastrophic health spending in India in 2011-12, with the highest level in Kerala (37.2%), followed by Andhra Pradesh (31.7%), and West Bengal (31.1%); the level was lowest in Assam (8.9%) and Delhi (11.3%). Catastrophic health spending did not show any association with the economic development of the state, and it was equally high in both the economically developed and undeveloped states (Mohanty et al., 2018). Pal et al. (2012) used the Consumer Expenditure Survey for 2004-2005 to study the incidence of catastrophic health expenditure variation based on the rural/urban location and socioeconomic status of the households in the different states. The results showed that the incidence of catastrophic health expenditures was highest among the poorest quintiles in the rural areas of Kerala (9.71%), and highest among the richest quintiles of the rural areas of Madhya Pradesh (21.82%). Among the poorest quintiles, the rate of catastrophic health



expenditures was highest in Rajasthan (13.34%) in urban areas and among the richest quintiles in urban areas in Orissa (11.26%) (Pal, 2012).

### *Assessing catastrophic healthcare expenditures sensitive to socioeconomic status*

The measures of incidence and intensity of CHE discussed in the previous section are insensitive to the socioeconomic status of the households and thus do not identify whether the poor or rich households exceed the threshold more. The headcount (HC) is defined by number of households whose levels of OOP payments exceed a certain threshold and overshoot (O) is the gap between actual payment and threshold level if the gap is positive, irrespective of economic status of households, i.e., whether household is poor or rich (O'Donnell et al., 2008). Many policy makers will consider it a more significant problem if the poorer households exceed the threshold level compared to the richer households. Wagstaff et al. recommend the method of concentration curves and the calculation of concentration indices to identify this (Wagstaff & van Doorslaer, 2003). Concentration curves are used to detect the presence of socioeconomic inequality in any health sector variable and whether it is more marked in one group than another. However, a concentration curve will not measure the magnitude of inequality. The concentration index which is related to the concentration curve can be used to measure the degree of socioeconomic related inequality in a health variable (Kakwani, 1977; Kakwani, 1980; Kakwani et al., 1997; Wagstaff et al., 1989). In literature, concentration indices have been used to estimate the socio-economic inequality for several health public health issues namely child mortality (Wagstaff, 2000), child immunization (Gwatkin et al., 2003), child malnutrition (Wagstaff et al., 2003), adult health (van Doorslaer et al., 1997), health subsidies (O'Donnell et al., 2007), and health care utilization (van Doorslaer et al., 2006).

The method of computation of concentration indices for the catastrophic payment headcount and catastrophic overshoot in this study is described in detail in the methods section.

### ***Impoverishment and Catastrophic Health Expenditures***

The incidence of CHS as discussed above does not demonstrate the degree to which CHS truly cause financial hardship. Some households may spend a higher proportion of their income on health and still not cross the poverty line, but other households may spend only a small proportion of their income on healthcare but still become impoverished. The idea of impoverishment goes further than incidence of CHS and the concept is that nobody should be pushed into poverty or further push already poor deeper into poverty because of healthcare expenditures (Wagstaff, 2008). Impoverishment can be measured by some of the methods suggested in literature. According to studies done by Wagstaff and van Doorslaer (2003) and van Doorslaer et al (2007), the impoverishing effects of OOP payments can be identified by calculating the difference between poverty estimations derived from household resources gross and net of OOP payments for healthcare (van Doorslaer et al., 2007; Wagstaff & van Doorslaer, 2003). Another study by Xu (2005) showed that a non-poor household is impoverished by health expenditures when it becomes poor after paying for obtaining the healthcare services, based on a defined poverty line in the country (Xu 2005).

### **2.3 GAPS IN RESEARCH**

Current studies on Poor People's Health Insurance Programs such as RSBY deal with issues in program enrolment (Shahi & Singh, 2015), barriers in implementation of the program (Rajasekhar et al., 2011), effect of information campaign (Das & Leino, 2011),

hospitalization patterns (Thakur, 2016), determinants of participation in the RSBY program (Nandi et al., 2013). There are only two district level studies on RSBY, one done in Amaravati district in Maharashtra (Rathi et al., 2012), and another in Gujarat (Devadasan et al., 2013) showed that RSBY increased hospitalizations and higher OOP health expenditures among the RSBY insured people. The study in Gujarat showed that RSBY enrollees experienced higher OOP health expenditures because they had to pay for medicines and diagnostics during the hospital admission (Aggarwal, 2010). Another state level study done for the state health insurance program Aarogyasri found different results with insurance significantly reducing the OOP health expenditures for hospitalizations (Fan et al., 2012). Most of the other studies that studied the impact of health insurance on hospitalizations and OOP health expenditures were community-based health insurance programs in different parts of the country (Aggarwal, 2010; Devadasan et al., 2009; Devadasan et al., 2007; Ranson, 2002) and thus their implications for nation-wide policy interest is limited.

The current study will present a considerable improvement on the available studies on Public Health Insurance Programs for the Poor in India on two important counts: i) the study uses nationally representative dataset which helps in estimating pan-India effects of Public Health Insurance Programs for the Poor which will have important policy implications ii) the study evaluates the effect of Public Health Insurance Programs for the Poor by using poor people who are enrolled and not enrolled under the program which may highlight the need for program scale up and the importance of expanding the insurance program for the poor who are eligible for the program. Many of the current available studies are based on RSBY enrollees alone and do not have controls, thus making it difficult to

identify the effects of the Public Health Insurance Programs for the Poor, but this study will use control population.

The previous section discussed the various determinants of catastrophic health expenditures from the literature available in India. Many studies have studied the health expenditures on specific diseases such as diabetes, tuberculosis, cancer, injuries etc., but the problem was that most of these studies were done in small geographical areas of the country and their representativeness for the whole nation was limited (Binnendijk et al., 2012; Yesudian et al., 2014; Rao et al., 2011; Prinja et al., 2015; Muniyandi et al., 2005; Ramachandran et al., 2007). Some studies have examined the determinants of out-of-pocket health expenditures for outpatient care in a few districts of India for certain age groups (Brinda et al., 2012; Gupta et al., 2016). Also, other studies have used different NSSO datasets and other nationally available data like National Family Health Survey (NFHS) etc. to study disease specific OOP health expenditures for hospitalizations (Kastor & Mohanty, 2018), OOP health expenditures due to non-communicable diseases (NCDs) (Tripathy et al., 2016), burden of OOP payments due to medicines (Selvaraj & Farooqui, 2018), OOP health expenditure for maternal care (Mohanty & Kastor, 2017), OOP health expenditure for accidental injury (Pradhan et al., 2017), but they did not address the specific research questions of catastrophic health expenditures, impoverishment and factors causing them that are addressed by this study.

The main reason for the Government of India and the various states in India seeking to establish different health insurance programs is to reduce the OOP health expenditures for inpatient services. The high burden of OOP health expenditures for hospitalizations and the occurrence of catastrophic health expenditures demonstrates that there are gaps in the

functioning of the current health insurance programs. This raises important questions: 1) Are the insurance programs for the poor effective in reducing OOP expenditures for inpatient care? 2) Are there other determinants which make people incur catastrophic health expenditures? 3) What is the incidence and intensity of catastrophic health expenditures experienced by the people? 4) How much does catastrophic health expenditures contribute to poverty in the households?

Evidence shows that high OOP health expenditures leading to catastrophic health expenditures are not essentially caused by a single event or by the use of costly medical procedures (Xu et al., 2003). Small payments that occur frequently also lead to higher OOP health expenditures. A study showed that the primary conditions that are necessary for the occurrence of high OOP health expenditures which are catastrophic are the availability and utilization of health care, poor capacity of households to pay for healthcare, and lack of any risk pooling and prepayment mechanisms (Xu et al., 2007). Thus, identifying the various determinants that cause individuals to have high OOP health expenditures is an important literature gap that this study will address. As discussed in the previous section, high OOP health expenditures have the potential to be catastrophic to the households. Catastrophic health expenditures may push the households into poverty and may push the households that are already poor further deep into poverty. The different states in India vary greatly in health outcomes, public health infrastructure, and health insurance coverage. The financial coverage, people covered, and number of people enrolled in the health insurance programs vary by states. It is vital to quantify the burden of catastrophic health expenditures in India to address and improve the financial coverage and provide financial protection to the people. No study has explored the various aspects of occurrence,

intensity, factors affecting catastrophic health expenditures and the impoverishing effect of catastrophic health expenditures using nationally representative dataset; this is another literature gap that this study aims to address.

Evidence obtained by addressing these two knowledge gaps will be vital for policy makers in India, both in the central government and in the different state governments, especially in the current scenario as the country transitions to UHC and the government is making massive investments to improve the financial coverage and address the underlying determinants. The present study can help decision-makers by identifying the effect of Public Health Insurance Programs for the Poor, quantifying catastrophic health expenditures and discussing the mechanisms driving them, thereby highlighting the need for developing options for addressing these determinants and developing stronger financial protection mechanisms. By identifying the incidence, intensity, socioeconomic inequalities in catastrophic health expenditures and the impoverishing effects of catastrophic health expenditures, this study helps the central government provide appropriate higher budgetary allocations for the groups that have higher OOP health expenditures and aids the designers of the national and state health insurance programs to design better benefit packages for those population groups. This investigation will serve as a basis for assessing India's policy options to reduce financial catastrophe due to health expenditures.

## **2.4 THEORETICAL MODEL**

Andersen's Behavioral Model of Healthcare Utilization will be used to guide this research (Andersen, 1995). The Andersen model examines the predisposing, enabling, need and healthcare utilization characteristics. In using the Andersen model, this study classifies individual and household characteristics as predisposing or enabling factors

associated with the use of health care services. Central government and state government health insurance schemes in India enroll population at the household level. This study focuses on the demographic characteristics such as age, gender, marital status, education, occupation, religion and social groups; household characteristics such as socioeconomic status, household size and composition, location of the household, WASH facilities, source of energy for household cooking; health system and utilization characteristics such as type of provider, level of care, type and severity of illness, nature of treatment, health insurance coverage and source of financing. Figure 2 illustrates the relationship between household's characters and its relationship to the OOP health expenditures.

### ***Predisposing Characteristics***

Predisposing characteristics of health services utilization are the demographic characteristics such as age, and gender composition of the household, which highlight the biological need for healthcare services (Andersen, 1995). Social structure denoted the household's ability to solve its problems (Andersen, 1995). Social structure consists of literacy and employment status of the household head, geographic location of the household which can either delay or facilitate access to health services, and social networks of the household which will be influential during the time of need. Beliefs are the norms, knowledge, values, and attitudes of the household about health and health services, which play an important role on the opinion of the household about need and utilization of health services (Andersen, 1995). Education is one of the important components which affects the beliefs of the household.

### ***Enabling Characteristics***

Enabling characteristics of health services utilization are financing and organization. Financing represents access to financial resources to pay for health care which can be income, assets, savings, coverage for health expenses through health insurance, and social safety nets. Organization refers to how the healthcare resources are distributed in the household's surroundings, which includes number and type of health facilities, access to transportation, time required to reach a health facility, and the waiting time to get the care.

### ***Need***

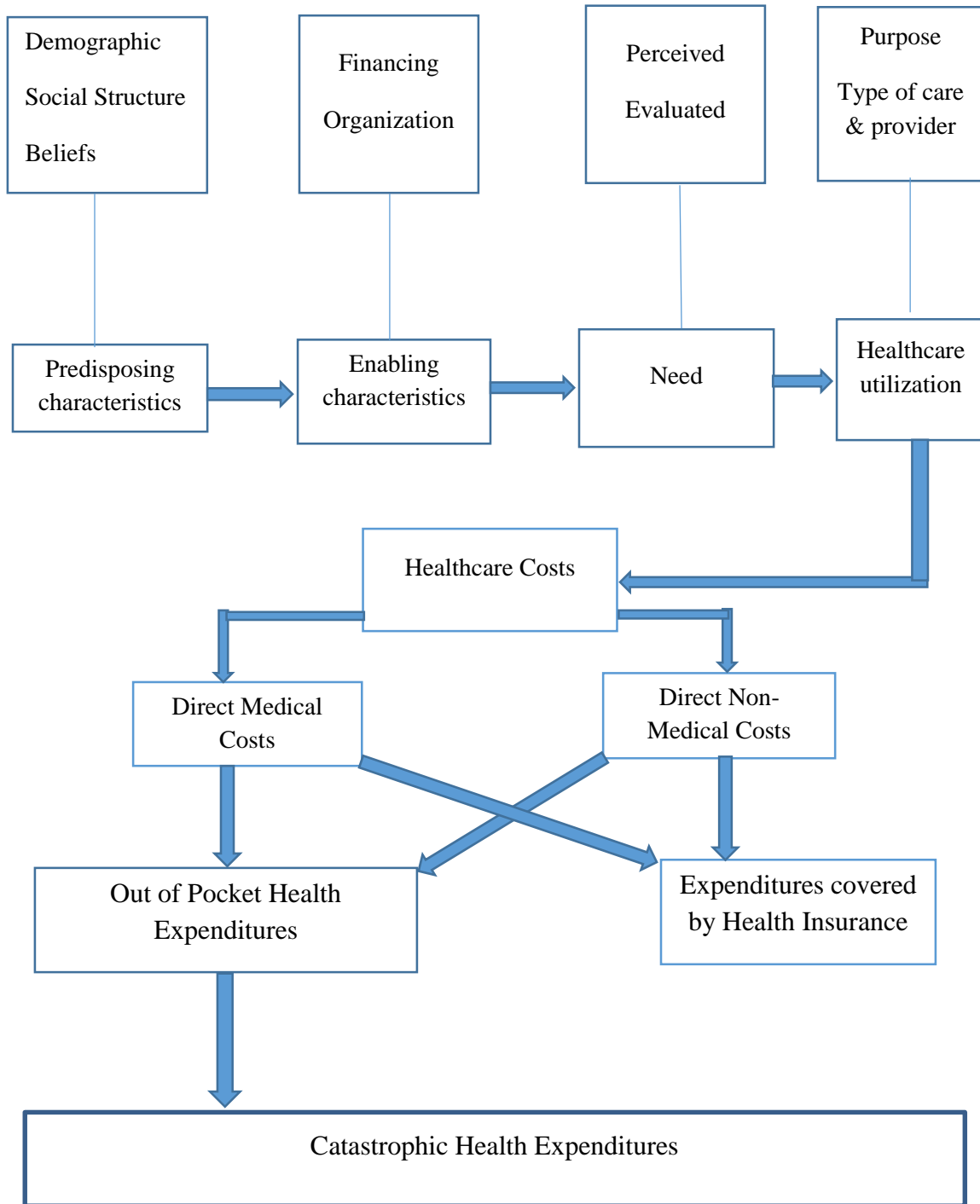
Need characteristics of health service utilization consist of both perceived needs and evaluated needs. Perceived needs indicate when an individual feels sick, the person decides to have a health consultation. The evaluated need denotes the objective and professional decisions made by the healthcare professionals regarding the illness of the individual. Thus, the evaluated need decides the type and duration of care that is prescribed to the patient. The diagnosis of the patient in a hospital usually highlights the evaluated need for healthcare and this usually determines the duration of hospitalization and medical services received by the patient.

### ***Healthcare utilization characteristics***

Healthcare utilization characteristics highlight the purpose of visiting the health facility (primary care for preventing an illness from starting, secondary care for providing treatment and retuning the patient to the normal healthy stage, and tertiary care for treating severe and chronic illnesses), type of care wanted, level of care wanted, and the type of



healthcare provider visited. The literatures on the effect of these different variables are discussed in the previous section.



**Figure 2.1 Determinants of Household’s OOP Health Expenditures using Anderson’s Behavioral Model of Healthcare Utilization**

## CHAPTER 3: METHODOLOGY

This chapter describes the methodology to be followed by the research study including the data set to be used. Some basic information about the data set will also be discussed. Empirical methodology for each of the principal aims of the paper will be presented.

### 3.1 DATA

#### *Source of Data*

The data from the National Sample Survey Organization (NSSO) of the Government of India will be used for the study. NSSO is a national organization under the Ministry of Statistics and Implementation which was established in 1950 to regularly conduct surveys and provide useful statistics in the field of socio-economic status of households, demography, health, industries, agriculture, consumer expenditure etc. The specific data from NSSO that will be used in this study is the Social Consumption (Health), NSS 71<sup>st</sup> Round for 2014, which is latest nationwide data available in India. The survey covered whole of the Indian Union. The survey used the interview method of data collection from a sample of 65,932 randomly selected households (36,480 in rural India and 29,452 in urban India) and 335,499 individuals, covering the members of the household in all the 36 states (including union territories). The data for the survey were collected over a period of six months, from January to June 2014. The NSSO Social Consumption (Health) collected data on demographic characters, employment, health

conditions, source of payments, health insurance coverage, type of coverage, costs of various inpatient services, level of care, type of care and a number of other variables. The survey also collected information on medical care received at inpatient and outpatient facilities of medical institutions including health expenditures for various episodes of illness. This is the first NSSO health survey that collected data on utilization of alternative medicines. The details of hospitalization for all current and former members of the household were collected for the last 365 days (hospitalization occurred from January 2013 to June 2014) and the details of outpatient services were collected for the last 15 days.

### ***Outline of the Survey Design***

The Social Consumption and Health Survey Interviews are conducted with a representative sample of households randomly selected through a stratified multi-stage survey design covering India. A rural/urban stratification is created within clusters called state-regions, which comprises of a continuous group of districts within a State or Union Territory. Within each district of a State/Union Territory, two strata were formed: the rural stratum comprising of all rural areas in the district, and the urban stratum comprising of all urban areas in the district. The First Stage Units (FSU) were the census villages in the rural sector and Urban Frame Survey (UFS) blocks in the urban sector. In case of large FSUs, one intermediate stage of sampling was done by the selection of two hamlet-groups/sub-blocks from each rural/urban FSU. The households constitute the Ultimate Stage Units (USU) in both the rural and urban sectors. A total of 4577 villages and 3720 urban blocks were surveyed, from which 36,480 rural and 29,452 urban households were sampled. In total, 335,499 individuals from 65,932 households were interviewed. The complete information of the survey design can be found in the survey report (NSSO 2014).

### ***Weighted Analysis***

Weighted analysis using the appropriate national weights based on stratification and clustering of the survey design was employed to derive nationally representative numbers or parameters. The NSSO has calculated the sampling weights and the weights are included in the data set for each of the observations. “Svy” commands in STATA version 14.0 was used for applying weights.

### ***Limitations of the Data***

Data were not collected from the floating population (people without any normal residence), but households residing in open spaces, roadside shelters and people who reside in the same place were listed. People residing in the protected residential areas of military, para-military, police areas and people in orphanages, rescue homes, etc., were not covered. The NSSO health survey data does not collect detailed consumption expenditure and the consumption expenditure in the NSSO survey does not differentiate between food and non-food expenditure. One approach of estimating catastrophic health expenditure requires data on non-food expenditure. It should also be noted that all information is reported by the surveyed individuals and households and some information required quite long recall time. Therefore, the data is prone to strategic, recall and other types of biases.

### ***Ethical Approval***

The dataset is available in the public domain after removing all individual level identification variables. It is not possible to identify the residence of any of the households as well. Therefore, ethical approval is not needed for the study. Permission has been

obtained from the Ministry of Statistics and Implementation of the Government of India for this research and potential future publications using the data set.

### **3.2 EFFECT OF HEALTH INSURANCE PROGRAM FOR THE POOR ON OUT-OF-POCKET INPATIENT HEALTH CARE COST IN INDIA**

#### ***Hospitalization***

Hospitalization in the NSSO data is defined as “an overnight stay in the hospital anytime in 365 days prior to the survey” (NSSO, 2014). Admission in inpatient facility of a medical institution for treatment of illness or injury, or for childbirth, will be called hospitalization. The birth of a baby in a hospital will not be taken as a case of hospitalization of the baby. If, however, a baby who has never left the hospital after birth or contracts an illness for which it has to stay in hospital, it will be regarded as a case of hospitalization. Surgeries undergone in temporary camps set up for treatment of ailments (ex. eye ailments) was considered as hospitalization by the survey. The recall period for the inpatient hospitalizations as well as hospital expenditures was 365 days. A total of 42,869 hospitalization cases were reported in the 2014 survey and all these cases will be included in the analysis.

#### ***Poverty Line***

The state-wise poverty lines of India for the urban and rural areas for the year 2011-2012 were calculated by the Planning Commission of India using Tendulkar Methodology of calculating poverty line. Details of the methodology can be found in the Planning Commission of India report (Planning Commission, 2014). This study will use the poverty lines to identify the individuals who are poor in the data set. The households with

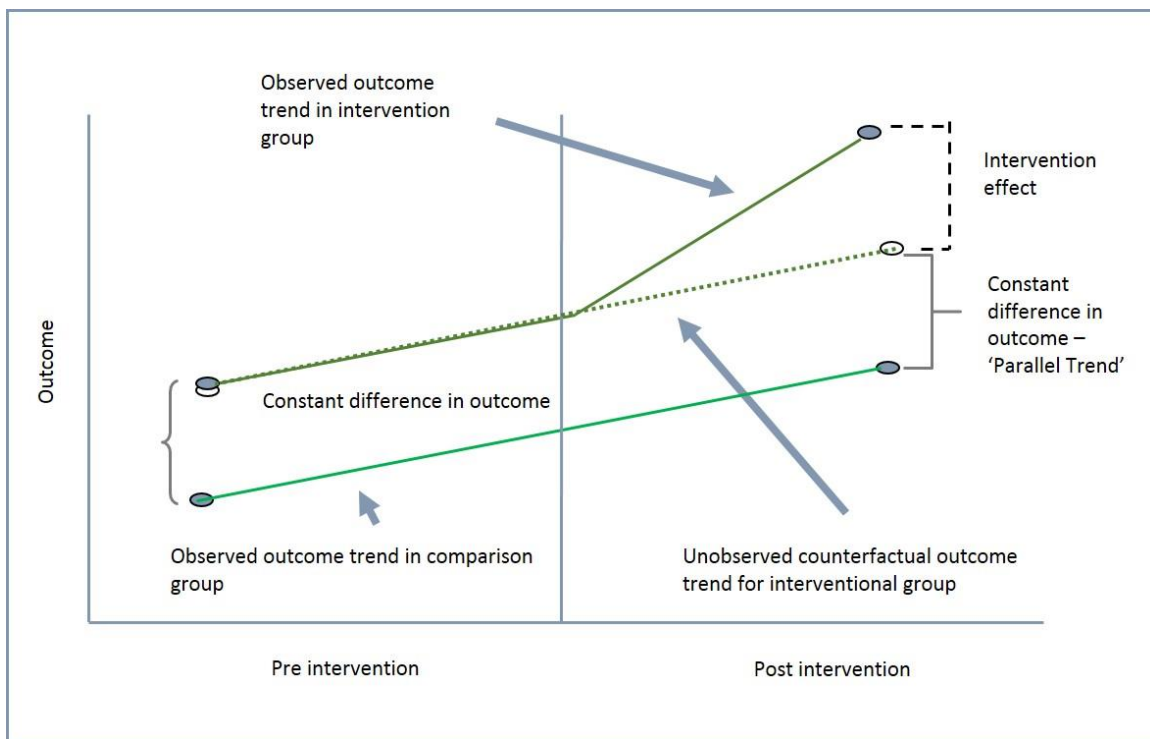
consumption expenditure below the respective poverty line for the state and area are defined as “poor”.

### ***3.2.1 Empirical Methodology***

The main objective of this study is to estimate the effect of Public Health Insurance Programs for the Poor on hospitalizations and OOP inpatient care costs. The effects of the program will be estimated by comparing the probability of hospitalizations and OOP inpatient healthcare costs between the groups who are eligible (poor) and covered by the insurance programs and who are eligible (poor) but not covered. In theory, the best approach of estimating the impact of a program would be to adopt a Difference-in-difference (DID) framework. DID is a quasi-experimental research design that is used to study the casual relationships where randomized controlled trials (RCTs) are infeasible or unethical (Wing et al., 2018). DID is typically used to estimate the effect of a specific intervention or treatment (such as a passage of law, policy, or large-scale program implementation) by comparing the changes in outcomes over time between a population that is enrolled in or affected by a program (the treatment group) and a population that is not (the control group). The framework requires data on these two groups in the pre-intervention period and then in the post-intervention period (Abadie 2008). DID estimators compare the change in mean outcomes before and after the intervention among individuals who acquire coverage (treated) and those remaining not exposed.

To estimate the causal effect using DID, the assumptions of DID must be satisfied. The main assumptions are that the treatment and control groups have parallel trends in outcome, the composition of the treatment and control groups are stable for repeated cross-sectional design, the allocation of treatment is unrelated to the outcome at baseline, and

there are no spillover effects. The most important assumption for DID is the ‘parallel trend assumption’. This means that in the absence of the intervention/treatment, the average difference in the outcome between the treatment and control groups would remain constant in post-intervention time period as in pre-intervention period. The violation of this assumption will imply that the DID approach will not be able to obtain unbiased estimates of the program impacts. The DID model cannot be used if composition of the pre-intervention and post-intervention groups are not stable, if the comparison group has a different outcome trend, and if the allocation of the treatment/intervention is determined by the baseline outcome (Abadie 2008).



**Figure 3.1 Intervention Effect using Difference-in-Difference Method**

However, the treated and untreated may differ in the distribution of both observable and unobservable characteristics. Heckman and Vytlačil (2007) highlighted that

unobservable variables may play a bigger (or smaller) role in influencing the with-treatment outcome than the without-treatment outcome (Heckman & Vytlačil 2007). Inability to control for them is likely to provide under (over) estimation of the effects of the programs. Since the main assumption of DID is parallel trend assumption and checking for the constant difference in outcome over time is necessary for deriving impact of a program or intervention using DID approach.

For the purpose of this study, a number of simplifying assumptions must be made as the data set is cross-sectional in nature and we only observe the outcomes in the year the data were collected. Therefore, the data set does not provide any information on the individuals who were enrolled in the insurance program in the previous period and those who were not enrolled. The insurance program is designed for the poor households and since belonging to the poverty group is a dynamic event, a household in poverty in pre-insurance period may not be in poverty in the post-intervention period. Moreover, household in poverty in the current year (the year of data collection) may not have been in poverty in the previous period. Almost all programs also show some degree of mistargeting implying that some poor people may not be offered the insurance while some non-poor were offered the insurance benefit. These potential deviations from expected enrollment may affect the estimate of outcomes when a post-intervention year's data are used.

In the DID model, the intervention effect will be the difference between the observed outcome in intervention group and the unobserved counterfactual outcome for intervention group as shown in Figure 1. It is possible to model the unobserved counterfactual outcome for intervention group in the post-intervention period in absence of the intervention if data on pre-intervention period are available. In the cross-sectional

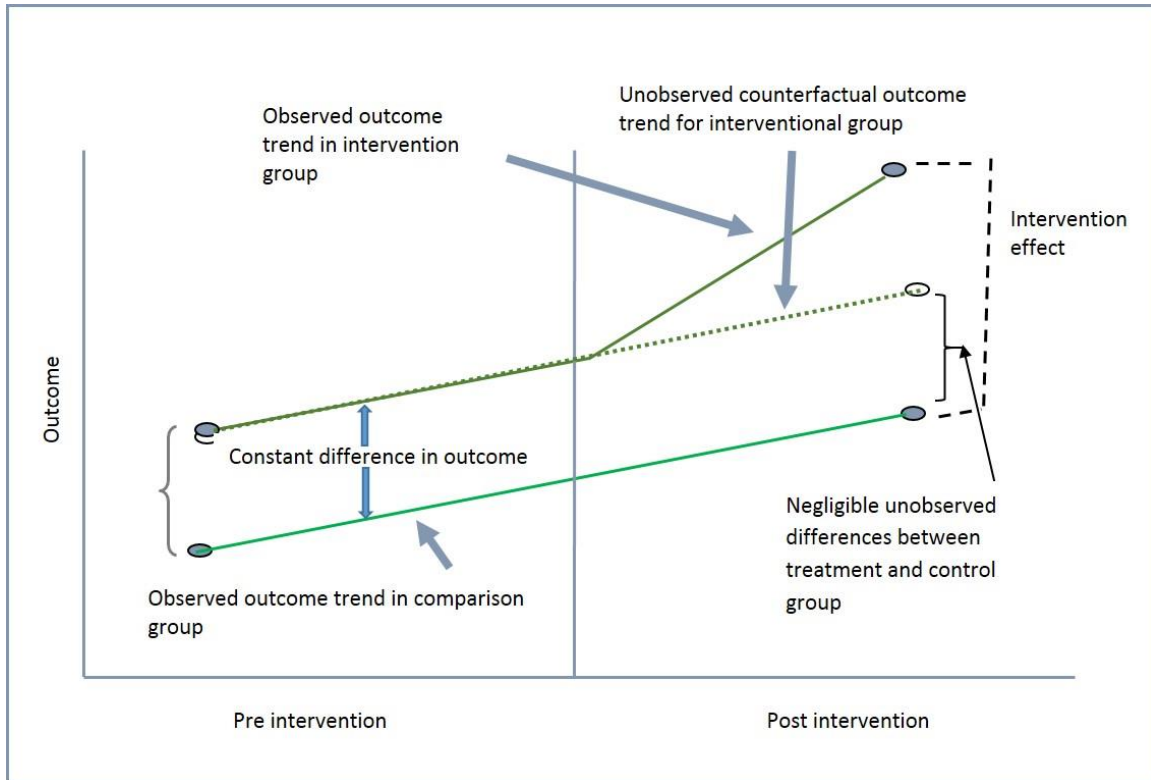


data of the study, we do not have information on the intervention and control groups in pre-intervention period and if intervention and control groups differed in terms of outcomes of interests, we have no way of correcting for this. The only alternative approach we can take is to select the comparison groups from the cross-sectional data in such a way that the likelihood of pre-intervention variability would be minimized.

Rather than identifying the economic status of individuals who were actually covered by insurance in the previous period, the implicit assumption we are using is complete absence of mistargeting or simply not allowing the mistargeted individuals in the analysis. It is also assumed the social mobility of poor households in India is relatively low and so the households belonging to poverty category in the current year (the year of the survey) were also poor in the previous few years. Since the sample size is large enough, most of the observed and unobserved characteristics of the poor who are in the program and who are not in the program are likely to be similar. Therefore, the factors other than insurance coverage that may cause differences between the intervention group and control group in terms of utilization of hospital services or out-of-pocket costs will be negligible. If the intervention and control groups are matched in the current year using a list of observable characteristics will further reduce the possibility of biased estimate or unequal starting point for the two groups in terms of outcome variables. Thus, using the cross-sectional post-intervention data, the intervention effect will be the difference between the observed outcome in the intervention group and the observed outcome in the control group as shown in Figure 2.

Two important assumptions are made in the impact evaluation process when using this cross-sectional data. The assumptions are, at the starting point in the pre-intervention

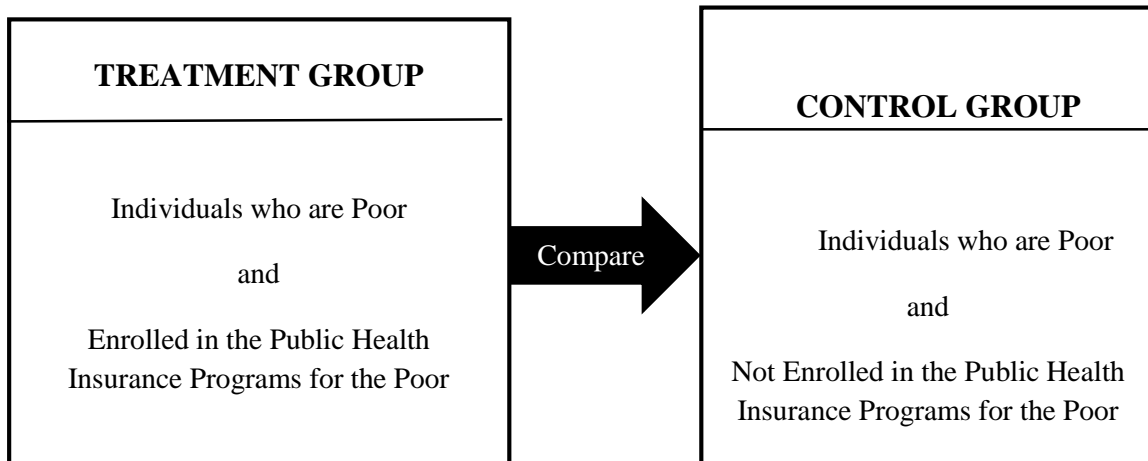
period, the unobservable differences between the intervention and control group are small, if any, and that both the intervention group and the matched control group would show similar trend in terms of outcomes in absence of the intervention.



**Figure 3.2 Intervention Effect using Cross-sectional data**

### ***Treatment Group and Control Group***

The treatment group will consist of all the people currently enrolled under the Public Health Insurance Programs for the Poor namely the RSBY and other state health insurance programs for the poor. The control group will consist of all people who are poor but not enrolled in the Public Health Insurance Programs for the Poor in the survey year 2014.



**Figure 3.3 Treatment and Control Groups**

### ***3.2.2. Propensity Score Matching***

In order to make both the groups comparable and to avoid selection bias, a propensity score matching will be used to match the treatment and control groups. A propensity score is the conditional probability that a subject receives “treatment” given the subject’s observed covariates. A propensity score matched regression analysis incorporating survey weights can better account for selection bias based on observed variables than an unmatched regression (Dugoff et al., 2014; Ridgeway et al., 2015). The main goal of propensity score is to balance the observed covariates from the individuals in the treatment and control groups in order to imitate a randomized study (Faries et al., 2010). To control for selection bias, samples who are poor and covered by Poor People Health Insurance Program with those who are poor and not covered by the Poor People Health Insurance Program will be matched by education, socioeconomic status, location of household (urban/rural), household size, and age of the individual, using a user-written command *psmatch2* in STATA. After matching, a regression analysis will be performed.

### ***3.2.3 Incidence of Hospitalization and Public Health Insurance for the Poor***

Hospitalization is determined by several factors. To study the effects of enrolment under Public Health Insurance Programs for the Poor on the incidence of hospitalizations after controlling for other factors, a binary logistic regression model will be used. The logistic regression model is preferred since the dependent variable is dichotomous.

The Logit model will be estimated as:

$$\ln\left(\frac{\text{Pr}(E)}{1 - \text{Pr}(E)}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \mu$$

“Whether the individual was hospitalized during the last 365 days?” will be used as the dependent variable. A dichotomous variable for hospitalization will be created with 0 for ‘not hospitalized during the last 365 days’ and 1 for ‘hospitalized during the last 365 days’. Thus, this dichotomous variable created for hospitalization will serve as the dependent variable for the logistic regression model. The independent variables include enrollment under the Poor People Health Insurance Program and other covariates as shown in Table 2. The model will estimate the log odds of incidence of hospitalization adjusted for a set of explanatory variables. Individual is the unit of analysis. The results for the logistic regression will be presented with the help of regression coefficients, odds ratio and 95% confidence intervals.

### ***3.2.4 Length of stay in hospital and Public Health Insurance for the Poor***

Tobit Regression Model will be used to study the association between Public Health Insurance Programs for the Poor and the duration of hospitalization. The Tobit model is

usually used when the dependent variable has a number of values clustered, usually at zero. For the duration of hospitalization, the dependent variable is either zero or higher than 0 (Wooldridge, 2003). The dependent variable duration of hospitalization is truncated below zero and thus the Tobit model is used.

The Tobit model will be estimated as:

$$Y^*_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \mu$$

$$Y_i = Y^*_i \quad \text{if } Y^*_i > 0$$

$$Y_i = 0 \quad \text{if } Y^*_i \leq 0$$

where  $Y^*_i$  is the latent dependent variable, and  $Y_i$  is the observed dependent variable.

### ***3.2.5 Out-of-Pocket Inpatient Care Cost and Public Health Insurance for the Poor***

Tobit Regression Model will be used to study the association between Public Health Insurance Programs for the Poor and the OOP cost for inpatient care. The Tobit model is usually used when the dependent variable has a number of values clustered, usually at zero. For the OOP inpatient healthcare cost, the dependent variable is either zero or higher than 0 (Wooldridge, 2003). The dependent variable duration of hospitalization is truncated below zero and thus the Tobit model is used.

The Tobit model will be estimated as:

$$Y^*_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \mu$$

$$Y_i = Y^*_i \quad \text{if } Y^*_i > 0$$

$$Y_i = 0 \quad \text{if } Y^*_i \leq 0$$

where  $Y^*i$  is the latent dependent variable, and  $Yi$  is the observed dependent variable.

### ***Dependent variable***

‘Total Out-of-Pocket health expenditures for inpatient care’ is defined as the total health expenditure for inpatient care net of reimbursement by health insurance. It is a continuous variable calculated in Indian Rupees (INR). The hospitalization expenses are included under two heads namely medical (direct) and direct non-medical (indirect) costs. Direct medical expenditure consists of package component and non-package component (doctor fee, medicines, diagnostic tests, bed charges, other medical expenses) and direct non-medical expenditure consists of transport for patient, transport for others, lodging charges of escort, food expenses, and other expenses and the details are provided in Annexure 1.

Total inpatient healthcare expenditure = (Medical expenditure, X) + (Direct Non-Medical Expenditure, Y)

Total out-of-pocket inpatient health expenditure = (Total inpatient healthcare expenditure) –

(Amount reimbursed by the health insurance, Z)

$$T = (X + Y) - Z$$

### ***State Fixed Effects***

State fixed effect model will be used to see the average effect of health insurance coverage dollars to the outcome variable (Inpatient OOP Health Expenditure) and we also allow for state-specific effect of the same variable to the outcome

## Covariates

All the independent variables including the main independent variable of health insurance and other covariates that will be analyzed at the individual level as shown below:

**Table 3.1: List of Covariates with Definition and Measurement**

Unit of Analysis - Individual		
Variable Name	Definition	Measurement
Health Insurance for the Poor	Categorical variable	= 0 if not enrolled = 1 if enrolled
Age	Continuous variable for the age of the individual	
Sex	Binary variable for sex of the individual	= 1 if male = 2 if female
Marital Status	Categorical variable for the marital status of the individual	= 1 if never married = 2 if currently married = 3 if widowed /divorced/ separated
Education level	Categorical variable created for education of the individual	= 1 if illiterate = 2 if primary/middle school educated = 3 if secondary school educated = 4 if higher secondary school educated = 5 if diploma/graduate/postgraduate educated
Disease diagnosed	Categorical variable created for disease diagnosed in the individual	= 1 if infections = 2 if cancers, blood diseases, endocrine, metabolic, eye & ear diseases = 3 if cardiovascular & respiratory diseases = 4 if gastro-intestinal diseases = 5 if skin, musculoskeletal, psychiatric & neurological diseases = 6 if genitourinary, obstetric & childbirth = 7 if injuries
Chronic illness	Binary variable for the presence of chronic illness	= 1 if Yes = 2 if No
Location of the household	Binary variable for location of household of individual	= 1 if rural = 2 if urban

Type of household	Categorical variable for the type of household of the individual	= 1 if self-employed = 2 if regular wage/salary earning = 3 if casual labor = 9 if others
Household size	Categorical variable for household size will be created	= 1 if household size 1 to 4 (small household) = 2 if household size 5 to 8 (medium household) = 3 if household size 9 & more (large household)
Source of drinking water	Categorical variable created for the source of drinking water	= 1 if safe water = 2 if unsafe water
Household cooking fuel	Categorical variable created for the cooking fuel in household of individual	= 1 if clean cooking fuel = 2 if unclean cooking fuel = 3 if no cooking arrangement
Type of drainage	Categorical variable for the type of drainage in household of individual	= 1 if open (kutchra and pucca) = 2 if covered (pucca and underground) = 3 if no drainage
Type of latrine	Categorical variable for the type of latrine in household of individual	= 1 if service and pit latrine = 2 if septic tank/ flush system' = 3 if no latrine
Socioeconomic status	Individual consumption expenditure per capita per year (INR) obtained from the household consumption expenditure by using the Adult Equivalent Unit	
Religion	Categorical variable for the religion of individual	= 1 if Hinduism = 2 if Islam = 3 if Christianity = 4 if Other religions
Social group	Categorical variable for the social group of the individual	= 1 if Scheduled tribes = 2 if Scheduled castes = 3 if Other backward classes = 9 if Others
Level of care	Categorical variable for level of care received by the individual	= 1 if HSC/PHC//CHC/mobile medical unit = 2 if Public hospital = 3 if Private hospital
Type of ward	Categorical variable for type of ward used by the individual	= 1 if Free = 2 if Paying general = 3 if Paying special



### 3.3 CATASTROPHIC HEALTH EXPENDITURES IN INDIA

Out-of-Pocket Health Expenditures for Inpatient Care (T) is already discussed in the previous section. Payments made by all the individuals in a household for inpatient care and outpatient care will be summed at the household level.

#### *Out-of-Pocket Health Expenditures for Outpatient Care (A)*

Total OOP healthcare expenditure for outpatient care (A) is the total health expenditure that is experienced by the patients after deducting the amount of money reimbursed or expected to be reimbursed by the health insurance. The total OOP health expenditure for outpatient care is calculated as follows:

Total outpatient healthcare expenditure = (Medical expenditure, B) + (Direct Non-medical Expenditure, C)

Total OOP outpatient health expenditure = (Total outpatient health expenditure) - (Amount reimbursed by the health insurance, S)

$$A = (B + C) - S$$

#### *Total Out-of-Pocket Health Expenditures (M)*

Total OOP health expenditure (M) is calculated by adding the OOP health expenditure for inpatient care (T), and the OOP health expenditure for outpatient care (A).

$$M = (T + A)$$

#### *Household Consumption Expenditure (X)*

Total household consumption expenditure is defined as comprising of both monetary and in-kind payment on all goods and services and the money value of the consumption of homemade products (199). The 71st round of NSS data provides a single

variable on consumption expenditure. There is no separate variable or information on non-subsistence consumption. The household's usual consumption expenditure in a month is provided in Indian Rupees (INR).

### ***Reference Period***

The reference period of institutional expenditure is 365 days, 1 month for household consumption expenditure. The amount of money reimbursed by the medical insurance company for inpatient healthcare is for the last 365 days. For outpatient care including the services and expenditure, the reference period was 15 days.

**Table 3.2: Reference Period for various categories**

<b>Categories</b>	<b>Reference Period (days)</b>
Household consumption expenditure	30 days
Medical treatment received as inpatient of a medical institution and expenses incurred	365 days
Expenses incurred for outpatient care	15 days
Spells of ailments of household members during the last 15 days (including hospitalization)	15 days

All the reference period will be converted into a common scale for analysis. Thus, in this study all the reference periods will be adjusted for 30 days. Expenses for outpatient OOP health expenditure will be multiplied by 2 to get the monthly estimates. Expenses for inpatient OOP health expenditure will be divided by 12 to get the monthly estimates.

### ***3.3.1 Measuring Incidence of Catastrophic Health Expenditures***

The method of calculation of incidence and intensity of CHE has been adopted from the article by Wagstaff et al. (Wagstaff & van Doorslaer, 2003). Incidence of catastrophic health expenditures is the fraction of households whose health payments as a proportion of household consumption expenditure exceed a particular threshold of overall household expenditure or household nonfood expenditure. Catastrophic payment headcount informs

the proportion/number of households affected by CHE i.e. the number of households who are experiencing an OOP healthcare expenditure above 10% of the total household consumption expenditure. Household consumption expenditures will be used as the proxy for income of the household.

Catastrophic payment headcount is given by the formula:

$$HC = \frac{1}{N} \sum_{i=1}^N E$$

HC is the Catastrophic payment headcount. The indicator  $E=1$  is defined when  $T_i/X_i > Z$  and zero otherwise. Here  $Z$  is 0.10.  $T$  is the household OOP health expenditure;  $X$  is the total household consumption expenditure and  $N$  is the sample size. The minimum and maximum value of catastrophic payment headcount are 0% and 100% respectively. The catastrophic payment headcount does not consider the intensity of the CHE, but only considers whether the household has experienced CHE. Since it is insensitive to the degree to which the CHE exceed the threshold value, it is vital to study the intensity of the CHE, to identify the households who are highly affected.

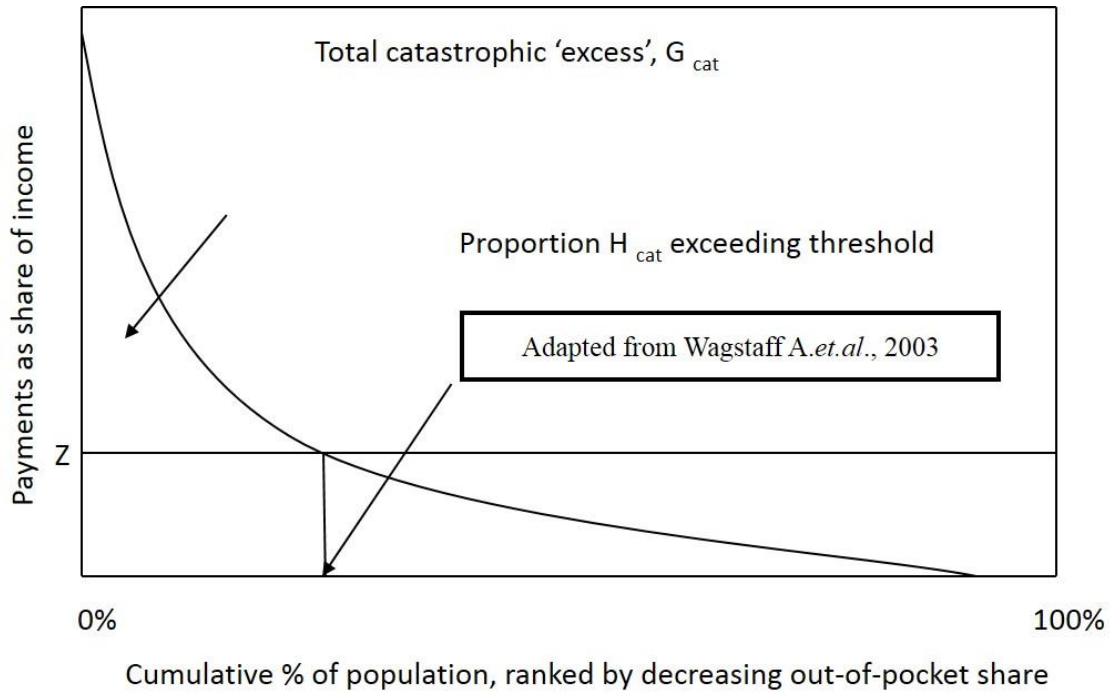
### ***3.3.2 Measuring Intensity of Catastrophic Health Expenditures***

The intensity of the CHE is calculated by the catastrophic payment gap (or excess). It is the average degree when the household OOP health expenditures as a proportion of the household consumption expenditure exceeds the pre-specified thresholds (10%).

$O_i$  is the excess or overshoot and it is calculated by the formula,  $O_i = E_i [(T_i/x_i) - Z]$ .  $T_i$  is the OOP health payment of household.  $X_i$  is the household consumption expenditure.  $Z$  is the threshold budget share. The minimum and maximum value of catastrophic payment gap is 0% and 90% respectively when the threshold value is fixed at 0.10.

Similar to community level incidence rate of CHE, we can also define community level CHE gap or intensity. At the community level, CHE gap is defined as

$$O = \frac{1}{N^*} \sum_{i=1}^{N^*} O_i$$



**Figure 3.4 Catastrophic out-of-pocket health expenditure as share of per-capita/household expenditure, by cumulative % of population, ranked by decreasing payment**

### 3.3.3 Measuring Socioeconomic Inequalities of Catastrophic Health Expenditures

Concentration index is calculated to separate the association of CHE with socio-economic status (Erreygers, 2009). To identify the proportion of households that are exceeding the threshold vary across the various income distribution, the computation of concentration index for  $E_i$  defined as  $C_E$  is necessary. Similarly, in order to identify the intensity of the CHE across the different socioeconomic groups, the concentration index for  $O_i$  needs to be computed which is defined as  $C_O$ . For  $C_E$ , the concentration curve will graph the cumulative share of the sample, ranked by household consumption expenditure

on the x-axis against the cumulative share of the households who exceed the pre-specified threshold on the y-axis. Similarly, for  $C_O$ , the concentration curve will graph the standard of living variable on the x-axis against the cumulative share exceeded on the y-axis. The socioeconomic rank of the household will be assigned such that the most well-off households ranked first and the least well-off ranked last. The ‘Convenient covariance’ approach will be used for the calculation of concentration index (Jenkins, 1988). According to this, the concentration index equals the covariance between the variable and the person’s rank in the income distribution, multiplied by two and dividing them by the mean of the variable (Lerman and Yitzhaki, 1989). The complete calculation of this formula is presented in Appendix 2.

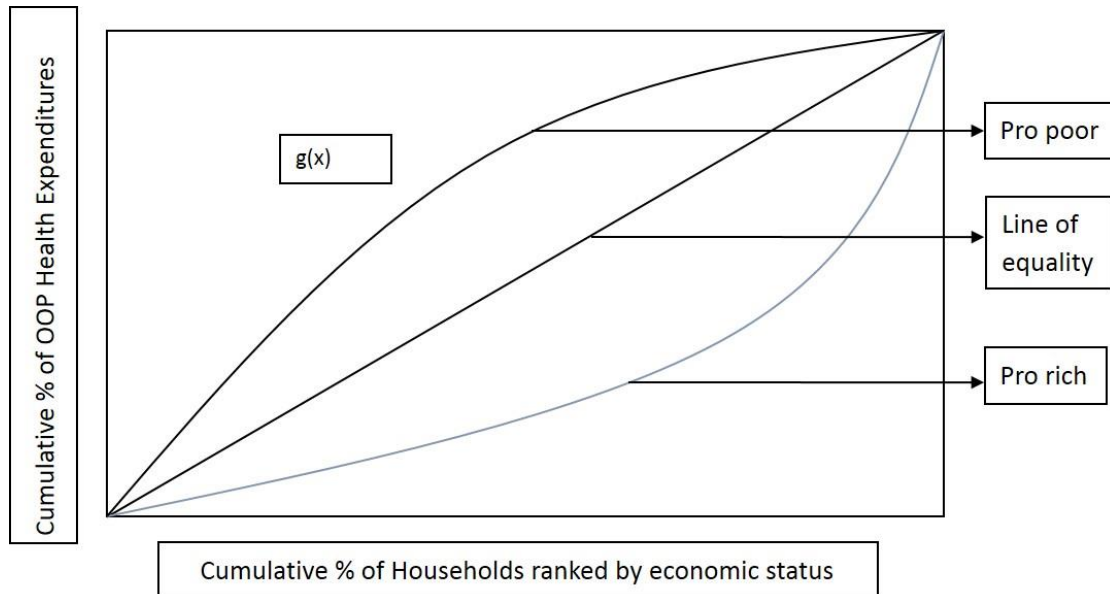
Concentration index is calculated using the following formula (10):

$$C = 2 \text{ cov } (y_i, R_i) / \mu$$

In the case of  $C_E$ , variable  $y_i = E_i$ ,  $R_i$  is the  $i$ th individual’s fractional rank in the per capita and  $\mu$  is the mean of  $E_i$ . Cov is the covariance between  $y_i$  and  $R_i$ . Similarly, for  $C_o$ , variable  $y_i = O_i$ ,  $R_i$  is the  $i$ th individual’s fractional rank in the per capita and  $\mu$  is the mean of  $O_i$ . Cov is the covariance between  $y_i$  and  $R_i$ .

When the curve lies above the line of equality, the concentration index takes a negative value, and this indicates a disproportionate concentration of CHE among the poor households, and when the curve lies below the line of equality, the concentration index takes a positive value indicating a higher concentration of CHE among the rich households. The concentration index is zero when there is no inequality. The value of the concentration index ranges from -1 to +1. For this research, positive value of  $C_E$  indicates that richer

households are more likely to exceed the threshold and a positive value of  $C_o$  indicates that there is greater tendency of overshoots among the richer households.



**Figure 3.5 Inequality Curve**

### 3.3.4 Factors affecting Incidence of Catastrophic Health Expenditure

To study the effects of various factors on the incidence of catastrophic OOP healthcare payments, the logistic regression model will be used. The logistic regression model is preferred since the dependent variable is dichotomous.

The Logit model will be estimated as:

$$\ln\left(\frac{\text{Pr}(E)}{1 - \text{Pr}(E)}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \mu$$

“Whether a household is incurring catastrophic health expenditure?” will be used as the dependent variable. A dichotomous variable for CHE will be created with 0 for not incurring catastrophic health expenditures and 1 for incurring catastrophic health expenditures.

CHE variable: A CHE variable takes up the value of 1 when  $T_i/x_i > z$  and 0 otherwise. The value of  $z$  will be set at 0.10 or 10%.

Thus, the dichotomous variable created for CHE will serve as the dependent variable for the logistic regression model. The independent variables include the various characteristics of the individuals, households and health facility as shown in Table 3. The model will estimate the log odds of incurring CHS adjusted for a set of explanatory variables. Household is the unit of analysis. The results for the logistic regression will be presented with the help of regression coefficients, odds ratio and 95% confidence intervals.

### ***3.3.5 Factors affecting Intensity of Catastrophic Health Expenditure***

To study the effects of various factors on the intensity of catastrophic OOP healthcare payments, the multiple regression model will be used.

The multiple regression model will be estimated as:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \mu$$

Where  $Y_i$  is the observed dependent variable,  $X_s$  are the independent variables and  $\beta_s$  are the coefficient of  $X_s$ . Catastrophic payment gaps were computed at threshold levels of 10%. The dependent variable will be the catastrophic payment gap ( $O_i$ ), where  $O_i = E_i ((T_i/x_i) - z)$ . The independent variables for the model will include the various characteristics of the individuals, households and health facility as shown in Table 3.

**Table 3.3: List of independent variables with their definition and measurement**

Unit of Analysis - Household		
Variable Name	Definition	Measurement
Age groups	Dummy variable	Presence of at least of one children (aged 5 years and less) in the household
	Dummy variable	Presence of at least one elderly person (aged above 60 years) in the household
Female	Continuous variable	Proportion of female members in each household
Divorced, widowed, separated	Dummy variable	Presence of someone divorced in the household
Education of female members in the household	Dummy variable	= 1 if no educated female member in the household = 2 if at least one secondary educated female member in household
Location of the household	Dummy variable for location of the household	= 1 if rural = 2 if urban
Household size	Continuous variable	Number of members in the household
Source of drinking water	Dummy variable	= 1 if safe water = 2 if unsafe water
Household cooking fuel	Dummy variable for the cooking fuel will be created	= 1 if clean cooking fuel = 2 if unclean cooking fuel = 3 if others = 4 if no cooking arrangement
Type of drainage	Dummy variable for the type of drainage in household	= 1 if open (kutchra and pucca) = 2 if covered (pucca and underground) = 3 if no drainage
Type of latrine	Dummy variable for the type of latrine in household	= 1 if service and pit latrine = 2 if septic tank/ flush system' = 3 if no latrine = 9 if others
Socioeconomic status	Categorical variable	Quintiles will be created from household consumption expenditure per month (INR) = 1 if lowest income quintile = 2 if second lowest income quintile = 3 if third income quintile = 4 if fourth income quintile = 5 if highest fifth income quintile
Religion	Dummy variable for the religion of members of the household	= 1 if Hinduism = 2 if Islam = 3 if Christianity = 4 if Sikhism = 5 if Jainism = 6 if Buddhism = 7 if Zoroastrianism = 9 if Others



Social group	Dummy variable for the social group of the household	= 1 if Scheduled tribes = 2 if Scheduled castes = 3 if Other backward classes = 9 if Others
Chronic illness	Continuous variable	Proportion of household members suffering from chronic illnesses in the household
Hospitalization	Continuous variable	Proportion of members hospitalized in the household
Level of care	Dummy variable for level of care	= 1 if Public Hospital = 2 if Private Hospital
Number of days of illness	Continuous variable	Total days of illness among all the members in a household summed together
Duration of stay in hospital	Continuous variable	Total number of days admitted in hospital among household members summed together
Health insurance	Dummy variable for health insurance of the household	= 1 if covered by any health insurance program = 2 if not covered by any health insurance program
State of hospitalization	Dummy variable for the place of hospitalization for all the 36 states and union territories	

## CHAPTER 4: MANUSCRIPT I

### 4.1 EFFECT OF HEALTH INSURANCE PROGRAM FOR THE POOR ON OUT-OF-POCKET INPATIENT CARE COST IN INDIA

#### Introduction

Achieving Universal Health Coverage (UHC) is the main goal for almost every nation in the world (WHO 2010). Financial risk protection is an important dimension of UHC. One of the specific targets of the recent Sustainable Development Goals (SDGs) is to provide financial risk protection (Saksena et al. 2014). The amount of financial protection rendered to population groups will depend on their degree of dependence on out-of-pocket expenditures (OOP) for financing health care (Xu et al. 2003). The primary conditions that are necessary for the occurrence of high OOP health expenditures are the availability and utilization of health care, poor capacity of households to pay for healthcare, and lack of any risk pooling and prepayment mechanisms (Xu et al., 2007). Evidence from National Health Account 2017 shows that OOP health expenditures for inpatient care constitutes around 31.96% of the total OOP health expenditures, even after coverage by various health insurance programs (NHA 2017). Lack of health insurance coverage and inadequate coverage are considered important for high OOP health expenditures (Sahrawat et al. 2011). Protecting households from hospital OOP expenses should significantly improve financial equity in health service delivery. Moreover, access to health care can be improved if the health system can protect the poor households from significant OOP

expenses. In order to improve access to health care by the poor, India initiated a number of health insurance programs for the poor since 2008 (Sahrawat et al. 2011). This paper advances our knowledge about financial risk protection and effect of health insurance programs for the poor in India.

The increase in health insurance coverage may lead to increase in health care utilization because of the change in behavior of the insured as well as the health care provider. A study by Anderson et al. (2012) on the effect of health insurance coverage on the utilization of medical services in the US showed that there was a 61% reduction in inpatient hospital admissions and 40% reduction in emergency department visits among the uninsured population (Anderson et al. 2012). Evidence from literature has shown that increased health insurance coverage leads to increase in utilization of health services, but the effect of health insurance coverage on financial risk protection is less clear, especially for poor beneficiaries (Escobar et al. 2010). The health insurance for the poor in India covers only inpatient services. This creates an incentive for the patients to visit hospitals and get hospitalized, instead of using basic primary health care services. Studies on hospitalization trends in India showed that an annual hospitalization rate increased from 16.6 per 1000 population to 37.0 per 1000 from 1995 to 2014 (Pandey et al. 2017).

There are many Public Health Insurance Programs for the Poor offered by the Government of India (GOI) and individual states cover the cost of hospitalization and inpatient care (Hooda 2017). RSBY is a health insurance program started by the Ministry of Labor and Employment of the Government of India in April 2008 and it provides a wide range of hospital-based healthcare services to Below Poverty Line (BPL) families (Kumar 2011). There are a number of state-run public health insurance programs for the poor in

three of the southern states in India which provide higher coverage than RSBY and are exempted from the national program. The programs are the Chief Minister's Comprehensive Health Insurance Scheme in Tamil Nadu State, Rajiv Aarogyasri Community Health Insurance (RACHI) in Andhra Pradesh State, and Vajpayee Aarogyasri Scheme (VAS) in Karnataka State (Hooda 2017). Table 1 summarizes the important features of the RSBY program and the state health insurance programs for the poor in Andhra Pradesh, Karnataka, and Tamil Nadu.

**Table 4.1 Key Parameters under Health Insurance Programs in India**

Parameter	Rashtriya Swasthya Bima Yojana (RSBY)		State health insurance programs for the poor (Andhra Pradesh, Tamil Nadu and Karnataka)
	Description	Additional Caveats	Description
Benefits covered	Cost of hospitalization for 725+ procedures at empaneled hospitals up to INR 30,000 per annum per household; INR 100 per visit up to INR 1,000 per year for transport cost	Pre-existing conditions are covered; minimal exclusions; day surgeries covered; outpatient expenditure is not covered	Andhra Pradesh - Families are provided coverage for INR 200,000 per family per year, and there are no restrictions on the number of family members enrolled Karnataka - INR150,000 per year for 5 persons in a family Tamil Nadu - INR100,000 per family per year
Eligibility criteria	Must be on the official state BPL list; Limited to five members of the household including household head, spouse, and three dependents	All enrolled members must be present to be enrolled;	Must be on the official BPL list of the specific state. No restrictions on the number of family members enrolled in Andhra Pradesh, and Tamil Nadu. Covers five members of family in Karnataka.
Premium and fees	INR 30 registration fee per household per annum paid by household.		No specific enrolment fee in the three states of Andhra Pradesh,

			Karnataka, and Tamil Nadu
Financing	75%/ 25% Government of India/ State Government	The ratio is 90% /10% in Northeast states and Jammu & Kashmir	Completely funded by the respective states
Insurer	Both public and private insurance companies can bid to work in a district or more than a district recommended by state governments	In one district only one insurance company is finally selected	Both public and private insurance companies can bid to work at the state level
Service provider	Both public and private sector service providers can apply to join the network of providers empaneled under the scheme	Minimum eligibility criteria on quality of services to be provided have been laid down by the MoL & E	Both public and private sector service providers in the specific state can join the network of providers empaneled in the program. Minimum eligibility criteria laid down by the respective State Health Ministries

Source: Ministry of Labor and Employment (MoL & E) and State Health Departments

Around 41 million families are enrolled in RSBY, covering around 150 million poor people as of September 2016. The enrolment under the program has been increasing starting from only 55 districts in 2008-2009. Nationally, around 460 districts participate in the program, with 57% of the eligible households are currently enrolled (Karan et al. 2017). There is significant inter-district and inter-state variation in the percentage of eligible households enrolled in RSBY. Across states, the degree of enrolment of households varies from a low of 24% in Arunachal Pradesh and 36% in Haryana to more than 75% in Kerala. The degree of enrollment of households by district varies significantly across the country, with a low rate of enrollment of 3% in Kannauj district and 6% in Kanpur district in the Uttar Pradesh state to a high enrollment rate of 90% of households in most of districts in the Chhattisgarh and Kerala states of India. Enrolment is not complete in many states, even a decade after the start of the program. Also, as of September 2016, the state of Rajasthan was still in its early stage for enrolling households in RSBY (Karan et al. 2017). This shows

that enrollment in the RSBY program has been slow in some parts of India. Not all states in India participate in RSBY. The state of Andhra Pradesh has not adopted RSBY as it already has a substantially more generous state level health insurance program than RSBY which pre-dates RSBY with relatively high population coverage, covering nearly 80% of its population (Fan et al. 2012). Studies show that access is not available to around 50% of the people eligible for RSBY program because they are currently not enrolled in RSBY due to lack of availability of full lists of eligible participants, and high migration rates (Karan et al., 2017).

Under the Public Health Insurance Programs for the poor only the hospitalization services and expenses are covered. It is expected that these health insurance for the poor will increase utilization of hospitals by the BPL households who would usually be forced to postpone their non-urgent procedures for a later time because of cost. Even with insurance, there may be OOP payments for drugs, tests and post-treatment care which are not covered by the health insurance that may increase the OOP payments for inpatient and inpatient-related care. Hence the direction of effect of the Poor People Health Insurance Programs on total inpatient OOP health expenditure is unclear. Also, RSBY leads to misuse of services, since both the physician and the patient have the incentive to convert an outpatient case into an inpatient admission, leading to unnecessary utilization (Taneja and Taneja 2016). The objective of this research is to examine the effect of Public Health Insurance Programs for the Poor on hospitalizations and inpatient OOP health expenditures.

Many studies show that people incur high OOP health expenditures despite being covered by the national health insurance program RSBY or other state health insurance

programs (Devadasan et al. 2013; Rao et al. 2014; Selvaraj and Karan 2012; Rajasekhar et al. 2011; Rent and Ghosh 2015; Mitchell et al. 2011).). However, studies on state health insurance programs in Karnataka and Andhra Pradesh showed that OOP health expenditures significantly declined with health insurance coverage (Aggarwal 2010; Fan et al. 2012; Sood et al. 2014). Cross-sectional studies done in Tamil Nadu and Maharashtra show that the utilization of healthcare was significantly higher among the insured compared to the uninsured population (Philip et al. 2012; Ghosh 2014).

Current studies on Poor People's Health Insurance Programs such as RSBY deal with issues in program enrolment (Shahi & Singh, 2015), barriers in implementation of the program (Rajasekhar et al. 2011), effect of information campaign (Das and Leino; 2011), hospitalization patterns (Thakur, 2016), and determinants of participation in the RSBY program (Nandi et al. 2013). There are only two district level studies on RSBY, one done in Amaravati district in Maharashtra (Rathi et al. 2012) and the other in Gujarat (Devadasan et al. 2013) showed that RSBY increased hospitalizations and higher OOP health expenditures among the RSBY insured people. The study in Gujarat showed that RSBY enrollees experienced higher OOP health expenditures because they had to pay for medicines and diagnostics during the hospital admission (Aggarwal 2010). Another state level study done for the state health insurance program Aarogyasri found different results with insurance significantly reducing the OOP health expenditures for hospitalizations (Fan et al. 2012). Most of other studies that studied the effect of health insurance on hospitalizations and OOP health expenditures were community-based health insurance programs in different parts of the country (Aggarwal 2010; Devadasan et al. 2010;

Devadasan et al. 2007; Ranson 2002) and thus their implications for nation-wide policy interest is limited.

This study is a considerable improvement over other studies on Public Health Insurance Programs for the Poor in India on two important counts: i) the study uses nationally representative dataset which helps in estimating pan-India effects of Public Health Insurance Programs for the Poor ii) the study evaluates the effect of Public Health Insurance Programs for the Poor by comparing outcomes between poor people enrolled and not-enrolled in the insurance program. Many studies are based on RSBY enrollees alone and do not have any controls making it difficult to identify the effects of the Public Health Insurance Programs for the Poor. This study identified comparable control population from among those who are poor but were not enrollment in insurance. The specific research questions that will be addressed in this research are: (i) How do hospitalizations differ between the enrolled and not-enrolled groups under Public Health Insurance Programs for the Poor? and (ii) How does OOP health expenditure for inpatient care differ among people enrolled and not-enrolled under Public Health Insurance Programs for the Poor?

## **Methods**

### **Data source**

The data from the National Sample Survey Organization (NSSO) of the Government of India were used for the study (NSSO 2014). NSSO is a national organization under the Ministry of Statistics and Implementation which was established in 1950 to regularly conduct surveys and provide useful statistics in the field of socio-economic status of households, demography, health, industries, agriculture, consumer



expenditure etc. The specific data set from NSSO that was used in this study is the Social Consumption (Health), NSS 71<sup>st</sup> Round for 2014, which is the latest nationwide data available in India. The survey covered whole of the Indian Union. The survey used the interview method of data collection from a sample of 65,932 randomly selected households (36,480 in rural India and 29,452 in urban India) and 335,499 individuals, covering the members of the household in all the 36 states (including union territories). The data for the survey were collected over a period of six months, from January to June 2014. The NSSO Social Consumption (Health) collected data on demographic characters, employment, health conditions, source of payments, health insurance coverage, type of coverage, costs of various inpatient services, level of care, type of care and a number of other variables. The survey also collected information on medical care received at inpatient and outpatient facilities of medical institutions including health expenditures for various episodes of illness. This is the first NSSO health survey that collected data on utilization of alternative medicines. The details of hospitalization for all current and former members of the household were collected for the last 365 days (hospitalization occurred from January 2013 to June 2014) and the details of outpatient services were collected for the last 15 days.

### **Empirical Methodology**

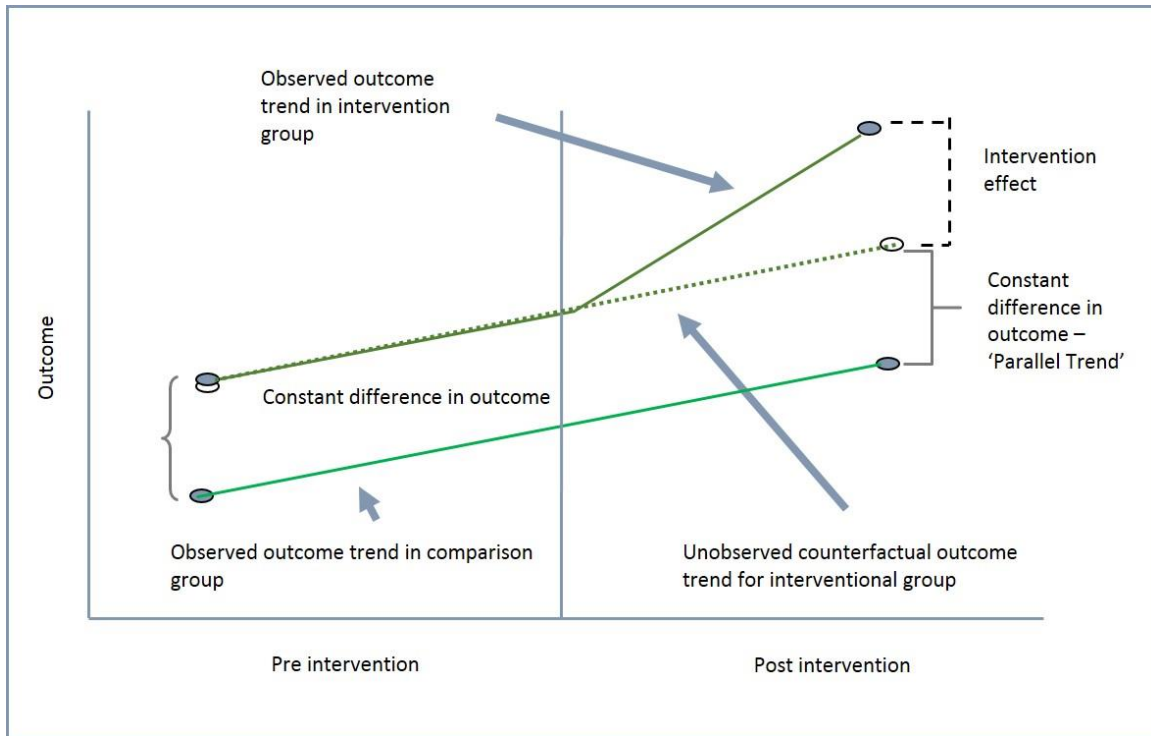
The main objective of this study is to estimate the effect of Public Health Insurance Programs for the Poor on hospitalizations and OOP inpatient care costs. The effects of the program were estimated by comparing the probability of hospitalizations and OOP inpatient healthcare costs between the groups who are eligible (poor) and covered by the insurance programs and who are eligible (poor) but not covered. In theory, the best approach of estimating the impact of a program is to adopt a Difference-in-difference

(DID) framework with randomized allocation of eligible individuals in the program group and the no-program group. The framework requires data on the two groups in the pre-intervention period and then in the post-intervention period (Abadie 2008). DID estimators compare the change in mean outcomes before and after the intervention among individuals who acquire coverage (treated) and those remaining not exposed.

To estimate the causal effect using DID, the assumptions of DID must be satisfied. The main assumptions are that the treatment and control groups have parallel trends in outcome, the composition of the treatment and control groups are stable for repeated cross-sectional design, the allocation of treatment is unrelated to the outcome at baseline, and there are no spillover effects. The most important assumption for DID is the ‘parallel trend assumption’. This means that in the absence of the intervention/treatment, the average difference in the outcome between the treatment and control groups would have remained constant in post-intervention time period as in pre-intervention period. The violation of this assumption will imply that the DID approach will not be able to obtain unbiased estimates of program impacts. The DID model cannot be used if composition of the pre-intervention and post-intervention groups are not stable, if the comparison group has a different outcome trend, and if the allocation of the treatment/intervention is determined by the baseline outcome (Abadie 2008).

However, the treated and untreated may differ in the distribution of both observable and unobservable characteristics. Heckman and Vytlacil (2007) highlighted that unobservable variables may play a bigger (or smaller) role in influencing the with-treatment outcome than the without-treatment outcome (Heckman and Vytlacil 2007). Inability to control for them is likely to provide under (over) estimation of the effects of

the programs. Since the main assumption of DID is parallel trend assumption and checking for the constant difference in outcome over time is necessary for deriving impact of a program or intervention using DID approach.



**Figure 4.1 Intervention Effect using Difference-in-Difference Method**

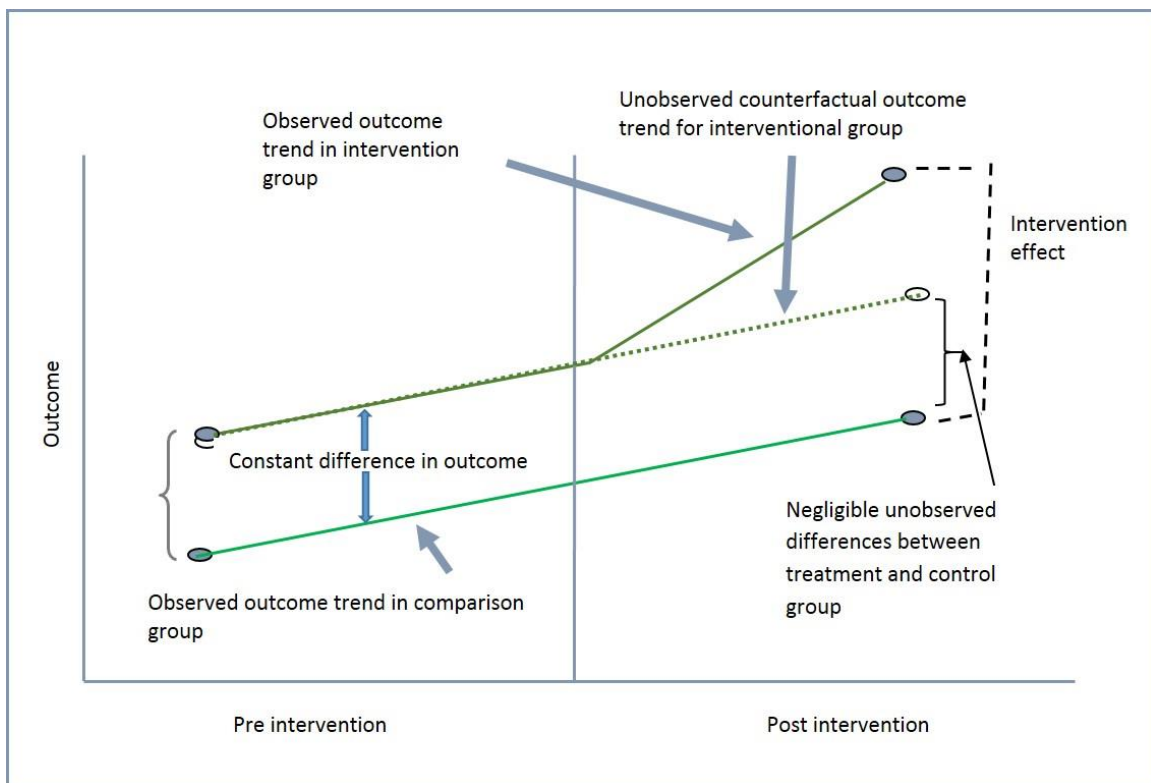
For the purpose of this study, a number of simplifying assumptions must be made as the data set is cross-sectional in nature and we only observe the outcomes in the year the data were collected. Therefore, the data set does not provide any information on the individuals who were enrolled in the insurance program in the previous period and those who were not enrolled. The insurance program is designed for the poor households and since belonging to the poverty group is a dynamic event, a household in poverty in pre-insurance period may not necessarily be in poverty in the post-intervention period. Moreover, household in poverty in the current year (the year of data collection) may not have been in poverty in the previous period. Almost all programs also show some degree

of mistargeting implying that some poor people may not be offered the insurance while some non-poor are offered the insurance benefit. These potential deviations from expected enrollment may affect the estimate of outcomes when a post-intervention year's data are used.

In the DID model, the intervention effect will be the difference between the observed outcome in intervention group and the unobserved counterfactual outcome for intervention group as shown in Figure 1. It is possible to model the unobserved counterfactual outcome for intervention group in the post-intervention period in absence of the intervention if data on pre-intervention period are available. In the cross-sectional data of the study, we do not have information on the intervention and control groups in pre-intervention period and if intervention and control groups differed in terms of outcomes of interests, we have no way of correcting for this. The only alternative approach we can take is to select the comparison groups from the cross-sectional data in such a way that the likelihood of pre-intervention variability would be minimized.

Rather than identifying the economic status of individuals who were actually covered by insurance in the previous period, the implicit assumption we are using is complete absence of mistargeting or simply not allowing the mistargeted individuals in the analysis. It is also assumed the social mobility of poor households in India is relatively low and so the households belonging to poverty category in the current year (the year of the survey) were also poor in the previous few years. Since the sample size is large enough, most of the observed and unobserved characteristics of the poor who are in the program and who are not in the program are likely to be similar. Therefore, the factors other than insurance coverage that may cause differences between the intervention group and control

group in terms of utilization of hospital services or out-of-pocket costs should be negligible. If the intervention and control groups are matched in the current year using a list of observable characteristics will further reduce the possibility of biased estimate or unequal starting point for the two groups in terms of outcome variables. Thus, using the cross-sectional post-intervention data, the intervention effect will be the difference between the observed outcome in the intervention group and the observed outcome in the control group as shown in Figure 2.



**Figure 4.2 Intervention Effect using Cross-sectional data**

Two important assumptions are made in the impact evaluation process when using this cross-sectional data. The assumptions are, at the starting point in the pre-intervention period, the unobservable differences between the intervention and control group are small,

if any, and that both the intervention group and the matched control group would show similar trend in terms of outcomes in absence of the intervention.

### **Treatment Group, Control Group and Propensity Score Matching**

The treatment group consist of all the people currently enrolled under the Public Health Insurance Programs for the Poor namely the RSBY and other state health insurance programs for the poor. The control group will consist of all people who are poor but not enrolled in the Public Health Insurance Programs for the Poor. In order to make both the groups comparable and to avoid selection bias, a propensity score matching was used to match the treatment and control groups. A propensity score is the conditional probability that a subject receives “treatment” given the subject’s observed covariates. A propensity score matched regression analysis incorporating survey weights can better account for selection bias based on observed variables than an unmatched regression (DuGoff et al. 2014 and Ridgeway et al. 2015). The main goal of propensity score is to balance the observed covariates from the individuals in the treatment and control groups in order to imitate a randomized study (Faries 2010). The variables used to get the propensity scores were education, socioeconomic status, location of household (urban/rural), household size, and age of the individual, using a user-written command *psmatch2* in STATA. After matching, a regression analysis was performed.

### **Data Analysis**

#### **Incidence of hospitalization and duration of hospital stay**

Hospitalization is determined by several factors. To study the effects of enrolment under Public Health Insurance Programs for the Poor on the incidence of hospitalizations

after controlling for other factors, a binary logistic regression model was used. The logistic regression model is preferred since the dependent variable is dichotomous. “Whether the individual was hospitalized during the last 365 days?” was used as the dependent variable. A dichotomous variable for hospitalization was created with 0 for ‘not hospitalized during the last 365 days’ and 1 for ‘hospitalized during the last 365 days’. The independent variables include enrollment under the Poor People Health Insurance Program and other covariates. The model estimated the log odds of incidence of hospitalization adjusted for a set of explanatory variables. Individual is the unit of analysis. The results for the logistic regression have been presented with the help of regression coefficients, odds ratio and 95% confidence intervals. Tobit Regression Model was used to study the association between the Public Health Insurance Programs for the Poor and the duration of hospitalization. The Tobit model is usually estimated when the dependent variable has a large number of observations clustered, usually at zero. For the duration of hospitalization, the dependent variable is either zero or higher than 0 (Wooldridge 2003). The dependent variable duration of hospitalization is truncated below zero and thus the Tobit model is used.

### **OOP inpatient healthcare cost**

Tobit Regression Model will be used to study the association between Public Health Insurance Programs for the Poor and the OOP cost for inpatient care. The Tobit model is usually used when the dependent variable has a number of values clustered, usually at zero. For the OOP inpatient healthcare cost, the dependent variable is either zero or higher than 0 (Wooldridge, 2003). The dependent variable duration of hospitalization is truncated below zero and thus the Tobit model is used.

The Tobit model will be estimated as:

$$Y^*_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \mu$$

$$Y_i = Y^*_i \quad \text{if } Y^*_i > 0$$

$$Y_i = 0 \quad \text{if } Y^*_i \leq 0$$

where  $Y^*_i$  is the latent dependent variable, and  $Y_i$  is the observed dependent variable.

## Results

### Descriptive Statistics

The total sample consisted of 336,470 individuals. In the total sample, 42,121 individuals were covered by the government sponsored health insurance programs such as Employee's State Insurance Scheme (ESIS), Central Government Health Scheme (CGHS), and the poor people's health insurance programs such as RSBY and other state health insurance programs. Poverty is a dynamic event where people move in and out of poverty. We used the poverty line for 2014 to find out the individuals who were poor in 2014. Since the data had only one variable for the individuals covered by the government sponsored health insurance programs which included both the poor people health insurance programs and other government health insurance programs for the non-poor, we considered that the people who were below the poverty line and enrolled under the government sponsored health insurance programs to be enrolled under the public health insurance programs for the poor such as RSBY, RACHI etc and the people who were below poverty line and not enrolled as the people who were eligible for the poor people's health insurance program but not enrolled. Only the poor people below the poverty line as of 2014 is used for this study. Descriptive statistics presented in Table 1 are at the individual level, consisting of only poor individuals. There were 64,270 observations. The mean age group of the poor



population is 25.29 years. Only 9.55% of the poor individuals in India are enrolled in any type of public health insurance programs for the poor. 9.41% of the poor individuals are enrolled in RSBY all over India except the states of Tamil Nadu, Andhra Pradesh, and Karnataka. In Andhra Pradesh, 39.97% of the poor people are enrolled in RACHI, 5.69% are enrolled in VAS in Karnataka, and only 4.45% are enrolled in CCHIS in Tamil Nadu. Around 41.30% of the poor in the sample is illiterate; 80.57% were of Hindu religion; 85.13% belong to the disadvantaged classes; 64.20% of the individuals were from medium sized households (5 to 8 members). 2.51% of the poor individuals were suffering from chronic illnesses; 3.33% were hospitalized in the previous one year with the mean duration of hospitalization per poor person being 0.1664 days (see below for admission statistics). The yearly OOP health expenditure for inpatient health care for the whole poor population was 269.26 INR.

**Table 4.2: Descriptive Statistics for the poor individuals in the 2014 survey**

Variables	Categories	Frequency (%) n = 64,270	Weighted Percentage
Hospitalization	No	56,755 (88.31%)	96.67%
	Yes	7,515 (11.69%)	3.33%
Health Insurance for the Poor	Enrolled	5,917 (9.21%)	9.55%
Sex	Female	32,152 (50.03%)	48.90%
Marital Status	Never married	32,938 (51.25%)	51.81%
	Currently married	28,443 (44.26%)	43.59%
	Widowed/divorced/separated	2,889 (4.50%)	4.60%
Education	Illiterate	26,063 (40.55%)	41.30%
	Primary/middle school	29,240 (45.50%)	47.39%
	Secondary school	4,834 (7.52%)	6.49%
	Higher secondary school	2,795 (4.35%)	3.46%
	Diploma/graduate/post graduate	1,337 (2.08%)	1.36%
Location	Rural	42,590 (66.27%)	80.03%
	Urban	21,680 (33.73%)	19.97%
Religion	Hinduism	46,464 (72.30%)	80.57%
	Islam	11,836 (18.42%)	15.09%
	Christianity	3,988 (6.21%)	2.09%
	Other religions	1,982 (3.08%)	2.25%

Social Group	Scheduled tribes	12,983 (20.20%)	16.65%
	Scheduled castes	13,759 (21.41%)	25.51%
	Other backward classes	26,105 (40.62%)	42.97%
	Others	11,423 (17.77%)	14.86%
Household size	Small household (1 to 4 members)	8,835 (13.75%)	18.07%
	Medium household (5 to 8 members)	39,009 (60.70%)	64.20%
	Large household (9 and more)	16,426 (25.56%)	17.73%
Household type	Self-employed	33,211 (51.67%)	49.44%
	Regular wage/salary earning	7,794 (12.13%)	9.27%
	Casual labor	21,617 (33.63%)	38.49%
	Others	1,648 (2.56%)	2.80%
Latrine type	Service and pit latrine	13,594 (21.15%)	14.65%
	Septic tank/flush system	16,931 (26.34%)	19.36%
	No latrine and others	33,745 (52.51%)	65.99%
Drainage type	Open	30,535 (47.51%)	44.05%
	Covered	8,543 (13.29%)	10.66%
	No drainage	25,192 (39.20%)	45.29%
Drinking water	Safe water	61,807 (96.17%)	98.36%
	Unsafe water	2,463 (3.83%)	1.64%
Cooking fuel	Unclean fuels	50,913 (79.22%)	84.91%
	Clean fuels	12,802 (19.92%)	13.69%
	No cooking arrangement	555 (0.86%)	1.40%
Chronic illness	Yes	1,911 (2.97%)	2.51%
Level of care	Sub-center/PHC/CHC	890 (1.38%)	0.42%
	Public hospital	4,005 (6.23%)	1.72%
	Private hospital	2,620 (4.08%)	1.18%
	Did not seek care	56,755 (88.31%)	96.67%
Type of ward	Free	4,532 (7.05%)	2.00%
	Paying general	2,672 (4.16%)	1.20%
	Paying special	311 (0.48%)	0.13%
	Did not seek care	56,755 (88.31%)	96.67%
Nature of ailment	Infections	1,518 (2.36%)	0.53%
	Cancers, blood, endocrine, metabolic, eye & ear diseases	486 (0.76%)	0.19%
	Cardiovascular, respiratory diseases	542 (0.84%)	0.22%
	Gastrointestinal diseases	553 (0.86%)	0.22%
	Skin, musculoskeletal, psychiatric & neurological diseases	576 (0.90%)	0.21%
	Genitourinary, obstetric & childbirth	3,204 (4.99%)	1.73%
	Injuries	636 (0.99%)	0.23%
	Did not seek care	56,755 (88.31%)	96.67%
<b>Continuous Variables</b>			

<b>Variables</b>	<b>Mean</b>	<b>Standard Error</b>	<b>95% Confidence Interval</b>
Age	25.29	0.1719	24.95 – 25.63
Age Groups			
0 – 18 years	9.21	0.0685	9.08 – 9.35
19 – 40 years	29.41	0.1003	29.21 – 29.60
41 – 60 years	50.06	0.1431	49.78 – 50.34
61 – 80 years	67.71	0.2262	67.27 – 68.16
80+ years	86.62	0.5686	85.50 – 87.74
Duration of hospitalization	0.1664	0.0067	0.1532 – 0.1796
Yearly inpatient OOP health expenditure	269.26	12.13	245.47 – 293.04
Monthly inpatient OOP health expenditure	22.43	1.01	20.45 – 24.42
Yearly individual consumption expenditure	8305.62	18.5608	8269.24 – 8342.00
Monthly individual consumption expenditure	692.13	1.5467	689.10 – 695.16

Table 2 shows the descriptive statistics for the poor individuals who were hospitalized. The mean age of hospitalized individuals is 30.92 years; mean yearly individual consumption expenditure is 8449.03 INR; mean duration of hospitalization is 5.009 days; yearly inpatient OOP health expenditure is 8149.41 INR.

**Table 4.3: Descriptive Statistics of Variables when Hospitalization =1**

Variable	Mean	Standard Error	95% Confidence Interval
Duration of hospitalization	5.009	0.1605	4.686 – 5.315
Yearly Inpatient OOP health expenditure	8149.415	317.9662	7526.11 – 8772.71
Age	30.927	0.3844	30.174 – 31.681
Yearly individual consumption expenditure	8449.035	46.2932	8358.287 – 8539.782
Monthly individual consumption expenditure	704.086	3.8577	696.523 – 711.648

Propensity score matching was done using the variables such as education, socioeconomic status, location of household (urban/rural), household size, and age of the individual, using a user-written command *psmatch2* as shown in Table 3. 5,917 samples in the intervention group were matched with 5,917 samples in the control group. Thus, the total matched sample consisted of 11,834 observations. After matching, different types of regression analysis were performed using the total matched sample.

**Table 4.4: One-One Propensity Score Matching**

	Treated	Control	Difference	T statistics	S. E
Total sample	5917	5917			
Average Treatment on Treated (ATT)	0.1407	0.1191	0.0216	2.89	0.0074
Propensity Score Testing of Two Groups					
	Treated (Mean)	Control (Mean)	% Bias	T statistics	Probability(t)
Age	26.821	26.426	2.0	1.10	0.269
Individual Consumption Expenditure	8588.9	8595.4	-0.3	-0.17	0.866
Household size	2.0255	2.014	1.9	1.04	0.299
Location	1.2505	1.2525	-0.4	-0.25	0.799
Education	1.7828	1.7725	1.2	0.67	0.503

## Multivariate analysis

The logistic regression model results for the effects of poor people health insurance program on incidence of hospitalization are shown in Table 4. People enrolled in poor people health insurance program have 1.21 higher odds of incidence of hospitalization compared to poor people not having health insurance coverage. Chronic illness, household size, and age of the individual had significant effects on incidence of hospitalization. The presence of chronic illness increased the probability of hospitalization, and the different age groups categories for individuals 19 years and above had higher probability of hospitalization compared to less than 18 years' age group. However, individuals belonging to the medium and large households had lower probability of incidence of hospitalization compared to individuals from small households. Social group, religion, urban/rural location, household type, marital status, education, number of hospital beds in the state had insignificant effects on the incidence of hospitalization. Average marginal effects of each of the independent variables on the probability of the incidence of hospitalization are presented in Table 4. Fixed effects for state of residence of the individual was used in the model. No significant effects for the state of residence were found.

**Table 4.5: Logistic Regression Results for the Effect of Poor People Health Insurance Program on the Incidence of Hospitalization**

Incidence of Hospitalization	Odds Ratio	95% Confidence Interval	P value
Public Health Insurance for the Poor Not enrolled (Reference)			
Enrolled	1.23	1.06 – 1.44	0.007
Social Group Other Backward Classes (Reference)			
Scheduled tribes	1.01	0.85 – 1.19	0.878
Scheduled castes	1.01	0.86 – 1.19	0.859
Others	1.17	0.96 – 1.42	0.103
Chronic Illness No Chronic illness (Reference)			

Chronic Illness	3.55	2.87 – 4.45	0.000
Age Groups			
0 to 18 years (Reference)			
19 to 40 years	1.06	0.82 – 1.36	0.635
41 to 60 years	2.44	1.89 – 3.15	0.000
61 to 80 years	2.99	2.14 – 4.17	0.000
Older than 80 years	4.85	1.71 – 13.69	0.003
Interaction Age Group* Sex			
Female and Age Group (19 to 40 years)	6.81	4.95 – 9.36	0.000
Female and Age Group (41 to 60 years)	0.91	0.63 – 1.30	0.617
Female and Age Group (61 to 80 years)	0.82	0.51 – 1.30	0.411
Female and Older than 80 years	0.76	0.19 – 3.04	0.703
Household Size			
Small household (Reference)			
Medium household (5 to 8 members)	0.77	0.66 – 0.89	0.000
Large household (9 & more members)	0.47	0.39 – 0.58	0.000
Hospital beds per 1000 population			
More than 1 bed per 1000 (Reference)			
0.5 to 1 per 1000 population	1.59	0.34 – 7.40	0.551
Less than 0.5 per 1000 population	1.16	0.26 – 5.05	0.843
Constant	0.15	0.03 – 0.68	0.013

Table 5 includes Tobit model results on the effect of poor people health insurance program on the duration of hospitalization. Being enrolled in health insurance for the poor had no significant effect on duration of hospitalization. People who did not have chronic illnesses had significantly lower duration of hospitalization compared to people with chronic illnesses. People belonging to the other backward classes social group category had significantly higher duration of hospitalization compared to the reference group (scheduled tribes). Other covariates such as household type, religion, age, urban/rural location, household type, household size, marital status, education, and number of hospital beds had no significant effect on the duration of hospitalization. Fixed effects for state of residence of the individual was used. Rajasthan, Uttar Pradesh, and Gujarat were the only three state showing significant results. Average marginal effects of each of the independent variables on the duration of hospitalization are presented in Table 5.

**Table 4.6: Tobit Regression Results for the Effect of Poor People Health Insurance Program on the Duration of Hospitalization**

Duration of Hospitalization	Coefficient	95% Confidence Interval	P value
Public Health Insurance for the Poor Not enrolled (Reference) Enrolled	0.44	-0.47 - 1.35	0.346
Social Group Other Backward Classes (Reference) Scheduled Tribes Scheduled Castes Others	-1.20 -0.08 -0.56	-2.21 – 0.20 -1.07 – 0.90 -1.72 – 0.60	0.019 0.870 0.344
Chronic Illness No Chronic illness (Reference) Chronic Illness	3.15	1.96 – 4.33	0.000
Household Type Self-employed (Reference) Regular wage/Salary earning Casual labor Others	0.38 0.45 -0.03	-0.72 - 1.48 -0.34 - 1.26 -2.02 - 1.92	0.497 0.263 0.970
Age Groups 0 to 18 years (Reference) 19 to 40 years 41 to 60 years 61 to 80 years Older than 80 years	-0.90 1.08 0.36 0.44	-1.87 - 0.05 -0.09 - 2.25 -1.14 - 1.88 -3.45 - 4.33	0.065 0.072 0.631 0.825
Household Size Small household (Reference) Medium household (5 to 8 members) Large household (9 & more members)	-0.15 -0.98	-0.99 - 0.68 -2.22 - 0.26	0.723 0.124
Number of Hospital Beds in States Less than 10,000 beds (Reference) 10,000 to 20,000 beds Greater than 20,000 beds	0.38 4.28	-7.86 - 8.64 -3.69 - 12.26	0.927 0.292
Constant	3.35	-4.47 - 11.18	0.401

Results of the two-part regression model on the effects of poor people health insurance program on inpatient out-of-pocket health expenditures are shown in Table 6. Enrollment under the poor people health insurance program did not have any effect on inpatient OOP health expenditures. Duration of stay in hospital, graduate level education, age groups of 19 to 60 years, using a private hospital for treatment, admission in paying ward (general and special), and having ailments such as cancers, blood, endocrine, metabolic, eye, ear

diseases, cardiovascular, respiratory diseases, skin, musculoskeletal, psychiatric, neurological diseases, and injuries had significant positive effect on the amount of OOP health expenditures experienced by the individual. Utilization of AYUSH type of treatment had significant negative effect of OOP health expenditures compared to individuals using allopathic treatment. Factors such as location, social group, household type, household size, and number of hospital beds in states had no significant effect on OOP health expenditures. Gujarat, and Kerala were the only two states showing significant results in the state fixed effects model.

**Table 4.7: Tobit Regression Results for the Effect of Poor People Health Insurance Program on Inpatient Out-of-Pocket Health Expenditures**

<b>Out-of-Pocket Health Expenditures</b>	<b>Coefficient</b>	<b>95% Confidence Interval</b>	<b>P value</b>
Public Health Insurance for the Poor Not enrolled (Reference) Enrolled	-950.36	-2501.48 – 600.75	0.230
Duration of Stay in Hospital	521.40	435.30 – 607.50	0.000
Social Group Other Backward Classes (Reference) Scheduled Tribes Scheduled Castes Others	-1073.94 -664.54 -273.32	-2818.92 – 671.04 -2328.89 – 999.81 -2251.07 – 1704.43	0.228 0.434 0.786
Education Illiterate (Reference) Primary/middle school educated Secondary school educated Higher secondary school educated Diploma/graduate/post graduate educated	1104.02 285.39 -1972.92 7634.86	-232.77 - 2440.81 -2359.45 - 2930.25 -5096.84 - 1150.99 2798.47 - 12471.25	0.105 0.832 0.216 0.002
Household Type Self-employed (Reference) Regular wage/Salary earning Casual labor Others	1034.10 -1275.76 140.24	-903.67 - 2971.88 -2654.16 - 102.62 -3201.46 - 3481.95	0.295 0.070 0.934
Age Groups 0 – 18 years (Reference) 19 to 40 years 41 to 60 years 61 to 80 years Older than 80 years	1857.13 2231.96 87.75 -1018.33	-68.31 - 3782.58 234.30 - 4229.63 -2479.51 - 2655.01 -7587.77 - 5551.11	0.059 0.029 0.947 0.761



Household Size Small household (Reference)			
Medium household (5 to 8 members)	352.09	-1064.15 - 1768.33	0.626
Large household (9 & more members)	2008.08	-79.56 - 4095.74	0.059
Number of Hospital Beds in States Less than 10,000 beds (Reference)			
10,000 to 20,000 beds	5850.75	-7936.70 - 19638.20	0.405
Greater than 20,000 beds	7440.12	-5846.08 - 20726.34	0.272
Nature of Treatment Allopathic treatment (Reference)			
AYUSH	-9020.48	-16223.98 - -1816.99	0.014
Level of Care Inpatient Sub-center/PHC/CHC (Reference)			
Public Hospital	949.24	-958.03 - 2856.53	0.329
Private Hospital	3772.82	1004.01 - 6541.63	0.008
Type of Ward Free (Reference)			
Paying General	9095.49	6978.86 - 11212.12	0.000
Paying Special	13642.31	9856.36 - 17428.27	0.000
Sector Rural (Reference)			
Urban	-309.89	-1754.49 - 1134.70	0.674
Nature of Ailment Infections (Reference)			
Cancers, blood, endocrine, metabolic, eye, ear diseases	3012.40	538.72 - 5486.08	0.017
Cardiovascular, respiratory diseases	3741.79	1137.12 - 6346.47	0.005
Gastrointestinal disease	-1184.58	-3789.95 - 1420.78	0.373
Skin, musculoskeletal, psychiatric & neurological diseases	2798.06	381.21 - 5214.90	0.023
Genitourinary, obstetric & childbirth	21.09	-1858.70 - 1900.90	0.982
Injuries	4338.32	1727.14 - 6949.50	0.001
Constant	-5660.85	-18905.18 - 7583.47	0.402

## Discussion and conclusions

Our study showed that poor people enrolled in the health insurance programs for the poor have higher incidence of hospitalization, but the health insurance enrolment had no effect on the duration of hospitalization. The increase in health insurance coverage may lead to increase in health care utilization because of higher access to care and due to changes in utilization behavior both by the insured and the provider. The results of our study are consistent with findings from other cross-sectional studies in Tamil Nadu (Philip

et al. 2012) and Maharashtra (Ghosh 2014) which showed that utilization of healthcare was significantly higher among the insured compared to the uninsured. Globally, evidence from the US showed that there was a 61% reduction in inpatient hospital admissions and 40% reduction in emergency department visits among the uninsured population (Anderson et al. 2012). Lack of health insurance coverage usually forces people to delay or postpone medical care even when the medical care needed is of emergency type. However, with health insurance coverage, people can utilize healthcare with potentially lower financial risk. Currently, the health insurance for the poor people in India covers only inpatient services. This creates an incentive for the patients to visit hospitals and get hospitalized, instead of using basic primary health care services. Also, it creates a financial incentive for the provider to admit poor patients in the hospitals. Studies on hospitalization trends in India showed that annual hospitalization rate increased from 16.6 to 37.0 per 1000 population from 1995 to 2014 (Pandey et al. 2017). Although evidence from literature has shown that increased health insurance coverage leads to increase in utilization of health services, but the effect of health insurance coverage on financial risk protection is less clear, especially for poor beneficiaries (Escobar et al. 2010; Acharya et al. 2012; Giedion et al. 2013).

Our study shows that chronic illnesses increase both the probability and duration of hospitalizations. The findings are consistent with other results in the literature which show chronic diseases are important determinants of hospitalizations (Dantas et al. 2016). Since the health insurance programs for the poor do not cover outpatient services, people do not get preventive services or outpatient treatment for their illnesses during the initial stages of disease to prevent disease progression and development of chronic diseases. Although,

public primary health care facilities provide free outpatient and preventive healthcare services, there may still be significant access barriers. In India, only 37% of the population in the rural areas have access to health care services within 5-kilometer radius and only 68% of the population have access to basic out-patient health facility (Kasthuri 2018). Further, India is facing demographic transition with increasing old population and epidemiological transition with increasing burden of non-communicable and chronic diseases (Patel et al. 2011). Incidence of hospitalization among poor people is also found to increase with age in our study. Elderly people over 80 years of age have the highest incidence of hospitalization. These findings are consistent with another study in India which showed that age is an important predictor for hospitalization (Kastor & Mohanty 2018). Hospital readmissions (Berry et al. 2018) and increase in the number of comorbidities in an individual also increase with age (McPhail 2016). Women in the age group of 19 to 40 years have higher incidence of hospitalization. This is consistent with other studies which show that women in the reproductive age group have higher rates of hospitalizations and incur higher health expenditures (Brinda et al. 2014; Getachew & Liabsuetrakul, 2019).

Our results show that medium and larger households have lower probability of hospitalization compared to smaller households. The odds of hospitalization for medium households is 0.77 and for the large households is 0.48. One of the probable reasons may be that larger households can arrange someone within the family to act as a caregiver in the case of illness or disability. This family caregiving may prevent hospitalization for many common conditions. Evidence from US have shown that home health provision has reduced both the number of visits and duration of stay in the hospital (O'Connor et al.

2015). The other reason may be due to problems in the design of the health insurance programs for the poor in India which causes difficulties in health care utilization (hospitalization) for households with large number of members. Poor people health insurance programs in India cover hospitalization costs only for limited number of household members. For example, health insurance programs such as RSBY and VAS in Karnataka are limited to maximum of five members in the household, but some of the state health insurance programs in Andhra Pradesh and Tamil Nadu cover the whole family irrespective of the number of the members (Hooda 2017; Karan et al. 2017; Fan et al. 2012). The RSBY program has a threshold ceiling of INR 30,000 and some of the state health insurance programs have much higher coverage limits of up to INR 200,000 in Andhra Pradesh (Hooda 2017). These enrolment restrictions and limited coverage threshold in the current health insurance programs will adversely affect the households with higher number of members by reducing their healthcare utilization and hospitalization, which may be one of the reasons for lower probability of hospitalizations among members from larger households.

People belonging to the scheduled tribe social group category had significantly lower duration of hospitalization compared to the other backward classes (reference group). Scheduled tribes have poor access to healthcare facilities since they live far away from the nearest health facility (Barik and Thorat 2015). This may one of the reasons for individuals belonging to the scheduled tribes to have lower duration of hospitalizations. People belonging to the other disadvantaged groups including the backward classes and scheduled classes live in the cities and villages and do not live in the inaccessible tribal areas like the scheduled tribal people. Thus, the access to the healthcare facilities and

coverage by health insurance programs will be much better for the other disadvantaged groups thus increasing their healthcare utilization and duration of hospitalizations.

Our study showed that coverage under the public health insurance programs for the poor had no significant effect on OOP health expenditures for inpatient care. This is contradictory to the studies done in Andhra Pradesh (Fan et al. 2012; Rao et al. 2014), Karnataka (Sood et al. 2014) which showed that coverage under health insurance programs reduced OOP health expenditures for hospitalizations. However, other studies in Tamil Nadu (Philip et al. 2012) and Andhra Pradesh (Mitchell et al. 2011) showed that households with health insurance coverage had higher OOP health expenditures. At the national level, another study by Karan et al. (2017) showed that the likelihood of incurring OOP health expenditures increased by 30% due to RSBY program and that RSBY has not been effective in reducing the burden of OOP health expenditures for poor households (Karan et al. 2017). However, the wellbeing of the poor increased due to the program, despite higher OOP health expenditure. Even the evidence found internationally on the effect of health insurance on OOP health expenditures is also mixed with studies from Indonesia, and Laos showing that health insurance programs reduced OOP health expenditures (Aji et al. 2013; Alkenbrack and Lindelow 2015), but evidence from Vietnam showed that the health insurance program had no effect on OOP health expenditures (Ekman 2007). OOP health expenditures are found to be increasing with increasing duration of stay in the hospital. A report from the World Bank in India (La Forgia and Nagpal 2017) and study of low and middle income countries (McIntyre et al. 2006) showed that hospitalizations are significantly associated with higher OOP health expenditures.

India has a pluralistic system of medical culture with a number of different types of alternative medical systems (apart from the allopathic systems of medicine) that are practiced widely all over the country (Rudra et al., 2017). The AYUSH training programs are officially regulated by the government of India, but there are many healers all over the country who practice these traditional systems of medicine without any formal qualifications in the field. In our study people who are using the alternate systems of medicine (AYUSH) for their treatment incur lower OOP health expenditures compared to people using the western (allopathic) systems of medicine. The findings of our study contrast with other studies done in Tanzania (Brinda et al. 2014) and Sri Lanka (Weerasinghe and Fernando 2009) which show that utilization of traditional systems of medicine were associated with higher OOP health expenditures. The reason may be that in India, the people who use alternate systems of medicine usually use them for minor ailments and people with complex conditions usually use the allopathic systems of medicine.

Our results showed that people who were admitted to a private tertiary hospital incurred higher OOP health expenditures compared people admitted to a primary healthcare facility such as a primary health center or community health center. A systematic review assessing OOP health expenditures across a number of countries found that the use of private healthcare facilities and inpatient admissions in private sector hospitals were both associated with higher OOP health expenditures (Alam and Mahal 2014). Also, evidence from Thailand support our finding of higher OOP health expenditures in private hospitals (Somkotra and Lagrada 2009). Even the use of the private sector hospitals for specific health services such as maternal health (Leone et al. 2013;

Bonu et al. 2009), chronic disease treatment (Bhojani et al. 2012) were associated higher OOP health expenditures. Apart from private ownership incurring higher OOP costs, the level of care in hospitals (i.e., primary, secondary, and tertiary care) increased OOP costs with higher likelihood of referral (tertiary) hospital expenditures being catastrophic (Bhojani et al. 2012). People who are getting admitted to a paying ward incur higher OOP expenses compared to getting admitted to a free ward. Most of the public health facilities in India provide inpatient admission free or at a very subsidized cost, but with basic facilities. Poor people who are getting admitted in the paying wards incur higher OOP costs because their ability to pay will be lesser and also the coverage by the poor people health insurance program is limited. Also, India also has a wide network of unregulated private sector hospitals with around 49% of total available hospitals being in the private sector (Thadani 2014).

In our study, ailments such as cancers, blood, endocrine, metabolic, eye, ear diseases, cardiovascular, respiratory diseases, skin, musculoskeletal, psychiatric, neurological diseases, and injuries incur OOP inpatient health expenditures compared to infections. India is facing an epidemiological transition from infectious diseases to chronic and non-communicable diseases (Yadav and Arokiasamy). The higher incidence and duration of hospitalizations for chronic diseases may be associated with higher OOP costs. Our results are consistent with other studies from India and other countries have shown that households with members with disabilities, injuries due to road traffic accidents, and chronic illnesses were positively associated with high OOP health expenditures, due to the severity of the illness and long treatment duration (Li et al. 2012; Kronenberg and Barros

2014; Saksena et al. 2010; Somkotra and Lagrada 2009; Molla et al. 2017; You and Kobayashi 2011; Mondal et al. 2014).

Poor people with a diploma/graduate/post graduate level of education were having higher OOP health expenditures compared to poor people who were illiterate. The results of our study are consistent with the evidence from China which showed that better educated had higher OOP health expenditures for healthcare (You and Kobayashi 2011). Also, education had an effect on OOP costs for specific services. Studies in India (Mohanty and Srivastava 2013), and in Brazil (Silva et al. 2015) show that educated mothers reported higher OOP health expenditures. Our study showed that people who were between 41 to 60 years had higher OOP health expenditures compared to the less than 18 years' age group. The odds of experiencing chronic diseases increase with age and chronic diseases are also important determinants of hospitalizations which also increase OOP costs. A number of studies from Bangladesh and China showed that healthcare expenditures were significantly associated with age, and the effect of age on health expenditures was highest among the elderly (Sarker et al. 2014; Li et al. 2012; Jiang et al. 2012; Shi et al. 2011; Alemayehu and Warner 2004). This is particularly important for India, since it does not have any specific health insurance programs or social security programs providing health coverage for older people who are more susceptible to chronic diseases, hospitalizations, and also higher burden of high OOP health expenditures.

The first set of analysis examined the differences in hospital utilization by health insurance status of the poor individuals. There are two aspects of hospital utilization – incidence of hospitalization and duration of hospitalization. The incidence indicates need and/or willingness to get admitted into a hospital. Decision to become hospitalized is often



not made by the patients; in most cases, individuals follow the instructions of physicians and other health care providers. Recommendation by health care providers is the triggering factor for being admitted in hospitals but some individuals may decide not to seek care from hospitals due to other barriers even though the hospitalization may be considered medically necessary. Once the patients decide to get admitted in the hospital, the length of stay is most likely determined by the health care providers and hospital managers.

The empirical results imply that the poor individuals enrolled in health insurance program are more likely to get admitted in a hospital than those who are not covered by health insurance. Incidence of hospitalization is a reflection of access to inpatient hospital services and it is not surprising to find that having insurance increases the likelihood of hospitalization. Even though the regression models, strictly speaking, do not show causal relationship, in this case it probably indicates causal pathway. Enrollment in insurance happens before utilization of hospital services and there exists no mechanism of obtaining insurance because of need for hospitalization. Therefore, only reasonable implication of the result would be that having insurance for inpatient services increases the incidence of hospitalization among poor individuals in India.

The second aspect of hospital service use is the intensity of service utilization after the patients are admitted. The empirical model indicates that insurance status had no relationship on the level of utilization of hospital services, measured by the length of stay. Again, most logical explanation would be that if insurance status has any relationship with duration of stay, the causal relationship should be from insurance status to duration, not the other way round. Since insurance status had no effect on duration of hospital stay, health care providers did not discriminate between insured and uninsured once they are admitted

in the hospitals. Again, this is not surprising for a number of reasons. The coverage limits in the health insurance programs for the poor is low and this low coverage limits did not create any incentive for increasing the duration of hospitalizations by the physician. The other reason may be that physicians are driven by the intrinsic motivation to provide better care for the patients, irrespective of their health insurance coverage or their capacity to pay. There is always the possibility that the clinicians are unaware of the insurance status of the patient, which are usually handled by the administrative divisions of the hospitals, and thus their clinical decisions are independent of any health insurance enrolment status.

Apart from the insurance status of individuals, a number of other factors affect hospitalization and hospital duration. Chronic illnesses increase both the incidence and duration of hospitalization. Early detection by preventive screenings and early treatment initiation will help in decreasing disease progression, and thus reduce preventable hospitalizations to a large extent. This early detection and treatment initiation could be delivered through the PHC system in India. India has a wide network of PHCs and the PHCs should be upgraded adequately with diagnostic and treatment facilities to detect and treat chronic diseases which will help in reducing hospital rates, the duration of hospitalizations, and the associated higher OOP healthcare costs for inpatient care. Many chronic diseases can be treated effectively in the ambulatory setting. Thus, better approaches to manage the chronic diseases in the outpatient settings must be implemented nationally to reduce hospitalizations for conditions that could be treated in the outpatient setting.

Lower incidence of hospitalization is seen among the larger households. The insurance for the poor may not cover all individuals in the household. In some states of

India, enrollment is limited to five members of household and the five members must be selected at enrollment. Therefore, for large households, many members may not be covered by the program even though the household is enrolled in the insurance plan. Lack of insurance coverage of some members may prevent access and service usage by those non-covered members. Since the non-covered members cannot utilize the healthcare delivery system for their health needs, they may end up showing lower rates of hospitalizations. This barrier in using the hospitals may adversely affect the health status of patients and overall health status of members in larger households may suffer. Thus, removing these enrolment restrictions will be helpful in improving hospital utilizations especially for the members of the larger households.

Our study shows that the Scheduled tribes in India have lower duration of hospitalization. Scheduled tribes have been traditionally neglected in the country who have lower capacity to pay because of their limited employment opportunities in the formal sector, lack of access to cash, and their area of residence which is mostly located in the hilly and remote tribal areas of India. They also have poor access to healthcare facilities since they live far away from the nearest health facility (Barik and Thorat 2015). In addition to this, the enrolment of tribal people in the health insurance programs for the poor is also quite low, both because of the presence of access barriers to reach them and enroll them under insurance programs, and of the problem of acceptability with some of the tribal groups who actively try to avoid participation in any governmental programs. Access barriers should be reduced for the Scheduled tribes and their enrolment in health insurance programs needs to be improved. Government should initiate outreach program to reach this hard-to-reach group so that their enrollment in insurance program can be expanded.

Both men and women who are 40 years or older have higher incidence of hospitalizations. This is expected since there is a declining stock of health capital with age and the severity of illness may also increase with age requiring higher number of hospitalizations. However, only women in the age groups of 19 to 40 years have higher incidence of hospitalizations, while men in the same group do not have higher incidence of hospitalizations. The main reason for this may be that women in the reproductive age group of 19 to 40 years have higher hospital admissions related to childbirth in healthcare institutions. In order to have safe deliveries, the Government of India promotes institutional deliveries through the Janani Suraksha Yojana (JSY) conditional cash transfer scheme, which may explain higher hospitalizations among women in the reproductive age group.

Utilization of private hospitals have higher OOP health expenditures. Utilization of private hospitals is not a problem if the richer households are using the private hospitals to get access to better quality services, but when the poor households obtain care from private hospitals, out-of-pocket expenses may become too high for the poor households to afford. The poor households need to be protected from the high OOP health expenditures when they are forced to use private hospitals. If the poor households needing hospital services do not have access to governmental facilities, they may decide to seek care from private hospitals.

The private healthcare system in India is highly unregulated. Regulation of private sector can be done by fixing prices for different diagnosis groups so that households would become fully aware of the total hospital bill for the medical condition at the time of utilization of services. Making the charges of hospitals more transparent will be another way of protecting households from uncertainty related to hospital service expenses. The

government sector hospitals act as an important source of healthcare delivery in India, especially for the poor people. Many poor people do not use the government healthcare facilities because of their perceived low quality, poor infrastructure, absences of health care providers and significant travel distances. Strengthening of government health facilities with better infrastructure and facilities is needed. Reducing access barriers to help the poor to reach the public health facilities should be done in order to protect the poor households from making high OOP health expenditures at private sector hospitals.

Increased duration of hospital stay leads to experiencing higher OOP health expenditures. Duration of hospital stay can be reduced either by reducing the severity of illness, so that people do not have to stay longer in the hospitals or by reducing the cost of services, so that they do not incur higher health expenditures. Increasing health insurance coverage limits and a defined benefit package for different types of medical conditions will also help in reducing the higher OOP health expenditures due to increased hospital stay.

This research finds that specific diseases such as cancers, cardiovascular, endocrine, respiratory, neurological, obstetric and childbirth, and injuries have higher OOP inpatient health expenditures. Specific national health programs can be established to include people affected by these diseases, and also provide them with disease-specific healthcare services. India is currently establishing a national health program for non-communicable diseases which is being piloted in some districts. Faster nation-wide implementation of this program will help the poor individuals suffering from these diseases to get specific health service package. Also, the health insurance coverage limits may be increased for the poor individuals who are suffering from these specific diseases. Increasing coverage limits may also encourage “up coding” of health conditions and

without a rigorous monitoring system, disease-specific limits may encourage reporting of high revenue earning health conditions at a higher rate.

Health insurance programs for the poor increase the incidence of hospitalization but has no effect on the duration of hospitalizations and inpatient OOP health expenditures. Presence of chronic illness, belonging to older age groups, women in the reproductive age group, and belonging to a small household have higher hospitalization. People who have higher duration of hospital stay, admitted to a private hospital, using allopathic treatment, having chronic illnesses, having higher level of education and belonging to the middle age group experienced higher OOP inpatient health expenditures. By identifying the groups most affected, this research aids the designers of the national insurance programs to design better benefit packages for those population groups. This investigation will serve as a basis for assessing India's policy options to reduce financial burden due to OOP health expenditures.

## **Limitations**

The main limitations of this study arise from the use of secondary data. Any study that uses secondary data suffers from this limitation, i.e., the study becomes limited by the data collected and survey methodology used. The contents and the questions asked in the survey are not what an assessment of a program would have done to explore the specific research questions of this study. One of the most important concern is the lack of information on the coverage of public health insurance for the poor. The NSSO dataset includes a variable that indicates insurance coverage by all public health insurance schemes, i.e., all the people covered by the government sponsored health insurance programs. Government sponsored health insurance schemes are many in India and includes

insurance programs like Employee's State Insurance Scheme (ESIS), Central Government Health Scheme (CGHS), and the poor people's health insurance programs such as RSBY and other state health insurance programs. Clearly, government sponsored health insurance programs cover poor as well as non-poor households. Employees of the central and state governments are covered by government insurance and none of them likely to be below the poverty line. It is also likely that many households covered by the insurance for the poor are not below the poverty line at any specific point in time. Since the enrollment into the insurance for the poor happens infrequently, economic status of households may change from enrollment date to the date of the survey.

This research needed to identify the individuals and households who are covered by the government sponsored insurance for the poor. Since many of those covered by public or government health insurance schemes are not poor by design, using all households/ individuals covered by public insurance will not provide the "target group" the study would like to examine. To identify the group covered by public insurance for the poor, a number of implicit assumptions were made: first, it is assumed that no insurance schemes of the government, other than the insurance program designed for the poor, covers the households or individuals below the poverty lines defined by the states. This conjecture is likely to be valid because governmental salary structure is such that almost no one covered by government employee health insurance program should be below the poverty line, irrespective of the size of the household. Second assumption is that the people who are below the poverty line and enrolled in a government sponsored health insurance program, they must be enrolled in the public health insurance programs for the poor such as RSBY, RACHI etc.

These assumptions do not identify all the households and individuals covered under the government insurance schemes for the poor but identifies only those who are covered by the insurance scheme and are below the poverty line. The households that are below poverty line and not enrolled in the government sponsored health insurance programs are assumed to be the control group, i.e., the households that are eligible for participation in the poor people's health insurance program but were not enrolled. Poverty is a dynamic event where people move in and out of poverty and it is almost impossible for any program to be as dynamic as the underlying dynamics of social mobility and poverty dynamics. The households who were covered by the insurance for the poor at the time of the survey but were not below the poverty line at the time can happen for two very different reasons. The first reason could be simple mis-targeting, i.e., the household should not be in the program based on the economic status of the household but were enrolled in the program. The second reason could be that the household belonged to the poverty category when the household got enrolled but the household graduated from poverty to above the poverty line during the intervening period. Since enrollment in the program and disenrollment from the program happens only infrequently, a certain percent of enrollees will be above the poverty line. This group was targeted correctly but they moved up the economic ladder since enrollment. Given the data we have, it is not possible to identify households who were covered by the insurance for the poor even though they were not poor.

In the empirical analysis, we have used the poverty line for 2014 to identify the individuals who were poor in 2014. Thus, our study focuses on the group who was below the poverty line and enrolled in any government health insurance program. Since the government health insurance scheme that covers individuals below the poverty line are the



insurance schemes for the poor, it is likely that all those who are poor and covered by government health insurance are actually covered by the public health insurance for the poor. The implication of these implicit assumptions is that the study cannot conduct an assessment or evaluation of the insurance program for the poor. It is only assessing the differences in utilization and out-of-pocket expenses between the poor households and individuals covered by the public health insurance schemes for the poor and those not covered by the scheme. Therefore, it is not an assessment of those who are covered by the insurance schemes for the poor and those not covered but at similar socioeconomic situations.

Also, the cross-sectional nature of the data creates an important limitation that it allows us to study only the association of health insurance with the various outcomes, and not the actual evaluation of the program. Cross-sectional data cannot infer causal association mainly because temporality is not known and thus cannot assess the change in outcomes over a period of time. Thus the availability of data over time is required to effectively evaluate the program. Data were not collected from the floating population (people without any normal residence), but households residing in open spaces, roadside shelters and people who reside in the same place were listed. People residing in the protected residential areas of military, paramilitary, police areas and people in orphanages, rescue homes, etc., were not covered. The NSSO health survey data does not collect detailed consumption expenditure and the consumption expenditure in the NSSO survey does not differentiate between food and non-food expenditures. It should also be noted that all information is reported by the surveyed individuals in the households and some

information required quite long recall time. Therefore, the data is prone to strategic, recall and other types of biases.

### **Ethical Approval**

The dataset is available in the public domain after removing all individual level identification variables. It is not possible to identify the residence of any of the households as well. Therefore, ethical approval is not needed for the study. Permission has been obtained from the Ministry of Statistics and Implementation of the Government of India for this research and potential future publications using the data set.

## CHAPTER 5: MANUSCRIPT II

### 5.1 INCIDENCE AND INTENSITY OF CATASTROPHIC HEALTH EXPENDITURES IN INDIA: SOCIOECONOMIC INEQUALITY AND DETERMINANTS

#### Introduction

United Nations' Sustainable Development agenda incorporates one goal (Goal 3) that is related to health and well-being of the population and one of the specific targets of the goal is to improve financial risk protection through universal health coverage (UHC). UHC includes securing access to quality healthcare and safe, affordable medicines and vaccines for everyone (Saksena et al .2014). Resolution 58.33 of the World Health Assembly recommends that all WHO member states should provide UHC to their entire population and protect households from catastrophic health expenditures (CHE) (Obermann et al., 2018). CHE is defined as out-of-pocket (OOP) health spending that exceeds a certain proportion of a household financial capability (Xu et al. 2003). More than 100 countries in the world have either started their reforms towards UHC or have already achieved it (Obama 2008; Summers 2015). Even though most countries are striving to enable their citizens to obtain the healthcare they need without financial barriers, 150 million people still experience CHE each year (Kastor & Mohanty, 2018). More than 90% of the people experiencing CHE live in in low-income countries (Xu et al. 2003). The amount of financial protection rendered to population groups will depend on their degree

of dependence on OOP health expenditures for financing health care (Xu et al. 2003). Dependence of the households on OOP payments for obtaining healthcare escalates the financial burden of the households (Wagstaff and van Doorslaer 2003; Xu et al. 2003; Amaya Lara and Ruiz Gomez 2011).

According to the World Health Organization's list of "countries with highest OOP expenditure on health," India ranks third in the region of Southeast Asia. In India, OOP expenses accounts for about 62.6% of total health expenditure - one of the highest in the world (Balarajan et al. 2011; Hooda 2017). There has been a significant increase in OOP and CHE in India because of declining importance of Government of India (GOI) funding in overall health expenditure (Hooda 2013), a strong private healthcare system and weakening of the public healthcare system (Peters et al. 2002), the user fee in the public sector tertiary hospitals (Thakur and Ghosh 2009), the liberalization of the pharmaceutical industry (Kumar, 2004), and the creation of the Drug Price Control Order, which led to an increase in drug prices (Hooda 2017).

India spends only 1% of its Gross Domestic Product (GDP) on publicly funded healthcare and by 2020, the GOI intends to increase public spending on healthcare to 3% of its GDP (Hooda 2013). This level of public health expenditure is extremely unfavorable, because the lower and middle-income countries spent, an average, 2.8% of their GDP on healthcare, and even impoverished sub-Saharan countries spent 1.7% of their GDP on public health (WHO 2019). Evidence from the recent National Health Accounts of India shows that among the total health expenditure in India, only 29% is from government health expenditure, 5.7% is from Social Security Expenditure on health, 3.7% is from Private health insurance expenditure and the rest 62.6% is OOP health expenditure. Out of

the 62.6% of OOP health expenditures, 59.1% are for outpatient and preventive health care, 31.96% for inpatient health care, 2.46% for medicines (not covered under inpatient and outpatient care), 6.24% for transportation, and 0.09% for laboratory and imaging services (NHA, 2017).

Evidence shows that high OOP health expenditures leading to CHE are not essentially caused by a single event or by the use of costly medical procedures (Xu et al. 2003). Small payments that occur frequently due to a number of factors leads to higher OOP health expenditures. A survey using data from 89 countries showed that the incidence of CHE is around 3% of the households in low-income countries, 1.8% households in middle-income countries, and 0.6% in high-income countries (Xu et al. 2007). Pal et al. (2012) used the Consumer Expenditure Survey for 2004-2005 to study the incidence of CHE variation based on the rural/urban location and socioeconomic status of the households in different states. The results showed that the incidence of CHE was highest among the poorest quintiles in the rural areas of Kerala (9.71%), and highest among the richest quintiles of the rural areas of Madhya Pradesh (21.82%). Among the poorest quintiles, the rate of CHE was highest in Rajasthan (13.34%) in urban areas and among the richest quintiles in urban areas in Orissa (11.26%) (Pal 2012). Many studies have examined the health expenditures on specific diseases such as diabetes, tuberculosis, cancer, injuries etc., but the problem was that most of these studies were done in small geographical areas of the country and their representativeness for the whole nation was limited (Binnendijk et al. 2012; Yesudian et al. 2014; Rao et al. 2011; Prinja et al. 2015; Muniyandi et al. 2005; Ramachandran et al. 2007). Some studies have examined the determinants of OOP health expenditures for outpatient care in a few districts of India for certain age groups (Brinda et

al. 2012; Gupta et al. 2016). Also, other studies have used different NSSO datasets and other nationally available data like National Family Health Survey (NFHS) etc. to study disease specific OOP health expenditures for hospitalizations (Kastor and Mohanty 2018), OOP health expenditures due to non-communicable diseases (NCDs) (Tripathy et al. 2016), burden of OOP payments due to medicines (Selvaraj et al. 2018), OOP health expenditure for maternal care (Mohanty and Kastor 2017), OOP health expenditure for accidental injury (Pradhan et al. 2017), but they did not address the specific research questions related to CHE in general and factors affecting incidence and depth or gap of CHE.

A number of studies have been published in Iran, China, Nepal, Turkey, Tanzania, Brazil, Thailand, Georgia, Vietnam, Portugal, Botswana, Lesotho, and South Korea analyzing the determinants of CHE and the burden of CHE (Nandi et al. 2017; Fazaeli et al. 2010; Van Minh et al. 2013; Shi et al. 2011; Saito et al. 2014; Kronenberg and Barros 2014; Yardim et al. 2010; Brinda et al. 2014; Akinkugbe et al. 2012; Barros et al. 2011; Choi et al. 2014). This study intends to do the same for India. The main objective of the study is to identify the characteristics of households, specific health conditions of individuals, and health delivery system issues that make people prone to CHE. In particular, the study will examine the association of households' demographic characteristics, social structure, and healthcare utilization that appear to be associated with relatively high level of expenditure and also quantify the burden of OOP health expenditures and CHE. In this research, we used the data from the 2014 National Sample Survey Organization (NSSO) to assess the level of financial protection in India (NSSO 2014). To measure the effect of CHE on households, we estimate (i) incidence and intensity

of CHE in India (ii) the degree of inequality among households in terms of incidence and intensity of catastrophic health expenditures (iii) the factors affecting the incidence and intensity of CHE in India.

India is currently taking measures to provide UHC to its population. Providing financial protection is considered the backbone of UHC. This research seeks to inform policy makers and health financing practitioners about the characteristics of beneficiaries and types of services to be considered for reducing likelihood of CHE. By identifying the incidence, intensity, socioeconomic inequalities in CHE, this study helps the central government provide appropriate higher budgetary allocations for the groups that have higher OOP health expenditures and aids the designers of the national and state health insurance programs to design better benefit packages for those population groups. This investigation will serve as a basis for assessing India's policy options to reduce financial catastrophe due to OOP health expenditures.

### **Study Conceptual Framework**

Andersen's Behavioral Model of Healthcare Utilization will be used to guide this research (Andersen, 1995). The Andersen model examines the predisposing, enabling, need and healthcare utilization characteristics. In using the Andersen model, this study classifies individual and household characteristics as predisposing or enabling factors associated with the use of health care services. Central government and state government health insurance schemes in India enroll population at the household level. This study focuses on the demographic characteristics such as age, gender, marital status, education, occupation, religion and social groups; household characteristics such as socioeconomic status, household size and composition, location of the household, WASH facilities, source

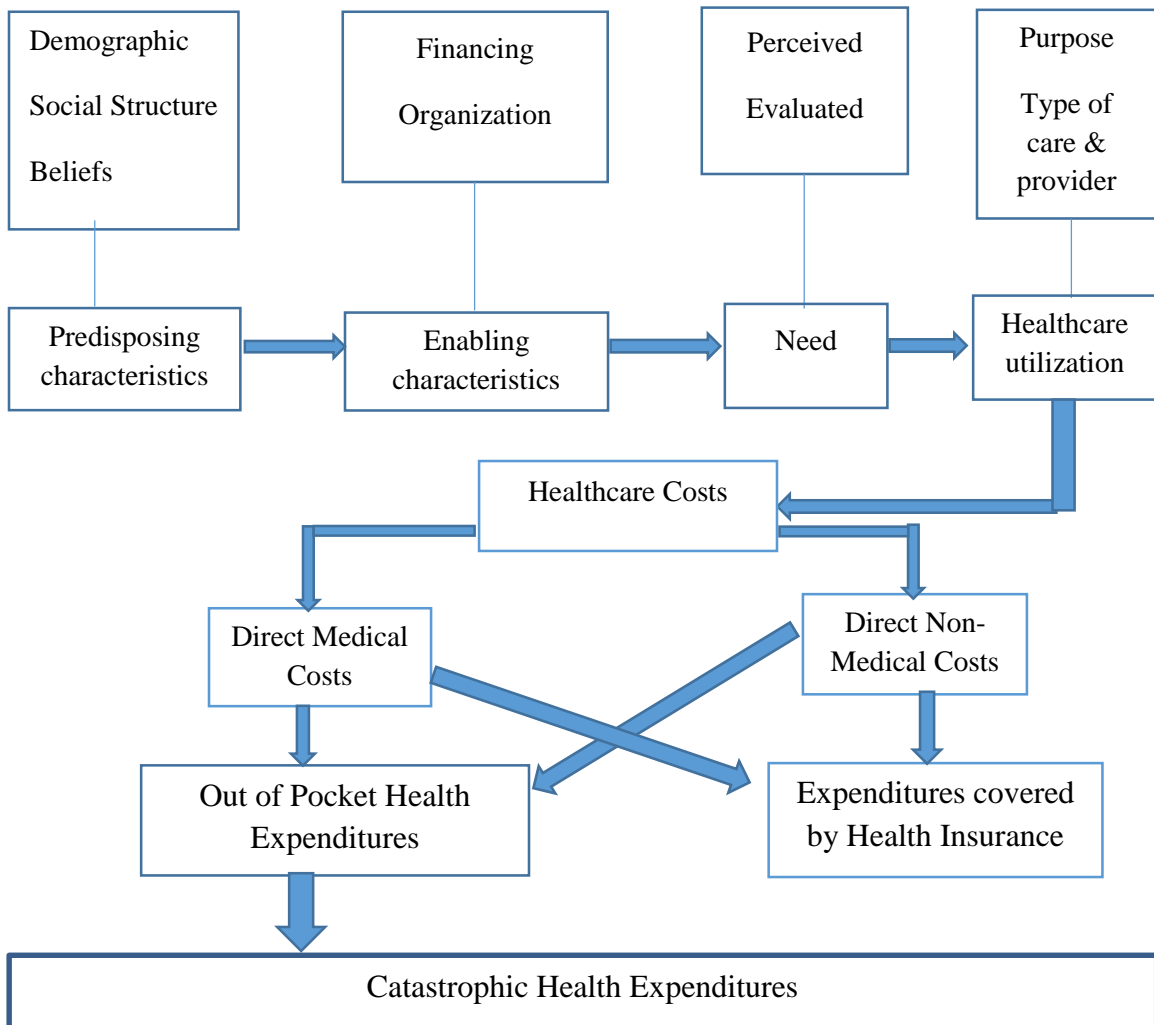
of energy for household cooking; health system and utilization characteristics such as type of provider, level of care, type and severity of illness, nature of treatment, health insurance coverage and source of financing. Figure 1 illustrates the relationship between household's characters and its relationship to the OOP health expenditures.

Predisposing characteristics of health services utilization are the demographic characteristics such as age, and gender composition of the household, which highlight the biological need for healthcare services. Social structure denoted the household's ability to solve its problems. Beliefs are the norms, knowledge, values, and attitudes of the household about health and health services, which play an important role on the opinion of the household about need and utilization of health services (Andersen, 1995). Education is one of the important component which affects the beliefs of the household. Enabling characteristics of health services utilization are financing and organization. Financing represents access to financial resources to pay for health care which can be income, assets, savings, coverage for health expenses through health insurance, and social safety nets. Organization refers to how the healthcare resources are distributed in the household's surroundings, which includes number and type of health facilities, access to transportation, time required to reach a health facility, and the waiting time to get the care.

Need characteristics of health service utilization consist of both perceived needs and evaluated needs. Perceived needs indicate when an individual feels sick, the person decides to have a health consultation. The evaluated need denotes the objective and professional decisions made by the healthcare professionals regarding the illness of the individual. Thus, the evaluated need decides the type and duration of care that is prescribed to the patient. The diagnosis of the patient in a hospital usually highlights the evaluated



need for healthcare and this usually determines the duration of hospitalization and medical services received by the patient. Healthcare utilization characteristics highlight the purpose of visiting the health facility, type of care wanted, level of care wanted, and the type of healthcare provider visited (Andersen, 1995).



**Figure 5.1 Determinants of Household's OOP Health Expenditures using Anderson's Behavioral Model of Healthcare Utilization**

## Methods

### Data sources

The data from the National Sample Survey Organization (NSSO) of the Government of India were used for the study (NSSO 2014). NSSO is a national organization under the Ministry of Statistics and Implementation which was established in 1950 to regularly conduct surveys and provide useful statistics on socio-economic status of households, demography, health, industries, agriculture, consumer expenditure etc. Social Consumption (Health), NSS 71<sup>st</sup> Round for 2014 of NSSO data were used for this analysis. The survey covered whole of the Indian Union and it is the latest social consumption (Health) data available. The survey used the interview method of data collection from a sample of 65,932 randomly selected households (36,480 in rural India and 29,452 in urban India) and 335,499 individuals, covering the members of the household in all the 36 states (including union territories). The data for the survey were collected over a period of six months, from January to June 2014. The NSSO Social Consumption (Health) collected data on demographic characters, employment, health conditions, source of payments, health insurance coverage, type of coverage, costs of various inpatient services, level of care, type of care and a number of other variables. The survey also collected information on medical care received at inpatient and outpatient facilities of medical institutions including health expenditures for various episodes of illness. This is the first NSSO health survey that collected data on utilization of alternative medicines. The details of hospitalization for all current and former members of the household were collected for the last 365 days (hospitalization occurred from January 2013 to June 2014) and the details of outpatient services were collected for the last 15 days.

## **Reference period**

The reference period of institutional expenditure is 365 days, 1 month for household consumption expenditure. The amount of money reimbursed by the medical insurance company for inpatient healthcare is for the last 365 days. For outpatient care including the services and expenditure, the reference period was 15 days. All the reference period will be converted into a common scale for analysis. Thus, in this study all the reference periods will be adjusted for 30 days. Expenses for outpatient OOP health expenditure will be multiplied by 2 to get the monthly estimates. Expenses for inpatient OOP health expenditure will be divided by 12 to get the monthly estimates.

## **Measuring incidence and intensity of CHE**

The incidence of CHE was calculated from the proportion of OOP healthcare payments which exceed a certain threshold in relation to the household consumption expenditure (Wagstaff and van Doorslaer 2003). Two definitions are commonly used. In the first definition OOP health expenditure is compared with the total household consumption expenditure (Pradhan and Prescott 2002; Wagstaff and van Doorslaer 2003; Russell 2004) and in the second one OOP health expenditure is compared with the household non-food consumption expenditure (Berki 1986; Xu et al. 2003, 2006). Total OOP healthcare expenditure is the total health expenditure that is experienced by the patients after deducting the amount of money reimbursed. Payments made by all the individuals in a household for inpatient OOP healthcare and outpatient OOP healthcare are summed at the household level. In the National Health Policy of India, CHE is defined as health expenditure exceeding 10% of its total monthly consumption expenditure or 40% of its monthly non-food consumption expenditure (GOI 2017). In this research, the OOP

health expenditure is compared with the household consumption expenditure and it is assumed that a household experienced CHE if health expenditure exceeds 10% threshold level. Catastrophic payment headcount informs the proportion/number of households affected by CHE i.e. the number of households who are experiencing an OOP healthcare expenditure above 10% of household consumption expenditure.

Catastrophic payment headcount is given by the formula:

$$HC = \frac{1}{N} \sum_{i=1}^N E$$

HC is the Catastrophic payment headcount. The indicator  $E=1$  is defined when  $T_i/X_i > Z$  and zero otherwise. Here  $Z$  is 0.10.  $T$  is the household OOP health expenditure;  $X$  is the total household consumption expenditure and  $N$  is the sample size. The theoretical minimum and maximum values of catastrophic payment headcount are 0% and 100% respectively. The CHE incidence (headcount) does not indicate the degree to which the household's CHE exceed the threshold value, thus the CHE intensity (overshoot) has also been estimated. The intensity (overshoot) of the CHE is the average degree when the household OOP health expenditures as a proportion of the household consumption expenditure exceeds the pre-specified thresholds (10%).

Average catastrophic excess ( $O$ ) measures this intensity of CHE and it is given by the formula below:

$$O = \frac{1}{N} \sum_{i=1}^N O_i$$

$O_i$  is the excess or overshoot and it is calculated by the formula,  $O_i = E_i [(T_i/x_i) - Z]$ .  $T_i$  is the OOP health payment of household.  $X_i$  is the household consumption expenditure.  $Z$  is the

threshold budget share. The minimum and maximum value of catastrophic payment gap is 0% and 90% respectively when the threshold value is fixed at 0.10.

### **Measuring socioeconomic inequalities of CHE**

The measures of incidence and intensity of CHE are insensitive to socioeconomic status of the households and thus do not identify whether the poor or rich households exceed the threshold more (O'Donnell et al. 2008). Many policy makers will consider it a significant problem if the poorer households exceed the threshold level compared to the richer households. Wagstaff et al. recommend the calculation of concentration indices to separate the association of CHE with socio-economic status (Wagstaff and van Doorslaer 2003). Concentration indices are used to detect the presence of socioeconomic inequality in any health sector variable and whether it is more marked in one group than another (Kakwani 1977; Kakwani 1980; Kakwani et al. 1997; Wagstaff et al. 1989). In literature, concentration indices have been used to estimate the socio-economic inequality for several public health issues namely child mortality (Wagstaff 2000), child immunization (Gwatkin et al. 2003), child malnutrition (Wagstaff et al. 2003), adult health (van Doorslaer et al. 1997), health subsidies (O'Donnell et al. 2007), and health care utilization (van Doorslaer et al. 2006). In this research, concentration indices were estimated to show the direction and magnitude of the intensity and incidence of CHE across the different socioeconomic groups. In the calculation of concentration indices, households were ranked according to the socioeconomic status (household consumption expenditure), starting with the poorest (Kakwani et al. 1997). The value of the concentration index ranges from -1 to +1. A positive value of concentration index indicates that richer households are more likely to

exceed the threshold and a negative value indicates that poorer households exceed the threshold.

### **Prediction model of CHE**

To study the effects of various factors on the incidence of catastrophic OOP healthcare payments, the logistic regression model is used. The logistic regression is preferred since the dependent variable is dichotomous. A dichotomous variable for CHE is created with 0 for not incurring catastrophic health expenditures and 1 for incurring catastrophic health expenditures. Thus, the dichotomous variable created for CHE will serve as the dependent variable for the logistic regression model. The independent variables include the various characteristics of the individuals, households and health facility. The model estimated the log odds of incurring CHE adjusted for a set of explanatory variables. Household is the unit of analysis. The results for the logistic regression are presented with the estimated regression coefficients, odds ratio and 95% confidence intervals. This analysis identifies the extent to which different explanatory variables affected the household's probability of incurring CHE. Among the households which incurred CHE, intensity of CHE were calculated and multiple regression model was used to identify factors affecting intensity levels. The dependent variable is the catastrophic payment gap, and the independent variables included various characteristics of the individuals, households and health facility.

## Results

### Descriptive Statistics

Descriptive statistics presented in Table 1 are at the household level. There were 65,932 households in the sample. 33% of the households have at least one child aged 5 years and less; 26.87% households have at least one elderly person; 667.44% households are located in the rural areas; 30.04% of the households belong to the lowest income quintile; 33.94% households have at least one secondary educated female member; 54.08% of the households were small; 82.35% of the households are Hindu; 71.09% households belonged to the disadvantaged classes. The mean proportion of members hospitalized in each household is 0.0456. 9.98% of the households had at least one member in the household who used a private healthcare facility for hospitalization. Mean proportion of members suffering from chronic illness in each household is 0.0637. The mean proportion of members enrolled in health insurance in each household is 0.1684. The mean total OOP health expenditures of all members in each household per month is INR 403.43, and the total consumption expenditure of all members in each household per month is INR 37,233.30.

**Table 5.1: Descriptive Statistics of Categorical and Continuous Variables**

Variables	Definition and Categories	Frequency (%) n = 65,932	Weighted Percentage
Age groups (Children)	Presence of at least one child (aged 5 years and less) in the household	31,361 (47.57%)	33%
Age groups (Elderly)	Presence of at least one elderly person (aged 60 years and above in the household)	20,234 (30.69%)	26.87%
Marital status	Presence of someone divorced in the household	15,649 (23.74%)	22.44%
Female education	Presence of at least one secondary educated female member in the household	27,723 (42.05%)	33.94%

Location of the household	Rural	36,480 (55.33%)	67.44%
	Urban	29,452 (44.67%)	32.56%
Socioeconomic status of household	Lowest Expenditure Quintile	13,607 (20.64%)	30.04%
	Second Lowest Expenditure Quintile	12,768 (19.37%)	21.77%
	Third Expenditure Quintile	13,825 (20.97%)	20.59%
	Fourth Expenditure Quintile	12,726 (19.30%)	15.59%
	Highest Fifth Expenditure Quintile	13,006 (19.73%)	12.01%
Drinking water	Safe water	64,376 (97.64%)	98.75%
	Unsafe water	1,556 (2.36%)	1.25%
Household cooking fuel	Unclean fuels	35,044 (53.15%)	5.97%
	Clean fuels	30,274 (45.92%)	38.78%
	No cooking arrangement	614 (0.93%)	1.51%
Drainage type	Open (kutchra and pucca)	27,670 (41.97%)	38.49%
	Covered (pucca and underground)	18,764 (28.46%)	26.95%
	No drainage	19,498 (29.57%)	34.56%
Latrine type	Service and pit latrine	13,269 (20.13%)	17.16%
	Septic tank/flush system	31,537 (47.83%)	40.76%
	No latrine and others	21,126 (32.04%)	42.07%
Household size	Small household (1 to 4 members)	29,055 (44.07%)	54.08%
	Medium household (5 to 8 members)	31,461 (47.72%)	40.94%
	Large household (9 and more)	5,416 (8.21%)	4.98%
Religion of the household	Hinduism	50,662 (76.84%)	82.35%
	Islam	8,987 (13.63%)	12.59%
	Christianity	3,924 (5.95%)	2.34%
	Other religions	2,359 (3.58%)	2.72%



Social Group of the household	Scheduled tribes	8,382 (12.71%)	9.14%	
	Scheduled castes	11,058 (16.77%)	18.69%	
	Other backward classes	25,842 (39.19%)	43.26%	
	Others	20,650 (31.32%)	28.91%	
Level of care of hospitalization	If at least one member in the household used a private healthcare facility for hospitalization	24,060 (36.49%)	9.98%	
<b>Variables</b>	<b>Definition</b>	<b>Mean</b>	<b>Standard Error</b>	<b>95% CI</b>
Sex	Proportion of female members in each household	0.48	0.0018	0.47 - 0.48
Health Insurance coverage	Proportion of members enrolled in health insurance in each household	0.16	0.0032	0.16 - 0.17
Chronic illness	Proportion of members suffering from chronic illness in each household	0.06	0.0014	0.06 - 0.06
Hospitalization	Proportion members hospitalized in each household	0.04	0.0006	0.04 - 0.04
Duration of hospitalization	Total duration of hospitalization of all members in each household	1.29	0.02474	1.24 - 1.34
Duration of ailment	Total duration of ailment of all members in each household	395.25	12.6161	370.52 - 419.98
Monthly consumption expenditure	Total consumption expenditure of all members in each household per month	37233.30	304.3445	36636.78 - 37829.81
Monthly inpatient OOP health expenditure	Total inpatient OOP health expenditures of all members in each household per month	287.46	11.57392	264.78 - 310.15
Monthly outpatient OOP health expenditure	Total outpatient OOP health expenditures of all members in each household per month	115.96	8.648854	99.01 - 132.91
Total monthly OOP health expenditure	Total OOP health expenditures of all members in each household per month	403.43	14.48582	375.04 - 431.82

## Incidence of catastrophic health expenditures

Table 2 shows the incidence of CHE at 10% of total household consumption expenditure. CHE incidence was 10.94% in the whole population, but higher incidence was observed in rural (11.17%) than urban (10.45%) areas. Incidence of CHE is 64.57% among households if at least one member in the household used a private health facility compared to households where no member used a private health facility (4.99%). Households in the highest fifth income quintile (13.82%) experience the highest incidence of CHE, while the households in the lowest income quintile (9.22%) experienced the lowest incidence of CHE. Households belonging to the other backward classes (11.28%) had higher incidence of CHE compared to scheduled tribes (7.13%). Large households (16.15%) had higher incidence of CHE compared to smaller households (9.14%). Households which have at least one child aged less than 5 years (14.49%), and elderly aged more than 60 years (15.43%) have higher incidence of CHE compared to households who did not have any elderly member or child. Presence of secondary educated female member in the household increase the incidence rate from 10.03% to 12.71%.

**Table 5.2: Incidence of CHE by Household Characteristics**

Variables	Categories	Incidence of Catastrophic Health Expenditures at 10% threshold level
Percent of total households reporting catastrophic health expenditures		10.94%
Sector	Rural	11.17%
	Urban	10.45%
Socioeconomic status of household	Lowest Expenditure Quintile	9.22%
	Second Lowest Expenditure Quintile	10.05%
	Third Expenditure Quintile	10.71%
	Fourth Expenditure Quintile	13.50%
	Highest Fifth Expenditure Quintile	13.82%
Household size	Small household (1 to 4 members)	9.14%
	Medium household (5 to 8 members)	12.68%

	Large household (9 and more)	16.15%
Religion of the household	Hinduism	10.67%
	Islam	12.36%
	Christianity	12.22%
	Other religions	11.49%
Social Group of the household	Scheduled tribes	7.13%
	Scheduled castes	10.52%
	Other backward classes	11.28%
	Others	11.90%
Private healthcare facility for hospitalization	If at least one member in the household used a private healthcare facility	64.57%
	No member in the household used a private healthcare facility	4.99%
Child aged 5 years and less in the household	At least one child aged less than 5 years present in the household	14.49%
	No child less than 5 years in the household	9.19%
Elderly aged 60 years and above	At least one elderly person aged 60 years and above in the household	15.43%
	No elderly aged 60 years and above in the household	9.29%
Secondary educated female in household	At least one secondary educated female member in the household	12.71%
	No secondary educated female member in the household	10.03%
Divorced person in household	At least one divorced person in the household	12.72%
	No divorced person in the household	10.42%

### Intensity of catastrophic health expenditures

Table 3 shows the intensity of catastrophic health expenditures at 10% of total consumption expenditure. Mean positive overshoot indicates that on average, the out-of-pocket health expenditures was 35.94% higher than the 10% threshold level of total household consumption expenditure. Higher intensity (overshoot) of CHE was observed in the socioeconomically poor households and in the rural households. Intensity of CHE was highest in smaller households (42.76%) compared to larger households (24.74%). Scheduled tribes (63.99%) faced higher overshoot compared to the other backward classes (32.96%). Presence of at least one elderly person in the household increased the overshoot

from 32.68% to 41.28%, but the presence of a child in the household decreased the overshoot from 43.45% to 26.27%. Presence of an educated female member in the household decreased the intensity of CHE from 39.48% to 30.50%, and the intensity of CHE in households having a divorced person increased from 33.29% to 43.45%.

**Table 5.3: Intensity of CHE by Household Characteristics**

Variables	Categories	CHE Overshoot among Households experiencing CHE	Standard error	95% Confidence Interval
Mean Positive Overshoot		35.94%	1.9897	32.04 - 39.84
Sector	Rural	36.91%	2.7993	31.43 - 42.40
	Urban	33.78%	1.5522	30.74 - 36.82
Socioeconomic status of household	Lowest Expenditure Quintile	58.03%	7.6230	43.08 - 72.97
	Second Lowest Expenditure Quintile	33.84%	1.6214	30.66 - 37.01
	Third Expenditure Quintile	25.10%	1.0343	23.08 - 27.13
	Fourth Expenditure Quintile	24.86%	1.4873	21.94 - 27.77
	Highest Fifth Expenditure Quintile	31.04%	2.3106	26.51 - 35.57
Household size	Small household (1 to 4 members)	42.76%	4.1385	34.65 - 50.87
	Medium household (5 to 8 members)	31.18%	1.3414	28.55 - 33.81
	Large household (9 and more)	24.74%	1.6253	21.55 - 27.93
Religion of the household	Hinduism	35.81%	2.2582	31.38 - 40.24
	Islam	34.81%	4.9103	25.18 - 44.43
	Christianity	45.44%	15.4347	15.15 - 75.74
	Other religions	36.50%	4.0923	28.46 - 44.53
Social Group of the household	Scheduled tribes	63.99%	27.2972	10.46 - 117.53
	Scheduled castes	36.03%	2.7315	30.67 - 41.38
	Other backward classes	32.96%	1.4396	30.14 - 35.78
	Others	34.80%	2.3728	30.15 - 39.45
Private healthcare facility for hospitalization	If at least one member in the household used a private healthcare facility	34.07%	0.7918	32.52 - 35.62
	No member in the household used a private healthcare facility	38.62%	4.7020	29.40 - 47.84

Child aged 5 years and less in the household	At least one child aged less than 5 years present in the household	26.27%	1.2708	23.78 - 28.76
	No child less than 5 years in the household	43.45%	3.3788	36.83 - 50.08
Elderly aged 60 years and above	At least one elderly person aged 60 years and above in the household	41.28%	4.7785	31.91 - 50.65
	No elderly aged 60 years and above in the household	32.68%	1.3121	30.10 - 35.25
Secondary educated female in household	At least one secondary educated female member in the household	30.50%	1.0207	28.50 - 32.50
	No secondary educated female member in the household	39.48%	3.2050	33.20 - 45.76
Divorced person in household	At least one divorced person in the household	43.45%	6.6062	30.50 - 56.40
	No divorced person in the household	33.29%	1.3265	30.69 - 35.89

### **Socioeconomic inequality in catastrophic health expenditures**

Households in the richest expenditure quintile have the highest incidence of CHE, but the poorest households experience the highest intensity (overshoot) of CHE. In the rural areas, households in the richest expenditure quintile and households in the second richest expenditure quintile in the urban areas have the highest incidence of CHE. However, the poorest households in both the urban and rural areas have the highest intensity of CHE. The Mean Positive Overshoot above the 10% threshold level of household consumption expenditure is higher in the rural areas (36.91%) compared to the urban areas (33.78%). The positive value of concentration index for headcount indicates that the richer households are more likely to exceed the threshold both in the urban and rural areas. However, there is a greater tendency of overshoots among the poorer households in the rural areas, and a higher intensity of CHE among the richer households in the urban areas.

**Table 5.4 Headcount and overshoot of CHE across expenditure quintiles**

<b>Threshold</b>	<b>Rural</b>	<b>Urban</b>	<b>Total</b>
<b>Headcount</b>			
Poorest	9.61%	7.33%	9.22%
Second	10.51%	8.68%	10.05%
Third	10.93%	10.24%	10.71%
Fourth	14.24%	12.66%	13.50%
Richest	18.61%	11.70%	13.82%
Total	11.17%	10.45%	10.94%
CI	0.0910	0.0904	0.0848
SE (CI)	0.0081	0.0096	0.0062
<b>Overshoot</b>			
Poorest	60.20%	43.92%	58.03%
Second	31.12%	43.78%	33.84%
Third	23.75%	28.21%	25.10%
Fourth	21.76%	28.81%	24.86%
Richest	28.37%	32.92%	31.04%
MPO	36.91%	33.78%	35.94%
CI	-0.1328	0.0277	-0.0882
SE (CI)	0.0242	0.0239	0.0177

**Multivariate analysis**

Table 5 shows the results from the logistic regression model for predicting the effect of various factors on the incidence of CHE. It was observed that the odds of experiencing CHE was higher among the households with at least one child aged less than 5 years, one elderly person, one secondary educated female member, and at least one member in the household used a private healthcare facility for their treatment. Urban households had lower probability of experiencing incidence of CHE, and households from all other expenditure quintiles also had lesser odds of incurring CHE compared to households in the poorest quintile. The likelihood of incidence of CHE increased with the increase in duration of stay in the hospital, with the highest odds being for the households who had members who stayed for more than 20 days in a hospital. Also, the presence of chronic illness among members in the household increased odds of CHE. Health insurance coverage in the

household reduced the likelihood of CHE incidence. Other factors such as religion, social group, proportion of female members in the household, household size, and presence of divorced members in the household did not have any significant effects on the incidence of CHE. Fixed effects for state of residence of the household was used in the model. Significant results were found in 23 states namely Uttaranchal, Chandigarh, Haryana, Delhi, Rajasthan, Uttar Pradesh, Sikkim, Nagaland, Mizoram, Meghalaya, Chhattisgarh, Madhya Pradesh, Gujarat, Daman and Diu, Dadra and Nagar Haveli, Maharashtra, Andhra Pradesh, Karnataka, Lakshadweep, Kerala, Tamil Nadu, Pondicherry, and Andaman and Nicobar Islands.

**Table 5.5: Logistic regression for the factors affecting incidence of Catastrophic Health Expenditures**

Characteristics	Odds Ratio	95% Confidence Interval	P value
At least one member in the household has health insurance coverage	0.62	0.52 - 0.75	0.000
Presence of at least one elderly aged more than 60 years present in the household	1.27	1.09 - 1.48	0.002
Presence of someone divorced in the household	0.94	0.82 - 1.09	0.467
Presence of at least one child aged less than 5 years in the household	1.34	1.18 - 1.52	0.000
Sector			
Rural (Reference)			
Urban	0.91	0.81 - 1.04	0.192
Socioeconomic status			
Poorest Expenditure Quintile (Reference)			
Second Lowest Expenditure Quintile	0.74	0.62 - 0.88	0.001
Third Expenditure Quintile	0.60	0.50 - 0.73	0.000
Fourth Expenditure Quintile	0.51	0.41 - 0.65	0.000
Highest Fifth Expenditure Quintile	0.28	0.21 - 0.38	0.000
Household size			
Small household (Reference)			
Medium household (5 to 8)	0.95	0.83 - 1.10	0.543
Large household (9 & more)	0.68	0.50 - 0.91	0.011
Duration of hospitalization			
Less than 5 days (Reference)			
5 to 10 days	8.41	7.46 - 9.49	0.000
11 to 20 days	16.42	13.64 - 19.76	0.000

More than 20 days	48.92	37.93 - 63.10	0.000
At least one member in the household used a private healthcare facility	28.21	24.57 - 32.38	0.000
Absence of at least one female member in the household	0.54	0.32 - 0.89	0.017
At least one person in the household suffers from chronic illness	3.11	2.65 - 3.64	0.000
Constant	0.07	0.05 - 0.12	0.000

Table 6 shows the results from the multiple regression model for predicting the effect of various factors on the intensity of CHE among households who incurred CHE. Households with at least one child aged less than 5 years, members being covered by health insurance, and not belonging to the poorest expenditure quintile had lower intensity of CHE. However, it was in the opposite direction among households with members having chronic illness, and increased duration of stay in the hospital since they significantly experienced higher intensity of CHE. Factors such as religion, social group, location, household size, presence of elderly person, divorced person, female member, secondary educated female member, and the utilization of private health facility by a member in the household did not have any significant effects on the intensity of CHE. No significant effects for the state of residence were found in the state fixed effects model for the intensity of CHE.

**Table 5.6: Multiple regression for the factors affecting intensity of Catastrophic Health Expenditures (if CHE=1)**

Characteristics	Coefficient	95% Confidence Interval	P value
Proportion of members having health insurance coverage in each household	-1.88	-3.36 - -0.40	0.013
Presence of at least one child aged less than 5 years present in the household	-7.06	-11.11 - -3.01	0.001
Presence of at least one elderly aged more than 60 years present in the household	3.74	-5.02 - 12.52	0.402
Presence of someone divorced in the household	8.83	-2.96 - 20.63	0.142
Presence of at least one secondary educated female member in the household	3.05	-0.58 - 6.70	0.100
Sector			



Rural (Reference)			
Urban	1.11	-3.96 - 6.18	0.668
Socioeconomic status			
Poorest Expenditure Quintile (Reference)			
Second Lowest Expenditure Quintile	-20.58	-31.15 - -10.012	0.000
Third Expenditure Quintile	-28.77	-37.15 - -20.38	0.000
Fourth Expenditure Quintile	-30.46	-38.92 - -22.00	0.000
Highest Fifth Expenditure Quintile	-27.78	-37.23 - -18.34	0.000
Household size			
Small household (Reference)			
Medium household (5 to 8)	-3.02	-10.24 - 4.19	0.412
Large household (9 & more)	-7.55	-16.95 - 1.85	0.116
Duration of hospitalization			
Less than 5 days (Reference)			
5 to 10 days	6.54	3.38 - 9.71	0.000
11 to 20 days	25.61	20.96 - 30.25	0.000
More than 20 days	64.66	51.30 - 78.03	0.000
At least one member in the household used a private healthcare facility	1.88	-8.30 - 12.08	0.717
Proportion of female members in each household	-22.31	-50.14 - 5.51	0.116
Proportion of members with chronic illness in each household	34.29	10.06 - 58.52	0.006
Constant	46.50	19.30 - 73.69	0.001

## Discussion and conclusions

In this study, around 10.94% of the households experienced CHE nationally, and it was more concentrated among the rural (11.17%) households compared to the urban (10.45%). One of the possible reasons for that is that the public sector health programs are better in the urban areas. Also, there is a better healthcare access to people in urban areas because there is a higher concentration of healthcare providers and better coverage under the urban health programs. The health infrastructure and primary health care programs in the urban sector were strengthened after the introduction of the National Urban Health Mission which primarily aimed to help the urban poor and strengthen the health infrastructure in the urban areas and reduce the OOP health expenditures (Bhat et al. 2018). The findings of our study are consistent with the results of other studies done in India

(Ghosh 2011; Garg and Karan 2009) and globally (Fazaeli et al. 2010; Li et al. 2012; Shi et al. 2011; Yardim et al. 2010; Akinkugbe et al. 2012; Van Minh et al. 2013; Kronenberg and Barros 2014; Saksena et al. 2010). Among the households which experienced CHE, the mean positive overshoot indicates that on average, the OOP health expenditures was 35.94% higher than the 10% threshold level of total household consumption expenditure. This shows that the intensity is very high among the households experiencing CHE.

Our study showed a higher odds of incidence of CHE among the households having at least one child aged less than 5 years, one elderly person, and at least one member in the household utilizing a private healthcare facility for treatment. Although the incidence of CHE was higher among the households with children, but the overshoot was lesser among the households with children. This is not an issue, since the overshoot shows that among the households with children the intensity is lesser when compared to other groups, although there is higher incidence of CHE in the households with children. This was consistent with literature which showed that households which consisted of members at extremes of age (Mohanty et al. 2014; Silva et al. 2015), members utilization of private health facility (Alam and Mahal 2014; Saksena et al. 2012; Kumara and Samarantunge et al. 2016; Somkotra and Lagrada 2009) had higher OOP and CHE. The likelihood of incidence of CHE in our study increased progressively with the increase in duration of stay in the hospital and among the households that experienced the incidence of CHE, the intensity of CHE also increased with increase in the duration of hospitalization. A report from the World Bank in India showed that hospitalizations are the major drivers of OOP health expenditures (McIntyre et al. 2006). Also, the presence of chronic illness among members in the household increased odds of CHE incidence and also increased the

intensity among households experiencing CHE. Similar results were found in India (Mondal et al. 2014), Bangladesh (Molla et al. 2017), and China (You and Kobayashi 2011) that showed that chronic illness is an important determinant for experiencing CHE. Our study showed that the presence of health insurance coverage among members in the household reduced the likelihood of CHE incidence and even among the households that experienced CHE, the intensity was lesser for households that had health insurance coverage. Other studies from India (Fan et al. 2012), Indonesia (Aji et al. 2013), Laos (Alkenbrack and Lindelow, 2015), and Vietnam (Sepehri 2013) supported this finding of the protective effect of health insurance from CHE. Our study shows that the incidence of CHE is higher among households with female members. This is consistent with other studies in literature which also show that households with female members incur higher OOP health expenditures and most of which is catastrophic (Brinda et al. 2014).

The regression results show that the households from all other expenditure quintiles had lesser odds of incurring CHE compared to households in the poorest quintile. Among the households that experienced CHE, the intensity was also highest among the households in the poorest expenditure quintile. For the poorer households, high level of intensity or overshoot may be due to low level of absolute income. Globally there is mixed evidence on the relationship between SES and CHE. Our study results are consistent with the findings from studies done in Bangalore, India (Bhojani et al. 2012), Thailand, Paraguay, and Burkina Faso (Makinen et al. 2000) which showed that low income households were associated with a higher likelihood of CHE. Other studies in Nigeria, Namibia, Albania, Kenya, Bangladesh, and India show that poorer households have lower absolute OOP health expenditures compared to richer individuals and households, but the relative

proportion of OOP health expenditures to non-food household expenditures was higher in poor households (Chuma, and Maina 2012; Gustafsson-Wright et al. 2011; Hotchkiss et al. 2005; Karan et al. 2014; Onwujekwe et al. 2014; Rahman et al. 2013). However, studies from 13 low-income Asian countries (O'Donnell et al. 2008), Sri Lanka, South Africa and Guatemala (Makinen et al. 2000) showed that richer households spent more on OOP health expenditures and also enjoyed a wide range of services.

In conclusion, coverage by health insurance programs reduces both the incidence and intensity of CHE in India. People belonging to the lower socio-economic status have higher incidence of CHE. It is expected that the poor people are more prone to experience CHE, since they have lower level of income and any expenditure that incur for healthcare will easily make it “catastrophic” since the proportion of the health expenditure will become relatively high for them because of low total consumption expenditure (low value of denominator). Thus, people with lower income levels are at a much higher risk of experiencing CHE even with a relatively small adverse health event. Health insurance benefit packages and coverage limits may be adjusted based on the income levels of poor households with the poorest group receiving the highest level of protection. This type of targeting is also difficult to implement in practice but it is not impossible with help from community organizations representing the poor and extreme poor households.

Households with children less than 5 years and elderly more than 60 years have higher CHE incidence. Children and elderly are the vulnerable age groups who are prone to higher level of health risks. They have higher healthcare utilizations and thus experience higher healthcare expenditures which make the expenditure levels catastrophic in many

cases. This implies that policy makers should also consider age as one of the factors in deciding the level of insurance coverage.

Utilization of private hospitals has higher incidence of CHE. It is not a problem if the richer households are using private hospitals more. They will have enough resources in terms of higher income, savings, and property to pay for the expenses in most cases. Our data uses expenditures as a proxy for income. Although richer households seem to experience CHE because of their higher healthcare spending, but this spending may not actually represent “catastrophic” in reality. When a high proportion of total expenditure is spent on health care, by definition, it creates catastrophic expenditure situation. However, richer households may decide to use high-cost private hospitals, use more expensive hospital services, etc. and for that year total expenditure may increase significantly due to health care expenditure. A part of this health care expenditure may be coming from savings and assets they own and therefore, the hospital expenditure will not create long-term economic and social stress for them. But poorer households need to be protected from CHE as their high medical care expenses are often funded by borrowing and selling whatever small amount of assets they have. Therefore, the CHE among the poor creates many social and economic problems for the poor. Increasing access to government health facilities, which are mostly free in India, and strengthening their service delivery, and health infrastructure will enable poor people to utilize the public healthcare facilities, thus reducing their probability of incurring CHE. As discussed before the regulation of the private sector with fixed prices for disease-specific diagnosis groups will also help in reducing CHE.

There is an increase in both the incidence and intensity of CHE with increased duration of stay in the hospital. Higher duration of hospital stay increases the chance of experiencing CHE. When the higher health expenditures are not covered adequately by health insurance programs, OOP health expenditures may become catastrophic for many households. The coverage limits provided by the current health insurance programs in India are limited and are not adequate especially when the patients stay for longer duration in the hospitals. Thus, the coverage limits for hospital insurance needs to be increased to protect households from CHE.

Chronic illness increases both CHE incidence and intensity. Steps should be taken for early diagnosis and treatment, to reduce the severity of illness, reduce the cost of services, and implementation of better approaches to treat them in the ambulatory settings. Lifestyle changes and changes in behavioral aspects, food consumption, etc, may also help. Increasing coverage limits and better benefit package for chronic disease treatment may also help in reducing CHE.

Households with female members have higher incidence of CHE. Women in the reproductive age group have higher incidence of hospitalizations for deliveries and if they experience higher delivery expenses, they may make the households prone for CHE. Specific health programs in India like the JSY provide minimum funds for promoting the institutional delivery of poor women. The coverage limits under JSY needs to be improved. In addition, specific health programs for women's health need to be started to provide them free and subsidized healthcare and protect the poor households from CHE.

People in the rural areas are found to have higher CHE incidence and overshoot. There are higher rates of poverty and lower incomes in the rural areas. Thus, the people in

the rural areas must be provided with better health insurance benefit packages and higher coverage limits to protect the households from experiencing CHE when they face a health event. People in the rural areas must be provided better access to public sector hospitals which are free. People in the rural areas have significant access barriers such as long travel distances which prevent their healthcare utilization. A study showed that only 37% of the population in the rural areas in India have access to health care services within 5-kilometer radius and only 68% of the population have access to even a basic out-patient health facility (Kasthuri 2018). The current health insurance programs for the poor in India provide the same amount of money for travel expenses both for the urban and rural people, but the rural people face significantly higher travel distances and associated higher travel costs. Inclusion of higher transportation charges in health insurance for people in rural areas must be done. Currently there are low rates of enrolment in the public health insurance programs for the poor in India (Karan et al. 2017). Health insurance coverage to the rural people must be increased.

Presence of health insurance coverage reduced both the incidence and intensity of CHE. Households with members at extremes of age, female member, utilized a private hospital, and small households have higher incidence of CHE. Households belonging to the poor socioeconomic status, and with members having higher duration of hospital stay, and chronic illness experienced both higher incidence and intensity of CHE. By identifying the groups most affected, this research aids the designers of the national insurance programs to design better benefit packages for those population groups. This investigation will serve as a basis for assessing India's policy options to reduce financial burden due to OOP health expenditures.

## Limitations

The main limitations of this study arise from the use of secondary data. Any study that uses secondary data suffers from this limitation, i.e., the study becomes limited by the data collected and survey methodology used. The contents and the questions asked in the survey are not what an assessment of a program would have done to explore the specific research questions of this study. One of the most important concern is the lack of information on the coverage of public health insurance for the poor. The NSSO dataset includes a variable that indicates insurance coverage by all public health insurance schemes, i.e., all the people covered by the government sponsored health insurance programs. Government sponsored health insurance schemes are many in India and includes insurance programs like Employee's State Insurance Scheme (ESIS), Central Government Health Scheme (CGHS), and the poor people's health insurance programs such as RSBY and other state health insurance programs. Clearly, government sponsored health insurance programs cover poor as well as non-poor households. Employees of the central and state governments are covered by government insurance and none of them likely to be below the poverty line. It is also likely that many households covered by the insurance for the poor are not below the poverty line at any specific point in time. Since the enrollment into the insurance for the poor happens infrequently, economic status of households may change from enrollment date to the date of the survey.

This research needed to identify the individuals and households who are covered by the government sponsored insurance for the poor. Since many of those covered by public or government health insurance schemes are not poor by design, using all households/ individuals covered by public insurance will not provide the "target group" the study would like to examine. To identify the group covered by public insurance for the



poor, a number of implicit assumptions were made: first, it is assumed that no insurance schemes of the government, other than the insurance program designed for the poor, covers the households or individuals below the poverty lines defined by the states. This conjecture is likely to be valid because governmental salary structure is such that almost no one covered by government employee health insurance program should be below the poverty line, irrespective of the size of the household. Second assumption is that the people who are below the poverty line and enrolled in a government sponsored health insurance program, they must be enrolled in the public health insurance programs for the poor such as RSBY, RACHI etc.

These assumptions do not identify all the households and individuals covered under the government insurance schemes for the poor but identifies only those who are covered by the insurance scheme and are below the poverty line. The households that are below poverty line and not enrolled in the government sponsored health insurance programs are assumed to be the control group, i.e., the households that are eligible for participation in the poor people's health insurance program but were not enrolled. Poverty is a dynamic event where people move in and out of poverty and it is almost impossible for any program to be as dynamic as the underlying dynamics of social mobility and poverty dynamics. The households who were covered by the insurance for the poor at the time of the survey but were not below the poverty line at the time can happen for two very different reasons. The first reason could be simple mis-targeting, i.e., the household should not be in the program based on the economic status of the household but were enrolled in the program. The second reason could be that the household belonged to the poverty category when the household got enrolled but the household graduated from poverty to above the poverty line

during the intervening period. Since enrollment in the program and disenrollment from the program happens only infrequently, a certain percent of enrollees will be above the poverty line. This group was targeted correctly but they moved up the economic ladder since enrollment. Given the data we have, it is not possible to identify households who were covered by the insurance for the poor even though they were not poor.

In the empirical analysis, we have used the poverty line for 2014 to identify the individuals who were poor in 2014. Thus, our study focuses on the group who was below the poverty line and enrolled in any government health insurance program. Since the government health insurance scheme that covers individuals below the poverty line are the insurance schemes for the poor, it is likely that all those who are poor and covered by government health insurance are actually covered by the public health insurance for the poor. The implication of these implicit assumptions is that the study cannot conduct an assessment or evaluation of the insurance program for the poor. It is only assessing the differences in utilization and out-of-pocket expenses between the poor households and individuals covered by the public health insurance schemes for the poor and those not covered by the scheme. Therefore, it is not an assessment of those who are covered by the insurance schemes for the poor and those not covered but at similar socioeconomic situations.

Also, the cross-sectional nature of the data creates an important limitation that it allows us to study only the association of health insurance with the various outcomes, and not the actual evaluation of the program. Cross-sectional data cannot infer causal association mainly because temporality is not known and thus cannot assess the change in outcomes over a period of time. Thus the availability of data over time is required to

effectively evaluate the program. Data were not collected from the floating population (people without any normal residence), but households residing in open spaces, roadside shelters and people who reside in the same place were listed. People residing in the protected residential areas of military, paramilitary, police areas and people in orphanages, rescue homes, etc., were not covered. The NSSO health survey data does not collect detailed consumption expenditure and the consumption expenditure in the NSSO survey does not differentiate between food and non-food expenditures. It should also be noted that all information is reported by the surveyed individuals in the households and some information required quite long recall time. Therefore, the data is prone to strategic, recall and other types of biases.

### **Ethical Approval**

The dataset is available in the public domain after removing all individual level identification variables. It is not possible to identify the residence of any of the households as well. Therefore, ethical approval is not needed for the study. Permission has been obtained from the Ministry of Statistics and Implementation of the Government of India for this research and potential future publications using the data set.

## CHAPTER 6: CONCLUSIONS

This chapter presents the conclusions and recommendations derived from the results of the two papers discussed in earlier chapters. Since out-of-pocket expenses is an important factor affecting fairness in financing, the results will be useful in identify mechanism through which fairness in financing can be improved in India. Fairness in financing will also reduce barriers to access to health care services and will help improve health and wellbeing of the population, especially the poorer sections of the population.

There are a number of limitations of the study which may adversely affect the generalizability of the empirical results obtained. It is important to clearly indicate the limitations of the study first so that the conclusions and policy implications can be discussed within the specific context of the data and the survey.

### 6.1 Limitations of the study

The main limitations of this study arise from the use of secondary data. Any study that uses secondary data suffers from this limitation, i.e., the study becomes limited by the data collected and survey methodology used. The contents and the questions asked in the survey are not what an assessment of a program would have done to explore the specific research questions of this study. One of the most important concern is the lack of information on the coverage of public health insurance for the poor. The NSSO dataset includes a variable that indicates insurance coverage by all public health insurance

schemes, i.e., all the people covered by the government sponsored health insurance programs. Government sponsored health insurance schemes are many in India and includes insurance programs like Employee's State Insurance Scheme (ESIS), Central Government Health Scheme (CGHS), and the poor people's health insurance programs such as RSBY and other state health insurance programs. Clearly, government sponsored health insurance programs cover poor as well as non-poor households. Employees of the central and state governments are covered by government insurance and none of them likely to be below the poverty line. It is also likely that many households covered by the insurance for the poor are not below the poverty line at any specific point in time. Since the enrollment into the insurance for the poor happens infrequently, economic status of households may change from enrollment date to the date of the survey.

This research needed to identify the individuals and households who are covered by the government sponsored insurance for the poor. Since many of those covered by public or government health insurance schemes are not poor by design, using all households/ individuals covered by public insurance will not provide the "target group" the study would like to examine. To identify the group covered by public insurance for the poor, a number of implicit assumptions were made: first, it is assumed that no insurance schemes of the government, other than the insurance program designed for the poor, covers the households or individuals below the poverty lines defined by the states. This conjecture is likely to be valid because governmental salary structure is such that almost no one covered by government employee health insurance program should be below the poverty line, irrespective of the size of the household. Second assumption is that the people who are below the poverty line and enrolled in a government sponsored health insurance

program, they must be enrolled in the public health insurance programs for the poor such as RSBY, RACHI etc.

These assumptions do not identify all the households and individuals covered under the government insurance schemes for the poor but identifies only those who are covered by the insurance scheme and are below the poverty line. The households that are below poverty line and not enrolled in the government sponsored health insurance programs are assumed to be the control group, i.e., the households that are eligible for participation in the poor people's health insurance program but were not enrolled. Poverty is a dynamic event where people move in and out of poverty and it is almost impossible for any program to be as dynamic as the underlying dynamics of social mobility and poverty dynamics. The households who were covered by the insurance for the poor at the time of the survey but were not below the poverty line at the time can happen for two very different reasons. The first reason could be simple mis-targeting, i.e., the household should not be in the program based on the economic status of the household but were enrolled in the program. The second reason could be that the household belonged to the poverty category when the household got enrolled but the household graduated from poverty to above the poverty line during the intervening period. Since enrollment in the program and disenrollment from the program happens only infrequently, a certain percent of enrollees will be above the poverty line. This group was targeted correctly but they moved up the economic ladder since enrollment. Given the data we have, it is not possible to identify households who were covered by the insurance for the poor even though they were not poor.

In the empirical analysis, we have used the poverty line for 2014 to identify the individuals who were poor in 2014. Thus, our study focuses on the group who was below

the poverty line and enrolled in any government health insurance program. Since the government health insurance scheme that covers individuals below the poverty line are the insurance schemes for the poor, it is likely that all those who are poor and covered by government health insurance are actually covered by the public health insurance for the poor. The implication of these implicit assumptions is that the study cannot conduct an assessment or evaluation of the insurance program for the poor. It is only assessing the differences in utilization and out-of-pocket expenses between the poor households and individuals covered by the public health insurance schemes for the poor and those not covered by the scheme. Therefore, it is not an assessment of those who are covered by the insurance schemes for the poor and those not covered but at similar socioeconomic situations.

Also, the cross-sectional nature of the data creates an important limitation that it allows us to study only the association of health insurance with the various outcomes, and not the actual evaluation of the program. Cross-sectional data cannot infer causal association mainly because temporality is not known and thus cannot assess the change in outcomes over a period of time. Thus the availability of data over time is required to effectively evaluate the program. Data were not collected from the floating population (people without any normal residence), but households residing in open spaces, roadside shelters and people who reside in the same place were listed. People residing in the protected residential areas of military, paramilitary, police areas and people in orphanages, rescue homes, etc., were not covered. The NSSO health survey data does not collect detailed consumption expenditure and the consumption expenditure in the NSSO survey does not differentiate between food and non-food expenditures. It should also be noted that

all information is reported by the surveyed individuals in the households and some information required quite long recall time. Therefore, the data is prone to strategic, recall and other types of biases.

## **6.2 Conclusions and Policy Implications**

The first set of analysis examined the differences in hospital utilization by health insurance status of the poor individuals. There are two aspects of hospital utilization – incidence of hospitalization and duration of hospitalization. The incidence indicates need and/or willingness to get admitted into a hospital. Decision to become hospitalized is often not made by the patients; in most cases, individuals follow the instructions of physicians and other health care providers. Recommendation by health care providers is the triggering factor for being admitted in hospitals but some individuals may decide not to seek care from hospitals due to other barriers even though the hospitalization may be considered medically necessary. Once the patients decide to get admitted in the hospital, the length of stay is most likely determined by the health care providers and hospital managers.

The empirical results imply that the poor individuals enrolled in health insurance program are more likely to get admitted in a hospital than those who are not covered by health insurance. Incidence of hospitalization is a reflection of access to inpatient hospital services and it is not surprising to find that having insurance increases the likelihood of hospitalization. Even though the regression models, strictly speaking, do not show causal relationship, in this case it probably indicates causal pathway. Enrollment in insurance happens before utilization of hospital services and there exists no mechanism of obtaining insurance because of need for hospitalization. Therefore, only reasonable implication of



the result would be that having insurance for inpatient services increases the incidence of hospitalization among poor individuals in India.

The second aspect of hospital service use is the intensity of service utilization after the patients are admitted. The empirical model indicates that insurance status had no relationship on the level of utilization of hospital services, measured by the length of stay. Again, most logical explanation would be that if insurance status has any relationship with duration of stay, the causal relationship should be from insurance status to duration, not the other way round. Since insurance status had no effect on duration of hospital stay, health care providers did not discriminate between insured and uninsured once they are admitted in the hospitals. Again, this is not surprising for a number of reasons. The coverage limits in the health insurance programs for the poor is low and this low coverage limits did not create any incentive for increasing the duration of hospitalizations by the physician. The other reason may be that physicians are driven by the intrinsic motivation to provide better care for the patients, irrespective of their health insurance coverage or their capacity to pay. There is always the possibility that the clinicians are unaware of the insurance status of the patient, which are usually handled by the administrative divisions of the hospitals, and thus their clinical decisions are independent of any health insurance enrolment status.

Apart from the insurance status of individuals, a number of other factors affect hospitalization and hospital duration. Chronic illnesses increase both the incidence and duration of hospitalization. Early detection by preventive screenings and early treatment initiation will help in decreasing disease progression, and thus reduce preventable hospitalizations to a large extent. This early detection and treatment initiation could be delivered through the PHC system in India. India has a wide network of PHCs and the

PHCs should be upgraded adequately with diagnostic and treatment facilities to detect and treat chronic diseases which will help in reducing hospital rates, the duration of hospitalizations, and the associated higher OOP healthcare costs for inpatient care. Many chronic diseases can be treated effectively in the ambulatory setting. Thus, better approaches to manage the chronic diseases in the outpatient settings must be implemented nationally to reduce hospitalizations for conditions that could be treated in the outpatient setting.

Lower incidence of hospitalization is seen among the larger households. The insurance for the poor may not cover all individuals in the household. In some states of India, enrollment is limited to five members of household and the five members must be selected at enrollment. Therefore, for large households, many members may not be covered by the program even though the household is enrolled in the insurance plan. Lack of insurance coverage of some members may prevent access and service usage by those non-covered members. Since the non-covered members cannot utilize the healthcare delivery system for their health needs, they may end up showing lower rates of hospitalizations. This barrier in using the hospitals may adversely affect the health status of patients and overall health status of members in larger households may suffer. Thus, removing these enrolment restrictions will be helpful in improving hospital utilizations especially for the members of the larger households.

Our study shows that the Scheduled tribes in India have lower duration of hospitalization. Scheduled tribes have been traditionally neglected in the country who have lower capacity to pay because of their limited employment opportunities in the formal sector, lack of access to cash, and their area of residence which is mostly located in the

hilly and remote tribal areas of India. They also have poor access to healthcare facilities since they live far away from the nearest health facility (Barik and Thorat 2015). In addition to this, the enrolment of tribal people in the health insurance programs for the poor is also quite low, both because of the presence of access barriers to reach them and enroll them under insurance programs, and of the problem of acceptability with some of the tribal groups who actively try to avoid participation in any governmental programs. Access barriers should be reduced for the Scheduled tribes and their enrolment in health insurance programs needs to be improved. Government should initiate outreach program to reach this hard-to-reach group so that their enrollment in insurance program can be expanded.

Both men and women who are 40 years or older have higher incidence of hospitalizations. This is expected since there is a declining stock of health capital with age and the severity of illness may also increase with age requiring higher number of hospitalizations. However, only women in the age groups of 19 to 40 years have higher incidence of hospitalizations, while men in the same group do not have higher incidence of hospitalizations. The main reason for this may be that women in the reproductive age group of 19 to 40 years have higher hospital admissions related to childbirth in healthcare institutions. In order to have safe deliveries, the Government of India promotes institutional deliveries through the Janani Suraksha Yojana (JSY) conditional cash transfer scheme, which may explain higher hospitalizations among women in the reproductive age group.

Utilization of private hospitals have higher OOP health expenditures. Utilization of private hospitals is not a problem if the richer households are using the private hospitals to get access to better quality services, but when the poor households obtain care from private hospitals, out-of-pocket expenses may become too high for the poor households to afford.

The poor households need to be protected from the high OOP health expenditures when they are forced to use private hospitals. If the poor households needing hospital services do not have access to governmental facilities, they may decide to seek care from private hospitals.

The private healthcare system in India is highly unregulated. Regulation of private sector can be done by fixing prices for different diagnosis groups so that households would become fully aware of the total hospital bill for the medical condition at the time of utilization of services. Making the charges of hospitals more transparent will be another way of protecting households from uncertainty related to hospital service expenses. The government sector hospitals act as an important source of healthcare delivery in India, especially for the poor people. Many poor people do not use the government healthcare facilities because of their perceived low quality, poor infrastructure, absences of health care providers and significant travel distances. Strengthening of government health facilities with better infrastructure and facilities is needed. Reducing access barriers to help the poor to reach the public health facilities should be done in order to protect the poor households from making high OOP health expenditures at private sector hospitals.

Increased duration of hospital stay leads to experiencing higher OOP health expenditures. Duration of hospital stay can be reduced either by reducing the severity of illness, so that people do not have to stay longer in the hospitals or by reducing the cost of services, so that they do not incur higher health expenditures. Increasing health insurance coverage limits and a defined benefit package for different types of medical conditions will also help in reducing the higher OOP health expenditures due to increased hospital stay.

This research finds that specific diseases such as cancers, cardiovascular, endocrine, respiratory, neurological, obstetric and childbirth, and injuries have higher OOP inpatient health expenditures. Specific national health programs can be established to include people affected by these diseases, and also provide them with disease-specific healthcare services. India is currently establishing a national health program for non-communicable diseases which is being piloted in some districts. Faster nation-wide implementation of this program will help the poor individuals suffering from these diseases to get specific health service package. Also, the health insurance coverage limits may be increased for the poor individuals who are suffering from these specific diseases. Increasing coverage limits may also encourage “up coding” of health conditions and without a rigorous monitoring system, disease-specific limits may encourage reporting of high revenue earning health conditions at a higher rate.

Coverage by health insurance programs reduces both the incidence and intensity of CHE in India. People belonging to the lower socio-economic status have higher incidence of CHE. It is expected that the poor people are more prone to experience CHE, since they have lower level of income and any expenditure that incur for healthcare will easily make it “catastrophic” since the proportion of the health expenditure will become relatively high for them because of low total consumption expenditure (low value of denominator). Thus, people with lower income levels are at a much higher risk of experiencing CHE even with a relatively small adverse health event. Health insurance benefit packages and coverage limits may be adjusted based on the income levels of poor households with the poorest group receiving the highest level of protection. This type of targeting is also difficult to

implement in practice but it is not impossible with help from community organizations representing the poor and extreme poor households.

Households with children less than 5 years and elderly more than 60 years have higher CHE incidence. Children and elderly are the vulnerable age groups who are prone to higher level of health risks. They have higher healthcare utilizations and thus experience higher healthcare expenditures which make the expenditure levels catastrophic in many cases. This implies that policy makers should also consider age as one of the factors in deciding the level of insurance coverage.

Utilization of private hospitals has higher incidence of CHE. As discussed earlier, it is not a problem if the richer households are using private hospitals more. They will have enough resources in terms of higher income, savings, and property to pay for the expenses in most cases. Our data uses expenditures as a proxy for income. Although richer households seem to experience CHE because of their higher healthcare spending, but this spending may not actually represent “catastrophic” in reality. When a high proportion of total expenditure is spent on health care, by definition, it creates catastrophic expenditure situation. However, richer households may decide to use high-cost private hospitals, use more expensive hospital services, etc. and for that year total expenditure may increase significantly due to health care expenditure. A part of this health care expenditure may be coming from savings and assets they own and therefore, the hospital expenditure will not create long-term economic and social stress for them. But poorer households need to be protected from CHE as their high medical care expenses are often funded by borrowing and selling whatever small amount of assets they have. Therefore, the CHE among the poor creates many social and economic problems for the poor. Increasing access to government

health facilities, which are mostly free in India, and strengthening their service delivery, and health infrastructure will enable poor people to utilize the public healthcare facilities, thus reducing their probability of incurring CHE. As discussed before the regulation of the private sector with fixed prices for disease-specific diagnosis groups will also help in reducing CHE.

There is an increase in both the incidence and intensity of CHE with increased duration of stay in the hospital. Higher duration of hospital stay increases the chance of experiencing CHE. When the higher health expenditures are not covered adequately by health insurance programs, OOP health expenditures may become catastrophic for many households. The coverage limits provided by the current health insurance programs in India are limited and are not adequate especially when the patients stay for longer duration in the hospitals. Thus, the coverage limits for hospital insurance needs to be increased to protect households from CHE.

Chronic illness increases both CHE incidence and intensity. As discussed before steps should be taken for early diagnosis and treatment, to reduce the severity of illness, reduce the cost of services, and implementation of better approaches to treat them in the ambulatory settings. Lifestyle changes and changes in behavioral aspects, food consumption, etc, may also help. Increasing coverage limits and better benefit package for chronic disease treatment may also help in reducing CHE.

Households with female members have higher incidence of CHE. As seen before, women in the reproductive age group have higher incidence of hospitalizations for deliveries and if they experience higher delivery expenses, they may make the households prone for CHE. Specific health programs in India like the JSY provide minimum funds for

promoting the institutional delivery of poor women. The coverage limits under JSY needs to be improved. In addition, specific health programs for women's health need to be started to provide them free and subsidized healthcare and protect the poor households from CHE.

People in the rural areas are found to have higher CHE incidence and overshoot. There are higher rates of poverty and lower incomes in the rural areas. Thus, the people in the rural areas must be provided with better health insurance benefit packages and higher coverage limits to protect the households from experiencing CHE when they face a health event. People in the rural areas must be provided better access to public sector hospitals which are free. People in the rural areas have significant access barriers such as long travel distances which prevent their healthcare utilization. The current health insurance programs for the poor in India provide the same amount of money for travel expenses both for the urban and rural people, but the rural people face significantly higher travel distances and associated higher travel costs. Inclusion of higher transportation charges in health insurance for people in rural areas must be done. Currently there are low rates of enrolment in the public health insurance programs for the poor in India (Karan et al. 2017). Health insurance coverage to the rural people must be increased.

Health insurance programs for the poor increase the incidence of hospitalization but has no effect on the duration of hospitalizations and inpatient OOP health expenditures. Presence of chronic illness, belonging to older age groups, women in the reproductive age group, and belonging to a small household have higher hospitalization. People who have higher duration of hospital stay, admitted to a private hospital, using allopathic treatment, having chronic illnesses, having higher level of education and belonging to the middle age group experienced higher OOP inpatient health expenditures. Presence of health insurance



coverage reduced both the incidence and intensity of CHE. Households with members at extremes of age, female member, utilized a private hospital, and small households have higher incidence of CHE. Households belonging to the poor socioeconomic status, and with members having higher duration of hospital stay, and chronic illness experienced both higher incidence and intensity of CHE. By identifying the groups most affected, this research aids the designers of the national insurance programs to design better benefit packages for those population groups. This investigation will serve as a basis for assessing India's policy options to reduce financial burden due to OOP health expenditures.

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