FEBRUARY, 2023

EXPLORING METHODS FOR IMPROVING OUT OF POCKET EXPENDITURE ESTIMATES FOR INDIA WORKING PAPER

Indranil Mukhopadhyay, OP Jindal Global University, Sonipat

Montu Bose, Tata Institute of Social Sciences, Mumbai,

Rahul S Reddy Kadarpeta, Health Systems Transformation Platform

Exploring methods for improving

Out-of-pocket expenditure (OOPE) estimates

for India

Indranil

Professor

Jindal School of Government & Public Policy

imukhopadhyay@jgu.edu.in

Montu Bose

Assistant Professor

TERI School of Advanced Studies

monbose@gmail.com

Rahul S Reddy Kadarpeta

National Coordinator

Health Systems Transformation Platform

rreddy@hstp.org.in

Contents

Tables

Figures

Executive Summary

Health Accounts presents an overview of sources of financing healthcare, how these finances are paid to the providers, for which services and for whom (population characteristics) within the health system at national or sub-national level for a financial year (FY). This information is presented in the Global Health Expenditure Database (GHED) for almost all countries based on health accounts. Out of Pocket expenditure (OOPE) is a major source of financing healthcare in most Low-and Middle-Income Countries (LMICs). OOPE is defined as any payment made by the household directly at the point of receiving a health service. OOPE is a significant indicator to measure financial risk protection offered by the health system and to monitor progress towards universal health coverage (SDG 3.8). When OOPE is a major source of financing, households tend to face financial hardship when seeking health services. Households that cannot afford to pay at point of service, may also forego care. OOPE estimates for India are presented in the National Health Accounts (NHA). These are available for FY 2001-02, FY 2004-05 & consecutively for FY 2013-14 to FY 2018-19. OOPE for NHA India is estimated from household health or consumption surveys conducted by the National Sample Survey Office, Ministry of Statistics and Program Implementation, Government of India (NSSO-MoSPI) and market data available on sale of medical goods. Routine health related administrative data captured by government, insurers, regulators, and providers which is commonly used in OECD countries is not the usual source in India due to limited data availability.

India's NHA estimates show a declining trend of OOPE as a proportion of its total health expenditures (THE). OOPE as % of THE was 70 in FY 2004-05, which declined to 64 in FY 2013-14 and to 48.8 in FY 2017-18 and 48.2 in FY 2018-19. The steep decline observed between FY 2013-14 and FY 2017-18 is debatable, which motivated us to conduct an exploratory analysis of the OOPE trends and methods of estimation in India from survey data.

It is understood that there is no change in the NHA-OOPE estimation method during this period. OOPE has been derived from the major data source-the National Sample Survey on Social Consumption-Health (NSS-Health) for two data periods (NSS 2014 and NSS 17-18). Items for which OOPE is derived from the consumption expenditure survey data (CES), data was extrapolated from NSS 68th Round (2011-12), as latest data is not available. Market data available on sale of medical goods for both years 2014 & 2017-18 was used. This directed a comparative analysis of the survey methods and instruments used in NSS-Health from the last four rounds (1995-96, 2004, 2014 & 2017-18). Further NSS-Health 2017-18 data is compared to other surveys conducted during the same period with similar objectives-Longitudinal Ageing Study in India (LASI), 2017-18 and Consumer Pyramids Household Survey-Centre for Monitoring Indian Economy (CPHS-CMIE), January 2014 to April 2018.

Between the consecutive NSS-Health rounds, there is no change in survey methods that can significantly explain a decline in the NHA-OOPE estimates. Between the NSS 2014 and NSS 2017-18, there is a decline in the reported proportion of ailing persons (PAP) and hospitalization rate which may explain the decline in OOPE. However, when these indicators are compared for various disease categories, this decline is also noticed for non-communicable diseases. NSS-Health 2017-18 hospitalization rates for persons aged 45 years or more, are lower than those reported in LASI 2017-18, indicating certain limitations with the NSS 2017-18 in capturing hospitalization rates. A comparative analysis of data from NSS-Health 2017-18 and CPHS-CMIE 2018, indicates that both surveys show majority health spending is incurred by households from the top deciles (richer sections). However, NSS-Health underrepresents the richer section and CPHS-CMIE might be more equipped to capture the low frequency and high magnitude spending incurred by the top deciles. We understand that the NSS-Health 2017-18 data has limitations with regards to reporting hospitalization rates and representing the health spending by the top deciles, which may have underestimated OOPE.

However, to be able to ascertain these findings and exactly suggest where NSS-Health methods are to be strengthened, further study of longitudinal trends of CPHS-CMIE and truncated NSS-Health and LASI data adjusted to age specific morbidity and hospitalization rates is required. Further, exploratory analysis is required to understand the impact of demonetisation and other economic policies implemented during this period, which many researchers believe influenced access to healthcare and utilisation of services in the country.

For accurate NHA-OOPE estimates, in parallel to strengthening the NSS-Health methods, it is suggested to explore pathways to derive estimates using an integrated approach that allows for triangulating NSS-Health data with administrative data from insurers and providers, as recommended by SHA 2011. For estimating OOPE from health facilities, a periodic provider survey can be conducted, as is a practice in most countries reporting health accounts. To arrive at a sample of providers for the survey, database of healthcare providers available from the National Health Resource Repository (NHRR) and the database of empanelled network hospitals available with Insurance Regulation & Development Authority of India (IRDAI) and the National Health Authority can be used.

1. Introduction

Out of pocket expenditures on health (OOPE)[1] is one of the key indicators to measure performance of the health system in terms of financial risk protection and progress towards Universal Health Coverage (WHO and World Bank, 2021)[2]. A higher proportion of OOPE as a share of total health expenditures, indicates people are exposed to high financial burden when seeking healthcare services (Xu, 2005). On an annual basis, country OOPE estimates, and other health financing indicators based on the System of Health Accounts 2011 (SHA 2011) are reported by the World Health Organization's Global Health Expenditure Database (GHED) (WHO, 2022). SHA 2011 is a tool to track expenditures in the health system and describes the fund flows by source of finances, pooling, and spending pattern (by which scheme, at which provider and what disease/illness and by population characteristics) (OECD, 2017). OOPE is major source of financing healthcare in most low-and middle-income countries and its measurement is of policy significance to accurately represent policy or program outcome in terms of financial risk protection. (Rannan-Eliya & Lorenzoni, 2010).

National Health Accounts Estimates for India (NHA- India), officially report OOPE estimates for India. The first two rounds of NHA for India were produced for FY 2001-02, FY 2004-05 (T R Dilip, 2017). After a gap of almost a decade, NHA was revived in 2016 with publication of NHA for FY 2013-14 and since, consecutive rounds of NHA being produced and the latest one being for FY 2018-19 (National Health Systems Resource Centre, 2022). A review of OOPE estimation methods for health accounts across the globe found that there are three approaches to derive OOPE (Rannan-Eliya & Lorenzoni, 2010) - (1) from health expenditures reported in household health survey and household consumption survey, (2) from health care utilization and expenditure data reported by healthcare providers in routine administrative capture by statistical agencies, health insurers or regulators, (3) An integrated approach where both survey and administrative data is used complementarily depending on data availability, quality, and appropriate methods.

In most LMICs, for purposes of health accounts, OOPE estimates are derived from household surveys. This poses limitations for accurate estimates due to sampling errors, biases arising from non-sampling errors and lack of annual repetition of household surveys (Rannan-Eliya & Lorenzoni, 2010). NHA-India is no exception and derives OOPE estimates from the National Sample Survey - Social consumption - Health (NSS - Health), National Sample Survey - Household Consumption

Expenditure (NSS -CES), National Family Health Survey (NFHS) and private databases on sale of medicines, with minimal scope for triangulation of data.

[1] OOPE is any spending incurred by a household when any member uses a health good or service to receive any type of care (preventive, curative, rehabilitative or long-term care); provided by any type of provider; for any type of disease, illness, or health condition; in any type of setting (outpatient, inpatient, at home). It includes formal and informal expenses directly related to the cost of seeking care. It excludes prepayment (for example, taxes, contributions, or premiums) and reimbursements to the household by a third party such as the government, a health insurance fund, or a private insurance company. It also excludes indirect expenses (for example, nonemergency transportation cost) and the opportunity cost of seeking care (for example, lost income) (World Bank Glossary for Metadata)

[2] Within the preview of SDG indicator 3.8, Universal Health Coverage. OOPE estimates are required for measuring financial hardship Indicators - Population with catastrophic health spending (SDG 3.8.2) and SDG related indicator - Population with impoverishing health spending). The definition of catastrophic health spending used in relation to SDG indicator 3.8.2 is focused on large out of pocket health spending; in effect, it includes those exceeding 10% and 25% of the household's total consumption or income. Impoverishing out of pocket health spending occurs when a household is forced by an adverse health event to divert spending from non-medical budget items such as food, shelter, or clothing to such an extent that its spending on such items is reduced to below or further below the level indicated by a poverty line defined by the country or the standard use of the poverty line of extreme poverty (PPP $1.90 a day per person).

The method of estimation of OOPE for NHA-India from these data sources is standardized and documented in the NHA Guidelines for India, 2016[3] (National Health Systems Resource Centre, 2016). NHA 2017-18 reported a steep decline in OOPE, as proportion of total health expenditure from 70% in 2004-05 to 64% in 2013-14 and 49% in 2017-18 (National Health Systems Resource Centre, 2022). This decline led to some researchers questioning the validity of data from the latest NSS-Health survey 2017-18 (75th round) on which the latest NHA OOPE estimates are based (T R, Narayanan, & Nandraj, 2021) (Dilip & Nandraj, 2021).

This working paper explores plausible explanations for this steep decline in OOPE by (1) analysing the methods and data of the NSS - Health (75th round) with the previous NSS-health rounds for comparability and (2) NSS - Health (75th round) with other nationally representative surveys conducted during the same period (the Longitudinal Aging Study in India, 2017-18 and Consumer Pyramids Household survey - Centre for Monitoring Indian Economy, 2018) with the aim to identify alternate methods and data sources of improving OOPE estimates derived from household surveys in India.

[3] The NHA guidelines for India, 2016; pages 82 to 86 provide a detailed estimation methodology which is reported as being followed for each consecutive NHA - India from FY 2013-14 to FY 2017-18 to ensure comparability across NHA rounds.

2. Methods

A review of literature was conducted. Google Scholar, PubMed, WHO and OECD data bases on country health accounts were searched to identify studies, reports that published information with regards to estimation methods for OOPE derived from household surveys for health accounts in India & other LMICs. Information is limited with regards to OOPE estimation methods, and a review conducted by OCED by Rannan-Eliya & Lorenzoni, 2010 was an important source that compiled information on OOPE estimation methods from several countries.

A comparative analysis of the methods and data of various NSS-Health rounds: 1995-96 (52nd round), 2004 (60th round), 2014 (71st round) and 2017-18 (75th round) is conducted. Also, the morbidity and hospitalization data from NSS-Health (75th round) is compared with the data from Longitudinal Ageing Study in India (LASI). The wave I of LASI has been conducted during the same period as NSS-Health 2017-18 (75th round). LASI captures the socio-economic and health characteristics of Indians aged forty-five years or more including their spouses, while NSS-Health 2017-18 (75th round) considers all household members in the survey. Therefore, to compare both the data sets, only the population aged forty-five years or more and their spouses from NSS-Health 2017-18 (75th round) is considered in the analysis. Finally, at the all-India level, the sample size was 1,43,364 individuals in the truncated NSS-Health data. On the other hand, there were 72,250 individuals in the LASI data.

Further, the method and estimates of NSS-Health 2017-18 (75th round) are compared with Consumer Pyramids Household Survey-Centre for Monitoring Indian Economy (CPHS-CMIE). For comparative analysis, the CPHS four monthly rounds-January to April 2018 are combined to generate the estimates and the monthly per capita consumer expenditure (MPCE) of NSSO 75th round is used to divide the population into rural and urban deciles. The ranges of MPCEs obtained from the NSSO for each decile are then used to divide the CPHS rural and urban population into deciles. For trend analysis monthly rounds of CPHS data for the period of January 2014 to April 2018 (53 rounds of data) have been used.

The CPHS-CMIE comprises data of individuals living in about 174,000 sample households (about 111,000 rural and 63,400 urban) spread across India. The sample is surveyed repeatedly in four monthly Waves. Within a Wave, a roughly equal number of households are surveyed every month. The data are divided into four modules. These include a module on basic demographic and employment-related data (“People of India”), a module on consumption expenditure of households (“Consumption Pyramids”), a module on household incomes (“Income Pyramids”) and a module on assets, investment, debt, and consumer sentiments (“Aspirational India”). The data on health is included in the expenditure module where CPHS asks 10 questions at the household level regarding expenditure on healthcare, and the presence of water, sanitation, and hygiene facilities in the household. In addition, at the individual level, CPHS asks each member whether they possess a health insurance policy.

3. Results and Discussion

3.1 The NHA India-OOPE Estimates: Setting the Context

Tracking health spending from various sources gained momentum in India in the early 2000's. Before this, discreet research studies laid down a conceptual framework for customizing the global health accounts framework for India (Garg CC, 2001). Health Accounts at National Level was published for the year FY2001-02 and for FY 2004-05. After a gap of a decade, health accounts production and dissemination were institutionalized at National Health Systems Resource Centre (NHSRC), a technical arm of the Ministry of Health and Family Welfare Government of India (MoHFW, GoI). There on, National Health Accounts have been consecutively produced and from FY 2013-14 onwards till the latest one for FY 2018-19 published in September 2022.

The key difference between NHA 2004-05 and NHA 2013-14 onwards, is a shift from SHA 1.0 to SHA 2011 framework for estimations and introduction of the concept "current health expenditures", as a basis for estimating all health financing related indicators. According to NHA guidelines for India 2016, in Indian context, from NHA 2013-14 onwards, SHA 2011 framework was implemented, where there is a separation of current consumption and capital formation. Thus, in NHA India certain expenditure items are classified as part of the capital account and is now outside the boundary of current healthcare expenditure. The expenditure on health infrastructure, provision of education and training of health personnel, including the administration, inspection or support of institutions providing education and training of health personnel is also a part of capital account, unless the trainings are on the job trainings, which is included in current health expenditures. Research and development programs directed towards the protection and improvement of human health is also a part of the capital account.1 The NHA India-OOPE Estimates: Setting the Context

Table 1. Trend of key health accounts indicators for India (2004-2019)
Source: National Health Accounts estimates for India, NHSRC, MoHFW, India

S.no	Indicators	NHA 2004-05	NHA 2013-14	NHA 2014-15	NHA 2015-16	NHA 2016-17	NHA 2017-18	NHA 2018-19
1	Total Health Expenditure (THE) as % GDP	4.2	4.0	3.9	3.8	3.8	3.3	3.2
2	Per-capita THE (Constant Prices in Rs.)	2066	3174	3231	3405	3503	3333	3314
3	Current Health Expenditure as % of THE	98.9	93.0	93.4	93.7	92.8	88.5	90.6
4	Government Health Expenditure as % GDP	0.96	1.15	1.1	1.18	1.2	1.35	1.28
5	Current Government Expenditure as % of GDP	NA	0.86	0.86	0.93	0.95	0.97	0.98
6	Government Health Expenditure as % of THE	22.5	28.6	29	30.6	32.4	40.8	40.6
7	OOPE as % of THE	69.4	64.2	62.6	60.6	58.7	48.8	48.2

Like many low-and middle-income countries, out-of-pocket expenditures (OOPE) is the predominant source of financing health in India. Thus, the major source of data for deriving OOPE estimates is self-reported Sample Survey-Social Consumption Health (NSS-Health), National Sample Survey-Household Consumption Expenditure (NSS-CES), National Family Health Survey (NFHS) and private databases on

sale of medicines. There is minimal scope for triangulation with administrative data due to data non-availability. However, the methods of estimation of OOPE for NHA-India from these data sources is standardized and documented in the NHA Guidelines for India (National Health Systems Resource Centre, 2016). The changes in methods of estimation are also documented in the NHA reports to support tracking deviations in the estimates.

According to NHA 2013-14, the total OOPE was estimated as Rs 2,90,932 crores, which was 64.2% of total health expenditure (THE) and the total government expenditure was Rs. 1,29,778 crores (28.6% of THE). There on, these survey data was extrapolated annually using a standard method to arrive at NHA-OOPE estimates until FY 2016-17. The method for extrapolation is documented in NHA guidelines for India, 2016. NSS-Health was conducted for year 2017-18 and the survey data was used to estimate NHA-OOPE for the year FY 2017-18. The total OOPE was Rs. 2,76,532 crores (48.8% of THE) and the total government expenditure was Rs. 2,31,104 crores (40.8 % of THE).

Between the NHA estimates of FY 2013-14 and FY 2017-18 there was a reduction in the total OOPE estimate (Rs.14,400 Crores) and an increase in total government health expenditure (Rs.1,01,326 Crore). This significant rise in Government health expenditures when compared to a small decline in OOPE explains the marked decline in OOPE as % of THE. However, the Current Government Health Expenditure as % of GDP **(Table 1, row 5)** during the same period has increased only marginally and remains lower than 1%. This indicates the increase is due to a large capital investment by Ministry of Defence on their health infrastructure between 2016-17 and 2017-18, rather than a sustained increase (Indranil, 2021). This further strengthens the concept of using current health expenditures for estimating indicators and tracking them for appropriate policy guidance, provided in SHA 2011.

Moreover, no significant change in private sector utilization in the consecutive NSS-Health Rounds 2004, 2014 and 2017-18 (Hooda, 2015 and Dilip, Narayanan, Nandraj, 2021) draws attention to the decline in OOPE during this period. Recent research on NSS-Health 2017-18 findings suggest in-depth analysis of NSS-Health rounds data for possible limitations of this survey methods, instruments and weightage provided in the data sets, that impact utilization and expenditure indicator values. Thus, to understand this further, an in-depth analysis of the health care utilization and expenditure data of various NSS-Health based on which NHA estimates are calculated is presented in **Section 3.2.**

3.2 Comparison of NSS-Health (2017-18) with previous NSS-Health Rounds

A comparative analysis of the NSS-Health 1995-96 (52nd round), 2004 (60th round), 2014 (71st round) and 2017-18 (75th round) was conducted to understand whether there are fundamental changes in the–(1) period of conducting the survey (2) schedule (3) sampling strategy and data collection methods (4) method for estimation of population parameters including sample weights. If these fundamental parameters are similar without major deviations, it allows us to compare the findings of our interest (disease burden, utilization pattern and OOPE estimates) from respective NSS-Heath rounds.

Period of survey: It is observed that 52nd and 75th rounds are full-year rounds, and 60th and 71st round are half-year rounds, which clarifies that seasonality, in terms of disease patterns for communicable diseases is only partially captured in the half-early rounds.

Schedule: A thorough review of all four rounds of NSS-Health schedules is conducted. No major change in the schedule has been identified that could influence the estimation of morbidity, hospitalization

rates or the OOPE estimates. Minor changes are observed during the later rounds (71st and 75th) in response categories for providers, ailment categories and few additional questions introduced to capture government health insurance.

In the household characteristics section few new questions were added in the 75th round. Access to latrine, how many members use latrine, arrangement of garbage disposal, sudden outbreak of communicable diseases and payment of childbirth expenses for non-household members related information were included in the household module for the first time in NSS-Health 75th round data. At the individual level principal activity status of the household members was added in the latest round and information related to dwelling in student hostels are dropped. The sampling strategy, data collection methods and the steps to calculate the multipliers/sample weights across all rounds indicate no deviation. A detailed discussion is presented in **Annexure 5.1.**
Morbidity and hospitalization rate: There is a reported decrease in morbidity and hospitalization in 75th round in comparison to earlier rounds in both rural and urban region,
Figure 1 & 2 which may explain the reported decline in OOPE estimates. To understand the nature of overall decline in utilization, a comparison of disease burden across various rounds is presented in **Section 3.3.** To compare the half round and full round estimates of NSS, we have bifurcated the NSS 75th round (full round) data into two sub-rounds: July-December 2017 (SR-1) and January-June 2018 (SR-2). The 71st round (half round) data was collected during January-June 2014; therefore, estimates of the second sub-round could be compared with 71st round estimates.

Estimates of the SR-2 shows that the PAP for the rural region is 60 and 81 in the urban sector. Whereas the corresponding estimates for the 71st round were 89 and 118 respectively. Surprisingly, the estimates are even lower than the PAP of the 60th round (January-June 2004). Also, the hospitalization rate reported in the SR-2 of NSS-Health (75th round) was 23 (rural) and 31 (urban) per 100 population which has declined substantially in the 71st round to 35 (rural) and 44 (urban).

Figure 1. Proportion of Ailing Population (PAP) per 1000 population in NSS-Health Rounds
Source: Authors' compilation from various NSS reports'

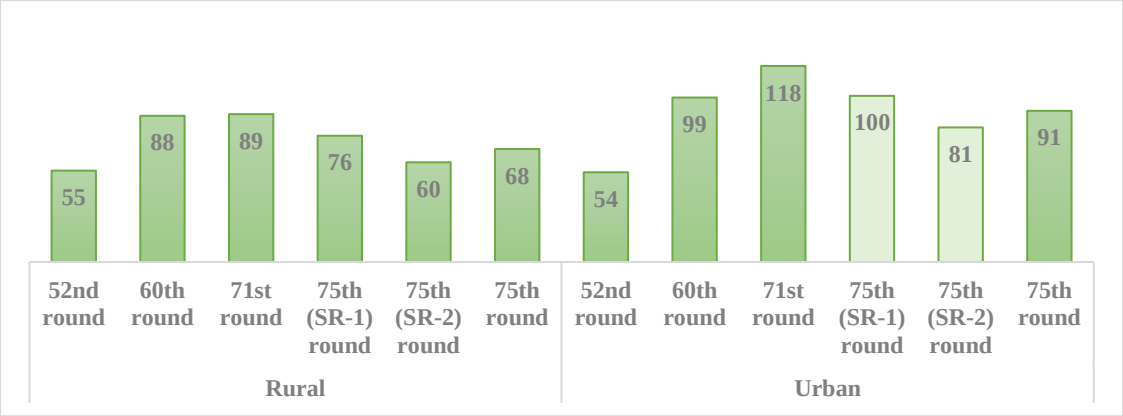
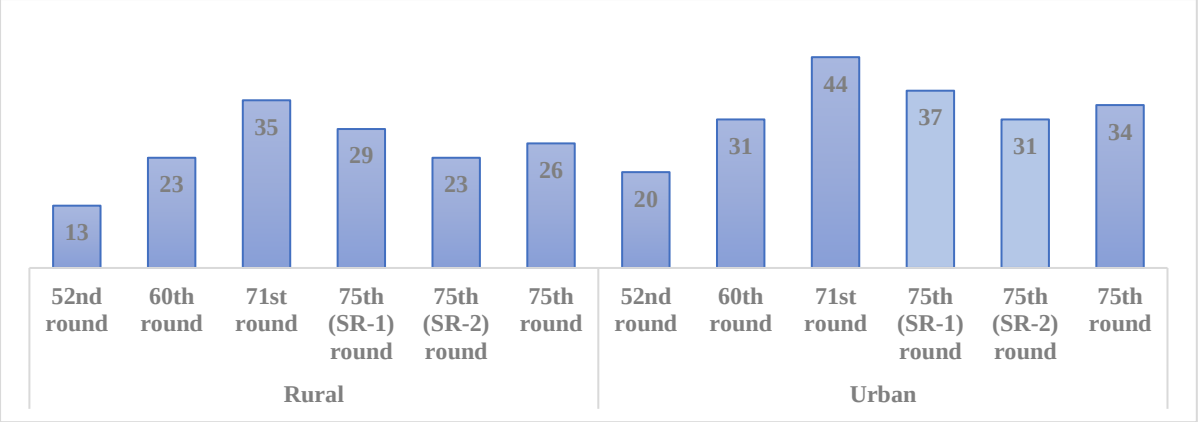
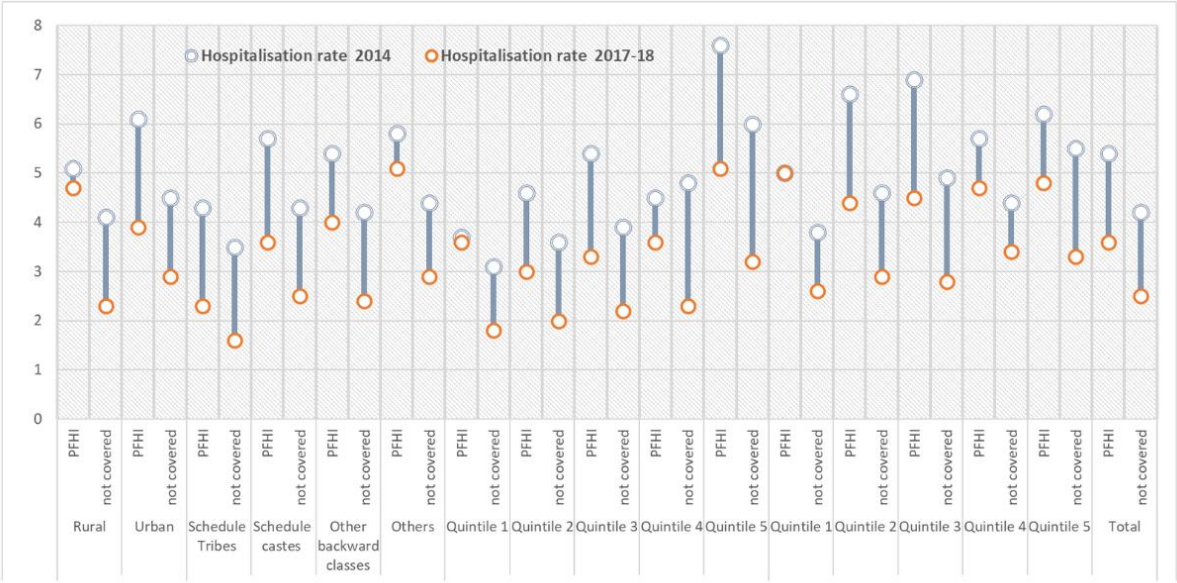


Figure 2. Hospitalization per 1000 population in NSS-Health Rounds
Source: Authors' compilation from various NSS reports'



Similarly, in Figure.3, between both the rounds 75th and 71st utilization of hospitalization care services has decreased in every socio-economic group. However, the hospitalization rate of the people with publicly funded health insurance (PFHI) remain always higher compared to people without any insurance coverage in both the years (except the 4th quintile group of the rural region during 2014). Interestingly, for few groups who were covered under PFHI recorded no change in utilization of hospitalization care service during the time period. Specifically, rural sector, and first monthly per capita expenditure (MPCE) quintile group of both the rural and urban region who are covered under PFHI have reported almost same level of hospitalization in both the rounds.

Figure 3: Decline in access to hospitalisation care by various socio-economic groups and insurance coverage: NSS 2014 and 2017-18



3.3 Comparison of NCDs Burden across NSS-Health Rounds

The disease burden and utilization for inpatient and outpatient care in India across NSS rounds for select ailments is presented in **Table 2.** Non-communicable disease (NCDs) burden has been the focus of analysis considering that seasonality influences reporting of ailments with regards to communicable disease especially between the half rounds (2004 and 2014) and full rounds (1995-96 and 2017-18). For all the major NCDs like cancer, diabetes, mental health, hypertension and heart diseases, the outpatient care and hospitalization rate increased between 1995-96 & 2014; and in 2017-18, there is a substantial decrease. Considering seasonality, a comparative analysis by Mukhopadhyay, Bose, Anil, & Lahariya (2022), shows a decline in PAP between during sub-round 2017-18 (January to June,75th round) and 2014 (71st round).

Table 2. Share of hospitalization and outpatient visits in India across NSS-Health Rounds

Source: Authors' estimation based on NSS-health rounds data

Disease	In-patient (per 1000)				Out-patient (per 1000)			
	1995-96	2004	2014	2017-18	1995-96	2004	2014	2017-18
Cancer	0.27	0.83	0.87	0.71	0.26	0.40	0.51	0.15
Diabetes	0.16	0.55	0.72	0.57	10.05	10.48	3.38	0.71
Mental Health	0.24	0.25	1.41	0.96	2.75	4.81	0.64	0.49
Hypertension	0.32	0.64	1.10	0.56	10.74	10.51	4.95	1.14
Heart Diseases	0.78	1.54	2.27	2.01	2.58	3.37	2.57	0.83
Accident & Injury	1.16	2.75	3.46	2.78	0.82	1.54	2.56	1.16
Kidney Problem	0.52	1.16	1.26	0.81	0.43	0.97	0.93	0.42
Fever	1.41	0.72	2.14	5.88	2.48	1.91	18.05	20.64
STDs	0.01	0.08	0.04	0.01	0.01	0.03	0.06	0.02
Vision Problem	0.11	0.09	0.11	0.05	0.09	0.32	1.04	0.40
Others	11.67	19.7	37.64	27.77	30.29	60.49	61.22	49.44
All	16.69	28.27	51.04	42.16	56.30	95.18	95.57	79.70

Hospitalization due to heart diseases increased from 0.79 per 1000 population in 1995-96, to 1.54 in 2004, 2.27 in 2014 and decreased to 2.01 in 2017-18. Global burden of disease studies states that there is no reason to believe this decline can be observed within a span of five years, especially in the disease categories for non-communicable diseases and accident & injuries. This is further substantiated with the theory of epidemiological transition[4]. Thus, to estimate the extent of under-reporting between NSS 2014 and 2017-18, further in-depth analysis is required.

3.4 Comparing NSS-Health (2017-18) & Longitudinal Aging Study in India (LASI), 2017-18

To make NSS-Health (75th round) sample comparable with LASI 2017-18, only individuals aged 45 years and above and their spouses have been retained in the NSS sample. It is observed that both NSS-Health and LASI data provide almost similar estimates at the population level in terms of age and gender composition **Table 3.** The median age in NSS is 53 years and in LASI is 58 years. Therefore, the population level estimates could be used for comparison of utilization pattern and disease prevalence

[4] As formulated by (AR, 1971) the epidemiological transition described the shift from morbidity & mortality due to acute infectious diseases to morbidity or death via chronic, non-infectious, degenerative diseases.

across the surveys. As there is some variation in the median age between the two surveys, hospitalization rates need to be age adjusted for better comparability.

Table 3. Comparison of truncated NSS-Health (75th Round) & LASI 2017-18 Data

Source: Authors' estimation based on NSS-Health (75th round) and LASI 2017-18 data

Group	Category	NSS	LASI
Gender (in %)	Male	45.5	42.0
	Female	54.5	58.0
Region (in %)	Rural	68.6	68.2
	Urban	31.4	31.8
Age (median)		53 years	58 years

Comparing the hospitalization rates of both the surveys, it is observed that NSS -health reported 50 cases per 1000 population while LASI reported 74. The share of chronic ailment related hospitalization for NSS is 34 cases per 1000 and for the LASI data is 43 **(Table 4).**

Table 4. Comparing hospitalization (per 1000) in NSS-Health (75th Round) & LASI 2017-18
Source: Authors' estimation from NSS - health (75th round) & LASI 2017-18 data. People aged 45 years or above and their spouses (even below 45 years of age) have been considered for this table from NSS and LASI data.

Table-4: Comparison of hospitalization in NSS -Health (75th Round) and LASI 2017-18 (per 1000)		
Disease	**Inpatient Care**	
	NSS	**LASI**
Hospitalization related to chronic ailments[5]	33.84	43.26
Hospitalization Rate (overall)	50.38	74.33

Further the hospitalization rates differ for various diseases and for most, substantially higher in LASI compared to NSS data **Table 5.** Hospitalization for cancer, diabetes, hypertension, stroke, and fever are higher in LASI and hospitalization for mental health, heart disease and accidents are slightly higher in NSS.

Table 5. Disease wise hospitalization (per 1000) NSS-Health (75th Round) & LASI 2017-18
Source: Authors' estimation based on NSS-Health 75th round and LASI 2017-18 data

Disease	Hospitalization (per 1000 population)	
	NSS	**LASI**
Cancer	1.59	1.76
Diabetes	1.80	5.46
Mental Health	1.63	1.16
Hypertension	1.70	4.38
Heart Diseases	5.53	5.22
Accident & Injury	4.33	4.16

[5] LASI has included CVD, Hypertension, chronic heart diseases, stroke, diabetes, lung diseases, psychological problems, cancer, bone and joint diseases, oral, hearing and eye problem under chronic conditions. Same set of diseases are categorized as chronic ailments from the NSS data. Both the data are self-reported by respondent

Stroke	1.60	3.33
Fever	7.33	10.94

Therefore, it could be summarized that NSS 2017-18 is likely to under-report hospitalization due to various high-cost chronic ailments like cancer, hypertension, or stroke, whereas it could over-emphasize low-cost common ailments like fever. Low utilization of healthcare facilities for the high-cost ailments would adversely impact the estimation of OOPE at the aggregate level. Therefore, there is a need to further explore how to understand this under-representation between LASI and NSS and its influence on OOPE.

3.5 Comparison of NSS-Health (2017-18) with CPHS-CMIE, 2018

NSS-Health surveys are focused on estimation of morbidity, utilization, and healthcare expenditure. CPHS-CMIE is focused on household consumption expenditure of which, healthcare expenditures are one of the components, like the NSS Consumer Expenditure Survey (NSS-CES). Consumption expenditure survey allows for a better estimation of various household expenditure components as well as aggregate expenditures and might under-report the magnitude of household health spending. In contrast, a health survey captures the details of healthcare utilization and expenditure and is likely to underestimate overall household consumption, especially as NSS-Health captures this component only through a single question.

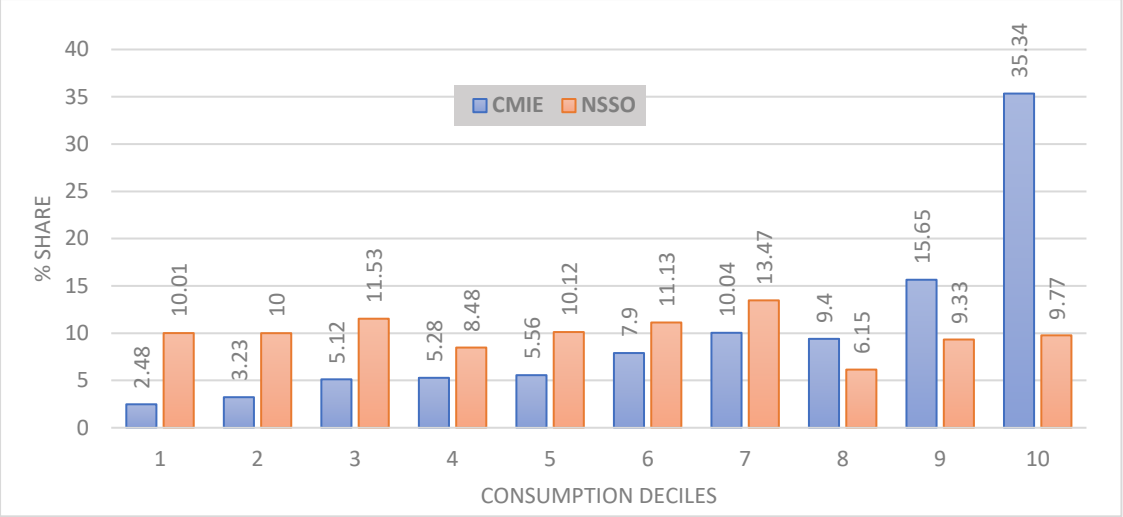
Thus, a comparison between estimates of both these survey data is necessary to arrive at a better estimation of overall OOPE burden (Sanjay K. Mohanty, 2021). Since the data for NSS-CES is not available after 68th Round (2011-12), CPHS allows us to compare overall healthcare expenditure in relation to household consumption expenditure.

CPHS and NSS-Health survey is compared to understand data variability between both the surveys using various approaches-(1) comparison of distribution of MPCE classes, (2) comparison of range and mean of MPCE across deciles to study the dispersion and central tendency respectively and understand distribution within and across deciles, (3) comparison of OOPE estimates across deciles.

The monthly per capita consumer expenditure (MPCE) of NSS-Health (75th round) is used to divide the population into rural and urban deciles. The ranges of MPCEs obtained from the NSS for each decile are then used to divide the CPHS rural and urban population into deciles.

When NSS and CPHS deciles are compared, it is observed that in the rural areas, more than 35% of CPHS sampled individuals belong to the richest decile (Figure 3). While for the poorest five deciles CPHS has 5% or less population. On one hand CPHS under-represent the poorest sections while NSS is not able to capture the richest section of the population in rural areas. For the urban areas the problem of under representation of the poor is less pronounced (Figure 4).

Figure 4: Share of each decile in total sample in rural areas: NSS-Health (75th Round) & CPHS-CMIE
Source: Author's estimate based on unit records CPHS Jan-Apr 2018 wave & NSS 75th Round



Findings also correspond to existing research by Drèze & Somanchi, 2021, that has pointed out issues with the sample design and survey implementation of CPHS. In particular, the survey design of CPHS and its implementation tends to exclude households that are poor, migrating and belong to marginalised communities. The sample of CMIE survey is not completely randomized with households in the villages being picked up each with a given gap in the household id number. This causes issues because many villages have haphazard clusters of houses instead of sequential clusters according to a plan by the authority. These clusters are usually dominated by some castes and hence such sampling results into some castes being represented more in the survey. Also, such a sampling strategy results in unequal probability of all households being picked up for survey. Many villages in India have wealthier households in the central parts of the villages and marginalized being in the fringes or in separate settlements away from the main habitation and these marginalized have a lower chance of being represented in the surveys.

Figure 5: Share of each decile in total sample in urban areas: NSS-Health (75th Round) and CPHS-CMIE

Source: Author's estimate based on unit records CPHS Jan-Apr 2018 wave & NSS 75th round

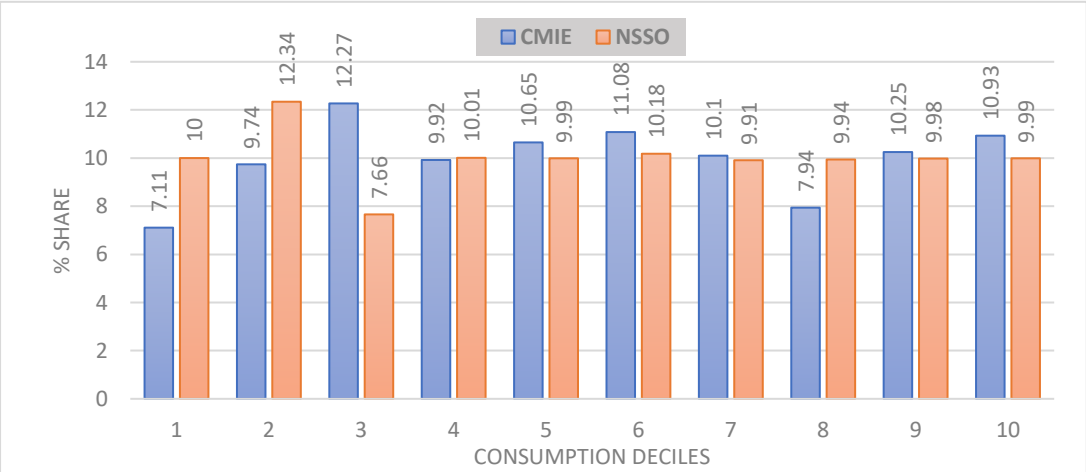


Table 6. Range of MPCE across various deciles: NSS-Health (75th Round) and CPHS-CMIE
Source: Author's estimate based on unit records CPHS Jan-Apr 2018 wave & NSS 75th round

	Rural				Urban			
	CPHS		NSS		CPHS		NSS	
Decile	Minimum	maximum	Minimum	maximum	Minimum	maximum	Minimum	maximum
1	0	1225	83	911	0	1715	100	1570
2	1225	1509	912	1075	1715	2118	1571	2000
3	1509	1761	1075	1250	2118	2471	2000	2440
4	1761	2011	1251	1405	2471	2836	2441	2800
5	2011	2279	1405	1550	2836	3237	2801	3223
6	2279	2584	1551	1750	3237	3707	3224	3750
7	2584	2966	1750	2000	3707	4314	3752	4375
8	2966	3504	2000	2250	4314	5183	4377	5050
9	3504	4425	2251	2750	5183	6812	5052	6600
10	4425	386933	2751	30000	6813	418380	6602	60000
Total	0	386933	83	30000	0	418380	100	60000

Table 6 presents the range of values of MPCE for each of the NSS and CPHS deciles. Here MPCE values derived from CPHS to obtain the decile ranges for rural and urban areas are used. It is observed that for each of the deciles in rural and urban areas, maximum values of MPCE are much higher in CPHS. For instance, in rural areas, a household with MPCE of INR 2751 would belong to richest decile in NSS, while for as per CPHS, this household would belong to decile seven. This shows that the NSS is not able to capture the upper strata of the society adequately in rural areas. The difference is relatively less pronounced in urban areas, even though there are considerable number of households with MPCE higher than the maximum MPCE captured in the NSS.

It needs to be also kept in mind that NSS morbidity round captures only value of usual monthly expenditure, while CPHS combines expenditure on hundreds of items to derive the household consumer expenditure. As a result, the level of accuracy of CPHS estimates are likely to be higher, while NSS is likely to under report MPCE. As it is quite clear from the above discussion that these two data sources may not be strictly comparable because different nature and purpose of the two surveys, there are certain trends that can be drawn from the CPHS data as it provides monthly rounds of data.

To elaborate the point further, **Table 7** represents the mean MPCE based on the CPHS and NSS classifications. When compared, mean MPCE is much higher in the CPHS deciles than NSS. When converted CPHS deciles using NSS ranges are compared, the difference between NSS and CPHS narrows down, but there remains considerable gap. This essentially points out that for every decile, NSS is biased towards the minimum while CPHS has upward bias.

Table 7. Mean MPCE across deciles in rural & urban areas:
NSS-Health (75th Round) & CPHS-CMIE
Source: Author's estimate based on unit records CPHS Jan-Apr 2018 wave & NSS 75th round

	Rural			Urban			Total		
Deciles	CPHS	CPHS (NSS deciles)	NSS	CPHS	CPHS (NSS deciles)	NSS	CPHS	CPHS (NSS deciles)	NSS
1	997	776	755	1377	1281	1129	1111	1044	866
2	1370	999	973	1921	1793	1623	1536	1420	1158
3	1634	1165	1133	2295	2221	1982	1832	1662	1371
4	1883	1329	1278	2651	2617	2362	2112	1854	1658
5	2141	1479	1448	3029	3004	2719	2407	2103	1689
6	2425	1650	1588	3464	3475	3116	2734	2254	2261
7	2765	1873	1753	3991	4042	3645	3134	2444	2226
8	3214	2122	1986	4706	4687	4194	3672	2720	2672
9	3896	2483	2303	5888	5723	5161	4522	3115	3096
10	6155	4082	3406	9658	9387	8374	7256	4680	4936
All	2371	2371	1643	3504	3504	3404	2714	2714	2162

Further investigation is required to find out which survey is a better representation of distribution of household consumption in the country. CPHS contains overall health expenditure incurred by a household along with information on specific expenditure sources, namely, doctor visits, medicines, diagnostics and tests, hospital visits, health enhancement, insurance premiums, outstanding borrowings for health from banks, money lenders, credit cards and informal sources. NSS morbidity and health consumption rounds capture much greater details of items, including the expenditure on non-medical expenses like transportation etc. Since the main purpose is to arrive at better estimates of direct out-of-pocket (OOP) expenses, the mean monthly per capita health expenditure is estimated by subtracting the insurance premiums and reimbursements (if any) from health expenditure. We have compared net direct health expenditure of CPHS with the net medical expenditure of NSS.

A comparison of OOPE between both the surveys, observes that mean per capita health expenditure is higher in NSS for most deciles compared to CPHS in **Table 8.** If we compare the modified deciles of CPHS, the difference is much more pronounced. Thus, NSS can capture the health expenditure better for individuals and households compared to the CPHS.

Table 8. Mean monthly per capita expenditure:
Health & medicines across deciles in rural & urban
Source: Author's estimate based on unit records CPHS Jan-Apr 2018 wave & NSS 75th round

		Rural			Urban			Total		
Decile	monthly per capita expenditure	CMIE	CMIE (NSS deciles)	NSS	CMIE	CMIE (NSS deciles)	NSS	CMIE	CMIE (NSS deciles)	NSS
	Health	24.2	19.1	51.7	38.3	35.5	94.8	28.44	27.8	65.9
1	Medicines	10.7	8.6	22.2	17.0	15.8	38.8	12.60	12.4	27.7
	Health	36.4	24.2	58.2	55.1	51.1	114.3	42.06	38.4	78.4
2	Medicines	17.4	10.6	25.0	24.2	22.4	43.5	19.48	16.9	31.6
	Health	45.3	28.4	78.8	67.5	64.8	147.8	51.94	45.5	94.4
3	Medicines	22.2	12.7	34.8	30.7	29.2	65.0	24.72	20.5	41.7
	Health	51.9	34.5	82.4	78.1	77.5	151.2	59.73	52.0	104.3
4	Medicines	25.2	16.4	30.1	35.1	34.8	56.5	28.19	23.9	38.5
	Health	60.3	40.6	75.3	88.8	88.0	166.2	68.85	60.0	102.6
5	Medicines	29.9	19.7	30.6	40.3	40.0	60.0	33.00	28.0	39.4
	Health	68.8	45.8	103.1	101.4	101.6	195.0	78.48	64.3	128.2
6	Medicines	35.0	22.4	40.9	45.4	45.5	69.9	38.09	30.0	48.8
	Health	78.1	51.7	95.8	114.5	115.7	173.1	89.02	68.6	113.5
7	Medicines	39.5	25.1	36.7	49.8	50.3	61.6	42.58	31.8	42.4
	Health	90.6	59.8	127.6	137.3	137.1	195.2	104.89	77.8	152.7
8	Medicines	46.1	29.5	50.1	57.7	57.5	66.5	49.61	36.0	56.2
	Health	108.3	70.7	141.3	176.8	171.2	195.0	129.83	90.3	156.4
9	Medicines	55.3	36.1	59.7	70.7	69.1	66.2	60.12	42.5	61.6
	Health	188.7	118.3	257.1	321.6	311.0	325.0	230.51	140.0	276.1
10	Medicines	86.3	57.6	100.4	105.1	102.6	109.6	92.21	62.7	103.0
	Health	66.8	66.8	98.7	105.2	105.2	164.0	78.38	78.4	118.0
Total	Medicines	32.6	32.6	39.8	43.2	43.2	60.2	35.81	35.8	45.8

Sample distribution has huge implications on overall estimation of OOPE. Majority of OOPE is incurred by the top deciles. Table 9 presents the distribution of total spending by various deciles, that sum of all the groups add to total consumption (100%). In rural areas almost half of total spending is incurred by people belonging to the top decile (35% population share). The top NSSO decile spend 22.5% of OOP in rural areas and 17% in urban areas. While CPHS top decile spend 19 and 22% respectively. At the same time bottom deciles spend substantially lower-roughly 3.5% to 5% of total spending. This indicates NSS oversamples the bottom deciles and underrepresents the top deciles. If the top deciles are not represented adequately, the survey might miss out the low frequency and high magnitude spending that these high-income households attribute. Since CPHS oversamples the top section, it is likely that these extreme levels of spending are captured better.

Table 9. Share (percentage) of various deciles in monthly per capita health expenditure: NSS-Health (75th Round) and CPHS-CMIE

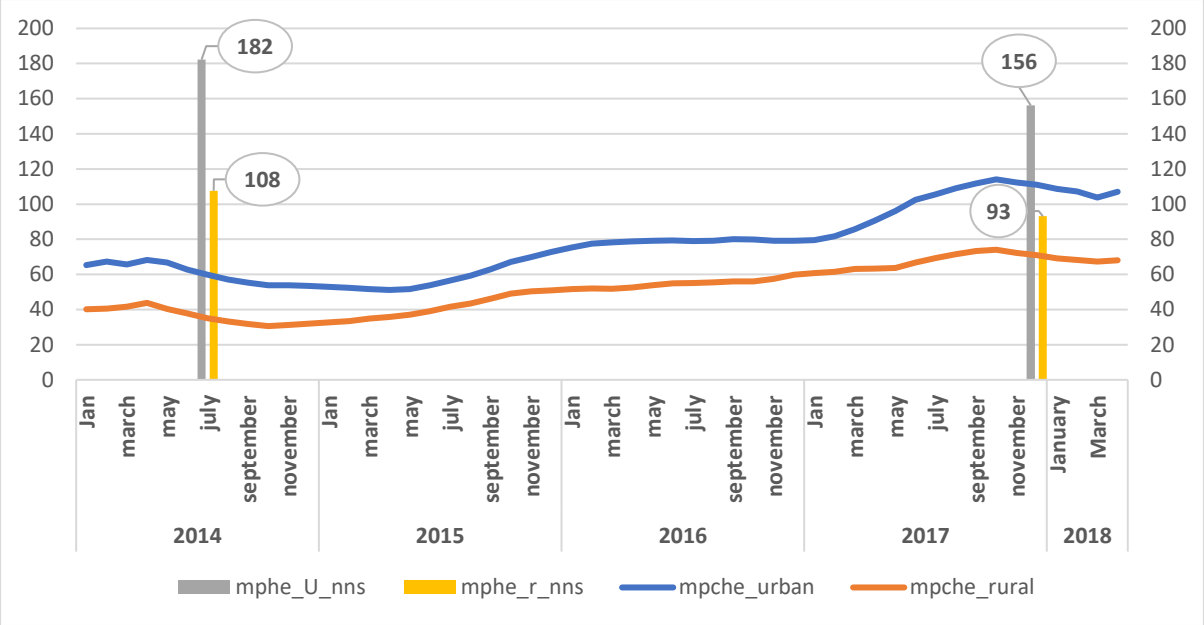
Source: Author's estimate based on unit records CPHS Jan-Apr 2018 wave & NSS 75th round

	Rural			Urban		
Decile	CPHS	CPHS (NSS deciles)	NSSO	CPHS	CPHS (NSS deciles)	NSS
1	5.3	1.2	5.2	5.3	3.6	5.4
2	6.7	1.7	6.2	6.4	6.0	6.6
3	7.7	2.9	7.9	7.2	8.6	7.4
4	8.3	3.4	7.0	7.8	7.7	11.3
5	9.1	4.0	11.3	8.3	8.8	7.6
6	9.8	6.2	5.8	8.9	9.9	12.3
7	10.4	8.3	11.1	9.6	9.7	9.2
8	11.1	8.5	9.1	10.9	8.6	11.0
9	12.2	15.5	13.9	13.4	13.3	12.2
10	19.4	48.3	22.5	22.2	23.6	17.0
All	100	100	100	100	100	100

From all the observations presented above, NSS captures consumption expenditure (mpce) through one variable and could potentially underestimate consumption expenditures when comparison to CPHS, which captures the same from various items with greater levels of accuracy. NSS captures the health expenditure in greater details, while CPHS has fewer variables to capture health expenditure-a potential source of under estimation. However, as observed earlier CPHS under-represents the bottom deciles of the rural population (only 1.2% share of the total consumption in the bottom NSS decile), while NSSO might not be able to capture the top deciles adequately (22.5% of total consumption). Since majority of the spending is incurred by the top deciles as given in **(Table 9)**, NSS's under representation of the top deciles might lead to underestimation, while CPHS might be more equipped to capture the low frequency and high magnitude spending incurred by the top deciles.

CPHS provides opportunity to track monthly trends in spending as the survey is repeated every month. We have presented five monthly moving average of monthly per capita health expenditure (mpche) for rural and urban areas in **Figure 6** (coloured lines) for the period of January 2014 to April 2018 to compare these with the mpche derived from NSS-Health rounds (71st and 75th) (presented in columns). The trend shows mpche has increased considerably. Compound monthly average growth rate of mpche in rural areas is 1.68%, while that for urban areas is 1.48% for the period. During the same period NSS shows a decline. Though CPHS is not strictly comparable with the NSS numbers, we can draw conclusions on the direction of health expenditure during this period. CPHS not only contradicts NSS findings, but it also shows considerable increase in OOPE.

Figure 6: Monthly per capita health expenditure from CPHS-CMIE (five month moving average) and NSS-Heath Rounds (INR)



To substantiate the findings further, we have brought in a comparison of monthly per capita consumption expenditure from both sources (Table 10). We indexed mpce obtained from both NSS 71st round and CPHS. For CPHS we have used five monthly moving average for month of September, which is also the middle point of the 71st NSSO round, to make it comparable. We have indexed them into '100' for the bases period and converted the mpce obtained from 71st round of NSS and corresponding period of CPHS into the scale of 100. The same exercise is repeated for mphe.

Table 10. A comparison of monthly per capita consumption expenditure derived from NSS-Health (75th & 71st Round) and CMIE-CPHS

		MPCE		MPCHE		MPCE_index		MPCHE_index	
	Source	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
2014	NSS	1287	2414	108	182	100	100	100	100
	CPHS	1680	2686	37	61	100	100	100	100
2017-18	NSS	1643	3404	93	156	128	141	87	86
	CPHS	2564	3795	73	117	153	141	197	193

It is clear that converted mpce data obtained from both the sources have similar growth trajectory during this period, particularly in urban areas. For instance, if mpces were 100 to start with in 2014, it has increased to 128 in rural areas in NSS and 153 in CPHS. In urban areas both have increased to 141. This shows that at least in the urban areas both the results show similar trend for overall consumption expenditure. However, for health expenditure shows different trajectory in the two data bases. As per NSS mpche could have declined from 100 to 87 and 86 respectively for rural and urban areas. During the same period, as per CPHS mpche would have increased to 197 and 193 respectively for rural and urban areas. Even though the overall consumption expenditure shows similar trends in both the data sources, so far as health expenditure is concerned NSS shows a decline and CPHS shows a steep increase.

4. Conclusion

OOPE estimates have a significant role in measuring India's progress towards sustainable development goals and targets set by the National Health Policy, 2017. Currently, OOPE estimates for NHA-India are largely derived from household health and consumption expenditure surveys. The comparative analysis of latest NSS-Health (75th Round) estimates with earlier NSS-Health rounds, LASI, 2017-18 and CPHS-CMIE indicates that the limitations of the NSS-Health do impact NHA-OOPE estimates.

1. NSS-Health morbidity and hospitalization rate shows a sudden decline between 2014 and 2017-18 which may have influenced the decline in NHA-OOPE estimates. This decline is pronounced for NCDs, which is highly unlikely to occur within the span of four years between both the survey periods.
2. A comparison of the morbidity and hospitalisation indicators of NSS-Health (75th round) with LASI 2017-18 shows specifically, for rate of hospitalization of NCDs and chronic ailments for persons, (aged 45 years or more and their spouses) NSS-Health estimates are on the lower side. This strengthens that NSS-Health has limitations in capturing data on this specific age group and the related diseases.
3. A comparative analysis of CPHS-CMIE and NSS-Health (75th Round), indicates that majority of health spending is incurred by households from the top deciles. CPHS-CMIE might be more equipped to capture the low frequency and high magnitude spending incurred by the top deciles while NSS-Health underrepresents these, which may again lead to underestimation of OOPE.
4. Trend analysis of CPHS-CMIE rounds between 2014 and 2018 indicates that OOPE has increased during this period. During the same period, NSS-Health shows a decline strengthening the argument that the survey has limitations and may not represent the ground realities.
5. The decline in hospitalisation rate, estimated by the NSS-Health between 2014 and 2017-18 may have been influenced because of multiple shocks of demonetisation, and related unemployment, which is not being captured. These have considerably affected rural consumption expenditure and affected health seeking behaviour of people (Tarun K G, et al 2020). The increase in public spending is not adequate to explain the decline in OOPE, as overall household utilisation of health services has declined, as per the NSS estimates.

5.Way Forward

To improve NHA India-OOPE estimation methods which are based on self-reported NSS-Health and consumption expenditure surveys, further exploratory research is required to understand the following:

Could the decline in morbidity and hospitalization reported in NSS-Health 2017-18 be explained through distress in consumption due to demonetization and other monetary and fiscal policies introduced during the period of survey impacting healthcare consumption, or any other contextual or methodological reason?

Using LASI, CPHS-CMIE and NSS-Health data can we arrive at a range of NHA-OOPE estimate that is closer to the current context? The results from longitudinal trends of CPHS-CMIE clearly shows the merit of such triangulation.

While improving existing NHA-OOPE estimation methods is of primary importance, it is suggested to work towards use of integrated approach for arriving at these i.e., using OOPE estimates from household surveys combined with computation derived from routine administrative data capture from insurers, regulators, statistical agencies reporting from providers (Rannan-Eliya & Lorenzoni, 2010). The following suggestions could be helpful in creating a dynamic database for administrative information available on OOPE with a scope to also triangulate the data for improving the estimates from the various data sources:

Initiatives already being undertaken towards registration of private healthcare providers, either through the Clinical Establishments (Registration and Regulation) Act, 2010 (Ministry of Law and Justice, 2010) for the states that have implemented it or the National Health Resource Repository (NHRR) (Central Bureau of Health Intelligence, 2020) could allow for creation of a dynamic database to anchor a provider survey to capture OOPE from this segment at the most disaggregate levels such as for urban, rural, disease and population characteristics.

The databases of the Insurance Regulatory and Development Authority of India (IRDAI) and Government Sponsored Health Insurance Schemes (including the Pradhan Mantri Jan Aarogya Yojana – PMJAY), that capture reimbursements to empanelled network hospitals and insurers could also begin to collect information on out-of-pocket expenditures (if any) made by the household during discharge. While this could open a pandora's box on "additional billing practices" especially for government insurance schemes that exists but is not formally captured expect in household surveys or exit interviews for program evaluation, it could be a move towards implementing a best practice deployed by several countries to ensure transparency in improving availability of data on pricing of services and reimbursement rates.

District level survey with a representative sample using multiple approaches to capture consumption expenditure, morbidity, healthcare utilisation & expenditure and provider's end-factor cost could estimate reliable OOPE.

6. Annexure

6.1 Sampling strategy and methodology for calculation of multipliers, NSS – Health Rounds

Estimation process: The estimation procedure of NSS largely depends on the sampling procedure followed to collect the data. The following sections would describe the sampling methodology followed by the NSS and how the multiplier of the data has been derived for the surveys.

Sample Design: Stratified multistage random sampling technique has been applied to collect data from the census villages and urban frame survey (UFS) blocks from all Indian states and Union Territories (UTs). The census villages and the urban blocks have been considered as the first stage unit (FSU) and the households have been treated as the ultimate stage unit (USU). However, for the large FSUs, the intermediate stage of sampling has been done. The hamlet groups in the villages and sub-blocks in the urban sector have been created for this. The 2011 census villages and UFS 2007-12 urban blocks have been used as the sample frame for identification of the FSUs.

Each district has been classified as urban and rural sector and a rural stratum (with population size say r) is formed with all the rural areas of the district. Similarly, with all urban regions of the district has been classified as an urban stratum (population size r). However, if the population (as per 2011 census for the NSS 60th, 71st and 75th rounds) of the urban areas of the district is more than 10 lakhs then another urban stratum (population size r) is formed. Then all the villages (and urban stratum for the urban region) of a district are arranged in ascending order according to the population size and r/4 number of sub-strata are formed. These sub-strata are formed in such a way so that all the strata comprise of almost same population size.

Sub-rounds for Data Collection: NSS conducts survey after dividing the total duration of a survey into sub-rounds. Three months is the usual period for a sub-round. Therefore, for the half round survey like 60th or 71st rounds, there are two sub-rounds and for the full survey like 52nd or 75th rounds, there are four sub-rounds. NSS usually allocates equal number of FSUs for data collection across all sub rounds of a survey.

Sample Selection: To select the sample, NSS follows four steps. The details are as follows –

1. From each sub-stratum of both the regions, the FSUs are selected following probability proportional to size with replacement (PPSWR). It must be noted here that the population of the village (number of households for the urban region) is considered as the size here.

2. If the population of the selected FSU is more than a threshold[6], then the FSU is divided into D-number of hamlet groups (known as HG & for the urban sector sub-block). The FSUs are divided in such a way so that the population of each hamlet group/subblock are more or less same.

3. Households living in an FSU (or HG/Sub-block) are classified into second stage strata (SSS) based on some criterion. The number of households that would be surveyed from a SSS is also planned at this stage. Like for the last two health rounds the formation of SSS & number of households for each SSS were same and it was as follows –

[6] Considering population density, region and district, the threshold and number of the hamlet group or sub-block varies. Therefore, this numbers vary across rounds.

a. Household with at least one child (age less than 1 year)[7]
b. Household with at least one hospitalization (including deceased)
c. other households

4. Finally, from the SSS the households are sampled following simple random sampling without replacement (SRSWOR).
Following the above sampling framework, to represent the observed value of any characteristics (say for π) we could write –
$\pi_{\alpha\beta\gamma i d j \eta}$, which means characteristics of π for the ηth household of the jth SSS of the dth HG/Sub-block of the ith FSU of the sub-sample γ for the βth sub-stratum of the αth stratum.
Therefore, we are defining the various notations of the estimation process from the sampling strategy is as follows -
α = αth stratum
β = βth sub-stratum
γ = sub-sample (γ = 1, 2)
i = ith FSU
j = jth second stage stratum (SSS)
ρ = hamlet-group/ sub-block
η = ηth sample household within an FSU/HG/Sub-block
D = total number of HG/Sub-block formed in the sample FSU
χ = total size of a sub-stratum, i.e., sum of sizes for all the FSUs of a sub-stratum
ε = size of sample FSU used for selection
n = number of sample FSUs surveyed
H = total number of households listed in a SSS of an FSU/HG/Sub-block of sample FSU
h = number of households surveyed in a SSS of an FSU/HG/Sub-block of sample FSU

To estimate any characteristics for the jth second stage stratum of a sub-stratum could be written as –

$$\widehat{\pi_j} = \frac{\chi}{n_j}\left[\frac{H_{i1j}}{h_{i1j}}\sum_{\eta=1}^{h_{i1j}}\pi_{i1j\eta} + D_i^{*}\,X\,\frac{H_{i2j}}{h_{i2j}}\sum_{\eta=1}^{h_{i2j}}\pi_{i2j\eta}\right]$$

It has to be noted here that D* would take the value zero if there is only one hamlet group/ sub-block in a selected FSU. The value of the parameter would be (D – 1) if the number of hamlet group/ sub-block is more than one in the FSU. Therefore, the combined estimate for all second stage strata would be –

$$\hat{\pi} = \sum_j \widehat{\pi_j}$$

Similarly, the overall estimate for a substratum based on the two sub-samples in a sub-stratum and overall estimate for a stratum could be written as –

[7] (a) 2 households from FSU without HG & 1 from with HG; (b) 4 from FSU without HG & 2 from with HG; (c) 2 from FSU with HG & 1 from with HG

$$\widehat{\pi_{\alpha\beta}} = \frac{1}{2}\sum_{\gamma=1}^{2} \hat{\pi}_{\alpha\beta\gamma}$$

$$\widehat{\pi_{\alpha}} = \sum_{\beta} \widehat{\pi_{\alpha\beta}}$$

The national/sub-national level estimates could be obtained by taking the sum of stratum level estimates of all the strata belonging to that geographical boundary.

Now, one of the most important aspects of estimation is minimization of error. One of the major advantages of NSS sampling technique is that it helps us to estimate the variances without much difficulty. To calculate the variances of the aggregate estimate of the above parameter, we could apply the following equation –

$$\widehat{VAR}(\hat{\pi}) = \sum_{\alpha} \widehat{Var}\,(\widehat{\pi_{\alpha}}) = \sum_{\alpha}\sum_{\beta} \widehat{Var}\,(\widehat{\pi_{\alpha\beta}})$$

However, to calculate the above equation, calculation of variance is needed. The variance could be calculated as –

$$\widehat{VAR}\left(\widehat{\pi_{\alpha\beta}}\right) = \frac{1}{4}\,(\widehat{\pi_{\alpha\beta1}} - \widehat{\pi_{\alpha\beta2}})^2$$

Specifically, the variance could be calculated by the quarter of the squared difference between the estimates of the two sub-samples for the stratum α and sub-stratum β.

The relative standard error (R̂) of the parameter could be estimated as –

$$\hat{R}(\hat{\pi}) = \frac{\sqrt{\widehat{Var}(\hat{\pi})}}{\hat{\pi}}\ X\ 100$$

Finally, the multiplier is an important component of estimation of the population level characteristics of any sample data. National Sample Survey formulates the multipliers at the stratum/sub-stratum or at the second stage stratum level for a sub-sample with the following equation –

$$\frac{\chi_{\alpha\beta}}{n_{\alpha\beta\gamma j}}\ X\ \frac{1}{\varepsilon_{\alpha\beta\gamma i}}\ X\ \frac{H_{\alpha\beta\gamma i1j}}{h_{\alpha\beta\gamma i1j}}$$

However, if there are more than one hamlet group/ sub-block in the sampled FSU then the equation could be modified as –

$$\frac{\chi_{\alpha\beta}}{n_{\alpha\beta\gamma j}}\ X\ \frac{1}{\varepsilon_{\alpha\beta\gamma i}}\ X\ D^{*}_{\alpha\beta\gamma i}\ X\ \frac{H_{\alpha\beta\gamma i1j}}{h_{\alpha\beta\gamma i1j}}$$

The sampling and estimation process of the last two round of NSS health survey (71st round and the 75th round) were the same (as discussed above). Additionally, the method used in the surveys to calculate the multiplier has also not changed in the surveys.

6.2 Sampling strategy and methodology for Consumer Pyramid-Household Survey (CPHS)

CPHS-CMIE is a large – scale private household expenditure surveys have become a popular source of data in recent time, in the absence of regular publication of Consumer Expenditure Survey (CES) conducted by the NSSO. The CPHS is a longitudinal survey of households. The CPHS comprises surveys of households living in about 174,000 sample houses (about 111,000 rural and 63,400 urban) spread across most states in India. The sample is surveyed repeatedly in four monthly Waves. Within a Wave, a roughly equal number of households are surveyed every month. The data are divided into four modules: basic demographic and employment-related data ("People of India"), a module on consumption expenditure of households ("Consumption Pyramids"), a module on household incomes ("Income Pyramids"). Household health expenditure data under CMIE is grouped under consumptions pyramid (CPHS) module.

A stratified multi-stage survey design is deployed by CMIE to draw its sample of households. The Primary Sampling Units (PSUs) are the villages and towns of the 2011 Census. The Ultimate Sampling Units (USUs) are the households from these PSUs. The broadest level of strata for sampling purpose is the Homogeneous Region (HR), which is a set of neighbouring districts that have similar agro-climatic conditions, urbanisation levels and female literacy. HRs are also approximately of the same size, except in the northeast, where the entire set of north-eastern states is considered as one HR.
The sub-strata are the rural and urban regions within each stratum, i.e., within each HR. The sampling frame for rural PSUs is the list of villages as of the 2011 Census. The sampling frame for urban PSUs is the list of towns as of the 2011 Census. All towns of an HR are stratified into four strata based on the number of households in 2011, as follows:

• Very large towns with more than 200,000 households in 2011.

• Large towns that had between 60,000 and 200,000 households.

• Medium sized towns with households between 20,000 and 60,000.

• Those with less than 20,000 households were the small towns.

Around 318 towns are selected through this process and from each of these towns, 21 Census Enumeration Blocks (CEB) is randomly selected. A CEB is a cluster of about 100-125 neighbouring households. Households are then selected through a process of systematic random sampling from each of the CEBs. Like the urban sample, the rural sample selection is also a two-staged sampling process. The first step in the design is to select villages and then the final step is to select households. Villages are selected through simple random sampling process. Villages are the PSUs. Households are selected from these through a process of systematic random sampling from each selected village.

Expenses screen – Health expenditure

There are ten monthly expenses screens and a separate weekly expense screen. One of them is health which includes monthly expenses on medicines, doctors' fees, tests, hospitalisation fees, health insurance premium, hygiene products, fees to dieticians, gymnasium, etc. CPHS captures the expenditure incurred by households on 7 independent heads as listed below.

1. Monthly household expenditure on medicines (319)- All types of medicines from across all disciplines are considered, along with the purchase of balms, creams, ointments, etc. for medical purposes, either over the counter or by prescription.

2. Monthly household expenditure on doctors/physiotherapists fee (320)-Consultations/treatment by all doctors, dentists, physiotherapists, etc.

3. Monthly household expenditure on medical tests (321)- Any tests ordered by doctors and undertaken by household members to identify their ailments, including X-rays, blood tests, MRIs, CT scans, etc.

4. Monthly household expenditure on hospitalization fees (322)- Includes costs such as charges for a room, treatment procedures. Importantly, this amount is recorded even if it is reimbursed by insurance.

5. Monthly household expenditure on premium for health insurance (323)- If the household has health insurance, the premium paid for the same is recorded.

6. Monthly household expenditure on health supplements (189)- Includes over-the-counter items like Horlicks, Bournvita, Whey Protein, Glucon-D, Chayawanprash intended to supplement one's diet, but excludes medically prescribed health supplements taken for illnesses.

7. Monthly household expenditure on health enhancements (324)- Includes services such as gyms, yoga sessions, nutritionist's fees to improve one's health status.

At times, households may not be able to cover the above healthcare costs out of their savings. In such cases, they borrow from either formal or informal sources like banks, NBFCs, friends, SHGs, moneylenders, etc. Therefore, CPHS also asks Does the household have a borrowing for medical expenditure (457) as of the date of the survey. This data is captured by source of borrowing. This can help investigate questions such as the gap between healthcare requirements and access in India, or the impact of healthcare costs on a household's financial wellbeing, among other things. However, assessing the out-of-pocket expenditure of a household or an individual from the CPHS data would be challenging as the only ask the source of the borrowing and not noting down the amount that was spent on the same.

Missing the poor?

CPHS deploys a large sample size that is well distributed over time and space during the execution period to ensure that the sample for even small time periods is large enough and representative enough to make assessments about household well-being. But the challenge lies in the selection of the samples. CMIE selects villages via simple random sampling (Instead of probability-proportional-to-size (PPS) approach which ensures units with larger population have higher probability of getting sampled) and sub-divides towns into four sub-groups based on population size and then randomly samples one from each group. CMIE has a fixed quota of 16 households to be surveyed in each sample village and CEB. CMIE's approach is quite likely to yield a biased sample since they begin sampling from the 'main street' or 'central circle' in each village and CEB. It is a well-known fact that Indian villages are spatially segregated spaces - better-off households tend to live closer to the village centre and marginalized groups like Scheduled Castes are often forced to the periphery.8 Moreover, even in urban areas, recent research points to the persistence of caste-based segregation as well as the 'peripheralization of the poor'. Hence, commencing sampling from the main street or village centre is unlikely to result in a representative sample, it may not be left out but may be less represented. Another issue with the CPHS sampling design that deserves mention is that it results in a highly urban-skewed sample.

References

Rannan-Eliya, R., & Lorenzoni, L. (2010). Guidelines for Improving the Comparability and Availability of Private Health Expenditures Under the System of Health Accounts Framework. Paris: OCED Publishing. doi:https://doi.org/10.1787/5kmbrcg0clvc-en.

AR, O. (1971). The Epidemiological Transition: A Theory of the Epidemiology of the Population Change. The Milbank Memorial Fund Quarterly. Vol. 49(4), 509-38.

Bank, W. H. (2022, March 31). SDG Indicator Metadata.

Central Bureau of Health Intelligence, M. o. (2020). National Health Resource Repository (NHRR). New Delhi: Central Bureau of Health Intelligence, Ministry of Health & Family Welfare & National Remote Sensing Centre,

Garg CC. Financing of Health Care in India: Results of NHA from Karnataka. Journal of Health Management. 2001;3(2):199-237. doi:10.1177/097206340100300203

Dilip, T., & Nandraj, S. (2021, December 12). Why India's recent report on a fall in out-of-pocket health expenditure may not be accurate. Retrieved from Sroll: https://scroll.in/article/1012059/why-indias-recent-report-on-a-fall-in-out-of-pocket-health-expenditure-may-not-be-accurate

Drèze, J., & Somanchi, A. (2021, June). The Covid-19 Crisis and People's Right to Food. SocArXiv. doi:doi:10.31235/osf.io/ybrmg.

Hooda, S. (2015, December). Private Sector in Healthcare Delivery Market in India:Structure, Growth and Implications. (ISID, Ed.) New Delhi, Delhi, India.

Indranil. (2021, December 08). Health account numbers that require closer scrutiny. India: The Hindu. Retrieved December 21, 2022, from https://www.thehindu.com/opinion/op-ed/health-account-numbers-that-require-closer-scrutiny/article37889514.ece?homepage=true

Ministry of Law and Justice, G. o. (2010). The Clinical Establishments (Registration and Regulation) Act. New Delhi: Ministry of Law and Justice, Government of India.

MoSPI, I. (2022, April 5). Ministry of Statistics and Program Implementation, India. Retrieved from National Data Archieve - An online microdata library: http://microdata.gov.in/nada43/index.php/catalog/135

Mukhopadhyay, I., Bose, M., Anil, V., & Lahariya, C. (2022). Analysis of Household Expenditure on Healthfrom the Primary Data of 75th and 71st Rounds ofSurvey by the National Sample Survey Office. doi:https://doi.org/10.54945/preserve.8

National Health Systems Resource Centre. (2016). National Health Accounts Guidelines for India. New Delhi: National Health Systems Resource Centre, Ministry of Health and Family Welfare, Government of India.

National Health Systems Resource Centre. (2022). National Health Accounts Estimates for India. New Delhi: National Health Systems Resource Centre, , Ministry of Health and Family Welfare, Government of India .

NHSRC, N. H. (2016). Household Health Expenditures in India. New Delhi: National Health Systems Resource Centre, Ministry of Health and Family Welfare, Government of India.

OECD. (2017). A System of Health Accounts 2011 - Revised Edition. Paris: OECD.

Press Information Bureau, G. o. (2019, November 23). Household social consumption in India: Health NSS 75th round (July, 2017 – June, 2018). New Delhi, Delhi, India.

Ray Moynihan, S. S. (2021). Impact of COVID-19 pandemic on utilisation of healthcare services: a systematic review. BMJ Open. Retrieved from https://bmjopen.bmj.com/content/11/3/e045343

Sanjay K. Mohanty, J. R. (2021). Morbidity compression or expansion? A temporal analysis of the age at onset of non-communicable diseases in India. GeroScience Official Journal of the American Aging Association (AGE).

T R Dilip, S. N. (2017). National Health Accounts Estimates - The More Things Change, the More They Remain the Same. Economic and Political Weekly, LII No 23.

T R, D., Narayanan , D., & Nandraj , S. (2021). Utilisation of Public Healthcare Facilities Have They Improved? Economic and Political Weekly, vol lVi no 38.

Tarun K George, J. V. (2020). The impact of demonetisation on the utilisation of hospital services, patient outcomes and finances: a multicentre observational study from India. BMJ Global Health ;5:e002509. Retrieved from https://gh.bmj.com/content/5/9/e002509

WHO. (2022, April 14). Global Health Expenditure Database. Retrieved from Global Health Expenditure Database: https://apps.who.int/nha/database

WHO and World Bank. (2021). Tracking universal health coverage, Global Monitoring Report 2021. Geneva: World Health Organization.

Xu, K. (2005). Distribution of health payments and catastrophic expenditures Methodology. Geneva: World Health Organization.

We thank you for your ongoing support of our programme.

Prof Maharaj Kishan Bhan, HSTP's pillar of strength, continues to inspire our work. We are grateful to the HSTP Board and Chief Executive Officer for this work. Dr Rajesh Kumar Technical Advisor, and Pratheeba John, Health Financing Specialist at HSTP for their review. Thanks to Aparna Singh for supporting data analysis of CPHS-CMIE data and Aaliyah Ali Khan for the compilation and report design.

Health Systems Transformation Platform
C-Block, Plot 4, ISID Campus, Institutional Area II, Vasant Kunj, New Delhi 110070
+91-11-6132-6500 I +91-11-6132 6599
www.hstp.org.in I @HSTPIndia