HARVARD T.H. CHAN
SCHOOL OF PUBLIC HEALTH
Department of Global Health and Population

India Health Systems Project

Odisha Health System Assessment Study Report

Anuska Kalita, Annie Haakenstad, Bijetri Bose, Jan Cooper, Liana Woskie, the IHSP Team*, and Winnie Yip

February 2022

* The Principal Investigator of this project is Prof. Winnie Yip. Members of the project team include Prof. William Hsiao, Prof. Michael R. Reich, Dr. Griffith Bell, Dr. Bijetri Bose, Dr. Jan Cooper, Dr. Annie Haakenstad, Dr. Anuska Kalita, Ms. Elizabeth Osborn, Dr. Dan Schwarz, and Ms. Liana Woskie. We acknowledge the contributions from a team of research assistants: Deepika Dilip, Alex Gachanja, Benjamin Gelman, Neha Gupta, Elaine He, Joanne Hokayem, Tejal Patwardhan, Alison Ross, and Brian Zhou; and collaborators at the Ariadne Labs.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table of Contents

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Preface

The India Health Systems Project is motivated by the goal of advancing health system reforms in India to provide equitable access to good quality of care and financial risk protection for its citizens. The Project adopts a system approach to assess the strengths and weaknesses of India's current healthcare system, identify underlying causes, propose potential solutions drawing on best practices within India and international experience, and, finally, to monitor and evaluate progress and impacts of reforms.

Funding from the Bill and Melinda Gates Foundation (OPP-1181215 and OPP-1181222) is gratefully acknowledged.

Winnie Yip, PhD
Professor of Global Health Policy and Economics
Principal Investigator, India Health Systems Project
Harvard T.H. Chan School of Public Health

Acknowledgments

The authors gratefully acknowledge the advice on statistical sampling from Dr. Sowmya R. Rao from MGH Biostatistics Center and Harvard Catalyst, and Dr. Alyssa Bilinski from the Department of Biostatistics at the Harvard T.H. Chan School of Public Health.

We are grateful to the team at Oxford Policy Management (OPM) who collected the data for this study.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Chapter 1
Systemic Analysis of Odisha's Healthcare System*

1.1 Introduction

Over the past few years, India has introduced a number of major healthcare reforms, both at the national and state levels. These reforms include the National Health Mission (NHM) in 2005, the Pradhan Mantri Jan Aarogya Yojana (PMJAY) and the Health and Wellness Center (HWC) Program in 2018-19, and the recent National Digital Health Mission (NDHM) launched in 2020. In addition, India has implemented various state-level initiatives on health financing and healthcare delivery—all seeking to improve the performance of the health system. Despite these reforms that made some improvements, India continues to face challenges in achieving better health system outcomes such as assuring financial risk protection, affordable and equitable access to quality healthcare, efficiency in service delivery, and citizen satisfaction about how the health system performs.

Odisha, one of the poorest states in India, faces many of these challenges in its health system. Addressing these challenges is complicated by the state's widespread poverty, difficult geographical terrain, its proneness to natural calamities, and a high proportion of vulnerable populations like Scheduled Tribes (ST) and Scheduled Castes (SC).[1]

It is against this background that the Odisha Health System Project was initiated by the Harvard T.H. Chan School of Public Health (Harvard) with support from the Bill and Melinda Gates Foundation (BMGF). The project's overarching goal is to improve Odisha's health system in order to provide affordable and equitable access to quality care for its population, while avoiding major financial risk and improving citizen satisfaction. The project also seeks to draw lessons relevant for other states in the Empowered Action Group (EAG) in India, which makes up the majority of the country's poor population.

The project consists of four components: 1) an empirical assessment of the performance of Odisha's health system; 2) diagnosis of the underlying causes of the strengths and challenges of Odisha's health system; 3) proposal of reform options to improve Odisha's health system; and 4) pilots and evaluation of reform options, subject to agreement with the Odisha government, with potential for scaling up.

This report presents findings of the empirical assessment of Odisha's health system performance, measured in terms of a set of final and intermediate outcomes (explained below). The report also presents some preliminary diagnoses of the underlying causes.

---

* This chapter was led by Michael R. Reich, William Hsiao, Winnie Yip, and Anuska Kalita, with participation from Bijetri Bose, Jan Cooper, Annie Haakenstad, and Liana Woskie.

[1] The Scheduled Caste (SCs) and Scheduled Tribes (STs) are officially designated groups recognized in the Constitution of India, comprising about 16.6 percent and 8.6 percent, respectively, of India's population (according to the 2011 census).

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

The final diagnostic analyses will be presented in the next report. This chapter provides an overview of the project's systemic analysis of Odisha's health system, using key data gathered through new surveys and identifying new findings.

1.2 Our Analytical Approach

In this project, we adopt the Control Knob Framework. Under this framework, a health system is conceptualized as a means to an end. The framework is based on a set of relationships in which certain structural components (the means) and their interactions are connected to the goals that the health system is designed to achieve (the ends) [1].

The framework identifies five policy levers that can be used in combination to achieve the health system's final and intermediate goals (Figure 1.1). The final goals are the level and distribution of *health status*, *financial risk protection*, and *citizen satisfaction*; the intermediate goals are *access, quality,* and *efficiency*. In considering both kinds of goals, the framework gives special attention to distributional issues, which are central to the role of equity in a health system.

Figure 1.1: The Control Knob Framework

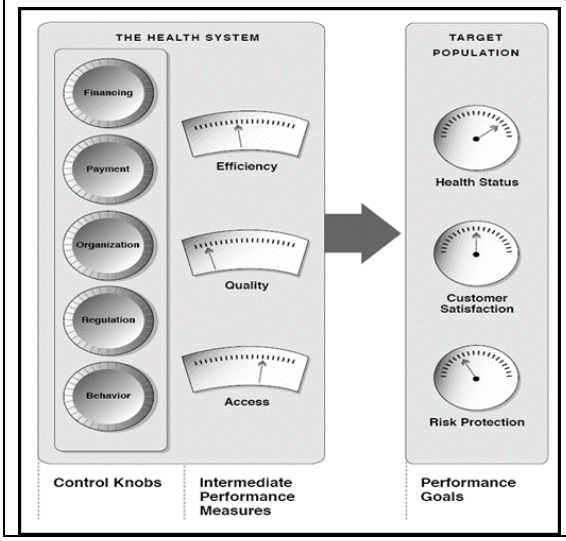
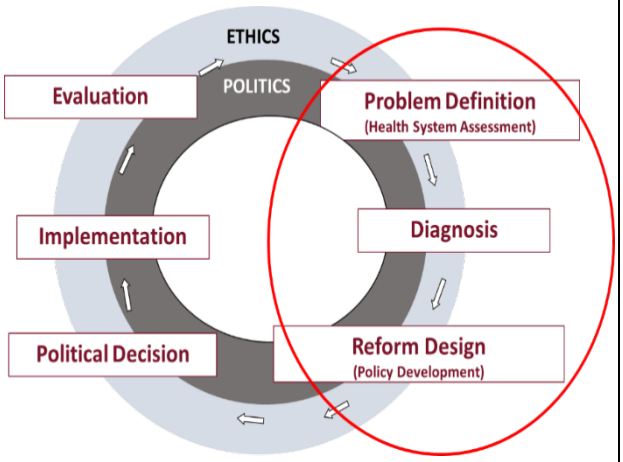


Figure 1.2: The Policy Cycle



Source: Roberts et al., 2004.

Our project's analytical approach follows the logic of a policy cycle (Figure 1.2) [1]. As such, the project started with an assessment of the strengths and weaknesses of Odisha's health system in terms of the final and intermediate outcomes (as defined in the Control Knob Framework in Figure 1.1), to identify the major issues (i.e., problem definition). This assessment will be followed by diagnosis, in which we will analyze the underlying causes of good or poor performance, especially in relation to the policy levers (financing, strategic purchasing and provider payment methods, organization of the delivery system and market dynamics, and regulation) and various inputs (health facilities, human

resources, drugs, supplies, and infrastructure). The evidence generated by these analyses, combined with careful reviews of international and Indian experiences, will inform the design and proposal of health system reform options for Odisha.

1.3 Sources of Data: Existing and Innovative Surveys

To support the assessment and diagnosis of Odisha's health system, the Harvard team first assessed existing data, such as the National Sample Survey (NSS), the National Family Health Survey (NFHS), the Economic Survey, and the Rural Health Survey. The team concluded that the existing data cover only a subset of the health system and therefore are not adequate for a systemic analysis. To address this, the team designed an innovative and new package of surveys for a comprehensive assessment of Odisha's health system. This package includes ten different surveys, with questionnaires for households, patients, providers, public and private sector health facilities at various levels of care, and chemist shops (presented in Table 1.1). (For more details, see Appendix 2, Research Design and Methodology.)

The health system surveys prepared for this assessment of Odisha have the following novel and unique characteristics:

i. **Linking demand with supply-side perspectives:** Most large-scale datasets in India have focused only on household data, such as the NSS and NFHS. Our study goes beyond households to include public and private providers and allows linking household's utilization data to characteristics of providers so we can assess how both demand and supply influence people's utilization of services and the costs associated with care.

ii. **Providing more comprehensive understanding of the private health sector:** There are huge data gaps in our knowledge of the private health sector in India and Odisha. While some data exist about large private sector tertiary-care hospitals, surveys seldom include smaller private providers, although they represent a significant proportion of the healthcare delivery system. Existing evidence on these categories of private providers is based on smaller-scale studies, usually concentrated in a few villages or a district. Our research addresses this gap in information and knowledge by collecting data from different categories of private sector providers, including hospitals and nursing homes, chemist shops, and providers engaged in solo-practice.

iii. **Collecting geospatial data to allow market analyses:** Our surveys collected geospatial data that allow analyses of market behavior, including such questions as where users and providers are located, whether providers are clustered in certain locations, and if users are bypassing the nearest providers to visit one that is further away.

iv. **Going beyond quantity to assess quality and effectiveness:** Existing analyses and data in India to date have focused on the quantity of services.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

> However, physical availability and quantity does not translate to health outcomes or patient satisfaction unless there is good quality. Our surveys include citizen satisfaction, with patient experiences collected at both outpatient and inpatient exit interviews across all levels of healthcare providers, and all three fundamental aspects of quality of care (patient safety, patient centeredness, and clinical effectiveness).

To supplement the ten new surveys, the assessment team used existing state-level data, such as the National Family Health Survey (NFHS) and Sample Registration System (SRS) Statistical reports.

In the next section, we present the key findings from our assessment of the health system goals in Odisha. We highlight the achievements and challenges that Odisha faces for each health system goal and the new knowledge that our study has added to understand each goal. We compare our findings to existing datasets and benchmarks, wherever applicable. As mentioned above, this assessment is the first step of health system analysis; it tells us how Odisha's health system is performing, but not the underlying reasons for good or poor performance. However, we also begin the process of diagnosis. For each outcome, we present possible causes and hypotheses that might lead to the observed findings.

We organize our results in the next two sections first by final outcomes (health status, financial risk protection, and citizen satisfaction), then followed by intermediate outcomes (access, quality, clinical effectiveness, patient safety, patient centeredness, and efficiency).

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 1.1: The ten Odisha health system surveys, with sample sizes, and objectives

SURVEY	SAMPLE SIZES*	OBJECTIVES
1. Household survey	• Households in sampled districts - 7567 (includes data about each member of the household) - 30645 individuals	• Assess financial risk protection, access to care, perception of quality, and satisfaction of households • Understand health seeking behaviors and reasons behind choice of providers • Understand referral patterns (how often patients are referred from public providers to private, including: pharmacies, diagnostic centers and private clinics) private clinics
2. Hospital and Community Health Center (CHC) facility survey	• State level census of Medical College Hospitals & Tertiary Hospitals - 6 • All District Hospitals (DH) from sampled districts - 4 • All Sub-Divisional Hospitals (SDH) from sampled districts - 5 • All "Other" public hospitals (based on inclusion criteria) - 29 • All private hospitals in the state (based on inclusion criteria) - 36 • All Community Health Centers (CHC) from sampled blocks - 83	• Understand the functions and efficiency of different types of healthcare providers • Analyze how financing, provider payments and incentives, governance, organization and management affect service delivery of different types of healthcare providers • Understand referral linkages among providers (including among public facilities, private facilities, solo-providers, and chemists)
3. Primary care facility survey	• All Primary Health Centers (PHC) from sampled blocks - 130 • All Sub-Centers (SC) from sampled blocks - 259 • All Health & Wellness Centers (HWC) from the sampled blocks - 7	
4. Providers in facilities survey	• Providers across Medical College Hospitals & Tertiary Hospitals, District Hospitals, Sub-Divisional Hospitals, other public hospitals, private hospitals, CHC, PHC - 794	• Understand provider motivations and their interactions with the facility in which they work • Understand dual-practice (public providers in private practice) • Understand referrals and motivations/incentives behind referral decisions • Undertake market analysis of different types of providers
5. Solo providers survey	• Providers practicing from their homes/private offices/pharmacies across sampled districts - 685	
6. Chemists survey	• Chemist shops (medicine shops) across sampled districts - 1036	
7. In-Patient exit survey	• In-patients from Medical College Hospitals & Tertiary Hospitals and District Hospitals - 507 • Out-patients from Medical College Hospitals & Tertiary Hospitals, District Hospitals , Sub-Divisional Hospitals, private hospitals, CHC, PHC, solo providers – 978	• Assess patient experience of seeking care, focused on perception of quality • Understand referral patterns • Assess healthcare expenses incurred by patients
8. Out-Patient exit survey		
9. Patient safety culture survey	• Providers across Medical College Hospitals & Tertiary Hospitals, District Hospitals, Sub-Divisional Hospitals - 2687	• Assess patient safety culture in hospitals
10. Clinical Vignette survey	• Providers at the primary level (includes Medical Officers in PHCs and solo providers) - 110	• Assess knowledge/competence of providers to provide clinically effective care • Understand prescribing behavior of providers (focused on unnecessary/irrational and harmful drugs)

* Sample sizes mentioned here are actual samples from whom data were collected in the surveys. In some cases, these actual sample sizes differ from the planned sample sizes. The details of these differences and the reasons behind the differences are discussed in Appendix 2 of this report.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

1.4 Final Outcomes

In this section, we summarize the achievements and challenges of Odisha's health system on the ultimate goals of any health system: improving health status, assuring financial risk protection, and providing citizen satisfaction.

1.4.1 Health Status

Odisha has achieved notable progress in health status over the past several decades, especially on indicators linked to maternal and child health (MCH). These advances are probably due to government priorities and donor support for vertical programs in MCH. Nonetheless, significant problems in health status persist, compared to other states in India, and room for improvement exists.

One key goal of a health system is to improve the health status of the population that it serves [1]. The key categories for measuring health outcomes include standard public health indicators of mortality, fertility, morbidity, and self-rated health. A considerable amount of data is available on health status indicators for Odisha. We have used these secondary data to assess Odisha's performance on health status.

Our analysis of existing data [2-4] shows that Odisha has made notable advances in health status in recent years. The state's infant mortality rate (IMR), for example, has reduced significantly from 112 in 1992-93 [5] to 40 in 2014-15 [4]. The state has achieved one of the fastest declines in maternal mortality compared to India's seven other EAG states,[2] with a decrease in maternal mortality rate (MMR) from 235 in 2010-12 to 168 in 2015-17. [2, 6]. Even though Odisha still has the highest incidence of malaria in the country, the state has seen a steep decline of more than 80 percent in malaria cases between 2017 and 2019 [7].

Despite Odisha's progress in some areas, several health status indicators continue to be major warning signals. Even with its significant decline, Odisha's IMR (40) compares poorly to the national average of 32, and the IMR found in other EAG states like Bihar (32), Jharkhand (30) and Rajasthan (37) [2]. Odisha's MMR (168) is still higher than the national average and many other states in India [2, 8]. While the mortality rates associated with infectious diseases such as diarrheal diseases (84), drug-susceptible tuberculosis (67), and malaria (24) have declined over the last two decades in Odisha, the rates are the highest among the EAG states [9]. Odisha faces the double burden of communicable and non-communicable diseases (NCDs); it had the highest incidence of both communicable, maternal, neonatal, and nutritional diseases (375,369 new cases per 100,000) and non-communicable diseases (181,283 new cases per 100,000) among the EAG states in 2019. More than half the deaths in the state are caused by NCDs, especially cardiovascular and respiratory diseases [3, 5].

[2] India has identified eight Empowered Action Group states, which are recognized as socioeconomically less developed, including high infant mortality rates and delayed demographic transitions. These EAG states include: Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Rajasthan, Uttaranchal and Uttar Pradesh, along with Odisha. The group of EAG states provides an important benchmark for assessing Odisha's health system performance in this report.

Odisha also shows significant equity concerns in health status for certain population sub-groups, especially people in rural areas, those belonging to Scheduled Tribes (STs), and households in the lower wealth quintiles. These groups also experience lower life expectancy, higher morbidities, and higher infant and maternal mortalities. (See Chapter 2 for more details on Health Status in Odisha.)

Odisha's improvements in health status indicators suggest the possible positive role of investment and priority given to vertical programs for MCH and malaria along with concerted efforts from the state government, central government, and international agencies. Initiatives such as the NHM and its community health worker (ASHA) program, Janani Sishu Suraksha Yojana (JSSY), and state-level schemes like Mamata and Sammpurna are all aimed at improving MCH outcomes [10-12]. (See Appendix 1 for more details on these programs.) The achievements in the reduction of malaria have been associated with the state's intensified malaria control initiative known as DAMAN [13, 14], as well as the contributions from both national and global malaria interventions.

1.4.2 Financial Risk Protection

Odisha residents experience high financial risks, with spending on medicines from the private sector being a major contributor, even for people who seek care at public sector health facilities. Existing health insurance provides limited financial risk protection due to low uptake and service coverage that may not address the source of high health spending.

Financial risk protection is the extent to which households are protected from economic hardship associated with paying for health services. The Odisha Health System Assessment Study aimed to answer two research questions regarding financial risk protection: (i) to what extent are households in Odisha protected from the financial risks of high healthcare costs? and (ii) what are the determinants of lack of financial risk protection in the state? The data used in assessing financial risk protection in Odisha are all sourced from our household survey (Survey 1 in Table 1.1), which captured responses from 7,567 households and 30,654 individuals. The detailed assessment of financial risk protection is presented in Chapter 3 of this report. Here we present new findings, highlighting how our study addresses critical knowledge gaps in understanding how Odisha's health system performs in pursuing the goal of financial risk protection.

Our analysis shows that financial risk protection in Odisha is worse than in other states in India, including other EAG states. Existing data show that Total Health Expenditure (THE) in the state is around $46 per capita (Rs. 2,949), which is below other Indian states. Most of this THE is paid by individuals through out-of-pocket expenditure (OOPE) (76 percent), one of the highest rates in India [15, 16]. A majority of this OOPE is spent on buying drugs (68 percent) [16]. Odisha has the second-highest rate of Catastrophic Health Expenditure (CHE) across India, according to NSSO data. For 24 percent of the state's households, OOPE on health surpasses 10 percent of household consumption expenditure (the standard definition of CHE), and around 10 percent of families are pushed into poverty due to

health expenses (the standard definition of Impoverishing Health Expenditure) [15, 16].

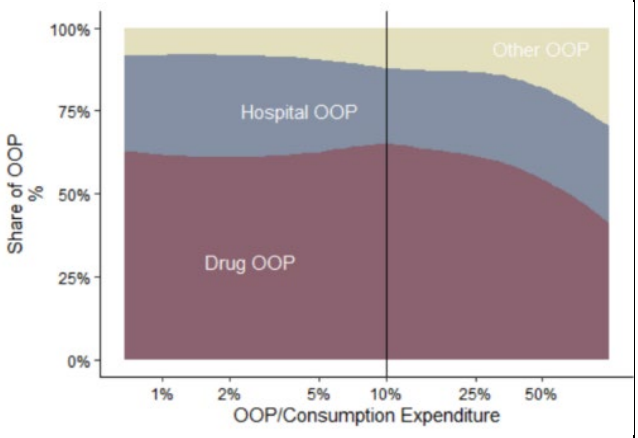
One key objective of our assessment was to gain a better understanding of where families spend their money on healthcare and the possible causes of high OOPE on drugs in Odisha. According to existing data, the majority of Odisha's households seek care at public sector facilities where treatment and drugs are free to a large extent, and more than 80 percent of the population has been automatically covered under the state health insurance scheme known as the Biju Swasthya Kalyan Yojana (BSKY). (See Appendix 1 for more details.) To gain this better understanding of the weak financial risk protection in Odisha required new data and new analysis. Next we use data from our survey to present key findings and possible causes for Odisha's high OOPE and high expenditure on drugs.

Our analysis confirms that OOPE and CHE are very high in Odisha, supporting the findings from existing data, and that a majority of OOPE is spent on drugs. Our new data provide additional insights on out-of-pocket spending by families. We found that expenses on medicines constituted a large proportion of the OOPE in the state, with 69 percent for outpatient (OP) care and 32 percent for inpatient (IP) care in hospitals. Table 1.2 and Figure 1.3 disaggregate Catastrophic Health Expenditure (CHE) by spending on drugs, hospitalizations, and other OOPE, showing that 65 percent of CHE (at 10 percent of household consumption expenditure) was due to drugs alone. We then estimated how different interventions could change CHE in Odisha. Our analysis estimated that eliminating health spending on drugs would reduce CHE to just 9 percent, a decline of 65 percent, whereas eliminating spending on hospitalizations would reduce CHE to 19 percent, a decline of only 22 percent (Table 1.2). Figure 1.3 shows that the proportions of expenditure for drugs, hospital care, and other care are more or less constant as OOPE on health (as part of all household spending) increases from zero to 10 percent.

Table 1.2: CHE overall and by spending type

Catastrophic Health Expenditures	Value
Share of households with CHE at 10%	24%
Share of households with CHE at 25%	10%
Share of CHE at 10% due to drugs	65%
Share of CHE at 10% due to hospital spending	22%
CHE at 10% if drug spending eliminated	9%
CHE at 10% if hospital spending eliminated	19%

Figure 1.3: OOP over consumption expenditure, decomposed by spending type



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

One possible explanation for Odisha's high OOPE on drugs could be the state's limited insurance coverage. Only 14 percent of the households in our study reported being covered under any insurance scheme. This is despite over 80 percent of Odisha households being eligible and automatically covered under BSKY. The low reported coverage might be because households are not aware of their insurance status. Additionally, the services covered under most insurance schemes do not include outpatient care or drugs; drugs are included for hospitalization only during the hospital stay and only if patients obtain the drugs from the same hospital where treatment occurs, but not if they buy drugs from another facility or a chemist shop. (See Appendix 1 for more details on BSKY and provider payments.)

Since most insurance schemes in Odisha cover only hospitalization, we sought to understand OOPE at hospitals, for both insured and non-insured patients. Our survey found that just 4 percent of respondents hospitalized in public facilities and 9 percent of those hospitalized in private facilities reported using an insurance program. For all hospitalized patients, OOPE at private hospitals was 226 percent higher than public hospitalizations on average (Rs. 10,407 for public and Rs. 33,886 for private hospitals). We also looked at the impact of hospitalization on financial risk for households. CHE rates were more than twice as high for those hospitalized in private facilities (52 percent) compared to respondents hospitalized in public facilities (19 percent), and insurance offered little protection (Figures 1.4 and 1.5). More than a fourth of those who were insured and went to public hospitals still incurred CHE.

Figure 1.4: CHE rates for hospitalization, by public/private facility

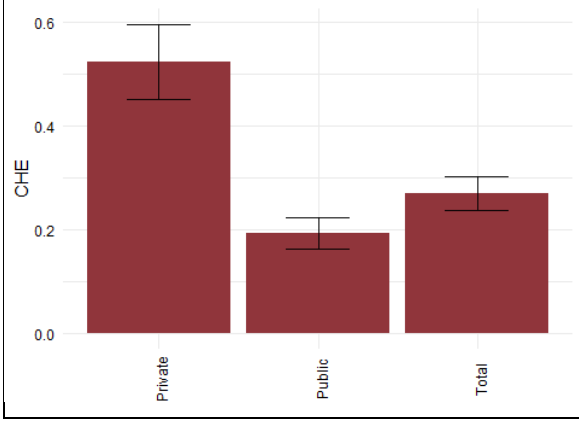
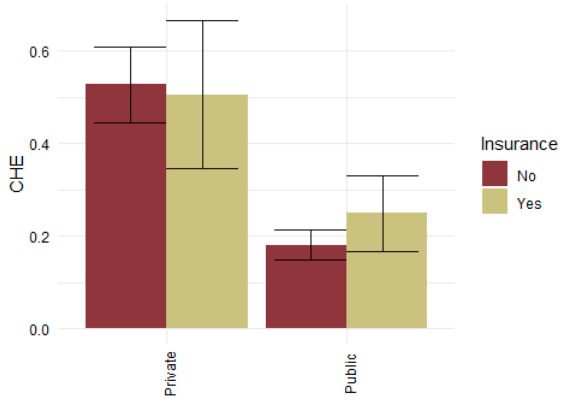


Figure 1.5: CHE rates for hospitalization, by public/private, and with/without insurance



Our results show that many patients purchase drugs from private sector chemist shops, and these purchases create significant economic hardship for families. These purchases occur even for people who seek care at public sector facilities. Our household survey found, among users of OP care, an overwhelming 86 percent purchased drugs from private chemists. Even among those seeking care in the public sector, 72 percent reported purchasing drugs from private chemists. Furthermore, the share of OOPE contributed by drug expenses for public sector hospitals is 41 percent, even though these expenses are included in the BSKY

benefits package (see Appendix 1 for details on BSKY), and Odisha's Niramaya Scheme specifically aims to provide free drugs in public sector hospitals. Table 1.3 presents these findings.

Table 1.3: OOPE on drugs by type of care and type of provider

Type of care and provider	Share of patients with CHE (using monthly consumption expenditure)	Mean spend per visit (Rupees)	Drug share of OOP	Mean drug OOP (Rupees)	Share purchasing drugs from private sector chemist
Outpatient					
Public (46%)	25%	790	59%	428	72%
Private hospital outpatient departments and solo providers (24%)	38%	1404	67%	754	100%
Private Chemists and other providers (30%)	25%	735	73%	512	98%
Inpatient					
Public (75%)	19%	10,407	41%	3,287	n/a
Private (25%)	52%	33,886	37%	10,380	n/a

Source: Survey 1, Household Survey; Note: n/a = not asked.

One possible explanation why people purchase drugs from private chemists is a lack of supply of drugs and frequent stock-outs at public sector facilities. Our study found that the availability of drug stocks varied for public sector facilities depending on the level of care; while 73 percent of essential drugs were available at public hospitals, this number was only 18 percent for Sub-centers. Our data show that public sector hospitals had better stocks than private-sector hospitals and lower-level facilities, but stocks were far from complete. The unreliable supply of drugs, especially at lower level public facilities, helps explain why 72 percent of patients at public sector outpatient facilities purchased drugs from private chemists (Table 1.3).

Another possible explanation for high spending at private chemists could be related to provider incentives. For example, public sector providers might send their patients to a private chemist where they have financial interests, through either ownership of the chemist shop or commissions for sales of drugs to referred patients [17]. Our data show that among users of public OP care, 15 percent reported that the provider referred them to a specific chemist shop, but cooperation between providers and chemists may also operate in three other, less direct ways:

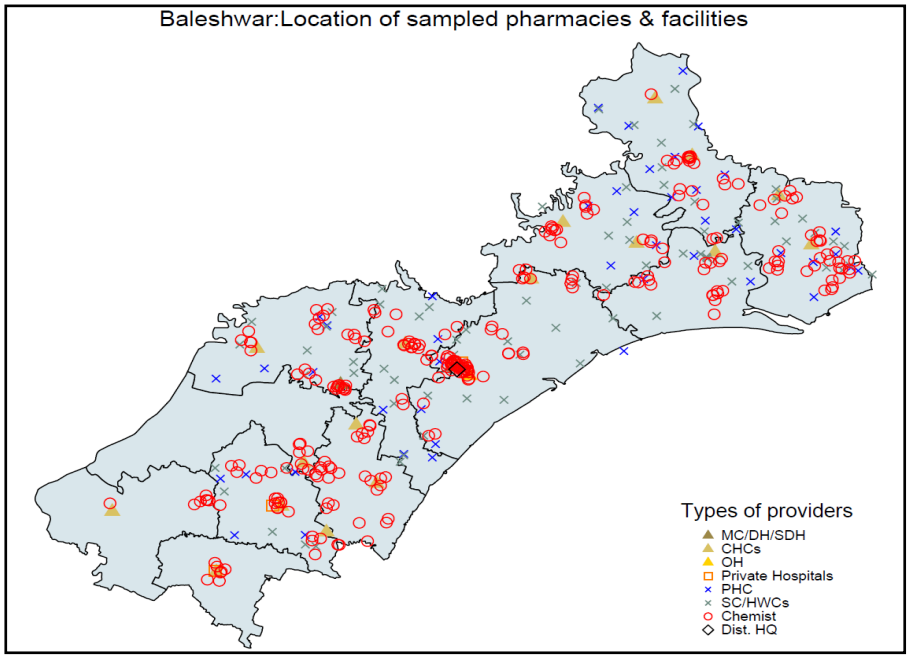
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

i. Providers may prescribe drugs that they know are not stocked in the public facility (for example, specific brands or fixed-dose combinations) but are carried by certain private chemists. Our data from vignette-based interviews with OP care providers in both public and private sectors show that providers prescribe a high number of drugs for each case of illness (2.90 drug products per visit), prescriptions are seldom for generic drugs, and a majority of these prescribed drugs are unnecessary to treat the condition. (See the discussion below on clinical effectiveness and Chapter 6.1 for more details.)

ii. Providers and chemist shops may collaborate through geographical co-location. Preliminary market analysis shows that 93 percent of public secondary and tertiary healthcare facilities and 58 percent of public primary healthcare facilities have a private chemist shop within a three kilometer radius. The mean number of private pharmacies within this three kilometer radius of a public hospital is eight, and the mean number for public primary healthcare facilities is two. Figure 1.6 illustrates this clustering of chemist shops in Baleshwar district. Evidence to support provider referral of private pharmacies to patients is weak, but this could be a result of respondents' under-reporting of such behavior. Three commonly self-reported reasons why patients prefer private pharmacies are for the stock of drugs, variety of drugs and convenient hours of operation. We find that the stocks of drugs at chemist shops have fewer essential medicines in stock than public hospitals on average. However, our results suggest that private pharmacies frequently order and stock select varieties of drugs, especially branded ones. Private chemists are also open for longer hours, making convenience an important reason why patients prefer going there. (See Appendix 4 for a more detailed market analysis of chemist shops.)

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 1.6: Geographical location of private chemist shops around public facilities



iii. People may also decide to purchase drugs from private chemists due to their preferences and perceptions of quality. Existing literature has found evidence that people prefer purchasing drugs at a private chemist over those available at public sector facilities [18-20]. This is due to perceptions of quality of the drugs at the two types of facilities: private facilities and chemists tend to stock branded or branded generic drugs, whereas government-run facilities tend to stock generic drugs, which, published literature has shown, are viewed as lower quality by much of the population [17, 21, 22].

The findings above offer a new and more nuanced understanding of financial risk protection in Odisha and suggest several possible explanations for high CHE and OOPE on drugs. We will undertake more analysis of possible causes in the diagnostic phase of our project, with the objective of informing the design of policies to improve financial risk protection in the state.

1.4.3 Citizen Satisfaction

Odisha residents expressed widespread dissatisfaction with their health system and a need for its improvement. Confidence in the health system was lower among people in rural areas, those belonging to ST and SC groups, those without insurance coverage, and among households with low income and educational attainment.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Citizen satisfaction is the degree to which citizens, or the public, are satisfied with the health system.[3] There are few data sets that include variables needed to assess citizen satisfaction, especially in low- and middle-income countries (LMICs) like India. To the best of our knowledge, our survey was the first attempt to assess citizen satisfaction of the health system in Odisha at this scale. We sought to answer two main research questions linked to citizen satisfaction: (i) How satisfied are citizens of Odisha with the state's health system? and (ii) What are the determinants of citizen satisfaction in the population? We analyzed the association of satisfaction levels with different variables: the place of residence (rural/urban), poverty, education levels, social groups, insurance coverage, and choice of providers. To assess citizen satisfaction, our study adapted questions from the Commonwealth Fund Survey [23], and included them in our household survey that was administered to 7567 households. A detailed assessment of citizen satisfaction is presented in Chapter 4 of this report. Below, we present several new findings from this survey of satisfaction.

Our findings in Odisha show widespread citizen dissatisfaction with the health system and a desire for improvement. In the survey, 56 percent expressed a need for major changes to the health system, 33 percent reported that the health system needs to be completely rebuilt, and 91 percent of households considered it "very important" to improve the health system. Even with these poor ratings, however, 57 percent of households reported that they are "very confident" about receiving care from the health system if they fall ill.

Here are additional new findings on citizen satisfaction from our survey, and some implications for future reforms:

i. Relatively high levels of citizen satisfaction were reported with physical access and availability of services, public and private providers together. For example, people reported high satisfaction with provider's location (70 percent for OP care and 68 percent for IP care), provider's hours of operation (69 percent for OP care and 72 percent for IP care), ability to choose providers for inpatient care (66 percent), and availability of drugs and diagnostics at hospitals (69 percent). As mentioned above, Odisha has improved the physical availability of healthcare and essential services in recent years. These improvements have probably contributed to people's positive perceptions of these aspects of the health system.

ii. The lowest satisfaction ratings were reported for treatment expenses for hospitalization, with 36 percent of people reporting poor satisfaction levels on this question. Households with insurance coverage, however, reported higher satisfaction with the health system than those that did not have coverage (Table 1.4). These findings highlight the need for efforts to improve financial risk protection in Odisha, as discussed in the previous section and in Chapter 3 of this report.

[3] Citizen satisfaction is different from patient satisfaction, in that it pertains to both non-users and users of health services, and incorporates people's perceptions, as well as their confidence and trust in the health system.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

iii. Citizen satisfaction with the health system in Odisha was significantly predicted by place of residence, educational attainment, income, and belonging to vulnerable social groups, as shown by the analysis presented in Table 1.4. People in rural areas, those belonging to ST and SC groups, and those with lower educational attainment reported lower confidence to receive care from the system and expressed a higher need for improving the system. Households below the poverty line expressed a higher need for improving the system. These findings raise critical concerns about equity of health system performance for different population groups in Odisha.

iv. Households who preferred going to a private provider for major illnesses expressed higher satisfaction with the health system and higher confidence to receive care when ill. These findings may indicate people's perceptions of public versus private providers and possibly a lack of trust in public facilities for certain types of care.

Table 1.4: Determinants of citizen satisfaction in Odisha

Dependent Variables / Independent Variables	Endorsement of the health system	Confidence to receive treatment from the health system	Perceived importance to improve the health system
Education	0.005 (0.017)	0.036** (0.018)	-0.155*** (0.033)
Social Group	-0.683***(0.149)	-2.945***(0.150)	1.681*** (0.256)
Income (BPL)	0.094* (0.052)	-0.016 (0.052)	-0.272***(0.099)
Insurance Status	0.177*** (0.062)	0.057 (0.062)	-0.320** (0.124)
Location (rural/urban)	-0.019 (0.060)	-0.288*** (0.062)	-0.217**(0.104)
Preferred provider minor illnesses	-0.008*** (0.003)	0.002 (0.005)	0.007 (0.009)
Preferred provider major illnesses	0.029*** (0.003)	0.033*** (0.005)	-0.039*** (0.013)

Source: Survey 1, Household Survey. *=p<0.1, **=p<0.05, ***=p<0.01; standard errors in parentheses.

This review of our survey suggests how satisfied or dissatisfied the people of Odisha may be with their state's health system. The results can help inform policymakers and political leaders about public perceptions of the health system. The findings importantly indicate how citizens perceive aspects of accessibility, equity, affordability, and service quality of their health system. This new information on public perceptions of Odisha's health system may also reflect how the public views the achievements and limitations of health reforms undertaken in recent years in the state, thereby suggesting strategies for new reforms that policymakers can consider.

1.5 Intermediate Outcomes

In this section, we summarize the achievements and challenges of Odisha's health system on three intermediate outcomes: access, quality, and efficiency.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

1.5.1 Access

In Odisha, close to 90 percent of the people seek care when ill, and a majority of them seek care from the private sector, including from chemist shops. Although the physical availability of health facilities and the uptake of essential services have improved, concerns persist about equitable access to services for vulnerable groups.

In this study, we define access as the use of health services measured by self-reported visits to healthcare providers for outpatient and inpatient care across public and private sectors. Access incorporates the availability, affordability, and acceptability of healthcare services. Most existing datasets and large-scale surveys have focused on the physical availability of health infrastructure or health services to measure access. While the availability of care is a necessary condition, care availability does not always result in equal access to utilization of care. Examples are low uptake of immunization services or the bypassing of public sector PHCs to go to hospital OP departments even for minor illnesses. It is therefore important to understand where people access care and why people may not access available services: is it because of health-seeking behaviors, knowledge, perception of quality of services, or inequity in the delivery of services?

Our assessment of access aimed to answer these questions and address existing knowledge gaps for Odisha. The data used in assessing access came from our household survey (Survey 1 in Table 1.1), which captured responses from 7,567 households and 30,654 individuals. A detailed assessment of access is presented in Chapter 5 of this report. Here we present key findings, highlighting how our study offers new insights into understanding access to healthcare in Odisha.

The first significant finding from our survey is the role of private sector providers, especially chemists, in where people seek OP care. Our analysis shows that, contrary to current understanding, a majority (54 percent) of the households sought OP care from the private sector. Out of these households, 16 percent sought care from chemist shops – a provider category that has been often neglected by other surveys and in health reform discussions.[4] Among households with people who sought OP care in the past 15 days, 13 percent reported having visited a chemist shop as the first contact. In addition, seeking care at chemist shops was common across households; no noticeable differences were found across wealth quintiles and social groups, and only a small difference between rural (17 percent) and urban (11 percent).

A second key finding is the important role that public and private sector hospitals provide for OP care. Out of the 46 percent of households who sought OP care in the public sector, 33 percent reported going to public primary care facilities, and 13 percent went to outpatient departments at public hospitals. Similarly, out of the people who sought care in the private sector, 20 percent reported seeking care at outpatient departments of private hospitals.

[4] Collecting data on utilization of chemist shops as a category of provider is the main reason why our data on private-sector care is much higher than that reported by the NSS (38.4 percent).

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

In terms of hospitalization, our data show that most people (almost 77 percent) went to public sector hospitals and out of these 56 percent went to district hospitals and CHCs.

Existing data sources (not our surveys) show that Odisha has made notable improvements in the physical availability and uptake of some essential health services. The state has improved coverage of health services over the last few decades. From 1992 to 2015, full basic immunization among children has increased from 36 to 79 percent [4, 5]. During the same period, Odisha has made significant improvements in both ante-natal care (ANC) and institutional deliveries, with ANC increasing by 26 percentage points (from 35 to 61 percent) and institutional deliveries rising from 14 to 85 percent [4, 5]. Our survey shows that this increasing trend is continuing: among recently pregnant women in our sample, 67 percent reported having at least four ANC visits. The confirmation of both the levels of care uptake and positive trends are important achievements for Odisha.

These achievements in access may reflect the influence of past health sector investments and priority given to MCH programs like the state-level Sammpurna Scheme (2017), implemented in conjunction with the national Janani Sishu Suraksha Yojana (JSSY), and the National Health Mission (NHM), especially the community health worker ASHA program [10-12], as well as efforts by non-government and international agencies. (See Appendix 1 for details on these programs.)

Another area of improved access is the physical availability of health services. Odisha has built a large number of primary and secondary health facilities to address shortfalls in health infrastructure. From 2005 to 2019, the state built 761 new Sub-centers, reducing the shortfall significantly. During the same period, the state addressed the auxiliary nurse midwife (ANM) shortfall for Sub-centers and the shortfall in Community Health Centers (CHCs) [24]. Our survey shows that 94 percent of households in our sample reported being less than 30 minutes away from a Sub-center, 82 percent reported being less than 30 min away from a PHC, and 58 percent reported being less than 30 minutes from a CHC. Respondents from rural areas have somewhat larger distances to travel, and, importantly for equity, tribal groups did not report significantly larger travel times to health centers.

Our study also confirmed patterns in existing data about ready access to care in Odisha. Our study found that even with Odisha's large low-income and vulnerable populations living in rural areas, close to 90 percent of people who were ill in the last two weeks sought care from some healthcare provider, either public or private, allopathic or AYUSH[5] [16].

Our study also found that utilization of both OP care and hospitalization were relatively high in Odisha, as shown in existing data. We found that 10 percent of the households surveyed used OP care over a two week period, and 4 percent were hospitalized in the past year. This compares favorably to other Indian states, and

[5] Providers practicing any of the following systems of medicine: Ayurveda, Yoga, Unani, Siddha, and Homeopathy. AYUSH is formally recognized by the Indian government as a system of medicine.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Odisha ranks ninth and tenth among the states for IP and OP care utilization, respectively [16].

Physical availability of medicines is another good indicator of access. Our study found that public sector hospitals (not lower-level facilities) had better stocks of drugs compared to private sector hospitals, indicating that supply chains of medicines for tertiary care facilities might be functioning well. Using lists of essential medicines tailored to the level of care, our study found that 73 percent of essential medicines were in stock at public hospitals on average as compared to 59 percent at private hospitals, 66 percent at public CHCs, 38 percent at public PHCs, 18 percent at other public clinics (Sub-centers and HWCs), and 48 percent at privately owned chemist shops. However, as discussed above, most people still purchase their drugs from private sector chemist shops.

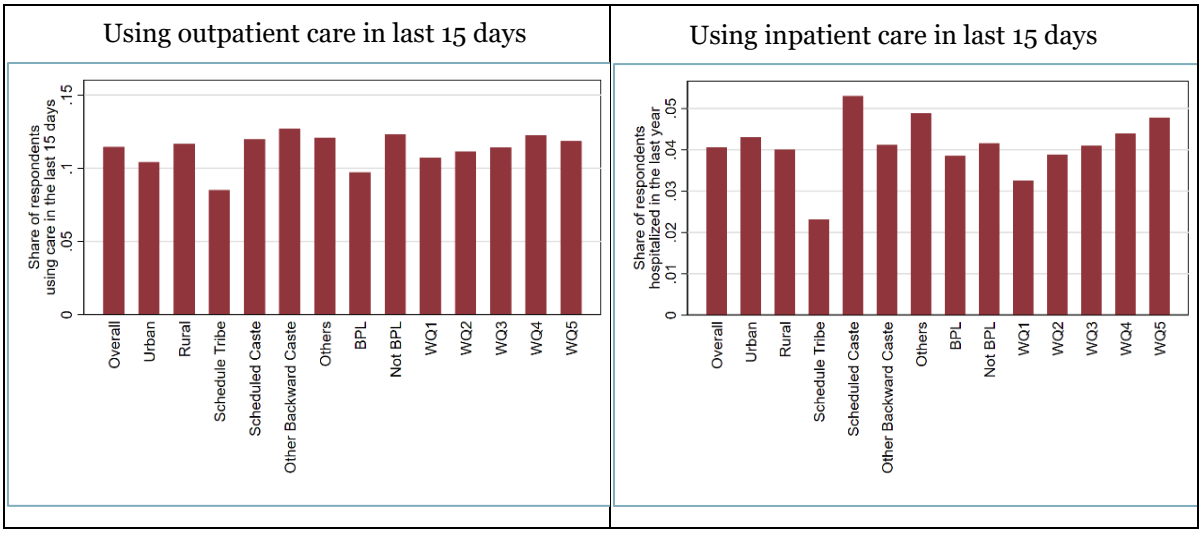
Good availability of drugs at public facilities may be a result of the Odisha government's Niramaya Scheme. This program focused on strengthening the supply chain of drugs in public facilities [25], especially public sector hospitals (see Appendix 1 for details), and involved procuring drugs through competitive tenders and online tracking of drug stocks, among other changes. However, this scheme has not been evaluated to date, so it is difficult to draw any firm conclusions about its impacts on drug stocks.

Odisha's main challenges in access are related to distributional differences in access to care, in short, questions of equity. Our study identified three main equity concerns about access.

i. First are differences in care utilization based on household wealth, social groups, and place of residence. We detected a slight gradient in hospitalization by wealth, with utilization increasing as household wealth increased. The survey found an increased use of private hospitals among wealthier quintiles, but an equal use of district/municipal hospitals across all subgroups. There is an inverse trend in seeking OP care at public primary care centers or private hospitals across wealth quintiles; among the lowest wealth quintiles, 34 percent seek OP care at public primary care centers, while in the highest wealth quintiles, 29 percent OP seek care in private hospitals. Households below the poverty line (BPL) were more likely to use OP care (2.6 percentage points, $p<.001$) but were not more likely to use IP care ($p=0.382$). Utilization of care among ST households was below the state averages: among STs, 9 percent reported using OP care in the last 15 days, compared to the mean across Odisha of 12 percent; 2 percent reported hospitalization in the last year compared to the state average of 4 percent. The rural population was slightly more likely to use OP care (1.2 percentage points) than urban residents ($p=.035$), but hospitalization rates were not distinct by area of residence ($p=0.240$) (Figure 1.7). These survey results suggest important problems of equity for both outpatient and inpatient care patterns in Odisha.

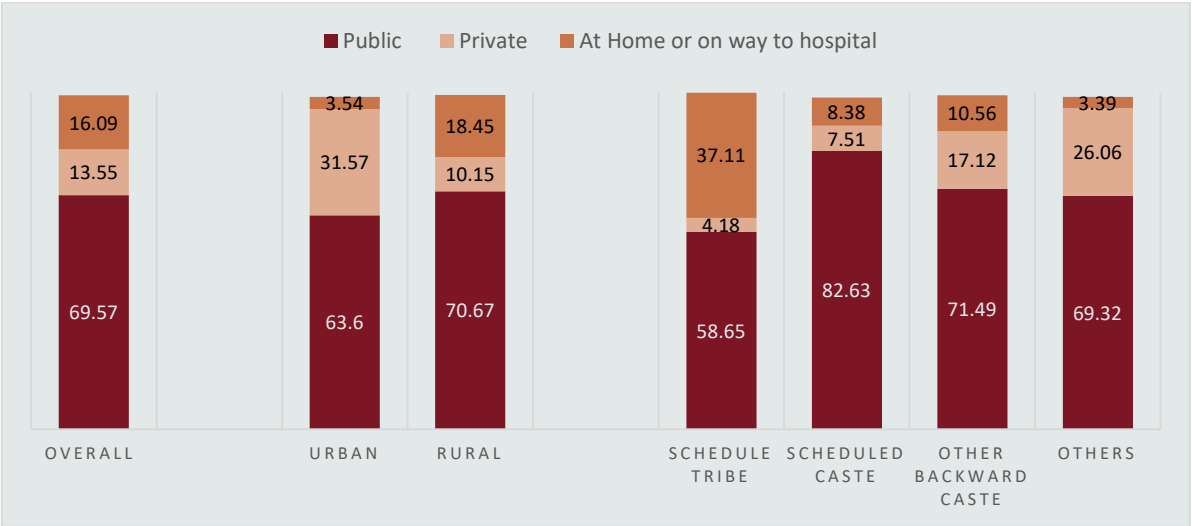
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 1.7: Differences in utilization of outpatient and inpatient care



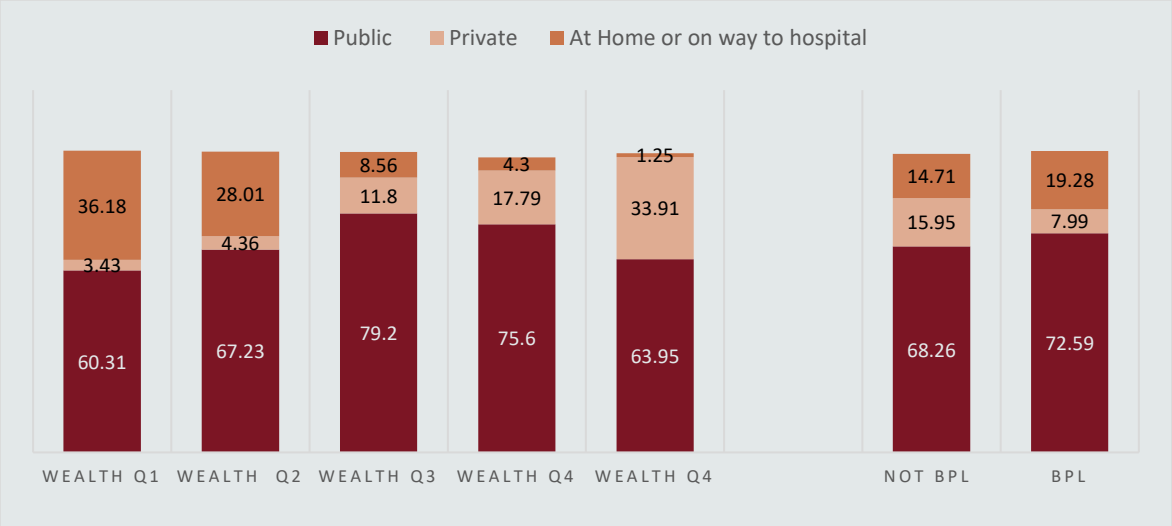
ii. A second important equity concern related to access is the use of ante-natal care (ANC) in Odisha. Our survey found differences in ANC use across subgroups, mainly according to income and wealth. Among women in the lowest income quintile, 49 percent reported having at least four ANC visits, compared with 80 percent in the highest income quintile. Similarly, our data indicate that gains on institutional deliveries have not been spread equally across the population. In particular, home deliveries are notably higher among rural areas (18 percent), STs (37 percent), and the lowest wealth quintiles (36 percent). Moreover, the use of private facilities for institutional deliveries are higher among urban women, higher wealth quintiles, and those not in a scheduled tribe or caste (Figures 1.8 and 1.9).

Figure 1.8: Inequities in place of childbirth by place of residence and social groups



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 1.9: Inequities in place of childbirth by poverty and household wealth



iii. Similar issues of equity in access appear in services related to child health. Although 85 percent of parents reported that their child had a medical check-up within 24 hours of birth, rates of these check-ups were lower among children in the lowest wealth quintile (76 percent) and STs (66 percent). We observed an inverse trend across wealth quintiles, where 48 percent of children in the lowest wealth quintiles most frequently sought care at Anganwadi Centers, and 38 percent in highest wealth quintiles sought care at hospitals.

The findings from our survey provide new insights about access to care in Odisha, especially: (i) that a majority of the households seek OP care from the private sector, and (ii) that chemist shops constitute an important source of such care are new knowledge about how Odisha's health system performs. Any effort to improve the state's health system must take these findings into account. Additionally, our findings about inequitable access indicate that although Odisha has improved the physical availability of health facilities, considerable challenges of utilization and equity remain.

1.5.2 Quality

Low quality of care is one of the most significant challenges for Odisha's health system. Poor competence among providers to diagnose and treat common conditions, poor patient safety culture in public sector hospitals, and low levels of patient satisfaction, especially among vulnerable groups, emerge as major findings of our study.

We assessed quality of care in this study according to three concepts: clinical effectiveness, patient safety, and patient-centeredness. These three aspects of quality are the major gaps in existing knowledge, but they are the critical components of healthcare linked to patient outcomes. In our study, we focused on three main questions related to quality:

i. Do patients in Odisha receive appropriate treatment for clinical conditions when they seek care? (*clinical effectiveness*)

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

ii. When patients receive care in different kinds of facilities, is the care safe and not harmful to patients? (*patient safety*)
iii. Are patients treated with respect and involved in decisions regarding their care? (*patient centeredness*)

We employed the most up-to-date effective methods to assess quality which are explained below. The detailed assessment of the three aspects of quality is presented in Chapters 6.1, 6.2, and 6.3 of this report. Here we present how our study addresses critical knowledge gaps in understanding quality for the health system in Odisha, highlighting new and important findings.

1.5.2.1 Clinical Effectiveness

Clinical effectiveness is the provision of health services based on scientific knowledge and avoiding both overuse of inappropriate care and underuse of effective care. Clinical processes, such as providing the correct clinical diagnosis and treatment are the cornerstones of effective care. The most important consideration for clinical effectiveness is the extent to which a diagnosis or treatment is based on evidence or standard guidelines and are shown to influence clinical outcomes.

A limited number of studies in LMICs, including India, have used standardized patients and vignettes to assess clinical effectiveness [26, 27]. However, our review of the literature did not find any published studies on the clinical effectiveness of OP care in Odisha, using vignettes to interview providers. Our studies in this area therefore represent an important new addition to knowledge and understanding about quality of care in Odisha.

Clinical effectiveness is usually assessed through three methods: chart reviews, standardized patients, and clinical vignettes. We decided to use vignettes because this is a cost-effective and reliable measure to assess clinical effectiveness [28-33]. We used clinical vignettes on five illness conditions (TB, childhood diarrhea, pre-eclampsia, heart attack, and asthma) (Survey 10 in Table 1.1) to interview 110 providers in the public and private sectors. Provider responses to the vignettes were evaluated against standard treatment guidelines. The public sector providers included physicians at government-run PHCs, and the private sector providers included those engaged in solo-practice, irrespective of medical qualifications. We examined differences between providers on three parameters: competence to make a correct diagnosis, knowledge of the diagnostic process, and competence to provide correct treatment. Additionally, we also analyzed prescription patterns among providers at the primary level, especially for prescription of unnecessary drugs and antibiotics.

Our study found that providers had poor competence and were often making wrong diagnoses, giving wrong and unnecessary treatment, and doing potential harm to their patients. Overall, only 58 percent of providers could make a correct diagnosis across the five illness conditions in our vignettes (Table 1.5). In most cases, providers could not prescribe the right treatment recommended by standard treatment guidelines: only 7 percent prescribed the right drugs for TB, and no provider prescribed them for the right duration, which is critical for treating TB and preventing potential drug-resistance. Similarly, only 5 percent of providers

prescribed the right treatment of oral rehydration salts (ORS) for childhood diarrhea. Although more than 50 percent of providers prescribed at least one correct drug for pre-eclampsia, heart attack, and asthma, not a single provider in our study prescribed the recommended treatment for any of these three conditions (Table 1.5).[6] Prescription of unnecessary drugs, antibiotics, and even harmful drugs were seen in a number of cases. The study found that an average of 26 percent of providers prescribed only unnecessary or incorrect drugs across all five conditions, usually consisting of antibiotics for conditions like a heart attack or pre-eclampsia, or antacids and NSAIDs (non-steroidal anti-inflammatory drugs or pain-killers) for conditions like TB, pre-eclampsia, and asthma (Table 1.5). For TB, over 90 percent of providers recommended only unnecessary or incorrect drugs.

A major problem identified by our study was the common prescription of antibiotics, even for conditions that do not require their use, such as heart attack and pre-eclampsia. Almost 90 percent of all childhood diarrhea cases were prescribed antibiotics, including, in some cases, a combination of 2 or 3 second-generation antibiotics. For TB, although almost all cases were prescribed antibiotics, they were not the recommended ones. These findings raise serious concerns about anti-microbial resistance (AMR), a major threat to global public health and to health conditions in India.

[6] Depending on the condition, the recommended treatments include drugs, follow-up diagnostic tests, and referrals to higher-level facilities. For example, according to the standard treatment guidelines for pre-eclampsia, the recommended treatment at the primary care level is a full intravenous or intramuscular dose of magnesium sulfate (instead of other anticonvulsants). In settings where it is not possible to administer the full magnesium sulfate regimen, the use of magnesium sulfate loading dose followed by immediate transfer to a higher level healthcare facility is recommended for women. For heart attack, the guideline recommends administration of 162 to 325 mg of non-enteric coated aspirin (chewed) unless contraindicated or already taken by patient, perform/evaluate 12-lead electrocardiograms (ECGs), and review a reperfusion "checklist" and immediately refer the patient to a hospital. For asthma, the recommended treatment is inhaled corticosteroid (ICS) containing controller treatment, with a combination of ICS and short-acting beta$_2$-agonists (SABA), and ICS-formoterol as needed.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 1.5: Competence of providers at the primary care level to diagnose and treat conditions

Condition	Providers who diagnosed correctly (%)	Providers who gave the right treatment as per standard treatment guidelines (%)	Providers who gave at least one correct drug (%)	Providers who gave only unnecessary/ incorrect drugs (%)
Tuberculosis	40	6.82	N/A	91.90
Pre-eclampsia	53.64	0	52.54	39.98
Diarrhea	71.82	5.06	72.15	22.78
Heart Attack	67.27	0	55.41	25.68
Asthma	55.45	0	60.66	29.51

Source: Survey 10, Clinical Vignette Survey

In most cases, we also found that public providers (medical officers at PHCs) showed poorer competence to correctly diagnose and treat patients compared to private sector solo-providers. Public sector providers also prescribed a slightly higher number of drugs (on average) for each of the conditions than solo-providers, except in the case of childhood diarrhea (Figures 1.10 and 1.11, and Table 1.6).

Figure 1.10: Difference in competence for correct diagnosis (public vs. private at primary care level)

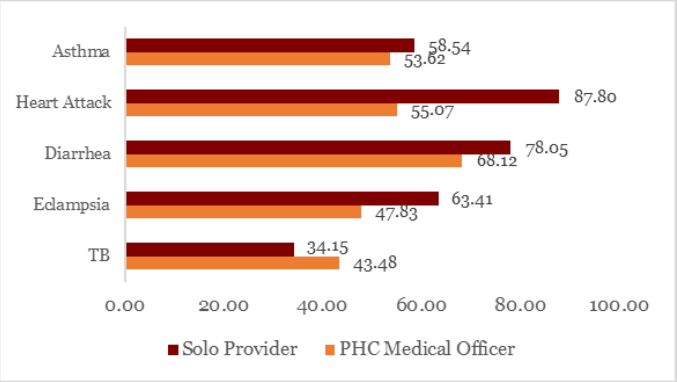
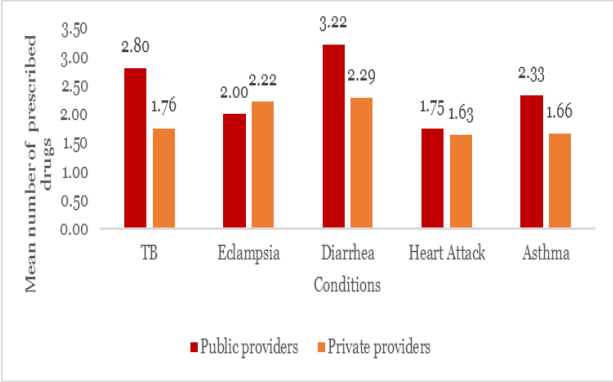


Figure 1.11: Difference in prescription of mean number of drugs (public vs. private at primary care level)



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 1.6: Difference in competence for correct treatment (public vs. private at primary care level)

Condition	Correct Treatment as per standard treatment guidelines (%)		At least one correct drug (%)		Providers who gave only unnecessary/ incorrect drugs (%)	
	Public	Private	Public	Private	Public	Private
Tuberculosis	10.00	0	N/A	N/A	16.00	0
Pre-eclampsia	0	0	33.33	65.38	51.52	34.62
Diarrhea	4.26	6.25	89.36	46.88	6.38	46.88
Heart Attack	0	0	39.47	72.22	44.74	5.56
Asthma	0	0	60.11	60.00	27.78	32.00

Source: Survey 10, Clinical Vignette Survey

The poor technical competence of providers in Odisha might be explained by many factors: poor training of providers, little regulation of issuing and renewing physicians' licenses, a lack of mandatory standard treatment guidelines followed by providers in Odisha, and a lack of incentives for providers to practice high-quality care. (See Appendix 1 for an overview of provider payment methods in Odisha.) As discussed above, the incentives for providers to prescribe more drugs and the connections between providers and chemist shops could also help explain the widespread patterns of prescribing large numbers of inappropriate, incorrect, and unnecessary medicines.

This study provides new evidence about the widespread problems of clinical effectiveness. These problems have important implications for designing policy recommendations. Improving the competence of providers in both public and private sectors is critical to create meaningful access and cost-effective care in Odisha. Most programs in India have focused on expanding coverage and access. This study shows that policy makers must give more attention to the low competence of primary care providers, especially public sector providers. India's efforts to improve access to primary care should be reformulated and redesigned to include clinical effectiveness, as *access with quality*.

1.5.2.2 Patient Safety

The safety of patients is a critical component of quality that has important consequences for how a health system performs. Patient safety culture has been defined as "The product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management" [34, 35].

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Patient safety culture scores are statistically associated with patient-level outcomes and decreased adverse events at hospital levels [36]. Understanding a facility's patient safety culture is foundational to identifying (and addressing) systems-level issues that may contribute to preventable harm in healthcare organizations.

Several studies from high-income countries estimate that a large number of citizens are injured, or die, due to adverse events [37], placing unsafe care within the top twenty causes of death globally [38-40]. Global estimates suggest that between 5.7 and 8.4 million deaths are caused by unsafe medical care in low- and middle-income countries annually and that approximately 10 percent of all hospital care results in some medical error [41]. Problems with patient safety thus can affect a health system's final outcomes of health status, financial risk protection, and citizen satisfaction.

Yet, there is relatively little empirical analysis of patient safety and its consequences in India, including, for example, the corresponding clinical burden. Our study addresses this gap in knowledge by assessing patient safety culture in Odisha's public hospitals through the use of a validated analytical tool – the Hospital Survey on Patient Safety Culture (HSOPS) – developed by the Agency for Healthcare Research and Quality (AHRQ) [42]. Our study is the first known administration of the HSOPS tool in Odisha.

Our study sought to answer the following questions on patient safety: (i) What is the overall state of patient safety culture across the sampled hospitals? (ii) How does performance vary by sub-domain, and is there an area of patient safety culture of particular concern in Odisha? (iii) Do respondent's ratings about patient safety vary significantly by facility or provider characteristics? The data for this assessment came from our patient safety culture in hospitals survey, which interviewed a total of 2,687 patient-facing staff members (including physicians, nurses, paramedics, and hospital management staff) across nine public sector facilities, including Medical College Hospitals, District Hospitals and Sub-Divisional Hospitals (Survey 9 in Table 1.1).

Our study found significant problems with the patient safety culture in Odisha's public hospitals. Almost no patient safety events (reports of a mistake that could harm a patient) were reported in any of the hospitals surveyed. Over 90 percent of respondents in some facilities reported never submitting an event report while working in their facility. Across facilities, the average share of staff that ever reported an event was only 12 percent. This is a relatively small share and particularly relevant, given global estimates that suggest approximately 10 percent of all hospital care results in some medical error. While we lack data on medical errors in India, our results suggest that many aspects of safety culture are poor in Odisha hospitals, indicating that the lack of reported events is unlikely to reflect an absence of error. We found a consistent lack of monitoring systems for the routine collection of medical errors. If hospitals are not reporting safety events, it is not possible to know how much physical harm is caused by the delivery of unsafe services in Odisha's inpatient settings and, in turn, address that harm.

Problems with patient safety have significant consequences for health system performance. Adverse events, or injuries that result from medical care, can include

both errors (for example, administration of the wrong drug to the patient) as well as events that are thought to be not so easily preventable (such as an allergic reaction to a medicine that the patient has not taken before). These harmful events have direct financial costs for the individual and the state, and represent a substantial opportunity cost for the health system in terms of time and resources spent treating the harm [43-45]. In addition, unsafe care can negatively impact the trust patients feel in the health system and their willingness to access care [45, 46].

As Odisha works to expand access to hospital-based care through programs like BSKY, more people than ever before will come into contact with the hospital services. This increase in utilization makes it imperative that policy makers quantify and prioritize the problem of unsafe medical care in inpatient settings.

1.5.2.3 Patient-Centeredness

Patient-centeredness is an important intermediate outcome of health system performance, with effects on health status, financial risk protection, and citizen satisfaction. The concept of patient-centeredness is defined as care that is respectful of and responsive to individual patient preferences, needs, and values, and that allows patients to help guide clinical decisions [47]. Patient satisfaction and patient experience are measures used to assess patient-centeredness. Existing evidence shows that patient satisfaction is associated with higher quality of care and better health outcomes [48-50]. There is further evidence that when patients have negative care experiences, they are more likely to delay seeking necessary medical care in the future and are also at higher risk of not adhering to treatment recommendations [51-53]. As such, in many LMICs, satisfaction ratings are increasingly being used by ministries of health as a measure to assess patient-centeredness.

Odisha has a lack of studies of patient satisfaction, and also a lack of databases that include information on both patient experience and patient characteristics. As a result, little is known about how patient-level characteristics affect experience or satisfaction ratings of care in Odisha. The Odisha Health System Assessment Study sought to address these gaps. We examined experience ratings of different aspects of care as well as patients' overall satisfaction with their care. By exploring the relationship between these two concepts (experience and satisfaction), we can better understand patient satisfaction ratings in Odisha. We can also gain a more nuanced understanding of the quality of interpersonal care that different types of patients receive as well as how patient characteristics (such as education level or caste.) might influence their care ratings. Our results represent the first known assessment of patient-centeredness in Odisha.

The main objectives of our assessment were: (i) to identify the drivers of patient satisfaction in Odisha's inpatient (IP) and outpatient (OP) settings, and (ii) to see if there were issues of equity in access to, or reporting of, high-quality interpersonal care. The data for our assessment of patient-centeredness come from interviews with 1485 patients through two surveys (Surveys 7 and 8 in Table 1.1). The first was an inpatient exit survey with 507 patients receiving care in 5 hospitals across Odisha adapted the Hospital Survey on Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) tool developed by the Centers for Medicare and

Medicaid Services (CMS) and the Agency for Healthcare Research and Quality (AHRQ) [54]. The second survey was an outpatient exit survey with 978 patients receiving OP care across a range of public and private sector providers, including OP departments of hospitals and nursing homes, CHCs, PHCs, and solo-providers.

This study of patient-centeredness in Odisha raises important concerns about equity in the quality of care received by different population groups. In both IP and OP settings, patients with no formal education and patients belonging to SC or ST groups received the lowest quality interpersonal treatment, as assessed through objective measures of care experience during a given clinical interaction. We found that within the same facilities, more educated patients, high caste patients, and non-obstetrics/gynecology (non-OBGYN) patients reported significantly higher interpersonal treatment from providers. Similarly, patients from ST groups were 14 percentage points less likely to report being treated with dignity and respect than patients from other social groups.

We also identified an important source of systematic reporting error that has implications for the equitable delivery of high-quality care in Odisha. Less educated patients reported being subject to worse quality interpersonal care than their more-educated counterparts; however, this poor treatment is not captured in their satisfaction ratings. These data raise concerns regarding the use of patient satisfaction as a health system performance measure, especially in contexts with large proportions of vulnerable and disempowered patients, like in Odisha. Satisfaction is subjective, and if certain patients evaluate and/or report satisfaction differently than their peers, the use of these ratings in isolation may mask, as opposed to reveal, poor quality interpersonal care.

1.5.3 Efficiency

Odisha's health system suffers from inefficiencies in allocation of resources. Public sector facilities have lower than recommended occupancy rates, sub-optimal staff mix and idle capacity of physicians, and a lack of backward referrals from hospitals to primary care facilities even for simple illnesses.

An efficient health system is one in which the inputs allocated to produce health outcomes are used optimally without wastage [47]. There are two commonly used concepts of efficiency: technical efficiency and allocative efficiency. Technical efficiency refers to using the least possible amounts of health inputs to produce a given amount of health output. Allocative efficiency captures whether health inputs are allocated among the production of different health outcomes to maximize society's health. Simply put, technical efficiency is about "doing things the right way," while allocative efficiency focuses on "doing the right things" [55]. Although a few previous studies have measured technical efficiency of the Odisha health system, they mostly use complicated statistical analysis and state- or district-level data on a few health inputs in the public hospitals [56-58]. Moreover, studies that examine ratio-based efficiency indicators focus on selected inputs or indicators and mostly rely on data from the public sector [59-63]. Our study addresses these issues; we designed and conducted multi-pronged surveys to provide a more complete understanding of health system inefficiencies in Odisha.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

In the Odisha Health System Assessment Study, we measured technical and allocative efficiency using a set of ratio-based indicators that focus on the three key health inputs necessary to produce health outputs or health services: (i) healthcare workers, including physicians, nurses, pharmacists, technicians, mid-level providers, and frontline workers; (ii) curative care beds; and (iii) medicines. The data for the assessment of efficiency come from four provider surveys used in our study: 554 public and private sector facilities included in our two facility surveys (the hospitals and CHC survey, and the primary care facility survey; Surveys 2 and 3 in Table 1.1) and 1124 providers surveyed in our two individual provider surveys (the providers in a facility survey and the solo-provider survey; Surveys 4 and 5 in Table 1.1). The detailed assessment of efficiency is presented in Chapter 7 of this report. Here we present the key findings, highlighting how our study offers new insights into understanding efficiency in Odisha's health system; we also offer hypotheses to help explain possible causes of different performance measures.

One striking finding from our study is that public sector hospitals have latent capacity in terms of beds and human resources (with low reported absenteeism for doctor and nurses). This result indicates that public hospitals are not being used to their full potential. For example, there is no shortage of certain categories of healthcare workers, such as nurses, paramedics, and mid-level providers in the surveyed public sector health facilities, as indicated by 81 to 89 percent of the sanctioned positions being filled for these healthcare workers on average. Our study found that 65 percent of all sanctioned positions for doctors and are filled, and out these filled positions, about 89 percent of doctors were reported to be on duty at the interview time in public healthcare facilities, on average.[7] A similarly high percentage of nurses (92 percent), paramedics (89 percent), and mid-level providers (92 percent) were also reported to be present at the time of the interview. Another important finding is that physicians working in PHCs have an average of 617 minutes (10 hours) per week of idle capacity, based on their self-reported time spent per patient, the number of patients seen, and days/hours worked per week (Figure 1.12).

[7] The staff reported as being on duty at the time of the interview were verified against the facility's records of attendance for the day. However, our survey did not physically verify if the staff who were reported as "present" were actually at the facility. As such, measurement error is probable in this variable.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 1.12: Idle capacity of physicians

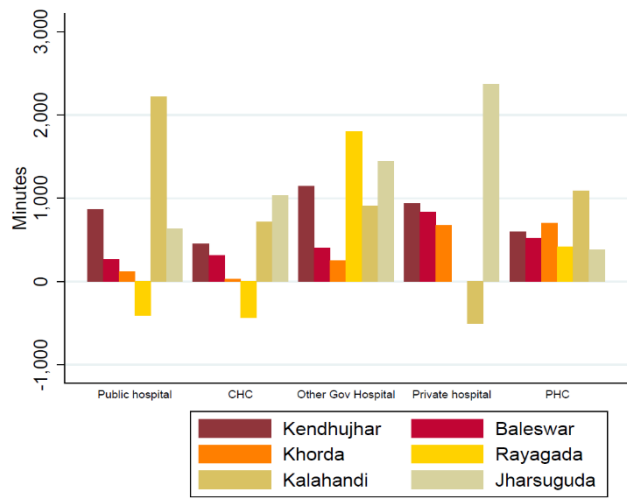
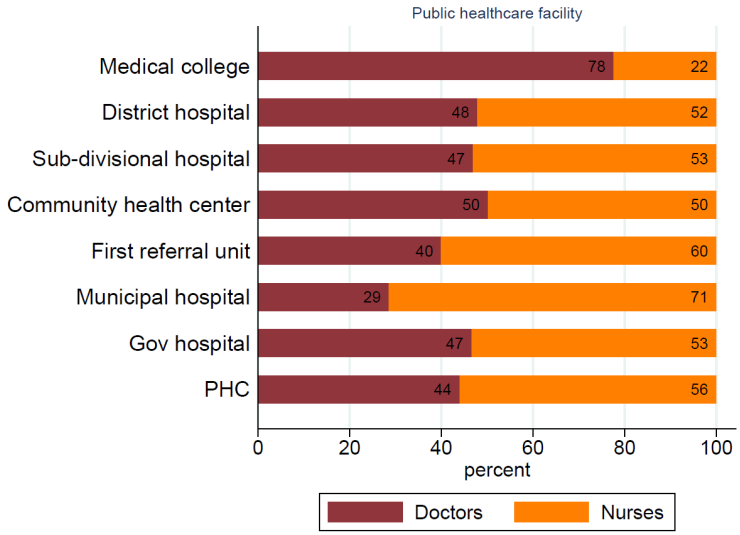


Figure 1.13: Mean number of doctors and nurses in public healthcare facilities.



One possible explanation for this latent capacity in the public sector is the efforts that the state government has taken to improve the production and distribution of healthcare workers across the state. As a part of the Odisha Health Policy (2017), the government prioritized programs such as sanctioning and filling up the required number of medical and paramedical posts, creating and empowering new cadres of staff, integrating and regularizing existing staff, improving medical and paramedical education, and strengthening performance management approaches. Although most of these efforts were directed towards doctors, there was likely some positive action targeting other healthcare workers.

Our study also found inefficiencies in the use of healthcare resources in the public healthcare delivery system in Odisha. There is a sub-optimal mix of trained nurses and allopathic doctors in public healthcare facilities with a mean nurse to doctor ratio of 1:1.43, which is less than the recommended ratio of 2 (Figure 1.13). One likely reason for this sub-optimal mix is the shortage of physicians in the public sector (as opposed to lack of shortage of other healthcare workers such as nurses, paramedics, and technicians). As mentioned above, 65 percent of overall sanctioned positions for doctors were filled, and most facility types having filled less than one-third of sanctioned positions (Figure 1.14). This is especially true for specialists, with only 56 percent of sanctioned specialist positions being filled across public healthcare facilities. Moreover, physicians in public secondary and tertiary care facilities report spending only about 6 minutes per patient, with a slightly higher reported time spent per patient for physicians at PHCs (9 minutes). Shortage and absenteeism among the frontline healthcare workers (ASHAs) are two other indicators of inefficiencies in the public healthcare system. Despite the availability of nurses, paramedical, and technicians in the facilities, ASHAs are important in reaching the community and bridging the gap between the people and facilities. Only 70 percent of sanctioned ASHA positions were reported to be filled on average, and 68 percent of ASHAs were present at work during the interview. The mean

occupancy rate at public secondary and tertiary care facilities is substantially below the recommended 80 percent, except for the one public Medical College Hospital in the data (Figure 1.15). Another sign of inefficiency is that only 12 percent of the public secondary or tertiary facilities in our data refer simple cases backward, on average, despite the existence of institutional linkages in over 70 percent of most all public healthcare facilities (Figure 1.16). Since a large share of individuals who reported seeking treatment when ill in the last 15 days, noted visiting secondary care facilities for outpatient care, the lack of referrals hints at inefficient use of resources between the primary and secondary/tertiary levels of care.

Figure 1.14: Mean percentage of sanctioned doctors positions filled in public healthcare facilities

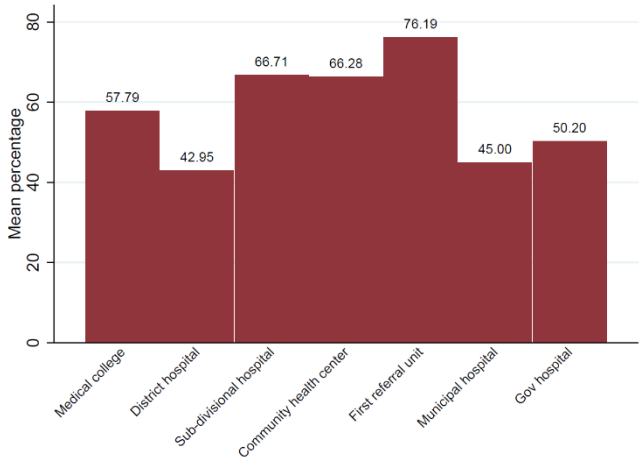
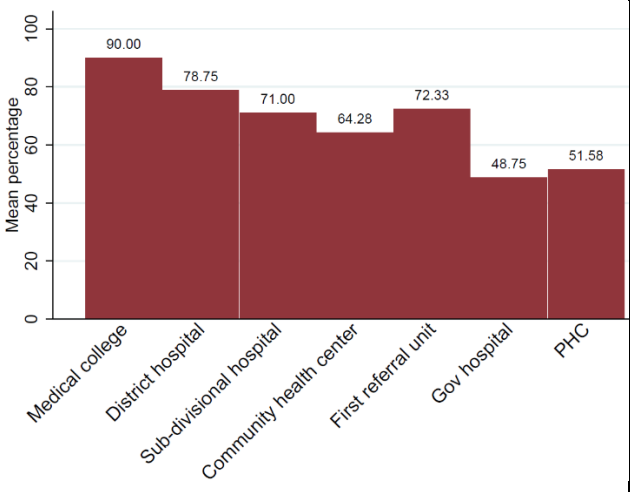
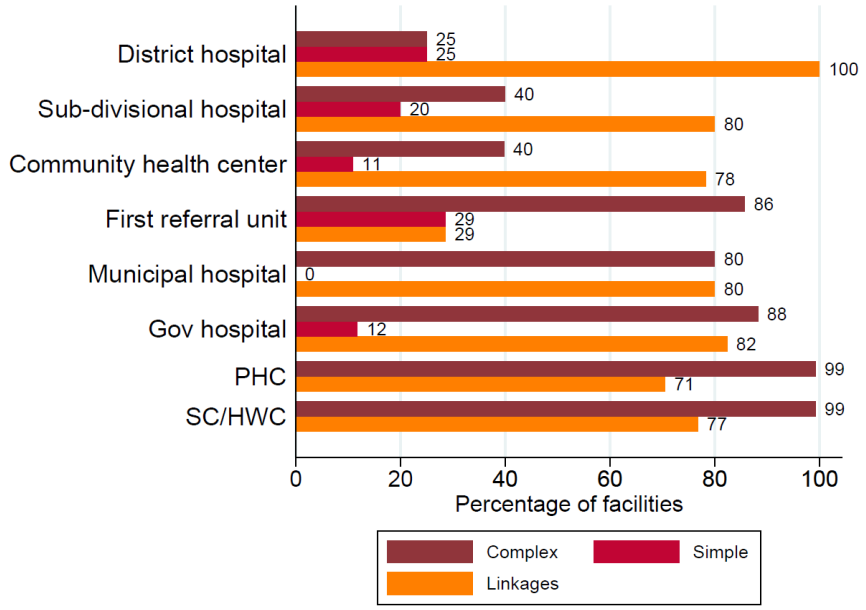


Figure 1.15: Mean bed occupancy rate in public healthcare facilities



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 1.16: Percentage of public facilities referring complex cases, simple cases, and with institutional linkages



There are likely various explanations for these inefficiencies. The lack of autonomy and accountability, poor incentives and management of the public sector could contribute to the inefficiencies. Poor incentives (including salary structure and promotion) and management systems resulting in low remunerations, poor job satisfaction, and lack of career prospects likely induce low productivity of physicians in public healthcare facilities. The potentially large differences in income/earnings between the private and the public sectors contribute to physicians' dual practices, which in turn may adversely affect physician performance in the public sector.

According to our review of the literature, this study is the first analysis of idle capacity and other productivity measures of doctors for Odisha. Our data on staff-mix ratio, inpatient bed occupancy rate, and time spent per patient are also new additions to knowledge about efficiency in Odisha's health system.

One goal of the government is to expand the fiscal space for health while moving towards universal health coverage. However, our study found that the existing public facilities and human resources are not being efficiently used. Attaining greater efficiency is particularly relevant for health systems, such as Odisha's, which has a scarcity of revenues and faces increasing health spending due to changes in population demographics, disease burdens, healthcare prices, medical technology, and population expectations [64]. (See Appendix 1 for more details on Odisha's fiscal space for health and the state's socio-demographic context.) In this context, our findings provide useful guidance for reforms that could make Odisha's health system more efficient.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

1.6 Conclusion

This chapter presents the main findings from our Odisha Health System Assessment Study, which examines the strengths and challenges of Odisha's health system in terms of final and intermediate goals of health system performance based on the Control Knob Framework. This comprehensive assessment is based on analyses of a large dataset comprising ten different new surveys (summarized in Table 1.1) administered to households, patients, health facilities, and individual providers in both public and private sectors. This comprehensive study, with its unique features, was designed to address critical gaps in data, knowledge, and understanding about the performance of Odisha's health system.

Odisha's health system has both achievements and challenges related to each of the health system goals: the ultimate performance goals of health status, financial risk protection, and citizen satisfaction; and the intermediate goals of access, quality, and efficiency. This study has produced new knowledge that helps us understand how Odisha's health system performs. We compare our findings to existing datasets and benchmarks, to place Odisha's circumstances in both national and global context.

This assessment is the first step of our health system analysis for Odisha; it tells us how Odisha's health system is performing, highlighting its strengths and challenges. The findings from this assessment form the basis of our diagnosis of the underlying causes behind the performance of the health system. This chapter presents some initial thinking about possible causes for the observed findings. We will undertake more careful and detailed analyses in the next phase of diagnosis for the project. The combined analysis will form the foundation of proposed policy reforms for Odisha, with implications for other states in India.

1.7 References

1. Roberts, M.J., Hsiao, W.C., Berman, P., Reich, M.R., *Getting Health Reform Right: A Guide to Improving Performance and Equity*. 2008, New York: Oxford University Press.
2. Sample Registration Survey, Government of India, Editor. 2016: New Delhi.
3. I.C.M.R., P.H.F.I., & I.H.M.E., , *India: Health of the nation's states – the Indian state-level disease burden initiative in the Global Burden of Disease Study*. . https://www.healthdata.org/, 2017.
4. International Institute for Population Sciences (IIPS), *National Family Health Survey (NFHS-4) 2015-16*. 2017, IIPS: Mumbai.
5. International Institute for Population Studies (IIPS), *National Family Health Survey of India – I, 1992-1993*. 1994.
6. Ali, S.C., *Odisha Improves Child & Maternal Health, Progresses Faster Than Other Poor States*, in *https://www.indiaspend.com/*. 19 August, 2019.
7. World Health Organization, *World malaria report 2019*. 2019, World Health Organization Geneva.
8. NITI Aayog, *State-wise data from Sample Registration Survey, 2016*. 2016, Government of India: New Delhi.
9. ICMR, PHFI, and IHME, *GBD India Compare 2019*. 2020.
10. Government of India, *National Health Mission* Ministry of Health and Family Welfare, Editor.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

11. Government of Odisha, *Mamata Scheme*, Department of Women and Child Development, Editor.
12. Department of Health and Family Welfare, *Sishu Abom Matru Mrityuhara Purna Nirakaran Abhijan (SAMMPurNA)*, Department of Health and Family Welfare, Editor., Government of Odisha: https://www.pradhanmantriyojana.co.in/sampurna-scheme-in-odisha/.
13. Bal, M., et al., *Assessment of effectiveness of DAMaN: A malaria intervention program initiated by Government of Odisha, India*. PloS one, 2020. **15**(9): p. e0238323-e0238323.
14. Pradhan, M. and P. Meherda, *Malaria elimination drive in Odisha: Hope for halting the transmission*. Journal of Vector Borne Diseases, 2019. **56**(1): p. 53-55.
15. National Sample Survey Office, *Key Indicators of Social Consumption in India: Health, (NSSO 71st Round)*, M. Ministry of Statistics and Programme Implementation, Editor. 2014, Government of India: Delhi.
16. National Sample Survey Office, *Key Indicators of Household Consumption on Health in India. NSS 75th Round* G.o.I. Ministry of Statistics and Program Implementation (MoPSI), Editor. 2019, Government of India: New Delhi.
17. Kotwani, A., et al., *Prices & availability of common medicines at six sites in India using a standard methodology*. Indian J Med Res, 2007. **125**(5): p. 645-54.
18. Bhargava, A. and S.P. Kalantri, *The crisis in access to essential medicines in India: key issues which call for action*. Indian J Med Ethics, 2013. **10**(2): p. 86-95.
19. Shahrawat, R. and K.D. Rao, *Insured yet vulnerable: out-of-pocket payments and India's poor*. Health Policy Plan, 2012. **27**(3): p. 213-21.
20. Tripathi, S., Bhattacharya, S., *Patient Perception about Generic vs. Branded Medicines Prescribed in a Tertiary Care Hospital in Northern India -A Descriptive Study*. Indian Journal of Pharmacy Practice, 2018. **11**(2): p. 91-95.
21. Aivalli, P.K., et al., *Perceptions of the quality of generic medicines: implications for trust in public services within the local health system in Tumkur, India*. BMJ Glob Health, 2017. **2**(Suppl 3): p. e000644.
22. Sreenivasan, M., Narasimha Reddy, T. L., *A study on the purchase decision behavior of doctors in india with respect to perception on quality of generic drugs*. International Journal of Current Advanced Research, 2018. **7**(9F): p. 15627-15635.
23. The Commonwealth Fund. *Commonwealth Fund International Health Policy Survey, 2013*. 2013.
24. Ministry of Health and Family Welfare, *Rural Health Statistics*, Ministry of Health and Family Welfare, Editor. 2019, Government of India: New Delhi.
25. Department of Health and Family Welfare, *Niramaya Scheme*, D.o.H.a.F. Welfare, Editor., Government of Odisha: https://www.e-niramaya.odisha.gov.in/.
26. The World Bank. *Medical Advice Quality and Availability in Rural India (MAQARI)*. 2003.
27. Mohanan, M., et al. , *Bihar Evaluation of Social Franchising and Telemedicine (BEST)*. 2011, US National Institutes of Health. Clinical Trials: Bihar, India.
28. Peabody, J.W., et al., *Comparison of Vignettes, Standardized Patients, and Chart Abstraction: A Prospective Validation Study of 3 Methods for Measuring Quality*. JAMA : the journal of the American Medical Association, 2000. **283**(13): p. 1715-1722.
29. Dresselhaus, T.R., et al., *Measuring compliance with preventive care guidelines: Standardized patients, clinical vignettes, and the medical record*. Journal of general internal medicine : JGIM, 2000. **15**(11): p. 782-788.
30. Peabody, J.W., et al., *Measuring the Quality of Physician Practice by Using Clinical Vignettes: A Prospective Validation Study*. Annals of internal medicine, 2004. **141**(10): p. 771-780.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

31. Peabody, J.W., et al., *Using Vignettes to Compare the Quality of Clinical Care Variation in Economically Divergent Countries*. Health services research, 2004. **39**(6p2): p. 1951-1970.
32. Dresselhaus, T.R., et al., *An evaluation of vignettes for predicting variation in the quality of preventive care*. Journal of general internal medicine : JGIM, 2004. **19**(10): p. 1013-1018.
33. Peabody, J.W. and A. Liu, *A cross-national comparison of the quality of clinical care using vignettes*. Health policy and planning, 2007. **22**(5): p. 294-302.
34. ACSNI Study Group on Human Factors Organising for Safety, in *London: H.M.S.O.* 1993.
35. Ito, S., et al., *Development and applicability of Hospital Survey on Patient Safety Culture (HSOPS) in Japan*. BMC Health Serv Res, 2011. **11**: p. 28.
36. DiCuccio, M.H., *The Relationship Between Patient Safety Culture and Patient Outcomes*. Journal of Patient Safety 2015. **11**(3): p. 135-142.
37. Brennan, T.A., et al., *Incidence of adverse events and negligence in hospitalized patients. Results of the Harvard Medical Practice Study I*. N Engl J Med, 1991. **324**(6): p. 370-6.
38. *The Economics of Patient Safety: Strengthening a Value-Based Approach to Reducing Patient Harm at National Level*. *https://www.oecd-ilibrary.org/social-issues-migration-health/the-economics-of-patient-safety_5a9858cd-en*.
39. Jha, A.K., et al., *Patient safety research: an overview of the global evidence*. Qual Saf Health Care, 2010. **19**(1): p. 42-7.
40. Panagioti, M., et al., *Prevalence, severity, and nature of preventable patient harm across medical care settings: systematic review and meta-analysis*. BMJ, 2019. **366**: p. l4185.
41. National Academy of Medicine, *Crossing the Global Quality Chasm: Improving Health Care Worldwide*. 2018: Washington (DC).
42. Agency for Healthcare Research and Quality (AHRQ). *Surveys on Patient Safety Culture (SOPS) Hospital Survey*. 2004.
43. Eric, J.T., et al., *Costs of Medical Injuries in Utah and Colorado*. Inquiry (Chicago), 1999. **36**(3): p. 255-264.
44. Aceves-Avila, F.J., V. Benites-Godínez, and C. Ramos-Remus, *Cost of medication errors in rheumatic patients in Mexico*. Clinical rheumatology, 2011. **30**(11): p. 1421-1424.
45. Rhodes, P., S. Campbell, and C. Sanders, *Trust, temporality and systems: how do patients understand patient safety in primary care? A qualitative study*. Health expectations : an international journal of public participation in health care and health policy, 2016. **19**(2): p. 253-263.
46. Hrisos, S. and R. Thomson, *Seeing it from both sides: do approaches to involving patients in improving their safety risk damaging the trust between patients and healthcare professionals? An interview study*. PloS one, 2013. **8**(11): p. e80759-e80759.
47. Institute of Medicine (IOM). National Academy of Sciences, *Crossing the Quality Chasm: A New Health System for the 21st Century*. 2001, Washington, D.C: National Academies Press.
48. Tsai, T.C., E.J. Orav, and A.K. Jha, *Patient satisfaction and quality of surgical care in US hospitals*. Annals of surgery, 2015. **261**(1): p. 2-8.
49. Isaac, T., et al., *The Relationship between Patients' Perception of Care and Measures of Hospital Quality and Safety: Relationship between Patients' Perception of Care and Other Measures*. Health services research, 2010. **45**(4): p. 1024-1040.
50. Wang, D.E., et al., *Association Between the Centers for Medicare and Medicaid Services Hospital Star Rating and Patient Outcomes*. JAMA internal medicine, 2016. **176**(6): p. 848-850.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

51. Apter, A.J., et al., *Adherence with twice-daily dosing of inhaled steroids: Socioeconomic and health-belief differences*. American journal of respiratory and critical care medicine, 1998. **157**(6): p. 1810-1817.
52. Ruiz-Moral, R., L.Á. Pérula de Torres, and I. Jaramillo-Martin, *The Effect of Patients' Met Expectations on Consultation Outcomes. A Study with Family Medicine Residents*. Journal of general internal medicine : JGIM, 2007. **22**(1): p. 86-91.
53. Agency for Healthcare, R.Q., *2010 National Healthcare Disparities Report*. 2011.
54. Centers for Medicare and Medicaid Services (CMS) and Agency for Healthcare Research and Quality (AHRQ). *Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS)*. 2002.
55. Yip, W. and R. Hafez, *Improving Health System Efficiency: Reforms for improving the efficiency of health systems: lessons from 10 country cases*. 2015.
56. Kathuria, V. and D. Sankar, *Inter-State Disparities in Health Outcomes in Rural India: An Analysis Using a Stochastic Production Frontier Approach*. Development Policy Review. **23**(2): p. 145–163.
57. Shetty, U. and T.P.M. Pakkala, *Technical Efficiencies of Healthcare System in Major States of India: An Application of NP-RDM of DEA Formulation*. Journal of Health Management, 2010. **12**(4): p. 501-518.
58. Purohit, B.C., *Health Care System Efficiency: A Sub-state Level Analysis for Orissa (India)*. Review of Urban & Regional Development Studies, 2016. **28**(1): p. 55-74.
59. Hota, A.K. and H.S. Rout, *Health Infrastructure in Odisha with Special Reference to Cuttack and Bhubaneswar Cities:*. http://dx.doi.org/10.1177/0974930615617275, 2016.
60. Hussain, M.A., L. Dandona, and D. Schellenberg, *Public health system readiness to treat malaria in Odisha State of India*. Malaria Journal, 2013. **12**(1): p. 1-11.
61. Padhy, G.K., et al., *Bottlenecks identified in the Implementation of components of national health programmes at PHCs of Cuttack district of Odisha*. International Journal of Medicine and Public Health, 2013. **3**(4): p. 271-277.
62. Swain, T.R., et al., *Pricing and availability of some essential child specific medicines in Odisha*. Indian Journal of Pharmacology, 2015. **47**(5): p. 496-501.
63. Patra, S.K., M. Ramadass, and A. L., *National Rural Health Mission (NRHM) & Health Status of Odisha*. Indian Journal of Public Health Research and Development, 2015. **5**(1): p. 241-246.
64. OECD, *Health care systems: Getting more value for money*. OECD Economics Department Policy Notes, 2010. **No. 2**.

Section I
Final Outcomes of Health System Performance

Health system reformers generally find it useful to focus on a limited number of performance goals to define problems and evaluate solutions. These are the final outcomes or the ultimate goals of a health system. These performance measures reflect the results, consequences, and outcomes of the health system as a whole. The set of final outcomes proposed by the Control Knob Framework is (i) health status of the population measured by standard public health indicators of mortality, fertility, morbidity, and self-rated health, (ii) financial risk protection, or the degree to which households are protected from economic hardships associated with paying for health services, and (iii) citizen satisfaction, or the extent to which the citizens, or the public, are satisfied with the health system (Figure 1.1).

The Framework has chosen this focused set of performance goals based on three criteria: (i) these three goals seem to have political relevance and salience across governments from around the world. They reflect and embody major political and social concerns. (ii) Taken together, these goals capture the critical ethical issues at stake in the reform process, i.e., the values by which a society prioritizes a problem

or adopts a solution; and (iii) These goals have causal dependence on health policy choices, which takes us back to the policy levers and how they influence health system performances discussed in Chapter 1 (Figure 1.1).

The next three chapters in this section present our assessment of the Odisha health system's final outcomes. Under this section, Health Status (Chapter 2) presents Odisha's performance of life expectancy, mortality, fertility, and morbidity indicators. Since a considerable amount of data is available on health status indicators for Odisha, we have used secondary data to assess this outcome. Using data from our large household survey (Table 1.1), Chapter 3 on Financial Risk Protection discusses the financial hardships that residents of Odisha face in accessing healthcare and explores possible causes behind the state's high out-of-pocket expenses, especially the substantial expenses on drugs. This chapter presents a more nuanced understanding of the aggregate statistics than is possible using existing datasets like the National Sample Surveys. In Chapter 4 on Citizen Satisfaction, we present our findings on how satisfied the public is with Odisha's health system. To the best of our knowledge, this is the first assessment of citizen satisfaction in an Indian state.

Chapter 2
Health Status♦

2.1 Summary

The health status of the population is one of the primary goals of any health system. In this chapter, we summarize the indicators of mortality, fertility, and morbidity of Odisha. For each indicator, we start by examining whether the indicator has changed over time, followed by benchmarking Odisha's indicators to the national estimates, the estimates of similar states, and the SDGs, where applicable. The health outcomes indicators reported in this chapter have been obtained from three secondary sources: the 2018 Sample Registration System reports, the 2017 Global Burden of Disease India Compare visualization dashboard, and the 2015-16 National Family and Health Survey state report.

We find that Odisha has made substantial headway in improving the health status of its people. The state has achieved considerable declines in the infant mortality rate (41.7 percent) and the maternal mortality ratio (41.8 percent) between 2006 and 2018. The declines in the percentage of total deaths due to infectious diseases such as diarrhoea and tuberculosis (TB) are also commendable. In 2018, the life expectancy at birth in Odisha (69.3 years) was only slightly below the national average (69.4 years).

Despite the state's progress, this report's findings demonstrate that several health outcomes indicators continue to be alarming. Several of the mother and child-specific mortality rate targets in the SDG remains distant for Odisha. The mortality and prevalence rates associated with communicable diseases such as diarrheal diseases, drug-susceptible TB, and malaria in Odisha are the highest among the Empowered Action Group (EAG) states and bigger Indian states. Moreover, Odisha had the highest incidence of both communicable, maternal, neonatal, and nutritional diseases (375,369 new cases per 100,000) and non-communicable diseases (181,283 new cases per 100,000) among the EAG states in 2019. The shift of the burden towards non-communicable diseases at a time when communicable diseases continue to afflict people is challenging. Further equity concerns emerge when looking at the health outcomes indicators by population sub-groups. While people in rural areas, those belonging to scheduled tribes, and households in the lower wealth quintiles experience lower life expectancy and higher mortality, a more nuanced understanding of disease prevalence among the population sub-groups is necessary.

We provide a comprehensive look at the health outcomes in Odisha using the most recent information available and reaffirm the Odisha government's focus on select health outcomes, as laid out in its Healthcare Vision 2025.

♦ This chapter was led by Bijetri Bose, with participation from Allison Ross and Joanne Hokayem.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

2.2 Introduction

The health status of the population is one of the primary goals of any health system, and its examination is a critical part of a health system performance assessment. This report examines the health outcomes for the state of Odisha to identify the health problems that are causing the greatest harm to the population, especially those that are unequally distributed across population sub-groups. Such an examination of health status is essential to evaluate whether health system inputs, such as infrastructure, healthcare labour, equipment, and other resources, are being converted into health outcomes for each citizen across every stratum of the society, as stated in Odisha's Healthcare Vision for 2025 [1]. By incorporating the most recent data available, this report presents an updated picture of Odisha's health needs.

We first explain how health status is defined and measured, along with a description of the data used for the analysis. The next section discusses the results and is divided into two parts. The first part summarizes the indicators of health status at the state level, while the second part presents the indicators disaggregated by population sub-groups. The comparison of health status across various groups, including rural-urban, female-male, tribal-nontribal, and wealth quintiles, allows us to understand where the state stands in terms of equity. The final section concludes by highlighting the achievements and challenges of Odisha in terms of its population's health status.

2.2.1 Defining and Measuring Health Status

Health is "a state of complete physical, mental and social well-being, and not merely the absence of disease and infirmity" [2]. It is summarized by a set of health outcomes indicators, which are quantitative measures that capture one or more dimensions of the health of a target population at a given period of time. Numerous health outcomes indicators have been developed by various countries, organizations, and academicians; this report describes some of the core health outcomes indicators for which data is available [3]. These indicators can be grouped under three categories: mortality, fertility, and morbidity.

The health outcomes indicators reported in this chapter have been obtained from three secondary sources. First, we relied on the 2018 reports of the Sample Registration System (SRS), the largest demographic survey in India authorized by India's government, to provide annual estimates of mortality and fertility at the state and national levels [4]. Second, we used the 2017 Global Burden of Disease (GBD) India Compare visualization dashboard [5], along with their 2017 report on the disease burden in Odisha for information on morbidity [6]. Third, the 2015-16 National Family and Health Survey (NFHS) state report [7] was the primary source for some of the group-wise health outcomes because the SRS reports provide estimates by residence and sex only and the GDB dashboard does not allow any sub-population analysis. Since the breakup of the indicators by wealth quintiles is not available in the Odisha NHFS report, we analysed the data from the women and children Demographic and Health surveys for this report [8].

To understand how the state is faring, we start our analysis by examining the trends over time for each health outcome indicator. We then compare the indicators for

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Odisha to the national average and the indicators in the 21 other bigger Indian states with a population of over 10 million. We also compare them to those of Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Rajasthan, Uttaranchal, and Uttar Pradesh. Since these eight socioeconomically disadvantaged states, collectively referred to as the Empowered Action Group (EAG) states, are at the same stage of demographic transition, they ensure a more helpful comparison. Finally, we compare the indicators to the relevant Sustainable Development Goals (SDGs) targets, given the efforts of the state to align with and operationalize the SDGs [9].

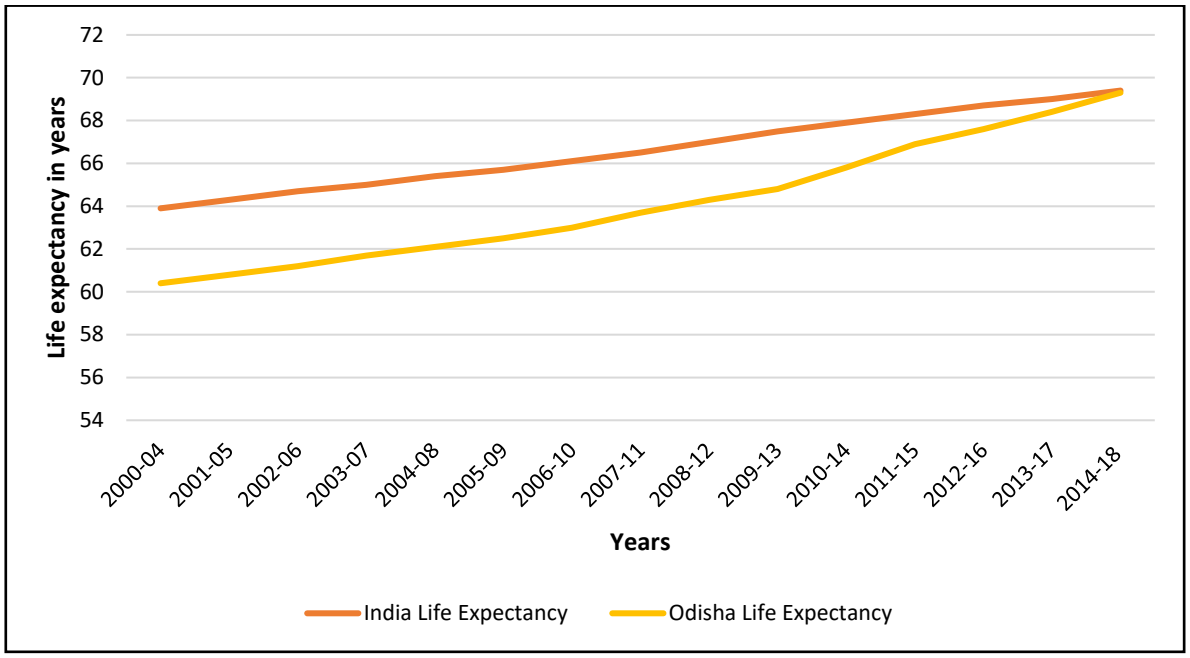
2.3 Results

Odisha has made significant improvements in the health status of its population over the last decade. Nevertheless, many health outcomes indicators considered in this report present a concerning picture compared to the national average, the indicators for the comparable EAG states, or the SDG targets. The following sub-sections summarizes the indicators for mortality, fertility, and morbidity.

2.3.1 Mortality

Life expectancy at birth in Odisha has improved over time, with a 0.49 per annum average increase in the indicator from 1970-75 to 2014-18 [10]. Although this has led to narrowing the difference between the state and the national estimates, life expectancy at birth in Odisha (69.3 years) continued to be less than that of India (69.4 years) in 2018.

Figure 2.1: Life expectancy at birth (in years) for Odisha and India over time



Source: Sample Registration System Based Abridged Life Tables 2014-18, GOI, 2020a.

Similarly, gains have been made in terms of the crude death rate in Odisha. There has been an 18.5 percent decline in the crude death rate between 2006-08 and 2016-18 for Odisha, but the state had the second highest crude death rate among the EAG states (Table 2.1) and among the bigger Indian states in 2018 [4].

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 2.1: Life Expectancy & Crude Death Rates for EAG states & India, 2018

State	Life Expectancy#	Crude Death Rates
Odisha	69.3	7.3
Bihar	69.1	5.8
Chhattisgarh	65.2	8.0
Jharkhand	69.1	5.4
Madhya Pradesh	66.5	6.7
Rajasthan	68.7	5.9
Uttar Pradesh	65.3	6.6
Uttarakhand	70.9	6.2
India	69.4	6.2

Notes: # Life expectancy at birth estimates are for the period 2014-18. Source: Sample Registration System Based Abridged Life Tables 2014-18, GOI, 2020a; Sample Registration System Statistical Report, 2018, GOI, 2020b.

2.3.1.1 Age-specific Mortality Rates

When we focus on age-specific mortality rates, we find that 9.9 percent of the deaths in the state in 2018 were deaths of infants under the age of one, despite the substantial 41.7 percentage decline in the infant mortality rate between 2006-08 and 2016-18 [4]. The percentage of neonatal deaths to infant deaths was the highest in Odisha (79.4 percent) relative to the bigger Indian states. As shown in Table 2.2, mortality rates for neonates (NMR), infants (IMR), and children under the age of five (U5MR) in Odisha in 2018 were higher than that of the national average. Moreover, Odisha ranked in the bottom half of the EAG states. For every thousand live births in the state, 31 neonates and 44 children under the age of five died in Odisha in 2018, numbers significantly higher than the SDG targets of 12 and 25 deaths per 1000 live births, respectively.

Odisha had the highest stillbirth rate among the bigger states in 2018 [4]. It was also one of the bigger Indian states with the highest death rates for children aged 5-14 (0.7 percent). The death rate for the age group of 15-59 in Odisha (3.3 percent) was higher than the national rate and rates for most EAG states, while the death rate for people aged 60 years or older was less than the rates for the country and most EAG states.

2.3.1.2 Cause-specific Mortality Rates

Odisha had one of the highest maternal mortality in the country, along with four other EAG states and Assam in 2018 [11]. The national maternal mortality ratio (MMR) in 2016-18 was estimated to be 113 per 100,000 live births, whereas Odisha stood at 150, as shown in Table 2.2. Although there has been a significant reduction over the last ten years from the MMR of 258 in 2007-09 [12], the SDG target of MMR of less than 70 per 1,00,000 live births remains distant. The five leading maternal disorders that caused the greatest share of deaths in the state in 2019 were haemorrhage, obstructed labour, hypertension, indirect causes, and other disorders [5].

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 2.2: Maternal & Child-specific Mortality Rates for EAG states & India, 2018

State	Neonatal Mortality Rate	Infant Mortality Rate	Under-5 Mortality Rate	Stillbirth Rate	Maternal Mortality Rate#
Odisha	31	40	44	10	150
Bihar	25	32	37	2	149
Chhattisgarh	29	41	45	9	159
Jharkhand	21	30	34	1	71
Madhya Pradesh	35	48	56	5	173
Rajasthan	26	37	40	6	164
Uttar Pradesh	32	43	47	3	197
Uttarakhand	22	31	33	8	99
India	23	32	36	4	113

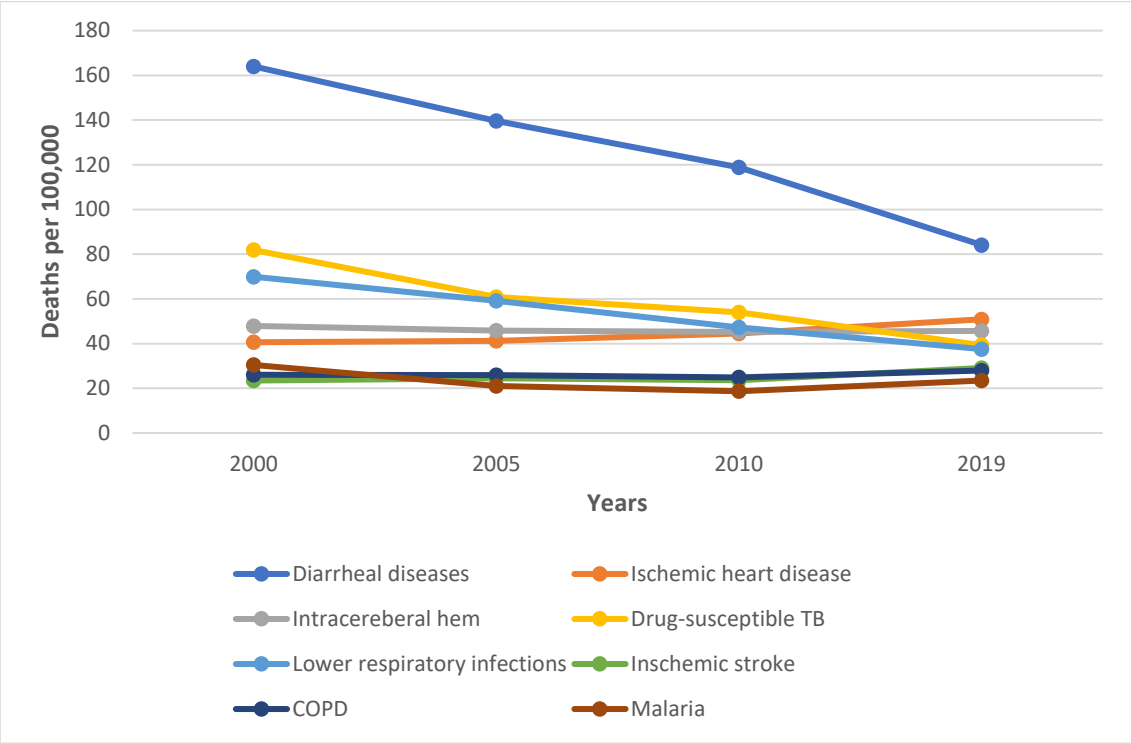
Notes: Notes: # Maternal mortality rates are for the period 2016-18. Source: Sample Registration System Statistical Report, 2018, GOI, 2020b; Special Bulletin on Maternal Mortality in India, 2016-18, GOI, 2020c.

In addition to maternal and child-specific causes of death, cardiovascular diseases, diarrheal and other enteric infections, respiratory infections and tuberculosis (TB), cancer and other neoplasms, digestive diseases, unintentional injuries, diabetes and kidney diseases, chronic respiratory diseases, and neglected tropical diseases and malaria accounted for the highest percentage of all deaths in Odisha in 2019. Of these causes of deaths, non-communicable diseases (NCDs) caused about half the deaths in the state (56.14 percent), while communicable, maternal, neonatal, and nutritional diseases (CMNNDs) caused 33.87 percent of deaths [5]. Injuries caused 9.9 percent of deaths, with the mortality rates from unintentional injuries (43.59 deaths per 100,000) being the highest, followed by transport injuries (15.31 deaths per 100,000) and injuries from self-harm/violence (14.5 deaths per 100,000).

While the mortality rates associated with communicable diseases such as diarrheal diseases (84.11), drug-susceptible TB (67.06), and malaria (23.51) have declined over the last two decades in Odisha, the rates are the highest among the EAG states and bigger states [5]. On the other hand, the death rates of NCDs, including ischemic heart diseases (50.87) and chronic obstructive pulmonary disease (COPD) (27.96), have increased over time. Even though these rates are the lowest among the EAG states and bigger Indian states, Odisha is moving away from the SDG target of reducing premature mortality from NCDs. The patterns and trends mentioned above are presented in Figure 2.2.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 2.2: Leading causes of deaths in Odisha over time



Source: ICMR, PFHI, IHME, 2020.

2.3.2 Fertility

The crude birth rate (CBR) in Odisha was 18.2 in 2018 [4]. There was a 14.8 percent decline in the average CBR between 2006-08 and 2016-18 in the state, making it one of few bigger Indian states with a CBR less than the national average of 20. Uttarakhand is the only other EAG state with a CBR of less than 20. We observe the same patterns when using total fertility rate (TFR), a refined measure of fertility for women that indicates the average number of children expected to be born per woman during her entire span of the reproductive period. The CBR and the TFR are reported in Table 2.3. The age-specific fertility rate in the age group 15-19 is also lower in Odisha relative to the entire country.

2.3.3 Morbidity

As mentioned previously, there has been a rise in the share of deaths in Odisha due to NCDs over CMNNDs, and a similar pattern emerges when we consider the incidence and prevalence of the diseases. Figure 2.3 tracks the change in the epidemiological transition ratios (ETL), the ratio of disability-adjusted life years (DALYs) in a population due to CMNNDs to those due to NCDs, for each state from 1990 to 2016. There has been a nation-wide drastic shift, with all states having ETLs of less than one in 2016, indicating a higher relative burden of NCDs over CMNNDs.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

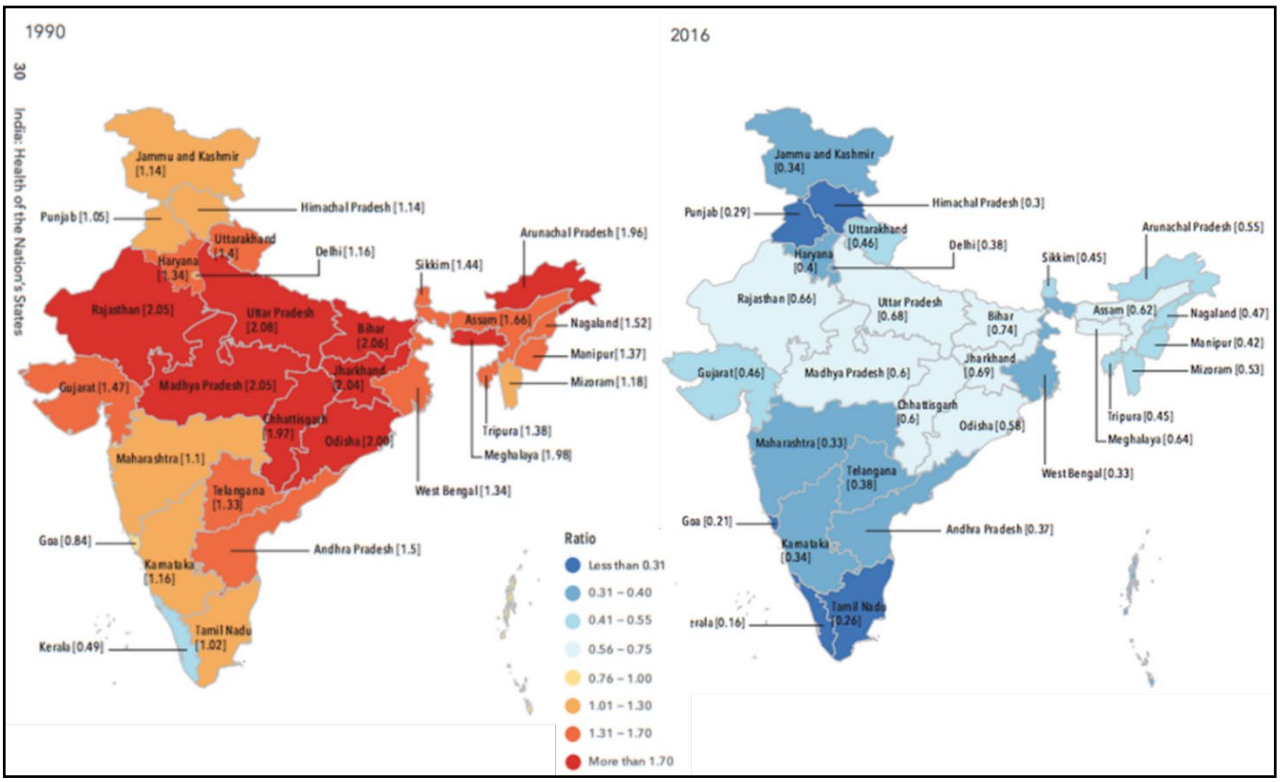
Odisha has one of the highest ETLs in 2016, demonstrating the problem of the double burden of diseases [6].

Table 2.3: Crude Birth Rates, Total Fertility Rates, & Age-specific Fertility Rates for EAG states & India, 2018

State	Crude Birth Rates	Total Fertility Rates	Age-specific Fertility Rates for ages 15-19
Odisha	18.2	1.9	10.3
Bihar	26.2	3.2	11.9
Chhattisgarh	22.5	2.4	15.1
Jharkhand	22.6	2.5	13.9
Madhya Pradesh	24.6	2.7	15.5
Rajasthan	24.0	2.5	9.0
Uttar Pradesh	25.6	2.9	8.5
Uttarakhand	16.7	1.8	5.5
India	20.0	2.2	12.2

Notes: # Life expectancy at birth estimates are for the period 2014-18. Source: Sample Registration System Based Abridged Life Tables 2014-18, RGI, 2020c; Sample Registration System Statistical Report, 2018, RGI, 2020a.

Figure 2.3: Epidemiological transition ratios of the states of India, 1990 and 2016



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Notes: Data for four new states, Chhattisgarh, Jharkhand, Telangana, and Uttarakhand, created in or after 2000, were disaggregated from their parent states based on their current district composition.
Source: ICMR, PFHI, IHME, 2017.

Table 2.4 presents the numbers of new cases and prevalent cases due to the broad groups of communicable diseases in Odisha in 2019. Within these broad groups, Odisha had the highest prevalence of TB, sexually transmitted diseases (STI), diarrhoea, lower respiratory tract infections, and varicella and herpes zoster in 2019, compared to the other EAG states [5] and the national averages. It also had the second highest prevalence of dengue, encephalitis, and malaria among the EAG states. Other communicable diseases such as dengue, Japanese encephalitis, zoonotic infections, swine flu, and Zika virus also added to the state's disease burden [13].

Table 2.4: Incidence & Prevalence of Communicable Diseases in Odisha, 2019

Disease	New cases per 100,000	Prevalent cases per 100,000
Respiratory infections & TB	210,558	38,213
Neglected tropical diseases & malaria	5,660	22,165
HIV/AIDS & STIs	7,153	10,988
Enteric infections	141,889	2,232
Other infectious diseases	4,676	1,754

Source: ICMR, PFHI, IHME, 2020.

Table 2.5 presents the numbers of new cases and prevalent cases due to the broad groups of NCDs in the state in 2019. Odisha has the highest prevalence of most NCDs compared to the other EAG states [5]. It had the second highest number of new and prevalent asthma cases in the country, after Meghalaya, and ranked as one of the top five Indian states with the highest prevalence of fungal skin diseases and depressive disorders. Figure 2.4 shows Odisha leading in terms of incidence of NCDs over time and the difference in the incidence rates of Odisha and the other EAG states being considerable.

When looking at the trends in the incidence of CMNNDs and NDCs over the last two decades in Figure 2.4, we see that there has been a resurgence of new cases of CMNNDs in the past few years in Odisha, making it the EAG state with the highest incidence of CMNNDs in 2019. The figure also shows Odisha leading in terms of incidence of NCDs over time and the difference in the incidence rates of Odisha and the other EAG states being considerable.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

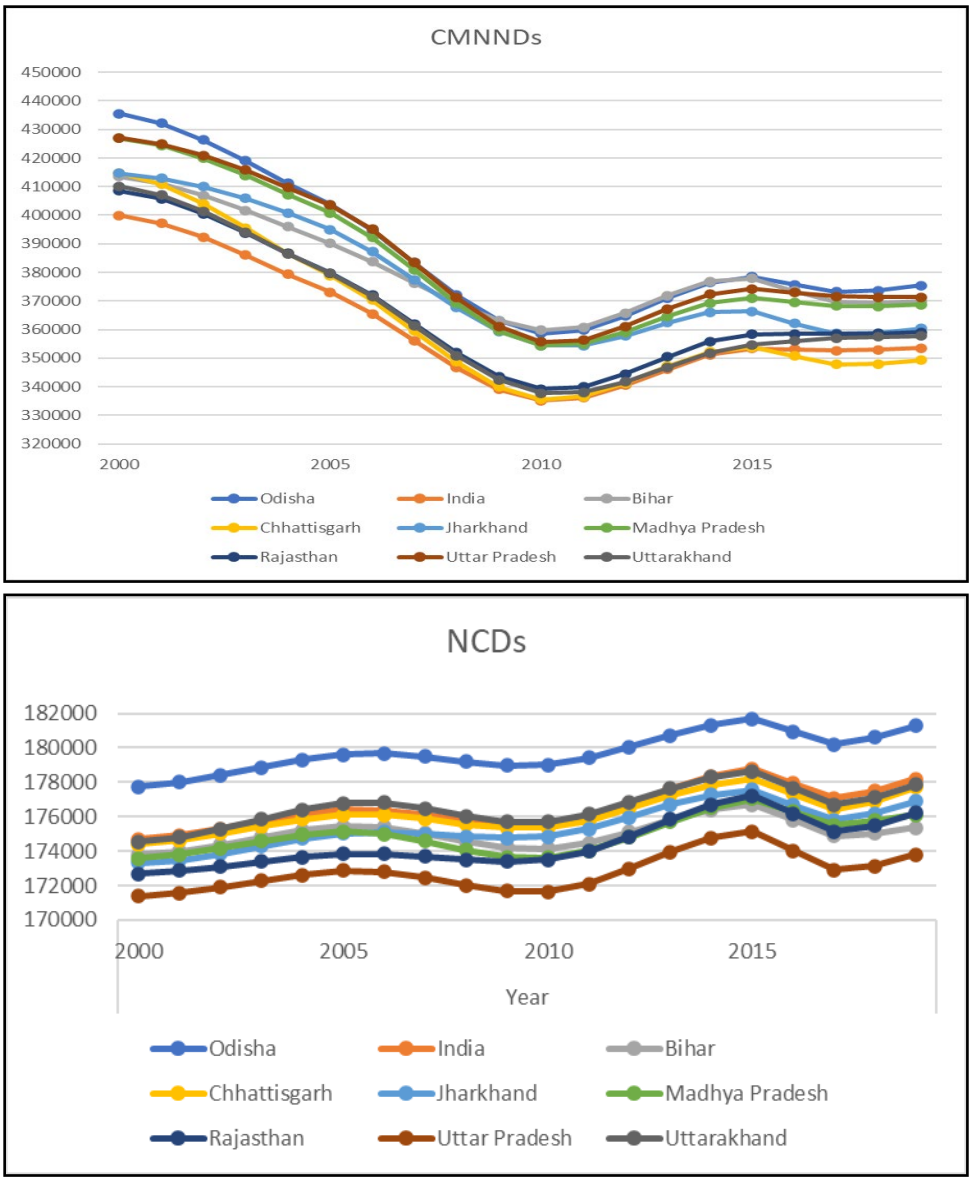
Table 2.5: Incidence & Prevalence of Non-Communicable Diseases in Odisha, 2019

Disease	New cases per 100,000	Prevalent cases per 100,000
Cardiovascular diseases	658	5,484
Neoplasms	1,826	2,634
Digestive diseases	6,929	29,057
Diabetes & kidney diseases	483	13,106
Chronic respiratory diseases	1,242	8,163
Neurological disorders	11,238	35,882
Other non-communicable diseases	79,873	75,820
Substance use disorders	870	1,923
Skin and subcutaneous diseases	69,104	24,138
Musculoskeletal disorders	3,198	17,660
Mental disorders	5,863	14,210
Sense organ diseases	-	26,044

Source: ICMR, PFHI, IHME, 2020

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 2.4: Incidence of CMNNDs & NCDs in EAG states & India over time



Source: ICMR, PFHI, IHME, 2020

2.3.4 Disaggregated Health Outcomes: by population sub-groups

The previous sections examined the state-level health outcome indicators for Odisha relative to those of the other EAG states and the bigger Indian states. It is further critical to explore the distribution of the indicators within the state. This section focuses on differences in health outcomes among different population sub-groups within the state and finds important differences in health outcomes based on residence, gender, caste/tribe, and wealth.

2.3.4.1 Rural-Urban

People living in rural areas in Odisha had a lower life expectancy at birth, higher mortality rates, and higher fertility rates than those in urban areas in 2018, although the rural-urban differential in these indicators has narrowed over the years [4].

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Rural areas also did poorly in terms of communicable diseases such as TB and had a greater percentage of children reported with diarrhea, as shown in Table 2.6. However, when we look at the prevalence of NCDs such as diabetes, asthma, thyroid, heart diseases, or cancer, urban areas with greater numbers of women per 100,000 who reported suffering from these diseases [7]. It is important to note that the difference in the rural-urban prevalence of NCDs depended on gender, with fewer men in urban areas reporting asthma and heart diseases. There were no reports of men suffering from thyroid or cancer in the NFHS survey.

Table 2.6: Health outcomes indicators by residence in Odisha

	Rural	Urban
Life expectancy at birth	68.7	72.0
Crude death rate	7.6	5.9
Neonatal mortality rate	33	22
Infant mortality rate	41	31
Under-five mortality rate	45	35
Still birth rate	11	9
Crude birth rate	19.2	13.4
Total fertility rate	2.0	1.3
Percentage of children with diarrhoea#	10.2	7.3
Number of persons (per 100,000) who reported suffering from TB	364	209
Number of women (per 100,000) who reported suffering from diabetes	1284	2659
Number of women (per 100,000) who reported suffering from asthma	2357	3178
Number of women (per 100,000) who reported suffering from goitre thyroid disorder	923	2755
Number of women (per 100,000) who reported suffering from any heart disease	1103	1228
Number of women (per 100,000) who reported suffering from cancer	52	95

Notes: # The NFHS asks if children aged 0-5 had diarrhoea in the two weeks preceding the survey. The self-reported health problems are for men and women aged 15-49 years. Source: Sample Registration System Based Abridged Life Tables 2014-18, GOI, 2020b; Sample Registration System Statistical Report, 2018, GOI, 2020a; NFHS Odisha Report, 2015-16.

2.3.4.2 Female-Male

Women had a higher life expectancy at birth and lower mortality rates than men in Odisha in 2018 (Table 2.7) [4]. A marginally smaller percentage of female children (9.7 percent) were reported having diarrhoea than male children (10 percent) in 2015-16 [7]. During the same period, the prevalence of medically treated tuberculosis and diabetes was approximately twice as high among men as among women. A greater number of men also reported suffering from cancer (199 per 100,000) than women (59 per 100,000). On the contrary, many more women suffer from goitre or any other thyroid disorders and heart diseases than men. That is, the

sex-based differences in morbidity were dependent on the type of disease, without a clear distinction based on communicable or non-communicable diseases.

Table 2.7: Health outcomes indicators by sex in Odisha

	Female	Male
Life expectancy at birth	70.8	68.0
Crude death rate	6.7	7.8
Infant mortality rate	39	40
Under-five mortality rate	43	44
Percentage of children with diarrhoea#	9.7	10.0
Number of persons (per 100,000) who reported suffering from TB	226	453
Number of persons (per 100,000) who reported suffering from diabetes	1525	2913
Number of persons (per 100,000) who reported suffering from asthma	2502	2233
Number of persons (per 100,000) who reported suffering from goitre or any other thyroid disorder	1245	287
Number of persons (per 100,000) who reported suffering from any heart disease	1125	1001
Number of persons (per 100,000) who reported suffering from cancer	59	199

Notes: # The NFHS asks if children aged 0-5 had diarrhoea in the two weeks preceding the survey. The self-reported health problems are for men and women aged 15-49 years. Source: Sample Registration System Based Abridged Life Tables 2014-18, GOI, 2020b; Sample Registration System Statistical Report, 2018, GOI, 2020a; NFHS Odisha Report, 2015-16.

2.3.4.3 Tribal-Nontribal

Another sub-group analysis that is especially important for Odisha is for the tribal populations. The state has the third largest concentration of tribal population in the country, with the Scheduled Castes (SC) and Scheduled Tribes (ST), which constitute around 40 percent of the state's total population. Table 2.8 illustrates that the scheduled tribes in Odisha had considerably higher children-specific mortality rates than the rest of the population in 2015-16. Simultaneously, children belonging to ST, SC, and Other Backward Castes (OBCs) were reported having a lower percentage with diarrhoea than their counterparts [7].

Women belonging to the ST reported the fewest cases of diabetes, asthma, thyroid, and heart diseases [7]. The highest prevalence of these NCDs was among women of other castes, followed by those in the OBC and SC. The highest number of cancer cases was reported among ST women. This implies that the tribal populations in Odisha have greater health needs, but they are not necessarily comparable to the rest of the state. Moreover, genetic disorders like sickle cell anaemia and thalassemia are also prevalent among the tribal groups [13].

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 2.8: Health outcomes indicators by caste/tribe in Odisha

	SC	ST	OBC	Other
Neonatal mortality rate	28.3	35.5	26.2	21.6
Infant mortality rate	37	51.8	36.7	31.5
Under-five mortality rate	45.7	65.6	42.9	35.2
Percentage of children with diarrhea#	10.6	10.3	8.1	11.2
Number of women (per 100,000) who reported suffering from diabetes	1383	732	1465	2693
Number of women (per 100,000) who reported suffering from asthma	2301	1719	2425	3767
Number of women (per 100,000) who reported suffering from goitre/thyroid disorders	834	629	1146	2457
Number of women (per 100,000) who reported suffering from any heart disease	1300	791	1077	1431
Number of women (per 100,000) who reported suffering from cancer	34	88	57	57

Notes: # The NFHS asks if children aged 0-5 had diarrhoea in the two weeks preceding the survey. The self-reported health problems are for men and women aged 15-49 years. Source: NFHS Odisha Report, 2015-16.

2.3.4.4 Wealth Quintiles

The percentage of children with diarrhea decreased with household wealth in Odisha in 2015-16 [8], as shown in Table 2.9. About 11 percent of children in the lowest wealth quintile were reported having diarrhea, almost double the share of children in households with the highest wealth quintile. The results are reversed for the NCDs, with the highest number of women in the richest wealth quintile households reporting suffering from diabetes, asthma, thyroid, heart diseases, and cancer.

2.4 Conclusion

In this chapter, we summarized the indicators of mortality, fertility, and morbidity of Odisha using secondary information sources. For each indicator, we start by examining whether the indicator has changed over time, followed by benchmarking Odisha's indicators to the national estimates, the estimates of similar states, and the SDGs, where applicable. We provided a comprehensive look at the health outcomes in Odisha using the most recent information available. It is important to note that some essential dimensions of health, such as mental health and social well-being, are not discussed here due to the absence of data. This report also does not discuss deaths and injuries linked to risk factors such as nutrition, substance use, environmental factors, as these are external to the health system framework.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

We find that Odisha has made substantial headway in improving the health status of its people. The state has achieved considerable declines in the infant mortality rate (41.7 percent) and the maternal mortality ratio (41.8 percent) between 2006 and 2018. The declines in the percentage of total deaths due to infectious diseases such as diarrhoea and TB are also commendable. In 2018, the life expectancy at birth in Odisha (69.3 years) was only slightly below the national average (69.4 years).

Table 2.9: Health outcomes indicators by wealth quintiles in Odisha

	Lowest	Second	Middle	Fourth	Highest
Percentage of children with diarrhea#	10.8	9.9	9.8	7.8	5.5
Number of women (per 100,000) who reported suffering from diabetes	834	1023	1706	3007	3883
Number of women (per 100,000) who reported suffering from asthma	1699	2563	2949	3514	3373
Number of women (per 100,000) who reported suffering from goitre/thyroid disorders	595	869	1356	2062	4161
Number of women (per 100,000) who reported suffering from any heart disease	1023	1355	1023	1245	852
Number of women (per 100,000) who reported suffering from cancer	61	61	33	79	83

Notes: # The NFHS asks if children aged 0-5 had diarrhoea in the two weeks preceding the survey. The self-reported health problems are for men and women aged 15-49 years. NHFS calculates wealth scores and quintiles based on the assets a household has. Source: NFHS-4 data.

Despite the progress of the state, the report demonstrates that there are several health outcomes indicators that continue to be alarming. The maternal mortality ratio, neonatal mortality ratio, and infant mortality ratio are significantly higher than the SDG targets for 2030. The mortality rates associated with communicable diseases such as diarrheal diseases, drug-susceptible TB, and malaria in Odisha are the highest among the EAG states and bigger states. The findings are similar when we examine the prevalence of communicable diseases. Moreover, Odisha had the highest incidence of both CMNNDs and NCDs among the EAG states in 2019. That is, there is a shift toward NCDs at a time when CMNNDs continue to be problematic.

Further concerns emerge when looking at the health outcomes indicators by population sub-groups. Life expectancy and mortality indicators are worse for vulnerable populations such as those in rural areas, scheduled tribes, and households belonging to the lower wealth quintiles. In terms of the prevalence of diseases, people in urban areas and richer people suffer more than their counterparts. However, the difference between sub-groups depends on the diseases

under consideration. For example, scheduled tribe women had the highest number of cases but the fewest diabetes, asthma, thyroid, and heart disease cases.

The findings of this chapter reaffirm the commitment of the Odisha government towards reducing maternal mortality, preventable newborn and under-five child deaths, premature mortality from NCDs, and ending epidemics of AIDS, TB, malaria, neglected tropical diseases, and other region specific diseases, as laid out in its Healthcare Vision 2025 [1], in order to yield 'maximal health outcomes' 'with special focus on those with poor health outcomes' [13].

2.5 References

1. Government of Odisha (GOO), *Healthcare Vision 2025: Healthcare for All*. 2020.
2. World Health Organization (WHO), *Preamble to the Constitution of the World Health Organization*. 1946, Geneva, Switzerland.
3. World Health Organization (WHO), *Global Reference List of 100 Core Health Indicators*. 2015: Geneva, Switzerland.
4. Government of India (GOI), *Sample Registration System Statistical Report, 2018*. 2020: New Delhi, India.
5. Indian Council of Medical Research (ICMR), Public Health Foundation of India (PFHI), and Institute of Health Metrics and Evaluation (IHME), *GBD India Compare 2019*. 2020.
6. Indian Council of Medical Research (ICMR), Public Health Foundation of India (PFHI), and Institute of Health Metrics and Evaluation (IHME), *Health of the Nation's States-The Indian State-Level Disease Burden Initiate*. 2017, New Delhi, India.
7. International Institute of Population Sciences (IIPS) and ICF, *National Family Health Survey NFHS-4 2015-16: Odisha*. 2017, Mumbai, India.
8. International Institute of Population Sciences (IIPS) and ICF, *India Demographic and Health Survey, 2015-16*. 2017.
9. Government of Odisha (GOO), *Odisha SDG Indicator Framework*. 2019: Bhubaneswar.
10. Government of India (GOI), *Sample Registration System Based Abridged Life Tables, 2014-18*. 2020: New Delhi, India.
11. Government of India (GOI), *Special Bulletin on Maternal Mortality in India, 2016-2018*. 2020: New Delhi, India.
12. Government of India (GOI), *Special Bulletin on Maternal Mortality in India, 2007-09*. 2011: New Delhi, India.
13. Government of Odisha (GOO) and Indian Institute of Public Health, Bhubaneswar (IIPH-B), *Odisha Health Policy: The Way Forward*. 2017: Bhubaneswar.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Chapter 3
Financial Risk Protection•

3.1 Summary

Financial risk protection is the extent to which households are protected from the financial risks of high healthcare costs. In this chapter, the Odisha Health System Assessment Study aimed to answer two research questions regarding financial risk protection: (1) to what extent are households in Odisha protected from the financial risks of high healthcare costs? and (2) what are the determinants of lack of financial risk protection in the state? By answering these questions, we filled gaps in what is known about the characteristics of financial risk protection and its determinants in the state of Odisha. The main metric we used to assess financial risk protection is catastrophic health expenditure (CHE), or when out-of-pocket (OOP) health spending surpasses 10 percent of household consumption expenditure. We assessed the rates of CHE for households on the whole (Section 3.3), as well as for outpatient visits (Section 3.4) and hospitalizations (Section 3.5). We considered the equity of financial risk protection by comparing CHE rates by key characteristics of households (social group, wealth, income, insurance status, and rural versus urban residence). Finally, we assessed the types of facilities, out-of-pocket (OOP) spending, and diseases or conditions most common when CHE arises. The data used in the assessment of financial risk protection were all sourced from the household survey (Survey Tool #1) which captured responses from 7,567 households and 30,654 individuals.

Our household survey showed that financial risk protection in Odisha is worse than other states in India, including other Empowered Action Group states. In 2019, 24 percent of households in Odisha suffered financial hardship due to healthcare costs, the second-highest rates of CHE across India. Across social groups, households that identified as belonging to a Scheduled Tribe had lower CHE rates than other groups, but they also had higher rates of reported foregone care due healthcare costs (as reported in Chapter 5.)

We highlighted novel findings that could inform the design of financial risk protection policies in Odisha. Our household survey showed that high rates of CHE can be explained in part by high drug spending, which contributes substantially to high OOP costs even in public sector health facilities, and evidence that use of insurance fails to reduce OOP costs. Drug spending comprised 32 percent of all OOP costs for hospitalizations on average and 69 percent of all OOP spending on outpatient care. Eliminating drug spending altogether would reduce CHE by 65 percent. This is connected to where drugs were obtained – 86 percent of users of outpatient care purchased drugs in the private sector. Despite being designed to cover the costs of hospitalizations, reported use of insurance is not associated with differences in the costs of hospitalizations.

• This Chapter was led by Annie Haakenstad, with participation from Tejal Patwardhan.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

3.2 Introduction

Protecting households from the financial risks of healthcare is a key component of health system performance. Health systems strive to ensure that households do not incur financial hardship when accessing (high-quality) healthcare. This section used standard measures of financial risk protection to assess the performance of the Odisha health system in this area [1].

3.2.1 Measuring Financial Risk Protection

Catastrophic health expenditure (CHE), or the proportion of the population with out-of-pocket (OOP) healthcare costs that surpass a given threshold share of consumption expenditure or income, is the most commonly used measure of lack of financial risk protection. In our assessment of the Odisha health system, we used 10 percent for that threshold, as defined in Sustainable Development Goal target 3.8.2_10 [2].

OOP healthcare spending, defined as spending sourced from household resources disbursed at the time of service, was collected in various sections of the household survey. In this chapter, we used the OOP costs collected in three sections with the aim of representing spending and utilization comprehensively. First, in Section 3.3, we used the spending on healthcare reported for the household on the whole, with spending on doctor fees, medicines, diagnostics and other costs reported for the last thirty days and spending on hospitalizations reported for the past year. We made the time frames consistent in our analysis. This portion of the household survey also collected information on total consumption expenditure, the result of summing 45 categories of consumption spending as well as home produced food and other goods. Second, in Section 3.4, we used spending on specific healthcare encounters for all household members that took place in the 15 days prior to the household survey, again collected separately for doctor fees, medicines, diagnostics and other costs. Finally, in Section 3.5, we used spending on specific hospitalizations that took place during the year prior to the survey, breaking down spending again by doctor fees, medicines, diagnostics, and other costs. For both the care pursued in the past 15 days and hospitalizations in the last year, respondents were asked to report the reason care was sought and where care was obtained, and we use that information to assess whether and how patterns of healthcare use and spending explain the rates of CHE observed in Odisha.

3.3 Research Design

We aimed to answer two research questions:

1. To what extent are households in Odisha protected from the financial risks of healthcare costs?
2. What are the determinants of lack of financial risk protection in the state?

With respect to (1), we used the definition of CHE articulated above. For (2), we assessed determinants first by examining equity and calculating CHE separately for the following groups based on the household survey:

1. Place of residence: rural or urban

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

2. Socio-cultural groups: Scheduled Caste (SC), Scheduled Tribe (ST), Other Backwards Caste (OBC), or Other
3. Insurance status: whether anyone reported having insurance or using insurance (for a hospitalization)
4. Poverty: report of possession of a below poverty line (BPL) card
5. Wealth Quintile: five wealth categories based on a principal component analysis of assets and conditions of housing and infrastructure
6. Income Quintile: five categories of income based on reported annual household income

The other key determinant examined is characteristics of the healthcare used, including where and why it was sought and what OOP spending went toward purchasing. Respondents reported whether they used public or private sector care and the type of facility, why they needed care and reported break downs of total OOP costs. We presented descriptive statistics in the sections focused first on CHE overall and broken down by household characteristics (Section 3.3), illness and healthcare in the last 15 days (Section 3.4), and hospitalizations and spending by facility (Section 3.5).

Our data for the analysis on financial risk protection came from the household survey (Survey 1 in Table 1.1). The household survey collected information from 7,567 households and 30,654 individuals. The specifics of the sampling strategy are discussed in depth in the methodology section but we present them briefly here. First, district strata were created based on a development index. Six districts were selected to be representative of the index and the geography of the state. Next, we sampled blocks proportionate to size and divided primary sampling units into rural and urban areas, sampling these strata according to the distribution of rural/urban areas in Odisha. Finally, we selected households in order to ensure we had sufficient sample sizes of healthcare users, oversampling households in which a member had an outpatient visit in the last 15 days, a chronic illness diagnosed by a health provider, and a hospitalization in the last year. Survey weights were developed to address the oversampling of these types of households and the multi-stage probability proportionate to size sampling. Post-stratification weights were also developed and employed to ensure our results are representative of the state of Odisha. (See Appendix 2, Research Design and Methodology.)

3.4 Results

3.4.1 Household Catastrophic Health Expenditure

Overall, CHE at the 10 percent threshold is high in Odisha. Figure 3.1, based on the 75th National Sample Survey, shows that Odisha had the second-highest CHE rates across Indian states, second only to Kerala.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 3.1 reports that CHE was 24 percent at the 10 percent threshold and 10 percent at the 25 percent in Odisha based on our household survey. Table 3.1 and Figure 3.2 break down CHE by spending on drugs, hospitalizations and other OOP spending, showing that 65 percent of CHE was due to drugs alone. In Figure 3.2, we show that while drugs as a share of OOP declines as spending exceeded the 10 percent CHE threshold, this spending remained a major share of spending even beyond 25 percent of consumption expenditure (Figure 3.2). Eliminating health spending on drugs would reduce CHE to just 9 percent, a decline of 65 percent, whereas eliminating spending on hospitalizations would reduce CHE by only 22 percent.

Figure 3.1: CHE rates by state (75 NSS)

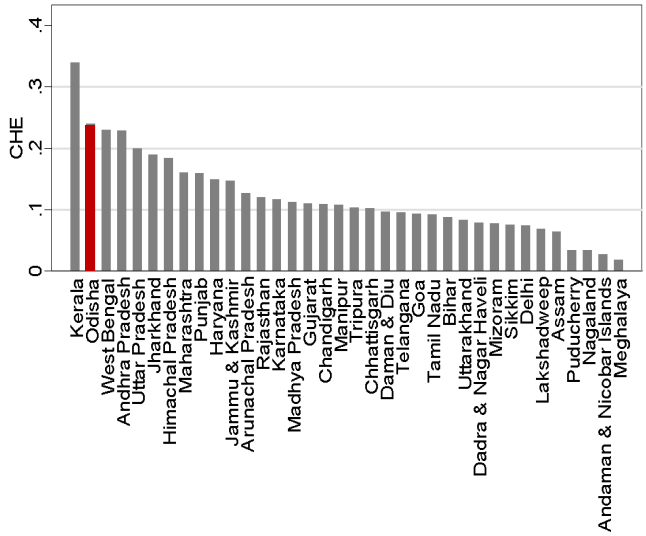


Table 3.1: CHE overall and by spending type

	Value
Share of households with CHE at 10%	24%
Share of households with CHE at 25%	10%
Share of CHE at 10% due to drugs	65%
Share of CHE at 10% due to hospital spending	22%
CHE at 10% if drug spending eliminated	9%
CHE at 10% if hospital spending eliminated	19%

Figure 3.2: OOP over consumption expenditure, decomposed by spending type

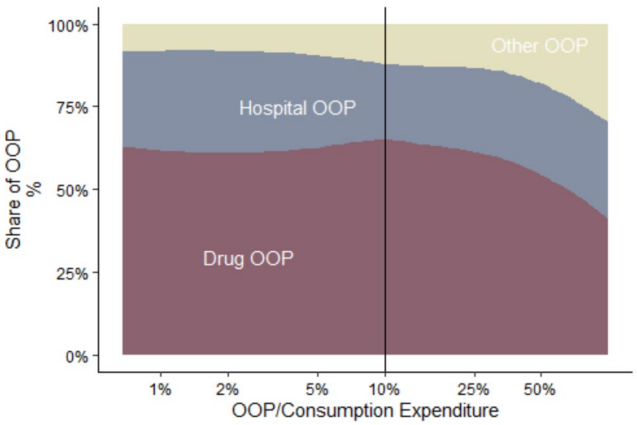


Table 3.2 presents results regarding consumption expenditure and health expenditure of households in Odisha in Rupees and United States Dollars (exchange rate: 0.014 dollars/rupee). We presented average and median spending because

health spending tends to be skewed – a very small number of high spending estimates can change the average substantially. Our survey estimated that, on average, households in Odisha spend 8 percent of their consumption expenditure on health and 4 percent have taken out loans for healthcare costs. These loans are substantial, amounting to 45 percent of consumption expenditure among those that took out loans. While average monthly spending on drugs (Rs. 1,254 or 18 dollars) and average annual spending on hospitals stays (Rs. 3,052 or 43 dollars) were large, many households did not have these expenditures with median spending of zero for both categories; just 42 percent of households had any drug spending and 19 percent had any hospital spending.

Table 3.2: Consumption expenditure, health expenditure and loans for healthcare

	Rupees	USD
Average yearly spending	121,996	1,707
Median yearly spending	85,620	1,199
Average annual health spending	11,528	161
Median annual health spending	250	3.5
Average health spending share of consumption expenditure	8%	-
Share of households with any health spending	50%	-
Share of households that have taken loans for healthcare	4%	-
Average loan amount for those with healthcare loans	51,913	727
Median loan amount for those with healthcare loans	30000	420
Share of healthcare loan as a share of consumption expenditure for households with healthcare loans	45%	-
Average annual hospital spending	3,052	43
Median annual hospital spending	0	0
Share of households with any hospital spending	19%	-
Average annual drug spending	1,254	18
Median annual drug spending	0	0
Share of households with any drug spending	42%	-

3.4.1.1 Household characteristics of catastrophic health expenditure

We examined rates of CHE and other spending elements by four different groups of households: rural versus urban, self-reported social group (Scheduled Tribe, Scheduled Caste, and Other), whether anyone in the household reported having insurance, whether a below poverty line (BPL) card was reported to be in possession, asset-based wealth quintile, and five quintiles of reported annual income (Table 3.3). Figure 3.3 presents results of CHE for a subset of these groups and Table 3.3 reports the CHE values and other health spending characteristics. Tested with ordinary least squares regression with indicators for each sub-group, rates of CHE were substantially lower for the Scheduled Tribe group (14 percent) than any other social group ($p<.001$). A slight wealth gradient in CHE was also detected: differences were statistically significant for CHE rates when comparing the first to fifth quintiles (19 percent vs. 26 percent, $p=.002$). However, rural versus urban residents had similar rates of CHE (25 percent vs. 23 percent, $p=.788$), as did

households with and without a BPL card (25 percent vs. 23 percent, p=.123).

Figure 3.3: CHE rates by rural/urban, social group, BPL and wealth quintile

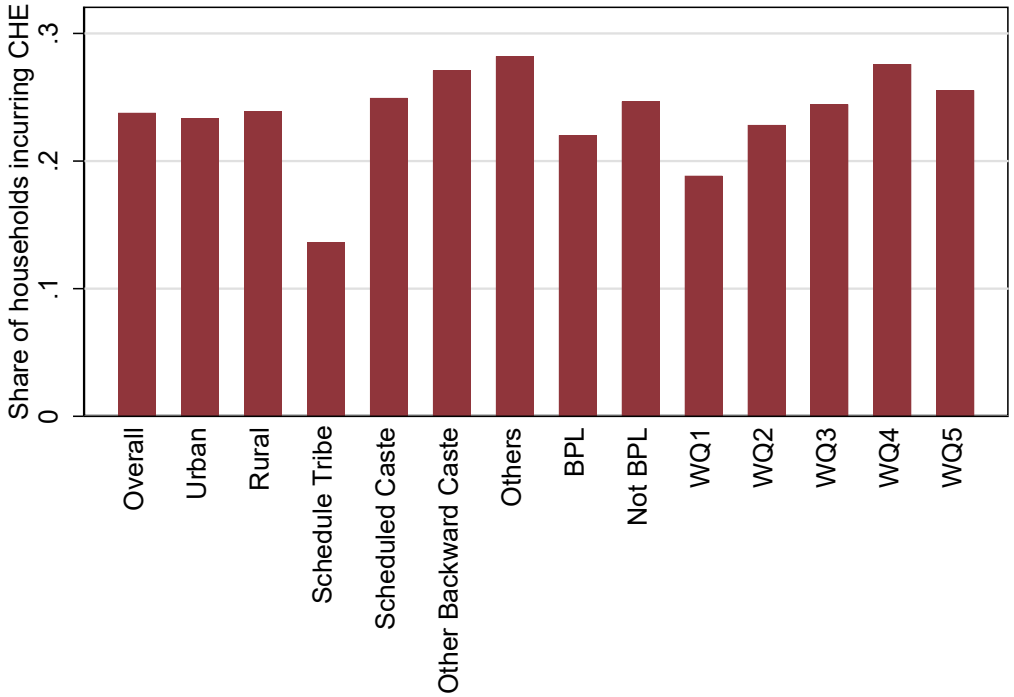


Table 3.3: CHE rates and other household spending characteristics by rural/urban, social group, insurance, BPL, wealth quintile and income quintile

	Yearly health spending	Share with any health spending	Yearly hospital spending	Share with any hospital spending	Yearly drug spending	Share with any drug spending	Share took loans for healthcare	CHE (10% budget)
Urban	13,534	53%	4898	30%	6957	40%	4%	23%
Rural	11,145	50%	2700	16%	6171	42%	4%	25%
Schedule Tribe	4,681	36%	953	12%	2902	29%	1%	14%
Scheduled Caste	10,098	53%	2537	16%	6062	45%	4%	25%
Other Backward Caste	13,686	53%	3218	19%	7407	45%	5%	27%
Others	16,039	57%	5440	25%	8065	47%	6%	28%
No ins.	11,393	50%	3,017	18%	6,329	41%	4%	24%

Any ins.	15,374	55%	3,787	21%	8,198	45%	7%	29%
BPL reported	9,727	47%	2908	15%	5400	40%	3%	23%
Not BPL	12,401	52%	3123	20%	6732	42%	5%	25%
WQ1	6,392	42%	1162	12%	4406	35%	2%	21%
WQ2	8,872	48%	1937	18%	4998	39%	5%	24%
WQ3	11,905	49%	3034	16%	6256	42%	6%	25%
WQ4	13,888	56%	3955	20%	7406	46%	5%	27%
WQ5	19,449	60%	6324	30%	9597	48%	3%	25%
Income Quintile 1	10,700	49%	2,730	17%	5,468	40%	3%	28%
Income Quintile 2	7,887	45%	2,475	17%	4,226	35%	3%	21%
Income Quintile 3	9,096	49%	2,105	16%	5,502	42%	4%	25%
Income Quintile 4	12,603	54%	2,839	19%	8,148	46%	6%	25%
Income Quintile 5	17,752	55%	5,229	23%	8,412	45%	4%	22%

3.4.2 Illness and Healthcare Utilization in the Last 15 Days

In this section, we presented the portion of the household survey in which we posed detailed questions to individuals who were ailing and used care in the 15 days prior to the survey. Of special interest was individuals who were ailing and, instead of pursuing advice from doctors or nurses, consulted a pharmacist for their ailment.

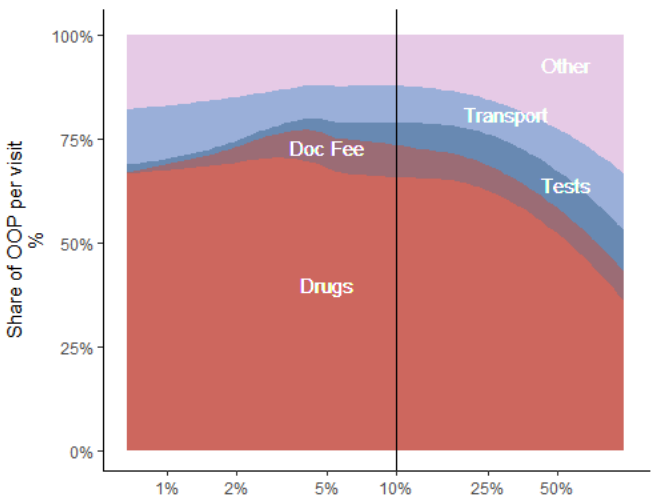
3.4.2.1 Healthcare use and OOP spending

Table 3.4 depicts basic information about ailing individuals and healthcare users. These elements were further broken down by rural/urban, social group, BPL card, wealth quintile, income quintile, insurance status, gender and age in Table 3.5. Of all those ailing, 9 percent did not pursue care – 85 percent of which because they did not consider themselves sick enough and 9 percent did not pursue care because of costs. The highest rates of non-use of care were among those aged 60 and older (Table 3.4). Scheduled Tribe individuals had the highest rates of reporting they did not use care because of costs (14 percent).

Table 3.4: CHE rates and other household spending characteristics

	Value
Share ailing that did not seek care	9%
Share that did not seek care because not sick enough	85%
Share that did not seek care because of costs	9%
Mean Total OOP Costs Rupees	852
Mean Total OOP Costs USD	12

Figure 3.4: Composition of OOP spending per healthcare visit in the last 15 days, spending type



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Mean Drug OOP Costs Rupees	528
Mean Drug OOP Costs USD	7
Number of drugs obtained	2.5
Share that obtained drugs from private sector	86%
Drug Share of OOP	69%
CHE (visit-based)	26%

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

On average, a visit cost Rs. 852, with 69 percent of the costs due to the need to purchase drugs and 2.5 drugs obtained on average. The vast majority of drugs (86 percent) were obtained in the private sector, ranging from 78 percent among Scheduled Tribe individuals to 90 percent among individuals in wealth quintile 5. Of those that used care in the last 15 days, 26 percent suffered CHE with the highest rate observed among income quintile one (36 percent) and the lowest rates observed among income quintile five (15 percent). Figure 3.4 shows that drugs were a substantial share of spending even for individuals that incurred CHE but the share of other OOP costs grew as OOP costs as a share of consumption expenditure increased.

Table 3.5: CHE rates and other household spending characteristics by rural/urban, social group, insurance status, BPL, wealth quintile, gender and age group

	Mean Total OOP Costs, Rupees	Mean Drug OOP Costs, Rupees	Mean no. of drugs	Drugs from private sector	Drug Share of OOP	CHE (10% visit based)
Urban	804	494	2.7	84%	72%	17%
Rural	861	465	2.4	86%	68%	27%
ST	622	276	1.7	78%	69%	23%
SC	814	489	2.6	87%	68%	31%
OBC	870	507	2.6	87%	69%	26%
Others	1042	541	2.6	87%	68%	24%
Any ins.	868	444	2.3	85%	63%	30%
No ins.	849	474	2.5	86%	69%	24%
BPL	808	473	2.3	85%	68%	31%
Not BPL	869	468	2.5	86%	69%	24%
WQ1	762	408	2.2	83%	72%	35%
WQ2	829	419	2.4	87%	67%	28%
WQ3	787	467	2.7	86%	65%	27%
WQ4	849	467	2.5	83%	69%	23%
WQ5	1060	604	2.5	90%	70%	16%
Income Quintile 1	998	564	2.6	86%	66%	36%
Income Quintile 2	778	439	2.4	85%	65%	29%
Income Quintile 3	735	515	2.5	87%	69%	29%
Income Quintile 4	800	531	2.5	85%	65%	21%
Income Quintile 5	955	579	2.5	86%	67%	15%
Male	885	489	2.5	85%	68%	24%
Female	821	451	2.4	87%	69%	28%
<18	572	309	2.4	85%	68%	18%
19-59	852	470	2.4	86%	69%	26%
60+	915	529	2.4	82%	70%	31%

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

3.4.2.2 Healthcare use and OOP spending by facility type

Significant variation in CHE and health spending was observed depending on where care was sought. We provide basic information on the CHE rates and contributing factors in Table 3.6. Public primary facilities were the facility type most used (30 percent of visits) followed by private hospitals (20 percent of visits). Mean cost per visit was 78 percent higher in private health facilities than public health facilities overall. Rates of CHE were highest among individuals that sought care at private hospitals (41 percent), as depicted in Figure 3.5a. The largest share of all CHE cases also occurred at private hospitals (Figure 3.5b).

Table 3.6: CHE rates and other spending characteristics by facility type

	Share of all visits in last 2 weeks	Mean Total OOP Costs, Rupees	Mean Drug OOP Costs, Rupees	Mean no. of drugs	Drugs from private sector	Drug Share of OOP	CHE (10% visit based)
Public Hospital	12%	1,429	594	3.2	73%	50%	38%
Private Hospital	20%	1,624	842	3.1	100%	64%	41%
Public Primary	30%	557	368	2.8	72%	64%	20%
Private Primary	4%	827	588	1.9	100%	80%	30%
Private Chemist	13%	555	387	2.0	100%	80%	24%
Ayush	6%	1,291	737	2.8	100%	69%	38%
Other non-provider	16%	248	392	1.1	96%	87%	8%
Public health facilities	46%	790	428	2.9	72%	59%	25%
Private health facilities	24%	1404	754	2.8	100%	67%	38%
Other (including Private Chemists)	30%	735	512	2.1	98%	73%	25%

Figure 3.5a: CHE rates, by facility

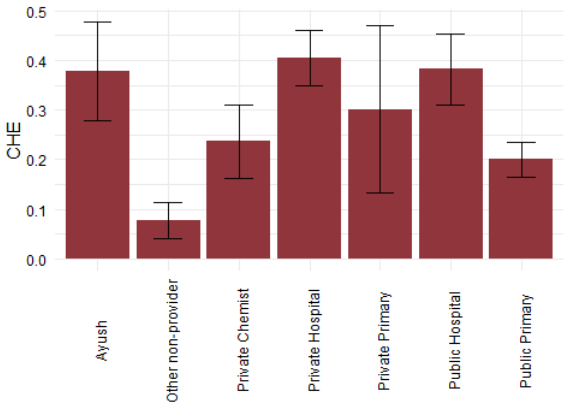
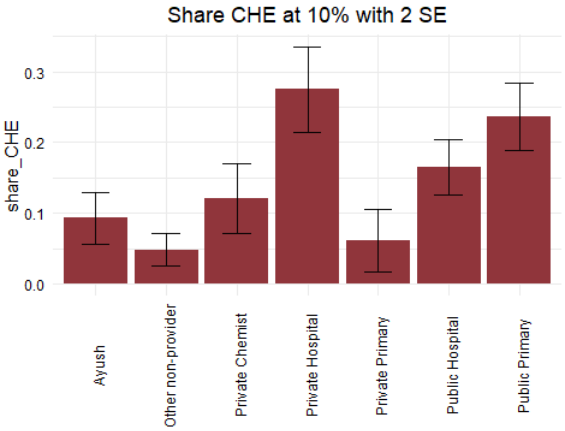


Figure 3.5b: Share of all CHE cases, by facility



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 3.6 shows that as OOP as a share of consumption expenditure rises, private hospitals and public hospitals increase as a share of all facilities in which care was sought.

Figure 3.7a shows that average spending per visit was highest in private hospitals (Rs. 1,624), followed by visits to AYUSH providers (Rs. 1,429), and public hospitals (Rs. 1,429). Figure 3.7b, which depicts the share of spending per visit by spending category, shows that for all providers, drugs make up the biggest portion of spending.

Figure 3.7a: Average OOP by spending category, by facility (Rupees)

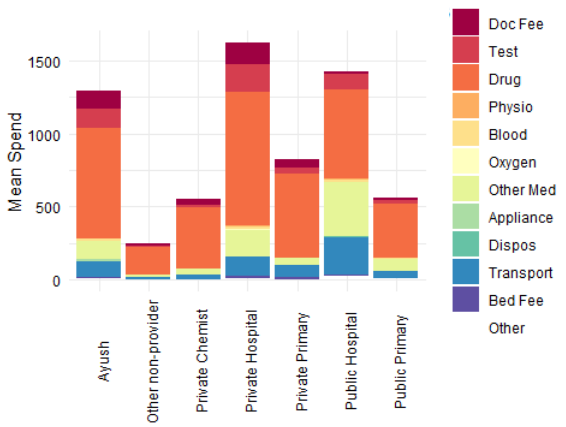
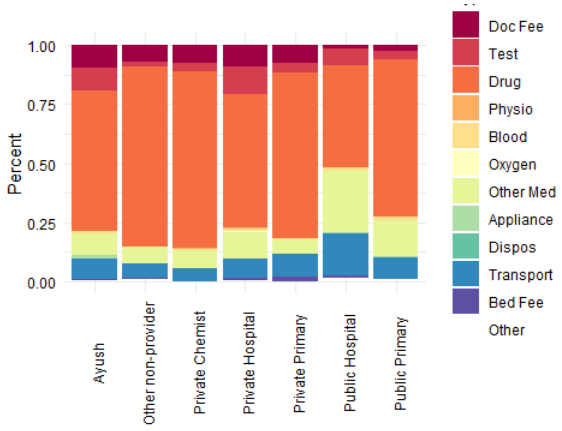


Figure 3.7b: Distribution of OOP by spending category, by facility



3.4.2.3 Healthcare use and OOP spending by reason for care

In this section, we present CHE rates and other characteristics of healthcare visits in the 15 days prior to the survey according to the reason for using care, as reported by the patient. More than half of all visits were reportedly due to fever (55 percent). Very few visits were due to cancer and heart disease (<1 percent) but these causes had the highest rates of CHE (Figure 3.8a). Fever, in contrast, because of the large share of visits due to this cause, was the driver of the largest share of CHE cases (Figure 3.8b).

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 3.7: CHE rates and other spending characteristics by reason for care

	Share of all visits in last 2 weeks	Mean Total OOP Costs Rupees	Mean Drug OOP Costs Rupees	Mean no. of drugs	Share that obtained drugs from private sector	Drug Share of OOP	CHE (10% visit based)
Acute Respiratory	8%	458	312	2.4	82%	73%	10%
Cancer	<1%	5,859	3667	4.8	100%	70%	100%
Child Birth	3%	1,969	738	2.6	87%	60%	39%
Diabetes	2%	2,026	1,415	2.4	89%	61%	46%
Diarrhea	4%	573	414	2.4	91%	74%	18%
Fever	55%	585	394	2.4	86%	70%	23%
Heart Disease	<1%	1,728	1,266	4.5	100%	85%	59%
Injury	2%	2,876	1,626	3.3	85%	66%	34%
Local Pain or Weakness	7%	1,441	948	2.8	87%	63%	41%
Other	17%	1,132	609	2.5	86%	64%	30%
Skin Infection	2%	958	712	3.2	91%	75%	44%

Figure 3.8a: CHE rates, by reason

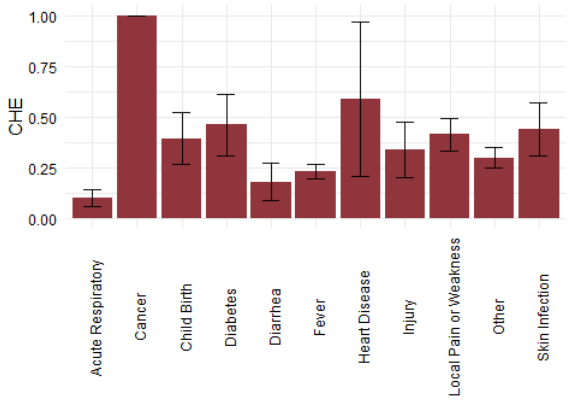
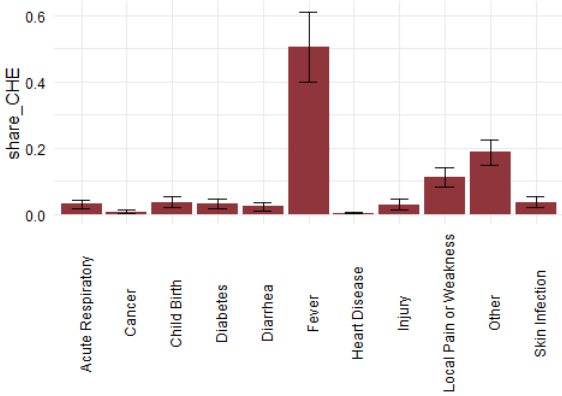
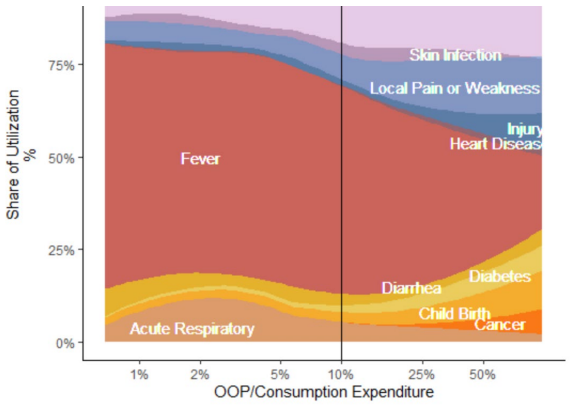


Figure 3.8b: Share of all CHE cases, by reason



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 3.9: Composition of OOP spending per hospitalization, spending type



In Figure 3.9, we present the composition of spending according to the reason care was sought against the share of OOP over consumption expenditure. This showed that fever was a major cause of visits but as the OOP share of consumption expenditure rises, fevers declined as a share of visits.

Figure 3.10a shows that spending on cancer per visit (Rs. 5,859) was substantially higher per visit than all other causes of care. For all causes, drugs were the largest spending category. Child birth costs per visits, in contrast to all other causes, had a more substantial share of spending due to transportation.

Figure 3.10a: Average OOP by spending category, by reason (Rupees)

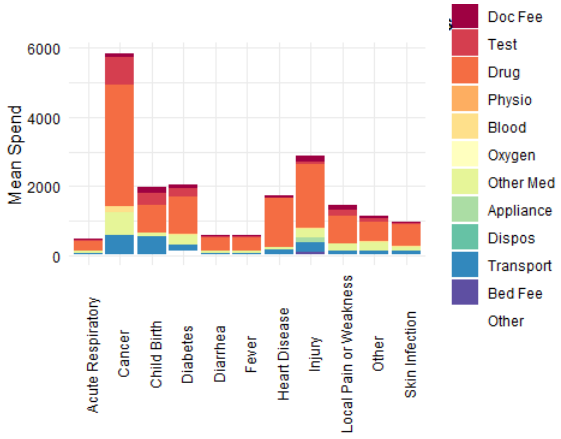


Figure 3.10b: Distribution of OOP by spending category, by reason

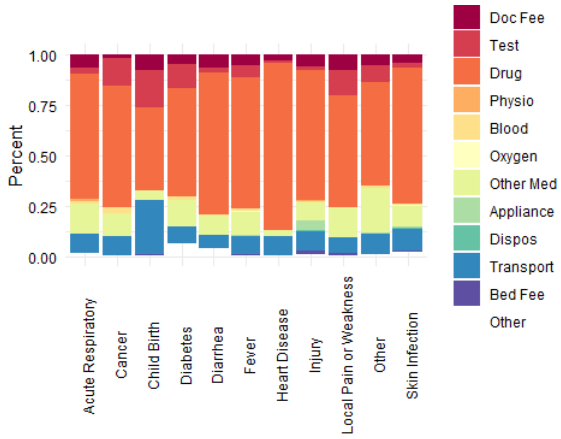
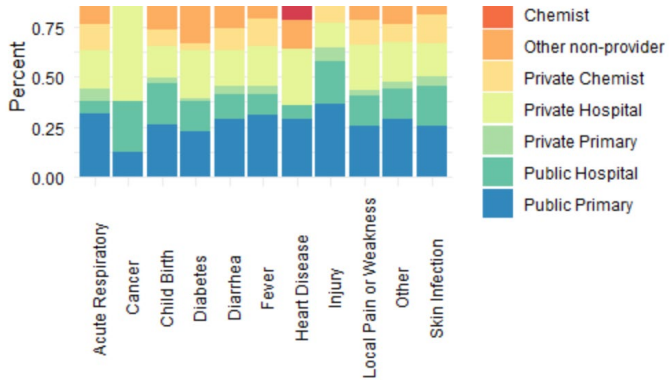


Figure 3.11 brings together the cause of care with where care was sought. More than half of cancer care was sought in private hospitals. For all other causes, a mix of facility types were used to treat the reason for care-seeking.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 3.11: Share of all visits by reason and facility type



3.4.3 Hospitalizations and Spending by Facility

In this section, we presented the portion of the household survey in which we posed detailed questions about hospitalizations in the last year. Of special interest in this section was whether insurance programs are associated with lower rates of spending, conditional on the facility and reason for using care.

3.4.3.1 Hospitalizations and OOP spending in public versus private facilities

Among the 1836 hospitalizations in our survey, 75 percent took place in public facilities, where average OOP costs (Rs. 10,407) were more than a third lower than average OOP costs in private facilities (Rs. 33,886), 226 percent higher than public hospitalizations on average. Use of insurance was low – just 4 percent of respondents hospitalized in public facilities and 9 percent of those hospitalized in private facilities reported using an insurance program. CHE rates were more than twice as high for those hospitalized in private facilities (52 percent) as compared to respondents hospitalized in public facilities (19 percent) (Figures 3.12a, 3.12b).

Table 3.8: CHE rates and other spending characteristics of hospitalizations

	No. of hospitalizations	Referral cited as a reason for selecting facility	Mean Total OOP	Mean Drug OOP Costs Rupees	Mean Drug Share OOP	% using an insurance program	Reimbursed?	CHE (10%)
Public	75%	4%	10,407	3,287	41%	5%	4%	19%
Private	25%	11%	33,886	10,380	37%	9%	8%	52%
Total	1836	6%	15,906	4,556	41%	6%	5%	27%

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 3.12a: CHE rates for hospitalizations, by public/private facility

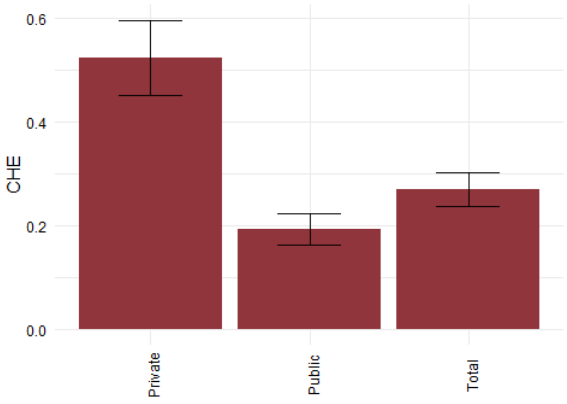
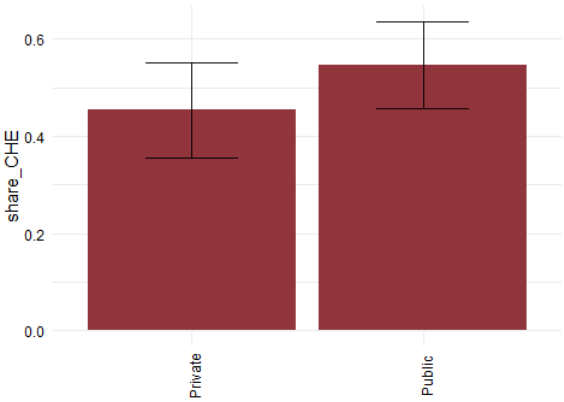
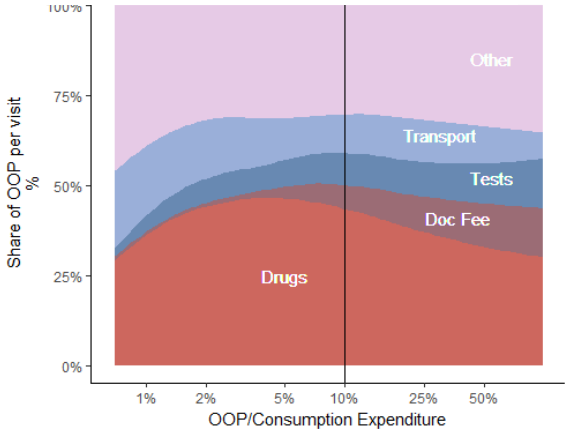


Figure 3.12b: Share of all CHE cases for hospitalizations, by public/private facility



Similar to household spending overall and care received in the last 15 days, drugs made up a major share of OOP spending on hospitalizations, although the share was lower than for healthcare pursued in the last 15 days (Figure 3.13). This is also shown in Figures 3.14a and 3.14b, which depict average spending per hospitalization, broken down by category. In both public and private facilities, drugs were the biggest category, although other medical costs make up a bigger share of costs in public facilities. Spending patterns were not distinct depending on whether the individual hospitalized reported using insurance (Figure 3.15). The share of hospitalizations that took place in the private sector increased as the OOP share of consumption expenditure rose (Figure 3.16).

Figure 3.13: Composition of OOP spending, by reason for care



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 3.14a: Average OOP per hospitalization by spending category and private/public (Rupees)

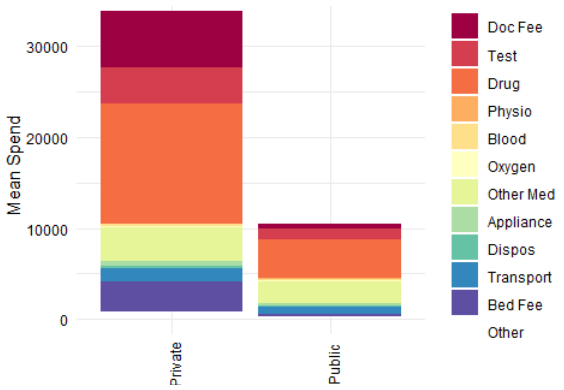


Figure 3.14b: Distribution of OOP per hospitalization by spending category and private/public

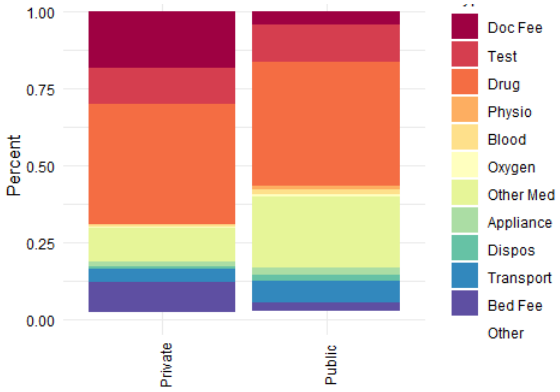


Figure 3.15: Composition of OOP spending per hospitalization, by public/private

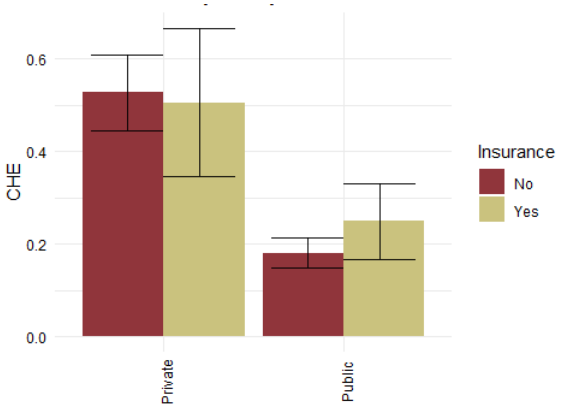


Figure 3.16: Composition of OOP spending per hospitalization, by public/private

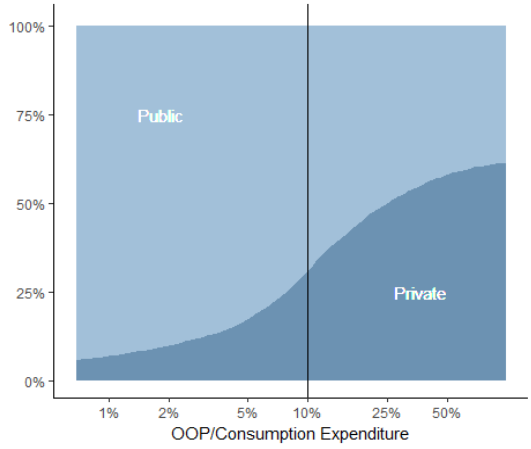


Table 3.9 presents hospitalization characteristics broken down by different groups.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 3.9: Characteristics of hospitalizations by rural/urban, social group, insurance status, BPL, wealth quintile, income quintile, gender and age group

	Share hospitalized	Referral cited as a reason for selecting facility	Mean Total OOP	Mean Drug OOP Costs Rupees	Mean Drug Share OOP	% using an insurance program	CHE (10%)
Urban	4%	2%	16,724	4,059	47%	7%	21%
Rural	4%	7%	15,733	4,656	40%	5%	28%
ST	2%	6%	8,482	1,626	26%	1%	17%
SC	5%	9%	12,558	4,436	42%	7%	23%
OBC	4%	5%	17,918	5,034	42%	6%	32%
Others	5%	5%	20,271	5,664	47%	6%	29%
Any insured	5%	8%	17,099	4,546	37%	21%	32%
No insured	4%	5%	15,654	4,558	41%	2%	26%
BPL	4%	9%	13,906	4,730	41%	8%	22%
Not BPL	4%	4%	16,814	4,473	41%	4%	29%
WQ1	3%	5%	10,499	3,482	35%	7%	27%
WQ2	4%	9%	10,085	3,173	48%	4%	25%
WQ3	4%	7%	15,796	5,007	43%	6%	31%
WQ4	4%	5%	20,357	5,740	36%	4%	29%
WQ5	5%	3%	21,581	5,147	40%	8%	22%
Income Quintile 1	4%	5%	12,890	3,524	36%	18%	32%
Income Quintile 2	4%	12%	17,676	6,173	29%	16%	29%
Income Quintile 3	4%	4%	12,113	4,480	37%	16%	25%
Income Quintile 4	5%	6%	14,118	3,852	31%	26%	26%
Income Quintile 5	4%	4%	22,003	4,915	28%	15%	25%
Male	3%	8%	20,896	5,309	44%	7%	32%
Female	5%	5%	12,486	4,050	38%	4%	24%
<18	2%	9%	11,173	2,239	32%	2%	18%
19-59	5%	6%	15,906	4,556	41%	6%	27%
60+	5%	5%	19,420	6,140	45%	10%	35%

3.4.3.2 Hospitalizations and OOP spending by the reason for care

Table 3.10 depicts characteristics of hospitalizations according to why respondents were hospitalized. Child birth was the cause of the largest share of hospitalizations (28 percent) followed by Fever (16 percent), although the other category was also a major share (27 percent), representing an amalgamation of many causes. OOP costs were highest for cancer (Rs. 47,534), followed by injury (Rs. 27,415) and local pain or weakness (18,249). CHE rates were also highest for cancer (60 percent) and injury (46 percent) hospitalizations, as shown in Figure 3.17a, but the largest share of CHE cases was due to child birth and other causes (Figure 3.17b).

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 3.10: Characteristics of hospitalizations by reason for seeking care

	Share of hospitalizations	Mean Total OOP, Rupees	Mean Drug OOP Costs Rupees	Mean Drug Share OOP	Share using an insurance program	CHE (10%)	Share that provided gifts for hospitalizations
Acute Respiratory	1%	14,719	3,582	50%	0%	24%	2%
Cancer	2%	47,534	6,248	20%	14%	60%	3%
Child Birth	28%	15,086	3,947	35%	3%	31%	12%
Diabetes	3%	9,948	5,780	56%	16%	15%	3%
Diarrhea	5%	10,691	6,335	48%	2%	17%	2%
Fever	16%	6,950	2,318	47%	2%	14%	1%
Heart Disease	0%	16,195	1,843	20%	5%	5%	0%
Injury	7%	27,415	8,944	47%	6%	46%	1%
Local Pain or Weakness	11%	18,249	5,139	44%	2%	27%	2%
Other	27%	18,258	4,779	39%	11%	29%	3%
Skin Infection	0%	1,312	1,006	76%	0%	0%	0%

Figure 3.17a: CHE rates for hospitalizations, by public/private facility

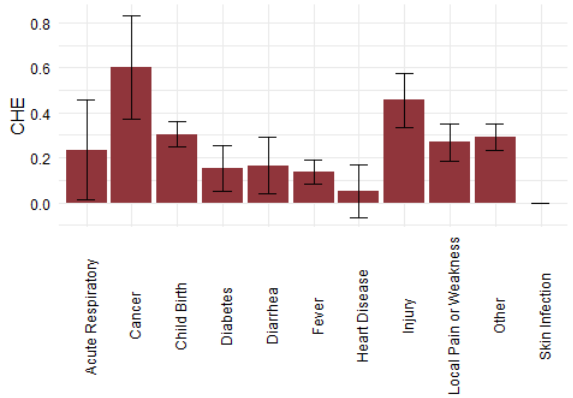
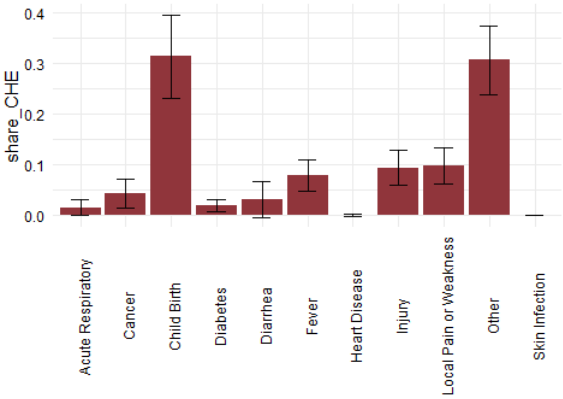


Figure 3.17b: Share of all CHE cases for hospitalizations, by public/private facility



Figures 3.18a and 3.18b show the costs per hospitalization broken down by spending type and reason for care. Drugs represented a major share of costs across reasons. CHE rates were not distinct by insurance status (Figure 3.19). As the OOP share of consumption expenditure rose, the share of hospitalizations tended to decline but the share related to child birth remained steady (Figure 3.20).

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 3.18b: Distribution of OOP per hospitalization by spending category and reason for care

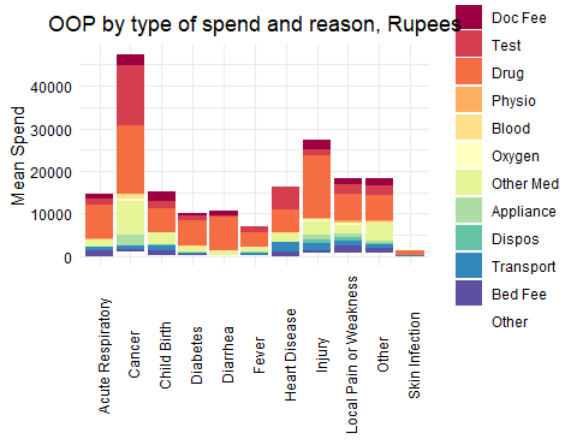


Figure 3.18b: Distribution of OOP per hospitalization by spending category and reason for care

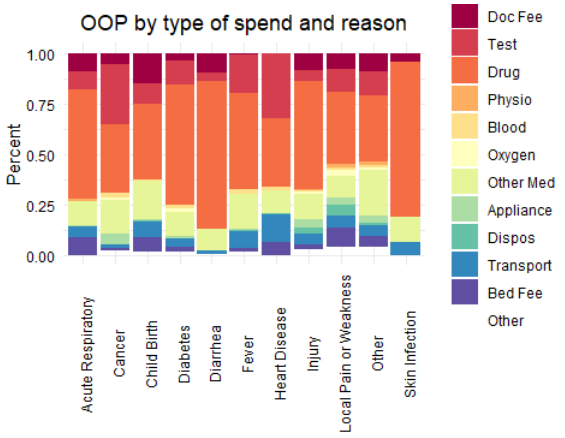


Figure 3.19: CHE rates by insurance status and reason for care

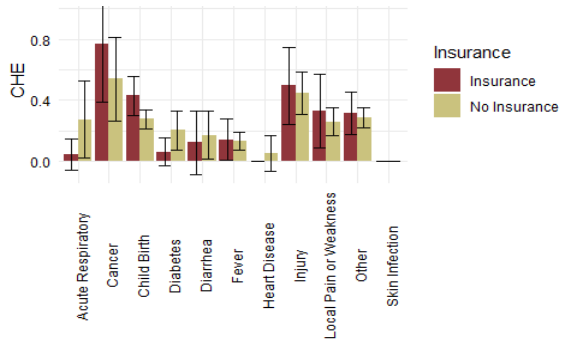
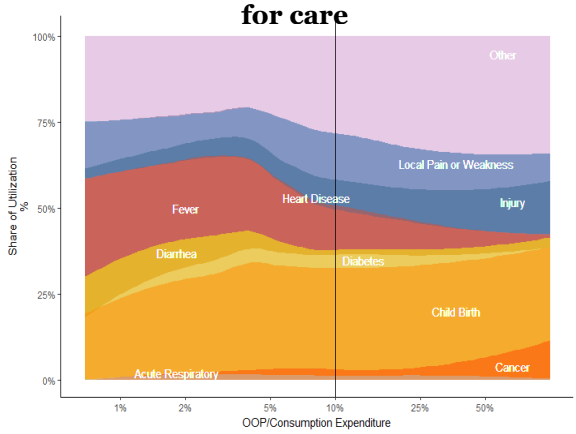


Figure 3.20: Composition of OOP spending per hospitalization, by reason for care



3.5 Conclusion

This chapter highlights that a major share of the population in Odisha incurs catastrophic health expenditure, underscoring that financial risk protection is an area where the health system is performing poorly. Our findings showed that drug spending is a major cause of CHE and that those substantial costs are connected to the purchase of pharmaceuticals at private sector chemists. We also found that CHE was high even among those that reported using insurance for hospitalizations, suggesting that the insurance schemes in place are not protecting users from the financial risks.

Financial risk protection is a key indicator of health system performance, including universal health coverage, but is also connected to broader objectives of poverty

alleviation and the development of human capital. With evidence and further analysis of CHE and the drivers of poor financial risk protection, the government of Odisha will be able to design policies that support the health system in further achieving these goals.

3.6 References

1. Roberts, Marc J., William Hsiao, Peter Berman, and Michael R. Reich. 2008. *Getting health reform right: a guide to improving performance and equity*. Oxford; New York: Oxford University Press.

2. Sustainable Development Goal (SDG) 3.8.2. Available at: https://unstats.un.org/sdgs/metadata/files/Metadata-03-08-02.pdf (Accessed December 9, 2020).

Chapter 4
Citizen Satisfaction[∝]

4.1 Summary

Citizen satisfaction is the degree to which citizens or the public are satisfied with the health system. Citizen satisfaction research remains undertheorized, and there are very few data sets that include variables needed to assess it, especially in low- and middle-income countries like India. In fact, as per our knowledge, our survey was the first attempt to assess citizen satisfaction in Odisha at this scale.

In the Odisha Health System Assessment Study, we attempted to answer two main research questions linked to citizen satisfaction: (1) how satisfied are citizens of Odisha with the state's health system? and (2) what are the determinants of citizen satisfaction in the population? The dependent variable was citizen satisfaction, as measured through three parameters: overall perception of the health system, confidence to receive care when ill, and importance of improving the health system. Based on existing literature, we analyzed the association of satisfaction levels with different independent variables: the place of residence (rural/urban), poverty, education levels, social groups, insurance coverage, and choice of providers. To assess citizen satisfaction, our study adapted questions from the Commonwealth Fund Survey, and were included as a part of our household survey administered to 7567 households.

Our findings showed that people's overall perception of the health system is poor, where 56.17 percent expressed the need for major changes to the health system to make it work and 33.39 percent expressed that the health system needs to be completely rebuilt. 91.25 percent of households expressed that it is very important that the health system is improved. Even with these poor ratings, it is interesting that 56.64 percent of households reported that they are "very confident" of receiving care from the health system if they were to fall ill, and most households rated different aspects of the health system like the convenience of location of providers or their ability to choose providers, as "good." These findings were comparable to other studies on citizen satisfaction in LMIC contexts. Our regression analysis showed that people with insurance coverage reported higher satisfaction levels than people without insurance. Related to this, charges for treatment at hospitals stood out as one key aspect of the health system that received low satisfaction ratings. These findings highlighted the need for financial risk protection in Odisha. People in rural areas and those belonging to Scheduled Tribes reported lower confidence to receive care from the system and expressed a higher need for improving the system. In contrast, people from urban areas, those from the "General" category of socio-cultural groups, and people with higher education levels expressed the opposite. These associations raised concerns about equity across different population groups. Households who preferred going to a private provider for major

[∝] This chapter was led by Anuska Kalita, with participation from Elaine He.

illnesses expressed better overall perception of the health system and expressed higher confidence to receive care when ill. This might indicate people's perceptions of public versus private providers.

It was noteworthy, although consistent with existing evidence that educational attainment and income are negatively associated with satisfaction. These findings need to be interpreted in a nuanced way, as they highlight that people's subjectivity and expectations play a role in their "satisfaction." These findings underscored the need for more research and better measures of citizen satisfaction, especially in resource-poor contexts with vulnerable populations like Odisha.

4.2 Introduction

Citizen satisfaction, along with health status and financial risk protection, was one of the final performance goals of health systems reform [1]. Understanding the determinants of citizens' satisfaction with a country's or state's health system has merit beyond its political and strategic value to reformers. Adequate responsiveness and accountability of health systems are widely considered to be core standards of health system performance, and public satisfaction is an important measure of the extent to which systems meet them. More broadly, high public satisfaction with specific services such as healthcare is linked with higher trust in public institutions, which is an important element in the effective functioning of democratic governments [2-5].

4.2.1 Defining and Measuring Citizen Satisfaction

Citizen satisfaction or public satisfaction[8] is the degree to which citizens/the public are satisfied with the services provided by the health sector. It allows us to capture various aspects/features of the health system, apart from the impact on health status [1].

Citizen satisfaction is regarded as one of the ultimate goals that a health system should strive for as it reflects the effectiveness of the health system from its consumers' perspective [6]. It is important because members of the public are beneficiaries and actors in a health system, capable of providing feedback on the quality and responsiveness of services. Their opinions can be important in shaping health policies and bringing legitimacy and accountability to the policymaking process.

It is important to highlight two important points here that are critical to understanding the concept of citizen satisfaction. First is the difference between citizen/public satisfaction and patient satisfaction, and second is the use of objective versus subjective definitions for citizen satisfaction.

The two terms – "public satisfaction" and "patient satisfaction" – are often confused. Patient satisfaction is based on user experiences of health services, connected to a specific visit of the user to a health provider. Unlike patient satisfaction studies, public satisfaction research includes users as well as non-users of healthcare, incorporating not

[8] Citizen satisfaction and public satisfaction are used interchangeably throughout this report.

only experiences of service delivery but also perceptions based on wider factors, such as ideological beliefs, trust in the government, and media influences. In this report, when we refer to *citizen satisfaction* as a performance goal of the health system, we mean public satisfaction, such as perceptions of both users and non-users of health services. Patient satisfaction has been described as a measure of *quality*, an intermediate outcome of the health system. (See Chapter 6.3.)

Another important definitional difference is in the conceptualization of citizen satisfaction. Some researchers have defined the concept in objective terms. For example, work by the World Health Organization only considers "legitimate" public satisfaction in the health system; particularly, there is a list of characteristics of an ideal health system determined by experts and people's perception of whether they are satisfied or not is measured against these characteristics. In this case, the response of a citizen as being "satisfied" with the health system in a remote tribal province of a country may not be considered as legitimate satisfaction. This is because this health system in a remote province may involve difficult physical access, long wait times, and shortage of health personnel. On the other hand, ethicists have critiqued this approach and proposed that satisfaction is a subjective construct and should be accepted as expressed by citizens, without imposing an expert's legitimacy.

Public satisfaction research remains undertheorized because there have been few attempts at synthesizing the results of prior research and very few data sets include the variables needed to test existing hypotheses rigorously, especially in low-and-middle income countries like India, and more specifically for resource-poor settings like Odisha.

Citizen satisfaction is measured primarily through survey questions asking respondents for self-reported "satisfaction" levels with their national or state health systems. Because satisfaction is mediated by expectation, most research has measured citizen satisfaction linked to measures of expectations or proxies for expectations. Citizen satisfaction with the health system is a very broad concept and not linked to specific use of a provider's services. As such, its measurement is usually at a national or state level, such as satisfaction with the country's or state's health system, instead of, satisfaction with a district level health system or a particular hospital.

While citizen satisfaction does not have a specific index, it has been measured through self-reported satisfaction levels through large surveys (mostly national and multi-country). Citizen satisfaction is measured as citizens' opinion about the need for reforms in their country's health system, the level of health expenditures, their trust in the health system, and whether they are satisfied with the system. Most surveys use either a four or five-point Likert scale for each of these questions, ranging from "dissatisfied", "neither satisfied nor dissatisfied", "fairly satisfied" and "very satisfied." The nature of these responses is highly subjective. Response categories such as "fairly satisfied" or "very satisfied" do not have the same meaning in all populations. There is now an extensive psychometric literature on survey instrument design that highlights the importance of differential item functioning—a technical term for when response categories such as "fairly satisfied" have different meanings to different groups of individuals [7-9].

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

4.2.2 Citizen Satisfaction Research in India

Most research on citizen satisfaction has been undertaken in high-income countries, most commonly in the United States and Western Europe. Unfortunately, none of the national surveys in India measured citizen satisfaction. Although the World Health (WHS) administered by the WHO in 70 countries during 2002–2003 measured citizens' trust in the health system, these variables were not a part of the WHS in India. This lack of data made it harder for our study to use benchmarks and compare our findings with national or state averages. Wherever possible, we have compared our study findings with evidence from the few research studies that have measured different aspects of citizen's satisfaction in India and other LMICs.

4.3 Research Design

We attempted to answer two main research questions linked to citizen satisfaction in our study:

1. How satisfied are citizens of Odisha with the state's health system?
2. What are the determinants of citizen satisfaction in the population?

The dependent variable was citizen satisfaction. We have measured this through three parameters:

1. Endorsement of the health system. This was assessed by the question: "*Which of the following statements comes closest to expressing your overall view of the healthcare system in this state?*", ranked across three statements by the respondents:
   1=Our healthcare system has so much wrong with it that we need to completely rebuild it.
   2=There are some good things in our healthcare system, but major changes are needed to make it work better.
   3=On the whole, the system works pretty well and only minor changes are necessary to make it work better.

2. Confidence to receive treatment from the health system if they were to fall ill. This was assessed by the question "How confident are you that if you became very sick tomorrow, you would be able to receive effective treatment from the health system?", ranked by respondents on a four-point Likert scale: 1 = Very confident, 2 = Somewhat confident, 3 = Not very confident, and 4 = Not at all confident.

3. Perceived importance for improving the health system. This parameter was measured by the question: *"How important is it that the government improves our health system?"* The responses to this question were on a four-point Likert scale: 1 = Very important, 2 = Fairly important, 3 = Not very important, and 4 = Not at all important.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Each of these parameters were associated with the following independent variables. These independent variables have been derived from a literature review.

1. Place of residence (rural/urban)
2. Socio-cultural groups (Scheduled Caste/Scheduled Tribe)
3. Poverty
4. Education level
5. Insurance coverage
6. Preferred healthcare providers for minor and major illnesses (public hospital, private facility or chemist, public primary care facility, or community health worker).

In the current study, we used questions adapted from the Commonwealth Fund Survey [10] to measure citizen satisfaction in Odisha. The three questions were ranked by respondents on a Likert scale.

The questions for measuring citizen satisfaction were included as a part of the household survey, administered to 7567 households (Survey 1 in Table 1.1). Only one member from each sampled household responded to the questions on citizen satisfaction. The respondents were chosen randomly from amongst the household members in order to get a representative perspective. A total of 7342 individuals responded to the citizen satisfaction survey. The remaining 225 were nonresponses. The detailed sampling design for the household survey is presented in Appendix 2, Research Design and Methodology.

We undertook both descriptive and statistical analyses of our variables. Multivariate regressions were carried out as tests of association between the different independent and dependent variables.

4.4 Results

The following sections present the analyses under each of these areas of citizen satisfaction and their association with the independent variables. Table 4.1 summarizes the results.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

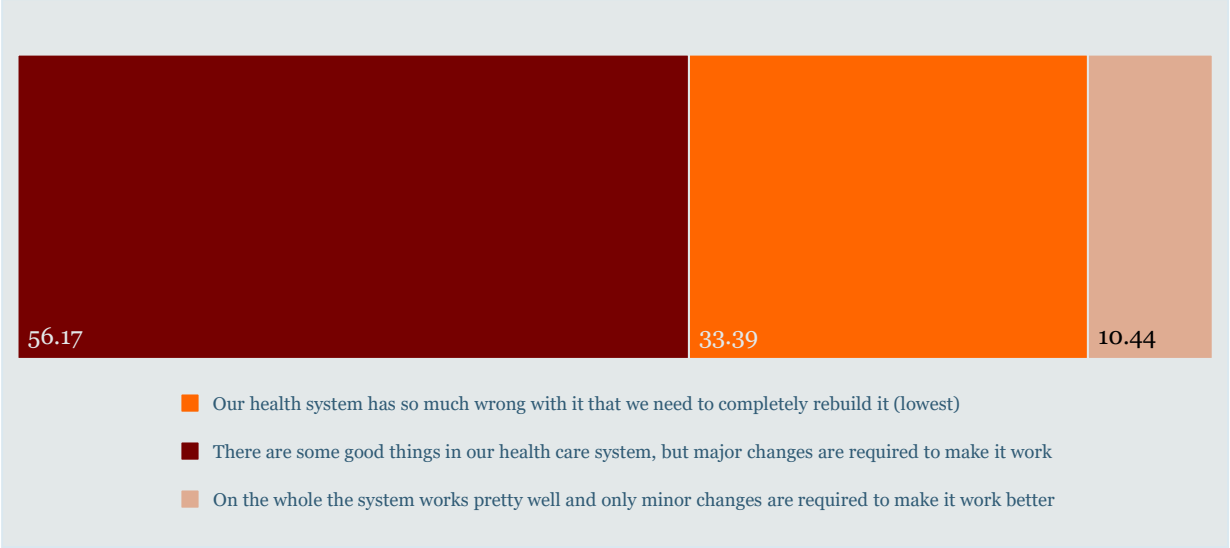
Table 4.1: Multivariate regression between independent variables and citizen satisfaction measures

Dependent Variables / Independent Variables	Endorsement of the health system	Confidence to receive treatment from the health system	Perceived importance to improve the health system
Education	0.005 (0.017)	0.036** (0.018)	-0.155*** (0.033)
Social Group	-0.683***(0.149)	-2.945***(0.150)	1.681*** (0.256)
Income (BPL)	0.094* (0.052)	-0.016 (0.052)	-0.272***(0.099)
Insurance Status	0.177*** (0.062)	0.057 (0.062)	-0.320** (0.124)
Location (rural/urban)	-0.019 (0.060)	-0.288*** (0.062)	-0.217**(0.104)
Preferred provider minor illnesses	-0.008*** (0.003)	0.002 (0.005)	0.007 (0.009)
Preferred provider major illnesses	0.029*** (0.003)	0.033*** (0.005)	-0.039*** (0.013)

Source: Survey 1, Household Survey. Note: Standard errors in parentheses. *p<0.1 **p<0.05 ***p<0.01.

4.4.1 Endorsement of the Health System

Figure 4.1: Endorsement of the health system



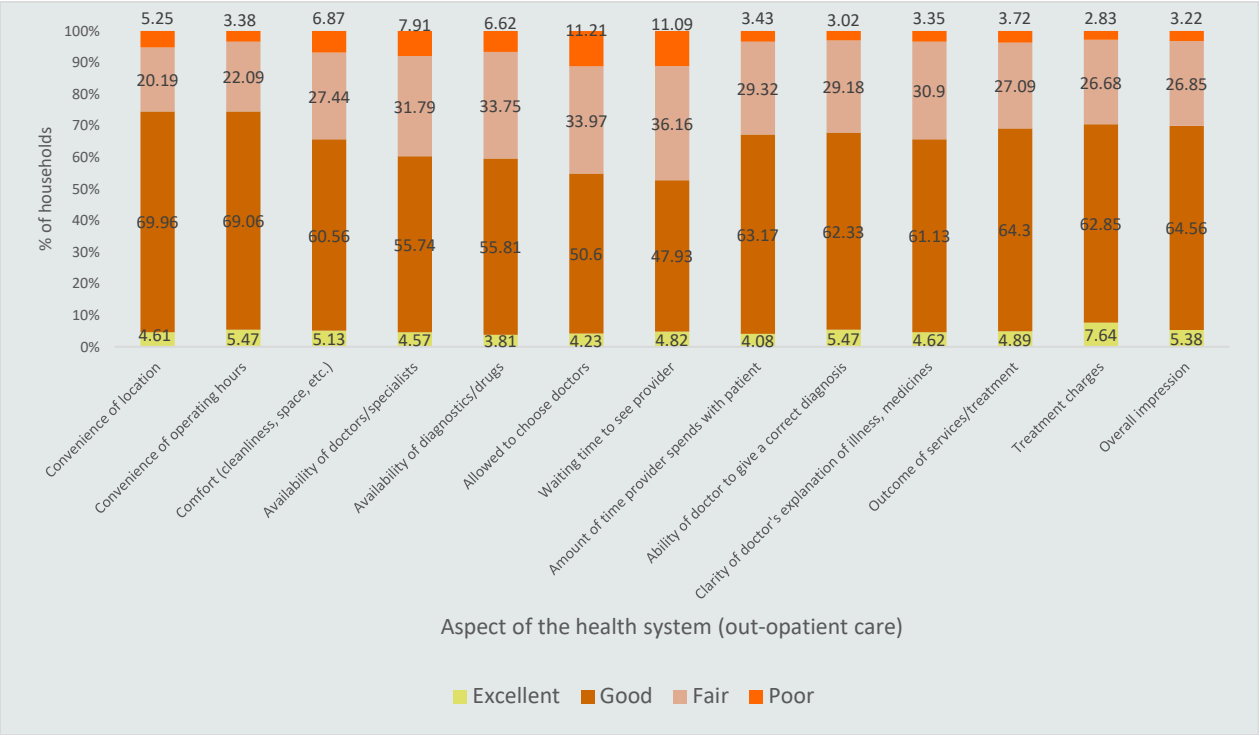
Endorsement of the health system refers to the level of satisfaction citizens showed in agreeing that the system functions well. Our findings showed that endorsement of the health system in Odisha by our sampled households was poor. Most households (56.17 percent) expressed the need for major changes to the health system to make it work. A

third of the households (33.39 percent) expressed that the health system needs to be completely rebuilt.

The poor endorsement level is in line with the existing literature. A multi-country study with 12 LMICs, including India, found that only around 20 percent of the sampled population endorsed the health system, that is, agreed that it 'works pretty well and only needs minor changes.' Additionally, India fared the worst among the 12 LMICs that were studied [5].

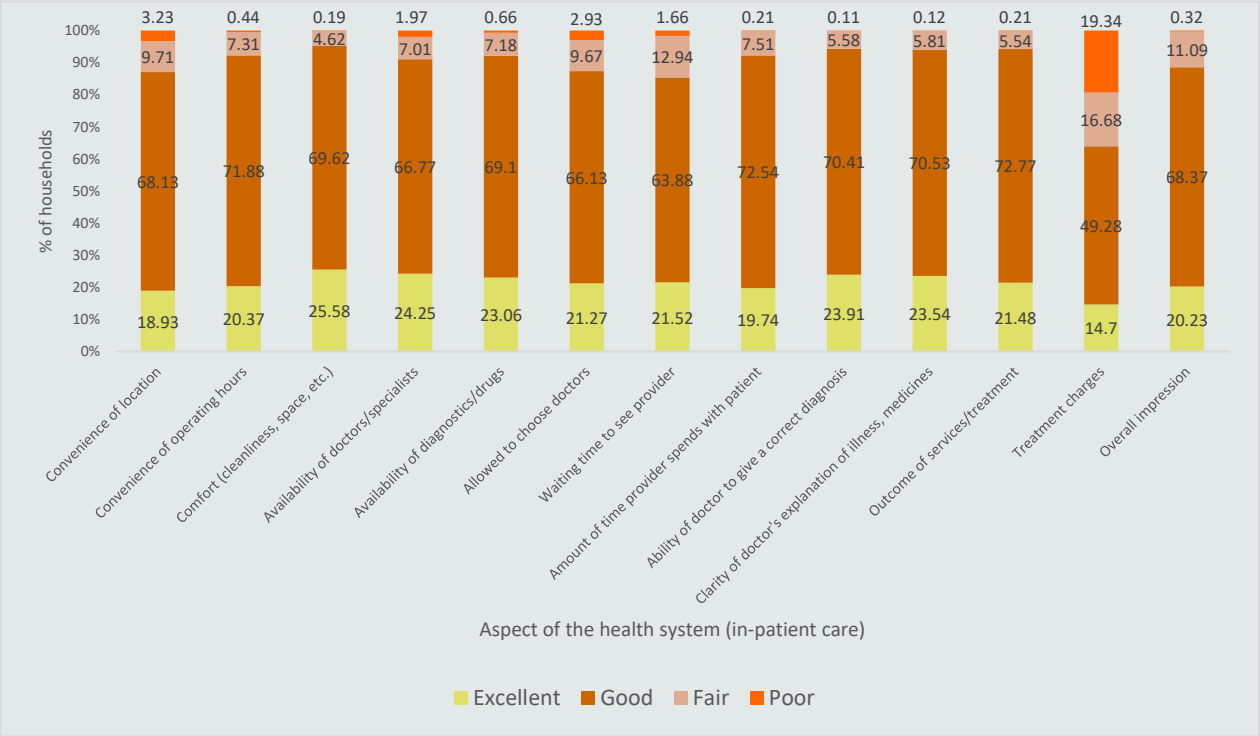
To get a nuanced understanding of people's satisfaction, our survey asked households to rate their perceptions about 13 different aspects of the health system on a 4-point Likert scale (1=Excellent, 2= Good, 3=Fair, 4=Poor). These aspects included convenience of location and timings of the provider, comfort at the facility, availability of doctors/specialists, availability of drugs and diagnostics, ability to choose doctors, waiting time to see the provider, ability of the doctor to give a correct diagnosis, outcomes of the treatment, treatment charges, and overall impression. An analysis of people's reported satisfaction levels with different aspects of the health system shows that a majority of the sampled households rated most aspects of the health system as "good" for both inpatient (IP) and outpatient (OP) care, although households reported higher levels of satisfaction with different aspects of IP care compared to OP. The aspect that had the lowest satisfaction rating was treatment charges for IP care (Figure 4.2 and 4.3). This relates to our findings on low financial risk protection and high OOPE in Odisha. (See Chapter 1 and Chapter 3.)

Figure 4.2: Citizen Satisfaction with different aspects of the health system (Outpatient care)



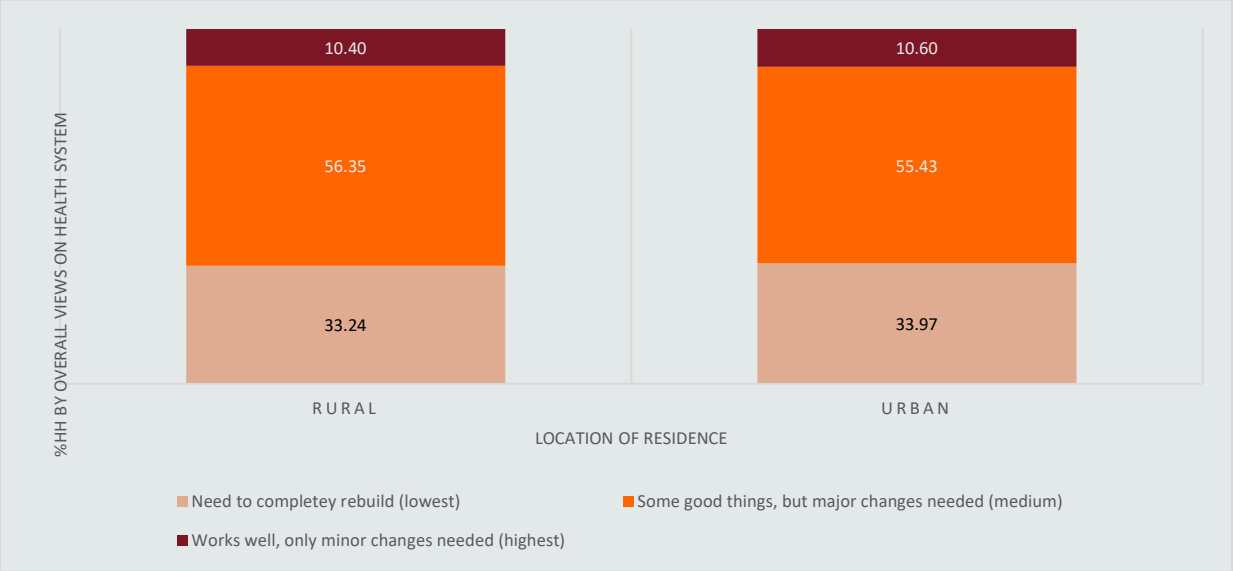
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 4.3: Citizen Satisfaction with different aspects of the health system (Inpatient care)



Our descriptive analysis showed the disaggregation of this data across different independent variables presented in the graphs below. From our multivariate regression analysis, we found that the independent variables associated with overall satisfaction were income, access to insurance coverage, and choice of providers. Table 4.1 shows the statistical significance of each association.

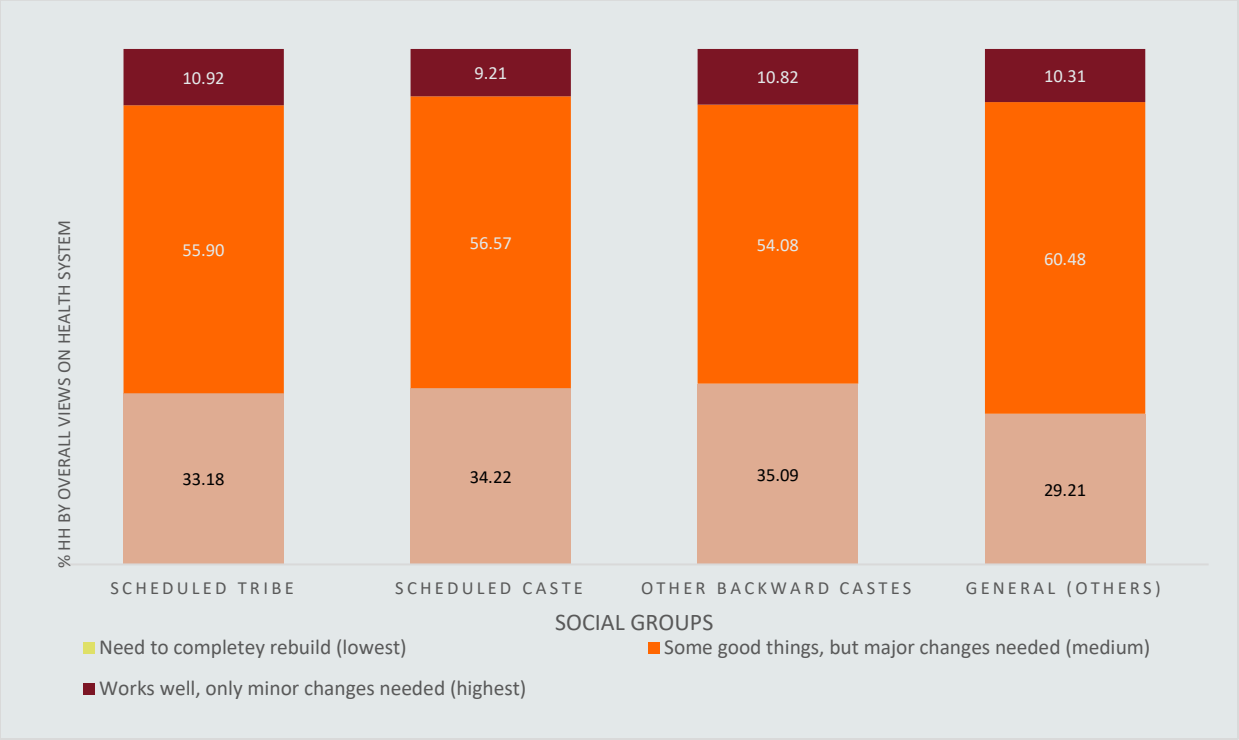
Figure 4.4: Endorsement of the health system across rural and urban areas



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

The majority of citizens (across rural and urban areas) reported that *there are some good things in our healthcare system, but major changes are required to make it work.* Our statistical analysis showed that place of residence (rural versus urban) is not significantly correlated with overall view of the health system.

Figure 4.5: Endorsement of the health system across social groups

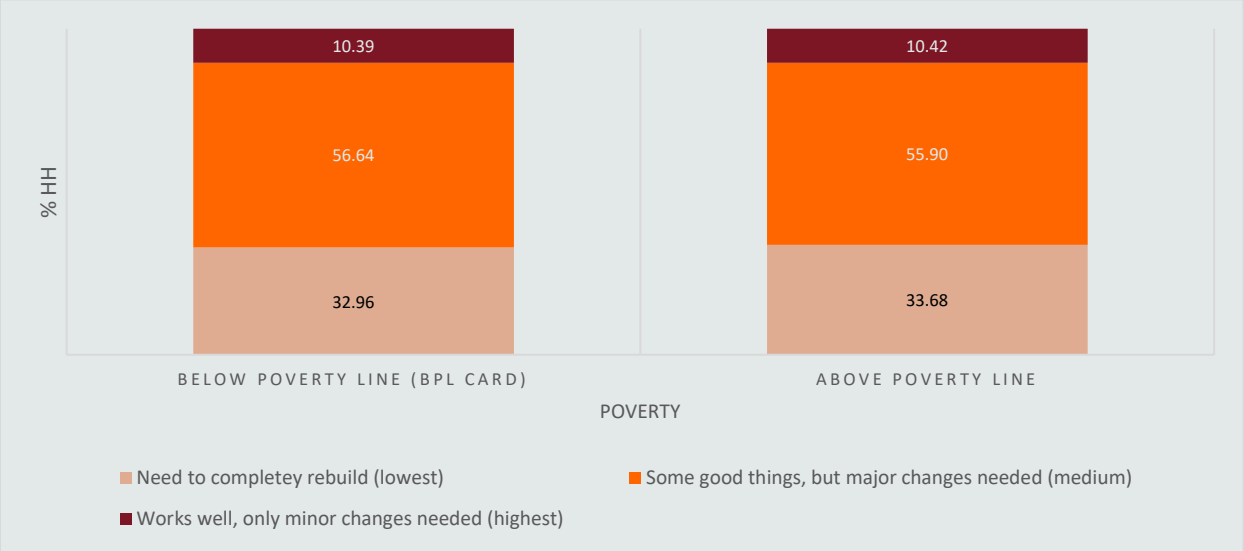


The majority of citizens (across all social groups) reported that there are some good things in our healthcare system, but major changes are required to make it work. Fewer households from the non-SC/ST category reported the lowest level of satisfaction, namely that the health system has so much wrong with it that we need to completely rebuild it.

Our statistical analysis showed that social group is significantly correlated with overall views of the health system. Respondents who belonged to a Scheduled Tribe or Scheduled Caste were more likely to have a worse view of the health system (either express that it needs major changes or that it needs complete rebuilding) compared to respondents who did not belong to these groups (Table 4.1).

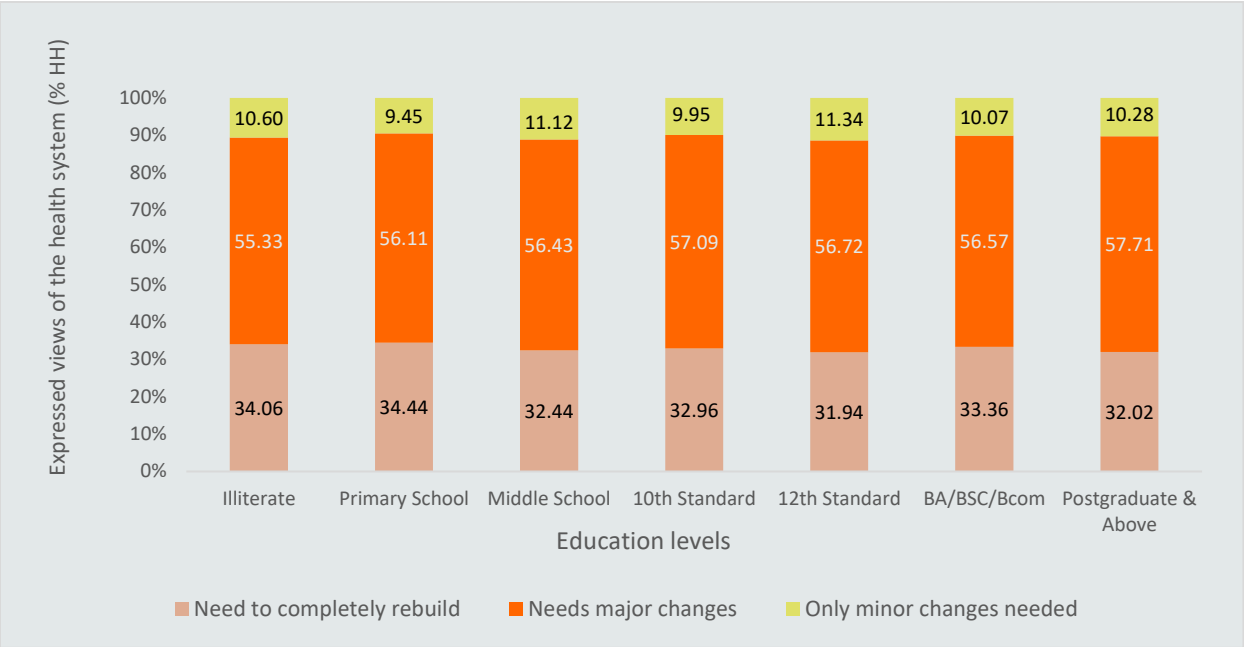
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 4.6: Endorsement of the health system and poverty



While a majority of citizens across both BPL and non-BPL groups reported that *there are some good things in our healthcare system, but major changes are required to make it work,* our statistical analysis showed that there is a significant difference between poor and non-poor respondents' views. We found that poverty is negatively associated with overall satisfaction, implying that poor households (as measured by "having a below poverty line (BPL) card") reported higher satisfaction with the health system than non-poor households. This is consistent with some of the literature which suggest that subjectivity of a measure like citizen satisfaction.

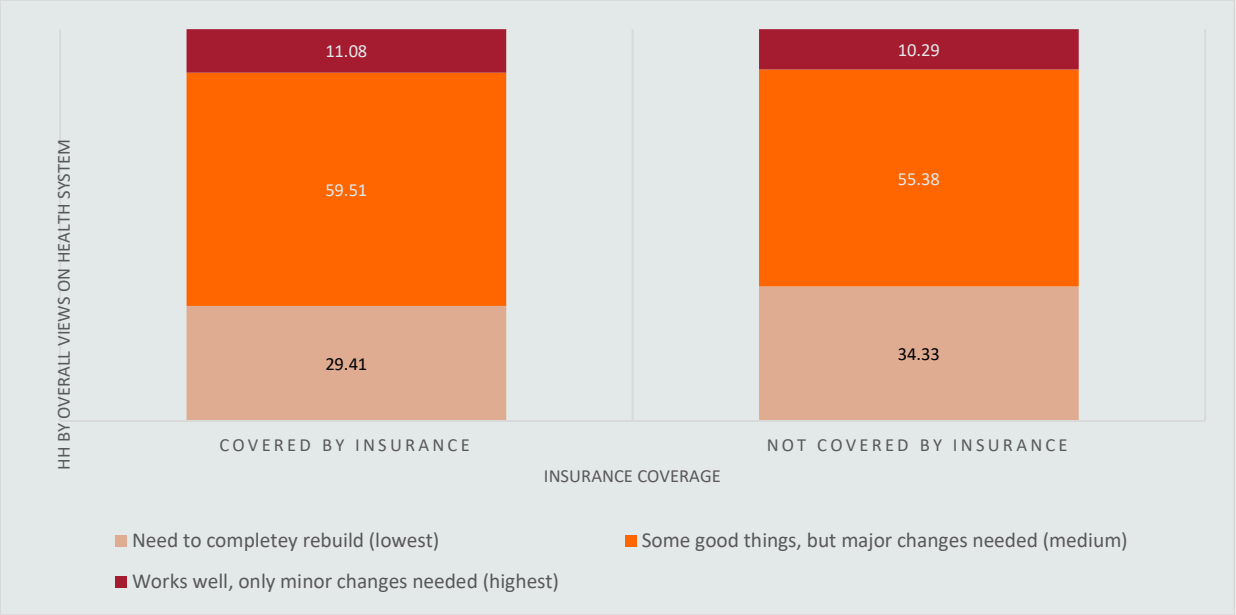
Figure 4.7: Endorsement of the health system and education levels



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

From Figure 4.7, we see that people with the lowest level of education were more likely to express the lowest level of satisfaction with the health system. People with the highest level of education were most likely to say that the health system needed major changes to work better, and least likely to express the extreme responses.

Figure 4.8: Endorsement of the health system and insurance coverage

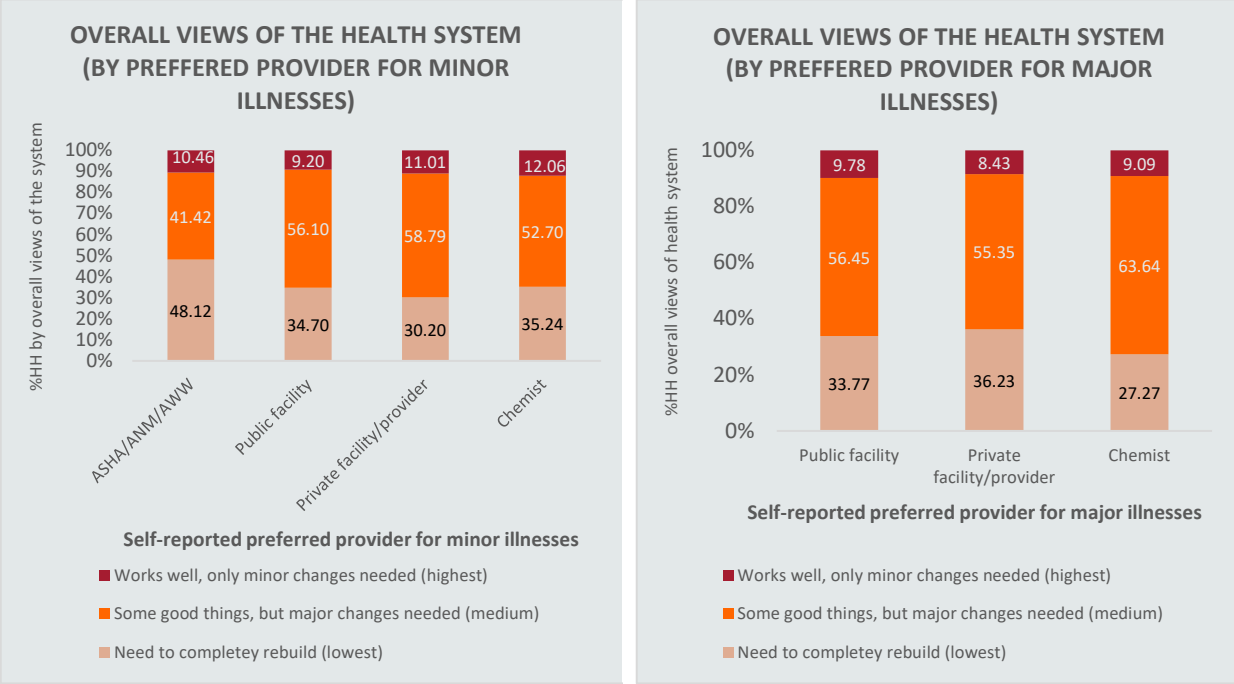


Citizens with insurance coverage reported higher levels of satisfaction with the health system than those without insurance coverage. Furthermore, we found that this difference between insured and non-insured respondents is statistically significant. Having insurance coverage was positively associated with satisfaction, implying that households that self-reported having any type of health insurance cover (either government-sponsored schemes, employment-based schemes or voluntary insurance) reported significantly higher levels of satisfaction with the health system than people who were not covered by any health insurance scheme.

From the graphs in Figure 4.9, we observe that people who preferred a private provider are most likely to express a higher level of satisfaction with the health system. Respondents whose preferred provider for minor illnesses was a frontline health worker (ANM, ASHA or AWW) expressed the lowest level of satisfaction with the health system and felt that there is a need to *completely rebuild the system for it to work*. Although the differences seem small, people whose preferred provider for minor illnesses was a chemist expressed the highest level of satisfaction with the health system, followed by people who preferred a private provider or facility.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 4.9: Endorsement of the health system and choice of providers



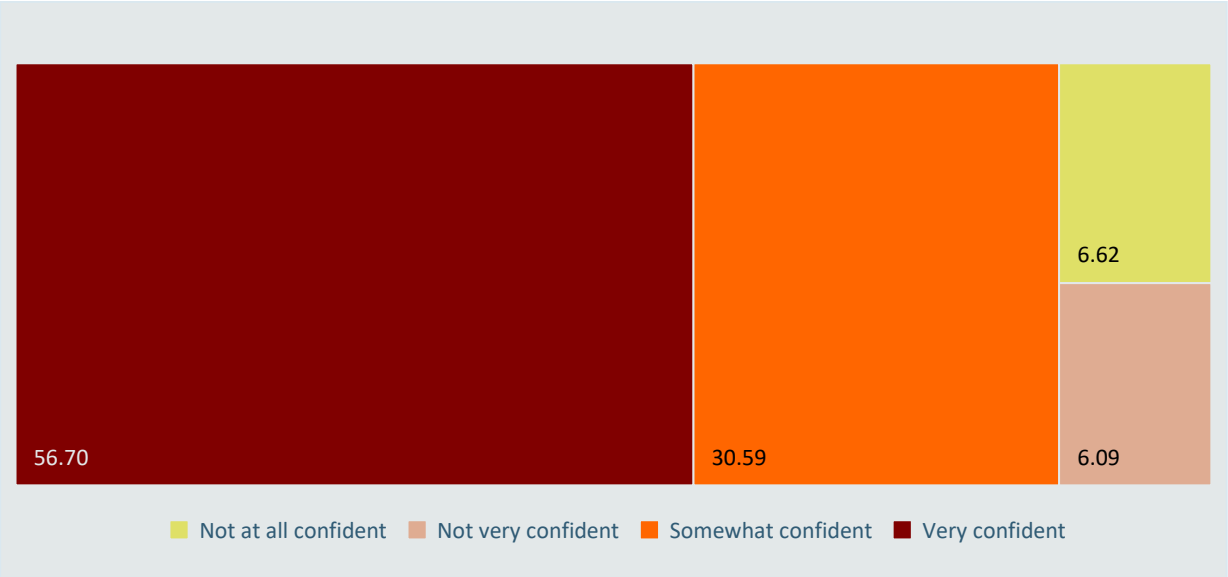
The choice of provider had mixed associations with citizen satisfaction. For major illnesses, households who preferred going to a private provider reported higher satisfaction compared to those that preferred public sector providers. Inversely, for minor illnesses, households who preferred going to a private provider or chemist for a minor illness reported lower satisfaction.

4.4.2 Confidence in the Health System

Confidence in the health system was measured by the question: "*how confident are you of receiving care from the health system if you were to fall ill tomorrow?*" In interpreting this variable, it is important to note that the question assesses perceived access or availability of care, rather than a perception of the quality of care that they would receive or if they are confident that they would be cured. Most respondents reported they were confident of receiving care from the health system if they were to fall ill, with 56.64 percent households reporting that they are "very confident" and another 30.56 percent reporting that they were "somewhat confident." Comparing this to evidence from other studies, these percentages were lower than those in other LMICs, where reported confidence levels go up to 80 percent [5].

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

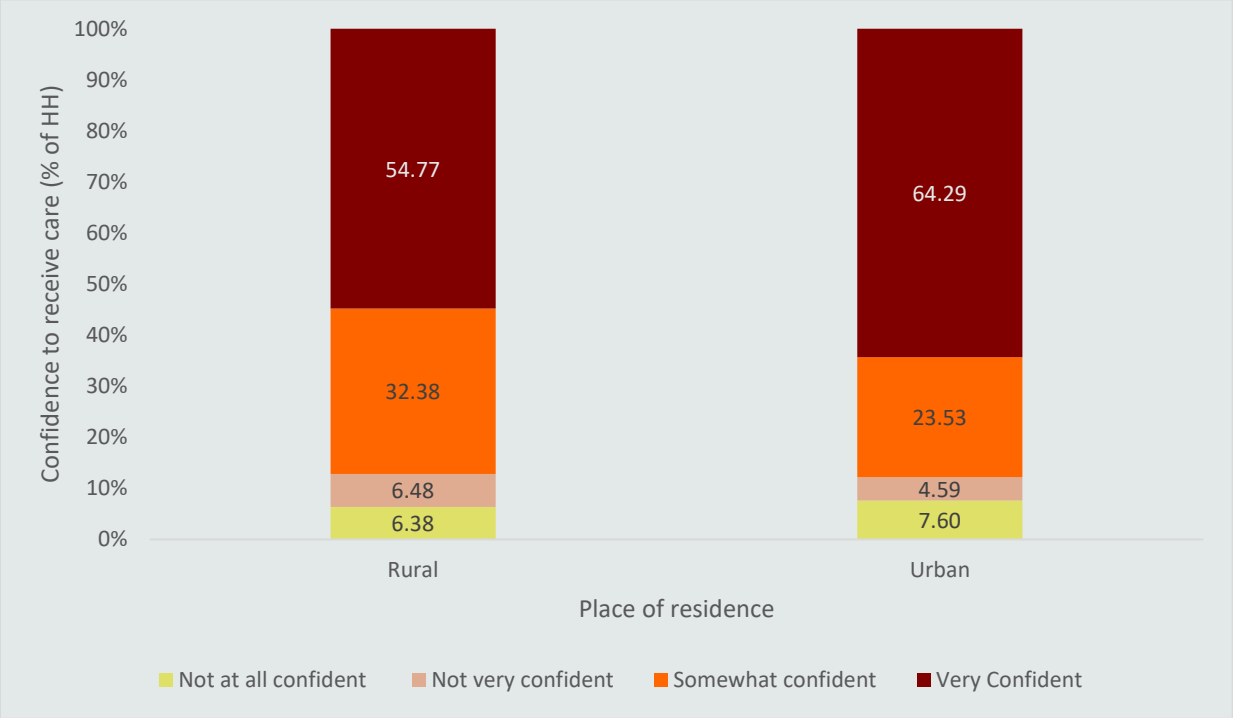
Figure 4.10: Confidence to receive care from the health system when ill



Our descriptive analysis showed the disaggregation of this data across different independent variables presented in the graphs below. From our multivariate regression analysis, we found that the independent variables for education, place of residence, social group, and choice of providers were associated with confidence to receive care from the health system if they were to fall ill. Table 4.1 shows the statistical significance of each association.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

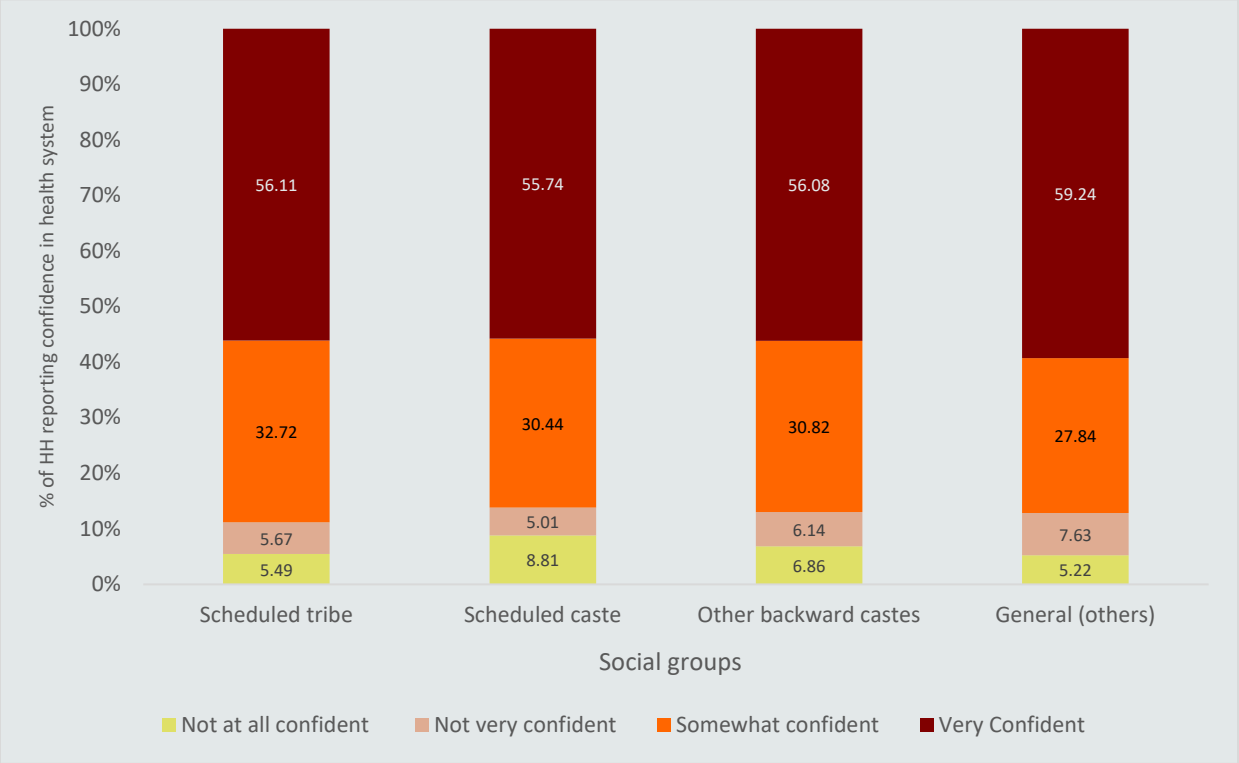
Figure 4.11: Confidence to receive treatment when ill and place of residence



The majority of rural and urban citizens reported a high level of confidence in the health system to receive treatment when ill. We found that the confidence to receive care from the health system was significant lower for people who live in rural areas of Odisha, compared to those that live in urban areas.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

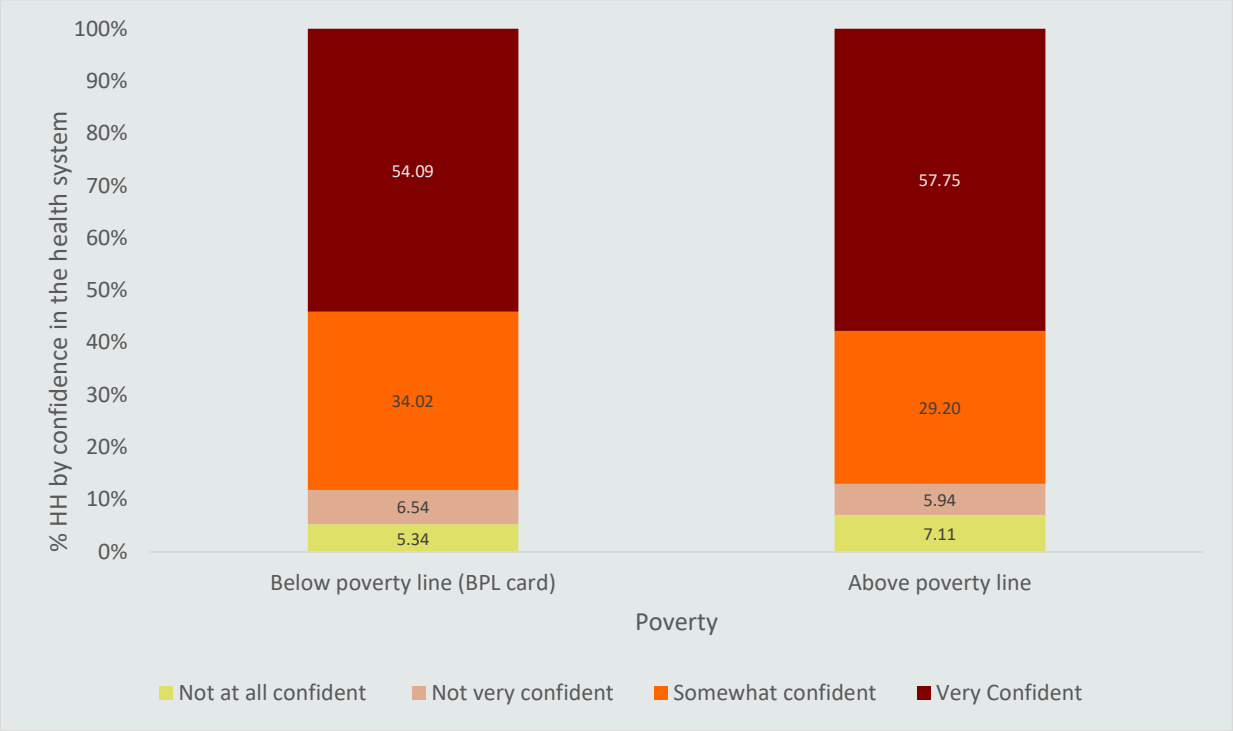
Figure 4.12: Confidence to receive treatment when ill and social groups



The majority of citizens across all different social groups reported a high level of confidence in the health system to receive treatment when ill. Based on our statistical analysis, respondents who belong to a Scheduled Tribe were less confident about receiving care from the health system when ill, compared to respondents in the general category.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 4.13: Confidence to receive care when ill and poverty



The majority of citizens, irrespective of poverty level, reported high levels of confidence in the health system to receive treatment when ill. Although not statistically significant, poverty was negatively correlated with respondents' confidence, implying that poorer people have less confidence to receive care from the health system when ill.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 4.14: Confidence to receive care when ill and education levels

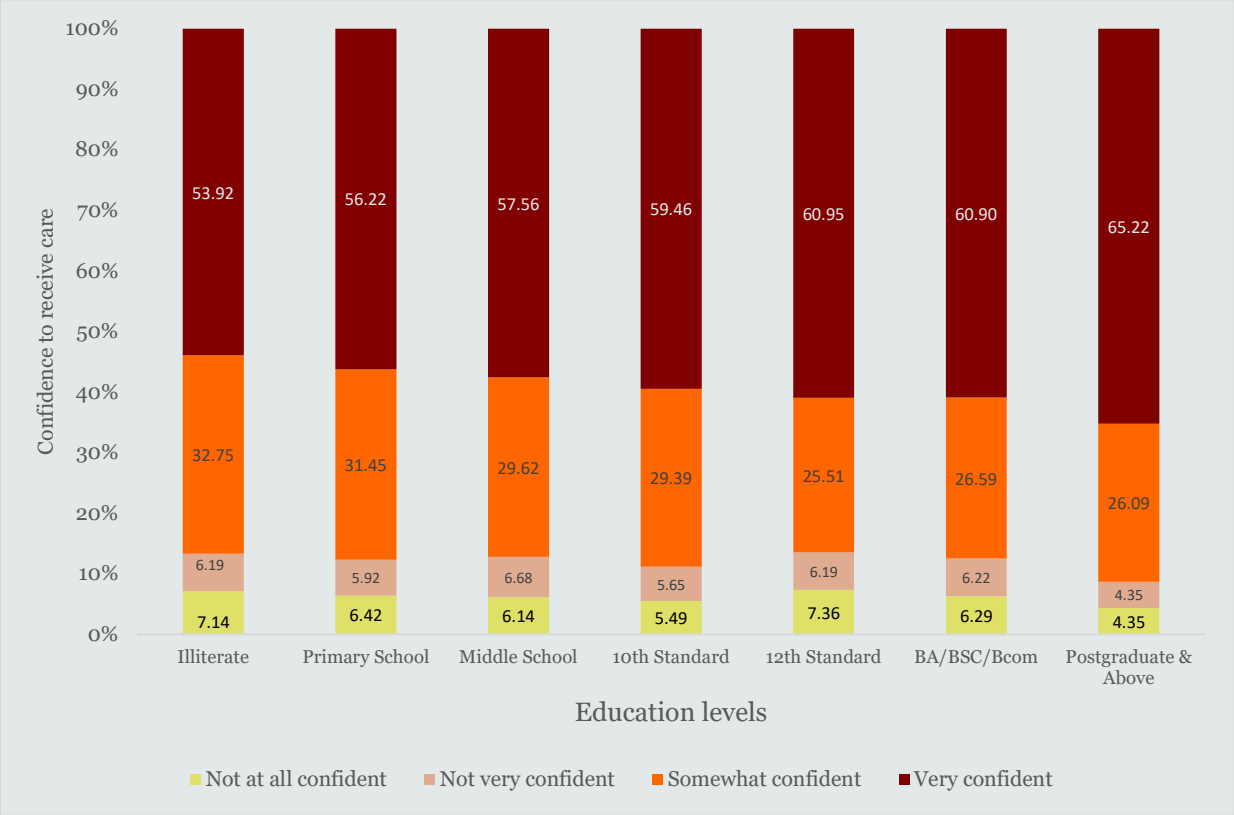
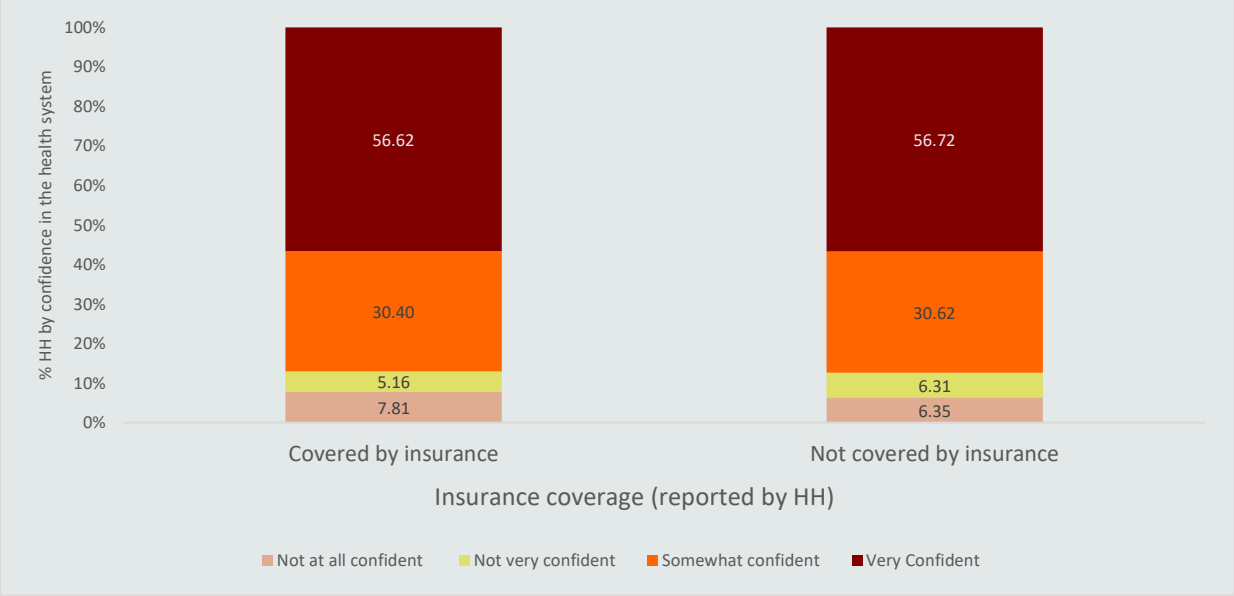


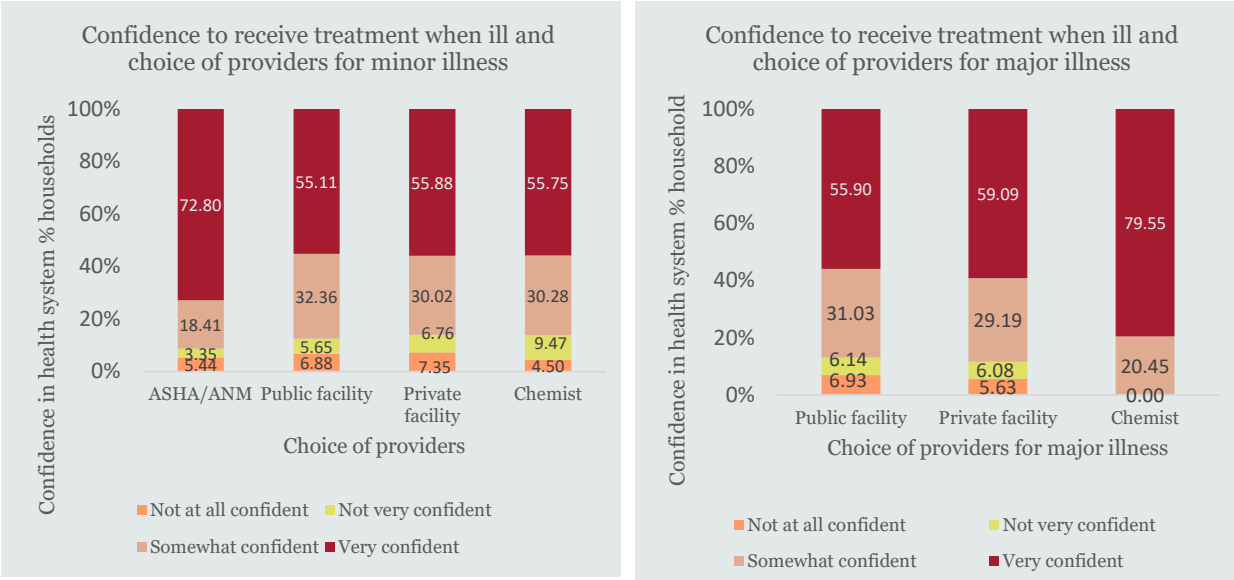
Figure 4.15: Confidence to receive care when ill and insurance coverage



Although we saw a positive correlation between having insurance coverage and confidence to receive care when ill, this association was not statistically significant.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

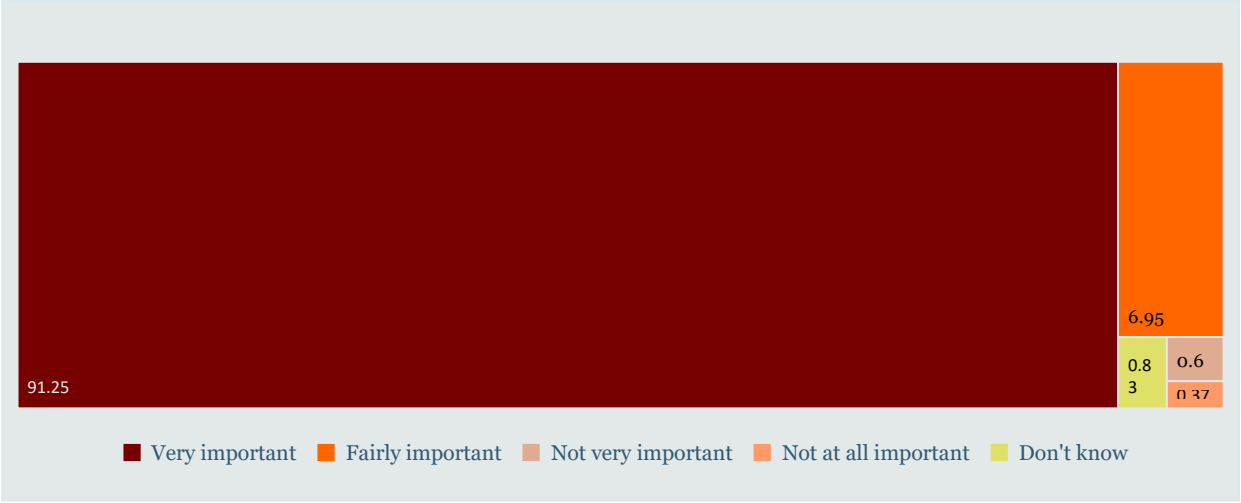
Figure 4.16: Confidence to receive care and choice of providers



Similar to what we saw in the overall perception of the health system, we found that households who preferred going to a private provider for major illnesses reported higher confidence to receive care compared to those that preferred public sector providers.

4.4.3 Perceived Importance of the Need to Improve the Health System

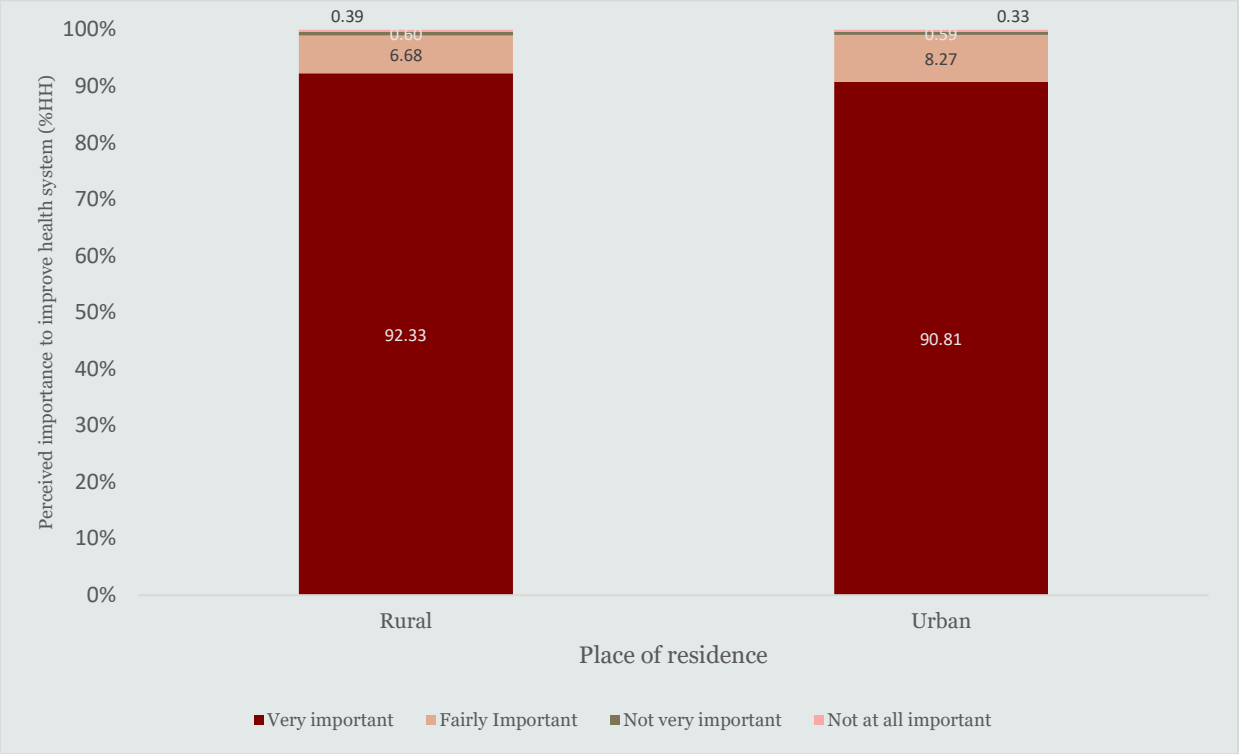
Figure 4.17: Perceived importance that the health system be improved



An overwhelming majority of the respondents (91.25 percent) expressed that it is "very important that the health system is improved." Our descriptive analysis shows the disaggregation of this data across different independent variables presented in the graphs below. Based on our multivariate regressions, we found that the respondents' education, place of residence, income, insurance coverage, and choice of providers were

associated with their expressed importance to improve the health system. Table 4.1 shows the statistical significance of each association.

Figure 4.18: Perceived importance of the need to improve the health system and place of residence



A significantly higher number of people who resided in rural areas, who lived below the poverty line (self-reported as having a BPL card), and who had higher educational attainment expressed the need for improving the health system compared to non-poor people in urban areas who had lower educational levels.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 4.19: Perceived importance of the need to improve the health system and poverty

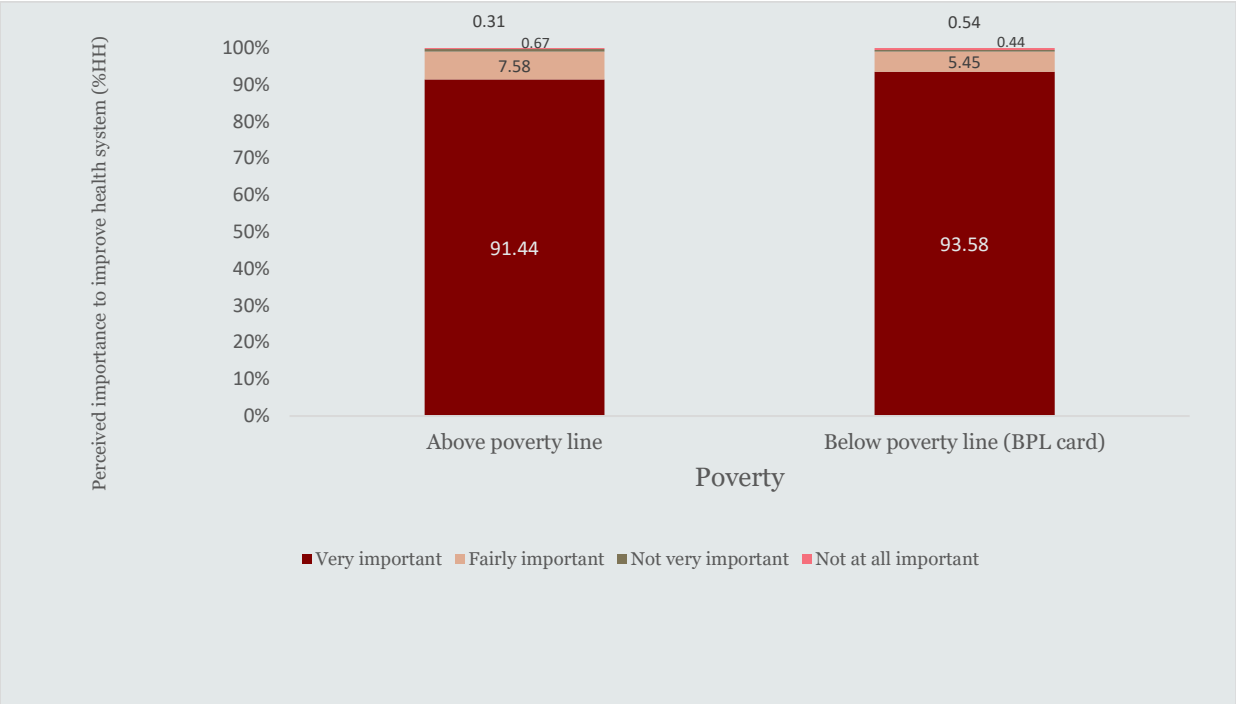
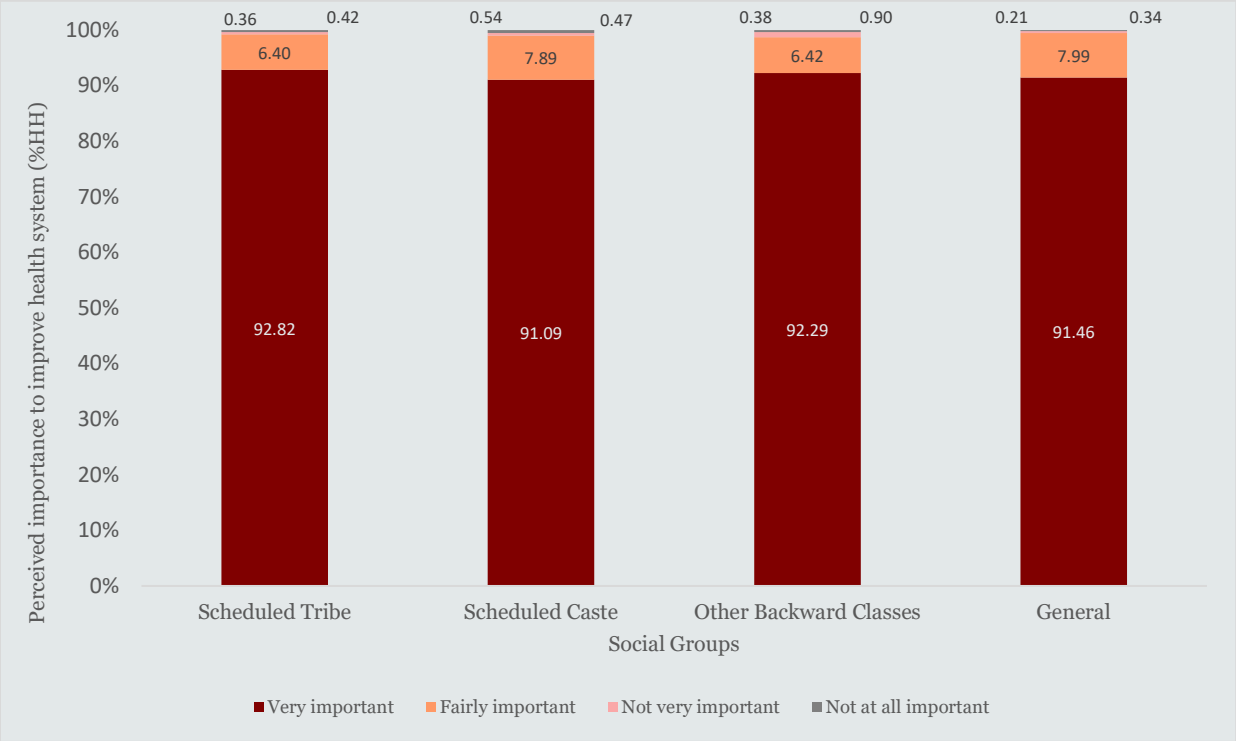


Figure 4.20: Perceived importance of the need to improve the health system and social groups



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 4.21: Perceived importance of the need to improve the health system and education levels

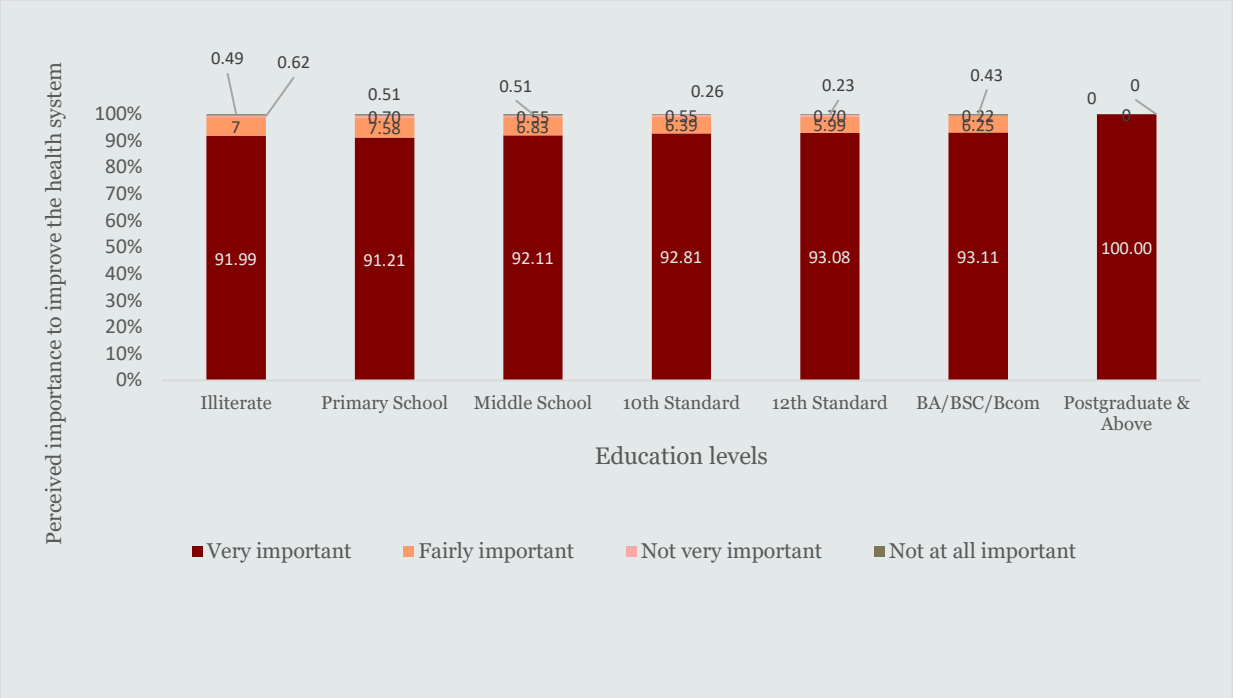
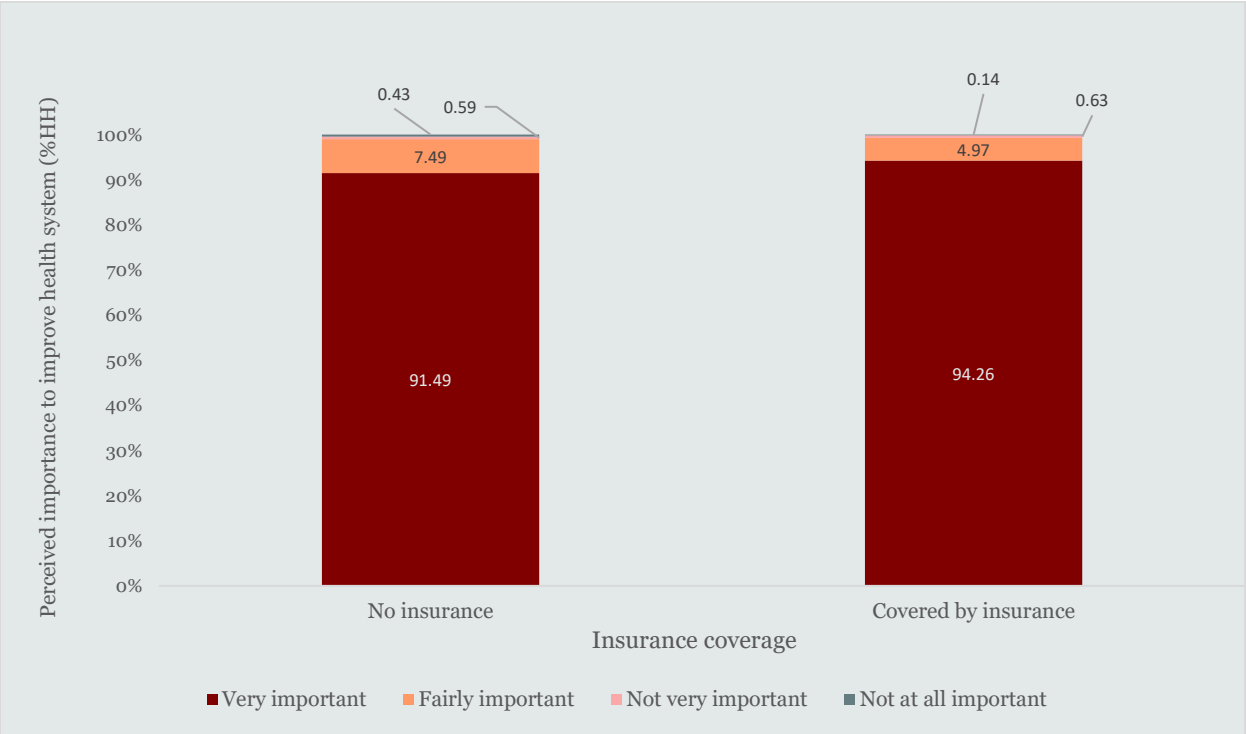


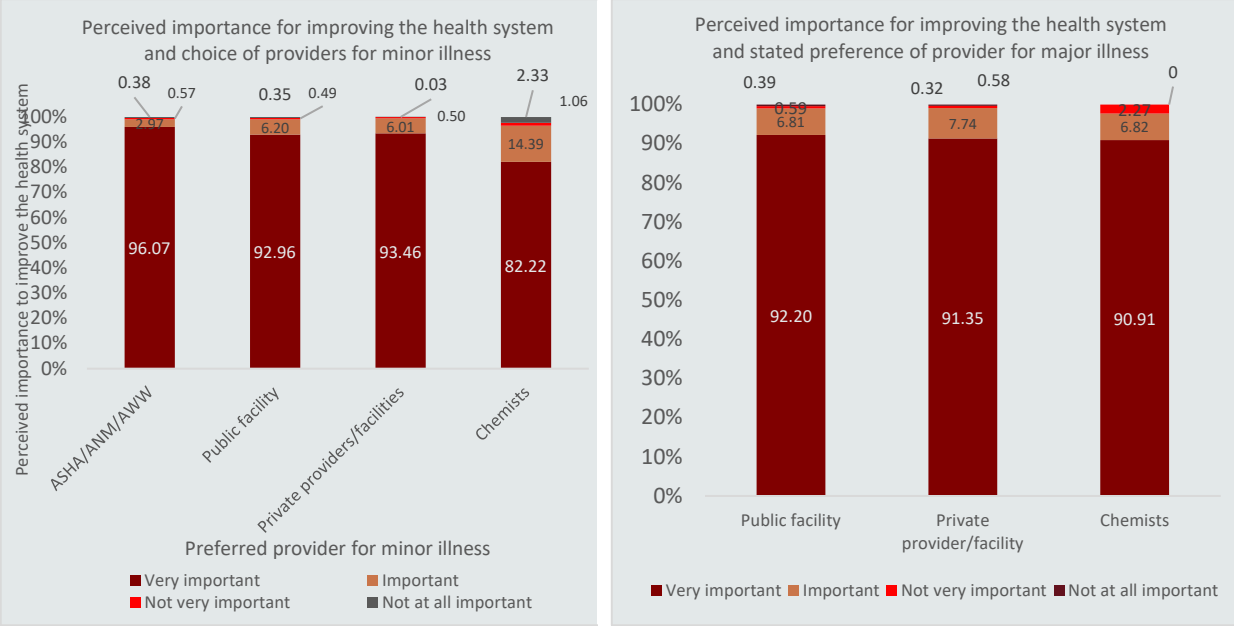
Figure 4.22: Perceived importance of the need to improve the health system and insurance coverage



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Congruent with the existing evidence, people without insurance coverage reported a greater need for improvement of the health system than people who had any type of health insurance coverage.

Figure 4.23: Perceived importance of the need to improve the health system and choice of providers



The choice of providers was significantly associated with expressed need for improving the health system. Households who preferred going to a private provider for major illnesses reported greater need for improvement in the health system compared to those that preferred public sector providers.

4.5 Conclusion

This study was the first of its scale to assess citizen satisfaction with the health system in an Indian state. As far as we are aware, an assessment of this health system goal has not been a part of any large survey in Odisha.

Our findings showed that people with insurance coverage are more satisfied with the health system reported higher confidence of receiving care when ill and lower need for improving the system. This indicated the importance of financial risk protection in determining people's perception of the health system. We also found that people in rural areas and people from vulnerable social groups (Scheduled Tribes) were less satisfied and reported lower confidence to receive care, which raises concerns of equity. It is also interesting to note that people whose stated preference was to visit private providers for major illnesses reported higher satisfaction with the health system than those that stated public providers as their preference. This might indicate people's perceptions of public and private providers.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

It is important to emphasize a set of findings from our analysis: educational attainment and income were negatively associated with satisfaction, where people with lower levels of education and lower income reported higher levels of satisfaction with the health system. We must interpret these findings in a nuanced way. As we have mentioned before, "satisfaction" is a subjective measure. To complicate this subjectivity, people's satisfaction is closely dependent on people's expectations. Satisfaction with one's healthcare system compares a person's assessment of the healthcare that is available with his or her expectations of healthcare. If two individuals differ in their satisfaction, it may be because of differences in their perception of what healthcare does, or in their expectations for healthcare, or both. Therefore, our findings may not necessarily indicate that people with lower education and income are more satisfied because they receive better care. These trends might just be an indication of their lower expectations from the health system given their socioeconomic status. These findings are congruent with the literature [11-14] and we aim to explore them through further analyses in the future.

Notwithstanding the difficulties in measuring citizen satisfaction, our analyses of citizen satisfaction can be interpreted to show how satisfied or dissatisfied the people of Odisha are with their state's health system. Politically, the ultimate goal, is for the system to provide what citizens want. Citizen satisfaction can inform policymakers and political leaders of public perception about the health system. It is a good measure to assess how citizens perceive accessibility, equity, affordability and service orientation of the health system as a whole. In the context of the various reforms that the government of Odisha has been undertaking in the recent past, an assessment of how the public perceives these changes, improvements, and new reforms can provide valuable feedback to policymakers.

4.6 References

1. Roberts, M.J., Hsiao, W.C., Berman, P., Reich, M.R., *Getting Health Reform Right: A Guide to Improving Performance and Equity*. 2008, New York: Oxford University Press.
2. Rockers, P.C., M.E. Kruk, and M.J. Laugesen, Perceptions of the health system and public trust in government in low- and middle-income countries: evidence from the World Health Surveys. J Health Polit Policy Law, 2012. **37**(3): p. 405-37.
3. Kruk, M.E., et al., High quality health systems in the Sustainable Development Goals era: time for a revolution. Lancet Global Health, 2018. **6**(11): p. e1196-e252.
4. Roder-DeWan, S., et al., Expectations of healthcare quality: A cross-sectional study of internet users in 12 low- and middle-income countries. PLoS Med, 2019. **16**(8): p. e1002879.
5. Sanam Roder- DeWan, et al., Level of confidence in and endorsement of the health system among internet users in 12 low-income and middle-income countries. BMJ Global Health, 2020. **5:e002205**.
6. Hsiao, W.C., *What is a health system? Why should we care*. . Harvard School of Public Health, Working Paper, 2003. **33**.
7. Groot, W., Adaptation and scale of reference bias in self-assessments of quality of life. J Health Econ, 2000. **19**(3): p. 403-20.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

8. Bjorner, J.B., et al., *Differential item functioning in the Danish translation of the SF-36*. J Clin Epidemiol, 1998. **51**(11): p. 1189-202.
9. Hays, R.D., Morales, L.S., Reise, S.P. , *Item response theory and health outcomes measurement in the 21st century*. Medical Care, 2000. **38 (9 Suppl): II28.**
10. The Commonwealth Fund. Commonwealth Fund International Health Policy Survey, 2013. 2013.
11. Bleich, S.N., Ozaltin, E., Murray, C.K., *How does satisfaction with the health-care system relate to patient experience?* Bull World Health Organ, 2009. **87**(4): p. 271-8.
12. Footman, K., Roberts, B., Mills, A., Richardson, E., McKee, M. , Public satisfaction as a measure of health system performance: a study of nine countries in the former Soviet Union. Health Policy, 2013. **112(1-2)**: p. 62-9.
13. Missinne, S., Meuleman, B., Bracke, P., *The popular legitimacy of European healthcare systems: a multilevel analysis of 24 countries*. Journal of European Social Policy, 2013. **23(3)**: p. 231-47.
14. Shmueli, A., Israelis evaluate their healthcare system before and after the introduction of the national health insurance law. Health Policy, 2003. **63(3)**: p. 279-87.

Section II
Intermediate Outcomes of Health System Performance

The intermediate outcomes of the health system proposed by the Control Knob Framework are (i) ***access***, (ii) ***quality***, and (iii) ***efficiency*** (Figure 1.1).

The intermediate outcomes are critical links in the chains that connect the root causes of a problem to the ultimate performance goals of the system discussed in Section I. We want to clarify a common misconception and point of confusion before we proceed. Poor performance on the intermediate outcomes is often incorrectly characterized either as "the problem" or "the cause" of other problems. Instead, these measures or variables are *intermediate* between root causes and ultimate performance goals. For example, when asked "what is the main problem of the health system in this state?" the answer is often "people in rural areas do not have access to health services" or "women are not delivering in hospitals." However, from what we have discussed previously in this report, it is now clear that these are not the main problems of the health system. The problems instead may be "poor health status of people in rural areas" or in the second instance, "high maternal mortality".

The intermediate outcomes of access, quality and efficiency have been chosen by the Control Knob Framework because of three reasons: (i) these variables are important causes relative to the final performance goals of the health system, (ii) these intermediate outcomes represent aspects of the health system that are salient in political and policy debates, and therefore, become important for our health system assessment and diagnostic analyses; (iii) these variables are influenced by health system reform choices; they play a "transmission" role between policy and outcome, and they are both responsive to and influential on health system changes.

In this section, we present our assessment of the intermediate outcomes of Odisha's health system. Chapter 5 on *Access* presents where residents of Odisha access care. The chapter includes estimates of utilization of different types of healthcare providers, in both public and the private sectors. To the best of our knowledge, this is the first large-scale estimation of utilization of care from chemist shops at a state level in India. In Chapter 6, we discuss different aspects of *Quality*. Due to the comprehensive way we define quality for our study, Chapter 6 is divided into three sub-chapters: *Clinical Effectiveness* (Chapter 6.1) measuring the competence of providers to correctly diagnose and treat common illnesses, *Patient Safety* (Chapter 6.2) to measure the patient safety culture in Odisha's public hospitals, and *Patient Centeredness* (Chapter 6.3) to measure how patients perceive the quality of health services they receive. As far as we are aware, our study is the first time that these three aspects of quality have been assessed in this way in Odisha. In Chapter 7 on *Efficiency*, we present the findings from our four provider surveys and discuss the inefficiencies and latent capacities in Odisha's health system.

Chapter 5
Access[¤]

5.1 Summary

When analyzing a health system and measuring how it produces its final outcomes, one key component is how, and how much, members of the population access healthcare. Measuring access to care can point to the health needs within the population, mismatches between the services sought and those provided, and patterns of health-seeking behaviors. Defining and measuring access to healthcare can take on different meanings in different contexts and different analyses. Access to care can reflect some or several individual components that influence or explain access. These components typically refer to the availability, the affordability, and the acceptability of the healthcare. Measuring access can point to gaps or overlaps in care-seeking behavior, care seeking within different levels of the healthcare delivery systems, and the role of the private sector in delivering care.

The use of outpatient and inpatient care is high in Odisha compared to other Indian states. And in India, care is often sought within the private sector. In Odisha, as in the rest of India, there is heterogeneity of the types of private sector providers, ranging from formal settings with care provided by doctors, private chemist shops, and private provider without formal medical training. We measured access to care within public and private settings to identify gaps or overlaps in service provision between public and private sectors. Furthermore, we measured access to health services across population subgroups to assess equity in access to care.

Here, we defined access as use of health services measured by self-reported visits to healthcare providers. We drew on data from the Household Survey (Survey Tool #1), which included responses from 30,654 individuals in 7,567 households. In particular, we examined outpatient care in the past 15 days, inpatient care over the past year, care sought for chronic illness, and care for maternal and child health. These indicators measure use of services across primary, secondary, and tertiary health services. These dimensions of access can be precisely measured in cross-sectional, quantitative surveys such as ours. To allow for comparison over time and within India as a whole, we constructed these measures in similar ways to national and state-level surveys, such as the Indian National Sample Survey (NSS), the National Family Health Survey (NFHS), and the Accessing Facility Capacity, Costs of Care, and Patient Perspectives: Odisha by the Access, Bottlenecks, Costs, and Equity (ABCE) Project.

In our sample, about 10 percent of respondents reported seeking outpatient care in the previous two weeks, which is comparable to other reports. Of these, about one third reported seeking care at a public primary care facility, yet about 20 percent reported

[¤] This chapter was led by Jan Cooper.

seeking care at a private hospital. Our data highlighted that about 15 percent of outpatient care was sought from private chemist shops. About 5 percent of our sample reported receiving inpatient care within the past year, which is similar to other reports. The majority of inpatient care was sought at district/municipal hospitals, CHC/rural hospitals, and private hospitals. Perceived competence was the most common reason for choosing the facility and cheaper care was not frequently a reason. Of those who sought inpatient care, about 5 percent reported having insurance to cover their stay. Among women who were recently pregnant, 60 percent reported having at least four antenatal care visits, which is on par with the national average. Similarly, rates of institutional delivery were similar to the average for India as a whole. However, there were differences in ante-natal care (ANC) visits and institutional deliveries across subgroups in the populations, particularly according to income and wealth.

Overall, these results suggest that when people are ill, they are able to access some form of care. In our sample, 46.32 percent sought care in the public sector, with over 30 percent of respondents report seeking care at public primary care facilities, and 53.68 percent sought care in the private sector, with 20 percent report seeking care at private hospitals. Our data highlighted that about 15 percent of outpatient care is sought from private chemist shops. By accounting for care sought at private chemists, our survey showed that what is typically measured as primary care is in fact capturing some health seeking at chemists. This dynamic is more pronounced in rural areas, among scheduled tribes, and lower wealth quintiles. Important questions remain about the effectiveness of the care that is available and about the equitable distribution of access to care across subgroups within the population.

5.2 Introduction

When analyzing a health system and measuring how it produces its final outcomes, one key component is how, and how much, members of the population access healthcare. Measuring access to care can point to the health needs within the population, mismatches between the services sought and those provided, and patterns of health-seeking behaviors. Within the Control Knob Framework, access to care is an intermediary outcome through which the control knob work to influence the final outcomes of the health system.

Defining and measuring access to healthcare can take on different meanings in different contexts and different analyses. Section 5.3 provides a conceptual summary of what access to care can mean, and section 5.4 specifies the definition used throughout this report.

5.2.1 Conceptual Framework

Access to care can reflect some or several individual components that influence or explain access. As elaborated by Frost and Reich, these components typically refer to the availability, the affordability, and the acceptability of the healthcare:

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 5.1: Definitions and key indicators for different aspects of access

	Definition	Key indicators
Availability	Appropriate healthcare provider or services are supplied in the right place and at the right time to meet the prevailing needs of the population.	-Physical distance & geography -Health condition & needs -Supply-side: facilities that are: (i) open and (ii) staffed (iii) according to population need
Affordability	An individual's ability to pay the full cost of services, based on their household budget	-Full cost of services (direct costs) -Related costs of care such as travel, time away from work (indirect costs) -Household wealth and/or budget -Other HH expenses
Adoption/Acceptance	Provider and patient attitudes towards each other and towards care.	- Cultural norms -Trust in healthcare system

For example, Sustainable Development Goal (SDG) 3.8 ("Achieve universal health coverage") includes "access to quality, essential health-care services" and "access to safe, effective, quality and affordable essential medicines and vaccines for all." The SDG 3.8 indicators include coverage of essential health services, service capacity and access, as well as "the proportion of population with large household expenditures on health as a share of total household expenditure or income." Roberts et al. (2004) define access as "effective availability", which means: "how easy is it for citizens to get care" that will produce the desired satisfaction and health status [1]. Effective availability reflects the physical or cultural barriers to care as well as the supply of healthcare. In addition, Frost and Reich (2008) describe access as "a continuous condition of different degrees" that includes availability, affordability, and adoption [1]. Similarly, Gulliford et al. (2001) describe "having access" to a service if it is available, but "gaining access" is a function of financial, organizational, and cultural barriers [2]. Moreover, a "satisfactory health outcome" is a function of services being relevant and effective.

5.2.2 Defining and Measuring Access

Measuring the use of health services often provides a simple set of indicators that summarizes contact with the health system. It can also point to gaps or overlaps in care-seeking behavior. However, it is possible that health seeking behaviors do not mirror the health services available, for instance, when individuals choose to seek care from specialists or higher-level hospitals rather than from local primary care centers. In other words, while use of healthcare provides a snapshot of the contact with the healthcare system, it does not always reflect how health services are supplied.

Several analytic approaches measure use of health services as proxy for access to care. Healthcare use can be measured at the household level, looking at how many individuals within the household engage with healthcare in a given period; or at the population level, looking at the proportion of individuals within the population receive care. These approaches begin with a definition of what constitutes "using" healthcare. Using healthcare can take on different meanings in different settings and have different

meanings for different conditions. Constructing a definition of healthcare use should reflect usual, or target rates of contact with a provider within the evaluation context and for specific conditions. In its general construction, use of health services is measured as the number of provider contacts within a specified time period. At the household level, access can be measured by looking at the number of individuals within the household who reported contact with a provider. For example, this can include measuring whether a member seeks specific kinds of care in a given period [10], probability of a household member having had a doctor or dentist visit [11], or members with conditions requiring treatment report receiving care [12]. Access can be measured at the population level by assessing the proportion of the population who have used health services. This can include direct measures such as proportion of the population who have in the last 12 months seen a family doctor, seen a specialist, or received a flu shot [13, 14], as well as routine visits specific health conditions [15]. Also, use of health services can be measured by looking at the prevalence of outcomes that reflect, or are affected by, routine healthcare use, including: the percent of the population who completed a full course of vaccinations; the percent not anemic, the percent of tuberculosis cases detected and treated successfully, or those reporting a self-perceived unmet need for care [13, 15, 16]. The WHO's Service Availability and Readiness Assessment (SARA) assessment tool measures healthcare use at population-level through the number of outpatient visits per capita per year as well as the number of hospital discharges per 100 population per year [17].

Here, we defined access as use of health services which is measured by self-reported visits to healthcare providers. In particular, we examined outpatient care in the past 15 days, inpatient care over the past year, care sought for chronic illness, and care for maternal and child health. These indicators measured use of services across primary, secondary, and tertiary health services. These dimensions of access can be precisely measured in cross-sectional, quantitative surveys such as ours. To allow for comparison over time and within India as a whole, we constructed these measures in similar ways to national and state-level surveys, such as the Indian National Sample Survey (NSS), the National Family Health Survey (NFHS), and the Accessing Facility Capacity, Costs of Care, and Patient Perspectives: Odisha by the Access, Bottlenecks, Costs, and Equity (ABCE) Project.

The use of outpatient and inpatient care is high in Odisha compared to other Indian states. And in India, care is often sought within the private sector. In Odisha as in the rest of India, there is heterogeneity of the types of private sector providers, ranging from formal setting with care provided by doctors, private chemist shops, and private provider without formal medical training. We measured access to care within public and private settings to identify gaps or overlaps in service provision between public and private sectors. Furthermore, we measured access to health services across population subgroups to assess equity in access to care.

5.3 Research Design

In the household survey, we measured access to care according to the following health-seeking behaviors: care sought for illnesses in the past 15 days, inpatient care within the

past year, care seeking among those with chronic illnesses, maternal healthcare, and child healthcare. Respondents who self-reported a chronic disease were included in a chronic disease survey module that assessed care-seeking within the past year. All women between the ages of 15-49 who were married, widowed, or divorced were asked a maternal health survey module, and care seeking for all children under the ages of five was assessed in a child health module. We measured access to care within public and private settings to identify gaps or overlaps in service provision between public and private sectors. Furthermore, we measured access to health services across population subgroups to assess equity in access to care.

5.3.1 Sample

Our analysis was based on the Household Survey, which included 7,567 households and 30,657 individuals (Survey 1 in Table 1.1). As described in Appendix 2, households were selected based on a multi-stage sampling design. At the district level, district strata were created based on an index with reflects relative levels of development, and six districts were selected to represent the levels of development and geography of the state. From these six districts, blocks were selected using proportionate stratified sampling, and the selection of blocks was done according to probability proportionate to size sampling. In each block, Primary Sampling Units (PSUs) were stratified between urban and rural regions at a ratio of 85:15 rural to urban to reflect the overall urban/rural distribution within the state. Within each PSU, all households were listed, and information gathered about outpatient care, chronic illness, and hospitalization. Households were selected based on outpatient healthcare visits in the past 15 days, hospitalizations within the past year, and diagnoses of chronic illness. Survey weights were developed to address the oversampling of these types of households and the multi-stage probability proportionate to size sampling. Post-stratification weights were also developed and employed to ensure our results are representative of the state of Odisha. (See Appendix 2 for more details.)

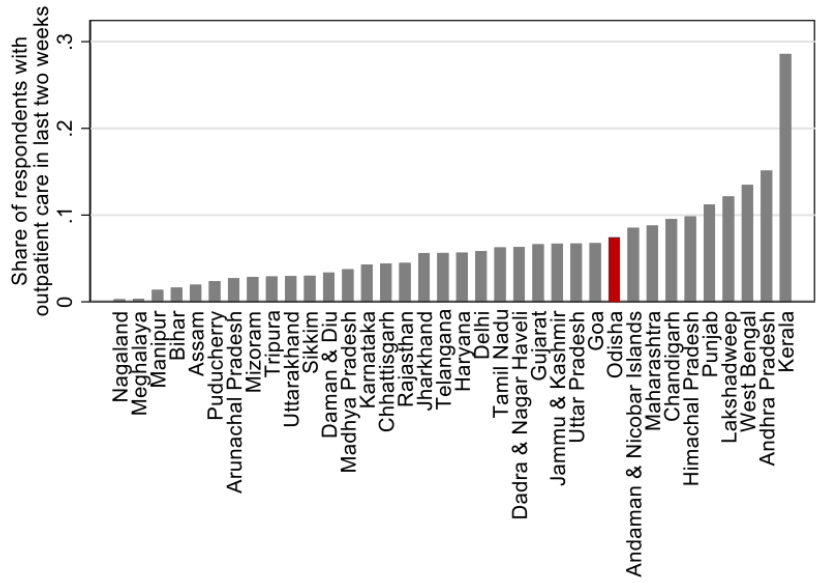
5.4 Results

5.4.1 Access to Care in the Past 15 Days

The use of outpatient care is high in Odisha compared to other states in India. Data from the 75th NSSO indicated that Odisha is among states with the largest share of respondents reporting outpatient care in the past 15 days.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.1: Outpatient care among states in India



Source: 75th NSSO data

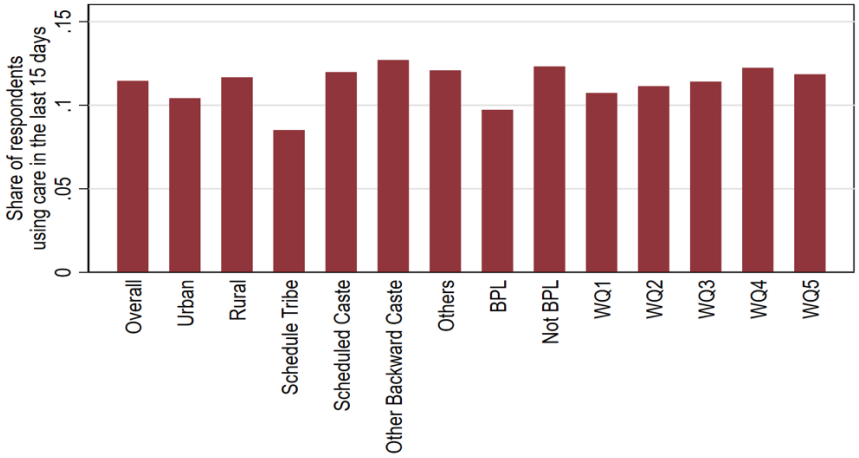
Our survey explored use of outpatient care within the past 15 days. These results provided insights on use of primary and preventive care vs secondary or tertiary care, as well as care sought at public vs private providers. Analyzing use of outpatient care across population subgroups pointed to areas of equity of access.

Reported care seeking

In our sample, about 12 percent of respondents reported being ill in the past 15 days. The share of outpatient care seeking was similar across most subgroups in our sample, yet those in scheduled tribes and below the poverty line reported somewhat lower outpatient health seeking.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.2: Outpatient care seeking in past 15 days



Among those who were ill, the majority (90 percent) reported seeking advice, either from formal or informal providers, for their ailment (Table 5.1). There was little variation in reported care-seeking across demographic subgroups. Among the 10 percent who did not seek care for their ailments, the vast majority reported that they did not think that they were ill enough to seek care.

Table 5.1: Outpatient care seeking in past 15 days

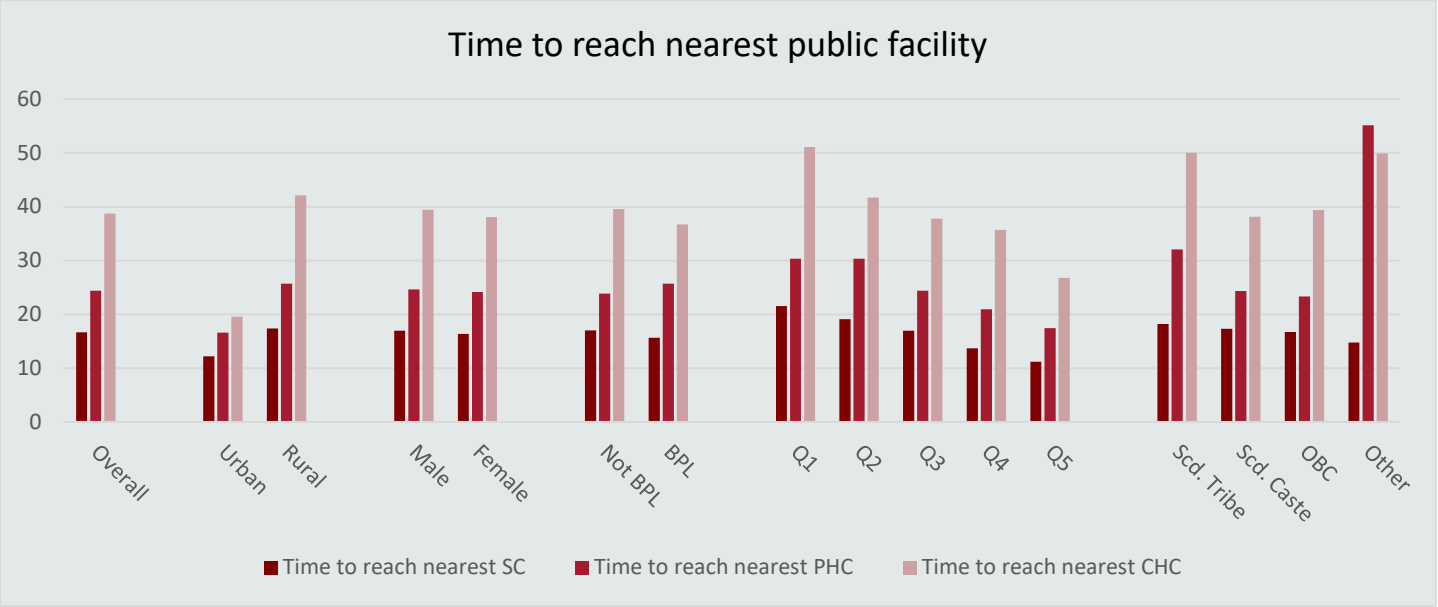
	Percent ill (of total sample)	Among ill, sought formal care	If self/no treat, reasons		
			Could not afford	*Not Sick Enough*	*Other*
Overall	12.36	88.09	9.31	84.76	5.93
Urban	11.06	87.38	4.24	95.69	0.07
Rural	12.62	88.22	10.38	82.45	7.17
Income Q1	12.99	88.17	8.59	88.32	3.1
Income Q2	11.48	88.88	21.25	74.37	4.38
Income Q3	12.6	87.84	8.88	80.39	10.73
Income Q4	12.35	91.13	11	88.33	0.67
Income Q5	12.11	84.77	0	93.49	6.51
Wealth Q1	11.36	86.44	12.09	77.56	10.34
Wealth Q2	12.2	88.03	21.47	75.82	2.71
Wealth Q3	12.42	91.69	7.38	84.34	8.29
Wealth Q4	13.21	88.69	4.44	90.23	5.32
Wealth Q5	12.66	84.82	0.62	95.43	3.95
BPL	10.49	89.84	7.21	88.84	3.95
Not BPL	13.28	87.41	9.89	83.62	6.49
Scd. Tribe	8.99	85.73	14.14	76.64	9.22
Scd. Caste	13.19	90.2	6.62	89.15	4.24
OBC	13.76	87.57	9.06	86.06	4.88
Other	12.98	89.03	6.16	88.06	5.78

Physical Access

Examining reported distances to a health facility provided insights on the supply of healthcare. Specifically, limited physical access could explain, in part, why some groups

use health services less than others. Notably, the majority participants in our sample reported being nearby to a public health facility. In our sample, 94 percent of households reported being less than 30 minutes away from a Sub-center, 82 percent reported being less than 30 min away from a Primary Health Center, and 57.7 percent reported being less than 30 minutes from a Community Health Center.

Figure 5.3: Physical access to public facilities



Using their usual mode of transport, participants reported the average time to reach a Sub-Center (SC) was 15 minutes, 25 minutes to reach a primary care center (PHC), and 38 minutes to reach a Community Health Center. Respondents from rural areas have somewhat larger distances to travel, yet tribal groups did not report significantly larger travel times to health centers. These results are similar to findings in the 2018 report, Accessing Facility Capacity, Costs of Care, and Patient Perspectives: Odisha by the Access, Bottlenecks, Costs, and Equity (ABCE) Project. Our analyses added information about travel times to Sub-Centers, which are within 30 minutes for 94 percent of our sample. Taken together, our results indicated that Odisha's efforts to build Sub-centers and Community Health Centers have provided good physical access to lower levels of care.

Illnesses

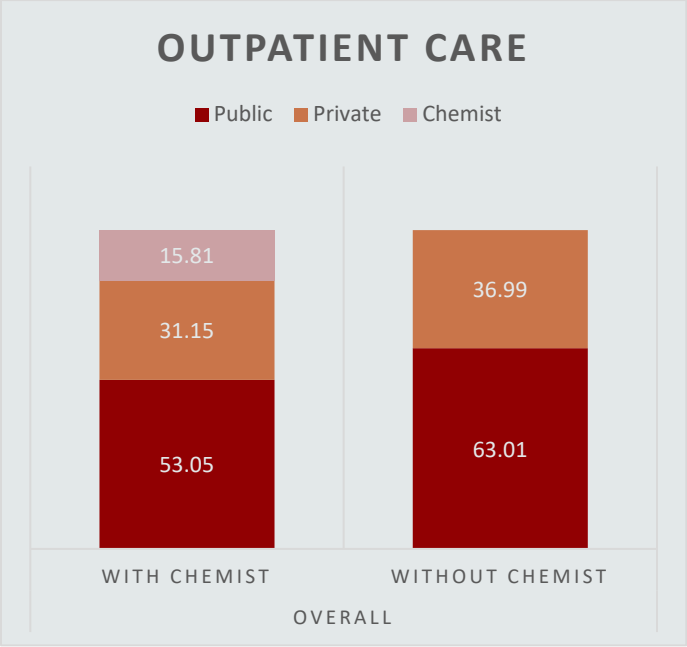
Among those seeking a healthcare provider in the past 15 days, half of respondents were seeking care for fevers. Chronic diseases (heart disease, stroke, diabetes, and respiratory illness) made up about 15 percent of illnesses. There was little variation in illness across demographic subgroups, although diabetes and heart disease were more common among urban settings and higher wealth quintiles.

Facility type and role of private chemists

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

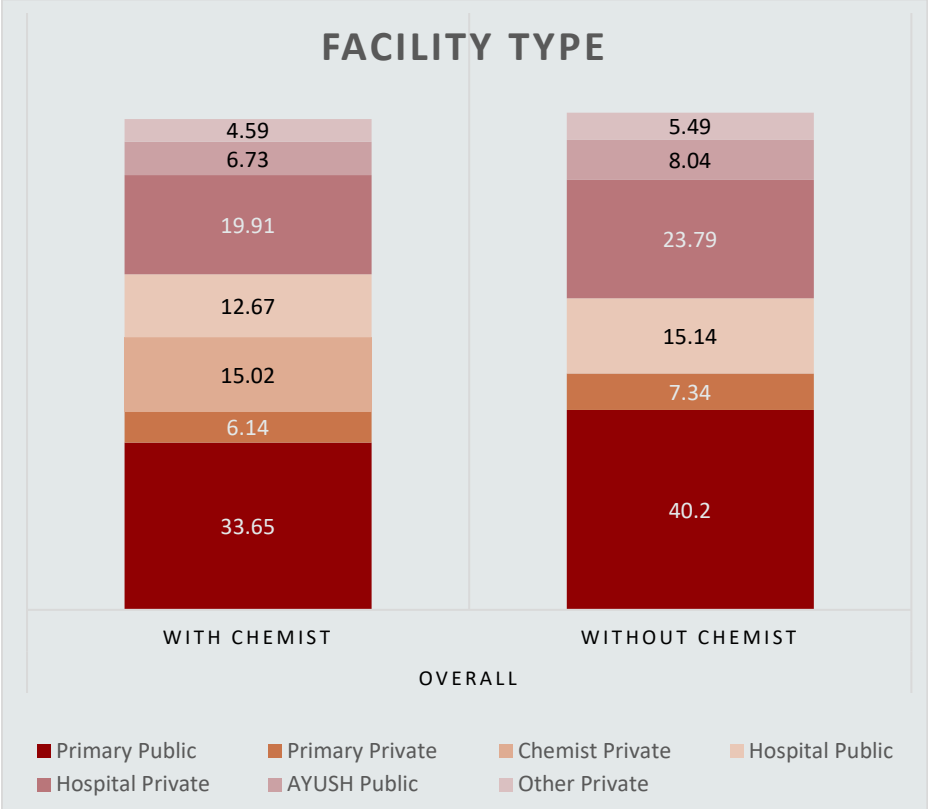
Data from the 75th NSSO indicates that in Odisha, among those who sought outpatient care in the past 15 days, 56.8 percent received care in the public sector while 38.4 percent received care in the private sector. In our sample, 46.32 percent sought care in the public sector, with over 30 percent of respondents reporting seeking care at public primary care facilities, and 53.68 percent sought care in the private sector, with 20 percent reporting seeking care at private hospitals. Our results differed somewhat the NSSO data because our survey accounted for care seeking at private chemists, which is common across all demographic subgroups. Notably in our survey, there was an inverse trend in seeking care at public primary centers or private hospitals across wealth quintiles; among the lowest income and wealth quintiles, the majority sought care at public primary care centers, while in the highest income and wealth quintiles, the majority sought care in private hospitals. Among those reporting seeking care at a public facility, about 75 percent reported that this was the closest government facility.

Figure 5.4: Outpatient care seeking at public or private provider



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.5: Outpatient care by provider type



In the figure above, the left-hand column shows the breakdown of facility types accounting for care sought at private chemists. The right-hand column shows the breakdown of facility types when private chemists are not accounted for, which suggests a larger share of public primary care use (from 33.65 percent to 40.2 percent). By accounting for care sought at private chemists, our survey showed that what is typically measured as primary care is in fact capturing some health seeking at chemists. This dynamic was more pronounced in rural areas, among scheduled tribes, and lower wealth quintiles.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.6: Outpatient care seeking by public or private provider among urban and rural settings

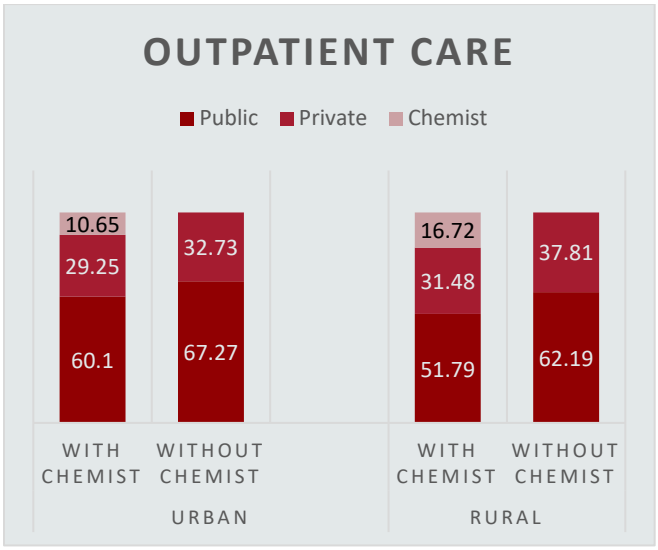
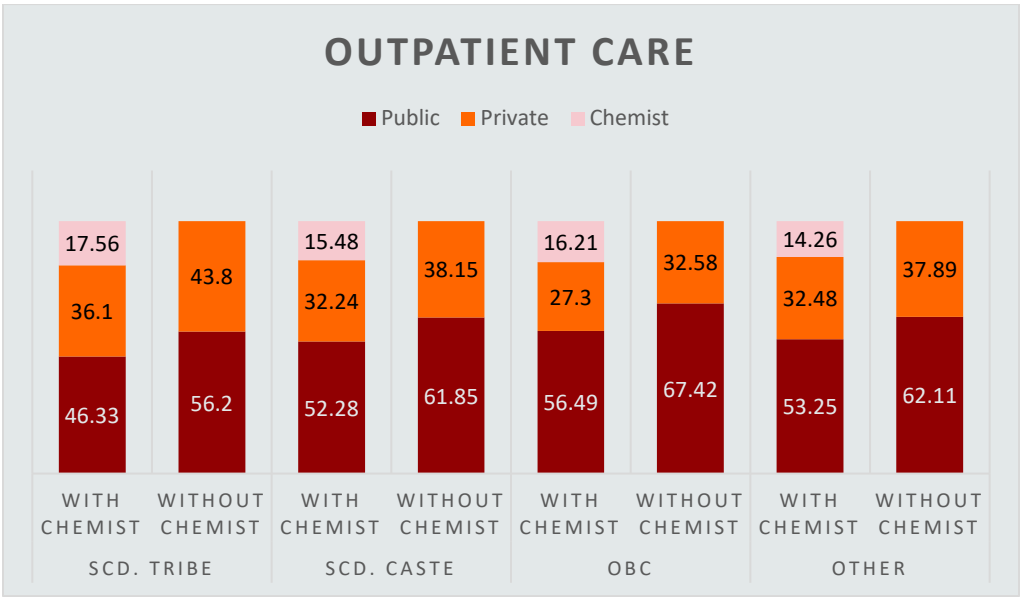


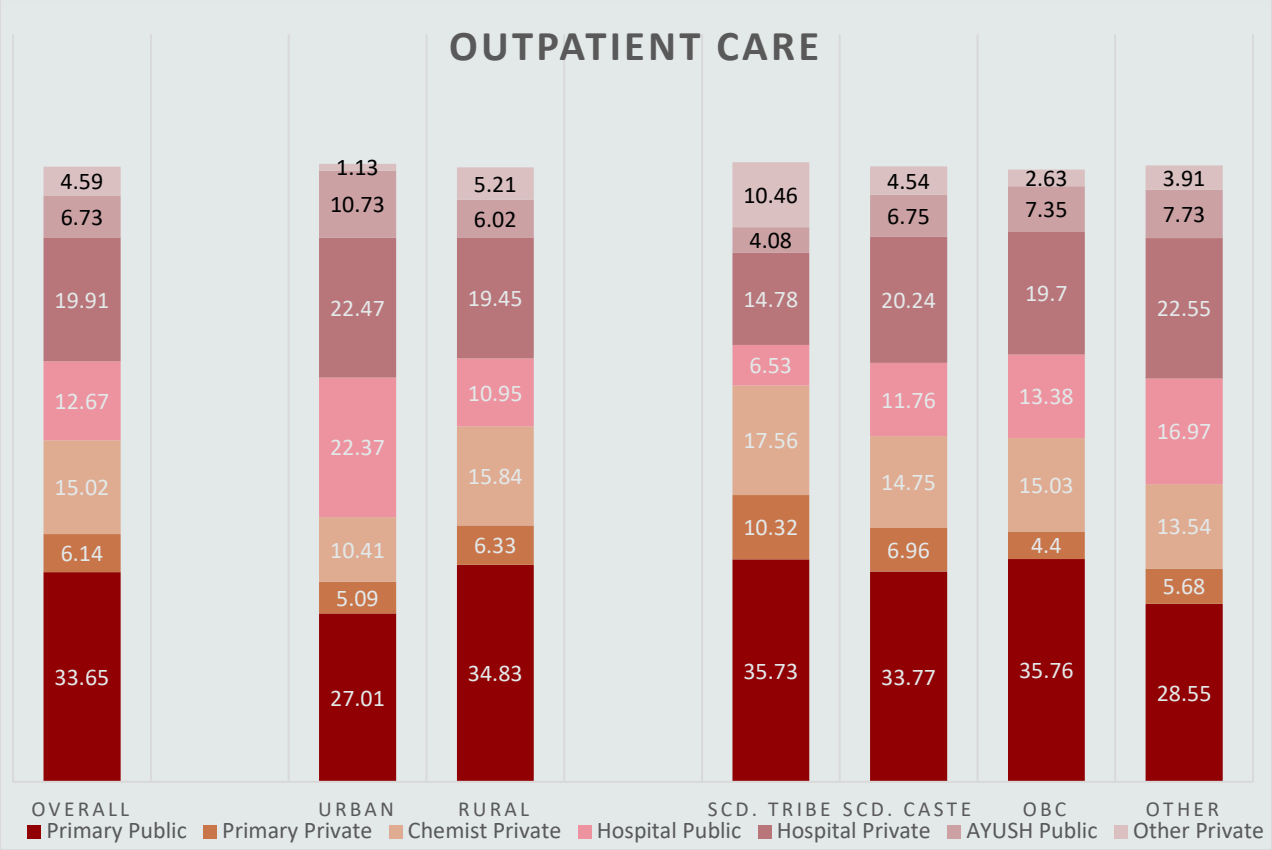
Figure 5.7: Outpatient care seeking by public or private provider among urban and rural settings



When analyzed by specific facility types, we see that care seeking at private chemists is common across all subgroups.

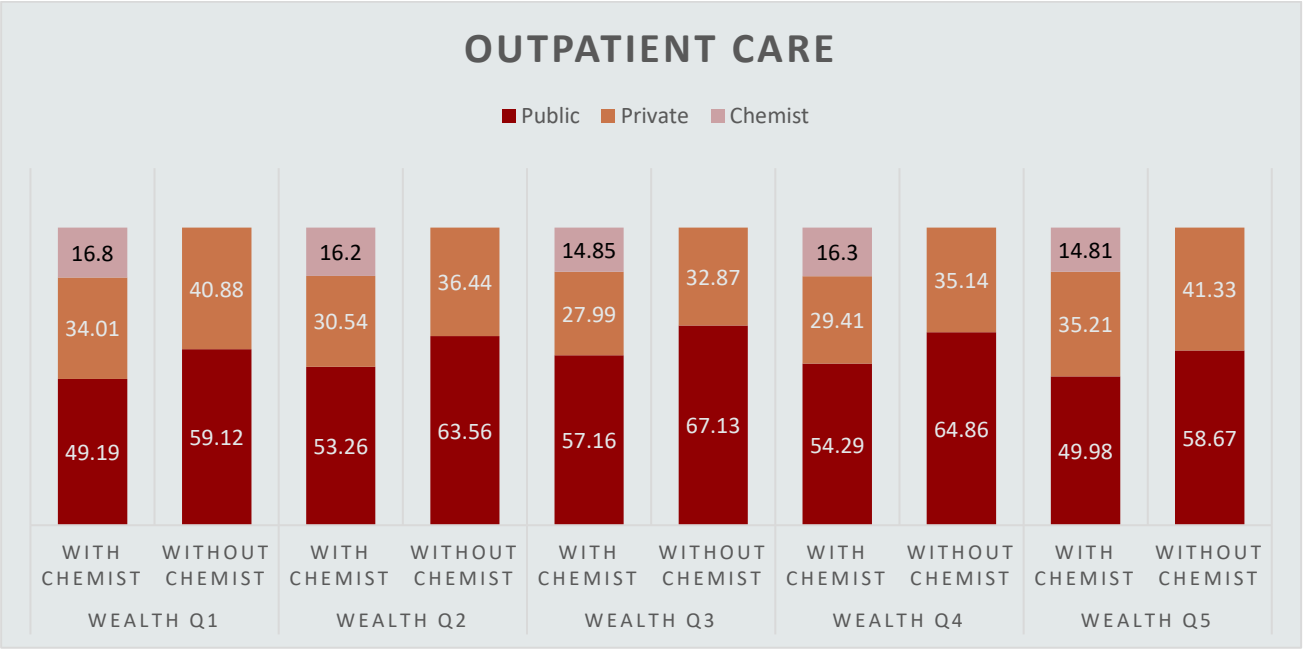
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.8: Outpatient care by provider type across regions and tribal groups



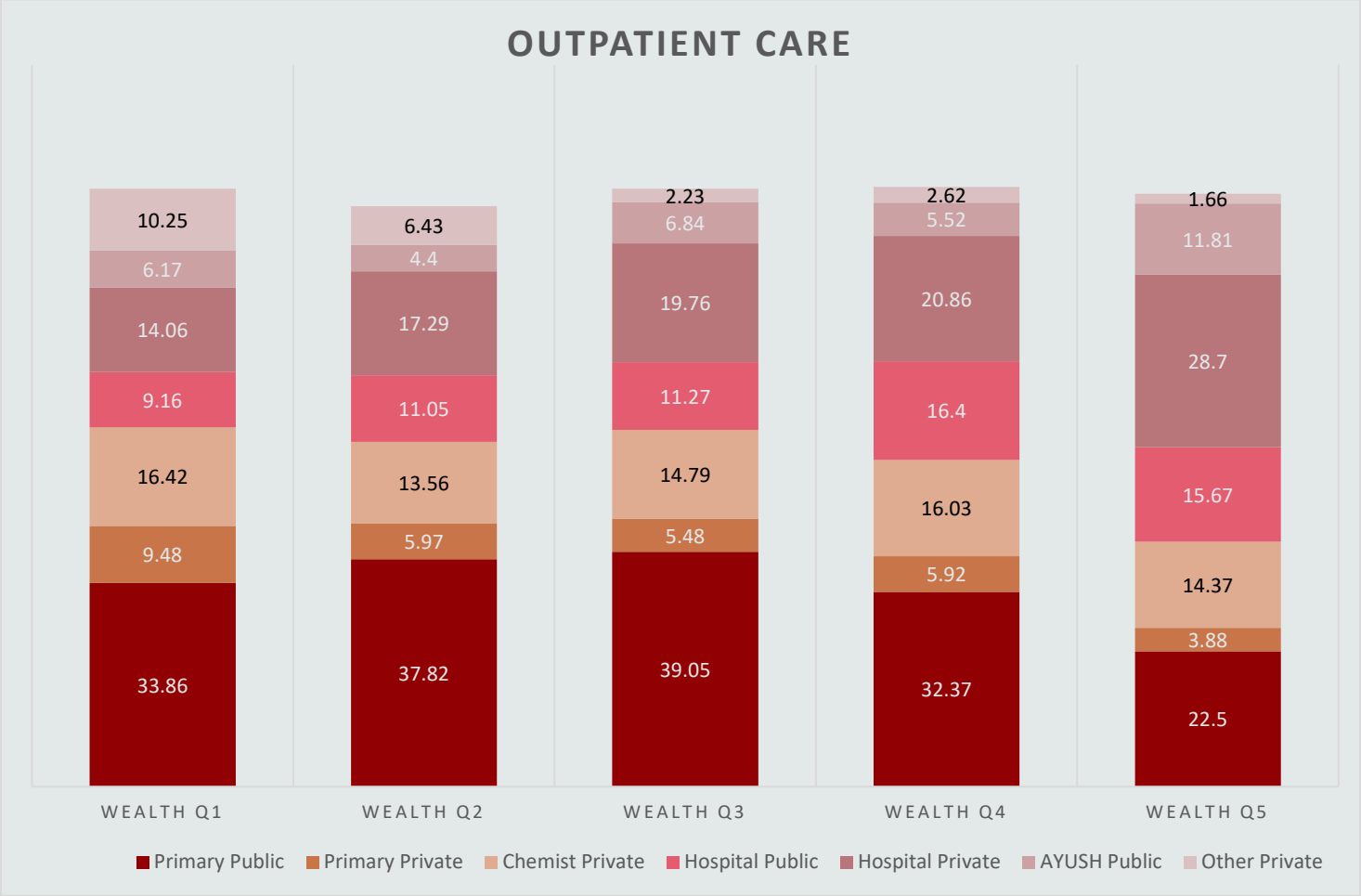
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.9: Outpatient care seeking by public or private provider among wealth quintiles



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.10: Outpatient care by provider type across wealth quintiles

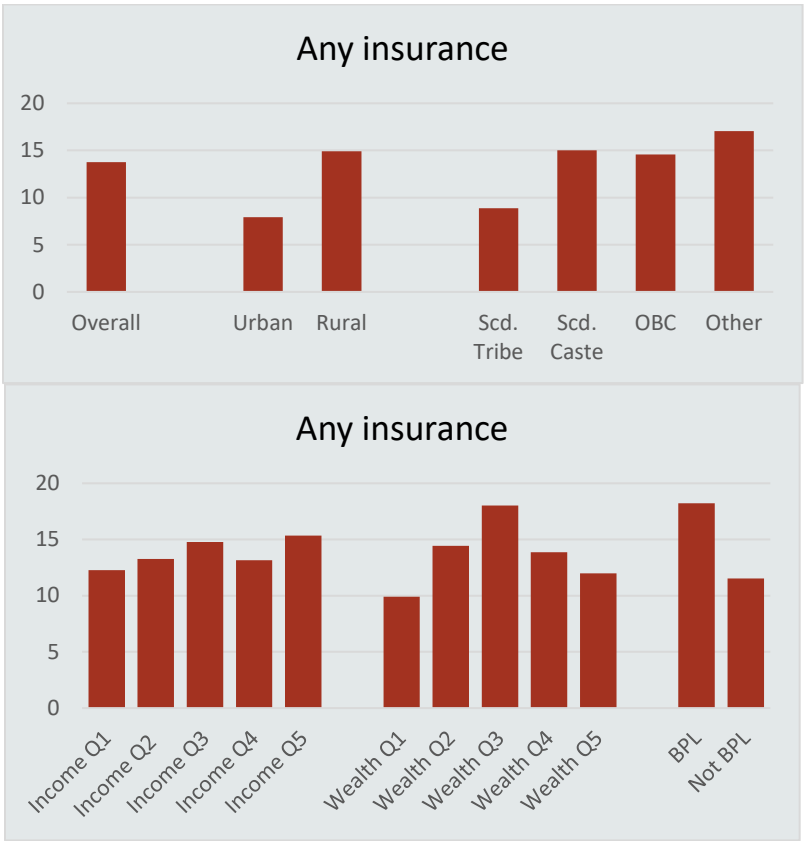


Insurance Coverage

About 15 percent of our sample reported having insurance coverage, which is similar to national-level data reported in the 75th NSSO.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.11: Insurance coverage



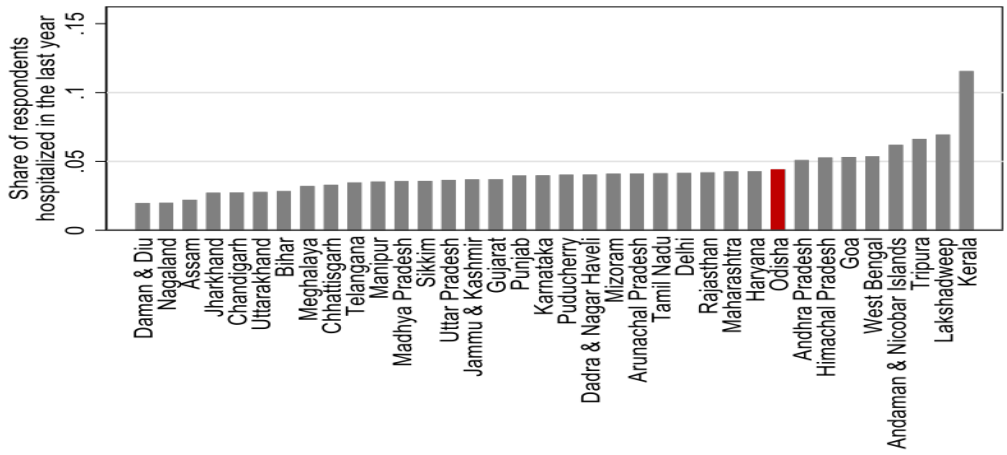
The most common reported insurance package scheme was BKKY, followed by RSBY. Insurance coverage was highest among those in rural areas and those below the poverty line.

5.4.2 Hospitalizations in the Past Year

Hospitalizations in Odisha are high. Using data from the 75th NSSO, Odisha ranks 9th among all Indian states for the share of hospitalizations.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.11: Share of hospitalizations among Indian states



Source: 75Th NSSO data

In the household survey sample, 1835 participants reported receiving inpatient care within the last year. The most common reasons for inpatient care were infections, followed by child- birth, and hospitalizations occurred most frequently during the rainy seasons of July to September. These trends which were similar across all demographic subgroups.

Across our sample, the rates of hospitalizations were similar for each subgroup, although tribal groups had lower rates of hospitalizations. Among those hospitalized, the majority were from rural regions, and a higher share were above the poverty line.

Table 5.2: Hospitalizations in the past year

	Any Hospitalization	Among Hospitalized, distribution
Overall	5.31	
Urban	5.72	18.17
Rural	5.22	81.83
Income Q1	5.54	24.68
Income Q2	4.79	17.12
Income Q3	5.4	25.04
Income Q4	5.34	15.35
Income Q5	5.4	17.81
Wealth Q1	4.31	16.33
Wealth Q2	5.18	21.32
Wealth Q3	5.28	20.87
Wealth Q4	5.71	21.73
Wealth Q5	6.19	19.75
BPL	4.8	29.98
Not BPL	5.55	70.02
Scd Tribe	2.99	13.41
Schd Caste	6.74	21.64
OBC	5.41	38.87
Other	6.56	25.66

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Facility type

The majority of inpatient care was sought at district/municipal hospitals, CHC/rural hospitals, and private hospitals.

Table 5.3: Facility types for hospitalizations in past year

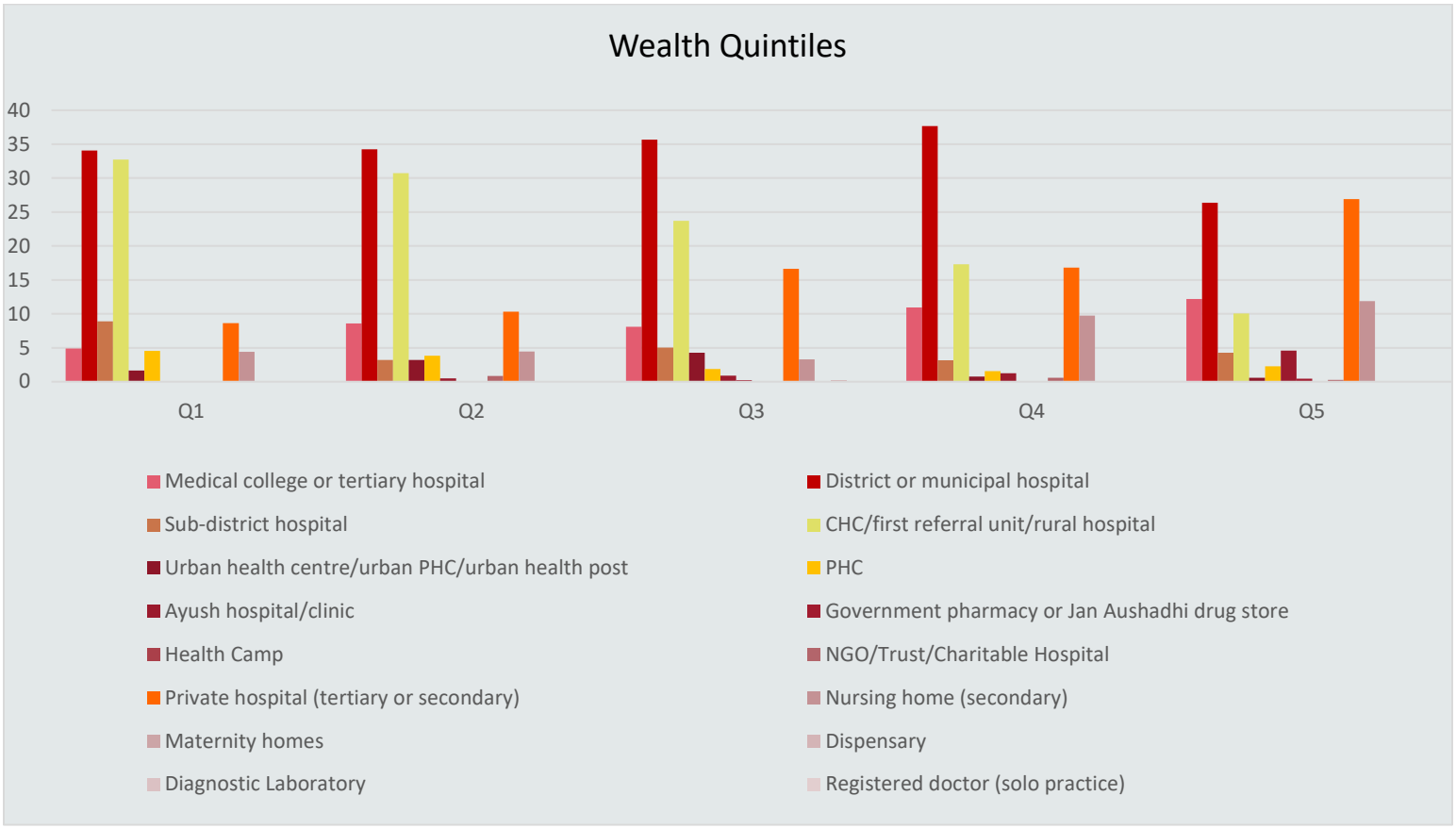
FACILITY TYPE	Overall	Urban	Rural	Male	Female	Not BPL	BPL
Medical college or tertiary hospital	9.11	9.22	9.09	12.36	6.88	9.44	8.38
District or municipal hospital	33.7	41.41	32.08	29.88	36.39	34.9	31.06
Sub-district hospital	4.72	2.09	5.27	3.82	5.35	3.87	6.59
CHC/first referral unit/rural hospital	22.48	11.77	24.74	18.37	25.34	21.37	24.92
Urban health centre/urban PHC/urban health post	2.12	1.34	2.29	2.62	1.79	1.39	3.73
PHC	2.72	2.3	2.81	1.84	3.34	2.49	3.23
Ayush hospital/clinic	1.48	4.26	0.89	2.6	0.71	1.07	2.38
Government pharmacy or Jan Aushadhi drug store	0.16	0	0.2	0.05	0.24	0.03	0.46
Health Camp	0.02	0	0.02	0	0.03	0	0.07
NGO/Trust/Charitable Hospital	0.36	0.28	0.37	0.43	0.31	0.07	0.98
Private hospital (tertiary or secondary)	16.1	20.75	15.12	19.57	13.73	17.95	12.02
Nursing home (secondary)	6.84	6.28	6.96	8.45	5.74	7.18	6.09
Maternity homes	0.02	0.11	0	0	0.03	0.03	0
Dispensary	0.06	0.18	0.03	0	0.1	0.04	0.09
Diagnostic Laboratory	0.02	0	0.02	0	0.03	0.03	0
Registered doctor (solo practice)	0.01	0	0.01	0.02	0	0.01	0

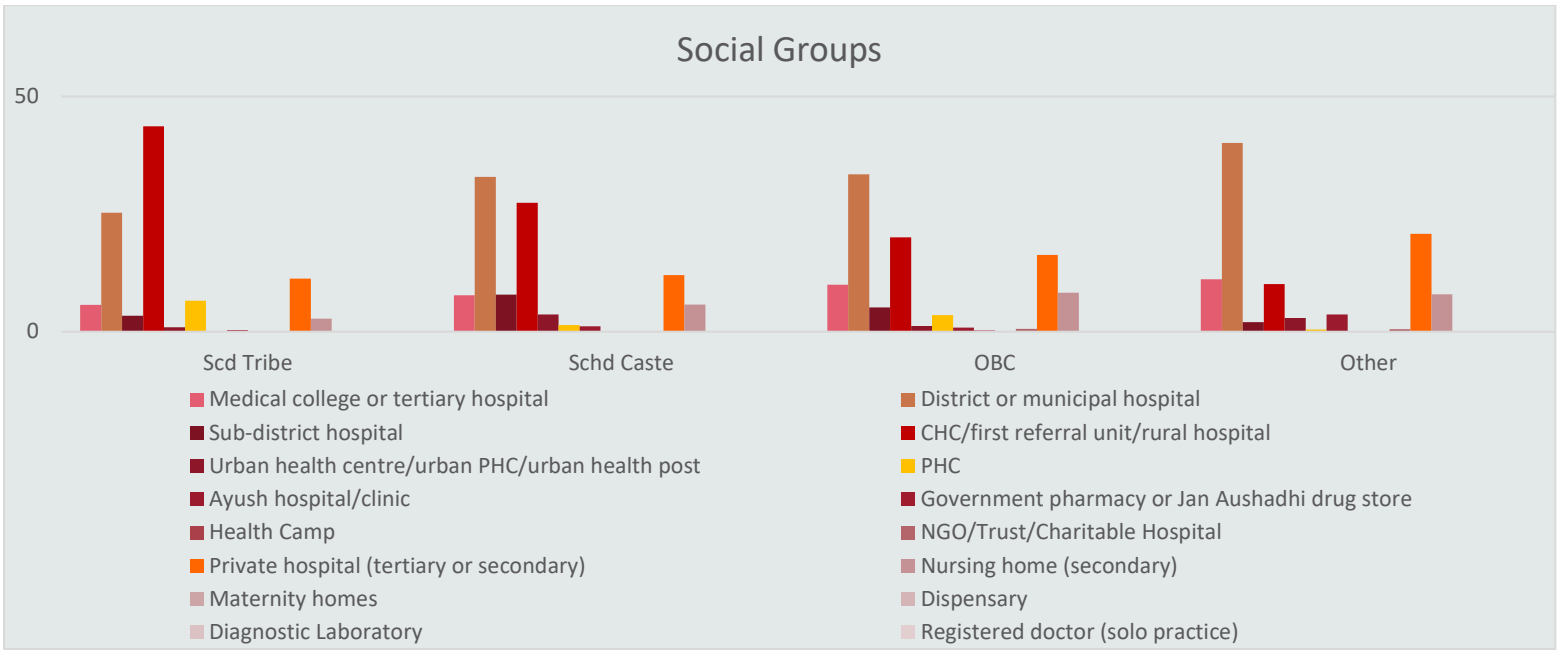
Notes: All variables are in percentage

There was increased use of private hospital among wealthier quintiles, yet an equal use of district/municipal hospitals across all subgroups:

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.12: Facility of hospitalization across wealth quintiles and tribal groups



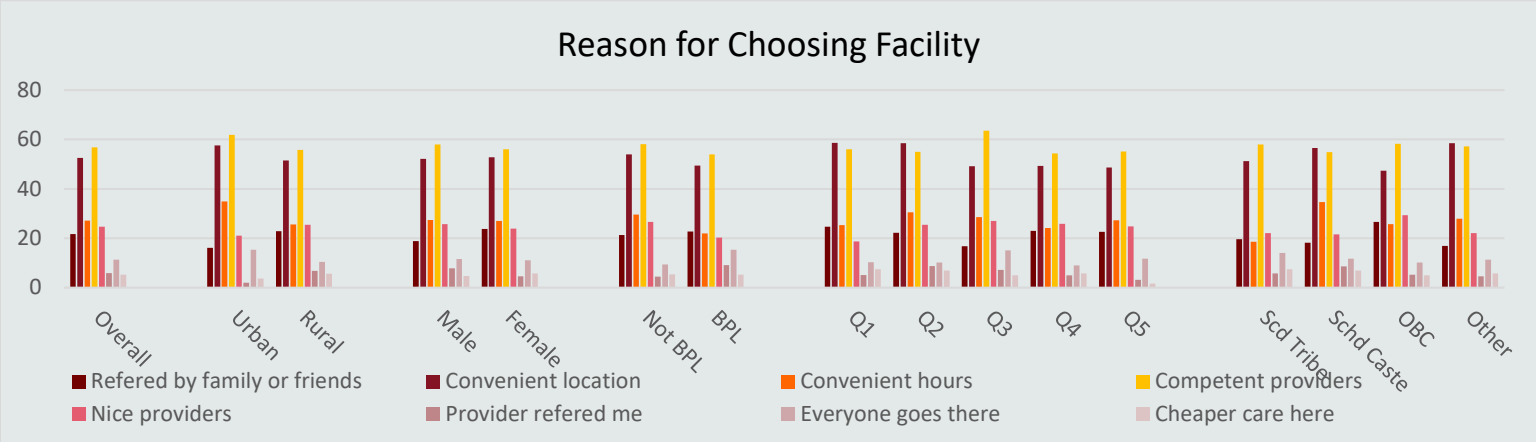


Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Reasons for choosing the facility

Participants reported choosing an inpatient facility based on the competence of the providers and for the convenience of location.

Figure 5.13: Reason for choosing facility by population subgroup



Respondents in the lower quintiles were more likely to report choosing a hospital based on the convenience of location while respondents in higher quintiles were more likely to report choosing a hospital based on the competence of the providers. Across all subgroups, there were infrequent reports of choosing a hospital because it provides less expensive care.

Treatment costs and insurance

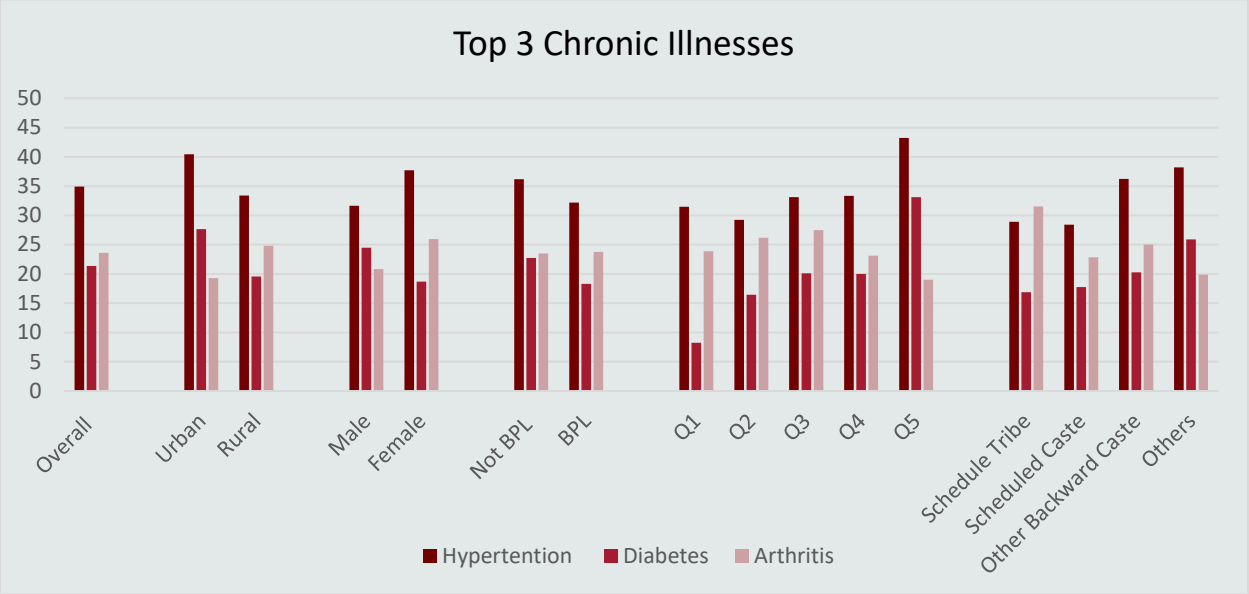
Those in rural areas and those below the poverty line report higher spending for their inpatient care. Among those who received inpatient care in the past year, insurance coverage was low; about 5 percent of the sample reported having insurance to cover their care. BKKY was most common among those in rural areas and below the poverty line. Those in the highest wealth quintile had the highest rates of coverage by ESIS or private insurance.

5.4.3 Chronic Illness

Our sample included 3517 respondents who reported being diagnosed with a chronic illness and have sought care for their condition over the past three months. The most common chronic illnesses were hypertension, diabetes, and arthritis. Access to care to diagnose and manage chronic illness is important; without early diagnosis and routine management, chronic illness can lead to worse health outcomes and more costly treatments.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.14: Top three chronic illnesses

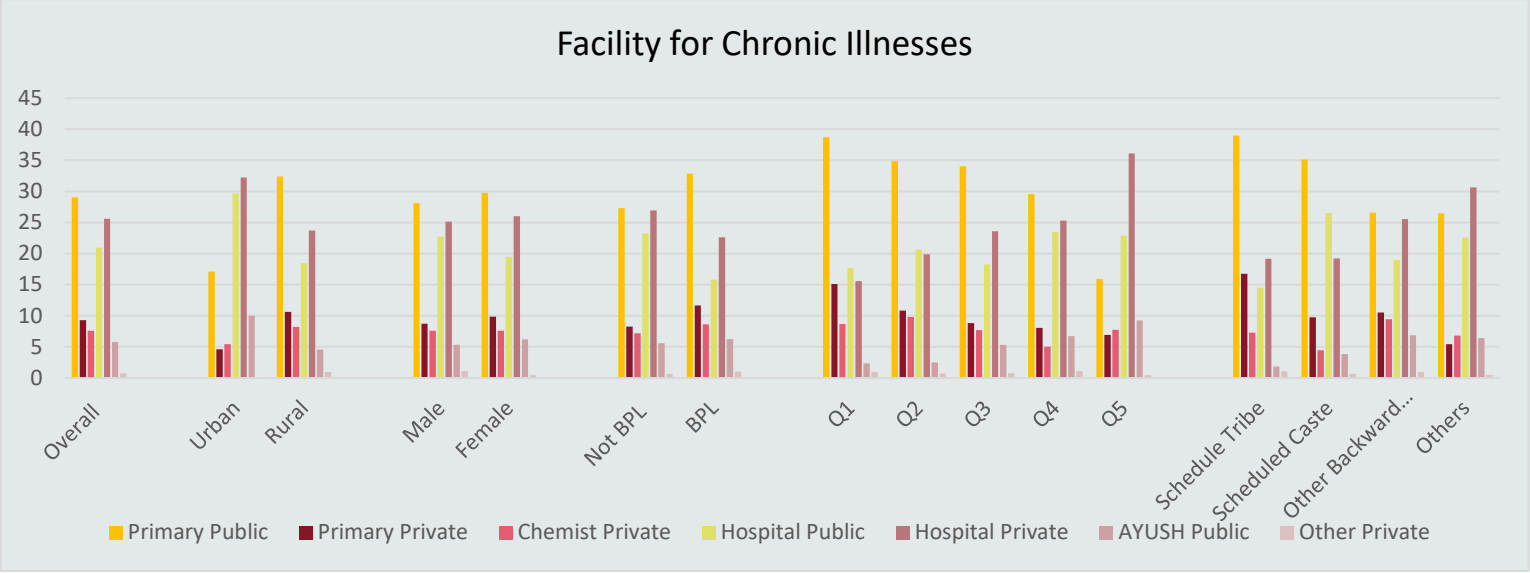


The rates of hypertension increase across wealth quintiles and among urban dwellers, whereas arthritis is more common among lower wealth quintiles.

Facility for care

Those with chronic illness sought care for their treatments in public primary care facilities as well as at private and public hospitals.

Figure 5.15: Treatment facility for chronic illness



There was an inverse trend across wealth quintiles and across schedule tribes and castes, where lower wealth quintiles reported seeking care at public primary care

facilities and higher wealth quintiles sought care at private hospitals. A similar trend occurred across the scheduled tribes and castes.

Spending and reimbursements

Over the previous three months, the mean out-of-pocket spending for chronic diseases was Rs. 670.00. Those in rural areas and those above the poverty line reported spending more than rural dwellers and those below the poverty line. Less than 1 percent of the sample reported receiving reimbursements for their spending on chronic conditions.

5.4.4 Maternal Health

In our sample 1,581 women reported giving birth since January 2016.

Antenatal care for most recent delivery

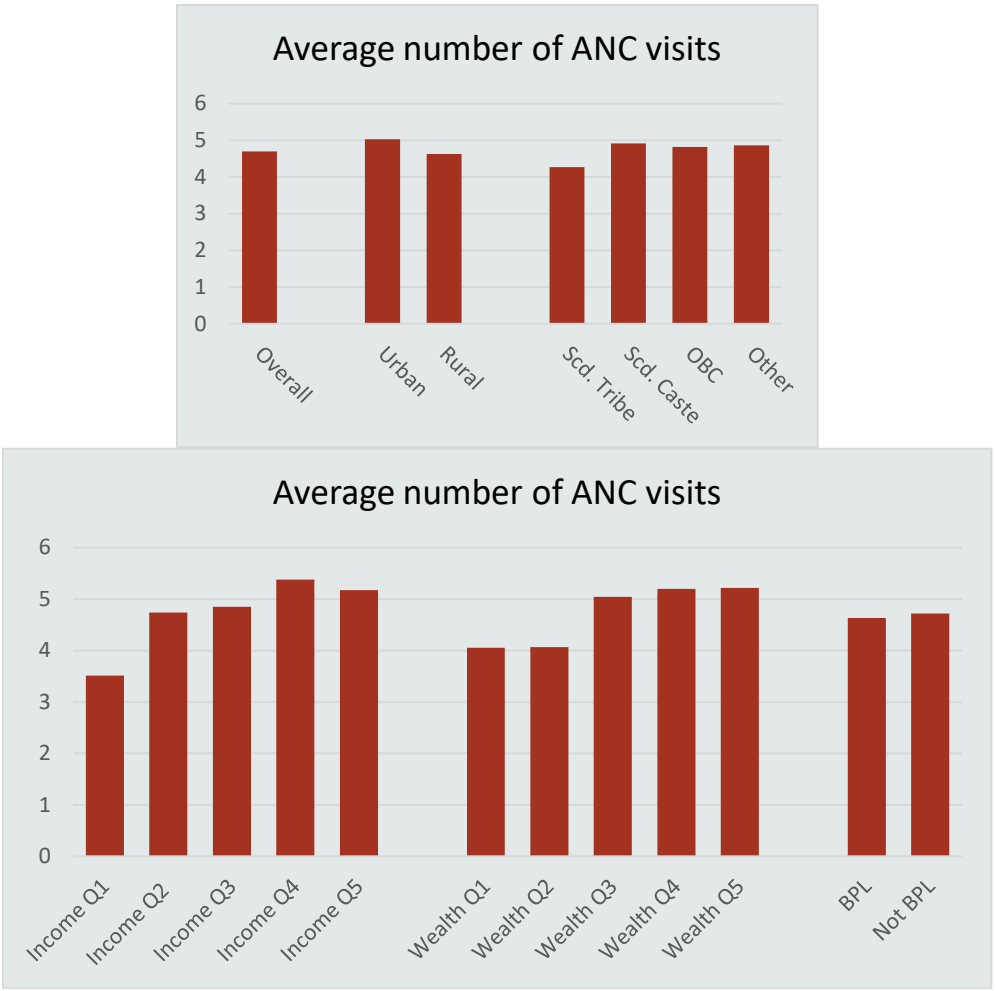
The number of women in Odisha receiving at least four antenatal care (ANC) visits has risen considerably in the past fifteen years. The National Family Health Survey (NFHS)-3 from 2005 to 06 reported that 36.9 percent of women received at least four ANC visits while the NFHS-4 from 2015 to 16 reports that this number has increased to 61.9 percent of women receiving at least four ANC. Our survey showed that this increasing trend is continuing: Among recently pregnant women in our sample, 67 percent reported having at least four ANC visits.

Subgroup heterogeneity for ANCs

Despite significant gains in antenatal care over the past 15 years, looking across sub-groups indicated that lower income and wealth quintiles and those in rural settings had fewer antenatal care visits on average. Specifically, among the sample of child-bearing women, the average number of antenatal care visits for their most recent pregnancy was 4.6. Those in lower wealth quintiles and in rural setting reported lower numbers of ANC visits.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

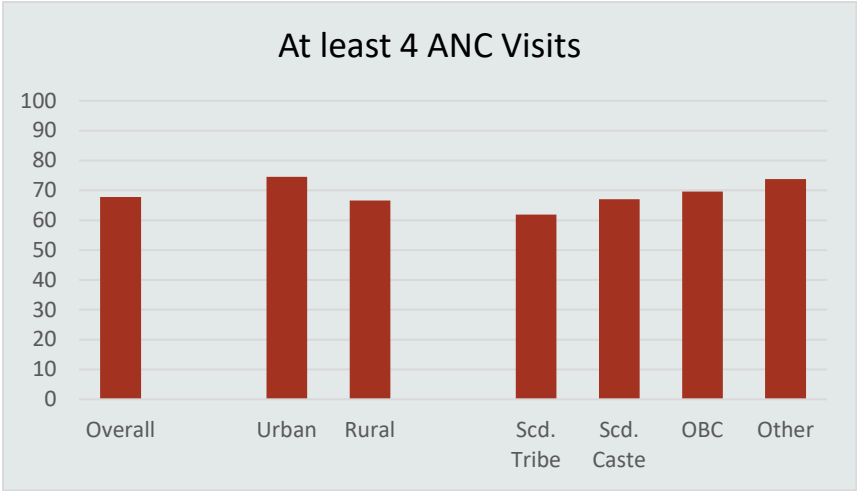
Figure 5.16: Average number of antenatal care visits

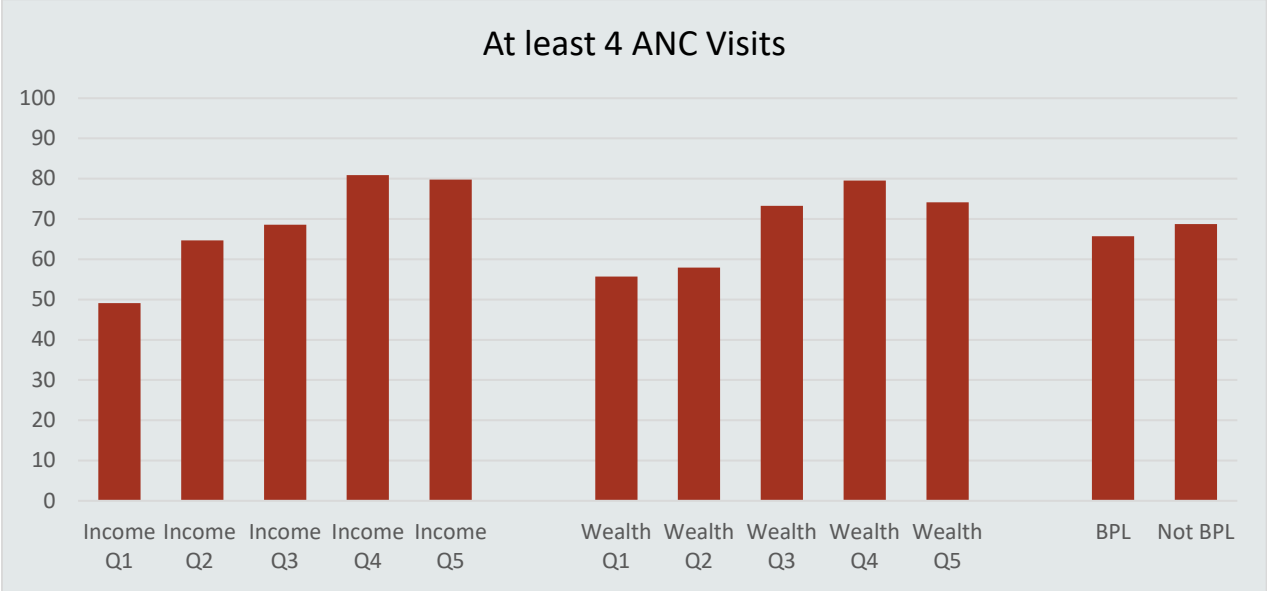


While overall, the percentage of women reporting at least four ANC visits was similar to the national average, there were differences across subgroups in the populations, particularly according to income and wealth. Among women in the lowest income quintile, 49 percent reported having at least four ANC visits, compared with 80 percent in the highest income quintile.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.17: Percentage with at least four antenatal care visits





Institutional Deliveries

Over the past 15 years, the rates of institutional deliveries in Odisha have risen dramatically, from 35.6 percent reported in the 2005-06 NFHS-3 to 85.3 percent in the 2015-16 NFHS-4. Similarly, the NFHS data indicates that this increase was taking place within public facilities, where deliveries in public facilities rose from 28.8 percent in 2005-06 to 77.3 percent in 2015-16. Our data supported this trend, although we found rates deliveries in public facilities to be slightly lower than those reported in 2015-16. Furthermore, we found notable differences in rates of institutional deliveries across demographic subgroups.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

While the majority of women in our sample reported giving birth at health facility, 15 percent of our sample reported delivering at home. Among women in rural areas, the rate of institutional delivery was 82 percent, compared to 96 percent in urban regions. Similarly, among the lowest wealth quintile, 64 percent of women reported having institutional deliveries, compared 98 percent of women in the highest wealth quintile.

Table 5.4: Location of most recent delivery

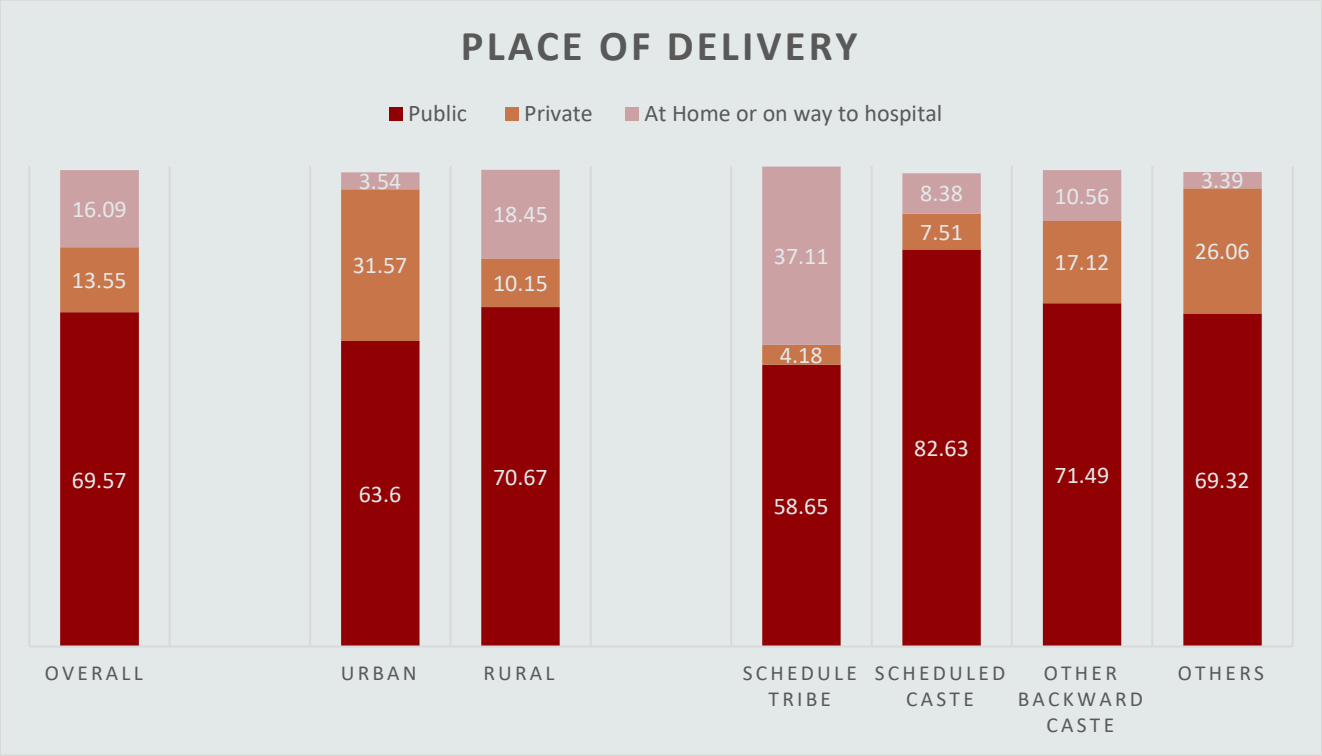
	Overall	Urban	Rural	Not BPL	BPL
FACILITY					
Medical college or tertiary hospital	1.05	0.5	1.15	1.27	0.54
District or municipal hospital	25.07	29.98	24.14	26.36	22.08
Sub-divisional hospital	4.61	4.51	4.62	3.59	6.98
UHC/UHP/UFWC	1.21	5.61	0.38	1.42	0.74
CHC/first referral unit/rural hospital	31.04	19.79	33.16	29.13	35.46
PHC	5.89	1.44	6.73	5.9	5.86
Sub center	0.4	0	0.47	0.45	0.27
Ayush hospital/clinic	0.3	1.77	0.02	0.14	0.66
Private NGO/trust hospital/clinic	0.23	0.65	0.15	0.15	0.42
Private Hospital/clinic	13.32	30.92	10	15.8	7.57
On way to hospital	0.61	0	0.72	0.87	0
At home	15.46	3.54	17.71	13.82	19.28
At parents' home	0.02	0	0.02	0.02	0
Other	0.81	1.3	0.71	1.09	0.14

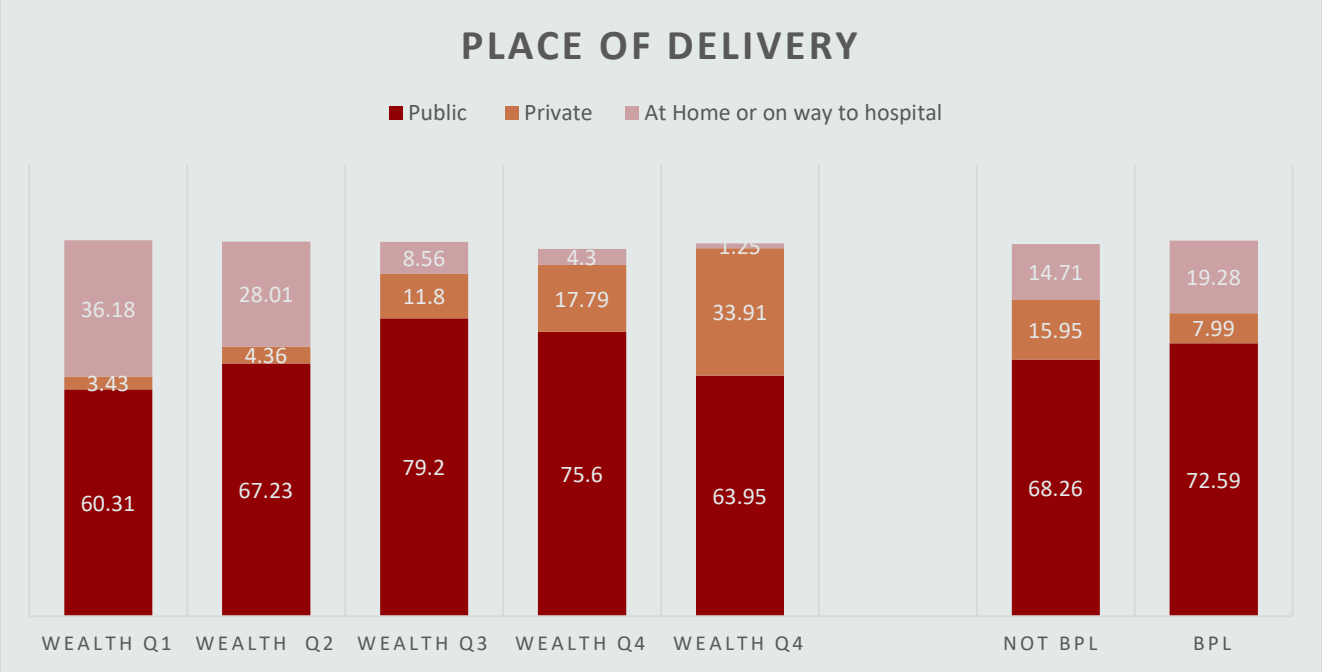
Notes: All variables are in percentage

As mentioned above, the NFHS-4 from 2015-16 indicates a notable increase in institutional deliveries, particularly for deliveries in public facilities (75.8 percent in 2015-16, up from 28.8 percent in 2005-06). Yet our data indicates that these gains have not been spread equally across the population. In particular, home deliveries were notably higher among rural areas, scheduled tribes, and the lowest wealth quintiles. Moreover, use of private facilities are higher among urban women, those not in a scheduled tribe or cast, and among higher wealth quintiles.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.18: Location of most recent delivery



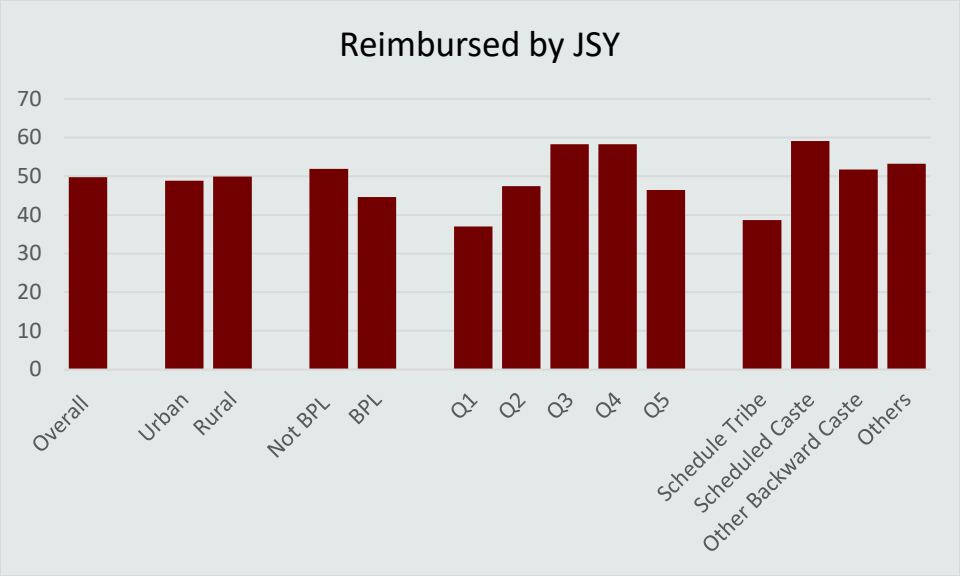


Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Reimbursed by JSY

About half of the women in our sample reported being reimbursed by the Janani Suraksha Yojana (JSY) for their most recent birth. These rates are lower than the state average reported in the NFHS-4, which indicates that 72.6 percent of mothers received assistance from JSY. The rates of reimbursement were slightly higher among those above the poverty line and those in wealthier quintiles. Tribal women reported the lowest rates of reimbursements.

Figure 5.19: Percent reimbursed by JSY



5.4.5 Child Health

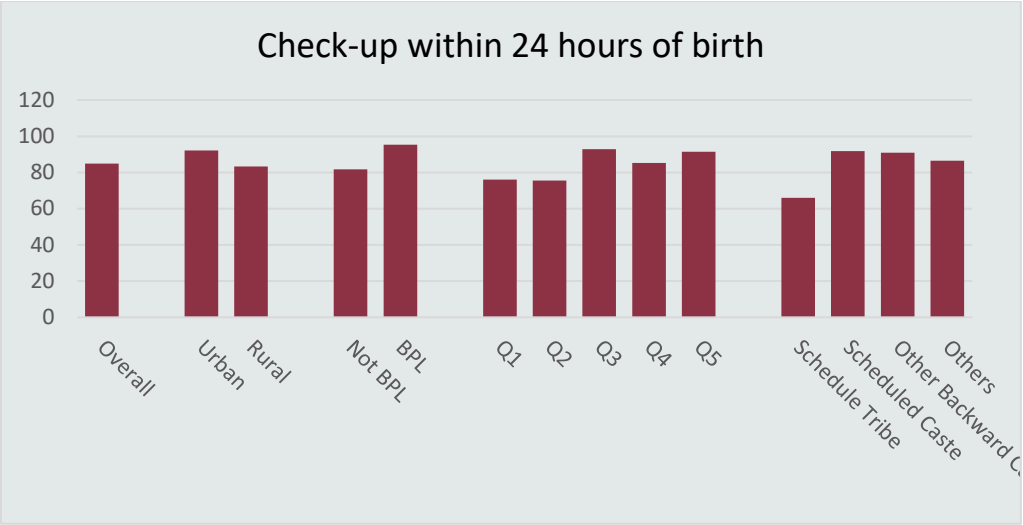
Our survey included a sample of children under five years of age. The median age of children in our sample was 2.2 years old, with an even distribution across age groups.

Check-up After Birth

Among our sample, 85 percent of parents reported that their child had a medical check-up within 24 hours of birth.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.20: Percent with check-up 24 hours after birth

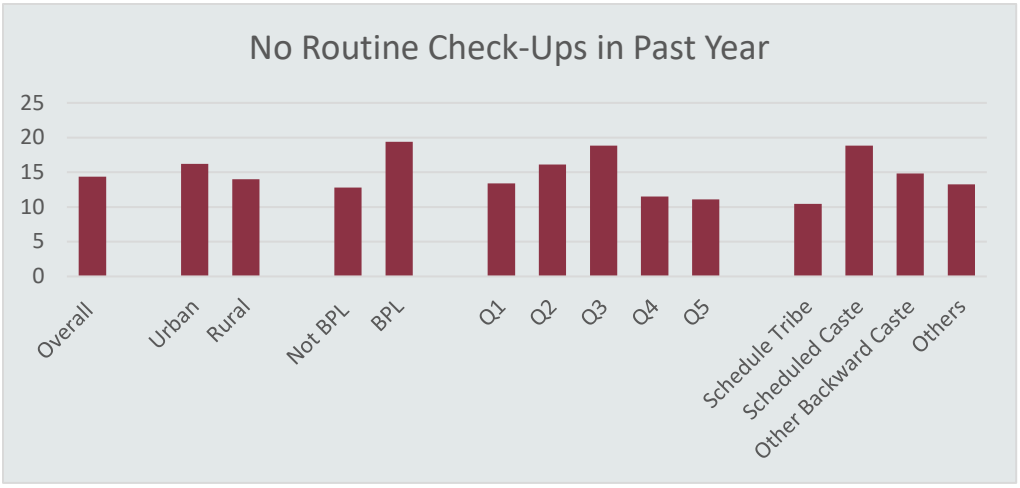


Children in rural areas, among lower wealth quintiles, and in tribal groups had lower rates of check-ups after birth.

Routine check-ups within past year

14 percent of parents reported that their child has had no routine check-up in the past year. Rates of no annual check-ups were highest among those below the poverty line.

Figure 5.21: Percent with no routine check-ups in past year

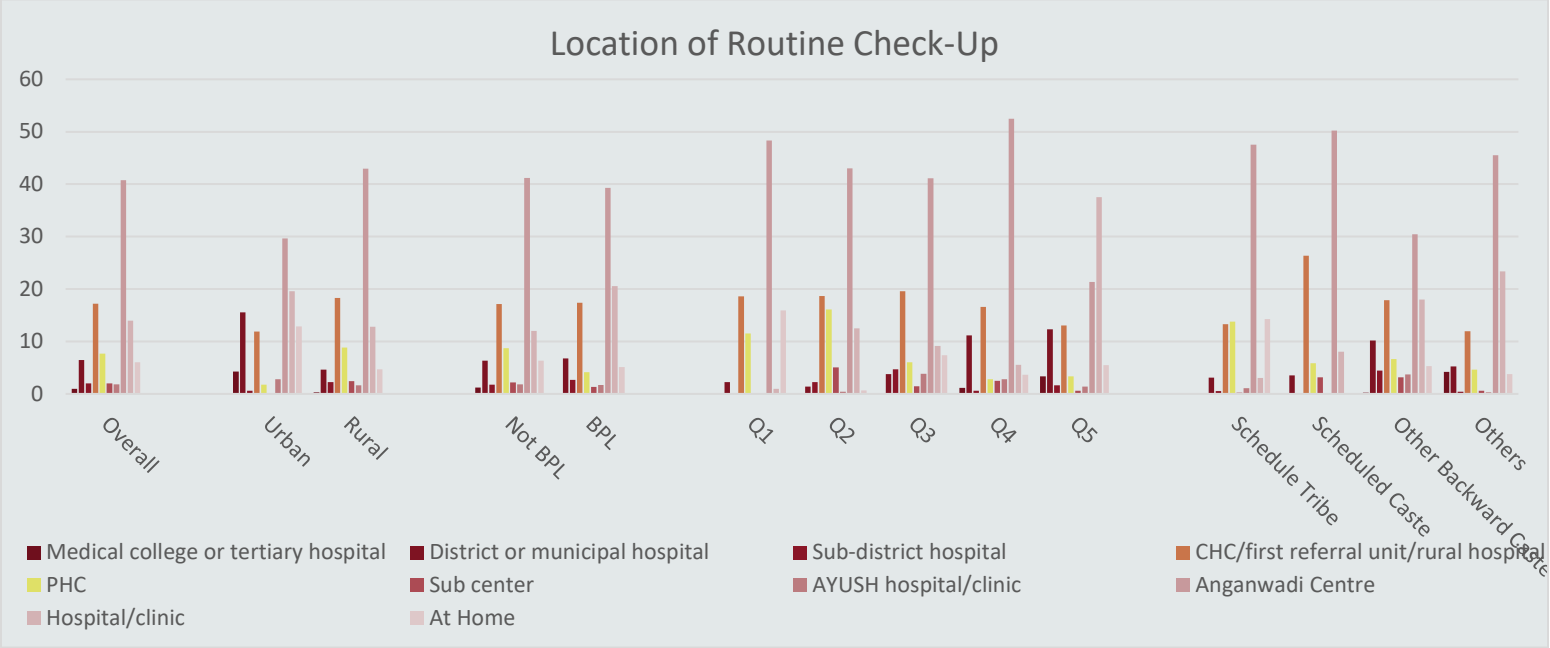


Location of routine check-up

Children in the sample most frequently received care at Anganwadi centers, CHCs or rural hospitals, and hospital clinics.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 5.22: Location of routine check-up



5.5 Conclusion

The use of outpatient and inpatient care is high in Odisha compared to other Indian states. Overall, our data suggested that when people are ill, they were able to access some form of care. Our data highlighted that about 15 percent of outpatient care was sought from private chemist shops. By accounting for care sought at private chemists, our survey showed that what is typically measured as primary care is in fact capturing some health seeking at chemists. This dynamic was more pronounced in rural areas, among scheduled tribes, and lower wealth quintiles. Furthermore, despite significant gains in antenatal care and institutional deliveries over the past 15 years, looking across sub-groups indicated that lower income and wealth quintiles and those in rural settings had fewer antenatal care visits on average. More broadly, across different domains of access, there were inequities between wealth quintiles in seeking care in public vs. private care settings. Reported insurance coverages are low, which is notable since those in rural areas and those below the poverty line reported the highest spending for their care. Taken together, important questions remain about the effectiveness of the care that is available, and about the equitable distribution of access to care across subgroups within the population.

5.6 References

1. Roberts MH, William; Berman, Peter; Reich, Michael. Getting Health Reform Right. 2004.
2. Gulliford M, Figueroa-Munoz J, Morgan M, Hughes D, Gibson B, Beech R, et al. What does 'access to healthcare' mean? J Health Serv Res Policy. 2002;7(3):186-8.
3. Fullman N, Yearwood J, Abay SM, Abbafati C, Abd-Allah F, Abdela J, et al. Measuring performance on the Healthcare Access and Quality Index for 195 countries and territories

and selected subnational locations: a systematic analysis from the Global Burden of Disease Study 2016. The Lancet. 2018;391(10136):2236-71.
4. Hogan DR, Stevens GA, Hosseinpoor AR, Boerma T. Monitoring universal health coverage within the Sustainable Development Goals: development and baseline data for an index of essential health services. The Lancet Global Health. 2018;6(2):e152-e68.
5. Manne-Goehler J, Geldsetzer P, Agoudavi K, Andall-Brereton G, Aryal KK, Bicaba BW, et al. Health system performance for people with diabetes in 28 low- and middle-income countries: A cross-sectional study of nationally representative surveys. PLoS Med. 2019;16(3):e1002751.
6. Gakidou E, Afshin A, Abajobir AA, Abate KH, Abbafati C, Abbas KM, et al. Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. The Lancet. 2017;390(10100):1345-422.
7. Naghavi M, Abajobir AA, Abbafati C, Abbas KM, Abd-Allah F, Abera SF, et al. Global, regional, and national age-sex specific mortality for 264 causes of death, 1980–2016: a systematic analysis for the Global Burden of Disease Study 2016. The Lancet. 2017;390(10100):1151-210.
8. Vos T, Abajobir AA, Abate KH, Abbafati C, Abbas KM, Abd-Allah F, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. The Lancet. 2017;390(10100):1211-59.
9. Haber N, Pillay D, Porter K, Barnighausen T. Constructing the cascade of HIV care: methods for measurement. Curr Opin HIV AIDS. 2016;11(1):102-8.
10. Johar M, Soewondo P, Pujisubekti R, Satrio HK, Adji A. Inequality in access to healthcare, health insurance and the role of supply factors. Soc Sci Med. 2018;213:134-45.
11. Allin S, Masseria C, Mossialos E. Measuring socioeconomic differences in use of healthcare services by wealth versus by income. Am J Public Health. 2009;99(10):1849-55.
12. Wagner AK, Graves AJ, Reiss SK, Lecates R, Zhang F, Ross-Degnan D. Access to care and medicines, burden of healthcare expenditures, and risk protection: results from the World Health Survey. Health Policy. 2011;100(2-3):151-8.
13. Sibley LM, Weiner JP. An evaluation of access to healthcare services along the rural-urban continuum in Canada. BMC Health Serv Res. 2011;11:20.
14. Miraldo M, Propper C, Williams RI. The impact of publicly subsidised health insurance on access, behavioural risk factors and disease management. Soc Sci Med. 2018;217:135-51.
15. Initiative PHCP. Methodology Note. 2015.
16. Dutta S, Lahiri K. Is provision of healthcare sufficient to ensure better access? An exploration of the scope for public-private partnership in India. Int J Health Policy Manag. 2015;4(7):467-74.
17. WHO. Service Availability and Readiness Assessment (SARA) - An annual monitoring system for service delivery. 2015.
18. Nolte E, McKee CM. Measuring the health of nations: updating an earlier analysis. Health Aff (Millwood). 2008;27(1):58-71.

Chapter 6.1
Quality: Clinical Effectiveness[∝]

6.1.1 Summary

Clinical effectiveness is the provision of health services based on scientific knowledge and avoiding both overuse of inappropriate care and underuse of effective care. Clinical processes, such as providing the correct clinical assessment, diagnosis, or treatment, are the cornerstones of effective care. The most important consideration for clinical effectiveness is the extent to which a diagnosis or treatment advice is based on evidence or standard guidelines and are shown to impact clinical outcomes. Clinical effectiveness is assessed through three different methods: chart reviews, standardized patients, and clinical vignettes. Although limited, studies in low- and middle-income countries, including India, have used standardized patients and vignettes to measure clinical effectiveness. In the Odisha Health System Assessment Study, we used data from a survey of 110 providers in public and private sectors who were administered clinical vignettes on five illness conditions. Provider responses to the vignettes were evaluated against standard treatment guidelines. The public sector providers included physicians at government-run Primary Health Centers, and the private sector providers included those engaged in solo-practice, irrespective of medical qualifications. We examined differences between providers on three parameters: competence to make a correct diagnosis, knowledge of the diagnostic process, and competence to provide correct treatment. Additionally, we also analyze prescription patterns among primary care providers, especially for prescription of unnecessary drugs and antibiotics.

Our results showed that competence of both public and private providers is poor, with only around half the provider respondents correctly diagnosing conditions presented in our vignettes. Public sector providers showed poorer competence to both correctly diagnose and treat most common conditions when compared to private sector providers. A majority of providers from both sectors prescribed a high number of incorrect and unnecessary drugs, with public sector providers prescribing more number of drugs for each condition. Furthermore, providers, especially those in the public sector, did not refer patients for conditions that mandatorily require referrals as per standard treatment guidelines. The widespread misdiagnosis of common conditions, the prescription of a high number of unnecessary drugs, and a lack of referrals raise concerns for meaningful access and health expenses in a context where primary care is uninsured.

Our findings were comparable to existing evidence from India, although in some cases, our study shows poorer competence of providers to correctly diagnose and treat conditions such as tuberculosis and pre-eclampsia.

[∝] This chapter was led by Anuska Kalita, with participation from Neha Gupta.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Most programs in India have focused on expanding coverage and access. Given the low competence of primary care providers in general and public sector providers in particular, India's policy efforts towards improving access to primary care may need to be re-examined. It is time that these programs go beyond access to include access with quality. Our findings have relevance for health systems like India's with healthcare markets with little de facto regulation and significant market failures arising out of information asymmetry.

6.1.2 Introduction

The National Academy of Science and Medicine (NASAM) defines clinical effectiveness as the provision of health services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit (such as avoiding both overuse of inappropriate care and underuse of effective care) [1]. Similarly, the World Bank, World Health Organization (WHO), and Organization for Economic Cooperation and Development (OECD) state that effective care is based on scientific knowledge and evidence-based guidelines catered to a patient's specific care needs. In addition, they highlight the importance of care coordination within this domain and the need to develop integrated care management plans with providers across the clinical interaction (56). The Lancet Global Health Commission on High Quality Health Systems in the SDG Era (HQSS) categorizes much of what the other two reports label clinical effectiveness measures as "competent care and systems". It highlights the importance of systematic assessment, correct diagnosis, appropriate treatment, counseling, and referral. Systems-level considerations may also include: prevention and detection, continuity and integration, and population health management [2]. Clinical processes, such as providing the correct clinical assessment, diagnosis or treatment, are the cornerstones of effective care. The most important consideration in the domain of effectiveness is the extent to which a diagnosis or treatment advice is based on evidence or standard guidelines and are shown to impact clinical outcomes.

6.1.2.1 Defining and Measuring Clinical Effectiveness

Clinical effectiveness is assessed through three different methods: chart reviews, standardized patients, and clinical vignettes.

Chart reviews can be used to routinely assess performance on clinical effectiveness measures, especially in hospitals. Retrospective chart reviews (also known as medical record reviews) are particularly relevant in assessing clinical effectiveness [3]. This methodology can be used to aggregate data from a spectrum of patients at the facility level. Such reviews can be relatively inexpensive and can produce, relatively quickly, actionable data for quality improvement for patient outcomes [4]. Although chart reviews are used regularly in high-income country settings, they have rarely been used in low to middle income countries (LMICs), including India. One of the barriers to using chart reviews in the Indian, or in our case, the Odisha context, is the lack of systematic maintenance of medical records.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

The use of ***standardized patients*** is another method for assessing clinical effectiveness [5-7]. Researchers at the World Bank and others have popularized this method, training actors to seek care while presenting with a pre-determined set of clinical symptoms and documenting what advice clinicians provide in response. This method has been used to assess healthcare providers' knowledge and practice in many outpatient settings and for a number of common disease conditions. It is uniquely well suited to avoid reporting bias – a common issue in assessing the quality of healthcare. However, this method is resource-intensive and requires the patient-actors to have some clinical training. These challenges make this method slightly difficult to employ in contexts like Odisha, although such studies have been conducted in some states of India and have contributed to a key body of evidence [8-16]

The third method to assess knowledge of providers linked to clinical effectiveness is the use of ***clinical vignettes*** – the method that we have used in our study. Vignettes are similar to standardized patients, in that the provider is presented with a fictitious case, but in this method, the interviewers do not pose as a patient, and the provider is informed that one of the two interviewers will answer all questions as the patient, while the other interviewer will record the questions that the provider asks to diagnose and treat the case. Clinical vignettes measure knowledge of healthcare providers, which are good indicators of clinical effectiveness [17-22], however, because the provider is aware of being evaluated, vignettes tend to be an upper bound on the quality of care of which the provider is capable [23].

6.1.2.2 Use of Clinical Vignettes in India

Out of the three methods to assess clinical effectiveness, we used clinical vignettes for a few reasons. One, in India (and Odisha), reliable records of charts or patient records are not available. These are even rarer in outpatient settings and primary care providers. Two, standardized patients as a method is resource intensive. It requires medically trained teams to collect data and therefore, survey costs are high. These were prohibitive barriers for our survey. Given the contextual realities and available resources for our survey, clinical vignettes proved to be the most suitable method for assessing clinical effectiveness of primary care providers. Literature on the reliability and validity of clinical vignettes as a method has shown that they are a suitable tool, especially for low-and-middle income country (LMIC) contexts [17-21, 25].

Clinical vignettes have been used in many LMICs, including India. Two key studies that have used clinical vignettes to assess knowledge of primary care providers in outpatient settings are the Medical Advice, Quality and Availability in Rural India (MAQARI) project undertaken by The World Bank in 2003 [31] and the Bihar Evaluation of Social Franchising and Telemedicine (BEST) project in 2012 [13, 32, 33].

We have used the findings from both the MAQARI and BEST projects as benchmarks to compare our results wherever applicable. Consistent with other studies, our results show poor competence of providers to diagnose and treat common condition correctly. In some cases, such as correct treatment of childhood diarrhea, our results are similar to

other studies; in other cases, such as correct diagnoses and treatment of TB, our results show far lower levels of knowledge [13, 23, 32].

6.1.3 Research Design

In the Odisha Health Systems Assessment Study, we used clinical vignettes to measure the clinical competence of providers at the primary care level in both public and private sectors on five different conditions – tuberculosis (TB), pre-eclampsia, childhood diarrhea, heart attack, and asthma (Survey 10 in Table 1.1).

A total of 110 providers were administered clinical vignettes, out of which 69 were medical officers from Primary Health Centers (PHCs), and 41 were solo providers. These providers were a sub-sample of respondents from two related surveys – one, the survey of providers in facilities (that included PHCs); and two, solo providers defined as those who practice from privately owned clinics at their homes or offices, or from chemist shops. These providers were sampled from across 30 blocks in six districts in Odisha, Balasore, Khorda, Jharsuguda, Keonjhar, Kalahandi, and Rayagada. (See Appendix 2 for more details on sampling.)

Out of the 129 PHCs in our sample, 75 PHCs were selected through with-replacement random sampling with a computer-generated algorithm. The medical officers from these 75 PHCs were included in our sample for the study on clinical vignettes. Out of these, 69 medical officers consented to participate in the study. Out of the 685 solo providers in our sample, 75 were selected through with-replacement random sampling with a computer-generated algorithm. Out of these 41 solo providers consented to the study.

The specific process that we have used in this study has been implemented and validated in low-income settings, including India [23-25].

As mentioned above, a clinical vignette is a hypothetical case in which the interviewer acts as an (un-blinded) patient and provides a very brief description of symptoms. The provider, who knows that the interviewer is not a real patient, is then invited to proceed exactly as they would under normal circumstances, asking questions about the history of the illness and performing necessary examinations. The “patient” provides standardized predetermined answers to the questions and examination procedures appropriate for the underlying condition. A second interviewer is present to provide answers to questions that the patients may not know, such as the results of a blood test should the provider say he or she would ask for one. The second interviewer also notes the treatment prescribed and the checklist items or questions asked by the provider [17, 19-22, 26-30].

Each of the five vignettes were asked of each provider and are intended to capture the provider’s behavior both for cases that should be treated at primary care clinics and for those that should be triaged to higher levels through referrals. For instance, in case of diarrhea in an infant or child, checklist items and related responses were included that would lead to a (correct) conclusion of viral diarrhea without dehydration, diarrhea with severe dehydration, or dysentery. Interview results—the number of relevant questions

asked, including those necessary to rule out more complicated or serious conditions; examinations conducted; tests requested; diagnoses offered (if any); or treatment suggested— were evaluated against standard treatment guidelines. Because providers realize that they are being tested, vignettes test what they know, which we call competence, versus what they might actually practice.

6.1.5 Results

For analysis of the clinical vignettes, three main areas of competence were measured:

1. Competence of providers to make a correct diagnosis for the five conditions
2. Competence to seek information relevant to arrive at a diagnosis or knowledge of the diagnostic process
3. Competence of providers to correctly treat the five conditions

Besides assessing the overall clinical effectiveness of healthcare providers in Odisha, the purpose of this study was to test the hypothesis that there is a significant difference between public and private sector providers in their competence to make correct diagnoses, follow the diagnostic process, and provide correct treatment advice. In addition, we also analyzed the prescription behaviors among providers, especially looking at the prescription of unnecessary drugs and the use of antibiotics.

The following sections present the analyses under each of these areas of competence, with disaggregation for the different conditions and for public and private sector providers.

6.1.5 Competence of Providers

In this section we present our findings on the competence of public and private providers at the primary care level to diagnose common illnesses, follow the diagnostic process, and to provide correct treatment for these conditions. To evaluate the competence of the providers, we have compared their responses for the clinical vignettes to standard treatment guidelines for the five different conditions.[9]

6.1.5.1 Competence of providers to make a correct diagnosis

Overall, the competence among providers to make a correct diagnosis for the five common conditions was quite poor. Only 40 percent providers were able to diagnose TB, 53.64 percent for pre-eclampsia, 55 percent for asthma, 67 percent for heart attack, and 71 percent for diarrhea (Table 6.1.1).

[9] The following guidelines were used to evaluate the clinical vignette interviews: (i) Tuberculosis – Revised National TB Control Program, Government of India; (ii) Pre-Eclampsia – WHO guidelines for diagnosis and management of pre-eclampsia; (iii) Diarrhea – WHO guidelines for diagnosis and management of childhood diarrhea; (iv) Heart Attack – Guidelines for diagnosis and management of myocardial infarctions issued by the American College of Cardiology and the American Heart Association; (v) Asthma – Guide for asthma management and prevention issued by the Global Initiative for Asthma (GINA).

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 6.1.1: Correct diagnoses of common conditions

Condition	Providers who diagnosed correctly (%)
Tuberculosis	40
Pre-eclampsia	53.64
Diarrhea	71.82
Heart Attack	67.27
Asthma	55.45

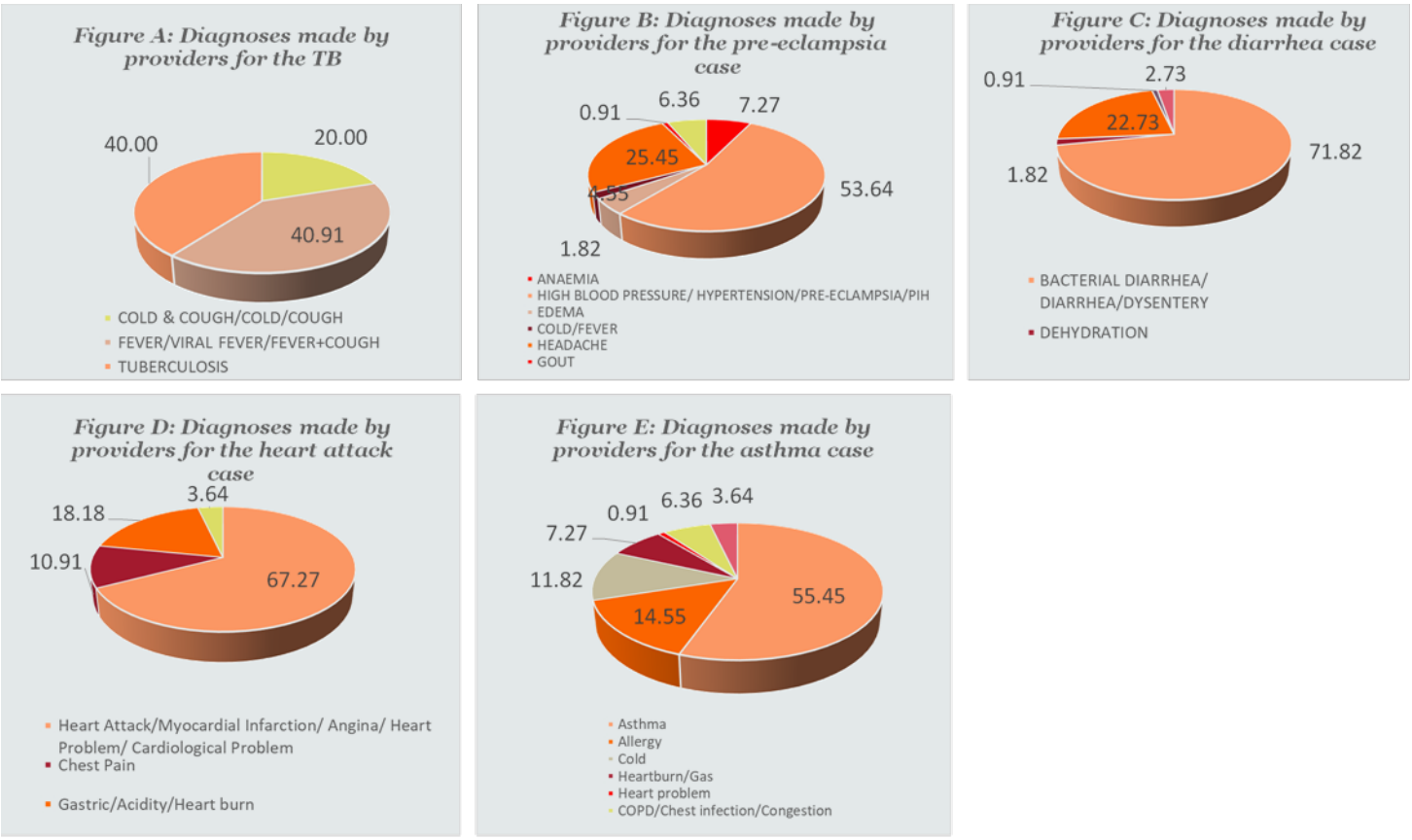
On an average, our findings show better competence of providers to make correct diagnoses (57.63 percent) compared to 23 percent found by the MAQARI study in Odisha [31]. However poorer competence of providers than clinical effectiveness studies, which find between 51 percent and 64.9 percent providers to be able to diagnose TB correctly [23, 32]; and better competence than for childhood diarrhea and pre-eclampsia where correct diagnoses rates were as low as 16 percent and 12 percent. Although not measured with clinical vignettes, but with standardized patients, correct diagnosis rates for asthma and angina were found to range between 12 percent and 23 percent [13, 15, 32, 34, 35].

The poor competence for correct diagnosis raises concerns about wrong or delayed diagnosis, and consequently, delayed treatment. This is especially important for the five vignette conditions we selected since the wrong diagnosis could have serious implications such as worsening of the condition, an infection spread to others (in case of TB), and death (in case of pre-eclampsia, heart attack, and childhood diarrhea).

Most providers misdiagnosed the cases as less serious conditions. For all five conditions, the providers who made an incorrect diagnosis identified it as a less serious condition (than the actual vignette condition), such as cold and cough instead of TB, headache instead of pre-eclampsia, acidity or heartburn instead of heart attack. The common diagnoses for the different conditions are presented in Figure 6.1.2 (A to E).

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 6.1.2: Diagnoses made by providers for common conditions



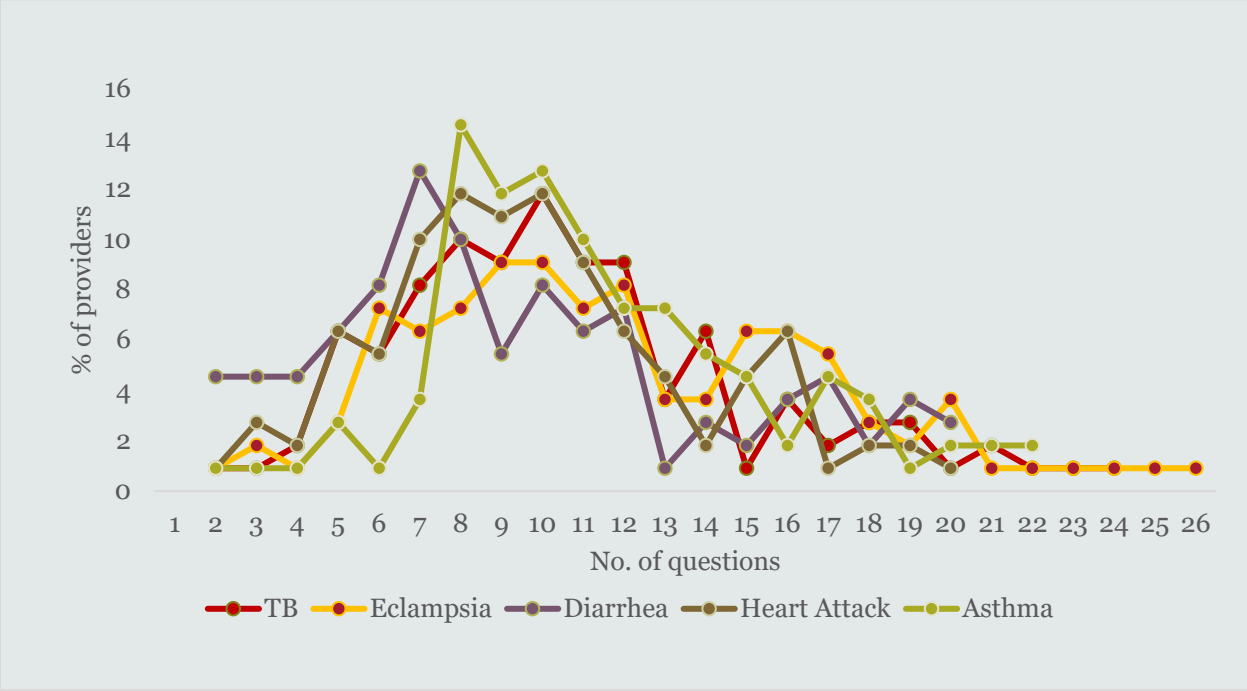
6.1.5.2 Competence to seek information relevant to arrive at a diagnosis or knowledge of the diagnostic process

In addition to making a correct diagnosis, our clinical vignettes measured whether providers have the knowledge to seek the relevant information to make a differential diagnosis. Knowledge of the diagnostic process and competence to follow it includes assessing whether the providers are asking key questions that help identify the condition, such as whether there was blood or mucous in the sputum for the TB case, whether the patient has edema (swelling) in the feet in the pre-eclampsia case. Seeking the right information also includes asking for laboratory test results (which are provided to support the diagnosis in case of clinical vignettes), for example, asking for sputum test for TB, ECG or angiogram for heart attack, urinalysis to check for proteinuria for pre-eclampsia.

Our analysis shows that most providers asked less than half of the total number of questions for diagnosis that were included in the vignettes. The mean number of questions asked by providers was 10.5. This included all types of questions – demographic information, case history, key symptoms, as well as questions about diagnostic tests and physical exams.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

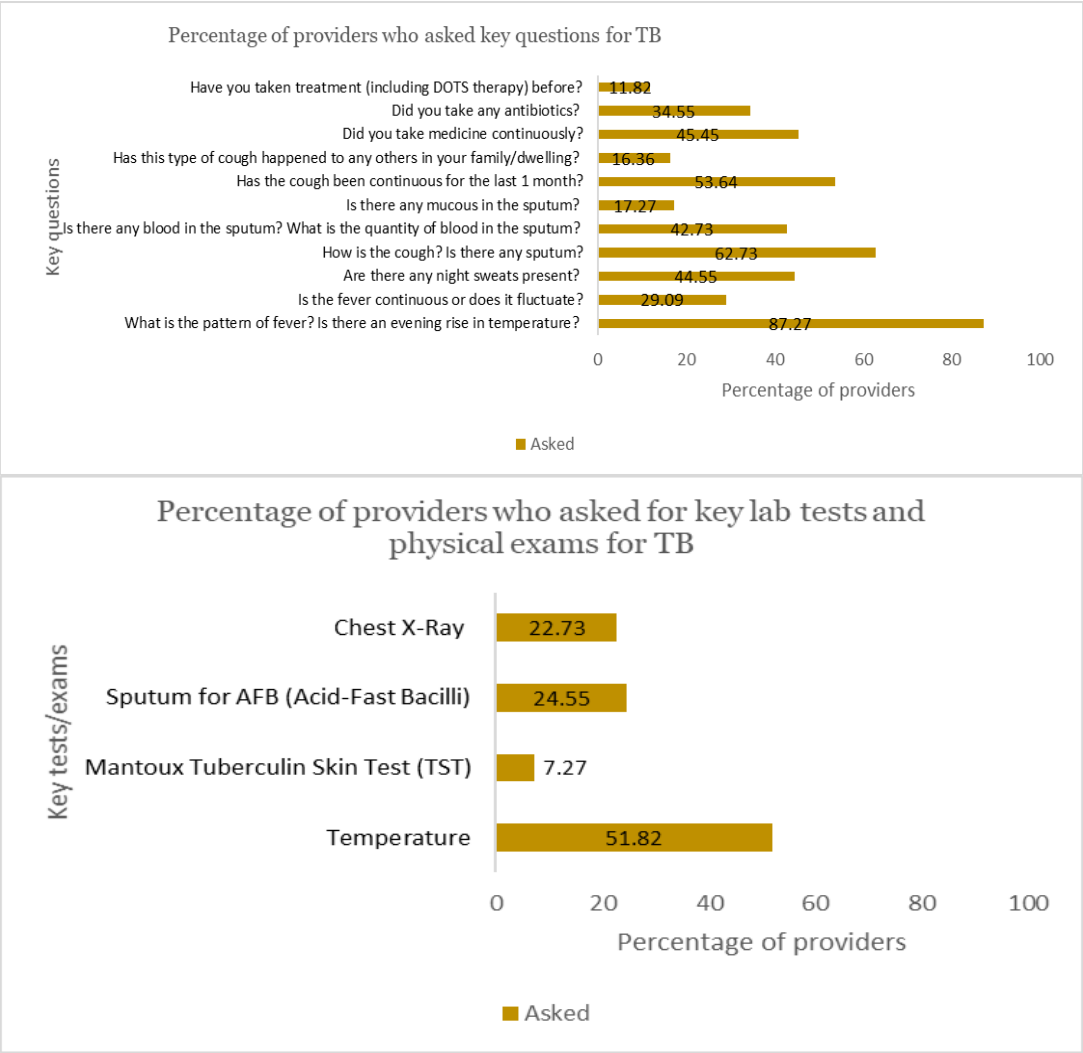
Figure 6.1.3: Number of questions asked by providers for each condition



Besides asking fewer questions than considered necessary for making a correct diagnoses, our analysis shows that the overall competence of providers across all five vignettes to follow the diagnostic process and seek key information to help make a correct diagnosis is quite poor. Most providers do not ask important questions, and even fewer providers ask to see laboratory test results. Figures 6.1.4 (A to E) present the results across the five vignettes for all providers.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 6.1.4A: Percentage of providers who sought the right information to diagnose TB

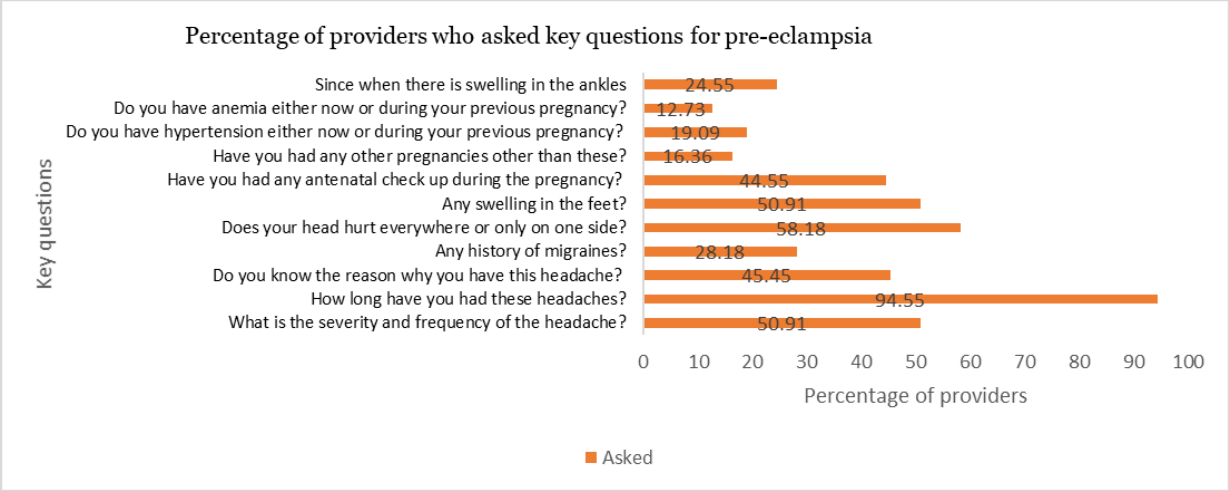


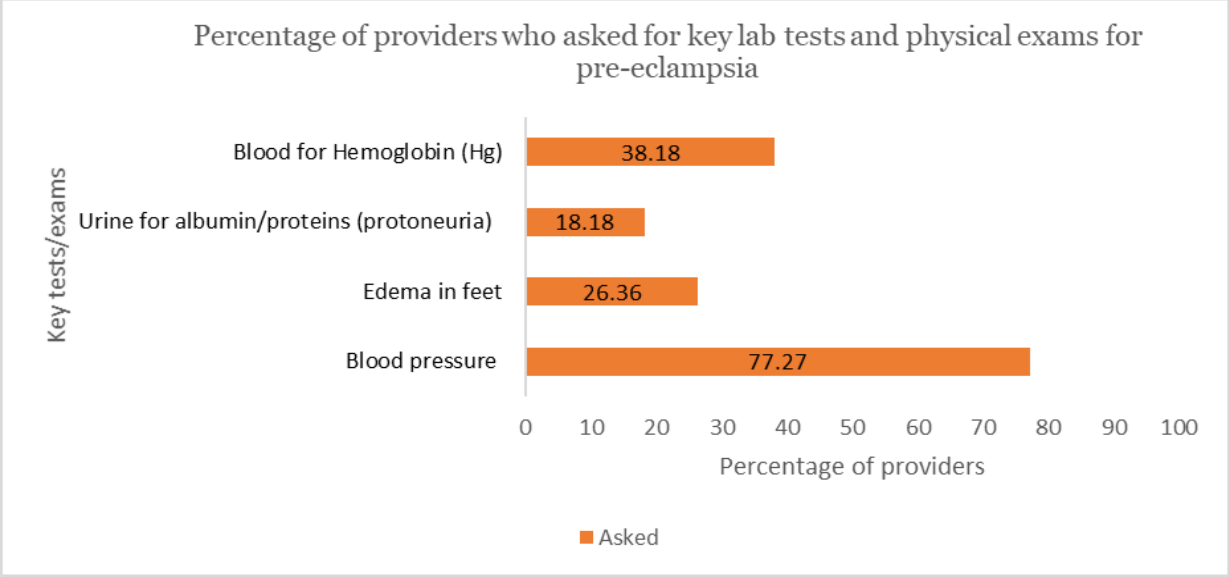
It is noteworthy that only around half the providers asked about the duration of the cough or blood in the sputum, and more than 80 percent did not ask about mucous in the sputum nor if others in the patients' household had similar symptoms, which are all key points of information to identify a TB case. It is also concerning that 88.18 percent providers did not ask about previous DOTS treatment, information that is essential to reach a TB diagnosis and prescribing treatment. A third of the providers did not ask for sputum tests or chest X-rays, again, key points of information to arrive at a correct diagnosis for TB.

Our findings are show better knowledge among providers about the diagnostic process compared to existing evidence from India, where only 31.4 percent providers asked diagnostic questions such as and 11.1 percent asked about bloody sputum [32].

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 6.1.4B: Percentage of providers who sought the right information to diagnose pre-eclampsia

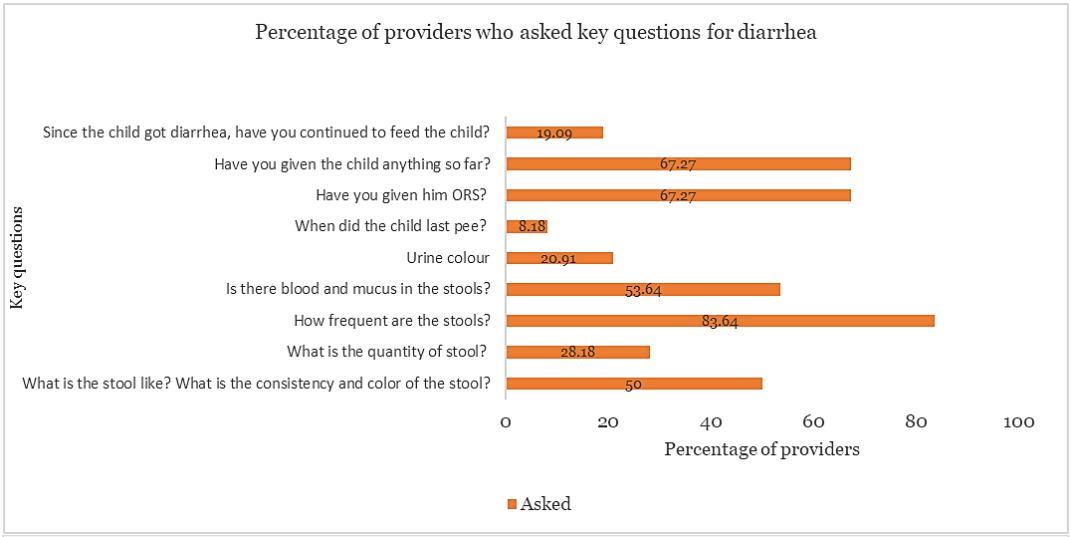


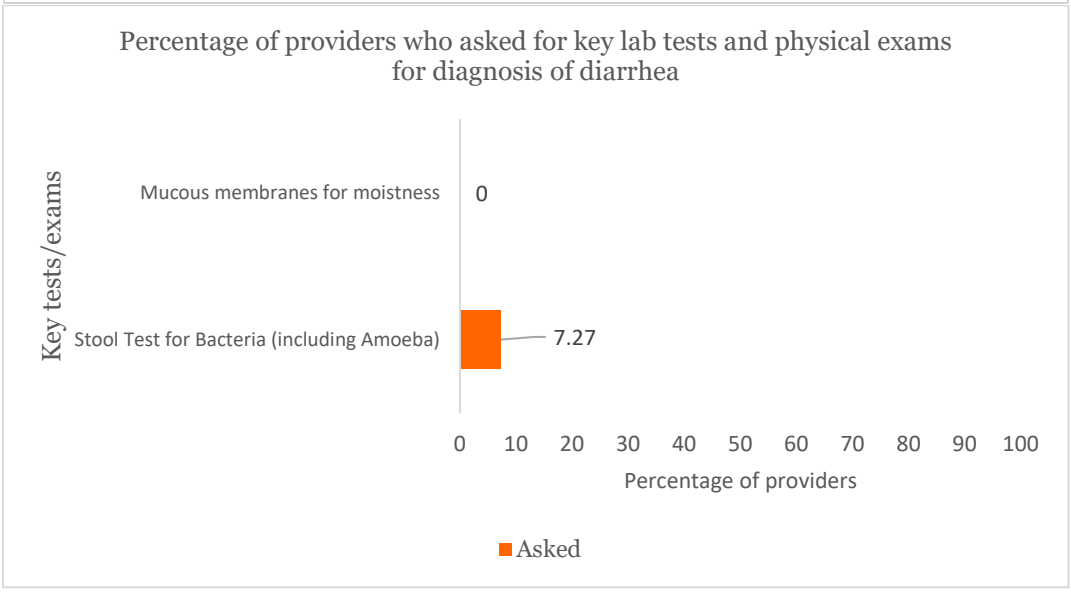


Most providers did not ask key questions linked to the diagnosis of pre-eclampsia, nor about the history of previous pregnancies. This links to the findings in Figure 6.1.1, where 25.45 percent of providers misdiagnosed the pre-eclampsia case as headaches. It is also noteworthy that most providers did not ask about edema and proteinuria, two of the most important markers for pre-eclampsia.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 6.1.4C: Percentage of providers who sought the right information to diagnose childhood diarrhea

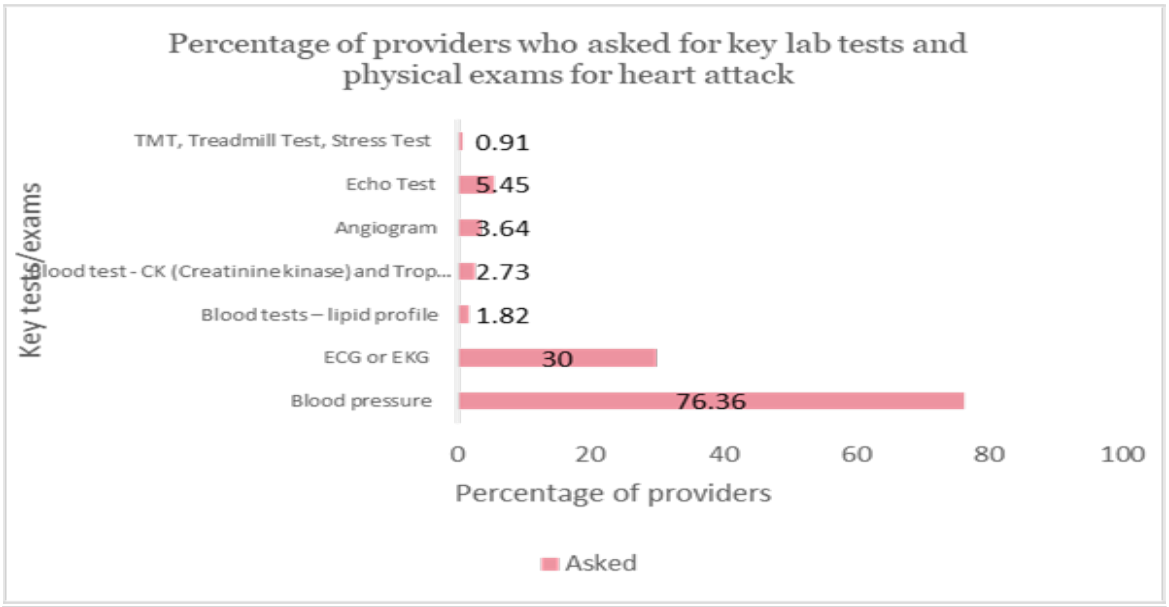


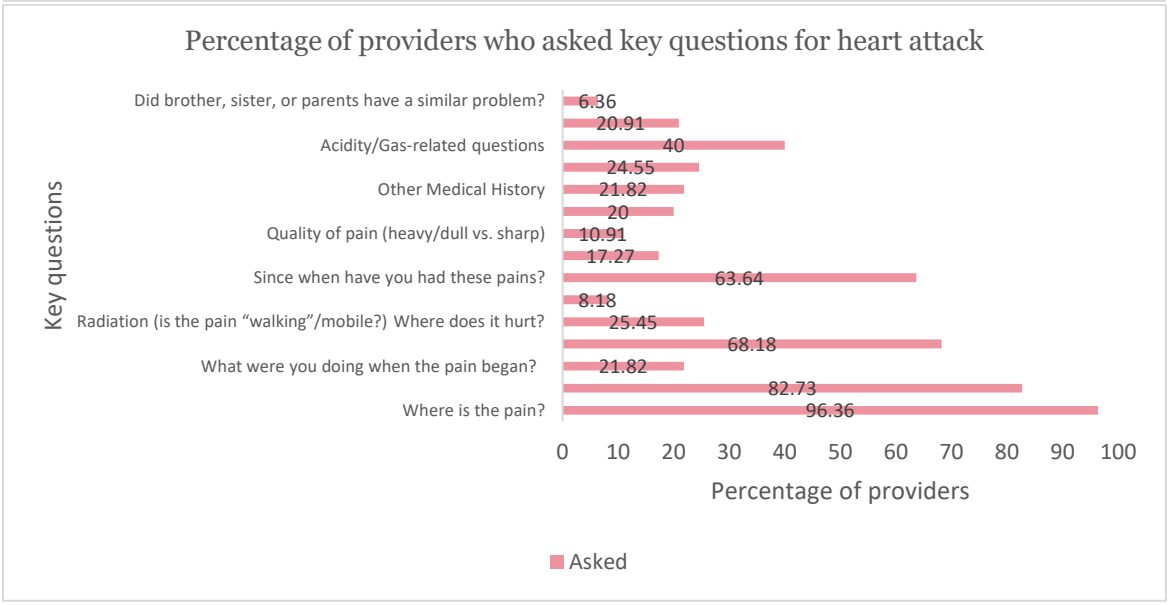


Similar to the other vignettes, we see that a majority of providers did not ask questions to determine if the child was dehydrated – an important consideration for treatment advice.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 6.1.4D: Percentage of providers who sought the right information to diagnose heart attack

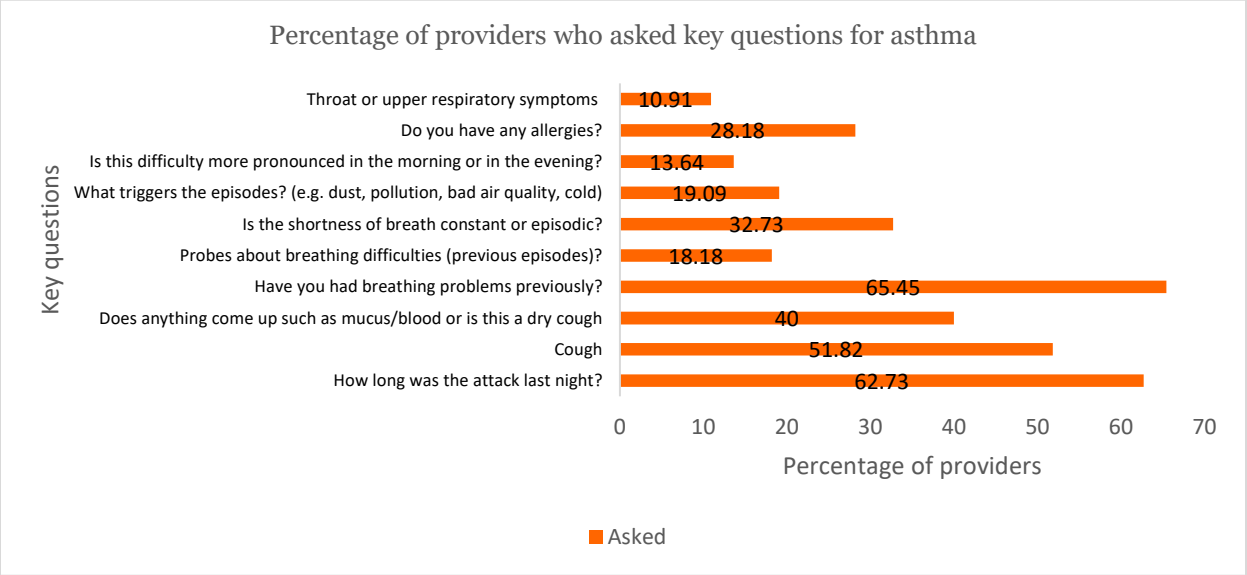




We see that most providers did not ask important questions about family history and co-existing conditions (co-morbidities), which are critical risk factors for heart disease. Questions about key diagnostic tests such as ECG/EKG, angiograms, or ECHO were very rarely asked.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 6.1.4E: Percentage of providers who sought the right information to diagnose asthma



Similar to the other vignettes, most providers did not ask key diagnostic questions about allergies, the nature of the cough, or other respiratory symptoms to diagnose asthma.

6.1.5.3 Competence of providers to correctly treat common conditions

The competence to prescribe correct drugs and treatment advice (such as referral) was assessed for the providers against standard treatment guidelines (STGs) for each of the five vignette conditions.

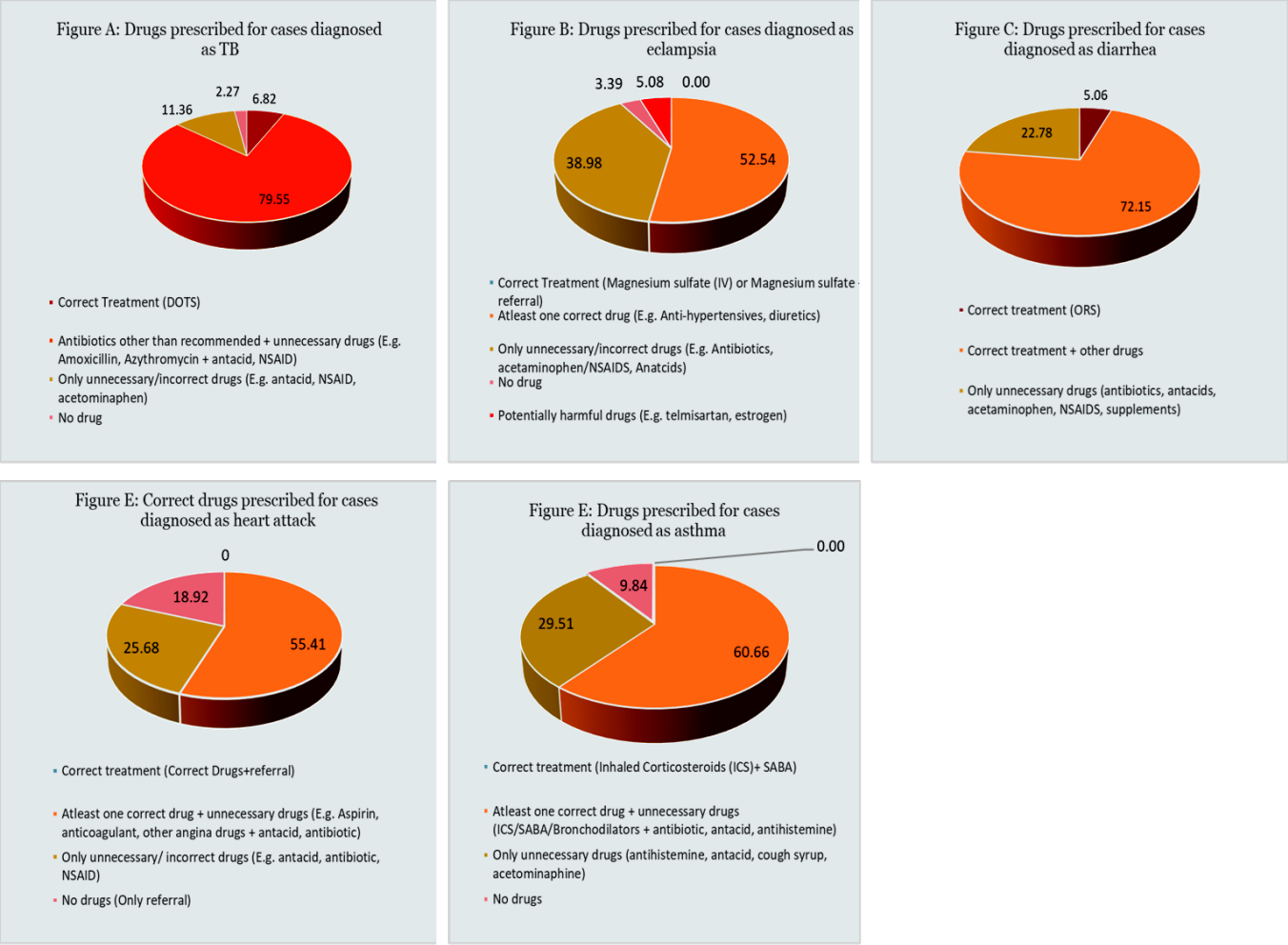
Our analysis shows that providers had extremely poor competence to provide the correct treatment. In most cases, providers could not prescribe the right treatment recommended by standard treatment guidelines: only 7 percent prescribed the right drugs for TB, and no provider prescribed them for the right duration, which is critical for treating TB and preventing potential drug-resistance. Similarly, only 5 percent of providers prescribed the right treatment of oral rehydration salts (ORS) for childhood diarrhea. Although more than 50 percent of providers prescribed at least one correct drug for pre-eclampsia, heart attack, and asthma, not a single provider in our study prescribed the recommended treatment for any of these three conditions[10] (Figures 6.1.5

[10] Depending on the condition, the recommended treatments include drugs, follow-up diagnostic tests, and referrals to higher-level facilities. For example, according to the standard treatment guidelines for pre-eclampsia, the recommended treatment at the primary care level is a full intravenous or intramuscular dose of magnesium sulfate (instead of other anticonvulsants). In settings where it is not possible to administer the full magnesium sulfate regimen, the use of magnesium sulfate loading dose followed by immediate transfer to a higher level healthcare facility is recommended for women. For heart attack, the guideline recommends administration of 162 to 325 mg of non-enteric coated aspirin (chewed) unless contraindicated or already taken by patient, perform/evaluate 12-lead electrocardiograms (ECGs), and review a reperfusion "checklist" and immediately refer the patient to a hospital. For asthma, the recommended treatment is inhaled corticosteroid (ICS) containing controller treatment, with a combination of ICS and short-acting beta$_2$-agonists (SABA), and ICS-formoterol as needed.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

(A to E) show the prescribed drugs for each vignette. It is noteworthy that not only was the percentage of providers prescribing correct drugs very low, or none (as in the case of pre-eclampsia), but the drugs that were prescribed were often unnecessary or even potentially harmful in some cases. The other finding of note is the rampant prescription of antibiotics across all conditions, including conditions like pre-eclampsia and heart attack.

Figure 6.1.5: Drugs prescribed to treat the five conditions



Some of the findings of note are that only 6.82 percent of correctly diagnosed cases had correct prescription of recommended TB drugs, and only one case had correct duration and combination, DOTS for at least six months.

For the treatment of pre-eclampsia, not a single case was prescribed the recommended treatment (Magnesium sulfate IV). Only 50.85 percent cases were prescribed an anti-hypertensive, and almost 39 percent cases were given combinations of antibiotics, antacids, acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs) and other unrelated/unnecessary drugs.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

A total of 64.56 percent cases diagnosed with diarrhea were prescribed ORS (with or without other drugs), although only 5.08 percent prescribed the correct recommended treatment of only ORS. 89.87 percent cases diagnosed with diarrhea were prescribed antibiotics. Out of these, 40.85 percent cases were prescribed two antibiotics, and 4.23 percent cases were prescribed three different antibiotics. Our results are comparable to those from other studies in India, where 3.50 percent of the providers prescribed the correct recommended treatment of ORS [13].

In case of heart attack, 25.68 percent providers prescribed drugs that are unlikely to help the patient in any way, including drugs like antacids, antibiotics and acetaminophen. While a total of 55.4 percent providers prescribed at least one drug that is recommended for angina, 43.24 percent prescribed these in combination with unnecessary drugs like antacids and acetaminophen.

It is noteworthy that not a single correctly diagnosed asthma case was prescribed the first level treatment recommended by global standard treatment guidelines (Global Initiative for Asthma, 2019) – which is inhaled corticosteroids (ICS) with Short Acting Beta Agonists (SABA). However, since the guidelines were only revised in 2019, we have also looked at the number of cases which prescribed only SABA – which was the globally recommended treatment until the revision in 2019. Unfortunately, this number was quite low at 1.64 percent. 62.29 percent cases prescribed some type of asthma drug – bronchodilators (Xanthine) was the most common drug class; glucocorticoids (dexamethasone), SABA and ICS were other drugs. 26.23 percent cases were not prescribed any asthma drug, and were instead given different combinations of antibiotics, antihistamines, antacids or acetaminophen (paracetamol). 50.81 percent cases were prescribed antibiotics, usually in combination with other drugs.

For most of the vignettes, a part of the correct treatment was to refer the patient to a higher-level facility. This is recommended especially for pre-eclampsia and heart attack. For TB, the protocol is for the provider to prescribe a combination of recommended drugs or DOTS therapy for the patient. Our analysis shows that providers did not refer patients even for conditions that mandatorily require referrals. It is concerning to see from Table 6.1.2 that even when providers diagnose the cases correctly, they do not always refer them to a higher level facility, especially for pre-eclampsia and heart attack.

Table 6.1.2: Percentage of correctly diagnosed cases that were referred

Condition	Total referrals for correctly diagnosed cases (%)
TB	70.45
Pre-Eclampsia	79.66
Diarrhea	26.58
Heart Attack	82.43
Asthma	37.70

Existing evidence from other studies is comparable to our results. The MAQARI study found that at least 50 percent of providers across different Indian states were likely to harm patients either with delayed referrals or wrong treatments. More specifically,

providers' likelihood of harming patients due to poor competence to treat illnesses was more than 50 percent for childhood diarrhea, 25 percent for pre-eclampsia, and 7 percent for tuberculosis.

6.1.6 Differences in Competence between Public and Private Sector Providers

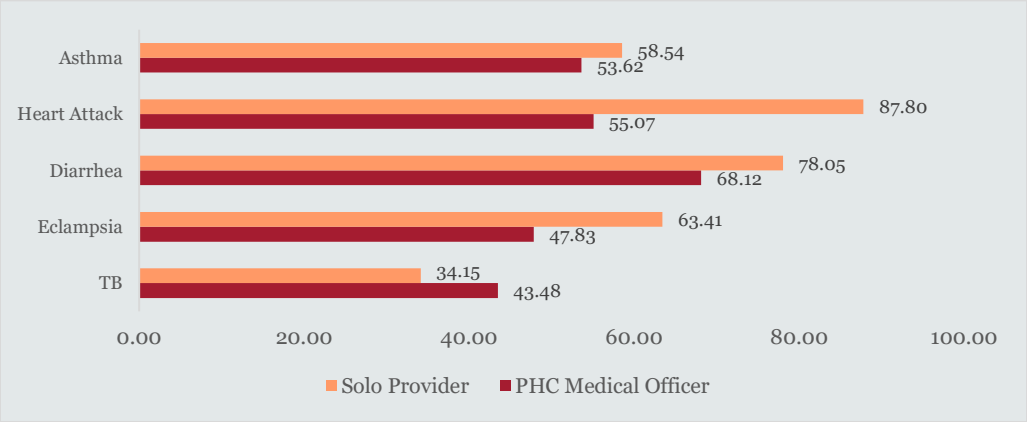
One of the questions we sought to answer through our analysis of the clinical vignettes data was – are there differences in competence between public and private sector providers? To answer this question, we conducted disaggregated analyses for the two types of providers in our sample (solo providers which are private sector providers, and medical officers at PHC's which are public sector providers). We compared the two types of providers on each of the three aspects of competence - competence to make correct diagnosis, knowledge of the diagnostic process, and competence to provide correct treatment advice.

The following sections present our findings from this analysis.

6.1.6.1 Difference in competence between public and private providers to make correct diagnoses

Private providers showed higher competence than public providers to make correct diagnoses. Disaggregating by public and private sector providers, the results show that except for the case of TB, the private sector solo providers showed higher competence to make correct diagnoses for all the other four conditions, compared to public sector doctors in PHCs.

Figure 6.1.6: Public v/s private provider competence for correct diagnoses

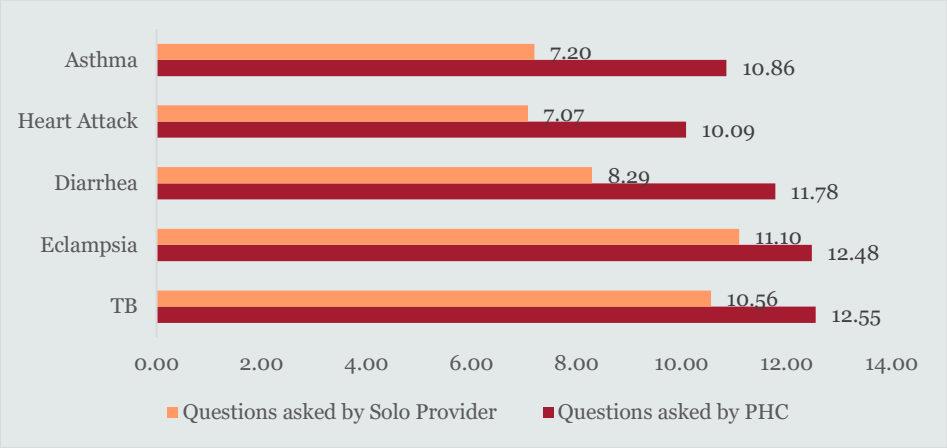


Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

6.1.6.2 Difference in knowledge of the diagnostic process between public and private providers

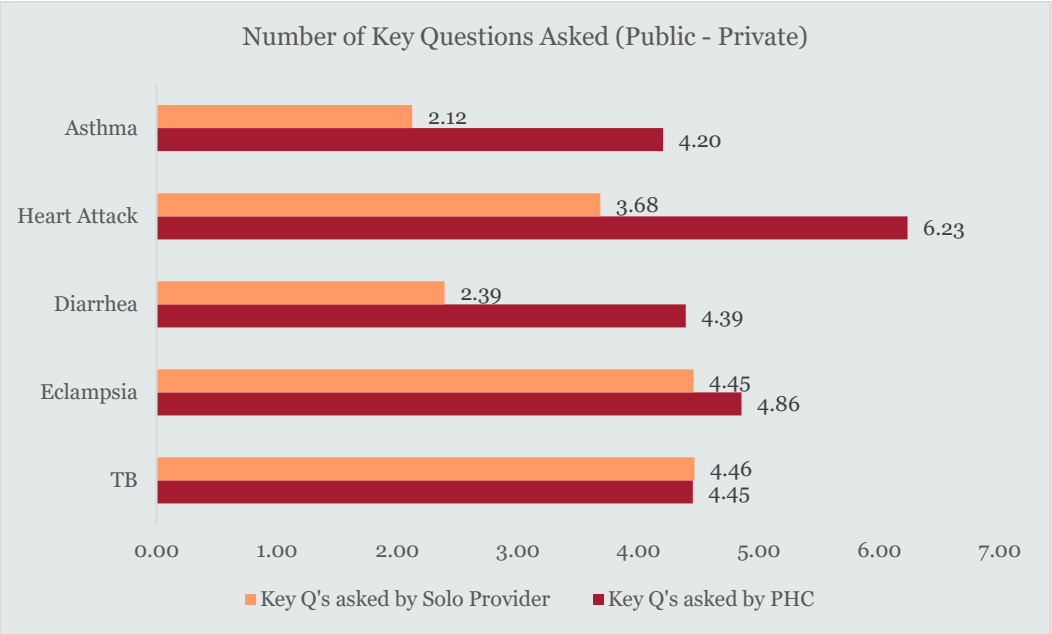
Disaggregating our data by public and private providers, we find that, on average, public providers asked more questions to our patient-interviewers than private providers. Since we used the method of clinical vignettes, this is not an indication of the providers' actual behavior with their "real" patients. Further, our analysis shows that public providers asked more key questions for all conditions, except TB. Interestingly, TB was the only condition where public providers had a higher rate of correct diagnosis. However, given that public sector providers were asking more number of key diagnostic questions, it is interesting that they were still making more incorrect diagnoses than solo providers (see Figure 6.1.6).

Figure 6.1.7: Number of questions asked by public v/s private providers during the diagnostic process



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 6.1.8: Number of key questions asked by public v/s private providers during the diagnostic process

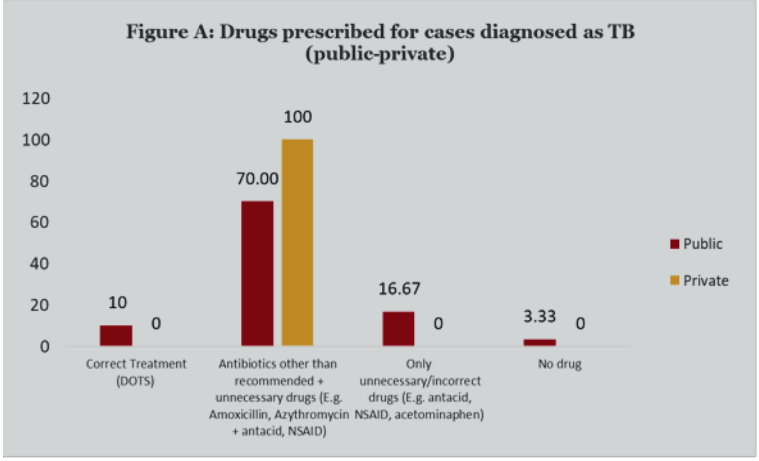


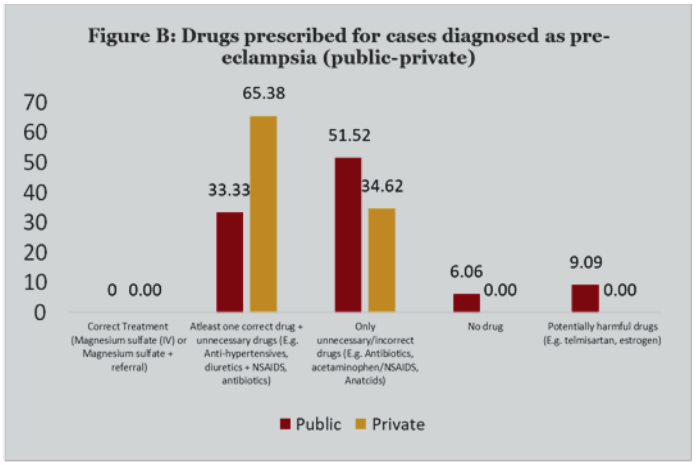
6.1.6.3 Difference in competence between public and private providers to provide correct treatment advice

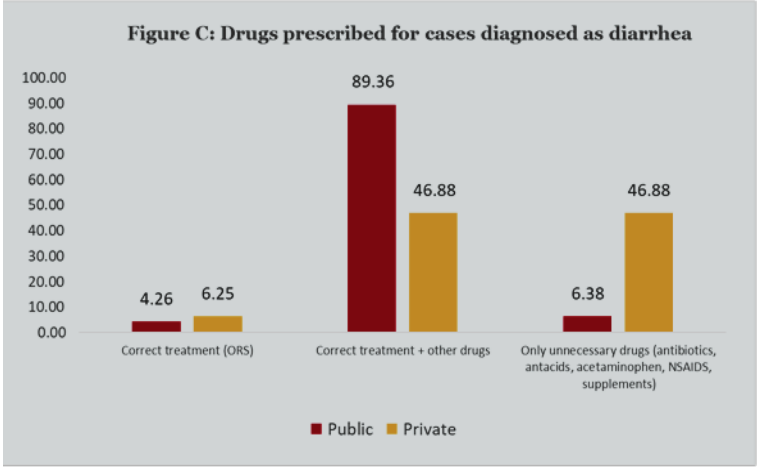
To assess providers' competence to correctly treat the vignette conditions, we analyzed the prescribed drugs for each correctly diagnosed case and referrals for each of the cases. Figure 6.1.9 (A to E) shows the difference in drug prescriptions between public and private providers.

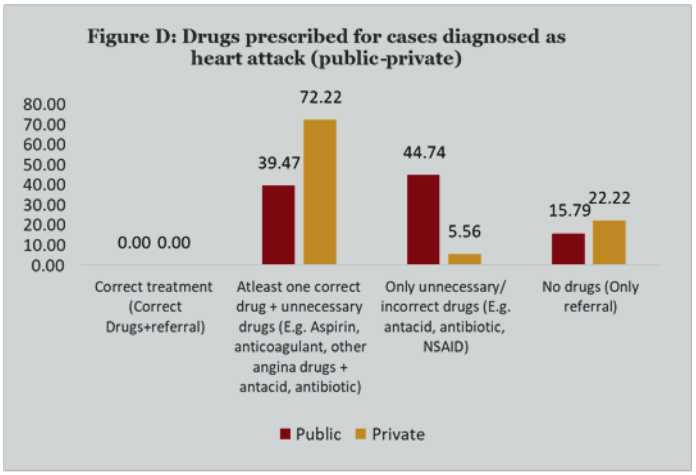
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

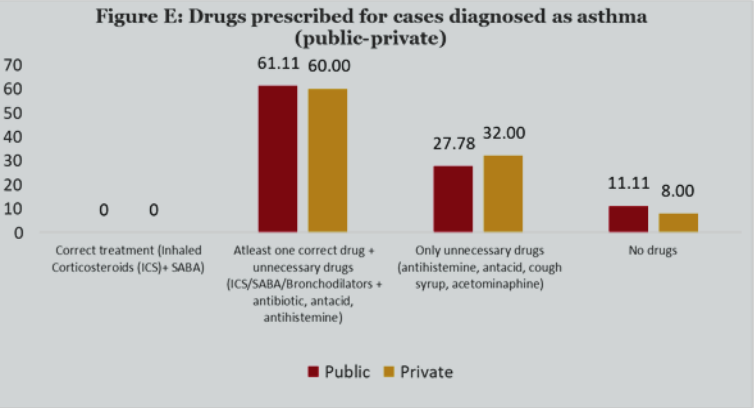
Figure 6.1.9: Public v/s private provider competence to prescribe correct drugs











As seen from Figure 6.1.5, the competence among all providers to prescribe correct drugs for treating the vignette conditions was quite poor. Disaggregating these findings by type of provider, we find that except in the case of TB, private providers prescribed more correct drugs than public sector providers.

For TB, the only cases that were prescribed correct drugs were by public providers. However, while all private providers prescribed antibiotics for their correctly diagnosed

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

TB cases, not all public providers did that, instead of prescribing unnecessary drugs like acetaminophen, antihistamines, NSAIDs, or antacids.

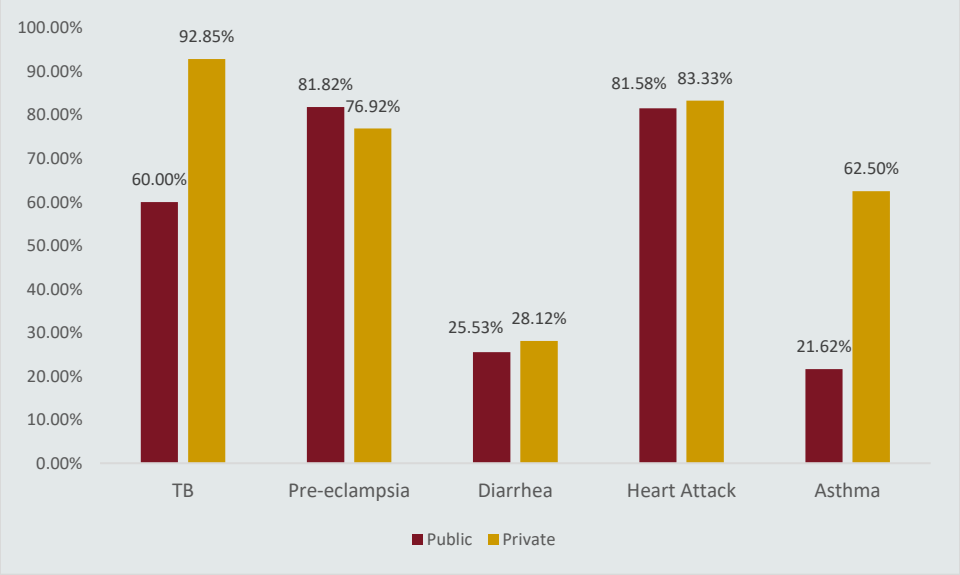
For pre-eclampsia, our analysis shows that more private providers prescribed at least one correct drug than public providers, while more public sector providers prescribed unnecessary drugs like antibiotics and antacids. It is also disconcerting to note that 6.06 percent of the public providers from our sample prescribed medicines that are indicated to have teratogenic effects for pregnant women and are potentially harmful to the fetus.

For childhood diarrhea, more private providers prescribed correct recommended treatment (oral rehydration solutions, ORS) than public sector providers. Although, more public sector providers prescribed at least one correct drug, but in combination with antibiotics and other unnecessary drugs. Our analysis shows that far more number of private providers prescribed only unnecessary drugs for childhood diarrhea; most of these were antibiotics.

In case of heart attack, more private providers prescribed at least one correct drug compared to public sector providers, while more public than private providers prescribed only unnecessary drugs, without even a single medicine recommended for angina. Most of these unnecessary drugs included antibiotics, antacids, and NSAIDs or pain-killers.

For asthma, almost an equal percentage of public and private providers prescribed at least one correct drug. The prescription patterns between the provider types were also very similar for the prescription of unnecessary drugs.

Figure 6.1.10: Public v/s private provider competence to advise referrals



As mentioned above, referrals from the primary care level to a higher level of care is an important part of treatment advice. Referrals may be made by primary care providers (the respondents for our clinical vignette study) either for advanced care or for diagnosis

of the case, especially in instances where the primary care provider was unable to make a diagnosis. Our analysis shows that the number of referrals for each condition (irrespective of correct diagnoses) differed between public and private providers. For all four conditions (except pre-eclampsia), a higher number of private than public providers referred their cases to a hospital or a specialist (Figure 6.1.10).

6.1.7 Prescription Patterns among Providers

In addition to provider knowledge and competence, clinical effectiveness also comprises of prescription patterns. This goes beyond the prescription of correct drugs and includes issues of unnecessary or over-prescription, especially of drugs like antibiotics that have population-level adverse effects such as drug resistance. This is salient for Odisha, where a third of all out-of-pocket expenses go into purchasing drugs [36, 37]. Our findings from the household survey also corroborate these high out-of-pocket expenses on medicines. (See Chapter 3 for more details on financial risk protection.) Another important trend to analyze is the prescription of antibiotics by providers, which is salient in the Indian context with increasing antibiotic resistance in the population [38-42].

In this context, we analyzed the data from our clinical vignette survey to examine providers' prescription behaviors. We present these findings in the following sections. The results from our survey show that, on an average, providers prescribe 2.29 drugs per case and that there is a rampant prescription of antibiotics, even for conditions that do not, in any way, require their use, such as heart attack and pre-eclampsia. Almost all childhood diarrhea cases were prescribed antibiotics, in some cases, even a combination of 2 to 3 antibiotics. On the other hand, for TB, although almost all cases were prescribed antibiotics, only a small percentage were given the correct ones. This raises serious concerns about developing antibiotic resistance, which is a rising public health concern.

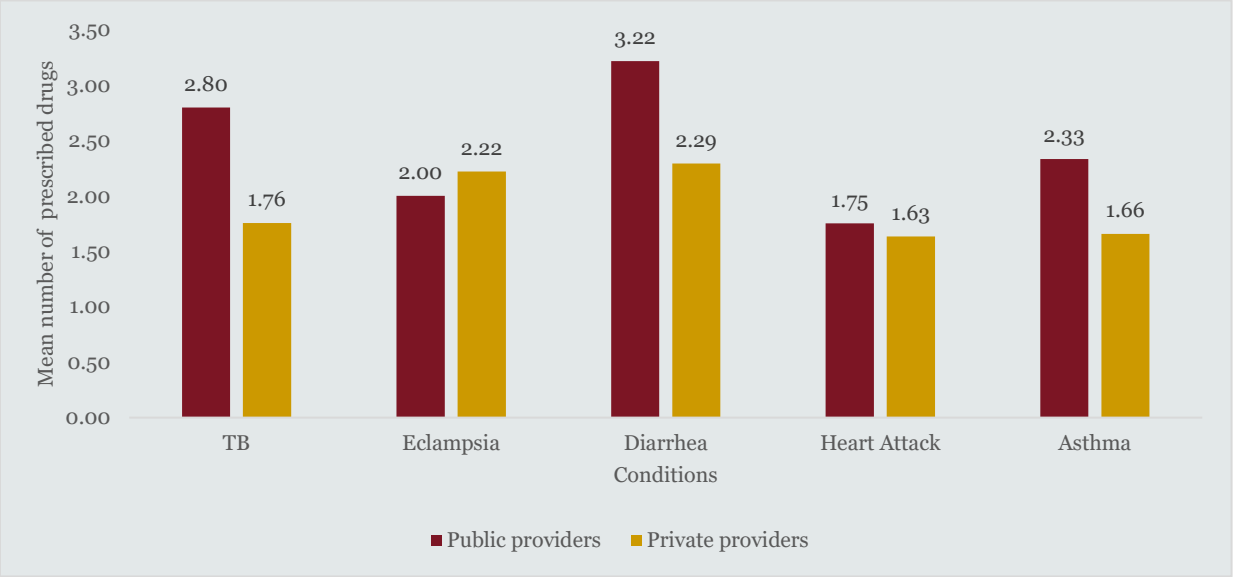
Table 6.1.3: Average number of drugs prescribed for the different conditions (irrespective of correct diagnoses)

Condition	Average number of drugs prescribed
TB	2.36
Pre-eclampsia	2.00
Diarrhea	3.01
Heart attack	2.00
Asthma	2.08
Overall average	**2.29**

Disaggregating by public and private sector providers, we find that public providers prescribe more drugs than private providers in all cases (except pre-eclampsia). Given that most households in Odisha access to care from public providers, the higher number (quantity) of drugs may lead to the higher out-of-pocket expenses on drugs that we see

from the existing literature as well as results from the household survey in this study. This hypothesis could be tested through further analysis of our datasets.

Figure 6.1.11: Mean number of drugs prescribed by public v/s private providers for different conditions



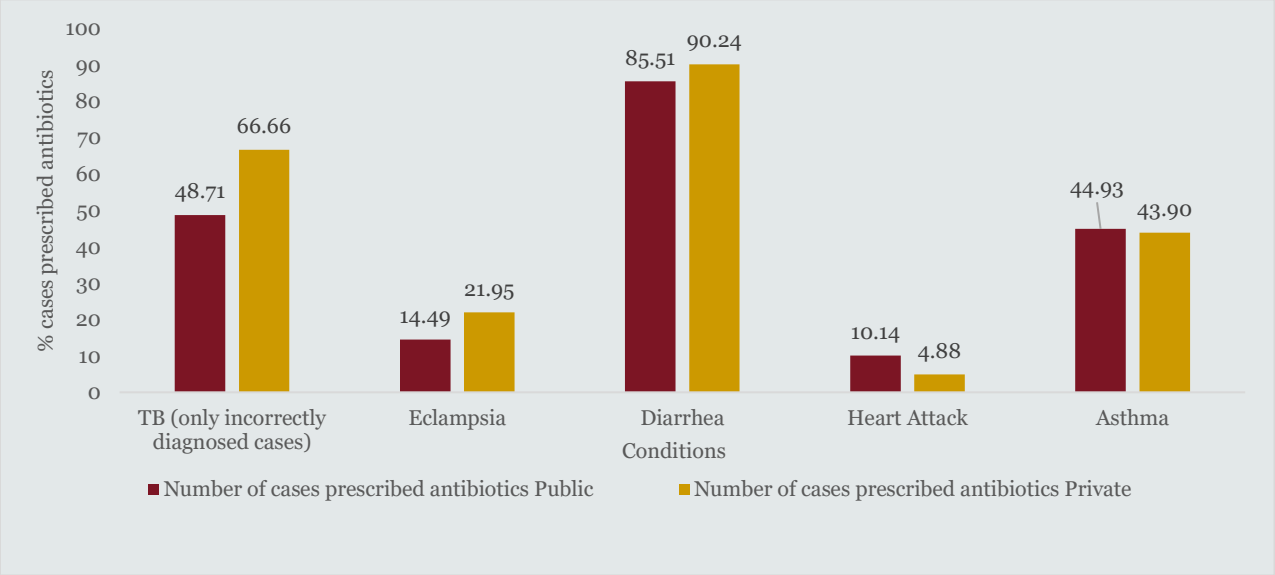
Our findings show that there is a widespread prescription of antibiotics across conditions.

As we also see from section 6.1.3, antibiotics are commonly prescribed across all conditions, even for cases that were correctly diagnosed as pre-eclampsia, heart attack, and asthma that do not, in any way require antibiotics for their treatment. In the case of TB, pre-eclampsia and diarrhea, we see that private providers tend to prescribe antibiotics slightly more often than public providers. This trend is reversed in the case of heart attack, and in the case of asthma, the difference seems very small.

Since antibiotics (under DOTS) are the recommended standard for treating TB, any other antibiotic prescribed for the TB cases are not considered correct. For all other conditions, we have analyzed the antibiotic prescription irrespective of diagnosis, since both the correct and the most common incorrect diagnoses do not require the use of antibiotics for their treatment (such as headache for pre-eclampsia, loose motions for diarrhea, acidity/gas for heart attack or asthma/allergies and breathing difficulties).

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 6.1.12: Percentage of cases that were prescribed unnecessary antibiotics



Our findings also show that there is the prescription of unnecessary drugs in all cases, irrespective of correct or incorrect diagnosis. Besides antibiotics, antacids and pain medications are the most commonly prescribed drugs (see Figures 6.1.5 and 6.1.9).

6.1.8 Conclusion

This section has discussed clinical effectiveness as an aspect of quality of care in Odisha's health system. We have used clinical vignettes on five common conditions (TB, pre-eclampsia, childhood diarrhea, heart attack, and asthma) to assess the competence of public and private sector providers at the primary care level across the six sampled districts in Odisha.

From our analysis of the data from the clinical vignettes, we find that providers' competence on three parameters of clinical effectiveness: to correctly diagnose, seek relevant information for diagnosis, and correctly treat the five common conditions is quite poor. The low competence of providers and the extent of incorrect and unnecessary prescriptions are a concern, especially since vignettes only measure the provider's knowledge and are an upper bound on the quality of care of which the provider is capable. Other methods of assessing competence, such as standardized patients, might show even higher levels of misdiagnosis and incorrect treatment.

Our study also finds differences in the competence between public and private sector providers. In most cases, we find that private sector providers show higher competence to correctly diagnose and treat the five conditions (except in the case of TB). The knowledge of both types of providers to prescribe correct drugs was very poor, with no provider in either sector able to prescribe the recommended treatment for pre-eclampsia, heart attack, and asthma. Despite public sector providers showing lower competence for correct diagnosis, we find that they ask more number of key questions relevant for making a differential diagnosis. Our study also finds that prescription of

unnecessary drugs, especially antibiotics, are very widespread across both public and private sectors.

Our analysis of clinical effectiveness is a step towards highlighting that quality of care and provider competence need to be prioritized in Odisha's health system. While the government's efforts over the past few years on increasing access to care for the people of Odisha have been beneficial, it is time that the focus now is on improving the quality of care and the competence of providers. Given the abysmally low competence of primary care providers in general and public sector providers in particular, India's policy efforts towards improving access to primary care need to be re-examined. It is time that these programs go beyond access to include *access with quality*.

6.1.9 References

1. National Academy of Medicine, *Crossing the Global Quality Chasm: Improving Health Care Worldwide*. 2018: Washington (DC).
2. Kruk, M.E., et al., *High quality health systems in the Sustainable Development Goals era: time for a revolution*. Lancet Global Health, 2018. **6**(11): p. e1196-e252.
3. Vassar, M. and H. Matthew, *The retrospective chart review: important methodological considerations*. Journal of educational evaluation for health professions, 2013. **10**: p. 12-12.
4. vonKoss Krowchuk, H., M.L. Moore, and L. Richardson, *Using Health Care Records as Sources of Data for Research*. Journal of nursing measurement, 1995. **3**(1): p. 3-12.
5. King, J.J.C., et al., *How to do (or not to do) … using the standardized patient method to measure clinical quality of care in LMIC health facilities*. Health policy and planning, 2019. **34**(8): p. 625-634.
6. Kwan, A., et al., *Use of standardised patients for healthcare quality research in low- and middle-income countries*. BMJ global health, 2019. **4**(5): p. e001669-e001669.
7. Wiseman, V., et al., *Using unannounced standardised patients to obtain data on quality of care in low-income and middle-income countries: key challenges and opportunities*. BMJ global health, 2019. **4**(5): p. e001908-e001908.
8. Das, J. and P.J. Gertler, *Variations in practice quality in five low-income countries: a conceptual overview*. Health Aff (Millwood), 2007. **26**(3): p. w296-309.
9. Das, J. and J. Hammer, *Location, location, location: residence, wealth, and the quality of medical care in Delhi, India*. Health Aff (Millwood), 2007. **26**(3): p. w338-51.
10. Das, A. and T.S. Ravindran, *Factors affecting treatment-seeking for febrile illness in a malaria endemic block in Boudh district, Orissa, India: policy implications for malaria control*. Malar J, 2010. **9**: p. 377.
11. Das, J., et al., *In urban and rural India, a standardized patient study showed low levels of provider training and huge quality gaps*. Health Aff (Millwood), 2012. **31**(12): p. 2774-84.
12. Das, J., et al., *Use of standardised patients to assess quality of tuberculosis care: a pilot, cross-sectional study*. The Lancet Infectious Diseases, 2015. **15**(11): p. 1305-1313.
13. Mohanan, M., et al., *The know-do gap in quality of health care for childhood diarrhea and pneumonia in rural India*. JAMA Pediatr, 2015. **169**(4): p. 349-57.
14. Das, J. and A. Mohpal, *Socioeconomic Status And Quality Of Care In Rural India: New Evidence From Provider And Household Surveys*. Health Aff (Millwood), 2016. **35**(10): p. 1764-1773.
15. Das, J., et al., *Quality and Accountability in Health Care Delivery: Audit-Study Evidence from Primary Care in India*. Am Econ Rev, 2016. **106**(12): p. 3765-99.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

16. Das, J., et al., *Two Indias: The structure of primary health care markets in rural Indian villages with implications for policy*. Soc Sci Med, 2020: p. 112799.
17. Peabody, J.W., et al., *Comparison of Vignettes, Standardized Patients, and Chart Abstraction: A Prospective Validation Study of 3 Methods for Measuring Quality*. JAMA : the journal of the American Medical Association, 2000. **283**(13): p. 1715-1722.
18. Dresselhaus, T.R., et al., *Measuring compliance with preventive care guidelines: Standardized patients, clinical vignettes, and the medical record*. Journal of general internal medicine : JGIM, 2000. **15**(11): p. 782-788.
19. Peabody, J.W., et al., *Measuring the Quality of Physician Practice by Using Clinical Vignettes: A Prospective Validation Study*. Annals of internal medicine, 2004. **141**(10): p. 771-780.
20. Peabody, J.W., et al., *Using Vignettes to Compare the Quality of Clinical Care Variation in Economically Divergent Countries*. Health services research, 2004. **39**(6p2): p. 1951-1970.
21. Dresselhaus, T.R., et al., *An evaluation of vignettes for predicting variation in the quality of preventive care*. Journal of general internal medicine : JGIM, 2004. **19**(10): p. 1013-1018.
22. Peabody, J.W. and A. Liu, *A cross-national comparison of the quality of clinical care using vignettes*. Health policy and planning, 2007. **22**(5): p. 294-302.
23. Das, J. and J. Hammer, *Quality of Primary Care in Low-Income Countries: Facts and Economics*. Annual Review of Economics, 2014. **6**(1): p. 525-553.
24. Das, J. and J. Hammer, *Which doctor? Combining vignettes and item response to measure clinical competence*. Journal of Development Economics, 2005. **78**(2): p. 348-383.
25. Leonard, K.L. and M.C. Masatu, *The use of direct clinician observation and vignettes for health services quality evaluation in developing countries*. Soc Sci Med, 2005. **61**(9): p. 1944-51.
26. Converse, L., et al., *Methods of Observing Variations in Physicians' Decisions: The Opportunities of Clinical Vignettes*. Journal of general internal medicine : JGIM, 2015. **30**(S3): p. 586-594.
27. Shimkhada, R., et al., *Misdiagnosis of obstetrical cases and the clinical and cost consequences to patients: a cross-sectional study of urban providers in the Philippines*. Glob Health Action, 2016. **9**: p. 32672.
28. Fritsche, G. and J. Peabody, *Methods to improve quality performance at scale in lower- and middle-income countries*. J Glob Health, 2018. **8**(2): p. 021002.
29. Lohela, T.J., et al., *Competence of health workers in emergency obstetric care: an assessment using clinical vignettes in Brong Ahafo region, Ghana*. BMJ open, 2016. **6**(6): p. e010963-e010963.
30. *The Use of Clinical Vignettes To Measure the Quality of Health Care*. Annals of Internal Medicine, 2004. **141**(10): p. I-67.
31. The World Bank. *Medical Advice Quality and Availability in Rural India (MAQARI)*. 2003.
32. Mohanan, M., et al., *Providers' knowledge of diagnosis and treatment of tuberculosis using vignettes: evidence from rural Bihar, India*. BMJ Glob Health, 2016. **1**(4): p. e000155.
33. Mohanan, M., et al. , *Bihar Evaluation of Social Franchising and Telemedicine (BEST)*. 2011, US National Institutes of Health. Clinical Trials: Bihar, India.
34. Das, J., et al., *In Urban And Rural India, A Standardized Patient Study Showed Low Levels Of Provider Training And Huge Quality Gaps*. Health Affairs, 2012. **31**(12): p. 2774-2784.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

35. Das, J., et al., *Rethinking assumptions about delivery of healthcare: implications for universal health coverage*. BMJ, 2018. **361**: p. k1716.
36. National Sample Survey Office, *Key Indicators of Social Consumption in India: Health, (NSSO 71st Round)*, M. Ministry of Statistics and Programme Implementation, Editor. 2014, Government of India: Delhi.
37. Office, N.S.S., *Key Indicators of Household Consumption on Health in India. NSS 75th Round* G.o.I. Ministry of Statistics and Program Implementation (MoPSI), Editor. 2019, Government of India: New Delhi.
38. Nair, M., et al., *"Without antibiotics, I cannot treat": A qualitative study of antibiotic use in Paschim Bardhaman district of West Bengal, India*. PLoS One, 2019. **14**(6): p. e0219002.
39. Kumarasamy, K.K., et al., *Emergence of a new antibiotic resistance mechanism in India, Pakistan, and the UK: a molecular, biological, and epidemiological study*. The Lancet Infectious Diseases, 2010. **10**(9): p. 597-602.
40. Laxminarayan, R., et al., *Antibiotic resistance-the need for global solutions*. Lancet Infect Dis, 2013. **13**(12): p. 1057-98.
41. Ganguly, N.K., et al., *Rationalizing antibiotic use to limit antibiotic resistance in India*. Indian J Med Res, 2011. **134**(3): p. 281-94.
42. Datta, S., et al., *A ten year analysis of multi-drug resistant blood stream infections caused by Escherichia coli & Klebsiella pneumoniae in a tertiary care hospital*. Indian J Med Res, 2012. **135**(6): p. 907-12.

Chapter 6.2
Quality: Patient Safety[θ]

6.2.1 Summary

Safety is a fundamental domain of healthcare quality. Between 5.7 and 8.4 million deaths are caused by unsafe medical care in low-and-middle-income countries annually. However, we lack subnational estimates and actionable information on what drives high rates of medical errors within India. To assess patient safety culture, a driver of medical safety, we fielded the Hospital Survey on Patient Safety Culture (HSOPS) tool to over 2,500 health providers working in nine hospitals across Odisha, India. The tool includes ten domains assessing different aspects of safety culture as reported by healthcare workers. This represents the first known administration of the HSOPS tool in Odisha, India. The goal of fielding the tool was to identify areas of high and low safety culture in ways that can inform process improvement and, in turn, reduce the delivery of unsafe care.

There was minimal variation in responses between hospitals, with providers consistently responding positively or negatively to the same domains regardless of which hospital or hospital-type they were employed by. Across all hospital types, HSOPS domains with the lowest scores on average were reporting patient safety events (for instance, how frequently reported are mistakes that could harm a patient, but not?) and staffing and workplace (such as doctors working in crisis mode or trying to do too much too quickly). The domains with the most positive scores were teamwork (as in, staff treating each other with respect, or working together to finish a high volume of work), organizational learning (actively taking actions to improve patient safety, or evaluating the effectiveness of efforts to improve safety), and handoffs / information exchange (for example, important information is not lost during shift changes and all hospital units work well together). The only provider characteristic that was significantly associated with a higher HSOPS rating was an individual's tenure at their given hospital: individuals who had been at a hospital for longer were more likely to rate their department's approach to patient safety positively.

The number of event reports submitted by survey respondents was very low, with over 90 percent of respondents in some facilities reporting that they have never submitted an event report while working in their given facility. Staff working in surgery and pharmacy departments were significantly more likely to report errors. However, those working in general medicine or emergency medicine were significantly less likely to have reported an error. However, there seems to be a relatively strong culture of teamwork and organizational learning already in place, which is both unusual and positive. More active recognition of errors may allow hospitals to leverage their existing positive patient safety culture. However, the low volume of reported errors may contribute to hospitals' ability to address the issues that do arise. With an increased volume in reporting, staff ability to

[θ] This chapter was led by Liana Woskie, with participation from Deepika Dilip.

actively address errors may be hindered. A majority of staff across all hospitals reported that they regularly work in "crisis mode," with just under 50 percent of respondents disagreeing with the statement, "we have enough staff to handle the workload."

6.2.2 Introduction

Safety is a fundamental domain of healthcare quality. A number of studies from high income countries estimate that a large number of citizens are injured or killed due to adverse events, placing unsafe care within the top twenty causes of death globally [1–4]. As India works to expand health coverage, particularly improved access to hospital-based care and acute services, more people than ever before will come into contact with the Indian health system. This increase in utilization makes it imperative that policymakers more clearly quantify and prioritize the problem of unsafe medical care in Indian inpatient settings. Adverse events, or injuries that result from medical care, can include both errors (such as the administration of the wrong drug to the patient), as well as events that are not so easily preventable (for instance, an allergic reaction to a medicine that the patient hasn't taken before). These harmful events have direct financial costs and substantial opportunity costs for the health system in terms of time and resources spent treating the harm, as well as the loss in health to the individual, society, and nation [5], [6]. In addition, unsafe care can negatively impact the trust patients feel in the healthcare system and their willingness to access care [7], [8].

Despite the importance of assessing unsafe care, there has been a relative paucity of information about how often these types of events occur in India and their corresponding clinical burden. An obvious challenge to estimating the burden of unsafe care is the lack of existing or comparable data on adverse events. A corresponding and complimentary body of literature exists on patient safety culture, defined as "the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management" [9]. Facilities with a "strong" safety culture are therefore characterized by these attributes: communication founded on mutual trust, shared perception of safety's importance, and confidence in the efficacy of existing measures to prevent unsafe events [9], [10]. Strengthening a facility's patient safety culture is thought to eliminate preventable harm in health care organizations. Indeed, a systematic review by DiCuccio found that patient safety culture scores were associated with patient outcomes and decreased safety events at both the hospital and nursing facility levels [11]. However, the number of studies with statistically significant results remains limited. These relationships may be complicated by the inclusion of unguarded or open reporting culture as an aspect of a strong patient safety culture, meaning that facilities with strong patient safety culture scores may have a higher likelihood of error or adverse outcome reporting. Even then, understanding a facility's patient safety culture is foundational to identifying and addressing systemic issues that may contribute to and compound safety challenges. Yet, the literature and understanding of patient safety culture in Indian inpatient settings is limited [12].

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

We fielded the Hospital Survey on Patient Safety Culture (HSOPS) tool to assess patient safety culture in Odisha, India and examine the broader applicability of the tool in Indian inpatient settings. By assessing safety culture across facilities, the tool is grounded in the theory that responsibility for safe healthcare lies with the system rather than any single care provider [13]. Within this framing, we sought to answer the following questions: first, what is the overall state of patient safety culture across the sampled hospitals? Second, how does performance vary by sub-domain and is there an area of patient safety culture that is particularly concerning in Odisha, India? Finally, do respondent ratings vary significantly by facility or provider characteristics (for instance, are medical professionals with a longer tenure more or less conservative in their answers)?

6.2.3 Research Design

6.2.3.1 HSOPS Survey Tool

The Hospital Survey on Patient Safety Culture (HSOPS) tool is a survey that assesses 12 dimensions of safety culture. Developed by the Agency for Healthcare Research and Quality (AHRQ), the tool is the most widely used and validated tool to assess patient safety culture [14]. The tool contains 10 safety culture dimensions and four outcome measures. Domains include teamwork, communication, non-punitive response to error, staffing and management support, and others. Each dimension has approximately three to five questions and uses a 5-point Likert scale (Strongly disagree to Strongly agree) or frequency (Never - Always). Each domain is included based on its expected impact on patient safety. For example, the strength of teamwork and communication between clinicians in a given clinical unit is expected to impact the comfort and ability of clinicians to speak freely, particularly to prevent or stop a procedure, such as catheter placement, that is not being performed to optimize patient safety [14]. Similarly, the comfort level of an employee to self-report an error without punishment is hypothesized to be important in reducing inappropriate catheter placement and care [14]. To reflect research on these relationships, the HSOPS tool has been adapted since its initial development. We use the 2018 version of the tool and corresponding users guide, which was the latest available version when the study was initiated [15].

Prior to fielding, the HSOPS tool was translated into Oriya by a bilingual English-Oriya translator. The Oriya tool was then subject to back translation. Back-translation was conducted with four health practitioners and administrators working in inpatient clinical settings in Odisha, India (in line with the target sample population for the tool). Questions and survey items were then rated by the survey team in terms of the accuracy of the back translation. For a sub-set of “conflict” items identified through this process, questions were revised by a small team (made up of researchers in Odisha, the survey administration team, health practitioners, and Harvard-based research team members) to ensure each question was framed in a way that ensured conceptual equivalence in Oriya. (See Appendix 2 for more details.)

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

6.2.3.2 Sample

The selection strategy for facilities followed that of the broader project. A census of all Medical College Hospitals in the state of Odisha was undertaken, including the All India Institute of Medical College (AIIMS) and Capital Hospital in Bhubaneshwar, for a total of nine public Medical College and Tertiary Hospitals. For District Hospitals (DH), Sub-Divisional (SDH) Hospitals, Community Health Centers (CHC), a census was undertaken at the district level across all six focus districts, which included six DHs and five SDHs. These 20 public facilities resulted in the sampling pool for the HSOPS tool. Three facilities were then randomly elected in each category: 1) Tertiary care/Medical College Hospitals 2) District Hospitals and 3) Sub-Divisional Hospitals. For groups 2 and 3, the facilities were selected from the regional development council (RDC) to align with the stratification used for selection of districts for other survey tools within the project.

For the selection of respondents in institutions with less than 500 employees, all employees were administered the survey. However, many facilities lacked a complete or updated staffing list for the facility. As a result, a subset of employees had to be selected using a list frame generated by the survey administration team. In these contexts, a standardized approach was used to identify the universe of eligible respondents. The steps taken at each facility are outlined in Appendix 2.

6.2.3.3 Enumerator fielding

Due to concerns regarding conceptual equivalence of the HSOPS tool in the Odisha inpatient setting, the survey was conducted as an interview as opposed to a self-administered survey. This mode of delivery was chosen to ensure items were consistently understood and, in turn, responses from each surveyed practitioner were interpreted as the survey developers intended. Enumerators were trained on the meaning of each item within the tool and provided with standard examples, which purpose was to provide consistent and structured responses to inquiries regarding an item's meaning or interpretation of Likert scales and responses. As a sensitivity analysis, reliability across raters was assessed at the enumerator level to check for clustering. Enumerator ID was not associated with practitioner response in any way, suggesting consistent delivery of the tool.

6.2.4 Results

In total, the HSOPS survey was conducted with 2,687 healthcare workers across nine hospitals in Odisha, India between September of 2019 and March of 2020. The participating hospitals included three Medical College Hospitals, three District Hospitals, and three Sub-Divisional Hospitals. 42 percent of respondents were nurses, 17 percent doctors, 33 percent paramedical staff, and just over 5 percent identified as administrators or senior management (Table 6.2.1.). With regard to clinical departments, just over 11 percent of respondents worked in pediatric wards (general medicine), 8.5 percent in obstetrics, followed by surgery (8.2 percent), emergency (7.8 percent) and general medicine (6.6 percent). The largest share of respondents reported

having worked at their given hospital for one to five years (27.6 percent), followed by six to ten years (26.6 percent), although over 13 percent reported a tenure of 21 years or more. The vast majority of staff had work weeks of between 40 and 59 hours (83.4 percent) with only six individuals reporting 20 hours or less work weeks.

In terms of responses to the HSOPS survey tool, we found there was minimal variation between hospitals, with providers consistently responding positively or negatively to the same domains regardless of which hospital or hospital-type they were employed by (Table 6.2.2a & b). Across all hospital types, the HSOPS domains that had the lowest scores on average were reporting patient safety events with a total average score of 2.27 out of 5 (for instance, the reporting of a mistake that could harm a patient, but does not) and staffing and workplace with a total average score of 2.81 out of 5 (such as doctors working in crisis mode or trying to do too much too quickly). The domains with the most positive scores were teamwork with a total average score of 4.18 out of 5 (as in, staff treating each other with respect, or working together to finish a high volume of work), organizational learning with a total average score of 4.40 out of 5 (such as actively taking actions to improve patient safety or evaluating the effectiveness of efforts to improve safety) and handoffs / information exchange with a total average score of 4.12 out of 5 (for example, important information is not lost during shift changes and all hospital units work well together).

The number of events or error reports submitted by survey respondents was very low across facilities. In some facilities, fewer than 10 percent of respondents had ever submitted an event report while working in their given facility, regardless of the duration of time spent at the facility. Those working in general medicine or emergency medicine were significantly less likely than their peers to have reported an error (Table 6.2.3). Conversely, staff working in the surgery or pharmacy department were significantly more likely to have reported a safety event report. This finding was consistent when controlling for respondent characteristics, such as duration of time spent at a given facility, number of hours worked per week, and position.

The only provider characteristic that was significantly associated with an individual's overall HSOPS rating was tenure at their given hospital. Individuals who had been at a hospital for longer were more likely to rate their departments approach to patient safety positively.

6.2.5 Conclusion

Overall, it is critical to institute monitoring systems that allow for the routine collection of medical errors. This includes reporting errors that do not actively cause harm to the patient but have potential to in other instances. It appears there is a relatively strong culture of teamwork and organizational learning already in place, which is both unusual and positive. What is needed is active recognition of errors so that hospitals' existing positive patient safety culture can be leveraged. However, low volume of reporting may contribute to hospitals' ability to address the issues that do arise. With an increased volume in reporting, staff's ability to actively address errors may be hindered, especially because a majority of staff reported that they regularly work in "crisis mode". This seems

to be a concern across hospitals with minimal use of temporary staff and just under 50 percent of the sample disagreeing with the statement: “We have enough staff to handle the workload”. Given that general medicine and emergency medicine staff are especially unlikely to report errors, these departments may be useful to target in improvement efforts.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 6.2.1. Characteristics of Hospitals and Surveyed Practitioners in Odisha

		Medical College Hospitals			District Headquarter Hospitals				Sub-Divisional Hospitals	
		Hospital 1	Hospital 2	Hospital 3	Hospital 4	Hospital 5	Hospital 6	Hospital 7	Hospital 8	Hospital 9
Individuals Surveyed		1,670	115	306	128	164	145	47	48	65
District		Cuttack	Khorda	Khorda	Kendhujhar	Khorda	Rayagada	Baleswar	Kendhujhar	Rayagada
Staff By Position *(h004)*	*Administration/Management*	55 (3.3%)	0 (0%)	24 (7.8%)	9 (7.0%)	6 (3.7%)	30 (21%)	2 (4.3%)	6 (12%)	12 (18%)
	Nurses	723 (43%)	114 (99%)	93 (30%)	41 (32%)	39 (24%)	56 (39%)	16 (34%)	16 (33%)	18 (28%)
	Paramedical	539 (32%)	1 (0.9%)	119 (39%)	51 (40%)	77 (47%)	34 (23%)	25 (53%)	19 (40%)	27 (42%)
	Physicians	318 (19%)	0 (0%)	55 (18%)	13 (10%)	38 (23%)	16 (11%)	4 (8.5%)	6 (12%)	4 (6.2%)
	Other	35 (2.1%)	0 (0%)	15 (4.9%)	14 (11%)	4 (2.4%)	9 (6.2%)	0 (0%)	1 (2.1%)	4 (6.2%)
Clinical Departments *(a01)*	*Medicine (non-surgical)*	68 (4.1%)	20 (17%)	36 (12%)	5 (3.9%)	7 (4.3%)	9 (6.2%)	1 (2.1%)	8 (17%)	24 (37%)
	Surgery	166 (9.9%)	7 (6.1%)	15 (4.9%)	6 (4.7%)	11 (6.7%)	9 (6.2%)	1 (2.1%)	3 (6.2%)	2 (3.1%)
	Obstetrics	129 (7.7%)	2 (1.7%)	26 (8.5%)	6 (4.7%)	19 (12%)	14 (9.7%)	4 (8.5%)	10 (21%)	18 (28%)
	Pediatrics	204 (12%)	12 (10%)	20 (6.5%)	18 (14%)	10 (6.1%)	15 (10%)	2 (4.3%)	5 (10%)	12 (18%)
	Emergency Department	122 (7.3%)	27 (23%)	19 (6.2%)	8 (6.2%)	17 (10%)	1 (0.7%)	3 (6.4%)	3 (6.2%)	10 (15%)
	ICU	58 (3.5%)	4 (3.5%)	32 (10%)	10 (7.8%)	4 (2.4%)	0 (0%)	1 (2.1%)	1 (2.1%)	0 (0%)
	Psychiatry/Mental Health	74 (4.4%)	1 (0.9%)	0 (0%)	3 (2.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Pharmacy	78 (4.7%)	1 (0.9%)	9 (2.9%)	3 (2.3%)	14 (8.5%)	5 (3.4%)	5 (11%)	5 (10%)	1 (1.5%)
	Laboratory	48 (2.9%)	1 (0.9%)	27 (8.8%)	11 (8.6%)	13 (7.9%)	9 (6.2%)	5 (11%)	5 (10%)	4 (6.2%)
	Radiology	33 (2.0%)	2 (1.7%)	5 (1.6%)	4 (3.1%)	3 (1.8%)	3 (2.1%)	1 (2.1%)	1 (2.1%)	1 (1.5%)
Time Worked in Hospital *(h001)*	*21 years or more*	282 (17%)	0 (0%)	32 (10%)	10 (7.8%)	5 (3.0%)	15 (10%)	5 (11%)	4 (8.3%)	2 (3.1%)
	16 to 20 years	82 (4.9%)	0 (0%)	7 (2.3%)	9 (7.0%)	4 (2.4%)	9 (6.2%)	3 (6.4%)	1 (2.1%)	2 (3.1%)
	11 to 15 years	260 (16%)	2 (1.7%)	29 (9.5%)	11 (8.6%)	21 (13%)	14 (9.7%)	4 (8.5%)	10 (21%)	9 (14%)
	6 to 10 years	476 (29%)	23 (20%)	75 (25%)	29 (23%)	34 (21%)	28 (19%)	16 (34%)	13 (27%)	20 (31%)
	1 to 5 years	332 (20%)	62 (54%)	116 (38%)	42 (33%)	75 (46%)	57 (39%)	16 (34%)	12 (25%)	30 (46%)
	Less than 1 year	238 (14%)	28 (24%)	47 (15%)	27 (21%)	25 (15%)	22 (15%)	3 (6.4%)	8 (17%)	2 (3.1%)
Hours Worked per Week *(h003)*	*100 hours per week or more*	14 (0.8%)	0 (0%)	2 (0.7%)	1 (0.8%)	0 (0%)	0 (0%)	2 (4.3%)	2 (4.2%)	3 (4.6%)
	20 to 39 hours per week	31 (1.9%)	19 (17%)	9 (2.9%)	2 (1.6%)	19 (12%)	1 (0.7%)	6 (13%)	4 (8.3%)	0 (0%)
	40 to 59 hours per week	1424 (85%)	93 (81%)	261 (85%)	105 (82%)	123 (75%)	124 (86%)	29 (62%)	31 (65%)	51 (78%)
	60 to 79 hours per week	174 (10%)	2 (1.7%)	33 (11%)	13 (10%)	18 (11%)	17 (12%)	8 (17%)	10 (21%)	8 (12%)
	80 to 99 hours per week	25 (1.5%)	0 (0%)	0 (0%)	6 (4.7%)	3 (1.8%)	3 (2.1%)	1 (2.1%)	1 (2.1%)	3 (4.6%)
	Less than 20 hours per week	2 (0.1%)	1 (0.9%)	1 (0.3%)	1 (0.8%)	1 (0.6%)	0 (0%)	1 (2.1%)	0 (0%)	0 (0%)
Direct Contact with Patients *(h005)*	*No interaction/contact*	78 (4.7%)	3 (2.6%)	32 (10%)	2 (1.6%)	7 (4.3%)	26 (18%)	10 (21%)	9 (19%)	10 (15%)
	Direct interaction/contact	1592 (95%)	112 (97%)	274 (90%)	126 (98%)	157 (96%)	119 (82%)	37 (79%)	39 (81%)	55 (85%)

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 6.2.2a. Mean Sub-Item Scores by Hospital in Odisha (5-point Likert Scale)

		Medical College Hospitals						District Headquarter Hospitals						Sub-Divisional Hospitals					
		Hospital 1		Hospital 2		Hospital 3		Hospital 4		Hospital 5		Hospital 6		Hospital 7		Hospital 8		Hospital 9	
Individuals Surveyed		1,670		115		306		128		164		145		47		48		65	
District		Cuttack		Khorda		Khorda		Kendhujhar		Khorda		Rayagada		Baleswar		Kendhujhar		Rayagada	
Teamwork	*a003*	**4.29**	0.73	**4.49**	0.61	**4.39**	0.75	**4.25**	0.92	**4.1**	0.95	**3.86**	1.15	**4.19**	0.88	**4.73**	0.45	**4.38**	0.9
	a004	**4.4**	0.6	**4.43**	0.58	**4.63**	0.55	**4.62**	0.59	**4.37**	0.68	**4.61**	0.6	**4.51**	0.59	**4.83**	0.38	**4.74**	0.51
	a011	**3.68**	1.17	**4.05**	0.88	**4.08**	1	**3.65**	1.29	**3.97**	1.08	**4.08**	0.95	**4.23**	1.05	**4.27**	1.07	**4.02**	1.14
Staffing and Workplace	*a002*	**2.66**	1.22	**2.85**	1.35	**2.86**	1.31	**2.91**	1.41	**2.48**	1.31	**3.14**	1.31	**2.98**	1.54	**3.19**	1.5	**2.54**	1.31
	a005	**3.53**	1.13	**2.57**	1.26	**3.1**	1.21	**3.52**	1.25	**3.29**	1.27	**3.12**	1.31	**3.17**	1.36	**3.67**	1.24	**2.97**	1.22
	a007	**3.29**	1.16	**2.68**	1.31	**3.21**	1.16	**3.45**	1.26	**3.29**	1.32	**3.07**	1.29	**3.02**	1.52	**3.52**	1.44	**3.62**	0.93
	a014	**1.87**	0.83	**2.2**	0.98	**1.76**	0.81	**1.94**	1.04	**1.96**	0.96	**1.74**	0.66	**1.83**	0.89	**1.48**	0.71	**1.82**	0.88
Organizational Learning	*a006*	**4.43**	0.60	**4.62**	0.54	**4.72**	0.46	**4.70**	0.61	**4.57**	0.51	**4.59**	0.53	**4.7**	0.46	**4.85**	0.36	**4.75**	0.43
	a013	**4.24**	0.70	**4.25**	0.53	**4.42**	0.55	**4.34**	0.8	**4.24**	0.67	**4.4**	0.53	**4.28**	0.88	**4.60**	0.74	**4.45**	0.53
Response to Error	*a009*	**3.64**	1.12	**3.46**	0.98	**4.01**	0.91	**3.66**	1.28	**3.22**	1.36	**3.82**	1.1	**3.89**	1.01	**4.04**	1.11	**4.05**	0.98
	a012	**3.58**	1.05	**3.15**	1.02	**3.68**	1.02	**3.38**	1.27	**3.29**	1.2	**3.67**	0.99	**3.04**	1.23	**3.48**	1.27	**3.88**	0.93
	a010	**1.79**	0.83	**2.62**	1.24	**1.62**	0.87	**1.62**	0.75	**1.94**	0.92	**1.41**	0.67	**1.70**	0.86	**1.40**	0.89	**1.43**	0.75
	a016	**3.66**	1.01	**2.77**	1.05	**3.79**	1.00	**3.70**	1.15	**3.32**	1.26	**3.92**	0.83	**3.70**	1.04	**3.73**	1.16	**4.09**	0.8
	a008	**3.53**	1.05	**2.14**	0.91	**3.51**	1.09	**3.38**	1.25	**3.13**	1.28	**3.6**	0.96	**2.98**	1.31	**2.90**	1.42	**3.74**	0.91
Supervisor, Manager, or Clinical Leader Support for Patient Safety	*b001*	**4.20**	0.75	**4.12**	0.94	**4.33**	0.95	**4.04**	0.95	**4.21**	0.84	**4.75**	0.43	**4.09**	1.02	**4.52**	0.95	**4.52**	0.53
	b002	**4.04**	0.76	**4.08**	0.94	**4.25**	0.78	**4.12**	0.82	**4.24**	0.73	**4.35**	0.52	**4.13**	0.99	**4.44**	0.92	**4.34**	0.59
	b003	**4.19**	0.68	**3.94**	1.04	**4.56**	0.57	**4.19**	0.84	**4.41**	0.63	**4.73**	0.44	**4.30**	0.69	**4.71**	0.58	**4.57**	0.50
	b004	**4.21**	0.67	**4.19**	0.96	**4.52**	0.66	**4.26**	0.92	**4.39**	0.66	**4.37**	0.66	**4.28**	0.77	**4.75**	0.53	**4.58**	0.50
	f001	**3.15**	1.19	**2.73**	1.20	**3.19**	1.21	**3.20**	1.31	**3.37**	1.27	**2.97**	1.26	**2.85**	1.40	**3.35**	1.39	**3.63**	0.99
	f008	**3.94**	0.94	**4.13**	0.83	**4.13**	0.77	**4.05**	0.89	**4.05**	0.83	**4.00**	0.78	**3.60**	1.17	**4.38**	0.73	**4.25**	0.69
	f009	**3.12**	1.25	**2.84**	1.27	**2.59**	1.37	**2.52**	1.39	**2.93**	1.37	**2.34**	1.20	**2.15**	1.22	**2.48**	1.58	**2.89**	1.50
	f002	**3.51**	1.20	**3.44**	1.22	**3.44**	1.40	**3.13**	1.40	**3.32**	1.37	**3.15**	1.43	**3.11**	1.49	**3.10**	1.60	**3.86**	1.13

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 6.2.2b. Mean Sub-Item Scores by Hospital in Odisha, India (continued)

		Medical College Hospitals						District Hospitals						Sub-Divisional Hospitals					
		Hospital 1		Hospital 2		Hospital 3		Hospital 4		Hospital 5		Hospital 6		Hospital 7		Hospital 8		Hospital 9	
Individuals Surveyed		1,670		115		306		128		164		145		47		48		65	
District		Cuttack		Khorda		Khorda		Kendhujhar		Khorda		Rayagada		Baleswar		Kendhujhar		Rayagada	
Communication About Error	*c001*	**3.05**	1.39	**3.72**	1.20	**2.70**	1.51	**2.56**	1.44	**2.68**	1.40	**3.58**	1.22	**2.36**	1.41	**2.15**	1.17	**2.92**	1.49
	c005	**3.03**	1.39	**4.10**	1.04	**2.83**	1.50	**2.50**	1.46	**2.88**	1.34	**3.83**	1.06	**2.26**	1.28	**2.29**	1.13	**2.69**	1.50
	c003	**3.32**	1.37	**4.28**	1.08	**3.30**	1.52	**2.98**	1.51	**3.35**	1.39	**3.86**	1.13	**2.64**	1.55	**2.90**	1.63	**3.05**	1.59
Communication Openness	*c004*	**4.49**	0.56	**4.49**	0.61	**4.69**	0.54	**4.62**	0.61	**4.37**	0.71	**4.81**	0.40	**4.32**	0.75	**4.73**	0.49	**4.58**	0.70
	a001	**3.36**	1.34	**4.00**	1.16	**2.95**	1.48	**2.72**	1.52	**2.90**	1.40	**3.34**	1.34	**2.60**	1.47	**2.90**	1.34	**2.94**	1.43
	c006	**3.44**	1.30	**3.84**	1.23	**3.04**	1.50	**3.19**	1.57	**3.43**	1.26	**3.49**	1.33	**3.09**	1.46	**3.19**	1.50	**3.06**	1.48
	c002	**4.01**	1.22	**3.68**	1.14	**4.24**	1.16	**4.38**	1.18	**4.18**	1.12	**4.46**	0.74	**4.51**	0.86	**4.35**	1.00	**4.77**	0.63
Reporting Patient Safety Events	*d001*	**2.80**	1.53	**3.37**	1.25	**2.75**	1.65	**2.93**	1.56	**3.10**	1.33	**2.01**	1.13	**2.87**	1.61	**2.69**	1.50	**1.52**	1.16
	d002	**2.02**	1.24	**3.04**	1.15	**1.99**	1.35	**2.18**	1.39	**2.51**	1.28	**1.80**	0.96	**2.38**	1.55	**1.79**	1.17	**1.37**	0.94
	d003	**1.93**	1.22	**2.96**	1.39	**1.89**	1.30	**1.84**	1.25	**2.38**	1.29	**1.75**	0.89	**2.32**	1.48	**1.65**	1.04	**1.42**	0.98
Overall Perception	*a015*	**3.82**	1.19	**4.08**	0.94	**4.25**	0.94	**4.22**	1.00	**4.04**	1.10	**3.74**	1.10	**4.28**	1.08	**4.33**	1.12	**4.55**	0.73
	a018	**4.07**	0.86	**3.85**	0.95	**4.20**	0.82	**4.12**	1.00	**4.06**	0.90	**4.31**	0.65	**4.11**	1.03	**4.23**	1.02	**4.18**	1.00
	e001	**4.34**	0.69	**3.97**	0.82	**4.34**	0.65	**4.36**	0.75	**4.25**	0.71	**4.46**	0.51	**4.45**	0.62	**4.40**	0.84	**4.25**	0.61
	a017	**3.87**	1.01	**3.19**	1.41	**3.88**	0.95	**3.95**	1.05	**3.92**	1.00	**3.45**	1.18	**3.70**	1.12	**3.98**	1.18	**4.17**	0.70
Handoffs and Information Exchange	*f004*	**4.26**	0.73	**4.16**	0.97	**4.47**	0.75	**4.54**	0.70	**4.37**	0.74	**4.25**	0.88	**4.53**	0.62	**4.60**	1.01	**4.57**	0.59
	f005	**4.24**	0.67	**4.12**	0.92	**4.50**	0.62	**4.33**	0.80	**4.40**	0.73	**4.46**	0.50	**4.38**	0.74	**4.81**	0.45	**4.51**	0.59
	f010	**4.21**	0.67	**3.99**	1.05	**4.31**	0.78	**4.41**	0.86	**4.40**	0.70	**4.30**	0.82	**4.19**	0.88	**4.50**	0.77	**4.22**	0.67
	f006	**3.79**	0.94	**3.32**	0.90	**3.99**	0.89	**4.11**	1.12	**3.97**	0.98	**4.04**	0.81	**3.94**	1.13	**3.90**	1.34	**4.12**	0.67
	f007	**3.93**	0.87	**3.35**	0.95	**4.08**	0.87	**4.00**	1.12	**3.83**	1.02	**4.06**	0.86	**3.62**	1.17	**4.15**	1.03	**4.20**	0.67
	f011	**4.03**	0.81	**3.77**	0.89	**4.06**	0.86	**4.05**	1.01	**4.04**	1.02	**4.04**	0.90	**3.66**	1.07	**4.31**	0.97	**4.00**	0.81
	f003	**4.10**	0.82	**4.14**	0.90	**4.27**	0.89	**4.28**	0.91	**4.16**	0.89	**4.19**	0.86	**3.72**	1.26	**4.21**	0.94	**4.31**	0.56

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 6.2.3. Likelihood of Reporting a Safety Event by Department

	Model I			Model II		
	Coef	P-value	95% CI	Coef	P-value	95% CI
Surgery	**0.128** (0.049)	0.009	0.033 – 0.224	**0.125** (0.049)	0.011	0.029 – 0.222
Laboratory	**0.168** (0.064)	0.009	0.042 – 0.293	**0.171** (0.064)	0.008	0.046 – 0.296
Emergency Medicine	**-0.152** (0.054)	0.005	-0.0258 – -0.047	**-0.146** (0.054)	0.007	-0.251 – -0.040
General Medicine	**-0.236** (0.050)	0.000	-0.334 – 0.139	**-0.229** (0.050)	0.000	-0.327 – -0.130

Notes: Specifications are estimated using linear OLS, standard errors are in parentheses.
Model I: Having reported a safety event as dependent variable, unadjusted
Model II: Having reported a safety event as dependent variable, controlling for an individual's tenure at their given hospital, hours worked per week and engagement level with patients while on shift

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

6.2.5 References

1. T. A. Brennan *et al.*, "Incidence of Adverse Events and Negligence in Hospitalized Patients," *N. Engl. J. Med.*, vol. 324, no. 6, pp. 370–376, Feb. 1991.
2. M. Panagioti *et al.*, "Prevalence, severity, and nature of preventable patient harm across medical care settings: systematic review and meta-analysis.," *BMJ*, vol. 366, p. l4185, Jul. 2019.
3. A. K. Jha, I. Larizgoitia, C. Audera-Lopez, N. Prasopa-Plaizier, H. Waters, and D. W. Bates, "The global burden of unsafe medical care: analytic modelling of observational studies.," *BMJ Qual. Saf.*, vol. 22, no. 10, pp. 809–15, Oct. 2013.
4. L. R. Woskie and I. Papanicolas, *Chapter 4: Crossing the Global Quality Chasm, Improving Health Care Worldwide*. Washington D C: National Academy of Medicine, 2018.
5. E. J. Thomas *et al.*, "Costs of medical injuries in Utah and Colorado.," *Inquiry*, vol. 36, no. 3, pp. 255–64, 1999.
6. F. J. Aceves-Avila, V. Benites-Godínez, and C. Ramos-Remus, "Cost of medication errors in rheumatic patients in Mexico," *Clin. Rheumatol.*, vol. 30, no. 11, pp. 1421–1424, Nov. 2011.
7. P. Rhodes, S. Campbell, and C. Sanders, "Trust, temporality and systems: how do patients understand patient safety in primary care? A qualitative study.," *Health Expect.*, vol. 19, no. 2, pp. 253–63, Apr. 2016.
8. S. Hrisos and R. Thomson, "Seeing It from Both Sides: Do Approaches to Involving Patients in Improving Their Safety Risk Damaging the Trust between Patients and Healthcare Professionals? An Interview Study," *PLoS One*, vol. 8, no. 11, p. e80759, Nov. 2013.
9. *ACSNI Study Group on Human Factors. organising for safety*. London: H.M.S.O., 1993.
10. S. Ito, K. Seto, M. Kigawa, S. Fujita, T. Hasagawa, and T. Hasegawa, "Development and applicability of Hospital Survey on Patient Safety Culture (HSOPS) in Japan," *BMC Health Serv. Res.*, vol. 11, no. 1, pp. 1–7, Feb. 2011.
11. M. H. DiCuccio, "The Relationship Between Patient Safety Culture and Patient Outcomes," *J. Patient Saf.*, vol. 11, no. 3, pp. 135–142, Sep. 2015.
12. P. H. C. Goyal, "Assessment of patient safety culture in a rural tertiary health care hospital of Central India," *Int. J. Community Med.*, vol. 5, no. 7, 2018.
13. IoM, "To Err Is HUman: Building a Safer Health System," 1999. [Online]. Available: https://www.nationalacademies.org/hmd/~/media/Files/Report Files/1999/To-Err-is-Human/To Err is Human 1999 report brief.pdf. [Accessed: 27-May-2016].
14. J. Meddings *et al.*, "Evaluation of the association between Hospital Survey on Patient Safety Culture (HSOPS) measures and catheter-associated infections: results of two national collaboratives."
15. "Hospital Survey on Patient Safety Culture: User's Guide," Rockville, MD, 2016.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Chapter 6.3
Quality: Patient Centeredness[θ]

6.3.1 Summary

Patient-centeredness, or person-centeredness, is a fundamental domain of healthcare quality. To assess patient-centeredness, we fielded two survey tools. First, we applied the Hospital Survey on Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) tool, which included 507 patients receiving inpatient care in five hospitals across Odisha, India. The HCAHPS tool was used to monitor patient experience and satisfaction in the United States. These results represented the first known adaptation in India. Second, 978 exit interviews were conducted with patients receiving outpatient care from different providers. This survey consisted of items on patient experience, satisfaction, and care seeking practices in the outpatient setting. The goals of fielding these tools were threefold: first, to test whether the HCAHPS tool was a viable instrument in assessing patient-centeredness in Odisha, India. Second, to identify the drivers of patient satisfaction in Odisha's inpatient and outpatient settings. And third, to see if there were issues of equity in access to, or reporting of, high quality interpersonal care.

Overall, the HCAHPS tool demonstrated strong conceptual equivalence and content validity. The two HCAHPS domains with the lowest ratings were "Understandings of care" (such as in preferences being taken seriously, or understanding the purpose of medications) and "Post discharge planning" (receipt of guidance, assessment of at-home needs, and so on). In general, there was low performance on items that assess providers' respect for or investment in patient knowledge. In addition, certain patients were subject to lower quality interpersonal care than others. The following groups reported receipt of the worst interpersonal care in the inpatient setting: patients with no formal education, low caste patients, and obstetrics patients. Conversely, obstetrics patients reported the highest experience ratings in the outpatient setting.

Similar to work in other settings, experience ratings were predictive of a patient's overall satisfaction and likelihood of recommending a given facility to friends and family. Interpersonal care from doctors was most predictive of overall satisfaction with a beta of 0.714 (SE: 0.103), followed by the hospital environment with beta = 0.284 (SE: 0.067), and third, care from nurses with beta = 0.207 (SE: 0.096). However, patients' rating of their experience with the hospital environment—while significant—had a low coefficient, indicating that patients may consistently care about the hospital environment, but not strongly. One new finding was a notable discordance between HCAHPS sub-item ratings and overall satisfaction amongst less educated patients. Less educated patients were more satisfied than any other group, but also reported receipt of the worst quality interpersonal care (as assessed through more objective experience sub-

[θ] This chapter was led by Liana Woskie, with participation from Deepika Dilip.

items). This discordance was not mediated by patient payment for care or other visit-level characteristics.

These data raise concern regarding the use of patient satisfaction as a health system performance measure. Satisfaction is subjective and if certain patients evaluate and/or report satisfaction differently than peers, the use of these ratings in isolation may mask, as opposed to reveal, poor quality interpersonal care.

6.3.2 Introduction

Patient satisfaction is a measure of person-centeredness in healthcare. It is one goal for a high performing health system and used as an essential measure (or set of measures) to assess healthcare quality. Patient satisfaction is not only seen as a goal in its own right, but also valued due to the relationship it often has with other, more objective measures of performance [1]. Previous work has shown that performance on measures of patient experience is associated with high performance on clinical processes and health outcomes [2]–[4]. Jha et al found that patients' satisfaction with care was associated with the quality of clinical care in hospitals for key process measures across four clinical categories (Acute Myocardial Infarction, Congestive Heart Failure, Pneumonia and Surgery) [5]. The causal pathway is less well explored, but there is evidence that when patients have negative experiences of care, they are more likely to delay seeking necessary medical care in the future and are also at higher risk of not adhering to treatment recommendations [6–8].

Recent research that examines patient experience disaggregated by patient characteristics brings into question how we measure and interpret patient experience ratings in Odisha and broader contexts. At a population level, high satisfaction with healthcare is common in low- and middle-income countries (LMICs) despite the widespread delivery of poor quality services in the same countries [9]. Patient-level data sheds light on this issue, for example: in a 2014 study by Kruk et al, nearly 20% of women giving birth in Tanzania reported having experienced disrespect or abusive care during their visit, yet only 16% rated their satisfaction as “poor,” [10]. A study from Kenya, which examined the accuracy of women’s perceptions of quality, suggests this may be driven by the inability of patients to identify poor quality clinical services and in turn report them [11]. Valentine et al explore this issue using 2002-03 World Health Survey data and identify significant relationships between satisfaction and a series of patient characteristics [12].

Another example is patient satisfaction ratings from racial minorities in the United States (U.S.). Among U.S. minority populations, Hispanic Americans are the least likely group to seek medical care when necessary, while being more likely to lack both health insurance coverage and a usual source of care [13], [14]. In addition, Hispanic Americans are less likely to receive important treatments for common medical conditions compared with non-Hispanic white Americans [15–17]. However, when assessing patient experience ratings provided by this population, Figueroa and colleagues found only modest differences in patient experience between Hispanic and white patients across U.S. hospitals and that Hispanic Americans were more satisfied with their care despite receiving care at lower-performing hospitals [18]. The

phenomena appears to extend beyond race. Looking to a 2008 paper by Jha et al, the lowest quartile of Medicaid patients (the US' public means-based insurance option) had the highest share of patients with a "high global (experience) rating" in the study [19]. The issue of some patients rating poor quality care highly is not well studied, but it appears that marginalized groups may rate their care differently than peers, even when receiving poor quality care.

If marginalized groups do rate their care differently than peers, it raises the need to critically re-examine how we are both collecting and analyzing patient satisfaction data and using it to assess performance. Yet, we lack robust databases that include both data on patient satisfaction and patient characteristics. As a result, surprisingly little is known about how patient-level characteristics impact satisfaction ratings and how this might lead to measurement error. This is particularly relevant in India due to recent efforts to routinely assess satisfaction and reward hospitals on their performance on this indicator. As a result, we sought to examine experience ratings of different aspects of care as well as patients' overall satisfaction with their care. By exploring the relationship between two concepts—what is experienced during a care visit and satisfaction—we can isolate and better understand what drives patients' satisfaction with healthcare. We can also gain a more nuanced understanding of the quality of interpersonal care that different types of patients are receiving, as well as how patient characteristics such as education level, and caste might impact their care ratings.

6.3.3 Research Design

In this chapter we examine patient centeredness and use three related, but distinct, terms: 1.) Patient-centeredness, 2.) Patient Satisfaction, and 3.) Patient Experience. Descriptions and examples of these terms are presented below. In summary, patient satisfaction and patient experience are types of measures used to assess patient-centeredness. Patient-centeredness is the overarching category used to assess health system performance (one of a series of domains, such as safety and effectiveness that together make up the care quality measurement sub-field).

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Term	Measure Type	Description	Example
Patient-centeredness	Domain of care quality	"Care that is respectful of, and responsive to, individual patient preferences, needs and values, and ensuring that patient values guide clinical decisions."*	N/A
Patient Satisfaction	An outcome measure used to assess patient-centredness Evaluating what occurred during a given visit	Subjective: a normative judgment provide by the patient, reflecting the patient's individual values, prior experiences with care and/or other patient-specific considerations	Q: How satisfied are you with the care you received during your visit?
Patient Experience	A process measure used to assess patient-centeredness Recounting what occurred during a given visit	Objective: reflecting what occurred during a given care visit, often phrased to minimize normative judgement from the patient	Q: Did the care provider ask about your home situation prior to discharge?

Source: Institute of Medicine, "Crossing the Quality Chasm: A New Health System for the 21st Century."

Patient experience measures are not entirely divorced from judgment e.g. if a patient is asked: "How often did you get help when you needed it?" The patent will have to pass judgment on if and when they needed help. However, these judgements are often bounded around a patient's own needs as opposed to their normative judgment of the quality of services delivered. For example, a similar question: "How satisfied were you with the quality of help you received when you needed it," would be categorized as a patient satisfaction measure. In this report, we look at satisfaction at the level of the clinical visit.

6.3.3.1 Inpatient Survey Tool

For assessing patient-centeredness, we adapted the U.S. Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) tool and administered it as an exit interviews to patients (Survey 7 and 8 in Table 1.1). To test the HCAHPS tool, we use three distinct components. The first component, referred to as "Part A" is made up of descriptive information about the survey, a consent section, and participant identifier questions. "Part B" is the 2018 version of the HCAHPS survey tool in full, which is the primary tool used to collect data on patient-reported experiences of hospital care in the United States (U.S.). Part C includes an additional set of patient experience questions commonly posed in LMICs, but not currently covered by the HCAHPS tool (for instance, timeliness, abuse, and discrimination). In addition, Part C includes questions that assess

general care seeking behavior and opinions of the health system. However, Part B is the primary subject of assessment for inpatient care throughout this paper.

6.3.3.2 Inpatient Sampling Strategy

Following a 4-stage formal pre-testing process, the translated HCAHPs tool was administered to patients (at the time of discharge) who were hospitalized for 24 hours or more in five hospitals in Odisha. These hospitals were randomly selected for the inpatient exit surveys as a sub-sample of the public hospital survey. Three Medical College Hospitals were selected randomly from the universe of seven such hospitals across the state. For District Hospitals, three were randomly selected, with one from the regional development council (RDC), as this is the same stratification used for selection of districts for the survey. The same randomization process was followed for both categories of hospitals. The seven Medical College Hospitals and six District Hospitals from the sampled districts were listed, and a with-replacement random sampling was followed with a computer-generated algorithm, so that each hospital had an equal probability of being selected. The algorithm was repeated until a unique list of three Medical College Hospitals and three District Hospitals (one from each RDC) was generated. Data collection was conducted in five of the six selected hospitals (one selected hospital could not be sampled due to the onset of the COVID-19 pandemic).

The total sample size for inpatient exit interviews was therefore 507, with approximately 100 patients from each of the five hospitals that were sampled. Out of the 100 patients, 20 percent of patients had received OBGYN care, while 80 percent of patients were from the hospitals' general inpatient departments, excluding the departments of emergency care, ICU, psychiatry, phycology, pediatrics, and neonatology. Out of these 80 patients, 50 percent were male and 50 percent female. Female patients within the 80 percent general inpatient population excluded individuals accessing care for OBGYN-related conditions. Patients below 18 years of age were excluded from the sampling frame. We took a time-limited total sample of eligible adult patients (18 years of age or older) until the threshold of 100 was met at that given hospital. In cases where there was a high volume of patients being discharged in a given day and the total sample could not be taken (for instance, a sampling pool of 20 in a single day with a limited number of enumerators), a stratified random sampling strategy was used with a list frame approach in order to reduce bias. The sampling strategy for the exit interview survey is further outlined in the Appendix 2. Only complete surveys conducted with patients meeting eligibility criteria were counted towards the hospital total.

6.3.3.3 Outpatient Sampling Strategy

For outpatient exit interviews, respondents were selected from a random sample of different categories of providers. These providers were a sub-sample of the facilities and solo-provider surveys mentioned in other sections of this report. The same Medical College Hospitals and District Hospitals as for inpatient surveys were included for the outpatient survey. Unfortunately the survey could not be undertaken at AIIMS-Bhubaneshwar because of COVID-19, thus reducing our sample of Medical College Hospitals to two out of the targeted three. For Sub-Divisional Hospitals, CHCs, and PHCs, the same with-replacement random sampling method was used to identify three

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

SDHs (one out of the two blocks from each RDC), 15 CHCs (five randomly selected from each of the three RDCs), and 40 PHCs (10 each from Northern and Southern Division, and 20 from Central Division). Nine private hospitals were randomly selected: one each from Northern and Southern RDs and eight from Central Division. (Additional content on the sampling process can be found in Appendix 2.) The higher number of private hospitals from the Central RDC was due to the larger presence of private hospitals in those districts.

For hospitals and CHCs, 15 patients were randomly interviewed from each facility. Out of these 15, three patients were selected from OBGYN. The rest of the 12 patients (with a male:female ratio of 50:50) were selected from departments of general medicine and general surgery. We ensured that the six female patients from these two departments were not patients accessing care for OBGYN-related conditions. At PHCs and solo providers, five patients (three female, two male) were interviewed at each facility. For selection of patients across providers, every fifth patient who exited the provider's office was selected for the sample until the target sample was achieved. The stratification of providers by RDCs are done to achieve representation of the diversity across the state. The stratification by sex was done for two reasons: (i) in order to ensure equal representation of all types of illnesses (especially from PHCs and CHCs) where the focus of care is often pregnancy related care, and (ii) in order to ensure representation of perceptions of both men and women, especially since literature shows that experiences and provider-patient interactions often vary by gender.

6.3.4 Results

Table 6.3.1a-b highlights the characteristics of inpatient and outpatient respondents. For the inpatient tool, 507 respondents across five hospitals completed the survey, including 193 male inpatients, 209 female inpatients, and 105 OB-GYN patients (Table 1a). Overall, OB-GYN patients were younger on average than their general inpatient peers, with a mean age of 25.5 as compared to 47.2 and 45.2 for male and female inpatients, respectively. Female inpatients were more likely to be illiterate (15.31 percent) or have no formal schooling (29.67 percent). The vast majority of all patients (95 percent) interviewed identified as Hindu practicing. For the outpatient exit interview tool, 978 interviews were conducted with 445 male outpatients, 533 female outpatients and 85 OB-GYN patients. Similar to the inpatient sample, the general male and female populations were much older on average (mean ages of 44.1 and 39.4 respectively) than female obstetrics patients (mean age of 26.8). Again, the general female outpatient population was more likely to have no formal schooling or have less than a primary school education than their male or OB-patient peers. The outpatient population also identified as overwhelmingly Hindu practicing and Oriya speaking.

Table 2a-b shows the inpatient and outpatient experience sub-item scores. For overall experience scores amongst the inpatient population in Table 2a, the areas of care resulting in the lowest ratings were "understandings of care" (for instance, preferences being taken seriously, or understanding the purpose of medications) and "post discharge planning" (as in, receipt of guidance and assessment of at-home needs). Scores on items assessing interpersonal care from doctors and nurses were the two most highly rated categories with mean scores of 3.36/4 and 3.32/4, respectively, for the

inpatient population. This was also the case for the outpatient population with a combined category for interpersonal care from providers of 3.25/4. For both the inpatient and outpatient populations, items within the "hospital environment" domain, such as facility cleanliness and privacy, had low overall scores.

Performance on experience sub-items was highly predictive of a patient's overall satisfaction and the likelihood of recommending a given facility (Table 3a-b). This was particularly true for interpersonal care from providers. However, we find a pronounced distance between sub-items and satisfaction for certain patients more than others, specifically for OB-GYN patients. Education, for example, had a significant impact on how a patient responded to the survey (Figure 6.2.1a-b). Patients who were more educated were less likely than peers to be satisfied. However, they simultaneously had higher ratings on interpersonal aspects of care. Patients who were less educated on average reported the opposite: they were more likely to have high overall satisfaction, while also having lower scores on the interpersonal aspects of care. Indeed, the less educated the patient, the more likely there was to be discordance between their performance on sub-items than overall satisfaction, suggesting that education may be a predictor of worse quality interpersonal care (Figure 6.2.1a & 1b). However, this would not necessarily be detected by the tool without adjusting for key patient demographics.

This relationship, between exposure to poor quality care and likelihood of rating that care poorly, did not appear to be mediated by a patient's insurance status or out of pocket payments (Table 4). In addition, most visit characteristics, such as the hospital/department or referral status, had no significant impact on patient satisfaction or likelihood of recommending the facility to friends or family members. This suggests interpersonal interactions between care providers and patients may be more important to patients' satisfaction than visit/facility characteristics (Table 4). However, if a patient considered alternate options, they were more likely to express dissatisfaction with their care. This may be a reflection of a patients' ability to exercise choice: an indication of wealth/privilege that is not picked up by demographic variables and may be sensitive to factors such as market concentration, which we do not have the ability to assess with the exit interview data.

6.3.5 Conclusion

These results are particularly relevant in light of current policy efforts. Patient centered care, as assessed through patient experience, is a priority for the Ministry of Health of India. The central government has supported an effort to collect information on patient experience through an online platform entitled "Mera Aspataal," which includes a short set of questions on a patient's experience and generates a binary rating for that patient's hospital visit. In addition, the National Accreditation Board for Hospitals and Healthcare (NABH) collects some data on patient satisfaction in the process of accrediting facilities. The patient satisfaction score which is computed from Mera Aspataal feedback was recently made mandatory for National Quality Assurance Standards (NQAS) certification of public health facilities. In addition, District Hospital Ranking System of the MOHFW and NITI Aayog have incorporated a patient satisfaction score as one of nine key outcome indicators for hospitals. As a result, as of late 2018, patient satisfaction scores for 436 district health facilities were being reported

in the HMIS portal on monthly basis. As the Mera Aspataal platform continues to scale up throughout the country, rigorous evaluation of what questions should be included, how these questions are understood, and what they are actually assessing in terms of performance is critical.

Areas of performance improvement include "understandings of care" (again, inclusive of preferences being taken seriously, understanding the purpose of medications, and so on) and "Post discharge planning" (such as receipt of guidance or assessment of at-home needs), particularly for poorly educated and low-caste patients. Additional research on why OBGYN patients are receiving better care in outpatient settings may be merited. In addition, focusing on improving the interpersonal care from doctors and nurses should be a sustained focus, considering this is what patients of all types care about most.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 6.3.1a: Characteristics of Inpatient Respondents

		Male Inpatients (193)		Female Inpatients (209)		OB-GYN / Pregnancy (105)	
		N	%	N	%	N	%
Age	mean	47.23		45.23		25.51	
Highest Educational Attainment	*Illiterate*	13	**6.74%**	32	**15.31%**	**0**	**0.00%**
	No formal schooling	32	**16.58%**	62	**29.67%**	11	**10.48%**
	Under primary	11	**5.70%**	22	**10.53%**	13	**12.38%**
	Primary	39	**20.21%**	21	**10.05%**	15	**14.29%**
	Upper primary / middle	38	**19.69%**	24	**11.48%**	18	**17.14%**
	Secondary	29	**15.03%**	25	**11.96%**	23	**21.90%**
	Higher secondary	19	**9.84%**	13	**6.22%**	21	**20.00%**
	Diploma/Certificate course	4	**2.07%**	1	**0.48%**	0	**0.00%**
	Graduate	7	**3.63%**	7	**3.35%**	4	**3.81%**
	Post graduate & above	1	**0.52%**	2	**0.96%**	0	**0.00%**
Caste	*ST*	34	**17.62%**	**40**	**19.14%**	28	**26.67%**
	SC	23	**11.92%**	**36**	**17.22%**	25	**23.81%**
	OBC	74	**38.34%**	**64**	**30.62%**	22	**20.95%**
	General	61	**31.61%**	**67**	**32.06%**	29	**27.62%**
	Other	1	**0.52%**	**2**	**0.96%**	1	**0.95%**
Religion	*Hindu*	189	**97.93%**	**205**	**98.09%**	100	**95.24%**
	Muslim	4	**2.07%**	**4**	**1.91%**	1	**0.95%**
	Christian	0	**0.00%**	**0**	**0.00%**	4	**3.81%**
Primary Language	*Odiya*	171	**88.60%**	**193**	**92.34%**	78	**74.29%**
	Hindi	4	**2.07%**	**4**	**1.91%**	1	**0.95%**
	Urdu	1	**0.52%**	**1**	**0.48%**	0	**0.00%**
	Bengali	1	**0.52%**	**0**	**0.00%**	1	**0.95%**
	Telugu	0	**0.00%**	**2**	**0.96%**	3	**2.86%**
	Tribal dialect	16	**8.29%**	**9**	**4.31%**	21	**20.00%**
	Other language	0	**0.00%**	**0**	**0.00%**	1	**0.95%**

Notes: General inpatient population is older than household, with OB-GYN younger on average; otherwise demographics relatively similar

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 6.3.1b. Characteristics of Outpatient Respondents

		Male Outpatients (445)		Female Outpatients (533)		Female OB (85)	
		N	%	N	%	N	%
Age	mean	44.08 (SD: 16.33)		39.4 (SD: 14.85)		26.84 (SD: 7.15)	
Highest Educational Attainment (D10)	*No formal schooling*	37	**8.30%**	86	**19.20%**	6	**7.06%**
	Under primary	28	**6.30%**	54	**12.05%**	3	**3.53%**
	Primary	85	**19.00%**	70	**15.62%**	9	**10.59%**
	Upper primary / middle	80	**18.00%**	78	**17.41%**	17	**20.00 %**
	Secondary	80	**18.00%**	63	**14.06%**	21	**24.71%**
	Higher secondary	74	**17.00%**	59	**13.17%**	20	**23.53%**
	Diploma/Certificate course	18	**4.00%**	11	**2.46%**	1	**1.18%**
	Graduate	42	**9.40%**	25	**5.58%**	7	**8.24%**
	Post graduate & above	1	**0.20%**	2	**0.45%**	1	**1.18%**
Caste (D11)	*ST*	64	**14.00%**	46	**10.27%**	13	**15.29%**
	SC	58	**13.00%**	85	**18.97%**	13	**15.29%**
	OBC	182	**41.00%**	162	**36.16%**	30	**35.29%**
	General	120	**27.00%**	118	**26.34%**	27	**31.76%**
	Other	21	**4.70%**	37	**8.26%**	2	**2.35%**
Religion (D13)	*Hindu*	433	**97.00%**	434	**96.88%**	83	**97.65%**
	Muslim	11	**2.50%**	12	**2.68%**	1	**1.18%**
	Christian	1	**0.20%**	0	**0.00%**	1	**1.18%**
Primary Language (D14)	*Oriya*	398	**89.00%**	407	**90.85%**	75	**88.24 %**
	Hindi	8	**1.80%**	3	**0.67%**	0	**0.00%**
	Urdu	5	**1.10%**	6	**1.34%**	1	**1.18%**
	Bengali	2	**0.40%**	3	**0.67%**	0	**0.00%**
	Telugu	9	**2.00%**	7	**1.56%**	3	**3.53%**
	Tribal dialect	23	**5.20%**	22	**4.91%**	6	**7.06%**
	Other language	0	**0.00%**	0	**0.00%**	0	**0.00%**

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Notes: OB-GYN patient, who are on average younger, were not excluded from the female outpatient population

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 6.3.2a. Inpatient Experience Sub-Item Scores (HCAHPS Tool, 4-point Likert scale)

	Experience Sub-Item	Item #	Male Inpatients 193		Female Inpatients 209		OB-GYN 105		Item Mean	Domain Mean
			Mean Score	95% CI	Mean Score	95% CI	Mean Score	95% CI		
Care From Nurses	*Courtesy & Respect*	*b4*	**3.36**	3.25 - 3.47	**3.41**	3.31 - 3.51	**3.51**	3.36 - 3.67	**3.43**	**3.32**
	Listen Carefully	*b5*	**3.44**	3.35 - 3.54	**3.38**	3.28 - 3.47	**3.44**	3.28 - 3.59	**3.42**	
	Explain	*b6*	**3.25**	3.14 - 3.37	**3.33**	3.22 - 3.43	**3.30**	3.14 - 3.47	**3.29**	
	Timely	*b7*	**3.12**	3.10 - 3.33	**3.28**	3.18 - 3.38	**3.05**	2.87 - 3.22	**3.15**	
Care from Doctors	*Courtesy & Respect*	*b8*	**3.38**	3.27 - 3.48	**3.49**	3.40 - 3.58	**3.53**	3.40 - 3.67	**3.47**	**3.36**
	Listen Carefully	*b9*	**3.29**	3.18 - 3.39	**3.43**	3.34 - 3.53	**3.28**	3.12 - 3.44	**3.33**	
	Explain	*b10*	**3.17**	3.06 - 3.28	**3.34**	3.25 - 3.44	**3.29**	3.12 - 3.45	**3.27**	
Hospital Environment	*Room Clean*	*b11*	**2.76**	2.62 - 2.89	**2.94**	2.82 - 3.06	**2.86**	2.69 - 3.03	**2.85**	**2.67**
	Quiet	*b12*	**2.64**	2.50 - 2.77	**2.67**	2.54 - 2.81	**2.12**	1.92 - 2.32	**2.48**	
General Experience	*Bathroom Help*	*b14*	**2.68**	2.20 - 3.17	**2.96**	2.61 - 3.32	**2.72**	2.28 - 3.17	**2.79**	**2.65**
	Talk Pain	*b16*	**2.72**	2.53 - 2.91	**2.56**	2.37 - 2.76	**2.59**	2.40 - 2.77	**2.62**	
	Talk Pain Treatment	*b17*	**2.91**	2.80 - 3.03	**2.95**	2.84 - 3.06	**2.62**	2.46 - 2.78	**2.83**	
	Explain Med Purpose	*b18*	**2.79**	2.58 - 2.99	**2.84**	2.67 - 3.01	**2.74**	2.55 - 2.93	**2.79**	
	Explain Med Side Effects	*b19*	**2.37**	2.12 - 2.61	**2.43**	2.23 - 2.64	**1.82**	1.59 - 2.04	**2.21**	
After Hospital	*Assessment of Post-Discharge*	*b21*	**0.51**	0.43 - 0.58	**0.46**	0.39 - 0.52	**0.38**	0.29 - 0.48	**0.45**	**0.64**
	Receipt Discharge Guidance	*b22*	**0.82**	0.76 - 0.87	**0.84**	0.79 - 0.89	**0.82**	0.74 - 0.89	**0.83**	
Understanding of Care	*Preferences Seriously*	*b25*	**1.86**	1.78 - 1.94	**1.82**	1.75 - 1.89	**1.63**	1.53 - 1.73	**1.77**	**1.76**
	Understand Responsibilities	*b26*	**1.88**	1.80 - 1.96	**1.82**	1.75 - 1.88	**1.59**	1.49 - 1.69	**1.76**	
	Understand Purpose of Meds	*b27*	**1.86**	1.79 - 1.94	**1.83**	1.75 - 1.91	**1.58**	1.46 - 1.70	**1.76**	
			2.57		**2.62**		**2.47**			

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 6.3.2b. Outpatient Experience Sub-Item Scores (4-point Likert Scale)

	Experience Sub-Item	Item #	Male Outpatients 445		Female Outpatients 448		Female OB/FP 85		Item Mean	Domain Mean
			Mean Score	SD	Mean Score	SD	Mean Score	SD		
Care From Providers	*Courtesy & Respect*	*b4*	**3.29**	1.25	**3.28**	1.25	**3.33**	1.21	**3.30**	**3.25**
	Listen Carefully	*b5*	**3.32**	1.23	**3.29**	1.25	**3.45**	1.13	**3.35**	
	Explain	*B6*	**3.09**	1.36	**3.06**	1.35	**3.16**	1.33	**3.10**	
OPD Environment	*Cleanliness*	*B7n*	**2. 64**	0.62	**2.62**	0.64	**2.64**	0.67	**2.63**	**2.63**
	Waiting Room	*B8n*	**2.70**	0.60	**2.64**	0.63	**2.62**	0.64	**2.65**	
	Privacy	*B9*	**2.50**	1.24	**2.57**	1.14	**2.79**	1.24	**2.62**	
Timeliness	*Wait Time*	*b11n*	**2.61**	0.62	**2.63**	0.61	**2.56**	0.65	**2.60**	**2.65**
	Visit Time	*b12n*	**2.73**	0.53	**2.71**	0.59	**2.68**	0.58	**2.71**	
After OPD	*Receipt Discharge Guidance*	*D3*	**86%**	34.67	**82%**	38.15	**87%**	33.76	**85%**	**N/A**
			2.89		**2.85**		**2.90**			

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 6.3.3a. Inpatient Alignment of Experience Sub-Items and Satisfaction as Latent Variable

	Question	item #	Male Inpatients		Female Inpatients		OB-GYN		
			193		209		105		
			Coef	p-value	Coef	p-value	Coef	p-value	
Care From Nurses	*Courtesy & Respect*	*b4*	**0.43**	<0.001	**0.76**	<0.001	**0.84**	<0.001	0.77
	Listen Carefully	*b5*	**0.58**	<0.001	**0.86**	<0.001	**0.98**	<0.001	
	Explain	*b6*	**0.65**	<0.001	**0.83**	<0.001	**1.00**	<0.001	
	Timely	*b7*	**0.64**	<0.001	**0.89**	<0.001	**0.81**	<0.001	
Care from Doctors	*Courtesy & Respect*	*b8*	**0.79**	<0.001	**0.88**	<0.001	**1.18**	<0.001	0.83
	Listen Carefully	*b9*	**0.71**	<0.001	**0.81**	<0.001	**0.96**	<0.001	
	Explain	*b10*	**0.70**	<0.001	**0.71**	<0.001	**0.74**	<0.001	
Hospital Environment	*Room Clean*	*b11*	**0.44**	<0.001	**0.66**	<0.001	**0.16**	<0.001	0.30
	Quiet	*b12*	**0.18**	<0.001	**0.26**	<0.001	**0.07**	<0.001	
General Experience*	*Talk pain*	*b16*	**0.93**	<0.001	**0.86**	<0.001	**1.00**	<0.001	0.73
	Talk pain treatment	*b17*	**0.67**	<0.001	**0.81**	<0.001	0.33^	0.072	
	Explain Med Purpose	*b18*	**0.54**	<0.001	**0.49**	<0.001	0.45^	0.058	
After Hospital	*Asked Help Post-Discharge*	*b21*	-0.17^	0.401	**0.55**	<0.001	0.52^	0.095	0.83
	Receipt Discharge Guidance	*b22*	**0.59**	<0.001	0.54^	0.056	**1.62**	<0.001	
Understanding of Care^^	*Preferences Seriously*	*b25*	**0.80**	<0.001	**0.54**	<0.001	**0.88**	<0.001	0.75
	Understand Responsibilities	*b26*	**0.61**	<0.001	**0.77**	<0.001	**1.04**	<0.001	
	Purpose of Meds	*b27*	**0.56**	<0.001	**0.78**	<0.001	**0.76**	<0.001	
Other	*Wait time*	*c1*	**0.39**	<0.001	**0.47**	<0.001	**0.47**	<0.001	0.52
	Time spent	*c2*	**0.85**	<0.001	**0.56**	<0.001	**0.86**	<0.001	
	Privacy	*c4*	**0.33**	<0.001	**0.40**	<0.001	0.11^	0.502	
			0.60		0.68		0.84		

*Bathroom help & explanation of medicine side effects Qs excluded from this figure due to small N; ^Not significant

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 6.3.3b. Outpatient Alignment of Experience Sub-Items and Satisfaction as Latent Variable (Outpatient)

	Experience Sub-Item	Item #	Male Outpatients 445		Female Outpatients 448		Female OB/FP 85		Domain Mean
			Coef	p-value	Coef	p-value	Coef	p-value	
Care From Providers	*Courtesy & Respect*	*b4*	**0.41**	<0.001	**0.40**	<0.001	**0.45**	0.004	**0.37**
	Listen Carefully	*b5*	**0.39**	<0.001	**0.39**	<0.001	**0.42**	0.012	
	Explain	*B6*	**0.34**	<0.001	**0.29**	0.001	**0.23**	0.122	
OPD Environment	*Cleanliness*	*B7n*	**0.37**	0.033	**0.21**	0.242	**0.19**	0.502	**0.25**
	Waiting Room	*B8n*	**0.04**	0.824	**0.29**	0.114	**0.51**	0.081	
	Privacy	*B9*	**0.22**	0.012	**0.15**	0.127	**0.28**	0.072	
Timeliness	*Wait Time*	*b11n*	**0.14**	0.446	**0.20**	0.278	**0.50**	0.091	**0.37**
	Visit Time	*b12n*	**0.38**	0.067	**0.15**	0.424	**0.84**	0.010	
After OPD	*Receipt Discharge Guidance*	*D3*	**0.86**	0.007	**0.05**	0.859	**0.09**	0.876	
			0.35		0.24		0.39		

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 6.3.1a. Raw Satisfaction Scores by Education (Inpatient Data)

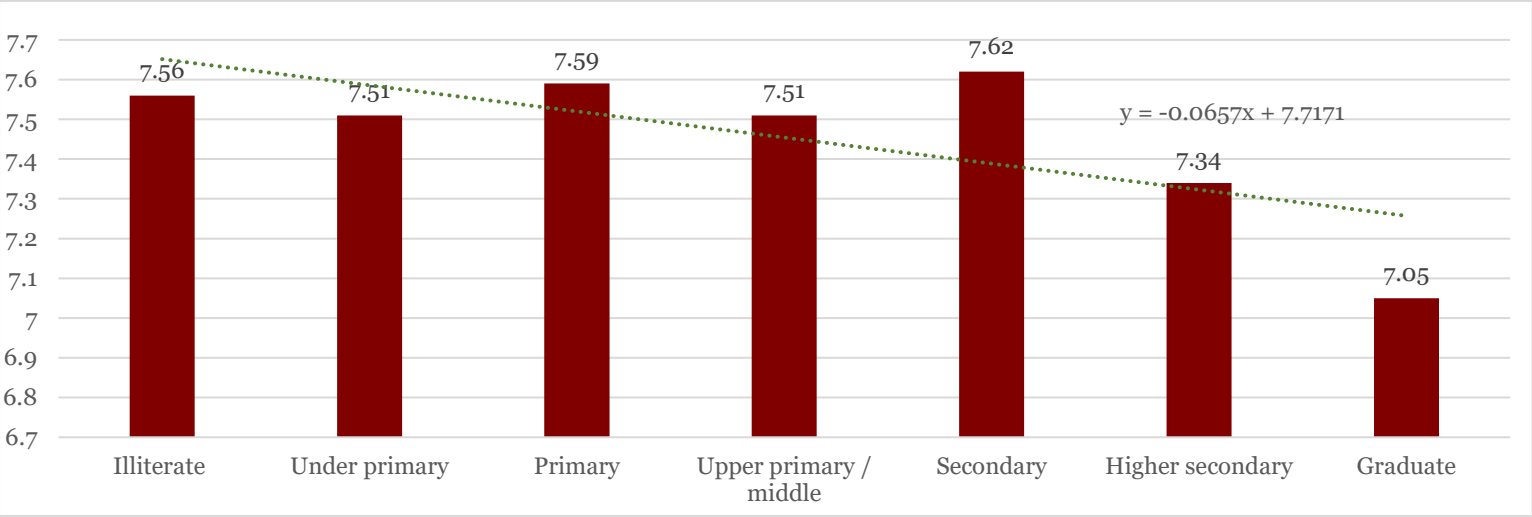
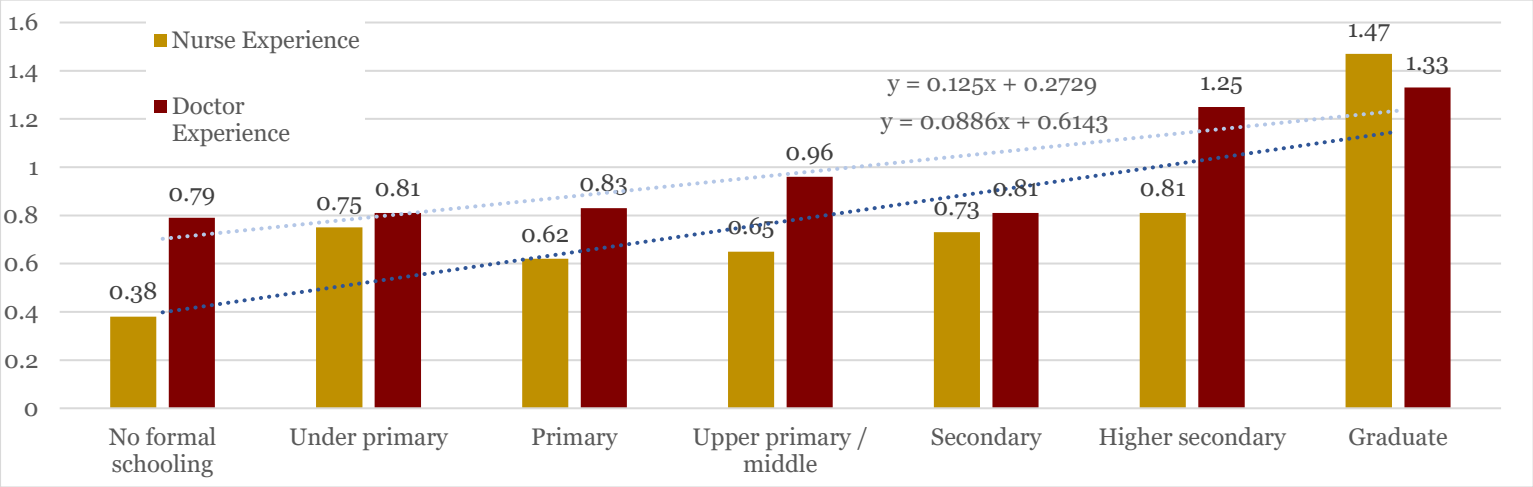


Figure 6.3.1b. Alignment of Experience Sub-Items and Satisfaction by Education (Inpatient Data)



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 6.3.4. Satisfaction Largely Driven By Experience Sub-Items, Even When Controlling for Visit-Level Factors (Inpatient Data)

	Model I			Model II		
	Coef	P-value	95% CI	Coef	P-value	95% CI
Care from Nurses	**0.207** (0.096)	0.030	0.020 – 0.395	0.184 (0.095)	0.055	-0.004 – 0.371
Care from Doctors	**0.714** (0.103)	0.000	0.512 – 0.916	**0.693** (0.102)	0.000	0.492 – 0.894
Hospital Environment	**0.284** (0.067)	0.000	0.152 – 0.415	**0.301** (0.067)	0.000	0.170 – 0.433

Notes: Specifications are estimated using linear OLS, standard errors are in parentheses.

Model I: Satisfaction rating as dependent variable, controlling for Hospital, Department, Interview Privacy & Presence of Family Member

Model II: Satisfaction rating as dependent variable, controlling for Hospital, Department, Interview Privacy, Presence of Family Member, Consideration / Choice of Alternate Facilities & Insurance Reimbursement

6.3.6 References

1. E. Larson, J. Sharma, M. A. Bohren, and Ö. Tunçalp, "When the patient is the expert: measuring patient experience and satisfaction with care.," *Bull. World Health Organ.*, vol. 97, no. 8, pp. 563–569, Aug. 2019.
2. T. C. Tsai, E. J. Orav, and A. K. Jha, "Patient Satisfaction and Quality of Surgical Care in US Hospitals," *Ann. Surg.*, vol. 261, no. 1, pp. 2–8, Jan. 2015.
3. T. Isaac, A. M. Zaslavsky, P. D. Cleary, and B. E. Landon, "The Relationship between Patients' Perception of Care and Measures of Hospital Quality and Safety," *Health Serv. Res.*, vol. 45, no. 4, pp. 1024–1040, Apr. 2010.
4. D. E. Wang, Y. Tsugawa, J. F. Figueroa, A. K. Jha, and S. R, "Association Between the Centers for Medicare and Medicaid Services Hospital Star Rating and Patient Outcomes," *JAMA Intern. Med.*, vol. 176, no. 6, p. 848, Jun. 2016.
5. A. K. Jha, E. J. Orav, J. Zheng, and A. M. Epstein, "Patients' perception of hospital care in the United States.," *N. Engl. J. Med.*, vol. 359, no. 18, pp. 1921–31, Oct. 2008.
6. A. J. APTER, S. T. REISINE, G. AFFLECK, E. BARROWS, and R. L. ZuWALLACK, "Adherence with Twice-daily Dosing of Inhaled Steroids," *Am. J. Respir. Crit. Care Med.*, vol. 157, no. 6, pp. 1810–1817, Jun. 1998.
7. R. Ruiz-Moral, L. A. Pérula de Torres, and I. Jaramillo-Martin, "The effect of patients' met expectations on consultation outcomes. A study with family medicine residents.," *J. Gen. Intern. Med.*, vol. 22, no. 1, pp. 86–91, Jan. 2007.
8. AHRQ, "NATIONAL HEALTHCARE DISPARITIES REPORT," 2011.
9. S. Roder-DeWan *et al.*, "Expectations of healthcare quality: A crosssectional study of internet users in 12 low-and middle-income countries," *PLoS Med.*, vol. 16, no. 8, 2019.
10. M. E. Kruk, S. Kujawski, G. Mbaruku, K. Ramsey, W. Moyo, and L. P. Freedman, "Disrespectful and abusive treatment during facility delivery in Tanzania: a facility

and community survey," *Health Policy Plan.*, vol. 33, pp. 26–33, 2018.
11. Z. A. Siam, M. McConnell, G. Golub, G. Nyakora, C. Rothschild, and J. Cohen, "Accuracy of patient perceptions of maternity facility quality and the choice of providers in Nairobi, Kenya: A cohort study," *BMJ Open*, vol. 9, no. 7, p. 29486, Jul. 2019.
12. N. Valentine, E. Verdes-Tennant, and G. Bonsel, "Health systems' responsiveness and reporting behaviour: Multilevel analysis of the influence of individual-level factors in 64 countries," *Soc. Sci. Med.*, vol. 138, pp. 152–160, Aug. 2015.
13. B. O. ' Hara and K. Caswell, "P70-133 Health Status, Health Insurance, and Medical Services Utilization: 2010," 2013.
14. J. Rhoades, "STATISTICAL BRIEF #83: The Uninsured in America, 2004: Estimates for the U.S. Civilian Noninstitutionalized Population under Age 65," *Medical Expenditure Panel Survey*, 2004. [Online]. Available: https://meps.ahrq.gov/data_files/publications/st83/stat83.shtml. [Accessed: 15-May-2019].
15. M. G. Cohen *et al.*, "Clinical characteristics, process of care, and outcomes of Hispanic patients presenting with non–ST-segment elevation acute coronary syndromes: Results from Can Rapid risk stratification of Unstable angina patients Suppress ADverse outcomes with Early implementation of the ACC/AHA Guidelines (CRUSADE)," *Am. Heart J.*, vol. 152, no. 1, pp. 110–117, Jul. 2006.
16. R. Correa-de-Araujo, B. Stevens, E. Moy, D. Nilasena, F. Chesley, and K. McDermott, "Gender differences across racial and ethnic groups in the quality of care for acute myocardial infarction and heart failure associated with comorbidities," *Women's Heal. Issues*, vol. 16, no. 2, pp. 44–55, Mar. 2006.
17. A. K. Jha, E. J. Orav, J. Zheng, and A. M. Epstein, "The Characteristics And Performance Of Hospitals That Care For Elderly Hispanic Americans," *Health Aff.*, vol. 27, no. 2, pp. 528–537, Mar. 2008.
18. D. E. Wang, Y. Tsugawa, J. F. Figueroa, and A. K. Jha, "Association Between the Centers for Medicare and Medicaid Services Hospital Star Rating and Patient Outcomes.," *JAMA Intern. Med.*, Apr. 2016.
19. A. K. Jha, E. J. Orav, J. Zheng, and A. M. Epstein, "Patients' Perception of Hospital Care in the United States," *N. Engl. J. Med.*, vol. 359, no. 18, pp. 1921–1931, Oct. 2008.

Chapter 7
Efficiency♦

7.1 Summary

Efficiency is one of the key indicators of the performance of a health system. In this report, we assess Odisha's healthcare delivery system's efficiency using primary survey data on healthcare facilities, public and private, and healthcare providers, those working in healthcare facilities and solo providers, from six districts of the state. We examine technical efficiency and allocative efficiency by constructing a set of ratio-based indicators that focus on the three key health inputs necessary to produce health output or health service: healthcare workers, curative care beds, and medicines. While many ratio-based efficiency indicators can be investigated, we focus on six indicators for which we have data from 554 facilities surveyed in the facility survey and 1124 providers surveyed in the providers surveys. While few studies in Odisha have investigated some of these inputs separately, our multi-pronged survey allows us to provide a more complete understanding of the health system of the state. For each of the efficiency indicators, we first examine their distributions, followed by their comparison to universally acceptable standards or estimates from other studies. We also present a disaggregated analysis to ensure that the observed inefficiency in the indicator is not merely an artifact of the large variations in the services provided by the different types of healthcare facilities and providers.

The primary sources of inefficiencies identified in this report are: a sub-optimal mix of trained nurses and allopathic doctors (a mean ratio of 1.68, which is less than the recommended ratio of two), shortage of physicians and ASHAs (63 to 70 percent of sanctioned doctor and ASHA positions are reported to be filled on average), high absenteeism rates of ASHAs (68 percent of ASHAs were present at work during the interview), low bed occupancy rates (the mean occupancy rate of 64 percent is less than the recommended 80 percent), a lack of commonly used essential medicines in stock (36 percent of the medicines were verified to be in stock at facilities with pharmaceutical services, on average), and minimal referral from higher to lower level facilities. At the provider level, we find evidence of physicians' low productivity in the form of fewer hours worked or unutilized capacity.

Overall, we find that there exists latent capacity in terms of human resources and curative care beds, but the inefficient use of these resources is a major limitation of Odisha's healthcare delivery system. Using ratio-based efficiency indicators constructed from facility-level and provider-level data, these findings supplement and expand the existing aggregate level evidence on the inefficient use of healthcare inputs in Odisha. Further, this report provides a wide-ranging assessment of inefficiencies, including often ignored inputs such as non-physician categories of healthcare workers, various levels of essential medicines, and inpatient beds. The

♦ This chapter was led by Bijetri Bose.

reduction of wastage of healthcare inputs in the state's health system can lead to the production of greater quantity and quality of healthcare services and outputs.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

7.2 Introduction

Efficiency is one of the key indicators of the performance of a health system. When trying to achieve universal health coverage, governments' obvious recourse is to expand the fiscal space for health. However, the scope of such expansion is limited in low-and-middle income countries [1], making the efficient use of resources available in the health system a critical goal to prioritize. The World Health Organization (WHO) identified inefficient use of resources as one of the main barriers to universal health coverage, with an estimated 20-40 percent of all health spending being wasted every year [2]. Attaining greater efficiency is particularly relevant for health systems facing increasing health spending due to changes in population demographics, disease burdens, healthcare prices, medical technology, or population expectations [3].

Odisha faces the challenge of improving several poor health outcomes, including high rates of maternal and child mortality, relative to similar Indian states and the Sustainable Development Goals (SDGs), increasing incidence of both communicable and non-communicable diseases, and inequity in the distribution of health outcomes. (See Chapter 2 for more details.) Simultaneously, there is also weak financial risk protection in the state (see Chapter 3), along with a low government revenue base and high health expenditures [4]. Acknowledging these realities, the government outlined improving efficiency as one of its goals as a part of its Healthcare Vision 2025 [5]. Moreover, enhancing efficiency is more relevant than ever for the state as it experiences the health and economic crises caused by the COVID-19 pandemic [6].

Given the relevance of efficiency in context of Odisha, it is important to assess how healthcare resources are currently being used. In this report, we evaluate the healthcare delivery system's efficiency in six districts of Odisha using primary survey data on public and private healthcare facilities and on healthcare providers working in healthcare facilities and as solo providers. We measure technical and allocative efficiencies using a set of ratio-based indicators, selected due to the availability of information in the survey data, that focus on the three key health inputs necessary to produce health outputs or health services: healthcare workers, including physicians, nurses, pharmacists, technicians, mid-level providers, and frontline workers; curative care beds; and medicines.

Although few existing studies have measured technical efficiency of the Odisha health system, they mostly use complicated statistical analysis and state- or district-level data on a few health inputs in the public hospitals [7-10]. Moreover, studies that examine ratio-based efficiency indicators focus on specific healthcare inputs or indicators and mostly rely on data from the public sector [11-15]. For some of the indicators considered in this chapter, we were unable to find any relevant studies set in Odisha. By considering multiple ratio-based efficiency indicators on multiple health inputs in the public and private sectors, this report provides a complete picture of the state's health system inefficiencies. We identify specific sources of resource wastage that supplements and expands the existing evidence on the inefficient use of health inputs in Odisha. Overall, we find that there exists latent capacity in terms of human resources and curative care beds, but the inefficient use of these resources is a major limitation of Odisha’s healthcare delivery system.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

In the next section, we explain how efficiency is defined and measured, followed by a description of the data and methods used for our analysis. We then summarize the results in Section 7.4, focusing on technical and allocative efficiencies in the health system. The last section concludes with a brief discussion of the implications of the findings in this chapter.

7.2.1 Defining and Measuring Efficiency

An efficient health system is one in which the inputs allocated to produce health outcomes, including "equipment, supplies, ideas, and energy," are used optimally without wastage [16]. There are two commonly used concepts of efficiency in economics: technical efficiency and allocative efficiency. Technically efficiency refers to using the least possible amounts of health inputs to produce a given amount of health output. Allocative efficiency captures whether health inputs are allocated among the production of different health outcomes to maximize society's health. Simply put, technical efficiency is about "doing things the right way," while allocative efficiency focuses on "doing the right thing" [17].

In this report, we use ratio-based efficiency indicators to measure efficiency. These indicators specify the resource used per unit of health output and are typically constructed by dividing the amount of health inputs used by the amount of health output produced. Such ratio-based indicators that investigate the performance of an input or a subset of inputs are also referred to as partial efficiency indicators since they provide insights about a specific part of the production process [18]. We chose the ratio-based efficiency indicators over frontier analysis methods of computing efficiency scores because the latter are data and time-intensive, sensitivity to model specifications and the data used, and are difficult to interpret.

We analyze three health inputs in this report: (1) healthcare workers, (2) curative care beds, and (3) medicines. These inputs form the core of any health system and are the costliest inputs [19]. In addition to technical inefficiencies in the use of these three resources in Odisha, the report also sheds light on the allocative inefficiencies arising between the primary and secondary/tertiary levels of care. While there are other ratio-based efficiency indicators [20], our choice of indicators analyzed here is driven by data availability from the facility and provider surveys. The efficiency indicators considered can be grouped under the following broad categories:

- Staff-mix
- Shortage of healthcare workers
- Absenteeism of healthcare workers
- Productivity of physicians
- Curative bed occupancy
- Shortage of essential medicines
- Referral between different levels of care.

For each efficiency indicator, we first examine the main summary statistics to understand their levels and distributions. To analyze whether the use of a health input is inefficient, we then compare the indicators to universally accepted standards. If such ethical benchmarks do not exist, we compare the indicators to similar estimates in other India based studies. When an indicator manifests

inefficiency, we present a disaggregated analysis to ensure that the observed inefficiency in the indicator is not merely an artifact of the large variations in the services provided by the different types of healthcare facilities and providers. For example, when examining wastage in the use of curative care beds, small healthcare facilities may have low bed occupancy rates relative to the accepted benchmark. They cannot be considered inefficient, but if only a few of these small facilities report low bed-occupancy rates, that would indicate inefficiency. We examine the efficiency indicators disaggregated by the healthcare facility and provider characteristics, including location, ownership, types of healthcare facilities, facility size, provider qualification, and others.

7.3 Research Design

Data on 554 healthcare facilities in the six sampled districts in Odisha was collected through surveys of the medical or administrative officers in charge (Survey 2 and 3 in Table 1.1). Here, we briefly outline the sampling strategy and the summary statistics for the healthcare facilities and providers in the data. A detailed description of the survey and the sampling strategies is available in Appendix 2.

The facilities in our sample include:

Public healthcare facilities providing secondary and tertiary care: A census of the public hospitals, Community Health Centers (CHC), and other hospitals in the sampled districts was undertaken. Public hospitals include Medical College Hospitals, District Hospitals, and Sub-Divisional Hospitals. Other hospitals consist of first referral units, municipal hospitals, and other government hospitals. Of the four public Medical College Hospitals in the sampled districts, two did not provide consent for the survey, while interviews at the All India Institute of Medical Sciences (AIIMS), Bhubaneswar was interrupted because of COVID-19. Further, two district hospitals, two other hospitals, and one CHC did not consent to the survey. The final sample size of public healthcare facilities at the secondary and tertiary levels is 122.

Private health facilities providing secondary and tertiary care: In the absence of a comprehensive central database with the details of private hospitals in Odisha, a database of private hospitals and nursing homes, excluding single-specialty facilities, in the sampled districts was compiled from secondary sources. The list included 63 private hospitals, of which 36 hospitals gave consent for the survey and for whom complete data is available.

Public health facilities providing primary care: Primary care in Odisha is provided in Primary Health Centers (PHC), Sub-Centers (SC), and Health and Wellness Centers (HWC). A census of PHCs was undertaken at the block level with the help of government records. However, some of the PHCs were converted into HWCs or were upgraded to CHCs, resulting in a mismatch between the targeted number of facilities and the number of surveyed facilities. The sample included SCs and HWCs located in or close to the sampled primary sampling units for the household survey, along with those identified as a preferred health provider for outpatient care by the surveyed households. Three SCs did not have any staff available on the day of the interview, and there were 39 SCs where one SC was

serving two PSUs in our study.[11] Since only seven HWCs were surveyed, they are clubbed with SCs for the analysis in this report. There are 396 primary care facilities in the sample.

The district-wise distribution of the sampled healthcare facilities is presented in Table 7.1. Note that only one public Medical College Hospital, one private Medical College Hospital, and one private Ayurveda, Yoga, Unani, Siddha and Homoeopathy (AYUSH) hospital are included in the sample. Also, note that no private hospitals were surveyed in Rayagada.

Table 7.1: District-wise distribution of surveyed facilities

	(1) Keonjhar	(2) Balasore	(3) Khurda	(4) Rayagada	(5) Kalahandi	(6) Jharsuguda	(7) Total
Medical College	.	0 (1)	1 (3)	.	.	.	1 (4)
District Hospital	0 (1)	0 (1)	1 (1)	1 (1)	1 (1)	1 (1)	4 (6)
Sub-district Hospital	2 (2)	1 (1)	.	1 (1)	1 (1)	.	5 (5)
Other Hospital	6 (6)	1 (1)	17 (19)	2 (2)	2 (2)	1 (1)	29 (31)
Community Health Center	16 (17)	17 (17)	16 (16)	11 (11)	17 (17)	6 (6)	83 (84)
Public Facilities	24	19	35	15	21	8	122
Medical College	.	.	1	.	.	.	1
Tertiary Hospital	1	.	3	.	1	.	5
Secondary Hospital	.	.	7	.	1	.	8
Nursing Homes	1	4	14	.	1	1	21
Ayush Hospital	.	.	1	.	.	.	1
Private Facilities	2	4	26	0	3	1	36
Primary Health Center	24 (31)	45 (52)	26 (31)	13 (13)	16 (23)	5 (8)	129 (158)
Sub Center	49	75	32	10	62	32	260 (375)
Health & Wellness Center	3	.	1	.	1	2	7
Primary care Facilities	76	120	59	23	79	39	396

Notes: Targeted sample sizes of facilities in parentheses.

Table 7.2A presents the descriptive statistics of the healthcare facilities in our data. All public hospitals in our data, including Medical College Hospital, District Hospitals, and Sub-Divisional Hospitals, are in urban areas. They provide basic to super-specialty services for both inpatients and outpatients. They also offer diagnostics and pharmaceutical services. These are typically large facilities with a mean bed size of 189 and a mean sanctioned staff size of 115. The majority of CHCs in the sample provide inpatient, outpatient, diagnostics, and pharmacy services in rural areas. While all CHCs offer services in basic specialties such as general medicine, surgery, obstetrics and gynecology, pediatrics, dental, other specialties including neonatal, ophthalmology, ENT, orthopedic, psychiatry, accident and trauma services, intensive care, and burns are also available; 71 percent CHCs deliver super-specialties. CHCs are considerably smaller than public hospitals in terms of bed and staff size. The unavailability of continuous electricity is an infrastructural problem, as reported by 65 percent of CHCs.

Nearly half of the other hospitals are in urban areas, focusing primarily on outpatient and pharmacy services. 76 percent of these facilities also provide diagnostic services. These are primarily one to six bedded facilities, with only 18 percent having more

[11] The reasons for the shortfall in the number of PHCs and SCs are based on the observations shared by the field team during the survey.

beds. The mean sanctioned staff size in these facilities is nine. Most private hospitals are also situated in urban areas and provide inpatient care, often specializing in a few basic specialties. Fewer private facilities provide outpatient care than inpatient care, contrary to the pattern in public facilities. About 60 percent of private hospitals offer diagnostics or pharmacy services. They have a mean bed size of 34 and the mean staff size of 66.

Except for a handful of primary health facilities, all PHCs and SCs are in rural areas. Both facilities focus on the provisions of outpatient care, with many providing pharmacy services. 60 percent of primary care facilities also provide diagnostic services. In addition to these, SCs also engage in outreach activities in the community. These facilities are typically small and have a poor infrastructure with a lack of water on the premises and continuous electricity.

Table 7.2A: Facility-level summary statistics (in percentages)

	(1) Public Hospital	(2) CHC	(3) Other Hospital	(4) Private Hospital	(5) PHC	(6) SC/ HWC
Urban	100.00	14.5	51.7	86.1	0.7	1.9
Service provided: Inpatient	100.00	97.6	37.9	97.2	9.3	0.7
Service provided: Outpatient	100.00	100.00	100.00	94.4	100.00	99.6
Service provided: Pharmacy	100.00	100.00	100.00	63.9	93.0	80.9
Service provided: Diagnostics	100.00	97.6	75.9	61.1	59.7	60.7
Specialties: Basic	0	1.3	28.6	38.9	.	.
Specialties: Basic, other	0	27.5	25.0	33.3	.	.
Specialties: Basic, other, super	100.00	71.3	46.4	27.8	.	.
Facility size: 1-6	0	19.8	81.8	3.0	100.00	100.00
Facility size: 7-30	0	71.6	9.1	81.8	0	0
Facility size: 31-100	40.0	8.6	9.1	9.1	0	0
Facility size: > 100	60.0	0	0	6.1	0	0
Staff size: 1-3	0	0	0	0	10.9	94.0
Staff size: 4-9	0	13.4	55.2	11.8	82.2	4.9
Staff size: 10-33	0	79.3	44.8	58.8	7.0	1.1
Staff size: 34-97	50.0	7.3	0	23.5	0	0
Staff size: >97	50.0	0	0	5.9	0	0
Infrastructure: Water on premise	100.00	97.6	96.4	100.0	89.1	54.7
Infrastructure: Continuous electricity	100.00	34.9	62.1	61.1	24.8	46.1
Infrastructure: Working phone	90.0	60.2	51.7	88.9	27.0	37.7
Observations	10	83	29	36	129	267

Notes: Categorization of specialties, facility size & staff size are based on the IPHS guidelines. Basic specialties include general medicine, surgery, obgyn, pediatrics, dental; other specialties include neonatal, ophthalmology, ENT, orthopedic, psychiatry, accident & trauma services, intensive care, burns; all other specialties are classified as super specialties. Facility size is measured by the number of beds and staff size is measured by the number of sanctioned healthcare workers.

In addition to the facility-level data, data on 1124 physicians was also collected through two related surveys.[12] In the first survey, providers were interviewed at the surveyed healthcare facilities at all levels of care. Individual providers at different career levels from a few pre-selected departments (general medicine, general surgery, obstetrics, and gynecology) were randomly selected for interviews. In the

[12] The survey also surveyed other healthcare providers such as pharmacists and laboratory technicians. These are excluded from this analysis. Physicians with incomplete surveyed are also excluded from the analysis.

second survey, solo providers were interviewed at privately owned clinics in their homes, offices, or chemist shops. Since the universe is unknown, a list of solo providers was compiled using two strategies: (1) providers were identified by individuals in the household listing as ones they usually visit or have recently visited, (2) providers located within a three km radius of a healthcare facility till the PHC level were mapped, often using the snowballing technique. A random sample of solo providers was chosen to be interviewed from the compiled list.

Table 7.2B summarizes the characteristics of the physicians surveyed. The mean age of physicians is 52, with a range of 22 to 83. Most physicians are males, especially in public and private hospitals and among solo providers. The mean years of experience vary from eight to 29 years, depending on the physician type. While 97 percent of physicians interviewed in public hospitals reported having a Bachelor of Medicine, Bachelor of Surgery (MBBS), or higher degrees, only 18 percent of physicians in PHCs are medically qualified where AYUSH providers are predominant. As many as six percent of solo providers have non-medical degrees such as Master of Science, Bachelor of Physiotherapy, and diploma courses. There are more specialist physicians in public and private hospitals than in the other healthcare facilities, as well as among solo providers.

Overall, Tables 7.2A and 7.2B show the variance among the different types of healthcare facilities and providers, underscoring the importance of in-depth examination of each indicator to draw correct conclusions about the health inputs' efficiency.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 7.2B: Provider-level summary statistics

	(1) All	(2) Public Hospital	(3) CHC	(4) Other Hospital	(5) Private Hospital	(6) PHC	(7) Solo Provider
Age	51.66	49.97	35.18	43.54	53.76	40.56	58.00
	(14.28)	(9.05)	(9.51)	(13.77)	(13.97)	(7.93)	(11.71)
Gender	79.9	84.7	70.1	57.1	83.1	59.2	86.4
	(40.1)	(36.3)	(45.9)	(50.2)	(37.8)	(49.4)	(34.3)
Experience	22.89	22.76	7,95	15.91	26.02	11.46	28.64
	(13.48)	(9.444)	(8.47)	(13.12)	(14.81)	(6.685)	(11.18)
Urban	67.4	100.0	16.8	54.3	91.5	1.7	87.1
	(46.9)	(0.00)	(37.5)	(50.5)	(28.1)	(12.9)	(33.5)
Qualification: MBBS	82.0	96.6	79.0	65.7	96.6	16.7	92.5
	(38.4)	(18.3)	(40.8)	(48.2)	(18.3)	(37.4)	(26.3)
Qualification: Alternate	14.0	0.0	19.8	31.4	3.4	82.5	1.8
	(34.7)	(0.0)	(39.9)	(47.1)	(18.3)	(38.2)	(13.1)
Qualification: None	4.0	3.4	1.2	2.9	0.0	0.8	5.7
	(19.6)	(18.3)	(10.9)	(16.9)	(0.0)	(9.1)	(23.2)
Specialization: Generalist	41.5	35.6	42.5	37.1	37.3	15.8	46.9
	(49.3)	(48.3)	(49.6)	(49.0)	(48.8)	(36.7)	(49.9)
Specialization: Specialist	45.1	64.4	37.1	31.4	62.7	0.8	52.3
	(49.8)	(48.3)	(48.5)	(47.1)	(48.8)	(9.1)	(50.0)
Specialization: AYUSH	13.3	0.0	20.4	31.4	0.0	83.3	0.7
	(34.0)	(0.0)	(40.4)	(47.1)	(0.0)	(37.4)	(8.5)
Association member	36.6	62.7	41.9	40.0	62.7	26.7	32.3
	(48.2)	(48.8)	(49.6)	(49.7)	(48.8)	(44.4)	(46.8)
Observations	1124	59	167	35	59	120	684

Notes: All variables are in percentages, except age and experience which are in years. SD in parentheses. Qualifications are grouped as MBBS degree or higher; alternative medical degree, including bachelor degree in Ayurveda, Homeopathy, and Unani; and no medical degree. Those with no medical degree report having a B.Com., B.A., M.A., M.Sc., Diploma in pharmacy or nursing, and others.

7.3.1 Efficiency Indicators

Using the above data, we constructed six technical efficiency indicators and one allocative efficiency indicator. For the healthcare worker efficiency indicators, there are separate indicators for the different types of healthcare workers on whom we have information. The efficiency indicators are defined as follows:

i. **Staff mix:** Staff mix in healthcare facilities, defined as the combination of different categories of health workers employed in a healthcare facility, is examined using three indicators: (1) the trained nurse to allopathic doctor ratio, (2) the pharmacist to allopathic doctor ratio, and (3) the technician to allopathic doctor ratio. The three non-physician categories' choice is based on the literature [21]. Following the National Occupation Classification [22], trained nurses are defined to include those with Master of Sciences (MSc), Bachelor of Sciences (BSc), General Nursing and Midwifery (GNM), and Auxiliary Nurse Midwifery (ANMs) degrees;[13] and allopathic doctors include general physicians and specialists. The survey contains information on laboratory technicians and imaging technicians, who are grouped together. The ratios are calculated using the number of sanctioned positions, not the

[13] Untrained nurses and trained but unaccredited nurses are excluded from the nurse-doctor ratio.

number of positions filled at the interview time, to identify workforce planning inefficiencies.

ii. **Shortage of healthcare workers:** Shortage (or surplus) of healthcare workers is measured as the percentage of sanctioned positions that are reported to be filled in each healthcare facility. The healthcare workers considered are all doctors, all nurses, paramedics, mid-level providers (MLP), and Accredited Social Health Activists (ASHAs). All doctors include general physicians, specialists, dentists, and AYUSH physicians. All nurses include trained registered nurses in facilities providing secondary and tertiary care as well as trained but unaccredited nurses and untrained nurses in primary healthcare facilities. Paramedics include laboratory technicians, imaging technicians, pharmacists, and other paramedical workers. MLPs include mid-level community health officers, nurses, and AYUSH physicians.

iii. **Presence of healthcare workers:** Absenteeism of healthcare workers (or the lack of it) is indicated by the percentage of filled positions that are reported to be on duty in each healthcare facility at the time of the interview. Since the interviewers were instructed to create the list of employees on duty by verifying the staff lists along with information provided by the principal respondent, measurement error is probable in this variable due to the interviews being conducted at various times in the facilities. The healthcare workers for whom absenteeism was assessed are all doctors, nurses, paramedics, MLPs, and ASHAs.

iv. **Productivity of physicians:** Productivity in this report is measured using four indicators: (1) average number of patients reported to be seen per week by a doctor, (2) time (in minutes) spent per patient as reported by a doctor, (3) the number of days worked in a week, and (4) number of hours worked per day by a doctor. The latter two are calculated based on the working hours reported by doctors on all seven days of the week. Since only two percent of the solo providers answered these questions, the analysis of the number of days and hours workers is restricted to physicians interviewed in healthcare facilities. Given that the four productivity measures are self-reported, these are likely to be over-estimates relative to doctor practice observations as shown in other studies [23, 24].

v. **Curative bed occupancy:** Curative care bed occupancy rate is the number of inpatient bed days divided by the number of available beds in a given period. In the survey, the respondents at healthcare facilities with inpatient services were asked to report the bed occupancy rate in the last year at the facility. Facilities with day beds are excluded from the analysis.

vi. **Shortage of essential medicines:** Shortage of essential medicines is examined by surveying whether healthcare facilities providing pharmaceutical services carry stock of 68 frequently used medicines on the Odisha Essential Medicine List (EML) in the correct dosage [25].[14] Of the 68 medicines considered, 51 are medicines on the primary care level EML and must be present in all healthcare facilities, while 17 are medicines on the secondary

[14] The 2014 Odisha EML contains over 350 medicines.

care level EML and must be in stock of secondary and tertiary facilities. The list of 68 medicines was compiled through discussions with pharmacists and healthcare providers in Odisha.

vii. **Referral between different levels of care:** In this report, the percentage of facilities reporting referral of complex or straightforward cases to higher-level or lower-level facilities is used as an indicator of allocative inefficiency.

7.4 Results

In this section, we discuss the results on the efficiency indicators that are presented in two parts. The first part summarizes the indicators of technical efficiency, while the second part discusses the indicators of allocative efficiency. Due to the nature of the data collected, there are six indicators of technical efficiency indicators and one for allocative efficiency.

7.4.1 Technical Efficiency

The distributions of the technical efficiency indicators are presented in Table 7.3. Panels A and B present the summaries of the indicators measured at the facility level and the provider level, respectively. Overall, the survey data indicate inefficiency in the use of the three resources considered in the report – healthcare workers, hospital beds, and medicines – as indicated by the sub-optimal mix of trained nurses and allopathic doctors, shortage of physicians and ASHAs, high absenteeism rates of ASHAs, low bed occupancy rates, lack of commonly used essential medicines in stock, and low productivity of physicians.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 7.3: Summary statistics of technical efficiency indicators

	(1) Mean	(2) Median	(3) SD	(4) Min	(5) Max	(6) N
			Panel A			
Nurse-doctor ratio	1.68	1.00	2.05	0.00	17.50	258
Pharmacist-doctor ratio	0.66	1.00	0.40	0.00	2.00	239
Technician-doctor ratio	0.45	0.25	0.49	0.00	3.00	195
% of filled sanctioned doctor positions	63.34	57.14	35.25	0.00	200.00	289
% of filled sanctioned nurse positions	87.87	100.00	29.81	0.00	250.00	519
% of filled sanctioned paramedic positions	81.47	100.00	32.19	0.00	150.00	463
% of filled sanctioned MLP positions	83.23	100.00	35.69	0.00	100.00	112
% of filled sanctioned ASHA positions	69.81	100.00	41.42	0.00	100.00	283
% of on duty filled doctor positions	86.91	100.00	56.54	0.00	650.00	254
% of on duty filled nurse positions	92.36	100.00	36.04	0.00	700.00	494
% of on duty filled paramedic positions	89.01	100.00	29.43	0.00	200.00	419
% of on duty filled MLP positions	92.16	100.00	26.20	0.00	122.22	96
% of on duty filled ASHA positions	67.50	100.00	44.51	0.00	100.00	239
Bed occupancy rate	63.69	70.00	28.58	0.00	100.00	147
% of select medicines from EML in stock	36.25	32.35	22.92	0.00	100.00	481
Observations			554			
			Panel B			
Number of outpatients seen a week	175.92	120.00	159.81	5.00	600.00	1122
Time spent per patient (min)	9.89	10.00	4.41	1.00	20.00	1121
Number of days worked in a week	6.21	6.00	1.10	0.00	7.00	440
Number of hours worked in a day	6.24	6.00	1.76	0.86	11.00	436
Observations			1124			

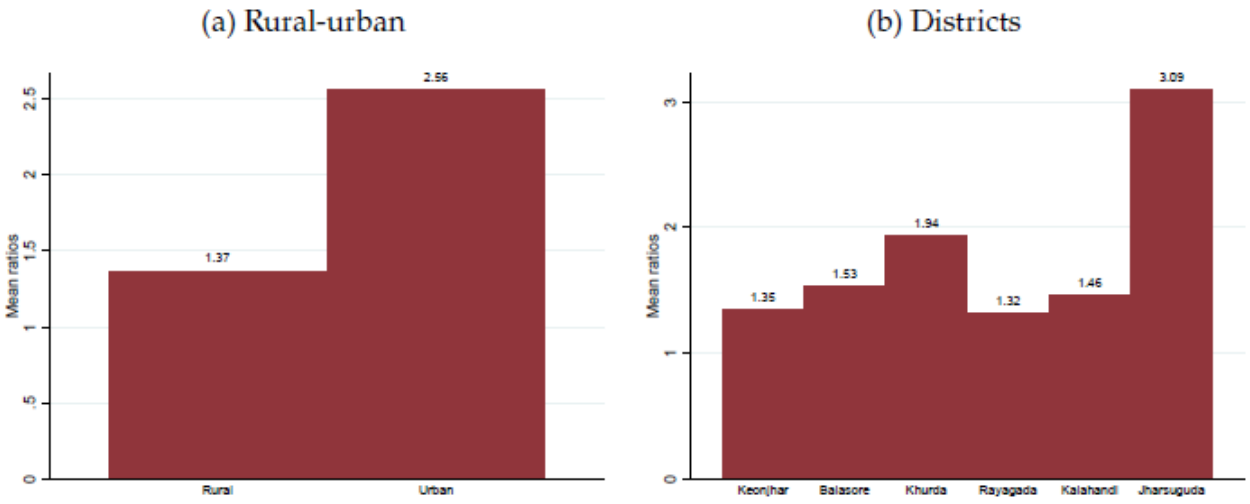
Notes: The observations are different for each indicator because of missing data. In Panel A this also occurs because an indicator is not applicable to certain facility types. In Panel B, the number of days and hours workers is reported only for providers interviewed at facilities. For indicators in Panel B, outliers are capped at the 95 percentile.

7.4.1.1 Staff-mix

The efficiency of the healthcare workers starts with proper workforce planning by the government in the public sector and the management in the private sector. An important aspect of the planning is to ensure an appropriate staff-mix. There is evidence, globally [26-28] and from India [29], to support the allocation of tasks to less costly healthcare workers who are trained to do the task reliably. Inadequate reliance on non-physician healthcare workers indicates a wastage of time, money, and human capital and can, therefore, be utilized as an indicator of inefficiency. There is a sub-optimal mix of sanctioned trained nurses and sanctioned allopathic doctors in Odisha's sampled districts. The mean nurse-doctor ratio is 1.68 across the surveyed healthcare facilities that reported having at least one sanctioned allopathic doctor, as shown in Table 7.3. This is lower than the minimum ratio recommended in the 1993 World Development Report [30]. According to this report, the rule of thumb is that the ratio should exceed 2:1 as a minimum with 4:1 or higher for cost-effective and quality care. Further, as suggested by the indicator range of 0 to 17.5,

inefficiencies in many facilities occur in the form of under and over provision of trained nurses relative to allopathic doctors. Of the 258 healthcare facilities till the PHC level that have at least one sanctioned allopathic doctor,[15] 10 percent reported having no sanctioned nurses, and seven percent reported having more than four sanctioned nurses for each sanctioned doctor.

Figure 7.1: Mean nurse-doctor ratio: by location



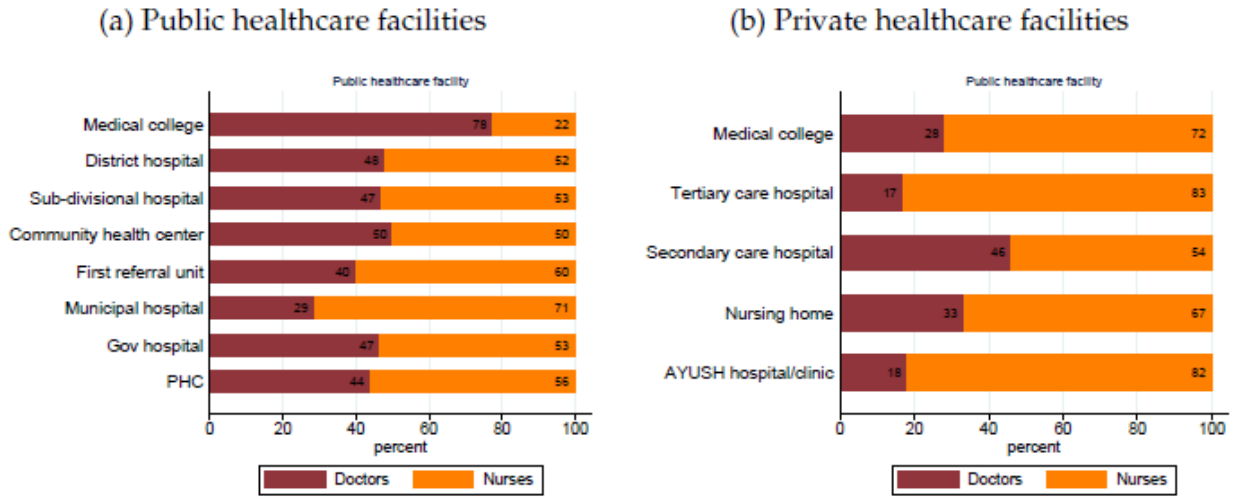
There is also considerable variation in the nurse-doctor ratio based on the location of the healthcare facilities. The number of sanctioned trained nurses per sanctioned allopathic doctors is smaller in rural areas (1.37) than in urban areas (2.56), as shown in Figure 7.1. This figure also shows the unequal distribution of the ratio across districts. Rayagada, the district with the second-highest concentration of tribal population in Odisha, has only 1.32 trained nurses sanctioned per allopathic doctor, on average. Only one district – Jharsuguda, a highly urbanized mining town - has a mean nurse-doctor ratio greater than the recommended minimum of two.

Since the number of healthcare workers sanctioned should account for the set of services provided at a healthcare facility along with the projected patient load, it is crucial to examine the staff-mix for each type of facility. Our data reveal that private hospitals have a mean nurse-doctor ratio that is greater than two. This is true for all types of private hospitals, except for secondary care hospitals, where the mean nurse-doctor ratio is 1.5 (Figure 7.2). In the public domain, all government healthcare facilities, excluding municipal hospitals, have approximately 1 to 1.5 trained nurses sanctioned for each allopathic doctor, on average. The mean nurse to doctor ratio across all public healthcare facilities is 1.43. Note that the Indian Public Health Standards (IPHS) guidelines for public healthcare facilities recommend a higher nurse-doctor ratio than the average ratio reported by the government facilities in our survey [31]. For example, the guidelines state that there must be a minimum of three staff nurses and one MBBS doctor in a PHC, but the mean nurse-doctor ratio was 1.3 for the surveyed PHCs.

[15] Data on the number of sanctioned healthcare workers is missing for 3 healthcare facilities.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 7.2: Mean nurse-doctor ratio: by facility type

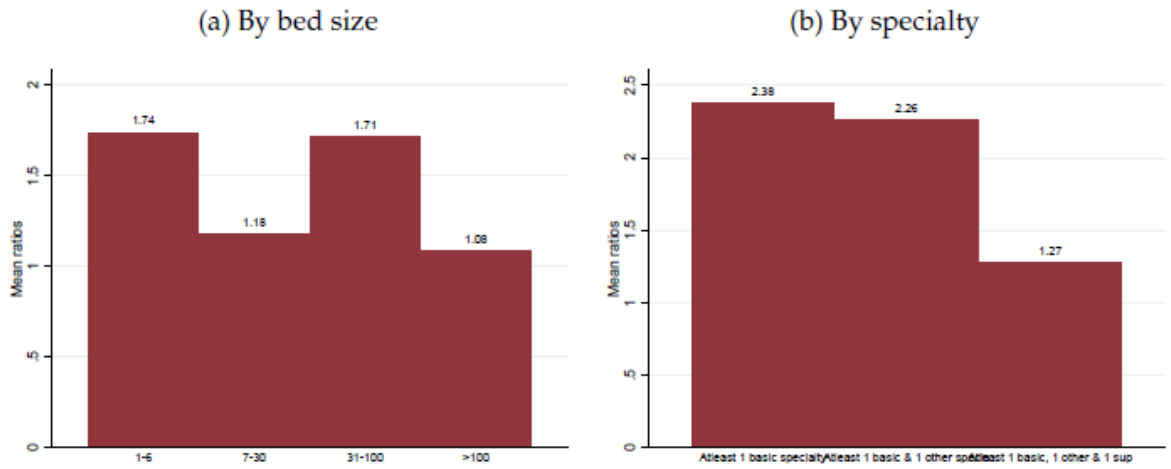


Another way to ensure that the low nurse-doctor ratios in the public sector do not reflect small patient loads or the limited services offered is to examine the relationship between staff-mix ratio and facility characteristics, including facility size and types of specialty services provided, as done in Figure 7.3. While we find no clear correlation between the bed size and the mean nurse-doctor ratio, facilities with more specialized departments have fewer sanctioned nurses per allopathic doctors. This is likely because the substitution of the more specialized tasks of doctors by nurses is unfeasible. Yet, the 1.27 mean nurse-doctor ratio in government healthcare facilities with super-specialties is well below the minimum recommended ratio.

For healthcare facilities with pharmaceutical and diagnostic services and positive numbers of sanctioned relevant healthcare workers, there are 0.7 and 0.5 sanctioned pharmacists and technicians per allopathic doctor, on average (Table 7.3). With no global benchmarks and very few studies on the ratio of pharmacists or technicians to doctors, it is difficult to judge whether these average ratios indicate inefficiencies. However, when 26 percent of facilities till the PHC level that conduct diagnostic/imaging tests (and have at least one sanctioned allopathic doctor) report having no sanctioned technicians (eight CHCs, five other hospitals, one private hospital, and 37 PHCs), there is a problem of untrained nurses or over-qualified doctors conducting the tests. Similar inefficiencies in the form of zero pharmacists at facilities providing pharmaceutical services are missing.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 7.3: Mean nurse-doctor ratio in public healthcare facilities



It is important to note that some healthcare facilities (two CHCs, one other hospital, one private hospital, and 22 PHCs) have no allopathic doctors sanctioned to provide care. Our data also indicates that 10 SCs reported having sanctioned allopathic doctors, exceeding the minimum staff requirement of one ANM and one health worker as per the IPHS. Although these facilities are excluded from the staff-mix analysis, they may be inefficient if doctors' presence does not correspond to the services available at these facilities.

7.4.1.2 Shortage of healthcare workers

The shortage of physicians is an acute problem in Odisha. The doctor to population ratio in the state was 1:2597 in 2019, much lower than the national average of 1:1457 [32]. This shortage is reflected in our data, which indicates the vacancy of 807 sanctioned doctor positions at the time of the interview (September 2019 to January 2020) across the 289 surveyed healthcare facilities with sanctioned doctor positions.[16] On average, only 63 percent of the sanctioned doctor positions in a healthcare facility were filled, as shown in Table 7.3. Since the WHO recommendation on the appropriate number of doctors is at the in terms of doctor-patient ratio, we compare our indicator of physicians' shortage, the mean percentage of sanctioned doctor positions that are filled, to 75 percent. This benchmark approximates the national average of the percentage of doctor sanctioned positions filled across various public healthcare facilities, as recorded in the 2018-19 Rural Health Statistics [33]. Using this benchmark confirm the shortage of doctors in the six sampled districts of Odisha. We also find that 35 healthcare facilities in our sample report having no doctor positions filled.

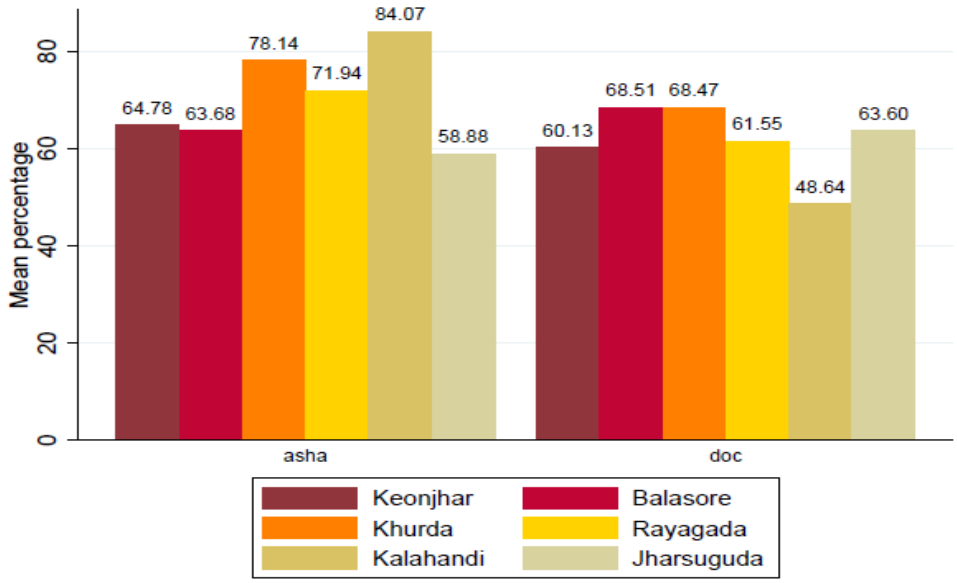
Using the same benchmark, we also observe a shortage of ASHAs across the sampled primary healthcare facilities. Across the PHCs and SCs with sanctioned ASHA positions, 1063 positions remain vacant. Only 70 percent of the sanctioned ASHA position were reported being filled on average. Given ASHA's role as frontline

[16] Data on the number of sanctioned and filled doctor positions is missing for 3 healthcare facilities.

workers to support ANMs in the primary care facilities and to carry out the vital outreach activities, their shortage can create health system inefficiencies.

The shortage of doctors and ASHAs is not uniform across locations. There are slightly fewer doctors in urban areas than in rural areas – a mean of 58 percent of the sanctioned doctor positions are filled in urban facilities compared to the 65 percent in rural facilities. Figure 7.4 indicates that there is no one district with the least shortage of both doctors and ASHAs. In fact, Kalahandi - a district with one of the lowest rates of urbanization in the state – has the highest percentage of filled ASHA positions and lowest percentage of filled doctor positions.

Figure 7.4: Mean percentage of sanctioned posts filled: By district



When looking across facility types in Table 7.4, public hospitals, other hospitals, and private hospitals have some of the lowest mean percentages of sanctioned doctor positions filled. Figure 7.5 presents a disaggregated picture of district hospitals and municipal hospitals in the public system and secondary care hospitals in the private system suffering from the greatest shortages. Interestingly, there is a stark difference in the situation at the public and the private Medical College Hospitals in the data. For the few PHCs that have ASHAs sanctioned, probably because the SCs nearby are non-functioning, 60 percent of ASHA positions are filled on average. This is considerably lower than the mean of 72 percent for SCs.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 7.4: Mean percentage of sanctioned doctors & ASHA positions that are filled

	(1) All	(2) Public Hospital	(3) CHC	(4) Other Hospital	(5) Private Hospital	(6) PHC	(7) SC/ HWC
All doctors	63.34	56.31	66.28	55.57	52.32	67.61	54.55
	(35.25)	(22.61)	(30.08)	(38.48)	(37.02)	(36.83)	(41.56)
Generalists	59.50	52.71	70.94	63.37	58.21	53.12	40.00
	(45.53)	(21.89)	(40.96)	(44.58)	(40.09)	(49.69)	(51.64)
Specialists	55.87	63.62	57.92	53.70	49.95	.	.
	(41.23)	(35.03)	(42.21)	(46.98)	(40.47)	(.)	(.)
Dentists	80.56	79.63	82.35	0.00	80.00	.	.
	(38.96)	(35.14)	(38.50)	(.)	(44.72)	(.)	(.)
AYUSH physicians	77.34	75.00	77.61	56.25	100.00	79.66	77.78
	(41.54)	(35.36)	(41.09)	(51.23)	(0.00)	(40.42)	(44.10)
ASHAs	69.81	.	.	.	.	59.80	72.39
	(41.42)	(.)	(.)	(.)	(.)	(47.66)	(39.36)
Doctor/ANM vacancy	89	90	98	97	97	94	80
is a problem	(32)	(32)	(15)	(19)	(17)	(24)	(40)
Observations	526	10	83	29	36	127	241

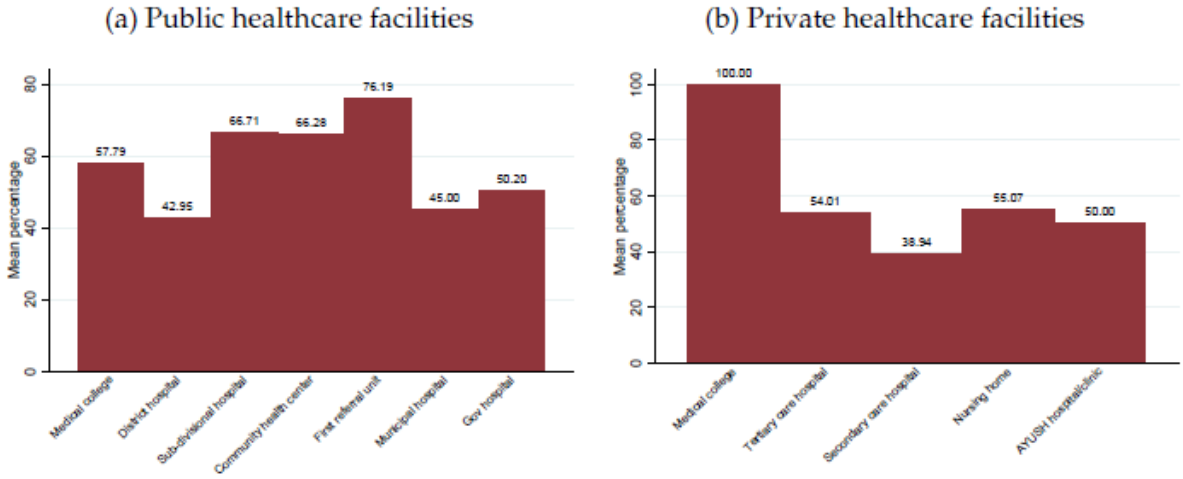
Notes: Standard deviation in parentheses. The percentage of facilities reporting vacancy of doctors/ANMs as a problem is reported.

Table 7.4 also shows that the shortage of specialists is a bigger problem than the shortage of generalists, except for public hospitals. On average, 56 percent of sanctioned specialist positions are filled relative to the 60 percentage filled generalist positions. The fewer general physicians in the PHCs and SCs is concerning since these are often staffed by one medical officer. There are fewer vacancies of sanctioned dentists and AYUSH providers across public and private facilities. Approximately less than 20 percent to 25 percent of sanctioned dentist and AYUSH positions are unfilled on average, respectively, with other hospitals being the only exception. In line with some of these findings, 89 percent of surveyed healthcare facilities agree or strongly agree that the vacancy of doctors or ANMs is a problem for their facilities.[17]

[17] The survey question asked whether vacancies of doctors was a problem at secondary and tertiary healthcare facilities. For the PHCs & SCs, the question was about doctors or ANMs.

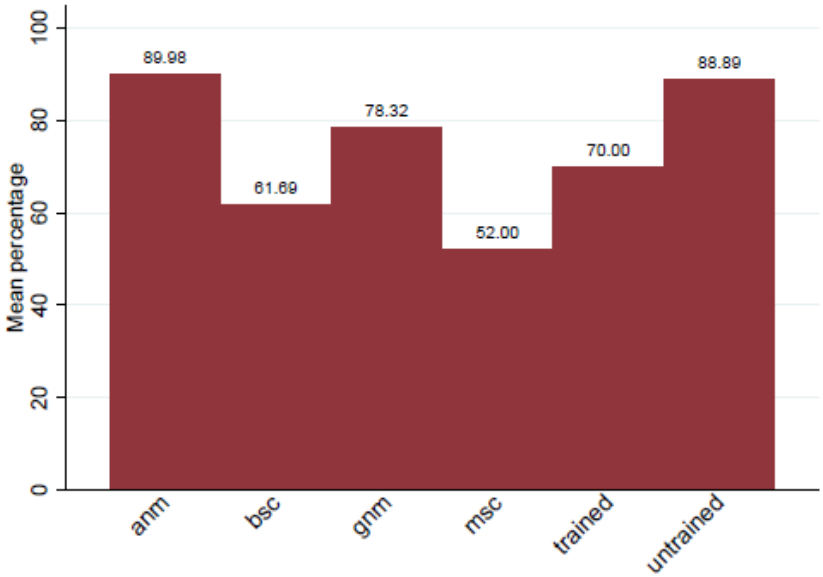
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 7.5: Mean percentage of sanctioned doctor positions that are filled: By facility type



With a mean of 81 to 88 percent of the sanctioned nurse, paramedic, and MLP positions being filled (Table 7.3), the shortage of these healthcare workers is not a source of concern in the surveyed healthcare facilities. This is true for both the public and the private sectors. However, it is important to note that some healthcare facilities report having none of these positions filled. Figure 7.6 also highlights the scarcity of more qualified nurses. The mean percentage of sanctioned M.Sc. and B.Sc. nurse positions filled is the lowest.

Figure 7.6: Mean percentage of sanctioned nurse positions that are filled: By qualification



7.4.1.3 Presence of healthcare workers

One of the frequently cited reasons for the inefficient use of health spending in low-and-middle income countries is the absence of healthcare workers from their jobs [34]. Using nationally representative data from over 1400 public health centers across 19 major states in India, the study found that 60 percent of doctors and other

medical service providers were present at work on a typical day. For Odisha, they found that 69 percent of doctors and 70 percent of all providers were present. However, the shares of healthcare workers present at the facilities in our data are considerably higher.

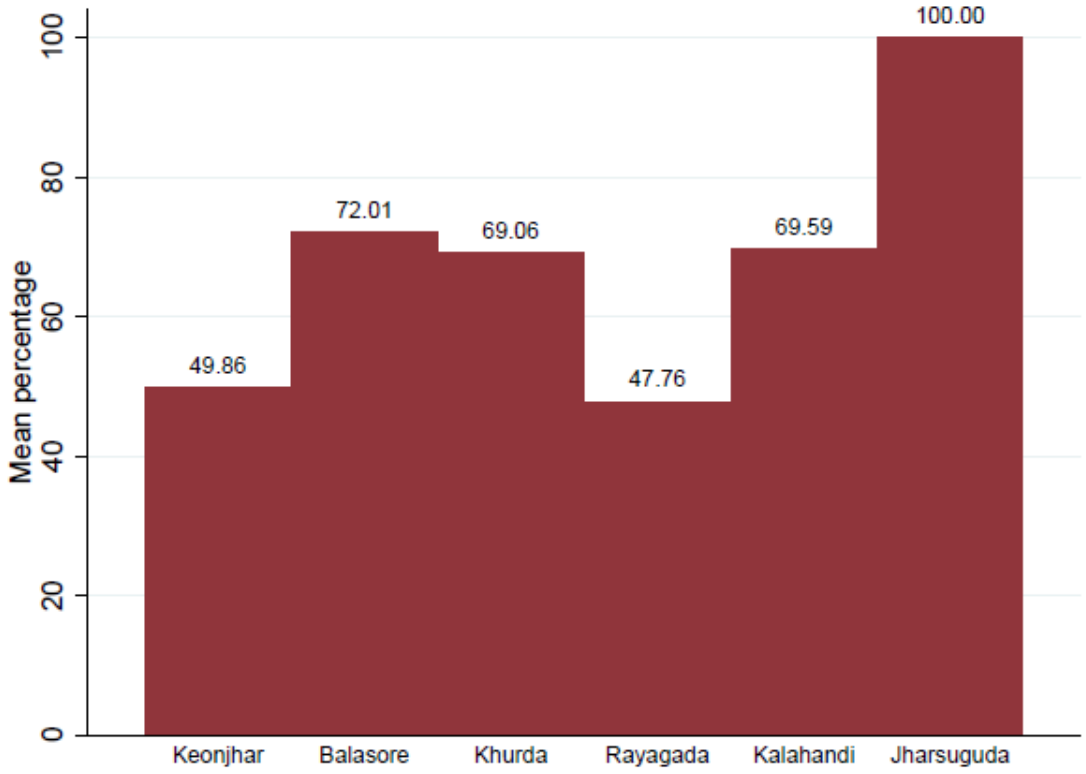
On average, about 87 percent of doctor positions that are filled were reported to be on duty at the interview time. Although we find that absenteeism of doctors is not a problem on average in the sampled districts of Odisha, Table 7.3 indicates that there are healthcare facilities where no doctor was present at the time of the interview. Similarly, 92 percent of nurses and 89 percent of paramedic positions that are filled were recorded as being on duty. When concentrating on the public sector, we continue to find low rates of absenteeism. About 89 percent of doctor positions that are filled were reported to be on duty at the interview time in public healthcare facilities, on average. A similarly high percentage of nurses (92 percent), paramedics (89 percent), and mid-level providers (92 percent) were also reported to be present at the time of the interview. Rates of absenteeism are typically higher among physicians than non-physician staff, mostly because part-time private practice opportunities are available and are more lucrative for doctors than for nurses or other staff [35, 36].

A possible explanation for the discrepancy between this report's results and other studies is the different methodologies. While absenteeism in our data is based on hospital records, the above-mentioned studies are based on direct physical verification of providers since administrative records often understate the reality. Moreover, our survey reflects the number of doctors in a facility at a point in time, whereas the other studies relied on repeat visits. Our survey methodology also probably explains why over 90 percent of the healthcare facilities in our data complained that absenteeism of doctors was a problem, despite the low reported absenteeism rates.

Nonetheless, our data indicate that the absenteeism of ASHAs is a problem. Only about 68 percent of ASHA workers were on duty at the surveyed PHCs and SCs (Table 7.3). Although many primary healthcare facilities report having all ASHAs on duty at the time of the interview, about 23 percent had zero ASHAs on duty. The rates of absenteeism are higher for ASHA working in the PHCs than SCs. Further, as demonstrated in Figure 7.7, the mean percentage of filled ASHA positions varied noticeably across districts. Less than 50 percent of the filled ASHA positions were on duty at the interview time in Keonjhar and Rayagada - the two districts with the highest share of tribal population in our sample. Simultaneously, the healthcare facilities in Jharsuguda, a highly urbanized mining district, reported that all the ASHAs were on duty.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 7.7: Mean percentage of ASHAs on duty: By district



7.4.1.4 Productivity of physicians

The low absenteeism rates of physicians in our data could hide the fact that doctors may be present in a facility for two or three hours each day or at inconsistent times, making it difficult for patients to predict a good time to visit the healthcare facility, as has been shown in studies in other parts of India [37]. Studies have also described how doctors have plenty of idle time that is spent on administrative and other unproductive activities [38]. To investigate whether these problems exist in Odisha, this report assesses the productivity of physicians with four indicators.

Physicians interviewed at healthcare facilities or at their solo-practices report seeing a mean of 176 outpatients in a week and spending 10 minutes per patient. Compared to the evidence from medical vignettes-based studies in India and other low-and-middle income countries [39], the average time spent per patient in our sample is high. This is true even when we consider the mean time of six minutes that a provider in a public secondary or tertiary health facility spends with a patient. However, the difference in the estimates is likely because self-reports are usually over-estimates relative to other techniques of measurement [17, 18]. Physicians on average reported working for six days a week. If these self-reports of working six days in a week is accurate, this implies that they spend about five hours a day seeing outpatients. However, the physicians interviewed at the facilities reported that they work for about six hours a day. That is, on average, they spend one hour a day on other activities, which can include inpatient visits, administrative duties, and unproductive activities. Since physicians are required to perform specific tasks depending on the type of facility they work at, a disaggregated analysis is necessary to judge whether idle capacity exists.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table 7.5: Productivity indicators of physicians: By provider type

	(1) Public Hospital	(2) CHC	(3) Other Hospital	(4) Private Hospital	(5) PHC	(6) Solo Provider
Number of outpatients seen a week	331.72	393.59	299.94	122.33	188.28	105.60
	(195.01)	(178.60)	(213.62)	(133.47)	(112.58)	(73.26)
Time spent per patient (min)	6.55	5.89	6.09	11.47	8.93	11.37
	(3.48)	(3.22)	(4.03)	(4.16)	(4.51)	(3.80)
Number of days worked in a week	6.44	6.24	5.80	6.19	6.20	.
	(0.79)	(1.10)	(1.84)	(1.21)	(0.87)	(.)
Number of hours worked in a day	7.05	6.50	6.09	5.75	5.79	.
	(2.51)	(1.68)	(1.30)	(2.36)	(0.75)	(.)
Calculated excess capacity (min)	624.21	311.95	531.76	737.41	617.21	.
	(1690.12)	(1315.86)	(1521.99)	(1737.43)	(1013.95)	(.)
Observations	59	167	35	59	120	684

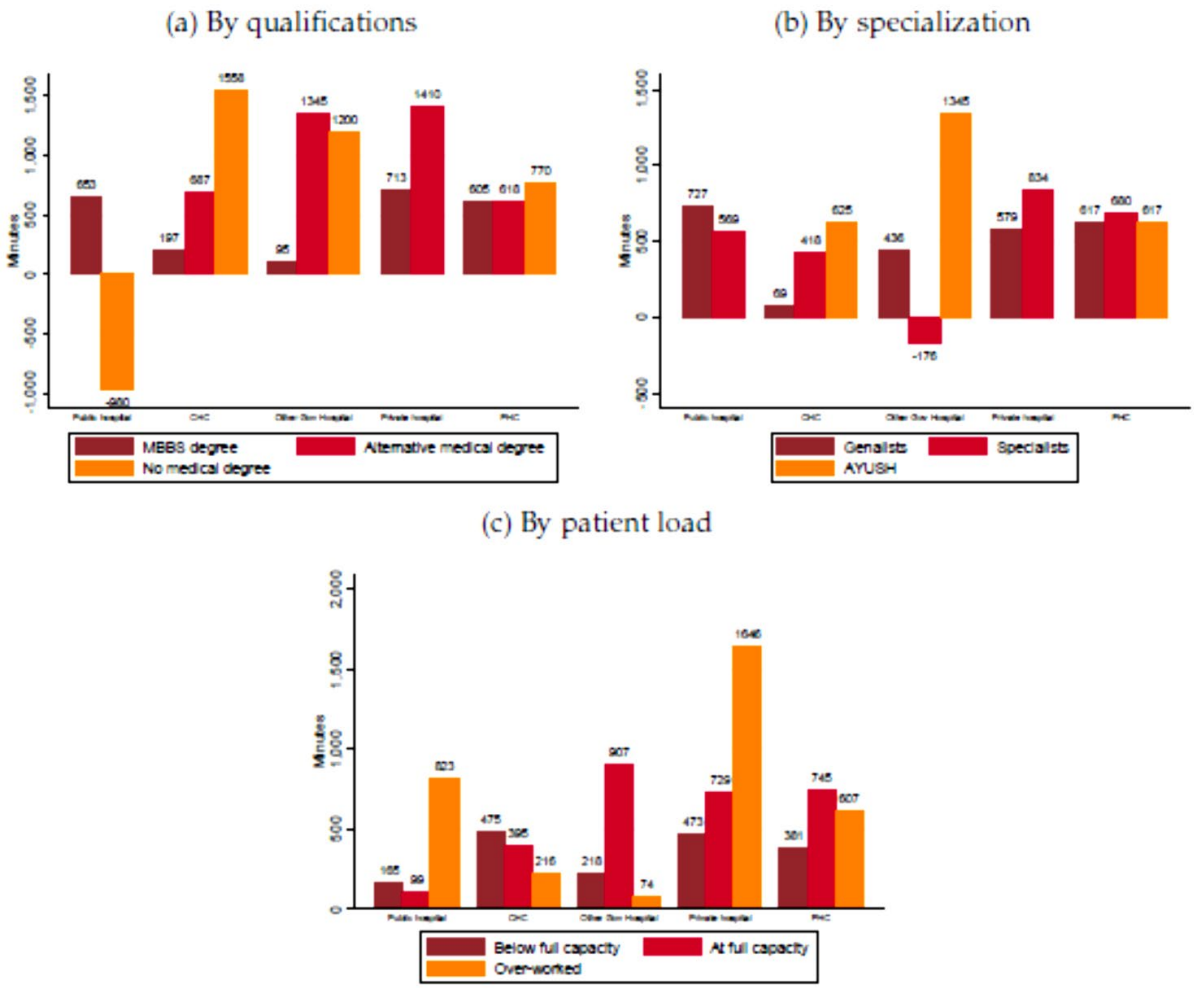
Notes: Standard deviation in parentheses. The number of days and hours workers is reported only for providers interviewed at facilities. Outliers are capped at the 95 percentile. Excess capacity, minutes per week a physician does not spend on outpatients, is calculated as (number of days worked in a week * number of hours worked in a day * 60) - (number of outpatients seen a week * time spent per patient).

As presented in Table 7.5, physicians in public healthcare facilities providing secondary and tertiary care see a mean of 300 to 400 outpatients in a week. This is significantly higher than the weekly outpatients seen at private hospitals and by primary care providers. The providers in public hospitals, CHCs, and other hospitals also spend lesser time with outpatients on average. All physicians work around six days a week, while the mean daily hours vary from 5.75 to 7.

Considering the self-reported hours and days worked in a week, physicians at public and private hospitals spend an approximate mean of 600 to 700 minutes per week on other activities. This is lower for physicians at CHCs and other hospitals. With over 97 percent of public hospitals, CHCs, and private hospitals, and some other hospitals provide inpatient care (Table 7.2A), it is difficult to figure out what share of the excess time is spent on inpatient visits versus unproductive tasks such as administrative duties. Since physicians working in PHCs mostly do not provide inpatient services, the mean 617 minutes per week of excess capacity is idle capacity and is indicative of inefficiencies.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

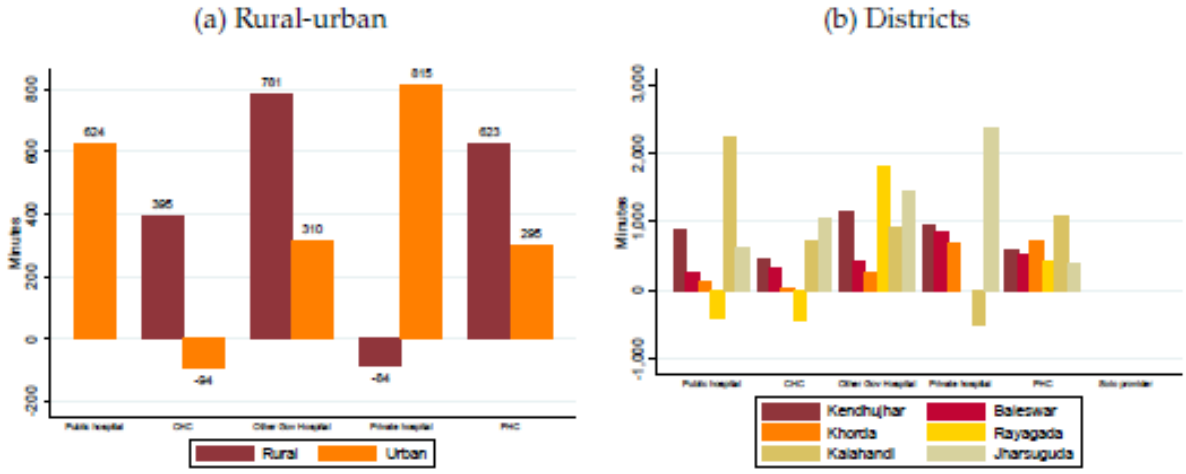
Figure 7.8: Excess capacity of physicians



Our data suggest that this excess capacity is not linearly correlated with the qualification of the provider, their specialization, or their reported patient load (Figure 7.8). Focusing on PHCs only, physicians with non-medical degrees have the highest amount of idle capacity. There is not a massive difference in the idle capacities based on the specialization of the PHC physicians. Interestingly, those who reported being at full capacity have the highest calculated idle capacity. No significant differences were also found in the illness that the physicians commonly treated. Figure 7.9 also shows considerable variation in the excess capacity of physicians by their location.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 7.9: Excess capacity of physicians: By location



7.4.1.5 Curative bed occupancy

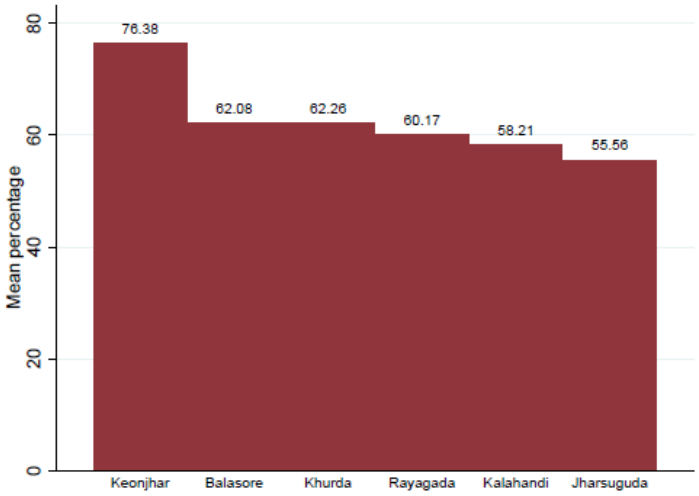
Since high rates of hospital bed occupancy are associated with better health outcomes, such as mortality, bed occupancy rates are used as efficiency indicators [40]. Rates of 82 to 85 percent have typically been considered optimal in many countries [41], and anything less than 80 percent signals a lack of planning and operational management of hospital beds. At the same time, an idle capacity of less than 20 percent, which is maintained as a 'safety margin' to accommodate the increased inflow of patients, can prove costly by delaying or denying admissions [42].

Our survey's mean bed occupancy rate of the healthcare facilities with inpatient beds is 64 percent (Table 3). This is lower than the benchmark rate, indicating the wastage of resources. There is substantial variation in the occupancy rates. Our data also shows that about 14 percent of the facilities report occupancy rates of greater than 90 percent, emphasizing their limited capacity to deal with patients' excessive inflow.

The are some minor differences in the inpatient bed occupancy rates based on the location of the healthcare facilities. The mean inpatient bed occupancy rate is 61 and 69 percent for healthcare facilities in rural and urban areas, respectively. The two mining intensive districts in our sample, Keonjhar, and Jharsuguda have the highest (76.38 percent) and the lowest (55.56 percent) mean bed occupancy rates, as depicted in Figure 7.10.

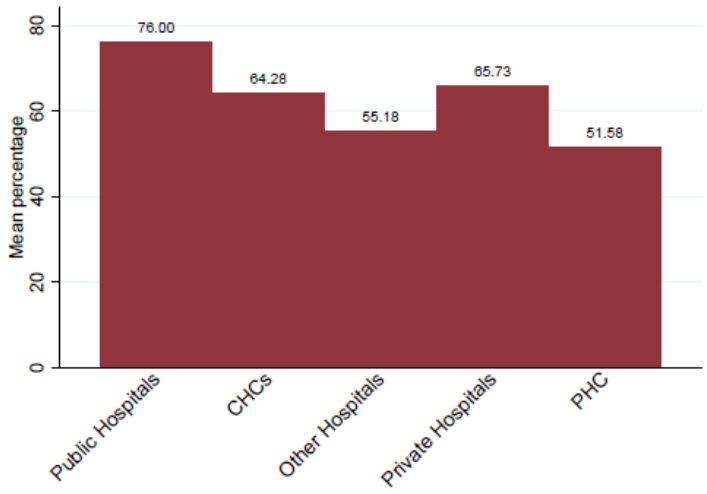
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 7.10: Mean bed occupancy rates: By district



There is substantial variation in the mean bed occupancy rates across facility types, with public hospitals reporting a mean bed occupancy rate of 76 percent and PHCs reporting a mean bed occupancy rate of 52 percent, as shown in Figure 7.11. The breakdown of this indicator at a finer facility level is presented in Figure 7.12. The public district hospitals and the private tertiary care hospitals are efficient, with mean bed occupancy rates of about 80 percent. Note that the two Medical College Hospitals in the data, one public and one private, have bed occupancy rates of 90-95 percent, indicating an excessive burden on these institutions.[18]

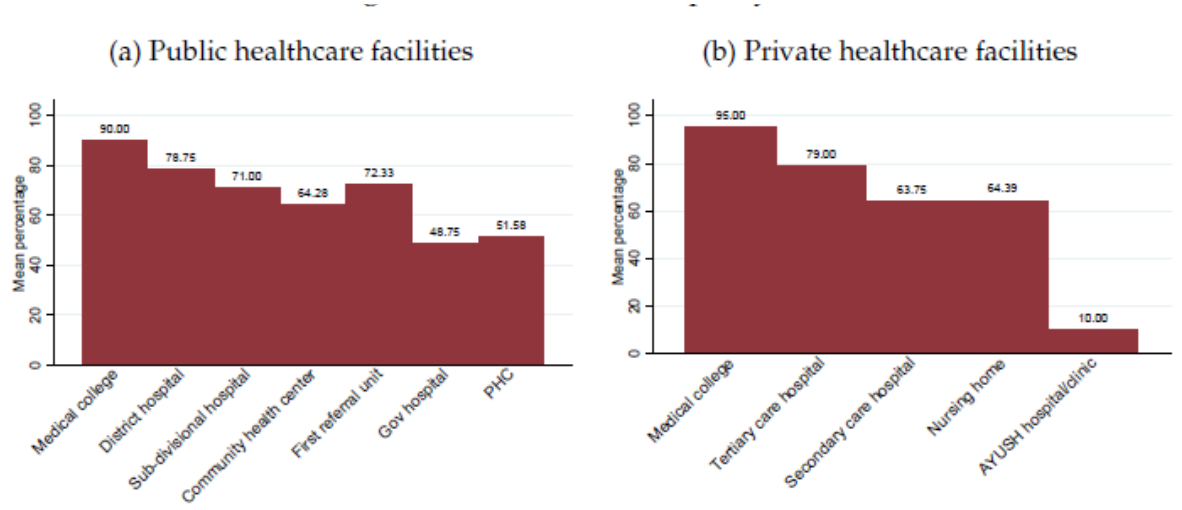
Figure 7.11: Mean bed occupancy rates: By facility type



[18] The IPHS guidelines states that the expected bed occupancy rate for district hospitals is 80 percent. They also assume that CHCs should have an occupancy rate of 60 percent.

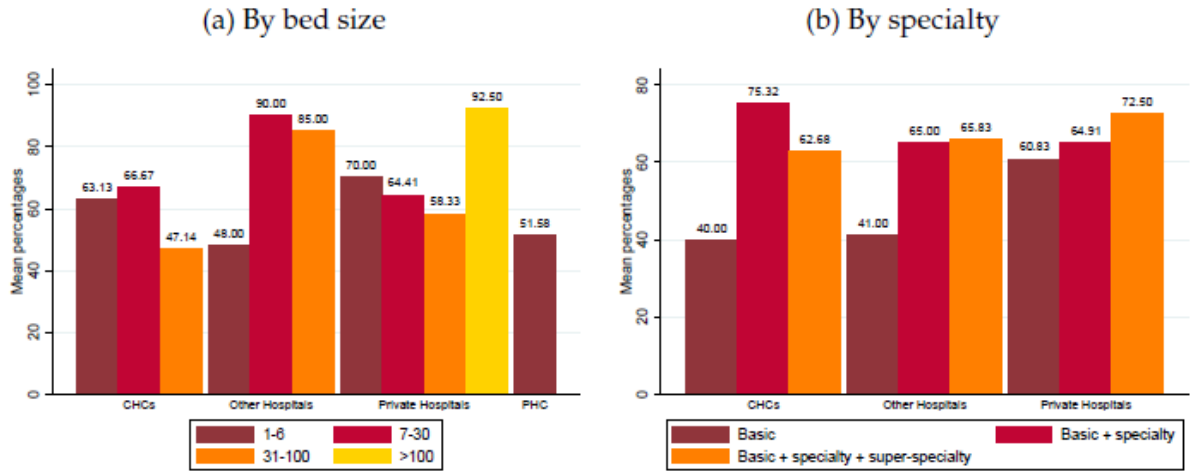
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 7.12: Mean bed occupancy rates



Since the IPHS guidelines state that the minimum bed, manpower, and other requirements at public facilities should depend on the bed occupancy rates, this report assesses whether lower bed rates occur at smaller facilities that are intended to provide basic services. Figure 7.13 shows an absence of any consistent patterns across the facilities of various sizes and specialty types. For instance, the larger CHCs have lower mean rates than their smaller counterparts, indicating excess capacity. For other hospitals and private hospitals, the mean bed occupancy rate increases when more specialized services are provided, while this is not the case for CHCs.

Figure 7.13: Mean bed occupancy rates

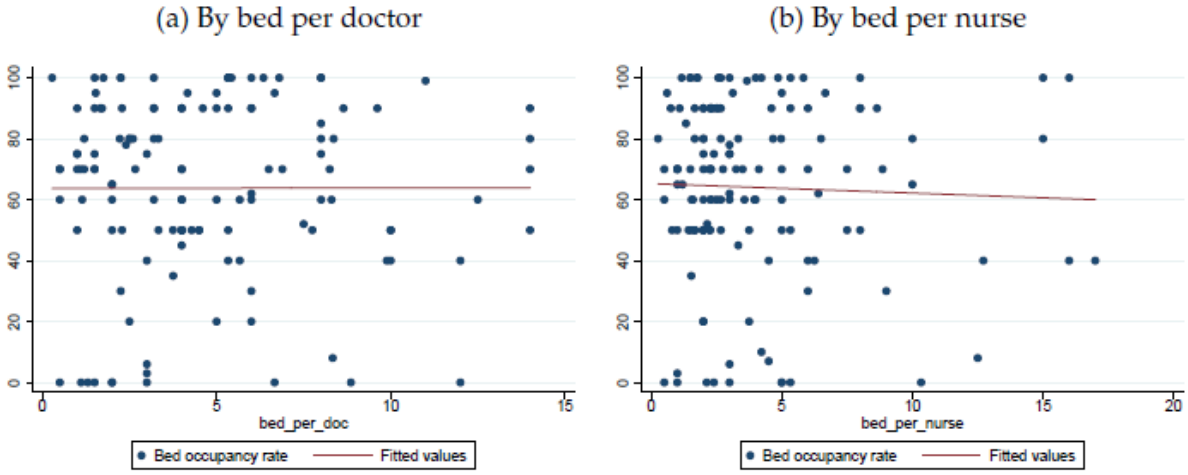


Another reason for the low bed occupancy rates could be the shortage of healthcare workers relative to the beds. If a healthcare facility with a high ratio of beds to doctors or nurses has low occupancy rates, it cannot be considered an inefficient use of inpatient beds. However, when plotting the bed occupancy rates against the ratio of beds to doctors/ nurses in Figure 7.14, a distinct negative slope is missing.[19] This implies that healthcare facilities are inefficient in terms of bed usage since the low

[19] All doctors and nurses in a facility are used to construct the bed to doctor/nurse ratios.

rates are not specific to facilities of a specific location, type, bed size, staff size, or specialty.

Figure 7.14: Mean bed occupancy rates



Notes: Outliers are excluded from these graphs plot but the inclusion of all facilities with does not the change the conclusion.

7.4.1.6 Shortage of essential medicines

Excessive use of medicines leads to wastage in the form of high out-of-pocket expenditures without any apparent improvements in health [43, 44]. To avoid the misuse of medicines, an essential medicine list (EML) has been identified by India and Odisha. The EML is a list of commonly used at primary, secondary, and tertiary healthcare levels medicines, with the appropriate dosages, that address the state's disease burden.

When asked about frequently used medicines, specific to the level of care provided by the surveyed healthcare facilities, only 36 percent of the medicines were verified to be in stock at facilities with pharmaceutical services, on average. Of the 481 facilities that provide pharmaceutical service, only one had a verified stock of all the 68 common essential medicines. The lack of essential medicines is likely to lead to inefficiencies through the purchase and consumption of costlier and poorer quality medicines.

More specifically, public hospitals have the greatest mean stock of select medicines on the EML (73 percent), with the other hospitals having the lowest stock (54 percent) among the facilities providing secondary and tertiary care, as shown in Figure 7.15. On average, private facilities have only 59 percent of the frequently used medicines on the EML in stock. Primary healthcare facilities have much fewer select medicines on the primary care EML, with SC doing worse than PHCs. Except for medical colleges - both public and private - most secondary and tertiary care facilities have a significantly greater stock of primary care level medicines than secondary care level medicines (Figure 7.16).

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 7.15: Mean percentage of select essential medicines in stock: By facility type

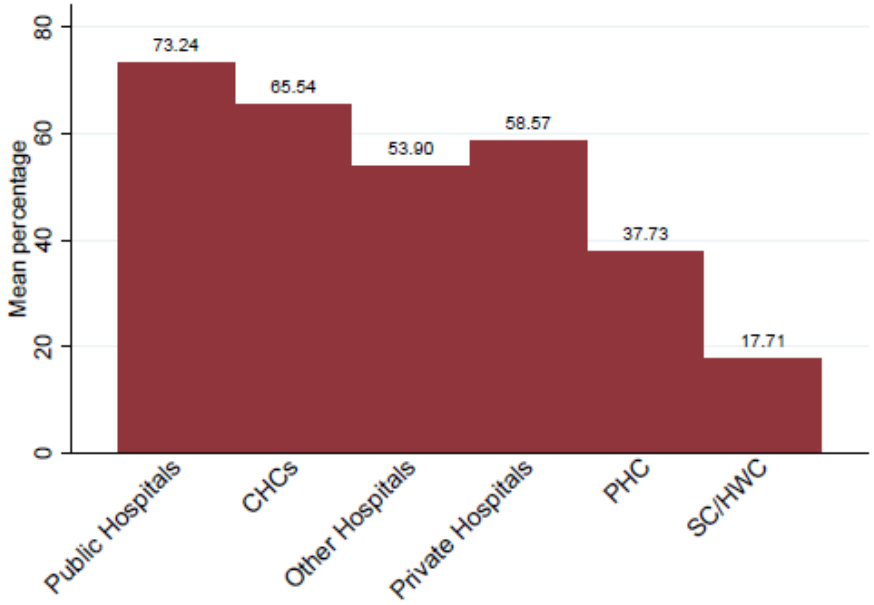
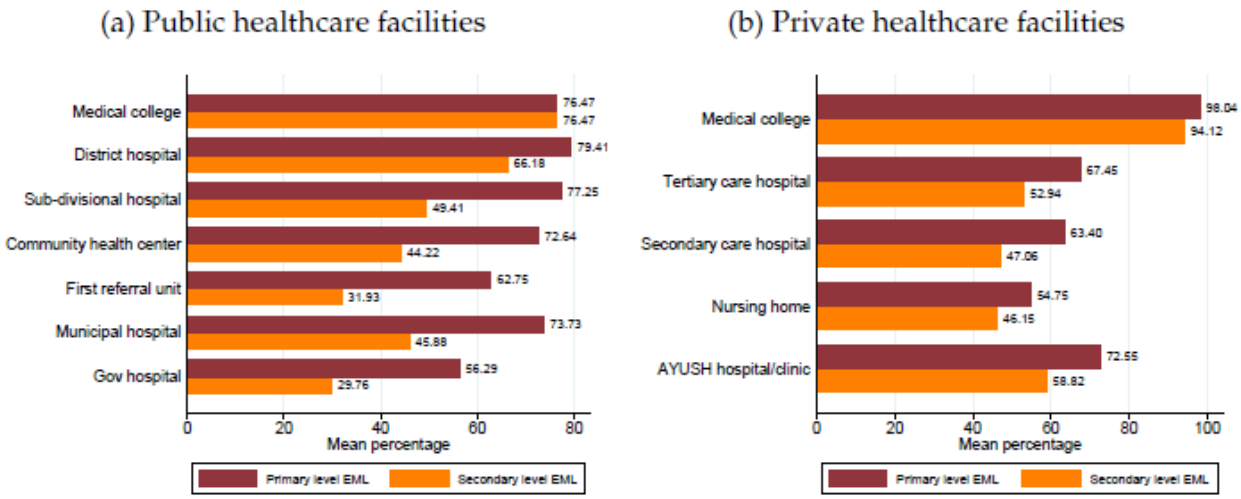


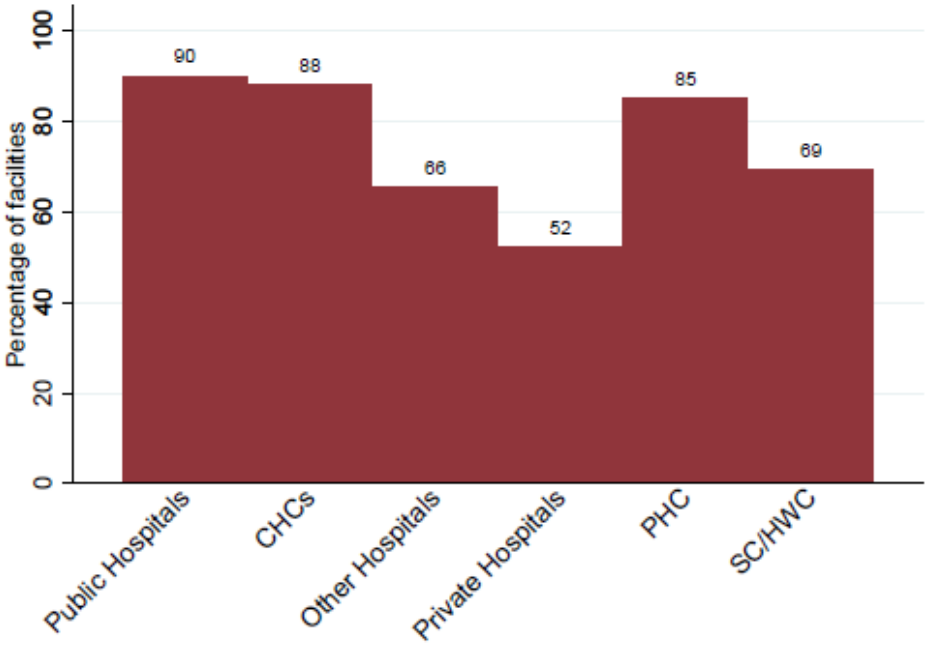
Figure 7.16: Mean percentage of select essential medicines in stock: By ownership



It is important to note that the shortage of essential medicines in stock is a potential reason behind EML's low consideration when prescribing medicines. Less than one-third of surveyed other hospitals, private hospitals, and SCs with pharmaceutical services reported considering the EML when prescribing medicines (Figure 17). Although the number is higher for the rest of the hospitals, there is scope for improvement.

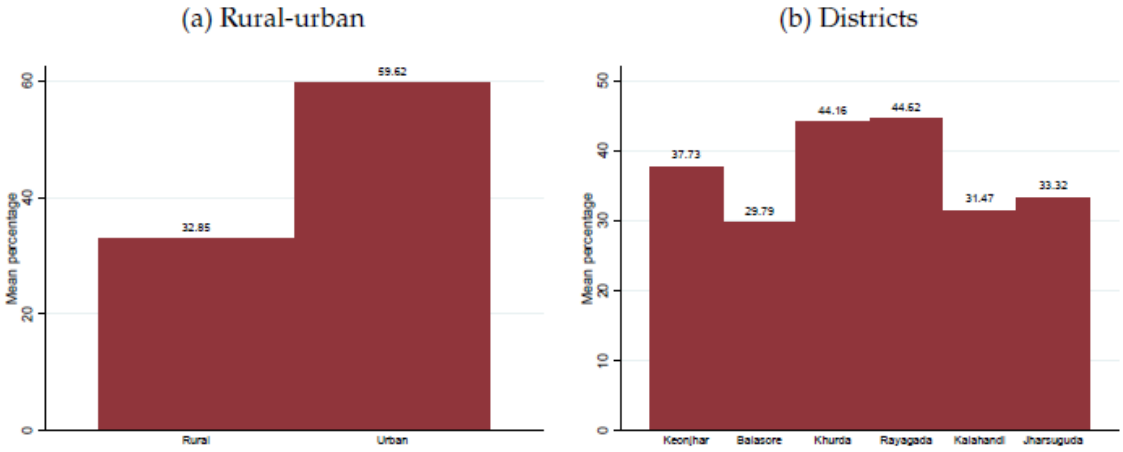
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure 7.17: Percentage of facilities that consider EML: By facility type



The shortage of essential medicines is a bigger concern for healthcare facilities in rural areas than in urban areas. As shown in Figure 7.18, rural healthcare facilities with pharmaceutical services carry only 33 percent of the frequently used medicines on the EML, while urban healthcare facilities carry 60 percent, on average. There is also an unequal distribution of the percentages of essential medicines that facilities stock across districts.

Figure 7.18: Mean percentage of select medicines from EML in stock: By location



Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

7.4.2 Allocative Efficiency

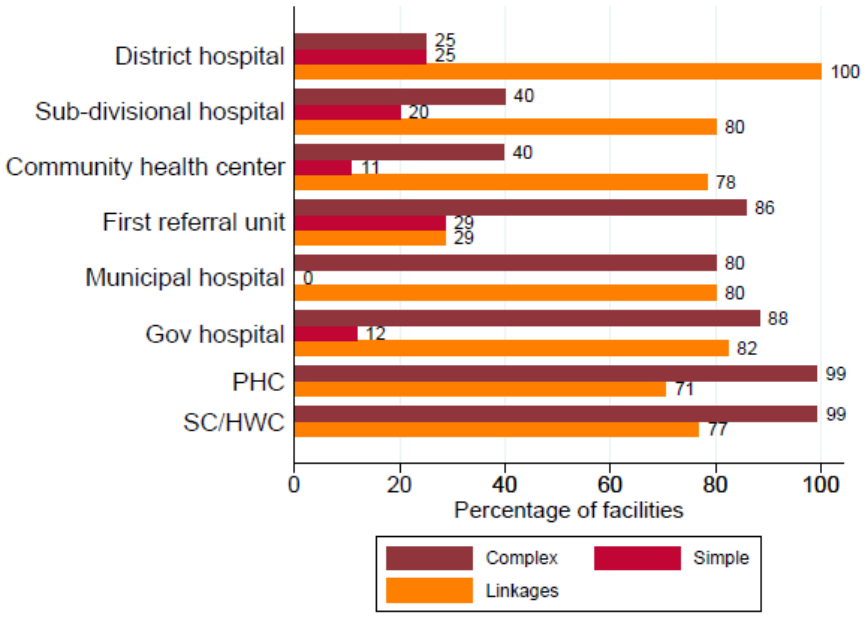
In addition to the technical inefficiencies discussed above, allocative inefficiencies also plague the health system in Odisha. One indicator that demonstrates allocative inefficiency is the referral rates between the different levels of care.

7.4.2.1 Referrals between different levels of care

India's national health policies have prioritized establishing a robust referral mechanism in the country's public health system. The system is designed to allow government healthcare facilities to refer patients from lower to higher levels and vice-versa, depending on the patient's need relative to the facility's resources. However, only 12 percent of the public secondary or tertiary facilities in our data refer cases backward, on average. The percent of healthcare facilities referring complex cases to higher-level facilities is greater at 84 percent, mostly driven by PHCs and SCs (Figure 7.19).[20]

The low referral rates are not due to the absence of institutional linkages between the facilities. Except for the first referral units, more than 70 percent of each type of public healthcare facility reported having some linkages. While the most common form of linkage was patient transportation to the referral facility, about 62 percent of the public facilities with linkages reported informing the referral facility of the patient's arrival or of the patient's conditions/medical records.

Figure 7.19: Percentage of facilities with referrals



If patients can choose to go to any healthcare facility irrespective of their illness's seriousness, the lack of referrals can hint at the existence of allocative inefficiency in the public healthcare system. In the household survey across the six districts of

[20] In our survey, the question on whether complex cases were referred to higher level facilities and what kinds of institutional linkages the facility had were asked to facilities at all levels of care; questions on referral of simple cases were asked to the secondary and tertiary care facility only.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Odisha, most individuals who reported seeking treatment noted visiting CHCs for outpatient or inpatient care.[21] Moreover, the majority of the patients reported seeking care for simple symptoms like fever. Given that the PHCs and SCs are intended to provide basic curative care and preventive and promotive care, their under-utilization by patients implies that resources are not distributed among the levels of care to maximize health outcomes.

7.5 Conclusion

This chapter summarizes the ratio-based indicators of technical and allocative efficiency using data collected from healthcare facilities and providers. We started with an analysis of each indicator's distribution, followed by a comparison with ethical or external benchmarks that allowed us to judge whether there were wastages in the use of the health inputs in the health system of Odisha.

We find that there exists inefficiency in the use of the three resources considered in this report – healthcare workers, hospital beds, and medicines - as indicated by the sub-optimal mix of trained nurses and allopathic doctors, shortage of physicians and ASHAs, high absenteeism rates of ASHAs, low bed occupancy rates, lack of commonly used essential medicines in stock, and low rates of backward referrals. At the provider level, we find evidence of physicians' low productivity in the form of unutilized capacity in terms of hours worked. It is also critical to note that there are some underperforming healthcare facilities, both in the public and the private sectors, for each partial efficiency indicator, irrespective of the average of the indicators. With the disaggregated analysis of the efficiency indicators, we find that the poorer levels of the indicators are not necessarily associated with specific characteristics of the healthcare facilities or providers.

The findings of this report indicate that there is latent capacity in terms of human resources and curative care beds, as shown by lack of shortage of certain categories of healthcare workers, low rates of absenteeism of doctors and nurses, and time spent by physicians not seeing patients. However, the inefficient use of these resources in the forms of low bed occupancy rates, low time spent per patient, and low referral rates is simultaneously prevalent in the system. For example, 93 of the 147 healthcare facilities with curative care beds had bed occupancy rates of less than the recommended 80 percent in the last year. If these facilities increased their bed occupancy rate from their reported level to the recommended level, then 21926 additional inpatient days would be available across these facilities.[22] In other words, these is a wastage in the use of inpatient beds.
While some of the results presented here underscores the existing evidence on the inefficient use of healthcare inputs in Odisha, this report provides the assessment of wide-ranging inefficiency indicators, including often ignored inputs. Knowledge of the sources of health system inefficiencies can enable clearer discussions of their causes. This report is the first step towards the adoption of polices and interventions

[21] The household survey asked people about their experiences with outpatient care during the past 15 days and inpatient care during the past year.
[22] This is calculation is based on the formula: Occupancy rate = Total number of inpatient days in a year x 100 / Available beds x 365 days. This calculation also assumes that the other inputs required to manage the beds is available, and is therefore, an upper-bound of the number of inpatient days that would be available if the bed occupancy rates were increased.

aimed at reducing wastage of healthcare inputs and the provision of quality of healthcare services and outputs for all.

7.6 References

1. Durairaj, V. and D.B. Evans, *Fiscal space for health in resource-poor countries: World Health Report*. 2010, Background Paper: Geneva.
2. WHO, *Health Systems Financing: The path to universal coverage, World Health Report 2010*. 2010: Geneva.
3. OECD, *Health care systems: Getting more value for money*. OECD Economics Department Policy Notes, 2010. **No. 2**.
4. Rout, S.K., et al., *Public Healthcare Systems in Odisha– A Brief Review*. 2018.
5. GOO, *Healthcare Vision 2025: Healthcare for All*. 2020.
6. Bauza, V., et al., *Experience of the COVID-19 pandemic in rural Odisha, India: knowledge, preventative actions, and impacts on daily life*. MedRxiv, 2020.
7. Kathuria, V. and D. Sankar, *Inter-State Disparities in Health Outcomes in Rural India: An Analysis Using a Stochastic Production Frontier Approach*. Development Policy Review. **23**(2): p. 145–163.
8. Shetty, U. and T.P.M. Pakkala, *Technical Efficiencies of Healthcare System in Major States of India: An Application of NP-RDM of DEA Formulation*. Journal of Health Management, 2010. **12**(4): p. 501-518.
9. Purohit, B.C., *Health Care System Efficiency: A Sub-state Level Analysis for Orissa (India)*. Review of Urban & Regional Development Studies, 2016. **28**(1): p. 55-74.
10. Dar, J.H. and T.A. Bhat, *Health Sector Efficiency across Indian States Using Stochastic Frontier Analysis*. Asian Development Policy Review, 2018. **6**(1).
11. Hota, A.K. and H.S. Rout, *Health Infrastructure in Odisha with Special Reference to Cuttack and Bhubaneswar Cities:*. 2016.
12. Hussain, M.A., L. Dandona, and D. Schellenberg, *Public health system readiness to treat malaria in Odisha State of India*. Malaria Journal, 2013. **12**(1): p. 1-11.
13. Padhy, G.K., et al., *Bottlenecks identified in the Implementation of components of national health programmes at PHCs of Cuttack district of Odisha*. International Journal of Medicine and Public Health, 2013. **3**(4): p. 271-277.
14. Patra, S.K., M. Ramadass, and A. L., *National Rural Health Mission (NRHM) & Health Status of Odisha*. Indian Journal of Public Health Research and Development, 2015. **5**(1): p. 241-246.
15. Swain, T.R., et al., *Pricing and availability of some essential child specific medicines in Odisha*. Indian Journal of Pharmacology, 2015. **47**(5): p. 496-501.
16. IOM, *Crossing the Quality Chasm: A New Health System for the 21st Century*, ed. I.o. Medicine. 2001, Washington (DC): The National Academies Press.
17. Yip, W. and R. Hafez, *Improving Health System Efficiency: Reforms for improving the efficiency of health systems: lessons from 10 country cases*. 2015.
18. Cylus, J., I. Papanicolas, and P.C. Smith, *A framework for thinking about health system efficiency*, J. Cylus, I. Papanicolas, and P.C. Smith, Editors. 2016, European Observatory on Health Systems and Policies: Copenhagen.
19. Chisholm, D. and D.B. Evans, *Improving health system efficiency as a means of moving towards universal coverage*. 2010.
20. Bose, B., *A Guide to Assessing the Efficiency of Health Systems*. 2021.
21. Buchan, J. and M.R. Dal Poz, *Skill mix in the health care workforce: reviewing the evidence*. Bulletin of the World Health Organization, 2002. **80**: p. 575-580.
22. GOI, *National Classification of Occupations - 2015 (Code Structure)*. 2015, Government of India, Ministry of Labor & Employment.
23. Davis, D.A., et al., *Accuracy of Physician Self-assessment Compared With Observed Measures of Competence: A Systematic Review*. JAMA, 2006. **296**(9): p. 1094-1102.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

24. Das, J., et al., *Two Indias: The structure of primary health care markets in rural Indian villages with implications for policy*. Social Science & Medicine, 2020: p. 112799-112799.
25. Corporation, O.S.M., *Essential Drug List*. 2014.
26. Joshi, R., et al., *Task Shifting for Non-Communicable Disease Management in Low and Middle Income Countries – A Systematic Review*. PLoS ONE, 2014. **9**(8): p. e103754-e103754.
27. Laurant, M., et al., *Substitution of doctors by nurses in primary care*. 2005, John Wiley and Sons Ltd.
28. McPake, B. and K. Mensah, *Task shifting in health care in resource-poor countries*. 2008, Elsevier Limited. p. 870-871.
29. Bhushan, H. and A. Bhardwaj, *Task shifting: A key strategy in the multipronged approach to reduce maternal mortality in India*. International Journal of Gynecology & Obstetrics, 2015. **131**: p. S67-S70.
30. Bank, W., *World Development Report 1993: Investing in Health*. 1993, New York: Oxford University Press.
31. GOI, *Indian Public Health Standards (IPHS) Guidelines*. 2012, Ministry of Health & Family Welfare, Government of India.
32. Patro, S.K., *In doc - population ratio, Odisha 8th from bottom in 2019*, in *Odishatv.in*. 2019.
33. GOO, *Rural Health Statistics*. 2019, Ministry of Health & Family Welfare, Government of India: New Delhi, India.
34. Muralidharan, K., et al., *Is There a Doctor in the House? Medical Worker Absence in India*. 2011.
35. Chaudhury, N. and J.S. Hammer, *Ghost doctors: Absenteeism in rural Bangladeshi health facilities*. World Bank Economic Review, 2004. **18**(3): p. 423-441.
36. Chaudhury, N., et al., *Missing in action: Teacher and health worker absence in developing countries*. 2006, World Bank. p. 91-116.
37. Banerjee, A., A. Deaton, and E. Duflo, *Health Care Delivery in Rural Rajasthan*. Economic and Political Weekly, 2004. **39**(9): p. 944-949.
38. Maestad, O., G. Torsvik, and A. Aakvik, *Overworked? On the relationship between workload and health worker performance*. Journal of Health Economics, 2010. **29**: p. 686-698.
39. Das, J. and P. Gertler, *Variations In Practice Quality In Five Low-Income Countries: A Conceptual Overview*. Health Affairs, 2007. **26**: p. 3.
40. Madsen, F., S. Ladelund, and A. Linneberg, *High Levels Of Bed Occupancy Associated With Increased Inpatient And Thirty-Day Hospital Mortality In Denmark*. Health Affairs, 2014. **33**(7): p. 1236-1244.
41. Keegan, A.D., *Hospital bed occupancy: more than queuing for a bed*. Medical Journal of Australia, 2010. **193**(5): p. 291-293.
42. Phillip, P.J., R. Mullner, and S. Andes, *Toward a better understanding of hospital occupancy rates*. Health Care Financing Review, 1984. **5**(4): p. 53-61.
43. Selvaraj, S., H. Hasan Farooqui, and A. Karan, *Quantifying the financial burden of households' out-of-pocket payments on medicines in India: a repeated cross-sectional analysis of National Sample Survey data, 1994-2014*. BMJ Open, 2018. **8**: p. 18020-18020.
44. Wagner, A.K., et al., *Access to care and medicines, burden of health care expenditures, and risk protection: Results from the World Health Survey*. Health Policy, 2011. **100**(2-3): p. 151-158.

Section III
Appendices

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Appendix 1
An Overview of Odisha and its Health System[∝]

A1.1 Introduction

It is important to understand the context of Odisha, where we conducted our health system assessment study. Understanding the context will help us better interpret the findings from our current assessment and make future diagnoses of the causes behind the good and poor performances of Odisha's health system on the different final and intermediate outcomes presented in Section I and II of this report. Such an understanding is also important for designing health reforms that are relevant to the state's context and therefore have higher chances of being adopted as policies and of having impact on desired goals.

In this chapter we provide an overview of the following aspects of the state and its health system that we consider salient for our work:

i. The socio-economic and demographic context of Odisha
ii. The political landscape of Odisha
iii. The key aspects of the health system in Odisha using the Control Knob Framework
iv. The major health policies and reforms in the state in the past 15 years
v. The administrative and fiscal arrangements for healthcare in Odisha, in the context of India's federal structure

For this chapter, we have used secondary data available from national and state-level datasets and existing published and grey literature.

A1.2 An Overview of Odisha

A1.2.1 Demographic and Socio-Economic Context

The state of Odisha in eastern India has a population of over 41 million and is predominantly rural (83.31 percent) [1]. With 32.6 percent of people living below the poverty line (BPL), Odisha is amongst the six most impoverished states in India with very low developmental indices [1]. Odisha is home to many vulnerable social groups, including a large tribal (indigenous) population base. The Scheduled Castes (SC) and Scheduled Tribes (ST)[23] constitute around 44 percent of the total

[∝] This chapter was led by Anuska Kalita.

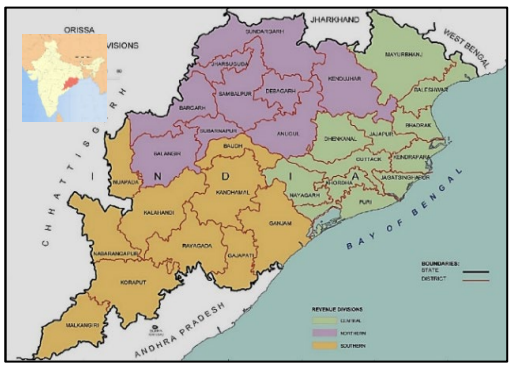
[23] The Scheduled Caste (SCs) and Scheduled Tribes (STs) are officially designated groups of recognized in the Constitution of India. Nationally, the SCs and STs comprise about 16.6 percent and 8.6 percent, respectively, of India's population (according to the 2011 census). The *Constitution (Scheduled Castes) Order, 1950* lists 1,108 castes across 29 states in its First Schedule, and the *Constitution (Scheduled Tribes) Order, 1950* lists 744 tribes across 22 states in its First Schedule. The Constitution lays down the general principles of positive discrimination for SCs and STs.

population (22 percent each) [1]. These groups are socially isolated and lag behind in income, education, and formal employment [2].

Odisha has 30 districts equally distributed across three revenue divisions, the Regional Development Clusters (RDCs), namely central, north and south (Table A1.1). Each district is separated into sub-divisions, which are further divided into revenue blocks (tehsils). Blocks consist of Panchayats (village councils) and town municipalities that govern local affairs. Out of the 30 districts, seven districts fully and six districts partly are classified as Scheduled Areas or hard-to-reach areas.[24] Table A1.1 presents a snapshot of the main characteristics of the three regions. The state is prone to natural disasters and has faced multiple cyclones and floods over the past years. These characteristics amplify inequities in health and development amongst different vulnerable groups and regions in the state.

Even though Odisha is a low-income state, it is extremely rich in mineral resources, and mining has emerged as one of its main industries. Agriculture, fishing, export of seafood, services, and handicrafts and handlooms are other important industries in the state.

Figure A1.1: Map of Odisha



[24] This classification was done under the Fifth Schedule to the Constitution of India, the revised Presidential Order titled "The Scheduled Areas (states of Bihar, Gujarat, Madhya Pradesh & Odisha) Order 1977".

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table A1.1: Main characteristics of the three regions in Odisha

Regional Development Clusters (RDC)	Main characteristics
Central (10 districts)	Higher level of urbanization – includes the urban centers of Bhubaneshwar (capital), Cuttack, and Puri. Higher per capita income. Coastal districts with major seafood farming/exporting industry. Lower ST, SC concentration. Frequently affected by cyclones. Higher concentration of health providers.
Northern (10 districts)	Some urban and peri-urban towns. High concentration of mines and related industry. Low per-capita income. High concentration of SC, ST population.
Southern (10 districts)	Very high concentration of ST population. Some extremely rural and remote areas, especially the infamous KBK region (Koraput, Bolangir, Kalahandi) with stark vulnerabilities. Low per capita income. Affected by civil unrest and the "Naxal" movement.

A1.2.2 Political Context

After India's independence in 1947, the Indian National Congress (INC) party formed the government in Odisha. The first decades after independence were marked by political instability in the state. The central government took over the state government several times by imposing President´s rule, the first one in 1961. The Communist Party of India and its allies have not become popular in the state; however, several parts of the state are affected by left-wing extremism or the Naxal movement. Naxalism has affected development in these areas, as delivery of public services, building basic infrastructure, and maintaining governance become a considerable challenge [3].

The main political parties active in Odisha are the Biju Janata Dal (BJD), a local state-level party, the Indian National Congress (INC), and the Bharatiya Janata Party (BJP). The BJD party forms the incumbent government, and the chief minister Naveen Patnaik is currently in his fifth consecutive term, being in power since 2000. The main opposition party is the BJP, which is the ruling party at the center. Healthcare, specifically adoption of the central government's Pradhan Mantri Jan Arogya Yojana (PMJAY) health insurance scheme by the state government in Odisha, has been a major point of political competition and negotiation in recent times [4, 5]. Instead of adopting the PMJAY for the state, the government of Odisha launched its own health insurance scheme – the Biju Swasthya Kalyan Yojana (BSKY). (See section A1.4 for more details on BSKY).

A1.3 The Health System in Odisha

In this section, we discuss Odisha's health system. Our choice of the specific aspects of the health system that we describe here is informed by the Control Knob Framework (Table 1.1) [6].

A1.3.1 Health Status

Even though Odisha has achieved significant improvements in maternal and child health (MCH) indicators in the past decades, the state still has one of the highest maternal mortality ratios (MMR) at 168, a high infant mortality rate (IMR) of 40 per, and a low life expectancy at birth at 69.3 years, compared to national averages and other EAG states [7]. (See Chapter 1 and Chapter 2 for more details.) The state has

been now grappling with a high prevalence of non-communicable diseases (NCDs), with more than half the deaths caused by NCDs, especially cardiovascular and respiratory diseases [8, 9]. At the same time, infectious diseases like diarrhea, malaria, and tuberculosis (TB) are still highly prevalent and leading causes of morbidity and mortality [10-12]. (See Chapter 2 for more details.)

A1.3.2 Health Financing

The last two rounds of the National Sample Survey (NSS) show that Odisha has one of the highest out-of-pocket expenses (OOPE) in the country [13, 14]. Total Health Expenditure (THE) in Odisha amounts to $1.97 billion or around $46 per capita (Rs. 2,949) [15], which is less compared to other Indian states, and a majority of this THE is borne by individuals through OOPE (76 percent). Government Health Expenditure (GHE) makes up 21.6 percent, and the pooling of these resources is very low [13, 16].

Figure A1.2: Formal and Informal Employment in Odisha

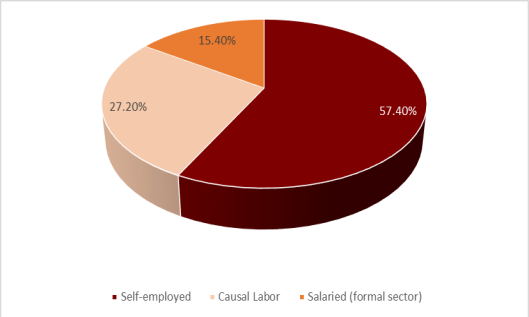
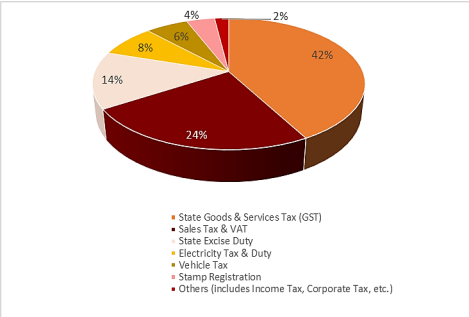
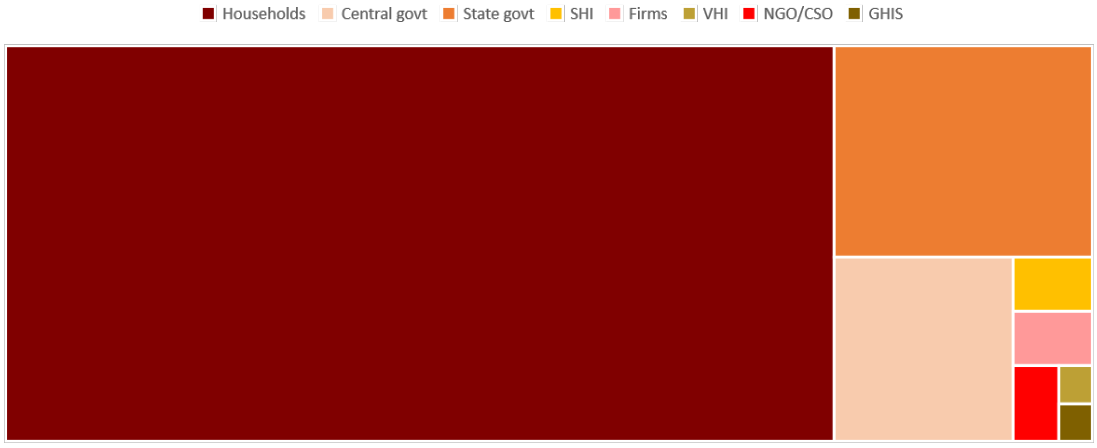


Figure A1.3: Composition of Odisha's tax revenue



Source: Odisha Economic Survey, 2019-20

Figure A1.4: Share of health expenditure by source



Source: State Health Accounts, 2014

Resource mobilization, allocation to health, pooling, and utilization have been challenges in Odisha. Even though the state has seen significantly high economic growth in the last few years [17], the tax base and the state's capacity to raise taxes remains very low at 6.4 percent of GSDP (Gross State Domestic Product) [17]. A majority of the population (84.6 percent) is employed in the informal sector, which includes the self-employed and casual laborers (Figure A1.3) [17]. The high informality of the economy raises the usual fiscal problems of tax collection, thereby affecting the state's revenues. Figure A1.4 shows the disaggregated sources of tax

revenue for Odisha, and it is evident that income tax contributes only a minuscule of the total pie.

Public spending on health remains low (0.9 percent) and has been constant as a share of the state's GDP [17]. Like the rest of the country, health has historically been low on the list of priorities. For example, out of the social sectors, Odisha spent 5.1 percent on health versus 14.7 percent on education [17]. In fact, the state government decreased allocations from Rs. 1203 crore ($1.6 billion) in 2019-20 to Rs. 1107 ($1.4 billion) in the budget of 2020-2021 [17]. Government funding comprises a mix of state funds through state tax revenues and transfers from the central government, with most large programs sharing a 60:40 ratio between the state and the center. (See section A1.6 for more details.)

Odisha has several government-sponsored health insurance schemes (GHIS). The state launched its own health insurance program in 2018 – the Biju Swasthya Kalyan Yojana (BSKY), instead of adopting the central government's health insurance scheme (the Pradhan Mantri Jan Arogya Yojana or PMJAY). However, the two schemes are very similar in design. BSKY is an amalgamation of a few older programs – the state-level BKKY (Biju Krishi Kalyan Yojana meants for farmers) and the national-level RSBY (Rashtriya Swasthya Bima Yojana for BPL). Other continuing GHIS include the Central Government Health Scheme (CGHS) for civil servants (funded by the central treasury and run by the central Ministry of Health); the Employee State Insurance Scheme (ESIS) meant for blue-collar formal sector workers (run by the central Ministry of Labor and Employment); and the insurance scheme for weavers (run by the Ministry of Textiles). Together, all social insurance schemes mobilize only 0.9 percent of the government's resources [16]. Voluntary health insurance (VHI) through private commercial insurers covers a minuscule of the population, and other employer-based insurance for formal sector workers are even smaller [16]. Each of these schemes has different benefits packages, with CGHS having the most generous one. CGHS and ESIS cover some outpatient care and costs of drugs and diagnostics. BSKY and the other smaller schemes cover only inpatient care, do not have any cost-sharing with the beneficiary, and are entirely tax-financed. ESIS has an employer contribution towards the premiums. Thus, the state has multiple fragmented risk pools and multiple purchasers, meaning that no one purchaser has been able to have any monopsonistic power to regulate the market.

A1.3.2 Healthcare Delivery

As in other parts of the country, Odisha has a mixed system with both public and private providers operating in parallel. The public system has its network of tertiary-care Medical College Hospitals, secondary-care District and Sub-Divisional Hospitals (DH and SDH), Community Health Centers (CHCs), Primary Health Centers (PHCs), Sub-centers (SCs), and Health and Wellness Centers (HWCs). The private sector is widely variable in quality and is heterogeneous, including a range of providers such as large super-specialty hospitals, doctors with small individual practices, chemist shops, and traditional healers. Another characteristic of the health delivery system is the existence of AYUSH providers; these are formal qualified physicians trained in Indian systems of medicine practicing Ayurveda, Yoga, Unani, Siddha and Homeopathy (AYUSH). AYUSH providers exist in both the public and private sectors and often co-exist with mainstream allopathic medicine. Doctors and other providers

in private practice and chemist shops are other categories of healthcare providers of outpatient treatment and drugs [19, 20].

Table A1.2: A snapshot of Odisha's health system

A snapshot of the health system in Odisha	
Delivery System	Hybrid system with public and private providers. Fragmented delivery without linkages between different levels of care. Majority seek care at public facilities for both IP and OP.
	No formal referral linkages, no gate-keeping. Lower level facilities are bypassed due to poor quality More providers in urban areas, Central RDC. Fewer in Southern and Northern RDC.
Health Financing	Government spends only 0.9% of its GSDP on health.
	Majority of THE is borne by individuals through OOPE (76%). GHE (%THE): 21.6%. Minimal pooling
	Most of the government money is spent on hospitals and curative care. Most of the OOPE is spent on drugs
	GHIS: BSKY eligibility based on poverty and other vulnerability criteria (SC/ST, disability, etc.). CGHS for civil servants, ESI for formal sector workers **Fragmented Risk Pools:** Multiple risk pools and payment rates **Multiple purchasers** – SHA (DoH) purchase for BSKY; MoH for CGHS; MoL for ESI; most purchasing is by individuals (reflected in high OOPE) **Benefit Package:** Wide-ranging coverage across different schemes. BSKY covers only hospitalization, no OP care or drugs **Cost-sharing:** No cost-sharing with beneficiaries. BSKY is entirely tax-financed. Social health insurance is not feasible due to large informal sector & low payroll tax contribution **Providers:** BSKY & CGHS automatically empanels all public hospitals. Private hospitals need to fulfil certain simple criteria. ESI has their own network of providers.
Provider Payment Mechanisms (PPM)	**Physicians** in public system paid by salaries – they are in state civil services & earn as per pay-grades (not performance). Private providers are paid through OOPE-POS.
	Public hospitals get annual line item budgets + reimbursement for BSKY & other GHIS. **Private hospitals** largely paid by OOPE. Private hospitals empanelled under BSKY/GHIS get reimbursements as per set package rates.
Cost Control	No clear cost-control mechanisms, except wait times, limited timings in the public system
Regulation	Regulatory mechanisms exist but are not strictly enforced

A1.3.3 Provider Payment Methods

Fee-for-service and line-item budgets are the principal methods of provider payments in Odisha. Physicians in the public system are paid through salaries; they are part of the state civil services and earn as per set pay-grades and not their performance. Staff at PHCs, SCs and HWCs are paid through salaries, but the source of funds is often a mix of the state Department of Health and Family Welfare's (DoHFW) facility-budget and a specific program budget, such as the National Health Mission, either from state or central government allocation. (See section A1.6 for more details.) Private providers are paid entirely through OOPE at point of service, which is most common when they are in solo practice; or they are paid salaries with profit-shares if they are employed by private hospitals. Public hospitals get annual line-item budgets from the DoHFW. In addition, there are reimbursements for GHIS beneficiaries. Private hospitals are primarily paid by individuals through OOPE. In cases where private hospitals are empaneled under GHIS or voluntary health insurance schemes, they receive reimbursements as per set package rates for their eligible patients.

Most care in the public sector is supposed to be free for the patients and user fees form a very small percentage of revenues for Odisha's public sector facilities. The government of Odisha had introduced user fees for District Hospitals and Medical College Hospitals in 1997 under a World Bank reform with an aim to augment the

financial resources and bring more efficiency in the system [8]. In 2018, user charges were waived off up to the district level public sector facilities [21]. For tertiary hospitals and Medical College Hospitals, user fees have now been restricted to nominal fees for registration, hospital beds or rooms, and diagnostics. The fees vary between Rs. 10 ($0.15) and Rs. 2,000 ($26) depending on the service, but low-income patients are exempt from paying, and individual hospitals or their Rogi Kalyan Samitis (community-based hospital management societies) decide who should be exempt. All emergencies and diseases covered by national programs are exempt from user fees. User fees contribute negligible amounts towards cost-recovery of health facilities (<1.5 percent on an average) [22].

A1.3.4 Regulation

Like in many other states in India, Odisha has struggled with successfully enforcing regulations for healthcare. Regulations in the form of acts, laws, and "anti-fraud" policies under GHIS exist, but there are considerable gaps in implementation and enforcement. For instance, only 57 percent of practicing doctors in Odisha were found to be medically qualified [19], 60.8 percent of private practices are not registered under any act, such as the Clinical Establishments Act, and chemist shops that form a large source of care are mostly registered under Shops and Establishment Act and not as clinical facilities. There have been cases to control dual practice among physicians, where public sector physicians also have private clinical practices [23, 24]. The BSKY has tried to regulate hospitals by setting prices and monitoring for fraudulent claims and charges. However, as often seen in many other parts of India, the opposition from strong medical lobbies like the Medical Council of India and the Indian Medical Association has made these regulatory mechanisms challenging to implement [25].

A1.4 Key Health Policies in Odisha in the Last 15 Years

Odisha has implemented many national health policies and programs. In addition to the national population policies and disease control programs on malaria, tuberculosis, leprosy, filariasis, and blindness, the National Health Mission (2005), the Janani Shishu Suraksha Yojana (2005), the Rashtriya Swasthya Bima Yojana (2008), and the Health and Wellness Center Program under Ayushman Bharat (2018) are noteworthy.

The National Health Mission (NHM) was launched in 2005 by the Indian National Congress-led government at the center. Although NHM covers the entire country, it has a special focus on the EAG states, which includes Odisha. The program has a broad mandate to strengthen the public healthcare delivery system and provide accessible, affordable, and good quality healthcare, especially to vulnerable groups. The NHM subsumed previous health and family welfare programs funded by the central government, including reproductive and child health (RCH-II) and the national disease control programs for malaria, tuberculosis, and other diseases. The central government contributes 60 percent of the NHM funding, and the state contributes the remaining 40 percent. NHM also provides flexible, supplemental funds for the operation and maintenance of public sector health facilities. These funds can be used to fill state-identified gaps in infrastructure, human resources, equipment, and other areas. NHM funds are routed through the State Health Society, which is also in charge of implementing the program. Two main focus areas of NHM

have been the building of public sector healthcare infrastructure and the ASHA Program that supports village-level community health workers, primarily with maternal and child health responsibilities [26].

Linked to the NHM, the Janani Shishu Suraksha Yojana (JSSY), launched in 2005, aims to increase the number of institutional deliveries. The scheme pays cash incentives for pregnant women to deliver at health facilities and provides free drugs, diagnostics, referral transport, and food to pregnant women and sick infants at health facilities [26].

The Rashtriya Swasthya Bima Yojana (RSBY), launched by the central government, was adopted by Odisha in 2009. A government funded health insurance scheme, the RSBY insured Below Poverty Line (BPL) households for hospitalizations costs up to $600 (Rs. 30,000) annually. RSBY did not cover outpatient expenses or drugs. Enrolment fees for a household were Rs. 30 (about 60 cents). The program was aimed at covering around 33 percent of Odisha's population. Initially implemented and managed by the Ministry of Labor and Employment, the program was transferred to the Ministry of Health and Family Welfare at the national level in 2015. The transfer was reflected at the state level, and Odisha's Department of Health and Family Welfare (DoHFW) started implementing the scheme through its state nodal agency. According to Odisha's State Health Accounts, 0.3 percent of total health expenditure in Odisha was spent through RSBY [27]. The RSBY was managed by commercial insurance companies, selected through a competitive bidding process for each district. The insurers empaneled hospitals based on prescribed criteria as well as enrolled eligible households. Premiums were paid by the government directly to the insurance company. The central government provided 60 percent of the premium, and the rest was covered by the state government. Claims were submitted by hospitals and reimbursed by the insurance company. The RSBY was subsumed into the state's new BSKY program in 2019-20. However, a number of its provider empanelment and payment arrangements are still operational through the BSKY.

In 2018, Odisha started the central government's Health and Wellness Center (HWC) Program under Ayushman Bharat. The HWC program is aimed at establishing new or upgrading existing Sub-Centers and Primary Health Centers (PHCs) to provide comprehensive primary care. The notable inclusion was the plan for preventing and controlling non-communicable diseases at the primary level and the training and placement of physicians, graduate nurses, or Ayurvedic doctors as the main provider at the HWC [28].

As mentioned before in this chapter, the other part of the central government's Ayushman Bharat, the PMJAY, has not been adopted by Odisha; instead, the state launched its own insurance scheme, the BSKY.

BSKY, a tax-funded GHIS launched in 2018, offers insurance coverage for hospitalization. Like the erstwhile RSBY or the central government's PMJAY, the BSKY benefits package does not cover treatment, drugs, and diagnostics for outpatient care, which account for the largest burden of OOPE in the state. (See section A1.3 and Chapter 3 for details.) BSKY identifies eligible families based on a

combination of income and other measures of vulnerability.[25] Based on the eligibility criteria, almost 80 percent of Odisha's population qualify for BSKY. The program covers up to Rs. 700,000 ($10,000) in hospital expenses. Beneficiaries can receive care at any public hospital or an empaneled private hospital. The state has created a State Health Agency (SHA) to play the role of the purchaser. Providers are paid on a fee-for-service basis at government-set price rates for a list of around 1500 procedures.

Between 2019 and 2020, some of the existing financial risk protection programs were consolidated under BSKY. These include the erstwhile RSBY, the state-level Biju Krishi Kalyan Yojana (BKKY) targeted at farmers, and the Odisha State Treatment Fund (OSTF) targeted at BPL households as a supplement to RSBY.

Many GHIS, however, continue in parallel with BSKY. Some of the key schemes include the Central Government Health Scheme (CGHS) for civil servants funded by the central treasury and run by the central Ministry of Health and Family Welfare, and the Employee State Insurance Scheme (ESIS) meant for blue-collar formal sector workers run by the central Ministry of Labor and Employment.

In addition to the BSKY, the government of Odisha has launched several other healthcare programs. Noteworthy are (i) the Niramaya scheme (2015) that aims to provide free drugs at public sector hospitals and improve supply-chain management through information technology [29], (ii) the Nidan scheme (2018) that aims to provide free diagnostic services to patients at public health facilities [30], (iii) Mamata (2011) [31]and Sammpurna (Sishu Abom Matru Mrityuhara Purna Nirakaran Abhijan) (2017) schemes [32], implemented in conjunction with the national JSSY, aim to reduce maternal morbidities and mortality among women who stay in remote places through conditional cash transfers for transportation to a health facility for institutional deliveries and for compensation for wage loss of pregnant women and mothers and ensure that they receive adequate rest and nutrition during pregnancy and post-delivery, and (iv) DAMAN (2017) is the state's intensified malaria control initiative to address the endemic prevalence of the disease, in conjunction with the national and global interventions [33, 34].

A1.5 Federalism and Administrative Structures Related to Healthcare Policies

India is a decentralized federal polity. It is important to bear in mind the federal system and its decentralized governance structure to understand the context of healthcare policies in Odisha. This section lays out some of the key constitutional and administrative arrangements that have a bearing on how healthcare policies are made and funded.

[25] BSKY uses a combination of the Socio-Economic Caste Census (SECC, 2011) of the Government of India. This includes BPL, ST/SC populations and households led by women or disabled individuals. In addition, BSKY also includes the population that was covered by the erstwhile BKKY, including workers in agriculture and related sectors (fishing, horticulture, sericulture, and others)

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

A1.5.1 Health as a Constitutional Subject

The Constitution of India has provided for a division of powers between the central and state governments, and the center-state relationship in the area of health is complicated. The Constitution determines the division of powers between the center and states through three lists – the union list, the state list, and the concurrent list. The union list has a range of subjects (such as defense, banking, and railways) on which the national parliament may make laws, and the state list includes subjects on which the state legislatures make laws (such as police, prisons, and sanitation). Laws on the concurrent list (such as marriage and divorce, adoption, and inheritance) are made by both the parliament and the state legislatures. However, laws made by the parliament can override the state legislative laws on both the state and the concurrent lists. Health (stated as public health and sanitation, and hospitals and dispensaries) is on the state list of the Indian Constitution.

A1.5.2 Fund Flows, Budgets, and Fiscal Transfers for Healthcare

A state's ability to make health policies and implement them is determined to a large extent by the availability of financial resources. In India, the majority of the revenue generation capacity lies with the central government, and Odisha, like other states, receives funds based on specific revenue-sharing rules. The Finance Commission (a body constituted in 1951 to define the financial relations between the Union and the states by determining the division of taxes)[26] has given the central government a wider range of revenue-generating powers than the states. Most indirect taxes, as well as income taxes, are levied and collected by the center. Central government revenues are disbursed to the states as per constitutionally-mandated revenue sharing streams and standardized formulas based on the state's population, income, and other characteristics. Even most of the funds for state-initiated programs come from these revenues and "discretionary funds" given by the central government.

For healthcare, the central government designs and partially funds major national programs, whereas the states have the responsibility to deliver healthcare with a high level of autonomy. A look at the health programs in India shows that most of the initiatives have been directed by the center. Examples include the vertical disease-specific programs, the family planning program, the JSSY, the NHM, the RSBY, and the Ayushman Bharat.[27] In most cases, the states have adopted the central programs, received money (in some cases, 100 percent of the program budget) from the center, and implemented the program. In most cases, even the salaries for the health

[26] The 14th Finance Commission recommended a greater devolution of power and resources to states. States' share in net proceeds of Union tax revenues increased to 42 percent from 32 percent earlier - the largest ever jump in percentage of devolution. In the past, changes have ranged between 1-2 percent increase. But with this higher access to revenues, the sharing pattern under various schemes also changed, with states bearing higher fiscal responsibility for schemes. For a number of health programs this translated to a 60:40 division between center and states. The Finance Act 1951. Accessed at http://lawmin.nic.in/

[27] Both NHM and the HWC program follows the financial guidelines of the state, but all approvals come from the Ministry of Health and Family Welfare at the center, and not from the DoHFW in Odisha.

workers are paid through central program funds, and the center specifies the rules of hiring and training these staff.

Funding for health programs is allocated based on health budgets. The budgeting process starts from district-level plans, where each district submits its estimated budgets to the state. At the state level, each of the 12 health directorates submits an annual budget proposal to the DoHFW.[28] The budget is bifurcated into two parts: program expenses and administrative expenses.[29] The DoHFW submits the program expense budget to the Planning and Convergence Department (DoP&C) and the administrative budget to the Finance Department (DoF). Both departments have pre-budget scrutiny meetings where questions are raised, and the budget is finalized. This final budget is submitted to the Cabinet and the Chief Minister for approval. Once this is approved, it is proposed to the State Legislative Assembly, which passes the Bill after deliberation. This Bill is then submitted to the central government for approval and requisition of funds. The contributions from both center and state go into the Consolidated Fund, out of which disbursements are made to the different health directorates and programs.[30]

Based on funding sources and fund flows, there are three different categories of programs: (i) State Sector Schemes, where the entire funding comes from the Government of Odisha. There are 38 such schemes or budget heads in Odisha. These may range from specific items and budget heads such as "bedding, clothing and linen" for health facilities to large programs such as the Niramaya scheme, (ii) Centrally-Sponsored Scheme where both the state and the center contribute funds to the program according to pre-determined ratios. There are seven such schemes in Odisha, including NHM, the erstwhile RSBY, and the HWC program under

[28] The Department of Health and Family Welfare in Odisha has 12 different directorates, or administrative units within it. These are (i) National Rural Health Mission, (ii) Directorate of State AIDS Cell, (iii) Directorate of Medical Education and Training, (iv) Directorate of Drug Control Administration, (v) Directorate of Health Services, (vi) Directorate of Family Welfare, (vii) Directorate of Public Health, (viii) State Institute of Health and Family Welfare, (ix) Directorate of Capital Hospital Bhubaneshwar, (x) Directorate of AYUSH, (xi) State Drug Management Unit, and (xii) Chief Electoral Officer.

[29] In principle, the Program Expense budget is for program related costs, and the Administrative Expense budget is for salaries (almost 80 percent of the budget) and costs of office maintenance or rents. Interestingly, for some programs, the Program Expense budget is not only related to programmatic costs or interventions but also salaries of staff. For example, NHM is under Program Expense (including the salaries of NHM staff). Contractual staff under NHM like District Program Managers and incentives for ASHAs are paid by the central government. Some contractual Medical Officers, ANMs or even medical and paramedical staff at CHCs, SDHs, DHs, and Medical College Hospitals may be paid under the NHM budget. Otherwise, all salaries of permanent staff from PHCs to Medical College Hospitals are paid under the Administrative Expense from the state government funds.

[30] Once the funds are in the Consolidated Fund, it is almost impossible to track the center-state contributions and determine the source of funds for exact components of a health program. It is only at the stage of budgeting and disbursements from the center, that the share of center-state funds can be demarcated.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Ayushman Bharat,[31] (iii) Central Sector Schemes where the entire funding comes from the central government. There are six such schemes in Odisha such as the TB Control Program, National Goiter Control Program, and Malaria Eradication Program.[32]

A1.6 Conclusion

This chapter aimed to provide an overview of Odisha, the state where our health system assessment study was conducted. Knowledge of the study context is important to help us better interpret and contextualize our findings from this assessment as well as to allow us to formulate hypotheses for diagnosing causes that explain our results. Using secondary data, we discussed the socio-demographic characteristics of the Odisha, its political landscape, an overview of certain aspects of the state's health system, its major health programs initiated in the last 15 years, and the context of health program implementation and funding within the Indian federal structure. The state of Odisha faces many challenges, especially related to poverty, vulnerable social groups, hard-to-reach areas, and natural calamities. Given all these adversities, the state has managed to improve health outcomes and initiate well-intentioned health programs; however, many challenges in the state's health system remain.

A1.7 References

1. Registrar General of India, *Census of India*. 2011, Ministry of Home Affairs, Government of India: New Delhi.
2. The World Bank, *Odisha Social Inclusion Brief*. *http://documents.worldbank.org/* 2012.
3. Kujur, R.K., *Naxal Movement in Orissa*. Institute of Peace and Conflict Studies. http://www.ipcs.org/comm_select.php?articleNo=1902, 2005.
4. Press Trust of India, BJP MPs urge Odisha govt to implement Ayushman Bharat, in Business Standard. *https://www.business-standard.com/*. August 12, 2019.
5. Express News Service, Odisha BJP MPs appeal to CM Naveen Patnaik on Ayushman Bharat scheme, in New Indian Express. *https://www.newindianexpress.com/*. 13 August, 2019.
6. Roberts, M.J., Hsiao, W.C., Berman, P., Reich, M.R., *Getting Health Reform Right: A Guide to Improving Performance and Equity*. 2008, New York: Oxford University Press.
7. NITI Aayog, *State-wise data from Sample Registration Survey, 2016*. 2016, Government of India: New Delhi.
8. International Institute for Population Studies (IIPS), *National Family Health Survey of India – I, 1992-1993*. 1994.

[31] In Odisha, the BSKY is under the National Health Mission Directorate, and it is not clear if it is a state sector scheme or a centrally sponsored scheme. There have been debates about the source of funds for the BSKY. As mentioned in an earlier endnote, it is hard to establish the exact source of funding for programs from the Consolidate Fund.

[32] After the 14th Finance Commission (2015) which revisited the center-state funding arrangements, central sector schemes have started getting funds from the state, although the majority of the funds come from the center.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

9. ICMR, P.a.I., India: Health of the nation's states – the Indian state-level disease burden initiative in the Global Burden of Disease Study. . https://www.healthdata.org/, 2017.
10. Government of India, *National Vector Borne Disease Control Program (NVDCP)*. M.o.H.a.F. Welfare, Editor.: New Delhi.
11. Government of Odisha, *Odisha State Malaria Information System (OSMIS)*, D.o.H.a.F.W.-N.H. Mission, Editor.: Bhubaneshwar.
12. Government of India, *Annual status report*. *http://tbcindia.nic.in/WriteReadData/TB%20India%202017.pdf*.
13. National Sample Survey Office, *Key Indicators of Social Consumption in India: Health, (NSSO 71st Round)*, M. Ministry of Statistics and Programme Implementation, Editor. 2014, Government of India: Delhi.
14. National Sample Survey Office, *Key Indicators of Household Consumption on Health in India. NSS 75th Round* G.o.I. Ministry of Statistics and Program Implementation (MoPSI), Editor. 2019, Government of India: New Delhi.
15. GBD 2013 Mortality and Causes of Death Collaborators, Global, regional, and national age–sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet, 2015. **385**: p. 117–71.
16. Rout, S.K., Sahoo, K.S., Mukhopadhyay, I., et. al. , *State Health Accounts, Odisha: 2013-14*. 2016, Public Health Foundation of India (PHFI): New Delhi.
17. Government of Odisha, *Odisha Budget FY 2020-2021*, D.o. Finance, Editor. 2020.
18. Comptroller and Auditor General of India, *Combined Finance and Revenue Accounts*. 2017, Government of India: New Delhi.
19. Anand, S., Fan, V., The Health Workforce in India, in Human Resources for Health Observer Series 2016, WHO: Geneva.
20. Gupta, I. *India*. International Health Care System Profiles: The Commonwealth Fund. https://www.commonwealthfund.org/international-health-policy-center/countries/india 2020.
21. Sambad English Bureau, *Odisha To Waive User Fee At Hospitals From I-Day*, in *Sambad*. *https://sambadenglish.com/*. August 1, 2018.
22. Government of Odisha, *Odisha Economic Survey 2018-19*, D.o.P.a. Convergence, Editor. 2020: http://ncds.nic.in/sites/default/files/OEDS1NCDS.pdf.
23. Venkatesan, J., Private practice by government doctors no criminal offence: court, in The Hindu. *https://www.thehindu.com/*. May 1, 2011.
24. Express News Service, National Human Rights Commission direction on private practice by Government doctors in duty hours, in The New Indian Express. *https://www.newindianexpress.com/*. July 31, 2017.
25. Sambad English Bureau, *Private Hospitals In Odisha Say No To BSKY Beneficiaries*, in *Sambad*. *https://sambadenglish.com/*. October 16, 2019.
26. (MoHFW), M.o.H.a.F.W. *National Health Mission*
27. Rashtriya Swasthya Bima Yojana, Available at: http://www.rsby.gov.in/about_rsby.aspx.
28. Ministry of Health and Family Welfare, *Ayushman Bharat - Health and Wellness Centers*. Government of India. https://ab-hwc.nhp.gov.in/.
29. Department of Health and Family Welfare, *Niramaya Scheme*, D.o.H.a.F. Welfare, Editor., Government of Odisha: https://www.e-niramaya.odisha.gov.in/.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

30. Government of India, *Nidan (Free Diagnosis) Scheme in Odisha*. https://www.pradhanmantriyojana.co.in/.
31. Government of Odisha, *Mamata Scheme*, D.o.W.a.C.D. http://wcdodisha.gov.in/, Editor.
32. Department of Health and Family Welfare, *Sishu Abom Matru Mrityuhara Purna Nirakaran Abhijan (SAMMPurNA)*, D.o.H.a.F. Welfare, Editor., Government of Odisha: https://www.pradhanmantriyojana.co.in/sampurna-scheme-in-odisha/.
33. Bal, M., et al., Assessment of effectiveness of DAMaN: A malaria intervention program initiated by Government of Odisha, India. PloS one, 2020. **15**(9): p. e0238323-e0238323.
34. Pradhan, M. and P. Meherda, *Malaria elimination drive in Odisha: Hope for halting the transmission*. Journal of Vector Borne Diseases, 2019. **56**(1): p. 53-55.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Appendix 2
Research Design and Methodology[∝]

A2.1 Introduction

The Odisha Health System Assessment Study was undertaken by the Harvard T.H. Chan School of Public Health (the Harvard team) as a part of the Odisha Health Systems Project. The main research objective of this study was to empirically assess the performance of the state's health system in terms of a set of final outcomes (health status, financial risk protection, and citizen satisfaction), and intermediate outcomes (access, efficiency, and quality).

The analytical approach adopted for the project, and this study, is the Control Knob Framework (Figure 1.1). Following the logic of the policy cycle in our analytical approach (Figure 1.2) the Odisha Health System Assessment Study is the first step of the Odisha Health System Project. (See Chapter 1 for more details.) This assessment will be followed by diagnosis, in which we will analyze the underlying causes of good or poor performance. The evidence generated by these analyses, combined with careful reviews of international and Indian experiences, will inform the design and proposal of health system reform options for Odisha.

We followed a systematic process to conduct the Odisha Health System Assessment Study. First, we assessed existing and recent data, such as the National Sample Survey (NSS), the National Family Health Survey (NFHS), the Economic Survey, and the Rural Health Survey, which gave us an understanding of a 'landscape' of the state's health system and policy context.[33] Based on this effort, the team concluded that the existing data cover only a subset of the whole system and therefore are not adequate for a system level analysis. The team therefore designed an innovative and new package of surveys that represent the new gold standard of assessment for health system analysis. This package includes ten different surveys to collect data from a range of stakeholders: 30,654 individuals across 7,567 households, 1485 patients, and 554 public and private sector facilities, across different levels of care, including hospitals, nursing homes, and primary care facilities, 1124 individual providers, including 794 providers at facilities and 685 providers engaged in solo practice, and 1035 chemist shops. Table A2.1 shows our ten surveys, their sample sizes, and their objectives, and Table A2.2 lists the main respondents for each of these surveys.

[∝] This chapter was led by Anuska Kalita and Winnie Yip, with participation from Annie Haakenstad.
[33] The report on the Landscape Analysis of Odisha's Health System was submitted by Harvard to BMGF in 2019.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

A2.1.1 Novel and Unique Characteristics of our Study

Our study and the surveys designed for this assessment of Odisha's health system have some novel and unique characteristics that aim to address the gaps in existing knowledge:

i. **Linking demand with supply-side perspectives:** Most large-scale datasets in India have focused only on household data, such as the National Sample Survey (NSS) and the National Family Health Survey (NFHS). Our study goes beyond households to include public and private providers and allows linking household's utilization data to characteristics of providers so we can assess how both demand and supply influence people's utilization of services and the costs associated with care.

ii. **Providing more comprehensive understanding of the private health sector:** There are huge data gaps in our knowledge of the private health sector in India and Odisha. While some data exist about large private sector tertiary-care hospitals, surveys seldom include smaller private providers, although they represent a significant proportion of the healthcare delivery system. Existing evidence on these categories of private providers is based on smaller-scale studies, usually concentrated in a few villages or a district. Our research addresses this gap in information and knowledge by collecting data from different categories of private sector providers, including hospitals and nursing homes, chemist shops, and providers engaged in solo-practice.

iii. **Collecting geospatial data to allow market analyses:** Our surveys collected geospatial data that allow analyses of market behavior, including such questions as where users and providers are located, whether providers are clustered in certain locations, and if users are bypassing the nearest providers to visit one that is further away.

iv. **Going beyond quantity to assess quality and effectiveness:** Existing analyses and corresponding data in India to date have focused on the quantity of services. However, quantity does not translate to health outcomes or patient satisfaction unless there is good quality. Our surveys include citizen satisfaction, with patient experiences collected at both out-patient and in-patient exit interviews across all levels of healthcare providers, and all three fundamental aspects of quality of care (patient safety, patient-centeredness, and clinical effectiveness).

In this chapter, we describe the research design of the Odisha Health System Assessment Study. We present a detailed description of our sampling methodologies and sample sizes for each of the ten surveys, the calculation of survey weights, the process of data collection and data cleaning, and the ethical approvals we obtained for the study.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table A2.2: The main respondents for the different surveys used in the Odisha Health System Assessment

S.No.	Surveys	Main respondents
1.	Household survey	Members of sampled households ≥18 years of age
2.	Facility survey for hospitals and CHCs	Officers-in-charge from sampled public and private sector secondary and tertiary hospitals and CHCs in the public sector
3.	Facility survey for PHCs, SCs and HWCs	Officers-in-charge at sampled primary care facilities in the public sector – PHCs, SCs, HWCs
4.	Survey for individual providers at facilities	Physicians, laboratory technicians, pharmacists from sampled public and private sector facilities across hospitals, CHCs, PHCs, SCs, and HWCs
5.	Survey for solo providers	Providers practicing from their homes, private clinics, or chemist shops (private sector)
6.	Survey for chemists	Managers/owners of sampled drug stores in the private sector
7.	Clinical vignettes for primary care providers	Medical officers at sampled public sector PHCs and private sector solo providers
8.	Outpatient exit interviews	Patients who accessed outpatient care from sampled public and private sector facilities and solo providers
9.	Inpatient exit interviews	Patients who accessed inpatient care from sampled public and private sector hospitals and CHCs
10.	Patient safety survey for hospitals	Providers at sampled public sector hospitals

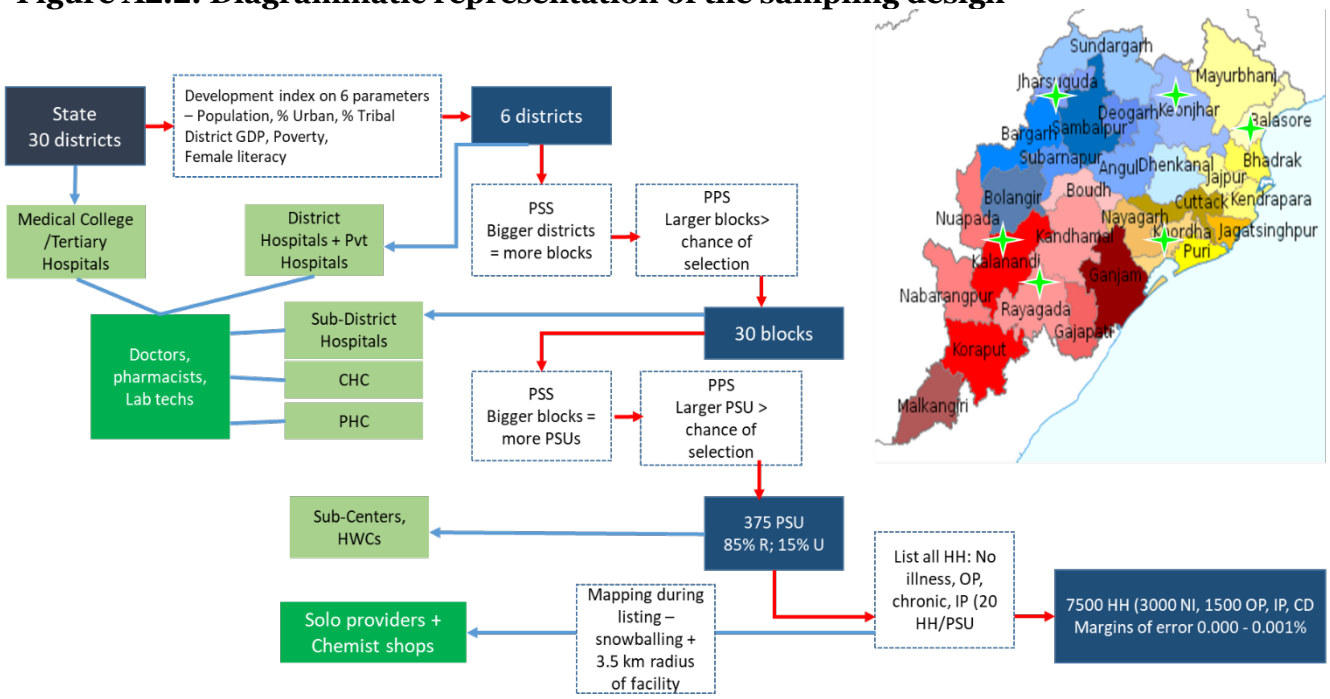
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table A2.1: The ten Odisha health system surveys, with sample sizes, and objectives

SURVEY	SAMPLE SIZES*	OBJECTIVES
1. Household survey	• Households in sampled districts - 7567 (includes data about each member of the household) - 30645 individuals	• Assess financial risk protection, access to care, perception of quality, and satisfaction of households • Understand health seeking behaviors and reasons behind choice of providers • Understand referral patterns (how often patients are referred from public providers to private, including: pharmacies, diagnostic centers and private clinics) private clinics
2. Hospital and Community Health Center (CHC) facility survey	• State level census of Medical College Hospitals & Tertiary Hospitals - 6 • All District Hospitals (DH) from sampled districts - 4 • All Sub-Divisional Hospitals (SDH) from sampled districts - 5 • All "Other" public hospitals (based on inclusion criteria) - 29 • All private hospitals in the state (based on inclusion criteria) - 36 • All Community Health Centers (CHC) from sampled blocks - 83	• Understand the functions and efficiency of different types of healthcare providers • Analyze how financing, provider payments and incentives, governance, organization and management affect service delivery of different types of healthcare providers • Understand referral linkages among providers (including among public facilities, private facilities, solo-providers, and chemists)
3. Primary care facility survey	• All Primary Health Centers (PHC) from sampled blocks - 130 • All Sub-Centers (SC) from sampled blocks - 259 • All Health & Wellness Centers (HWC) from the sampled blocks - 7	
4. Providers in facilities survey	• Providers across Medical College Hospitals & Tertiary Hospitals, District Hospitals, Sub-Divisional Hospitals, other public hospitals, private hospitals, CHC, PHC - 794	• Understand provider motivations and their interactions with the facility in which they work • Understand dual-practice (public providers in private practice) • Understand referrals and motivations/incentives behind referral decisions • Undertake market analysis of different types of providers
5. Solo providers survey	• Providers practicing from their homes/private offices/pharmacies across sampled districts - 685	
6. Chemists survey	• Chemist shops (medicine shops) across sampled districts - 1036	
7. In-Patient exit survey	• In-patients from Medical College Hospitals & Tertiary Hospitals and District Hospitals - 507 • Out-patients from Medical College Hospitals & Tertiary Hospitals, District Hospitals , Sub-Divisional Hospitals, private hospitals, CHC, PHC, solo providers – 978	• Assess patient experience of seeking care, focused on perception of quality • Understand referral patterns • Assess healthcare expenses incurred by patients
8. Out-Patient exit survey		
9. Patient safety culture survey	• Providers across Medical College Hospitals & Tertiary Hospitals, District Hospitals, Sub-Divisional Hospitals - 2687	• Assess patient safety culture in hospitals
10. Clinical Vignette survey	• Providers at the primary level (includes Medical Officers in PHCs and solo providers) - 110	• Assess knowledge/competence of providers to provide clinically effective care • Understand prescribing behavior of providers (focused on unnecessary/irrational and harmful drugs)

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure A2.2: Diagrammatic representation of the sampling design



Proportionate Stratified Sampling (PSS)
Probability Proportional to Size (PPS)

A2.2 Sampling for Household Survey

A complex multi-stage clustered sampling design was adopted for selecting the households for the survey (Survey 1 in Table A2.1). The healthcare facilities, individual health providers and patients of healthcare services were either a census of the universe, a random sample, or derived from their connection to the surveyed households (as seen through stated and revealed preferences). Therefore, the household sample remained at the core of this sampling process and design.

The multiple hierarchical levels of clusters of the household sample were as follows:

1. District
2. Block
3. Villages in rural areas or enumeration blocks in urban centers—referred to as primary sampling units or PSUs
4. Household

A2.2.1 Selection of Districts

The first level of the household sample was the district. Odisha has 30 districts that are classified under three administrative regions, Regional Development Clusters (RDC), each containing 10 districts. The three RDCs in the state are North, South and Central. Each RDC has differences in demographic and socio-economic characteristics such as poverty levels, proportion of tribal population, proportion of

urbanization and industrialization. (See Appendix A1 for more details.) Therefore, districts were stratified by RDCs.

The district selection was done using a multi-step approach that aimed to represent all sections of the socio-economic, demographic, and geographical characteristics of the state. The following variables were considered for assignment of a "development" index to each district:

1. Population in the district
2. Percentage of urban population
3. Percentage of tribal population
4. District Gross Domestic Product (DGDP)
5. Level of poverty
6. Level of female literacy

Principal Component Analysis (PCA) was conducted for all 30 districts of the state with the above-mentioned six variables. The first Principal Component (PC1) was used to divide the 30 districts into tertiles as this component explained ~50 percent of the total variability in the data. The districts were then stratified by the three RDCs and tertiles within their respective stratum (RDC) (Table A2.3).

Two districts from each RDC – one with a high tertile and the other with a low tertile – were selected through with-replacement random sampling. The randomization was through a computer-generated algorithm, and the process was repeated until we obtained a unique list of two districts with different tertiles under each RDC. With-replacement random sampling was chosen over without-replacement, as the former ensures that each district has an equal probability of being sampled.

From this process, we selected the following six districts:

North RDC: Jharsuguda and Keonjhar
South RDC: Kalahandi and Rayagada
Central RDC: Balasore and Khorda

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table A2.3: Tertile Positions of the 30 districts in Odisha based on Principal Component Analysis

	Northern Division		Central Division		Southern Division	
	Districts	**Original tertile position**	**Districts**	**Original tertile position**	**Districts**	**Original tertile position**
Division-wise Tertile 1						
	Angul	1	Cuttack	1	Boudh	2
	Dhenkanal	1	Jagatsingpur	1	Ganjam	2
	Jharsuguda	1	Khordha	1	Kalahandi	3
	Sambalpur	2	Puri	1	Kandhamal	3
Division-wise Tertile 2						
	Bargarh	2	Bhadrak	1	Koraput	3
	Sonepur	2	Jajpur	1	Nuapada	3
	Sundergarh	2	Kendrapara	1	Rayagada	3
Division-wise Tertile 3						
	Balangir	2	Balasore	2	Gajapati	3
	Deogarh	3	Mayurbhanj	3	Malkangiri	3
	Keonjhar	2	Nayagarh	2	Nabarangpur	3

Our sample yielded districts with a range of different characteristics. Among the sampled districts (highlighted in Table A2.3), Jharsuguda, Kendujhar, Kalahandi, and Rayagada have a high concentration of Scheduled Tribe (ST) population; except Jharsuguda, all other districts are predominantly rural; Jharsuguda and Kendujhar have mining industries while the other districts are largely agricultural; Kendujhar, Balasore, Kalahandi, and Rayagada have high poverty levels. This distribution of characteristics reflect the diversities of the state to a large extent. (See Appendix A1 for more details.)

A2.2.2 Selection of Blocks

The second level of clusters for the sample was the 'block,' which is the sub-district administrative unit in India.[34] A total of 30 blocks were selected from the six sampled districts. To select blocks, the following methods were used:

1. First, to determine the number of blocks to be chosen from each district, the method of Proportionate Stratified Sampling (PSS) was used —the district being the stratum and the proportion determined by the population of the district. Based on this, districts with bigger population sizes contributed a greater number of blocks to the sample than districts with smaller populations.

[34] On an average, a district comprises of 10 blocks. The average population of a district is 1,000,000, and of a block is 100,000. There is wide variation among districts and blocks across the country as well as within Odisha.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

2. From each district, the blocks were sampled using Probability Proportional to Size (PPS).[35] This ensured that the larger the population size of the block, the greater the chances of its inclusion in the sample.

First, the cumulative population of all blocks in each district was calculated. Then the total population of the district ($\sum population_{blocks}$) was divided by the sample size of blocks required from that district (Table A2.4). This number generated the Sampling Interval (SI). A computer-generated Random Start (RS) number between zero and the Sampling Interval was used. The population boundaries of the block that contained the RS number was selected as the first block ($Population_{block}$>RS). For selecting the subsequent blocks, the RS number was added to multiples of the Sampling Interval, the second block was selected by $Population_{block}$>(RS+1SI), the third block by $Population_{block}$>(RS+2SI) and so on, till the required number of blocks from each district were sampled.

Table A2.4: Number of blocks required from the sampled districts (based on Proportionate Stratified Sampling), and the blocks sampled (based on Probability Proportional to Size)

S.No.	Sampled Districts (as per PCA)	Total blocks	Number of blocks to be sampled (as per PSS)	Blocks sampled
1.	Kendujhar	13	6	1. Anandapur 2. Ghasipura 3. Harichandanpur 4. Jhumpura 5. Joda 6. Saharapada
2.	Balasore	12	8	1. Balesore 2. Baliapal 3. Basta 4. Bhogarai 5. Jaleswar 6. Nilagiri 7. Remuna 8. Soro
3.	Khorda	10	5	1. Balipatna 2. Begunia 3. Bolagad 4. Jatni 5. Tangii
4.	Rayagada	11	3	1. Bisam Cuttack 2. Kaashipur 3. Padmapur
5.	Kalahandi	13	5	1. Bhawanipatna 2. Golamunda 3. Kalampur 4. Koksara 5. Narla
6.	Jharsuguda	5	2	1. Jharsuguda 2. Lakhanpur

[35] For Probability Proportional to Size (PPS), in the first stage, larger clusters have bigger probability of being sampled; in the second stage, exactly the same number of individuals unit per cluster are sampled from the sampled larger clusters. This means that individual units in large clusters have smaller probability of being sampled. As a result, overall, the second stage compensates for the first stage, so that each individual unit in the population has an equal probability of being sampled.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

A2.2.3 Selection of Primary Sampling Units

Primary Sampling Units (PSUs) were the third level of clusters to be sampled. PSUs of each block were stratified into urban and rural (based on census data). 'Rural' is defined as census-villages, and 'Urban' is defined as census enumeration blocks.[36]

Based on the proportion of rural and urban population in the state, the rural-urban ratio for the sample was determined as 85:15. The sample contained approximately 85 percent rural PSUs and 15 percent urban PSUs. A total of 375 PSUs were sampled from the 30 blocks – 300 villages (rural) and 75 enumeration blocks (urban).

Sampling of PSUs was done using the same methods that we used for sampling blocks. First, Proportionate Stratified Sampling (PSS) was used to determine the number of PSUs that each block would contribute to the sample, calculated based on their population size. 85 percent of this number was the required number of rural PSUs and 15 percent was for urban PSUs. Compared to less populous blocks, more populous blocks contributed a greater number of PSUs to the sample.

Next, once the number of PSUs to be sampled from each block was determined, Probability Proportional to Size (PPS) was used to sample the PSUs in each block. The larger the size of the PSU, the greater the chance of its inclusion in the sample.

The cumulative population of all PSUs in each block was calculated. Then the total population of the block ($\sum population_{PSUs}$) was divided by the sample size of PSUs required from that block (Table A2.5). This number generated the Sampling Interval (SI). A computer-generated Random Start (RS) number between zero and the SI was used. The population boundaries of the PSU that contained the RS number was selected as the first PSU ($Population_{PSU} > RS$). For selecting the subsequent PSUs, the RS number was added to consecutive multiples of the SI, as in the second PSU was selected by $Population_{PSU} > (RS+2SI)$, the third PSU by $Population_{PSU} > (RS+2SI)$ and so on, until the required number of PSUs from each block were sampled. The process was repeated till the sample included the required numbers of rural and urban PSUs.

[36] Census villages and enumeration blocks are defined geographically. The population sizes of these geographies differ widely.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table A2.5: Number of PSUs needed from the sampled districts (based on Proportionate Stratified Sampling), and the blocks sampled (based on Probability Proportional to Size)

District	Block	PSU rural	PSU urban	PSU total
Baleswar	Balesore	13	11	24
	Baliapal	10	0	10
	Remuna	9	3	12
	Bhograi	15	0	15
	Jaleswar	10	2	12
	Basta	10	0	10
	Nilagiri	7	1	8
	Soro	7	3	10
Total		81	20	101
Jharsuguda	Lakhanpur	26	6	32
	Jharsuguda	15	4	19
Total		41	10	51
Khorda	Balipatna	6	2	8
	Begunia	7	0	7
	Bolagad	7	0	7
	Jatni	5	6	11
	Tangii	8	1	9
Total		33	9	42
Kalahandi	Bhawanipatna	19	19	38
	Golamunda	15	0	15
	Jaipatna	15	2	17
	Kalampur	7	0	7
	Koksara	13	0	13
	Narla	14	0	14
Total		83	21	104
Rayagada	Bisam Cuttack	3	2	5
	Kaashipur	5	0	5
	Padmapur	2	0	2
Total		10	2	12
Kendujhar	Anandapur	7	3	10
	Ghasipura	10	0	10
	Harichandanpur	10	3	13
	Jhumpura	8	3	11
	Joda	11	4	15
	Saharapada	6	0	6
Total		52	13	65

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

A2.2.4 Selection of Households

To sample households, first, all households in each sampled PSU were listed. From the listing data, the following information about each household in a PSU was collected: (i) Number of households with no event (NE); (ii) Number of households with an outpatient visit in the last 15 days (O); (iii) Number of households with a chronic illness diagnosed by a health provider (C); and (iv) Number of households with hospitalization in the last one year (H).

In addition to the four points of information above, the listing tool also collected information on the 'preferred provider of the household for outpatient care' and 'preferred provider of the household for inpatient care'. While this information was not used for household sampling, this was used for provider sampling (described later in this report).

An absolute precision of 0.007 and a design effect of 2.5 were assigned to arrive at a household sample size of 7500. Considering the rarest event, hospitalization (0.04 or 4.4 percent based on NSSO data), for a sample of 7500 households, the confidence interval (CI) is 95 percent and design effect is 2.5. The number of households sampled from each category were 3000 for no event (NE), and 1500 households each from the outpatient visit (O), chronic illness (C) and hospitalization (H) categories. The oversampling of these latter categories (O, C and H) in comparison to the NE group aims to provide enough precision to stratified estimates of these sub-samples, such as disease-specific expenditures or gender-specific care-seeking frequency. These sample sizes were based on the highest possible number of households that could have these events, as well as the margin of error estimates for variables of interest, for example, expenditure per hospitalization, expenditure per outpatient visit, or percentage referred to chemists. Therefore, the overall margin of error for the estimates of these groups grew even smaller, ranging from 0.000 to 0.001 percent.

The total number of households sampled was 7567. Data was collected about each member of each of these households, so the total number of individuals in the sample was approximately 30,645 (Table A2.1).

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table A2.6: Sample sizes for households based on screening criteria

Category	Maximum possible in the universe (based on NSSO & NFHS estimates)	Sample size (based on margin of error estimates for variables of interest)
Hospitalization - H (last one year)	3,655	1500
Outpatient visit – O (last two weeks)	2,442	1500
Chronic illness (C)	6,105	1500
No event (includes illness but none of the above three categories, and no illness) (NE)	70,298	3000
Total	82,500	7500

The number of households to be selected from each PSU was fixed at 20. PPS gives us an unequal probability for selection of districts, blocks, and PSUs that results in higher clusters based on their population sizes. However, selection of the same number of elements from unequally sized clusters neutralizes that unequal probability of selection, leading to self-weighting of the sample and equal probability for selection of households. Therefore, 20 HH from each PSU was fixed in order to maintain the integrity of the sample.

To select the 20 households from each PSU, all the households in the PSU were first categorized into the four categories shown above – NE, O, C, H based on the household listing data. These were randomly ordered into MS Excel. The ratio of 2:1:1:1 was followed (based on the sample sizes of 3000 for NE and 1500 each for O, H and C). So, out of the 20 households in each PSU, eight were in NE, and four were from each of the other three categories – O, C, H (not exclusive, some of the households had a combination of these three events).

- Out of the randomly ordered households, the first eight households falling under NE were selected (this included households with no illness in the last 15 days, illness in the last 15 days but none of the other three events, i.e., no chronic illness, no hospitalization, no outpatient visit). This ensured our sample included households that did not access care (foregone care or self-treatment), as well as households that did not have any illness in the last 15 days.

- Out of the randomly ordered households, the first four households that had said "yes" to an outpatient visit in the last 15 days were selected (irrespective of whether they had said "yes" to chronic illness and hospitalization).

- Out of the randomly ordered households, the first four households that had said "yes" to hospitalization in the past one year were selected (again, irrespective of whether they had said "yes" to chronic illness and outpatient visit).

- Out of the randomly ordered households, the first four households that had said "yes" to having been diagnosed with a chronic illness were selected (again,

irrespective of whether they had said "yes" to chronic illness and outpatient visit).

There were eight possible categories that came up for households:

1. Households with no event (NE)
2. Households with a diagnosed chronic illness (C)
3. Households with an outpatient visit in the last 15 days (O)
4. Households with an inpatient visit/hospitalization in the past one year (H)
5. Households with an outpatient visit in the last 15 days and a diagnosed chronic illness (C+O)
6. Households with a hospitalization in the past year and a diagnosed chronic illness (C+H)
7. Households with a hospitalization in the past year and an outpatient visit in the last 15 days (O+H)
8. Households with a hospitalization in the past year and an outpatient visit in the last 15 days and a diagnosed chronic illness (C+O+H)

A2.3 Calculation of Sampling Weights

Sampling weights were computed for the household survey to take into account the multi-stage sampling strategy and the oversampling of certain types of households (discussed in section A2.2). Weights account for three dimensions:

1. Selection of households in each village (PSU/cluster) based on four household characteristics
2. Selection of each village (PSU/cluster) and block (strata) based on sampling proportionate to the size of the population
3. Selection of districts based on a development index

A2.3.1 Selection of households in each village (PSU/cluster) based on four household characteristics

As discussed above, 20 households were selected from each PSU based on the household listing data about no event (NE), outpatient visit in the last 15 days (O), a diagnosed chronic illness (C) and a hospitalization in the last one year (H). For conditions O, C and H, four households were selected at random to participate in the survey. Among households with NE, eight households were selected. However, many households had more than one of these conditions, making them eligible to be selected for more than one group (see section A2.2.4). Therefore, we extended the probability of selection to take into account intersections represented by all the eight different categories listed in section A2.2.4: NE, O, C, H, C+O, O+H, C+H, C+O+H.

Let each of these conditions be denoted by j. Probability of j or P(j) then is given by:

$$P(j) = \frac{k_{ji}}{K_i} \; \forall \; j \; \in \{1,2,3,4,5,6,7,8\}$$

where {1,2,3,4,5,6,7,8} are one of the eight conditions, k_{ji} is the number of households with these conditions that participated in the survey and K_{ji} is the number of HH with condition 'j' in cluster 'i'.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

A2.3.2 Selection of each village (PSU) and block based on sampling proportionate to the size of the population

Blocks and PSUs were selected based on sampling proportionate to the size of the population. The probability proportionate to size (PPS) based sampling ensures that more populous clusters have a high probability of selection. However, as the same number of individuals are sampled from each cluster, individuals in a larger cluster had a lower probability of selection, which was taken to account in step one. Therefore, in step two, we calculated just the probability of selection for blocks and PSUs.

Let P_P be the weighted probability of each cluster being selected – this is calculated based on the number of households in the PSU as a share of all households in the block. Finally, each block in a district has a probability P_B of being selected based on the size of the population in the block divided by the population of all blocks in the district. The PPS weights are thus given by:

$$PPS\ weight = \frac{1}{(P_B * P_P\ )}$$

Through combining these probabilities with the probability from the household conditions, the base weight (BW) for the household survey is given by:

$$BW = \frac{1}{(P_B * P_P * P(j))}$$

A2.2.3 Selection of districts based on the development index of population, female literacy, poverty and gross domestic product, and social groups

A development index of population, female literacy, poverty and gross domestic product, and social groups was calculated to categorize districts by development status and select districts based on these strata in addition to geography. We addressed this selection approach by calibrating our Base Weights to the known population totals of the factors in the development index for the state of Odisha. We used the method of iterative proportional raking to construct these post-stratification weights [1]. This method minimized the differences between known population totals and the survey in an iterative manner, raking the distribution in the survey to the known population totals one margin at a time until the differences are minimized across all margins. An adjustment factor (π) is thus applied to the Base Weights (BW) to produce Raked Weights that represent these population totals.

The final Raked Weight (RW) is thus:

$$RW = BW * \pi$$

We relied predominately on the 2011 Indian census of Odisha to calculate the known population totals [1]. We raked over three margins: 1) the distribution of households by social group (Scheduled Tribe, Scheduled Caste and Other) and rural versus urban residence; 2) the distribution of households with at least one female matriculate (10th

grade or higher) by rural and urban residence; 3) the distribution of households with one member above the age of 60; and 4) the share of the population living below the poverty line, based on the population totals from the Reserve Bank of India and the reported possession of a Below Poverty Line card by households in the survey [1].

A2.4 Sampling for Facility Surveys

Our sample size for facility surveys is 554 healthcare facilities in the six sampled districts in Odisha (Table A2.1). These included healthcare facilities across all levels of care – primary, secondary and tertiary, in both the public and private sectors. The following sections describe the sampling methodologies that we used for the different categories of facilities.

A2.4.1 Sampling for facilities providing secondary and tertiary care

The survey of facilities providing secondary and tertiary level care (hospital survey) aimed to cover both the public and private facilities. Our target was a census of all four Medical College Hospitals in the sampled districts. In addition, the All India Institute of Medical College (AIIMS) and Capital Hospital in Bhubaneshwar, two large tertiary care hospitals were included, resulting in a targeted sample size of six Medical College and Tertiary Hospitals. For District Hospital (DH), Sub-Divisional (SDH) Hospital, Community Health Centers (CHC), our target was a census at the district level across all the six sampled districts. Public hospitals include Medical College Hospitals, District Hospitals, and Sub-Divisional Hospitals. “Other” hospitals consist of first referral units, municipal hospitals, and other hospitals such as those run by the Ministry of Railways, the Employees State Insurance Corporation (ESIC), and other government departments or programs. Our targeted samples sizes for each of these categories of facilities were six DHHs, five SDHs, and 84 CHCs. In addition, 31 “Other” public hospitals listed on the state government website was included. Around 63 private hospitals, nursing homes and clinics that are in the state were also included based on the inclusion criteria. Single specialty facilities were excluded.

A2.3.1.1 Public sector facilities for secondary and tertiary care

Public sector health facilities for secondary and tertiary care included Medical College Hospitals, District Hospitals (DH), Sub-Divisional Hospitals (SDH) and Community Health Centers (CHC) under the government’s health delivery system in Odisha. All the MCHs in the state, along with AIIMS-Bhubaneswar and Capital Hospital (Bhubaneswar) were included in the sample. All the DHs, SDHs, CHCs and “other” hospitals in the six sample districts were part of the sample.

The total sample covered under the hospital and CHC survey (Survey 2 in Table A2.1) is given below in Table A2.7. In total, the survey collected data from 122 hospitals – six Medical College Hospitals, four DHH, five SDH, 83 CHC and 29 “other” hospitals. These sample sizes fell short from the targets (shown in Table A2.7). Two MCHs and two DHs did not provide consent to participate in the study. For AIIMS-Bhubaneswar, the survey could not be completed due to COVID-19. Among the facilities in the “others” category, consent was provided by only 29 facilities.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table A2.7: Facilities covered for public hospitals providing secondary and tertiary level care

S. No	District	MCH	DHH	SDH	Others	CHC
1	Jharsuguda		1 (1)		1 (1)	6 (6)
2	Kendujhar		0 (1)	2 (2)	6 (6)	16 (17)
3	Balasore	0 (1)	0 (1)	1 (1)	1 (1)	17 (17)
4	Khorda	1 (1)	1 (1)		17 (20)	16 (16)
5	Kalahandi		1 (1)	1 (1)	2 (2)	17 (17)
6	Rayagada		1 (1)	1 (1)	2 (2)	11 (11)
	Other districts	5 (7)				
	Total	**6 (9)**	**4 (6)**	**5 (5)**	**29 (31)**	**83 (84)**
Note: Target number of facilities are provided in parentheses						

The primary respondent for these health facilities was the Officer-in-Charge, (permanent or temporary/acting), such as Director or Chief Executive Officer, Medical Superintendent, Hospital Manager, Administrative Officer, Chief Medical Officer. In some cases, the interviewer needed to interview more than one respondent for each facility, since one single respondent did not have all the information.

A2.3.1.2 Private sector facilities for secondary and tertiary care

The sampling frame for the private sector facilities providing secondary and tertiary level care included private hospitals and nursing homes, excluding single-specialty facilities. In the absence of a comprehensive central database providing the details of all private facilities, the database was compiled by collecting information from various secondary sources: (i) Lists of empaneled hospitals with the government sponsored health insurance schemes (RSBY, BSKY, BKKY); (ii) Information from Chief Medical Officers/Chief Health Officers in districts and Block Medical Officers in blocks; (iii) Lists of providers maintained by the Indian Medical Association/Medical Council of India and Hospital Administrators Associations; and (iv) Information from the household listing exercise that stated preferred providers for inpatient care. Based on a combination of these information, a list of 63 private hospitals located in the six sample districts was compiled and approached for data collection. Out of these, 36 hospitals gave consent to participate in the survey.

The primary respondents for these health facilities were the Officers-in-Charge, such as Director or Chief Executive Officer, Medical Superintendent, Hospital Manager, Administrative Officer and Chief Medical Officer.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

A2.3.2 Sampling for facilities providing primary care

The sample for our survey on primary care facilities included Primary Health Centers (PHC), Sub-centers (SCs) and Health Wellness Centers (HWCs) under the public health system in the state (Survey 3 in Table A2.1).

For primary care facilities, our target was to undertake a census of all PHCs, SCs and HWCs in the sampled blocks. In the 30 sampled blocks, there were a total of 158 PHCs and 375 SCs. The data from the Department of Health and Family Welfare about HWCs in Odisha was not found to be up to date. On paper, the number of HWCs listed for the blocks in our study sample was 70 (at the time of sampling in June-August 2019), but only seven HWCs were found to exist. The table below provides the details of the PHCs, SCs and HWCs, which were part of the survey (Table A2.8).

There is a shortfall in the number of facilities covered in the survey compared to the target sample sizes. For PHCs there was a shortfall of 28 facilities, out of which two were converted into HWCs, 22 were converted into CHCs but had not been updated on the official database, and four were not functional at the time of our data collection due to the effects of the cyclone in Odisha during May 2019. Of the 39 Sub-centers, three SCs did not have any staff available and one SC served two PSUs under our study.

Table A2.8: Facilities covered for public hospitals providing primary level care

S. No	District	PHC	SC	HWC
1	Jharsuguda	5	34	2
2	Kendujhar	24	52	3
3	Balasore	45	75	0
4	Khorda	26	33	1
5	Kalahandi	16	63	1
6	Rayagada	13	10	0
	Total	**129**	**260**	**7**

The main respondent for PHCs was the Medical Officers (MOs) or Officer-in-Charge. In cases where the post of MO was vacant, or if all the required information was not available with the MO, then data was collected from the Pharmacist or the Lady Health Volunteer at the PHC. For Sub-centers, the Auxiliary Nurse Midwife (ANM) was the key respondent for the survey, and in HWCs the survey was administered to the mid-level health provider who is in charge of managing the HWC.

A2.5 Sampling for Surveys of Individual Providers

Our survey included three types of individual providers – individual providers in facilities such as hospitals, CHC, and PHCs, providers engaged in solo-practice, and chemists. The following sections describe the sample methodologies used for each type of individual provider.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

A2.5.1 Sampling for individual providers in facilities

A total of 794 providers were interviewed at the surveyed health facilities at all levels of care. For individual providers at facilities, a sample of doctors, laboratory technicians, and pharmacists was drawn from the facilities selected in the Facility Surveys (Survey 2 and 3 in Table A2.1): (i) Medical College and Tertiary Hospitals (ii) District Hospitals (iii) Sub-Divisional Hospitals, (iv) private hospitals, (v) Community Health Centers, and (vi) Primary Health Centers. (See section A2.4.)

For public hospitals, two physicians (one senior and one junior/mid-level from the departments of general medicine, general surgery) and one physician from OBGYN[37] were selected. In case there were more than one physician, each physician was assigned a serial number and the physicians assigned #2 in both categories (senior and junior) for each department were selected. 85 individual providers were interviewed from public hospitals.

From private hospitals, three physicians, one from each of the three departments (general medicine, general surgery and OBGYN) were selected randomly. In private hospitals that did not have an OBGYN department, two physicians were selected from general medicine. A total of 61 providers were interviewed from private hospitals.

For CHCs and "other hospitals,"[38] the Chief Medical Officer, two other physicians (one senior and one junior/mid-level), the laboratory technician, and the pharmacist were selected. In cases with more than one physician/pharmacist/technician, three separate lists were prepared for each of these providers, and each person in each of the three lists was randomly assigned a serial number. The provider assigned #2 in each list was selected. A total of 322 providers across 84 CHCs and 71 providers across the 29 "other hospitals" were interviewed.

For PHCs, the Medical Officer (MO), AYUSH doctor, and the pharmacist were selected. In cases with more than one AYUSH physician/pharmacist, two separate lists were prepared for each of these providers, and each provider in each of the two lists was randomly assigned a serial number. The provider assigned #2 in each list was selected. There was a total of 309 interviews in the 129 PHCs.

There were some shortfalls in our sample sizes at the PHC level, primarily due to the lack of staff at these facilities. For hospitals, two MCHs, two DHHs, and 57 private hospitals did not consent to participate in the study. The survey could not be undertaken for the providers at AIIMS-Bhubaneswar due to COVID-19.

A2.5.2 Sampling for solo providers and chemists

For purposes of the survey, solo providers or providers engaged in private practice were defined to include: (i) providers practicing from private clinics, home offices, or group practices, and (ii) providers practicing from private pharmacies/chemist

[37] These departments were chosen because they are the lowest common denominator among all hospitals across different levels.
[38] These hospitals are mostly smaller government clinics and nursing homes, municipal hospitals.

shops. The respondents for the survey on chemists included shopkeepers and shop-owners of private pharmacies or drug stores. It should be noted here that we did not use any criteria of medical qualifications to identify the solo providers and chemists. Our sample could, therefore, include both medically qualified doctors and pharmacists, as well as unqualified providers of healthcare. Another important point is that our sample of solo providers does not preclude providers who might have jobs at a health facility, either public or private.

Since the universe for solo providers and chemists is not known, the following strategies were used to arrive at the sampling frame in the six sampled districts:

1. Mapping of private clinics, doctors' offices and chemist shops within a three kilometer radius of a facility
2. Information gathered from respondents of facility surveys and individual provider surveys through snowball sampling
3. Using the household listing data, where the households were asked about the service provider they normally visit for outpatient care, to create a list of solo providers and chemists

Table A2.9: Sample covered under solo providers and chemists survey

S. No	District	Solo Providers	Pharmacists
1	Jharsuguda	69	67
2	Kendujhar	102	200
3	Balasore	44	272
4	Khorda	378	197
5	Kalahandi	58	200
6	Rayagada	34	100
	Total	**685**	**1036**

The targeted samples sizes were 1000 each for solo providers and chemists across the six districts. Against these targets, the study achieved samples of 685 solo providers and 1036 chemists. One of the main reasons for the shortfall in the solo provider sample was due to a lack of availability of solo providers in the sampled blocks and an inability to find solo practices (Table A2.9). The second reason for the shortfall was because a number of solo providers did not give consent to participate in the study. Efforts to find more solo providers had to be abruptly stopped in March 2020 due to COVID-19.

A2.6 Sampling for Clinical Vignette Surveys

A total of 110 providers were administered clinical vignettes on five different illness conditions (tuberculosis, pre-eclampsia, childhood diarrhea, heart attack, and asthma). Out of the 110, 69 were Medical Officers from public sector PHCs and 41 were solo providers in the private sector. These providers were a sub-sample of the surveys described above (Survey 4 and 5 in Table A2.1).

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Out of the 129 PHCs in our sample, 75 PHCs were randomly selected with a computer-generated algorithm. The Medical Officers from these 75 PHCs were included in our sample for clinical vignettes. Out of these, 69 medical officers consented to participate in the study. Out of the 685 solo providers in our sample, 75 were randomly selected with a computer-generated algorithm. Out of these, 41 solo providers consented to participate in the study.

A2.7 Sampling for Patient Exit Surveys

Our study conducted exit interviews with inpatients who had undergone hospitalization for >24 hours and patients who had sought outpatient care. The following sections describe the sampling methodologies used for these two types of patient exit interviews.

A2.7.1 Inpatient exit interviews

Inpatient exit interviews were administered to patients at Medical College Hospitals and District Hospitals. A total of six hospitals were randomly selected for the inpatient exit surveys. These hospitals were a sub-sample of the public hospital survey described above. Three Medical College Hospitals were selected randomly from the universe of seven such hospitals across the state. Three district hospitals were also randomly selected, including one from the Regional Development Cluster (RDC). This was the same stratification used for selection of districts for the survey. The same randomization process was followed for both categories of hospitals. The seven Medical College Hospitals and six District Hospitals from the sampled districts were listed, and a with-replacement random sampling was followed with a computer-generated algorithm (on MS-Excel), so that each hospital had an equal probability of being selected. The algorithm was repeated till a unique list of three Medical College Hospitals and three District Hospitals (one from each RDC) was generated. Out of the targeted six hospitals and 600 inpatients, data could be collected from five hospitals. The data collection could not be completed for AIIMS-Bhubaneshwar because of COVID-19.

The total sample size for inpatient exit interviews was 507, with 100 patients each from five hospitals. Out of these 100 patients, 20 patients were from OBGYN, and 80 patients from all departments (excluding the departments of: emergency care, ICU, psychiatry, phycology, pediatrics or neonatology). Out of these 80 patients, 50 percent were male and 50 percent female. It was ensured that the female patients within these 80 were not patients accessing care for OBGYN-related conditions. The study collected data from patients who had been admitted for more than 24 hours. Patients below 18 years of age were not included in the survey. More details of the inpatient exit interview methodology are provided in Chapter 6.3.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table A2.10: Hospitals sampled for Inpatient Exit Interviews

Medical College Hospitals/Tertiary Hospitals	• AIIMS-Bhubaneshwar
	• Capital Hospital - Bhubaneshwar
	• SCB Medical College - Cuttack
District Hospitals	• Keonjhar
	• Khurda
	• Rayagada

A2.7.2 Outpatient exit interviews

For outpatient exit interviews, the total sample size was 978 (Survey 8 in Table A2.1). The respondents were selected from a random sample of different categories of providers. These providers were a sub-sample of the facilities and solo-provider surveys mentioned above (Surveys 2, 3 and 5 in Table A2.1). The same Medical College Hospitals and District Hospitals as in the case of inpatient exit survey (Survey 7 in Table A2.1) were included for the outpatient survey. Unfortunately, the survey could not be undertaken at AIIMS-Bhubaneshwar because of COVID-19, thus reducing our sample of Medical College Hospitals to two out of the targeted three. For Sub-Divisional Hospitals, CHCs, PHCs, the same with-replacement random sampling method was used to identify three SDHs one out of the two blocks from each RDC), 15 CHCs (five randomly selected from each of the three RDCs), 40 PHCs (10 each from Northern and Southern Divisions, and 20 from Central Division). Nine private hospitals were randomly selected, one each from Northern and Southern RDCs and eight from Central RDC. The higher number from the Central RDC was due to the presence of a higher number of private hospitals in those districts. 60 solo providers were sampled randomly from out of the sample for the solo provider survey (Survey 5 in Table A2.1).

For hospitals and CHCs, 15 patients were randomly interviewed from each facility. Out of these 15, three patients were selected from OBGYN; and the rest of the 12 patients (with a male: female ratio of 50:50) were selected from departments of general medicine and general surgery[39]). It was ensured that the six female patients from these two departments were not patients accessing care for OBGYN-related conditions. At PHCs and solo providers, five patients (three female, two male) were interviewed at each facility.

For selection of patients across providers, every fifth patient who came out of the provider's office was selected for the sample until the targeted numbers were achieved. The stratification of providers by RDCs was done to achieve representation of the diversity across the state. The stratification by gender was done for two reasons: (i) in order to ensure equal representation of all types of illnesses (especially from PHCs and CHCs) where the focus of care is often pregnancy related care, and (ii) in order to ensure representation of perceptions of both men and women, as

[39] These departments were selected because of two reasons – (i) they have the highest volume of patients, (ii) they are the lowest common denominator present across hospitals, irrespective of level of care.

literature shows that experiences and provider-patient interactions often vary by gender.

The distribution of sampled respondents for the outpatient exit survey is presented in Table A2.11.

Table A2.11: Respondents for the outpatient exit survey

Type of provider	Number of providers included in sample	Number of patients interviewed
Medical College Hospitals	2	31
District Hospitals	3	45
Sub-Divisional Hospitals	3	45
CHC	15	224
PHC	40	200
Private hospitals	9	129
Solo providers	60	304

A2.8 Sampling for Patient Safety Culture at Hospitals

A total of 2687 staff members from hospitals were sampled for the survey on patient safety culture. The facilities that were selected for the survey were three MCHs (AIIMS, SCB Cuttack and Capital Hospital), three DHs, and three SDHs. These hospitals were selected purposively, and they were the same as those included in the patient exit surveys (Survey 7 and 8 in Table A2.1). Unfortunately, the survey could not be undertaken at AIIMS-Bhubaneshwar because of COVID-19, thus reducing our sample of Medical College Hospitals to two out of the targeted three. At least 70 percent of the total current staff of the facilities (with at least 100 interviews per facility) were part of the study. This included all full-time staff, permanent staff who interact directly with patients, such as doctors, nurses, laboratory technicians, and other paramedical staff. The sample covered under the patient safety culture survey is presented in Table A2.12.

Table A2.12: Sample covered under patient safety culture survey

S. No	Facility	Sampled staff members
1	Medical College Hospital	2090
2	District Hospital	437
3	Sub-Division Hospital	160
	Total	**2687**

100 percent of current employees/staff (within the inclusion criteria) at the facility were interviewed. For cases where 100 percent of the sample could not be reached due to low response rates, the distribution across different categories of staff was as

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

follows:

	Category I: Nurses	Category II: Paramedical Staff*	Category III: Doctors	Category IV: Hospital managers, supervisors, and administrators
Respondent Distribution	50%	30%	15%	5%

For paramedical staff, the inclusion criteria were as follows:

General Duty Attendant	Pharmacist
Medical/Ophthalmic Assistant	Dietician
OT Technician	Dental Assistant/Technician/Hygienist
ECG/EEG Technician	Physiotherapist/Occupational Therapist/Rehabilitation Therapist
Audiometrician	Counselor
Lab Technician	Multi Rehabilitation Worker/ Rehabilitation Assistant
Lab Attendant	Social Worker
Radiographer	

A2.9 Design of the Survey Instruments

The survey instruments were designed by the Harvard team, led by the Principal Investigator of this project, Prof. Winnie Yip. Extensive literature reviews, including a review of existing survey instruments used in global and Indian studies, were conducted to inform the design of the instruments. Validated questions were adapted from surveys like the Demographic and Health Survey (DHS), the National Sample Survey (NSS), the Service Provision Assessments (SPA), and the Commonwealth Survey; the inpatient and outpatient exit interview instruments were adapted from the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS), and the patient safety survey instrument was adapted from the Hospital Survey on Patient Safety Culture (HSOPS) that has been widely used in different countries across the world. The clinical vignettes were adapted from those used in the Medical Advice, Quality and Availability in Rural India (MAQARI) Project of the World Bank undertaken in different states of India.

The survey instruments were translated into Oriya by professional translators. These were checked by two separate teams and back translated into English to ensure that the meaning and intention of each survey item was maintained.

The survey instruments were tested in two different phases – pre-testing and piloting. The first phase (from May to June 2019) was a pre-test conducted with paper-based tools on very small samples of respondents to check the survey items in

terms of comprehensibility by both the interviewer and the respondent, translation errors, suitability of the survey items, and phrasing of the questions. The instruments were revised on the basis of data from the pre-testing. The revised instruments were programmed onto electronic tablets. The second phase (from June to August 2019) was piloting of these electronic versions of the instruments with the entire team of interviewers. The purpose of the pilot phase was to check for errors in the electronically programmed tools as well as to train the data collection team for the final survey. The survey instruments were finalized after feedback from the pilot phase was incorporated.

A2.10 Data Collection, Cleaning and Analysis

All data was collected by Oxford Policy Management (OPM). Representatives from the Harvard team trained the OPM trainers and supervisors of the data collection team using the survey instruments. The Harvard team participated in the pre-testing and piloting of the instruments, collecting feedback from the field, and making revisions based on this feedback.

All data for this study were collected between August 2019 and March 2020. For some of the surveys[40], data collection had to be stopped prematurely due to the COVID-19 pandemic.

Data cleaning was undertaken by OPM, with inputs from the Harvard team. The analyses presented in this report was undertaken by the Harvard team on the de-identified and cleaned datasets shared by OPM.

A2.11 IRB Approvals

Three different IRB approvals were obtained for this study from the following institutions: (1) the IRB at the Harvard T.H. Chan School of Public Health, (2) an independent IRB, SIGMA, in India to meet domestic requirements, and (3) the health research approval committee of the Government of Odisha.

A2.12 Conclusion

The main research aim of the Odisha Health System Assessment Study was to empirically evaluate the strengths and challenges faced by the health system in Odisha on a set of final and intermediate outcomes selected on the basis of the Control Knob Framework. The key distinctive features of this study is the comprehensive approach that we have taken in assessment of the health system and the systematic way in which we have attempted to address existing data and knowledge gaps.

The study, designed by the Harvard team, involved collecting primary data from a range of different stakeholders using ten different surveys (Table A2.1). The household survey aimed to understand people's health seeking behaviors, health expenses, issues of access, and perceptions of the health system; the facility surveys

[40] The surveys for which data collection had to be stopped before reaching the targeted sample sizes due to COVID-19 are the solo provider survey, hospital patient safety survey, inpatient and outpatient exit interviews, and clinical vignettes.

to understand delivery of care, management of facilities and issues of efficiency, access and availability; the individual provider surveys to understand the interaction between the public and private sectors; the clinical vignettes to assess knowledge of primary care providers to correctly diagnose and treat illnesses; the exit interviews to understand patient experiences with the health system; and the patient safety culture survey aimed to assess patient safety as an aspect of quality of care in hospitals (Table A2.1).

The surveys were fielded in six districts of Odisha, Balasore, Khorda, Kalahandi, Rayagada, Jharsuguda, and Kendujhar, selected using a complex multi-stage sampling process with an aim to be as representative of Odisha as possible and to have meaningful generalizations of our findings.

The data for the different surveys were collected from August 2019 to March 2020 by an independent research agency, Oxford Policy Management (OPM). Data collection for the surveys started after obtaining the necessary IRB approvals at international, national and state levels, and undertaking pre-tests, pilot tests and training sessions of the field teams. Analyses presented in this report were based on the cleaned de-identified datasets shared with the Harvard team by OPM.

A2.13 References

1. Kolenikov, S., *Calibrating survey data using iterative proportional fitting*. The Stata Journal, 2014. **14**(1): p. 22-59.
2. Registrar General of India, *Census of India*. 2011, Ministry of Home Affairs, Government of India: New Delhi.
3. Reserve Bank of India, *https://web.archive.org/web/20170602074949/https://www.rbi.org.in/SCRIPTs/PublicationsView.aspx?id=16603*.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Appendix 3
Validation of the Odisha Health System Assessment Household Survey against the National Sample Survey•

A3.1 Comparison of our Household Survey and the National Sample Survey

To ensure the validity of the Harvard survey, we compared our results to the results from the National Sample Survey, conducted in the year prior to the Harvard surveys.

Table A3.1: Comparing Basic Household Characteristics

Indicator	Harvard Survey	NSS 75
Number of households	7,550	4,264
Share scheduled tribe	22%	26%
Share scheduled caste	17%	22%
Share rural	84%	83%
Number of individuals	30,654	19,392
Share female	50%	49%
Share married	56%	51%
Share under 5	8%	6%
Share under 18	31%	31%
Share over 60	11%	8%
Share ailing in last 15 days	11%	10%
Share of ailing in the last 15 days that did not seek treatment*	10%	21%
Share of individuals using care in last 15 days*	10%	7%
Share using care in the last 15 days in private sector	30%	29%
Median spend per visit in the last 15 days	400	390
Share of spending on drugs†	57%	39%
Share with hospitalization last 365 days	4%	4%
Share of hospitalizations in the private sector	23%	23%
Median spending per hospitalization	5000	4000
Share of spending on drugs	32%	25%

• This chapter was led by Annie Haakenstad.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Notes: SC/ST and share over 60 based on census and thus correct; *Harvard survey is slightly higher because of time of year and no adjustments to seasonality have been implemented; †Higher because of inclusion of chemist visits – NSSO did not consider that. How "Self-treatment" calculated: Harvard survey: No treatment / self-treatment based on selecting either: self-treated, did not do anything or A friend or family went and bought medicines for me in response to "After you fell ill, what did [NAME] do? (other options: Sought treatment/medical advice from a provider only, both self-treated and sought treatment; A friend or family member consulted the provider (chemist, doctor, ANM/ASHA) on my behalf and got medicines for me. NSS 75: No to: whether treatment taken on medical advice

Table A3.2: Comparing Catastrophic Health Expenditure

	Harvard	NSSO 75
CHE (10%), visit-based	24%	24%
CHE (25%), visit-based	12%	13%
Households with any OOP (visit-based)	38%	38%
Average monthly health USD (visit-based)	1049	489

Table A3.3.1 Comparing care in the last 15 days overall, by location and gender

	Overall		Urban		Rural		Male		Female	
	Harvard	NSSO	Harvard	NSSO	Harvard	NSSO	Harvard	NSSO	Harvard	NSSO
Ailing	11%	10%	10%	12%	12%	9%	11%	9%	12%	10%
Where: Public Facility	48%	43%	53%	47%	47%	42%	50%	45%	45%	41%
Where: Private Facility	30%	29%	28%	29%	31%	29%	27%	29%	33%	29%
Median Spend: Public	470	320	400	300	500	350	400	320	500	345
Median Spend: Private	500	500	700	500	500	500	500	500	600	500
No treatment/ Self- treatment*	10%	21%	8%	18%	10%	21%	8%	17%	11%	24%
Why: not sick enough	85%	85%	96%	71%	82%	88%	77%	86%	92%	84%
Why: too expensive	9%	7%	4%	10%	10%	6%	13%	5%	6%	8%

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table A3.3.2: Comparing care in the last 15 days by Social Group

	Scheduled Tribe		Scheduled Caste		Scheduled Tribe	
	Harvard	NSSO	Harvard	NSSO	Harvard	NSSO
Ailing	9%	8%	12%	8%	13%	11%
Where: Public Facility	41%	45%	48%	43%	49%	42%
Where: Private Facility	33%	21%	32%	25%	29%	33%
Median Spend: Public	250	300	485	345	500	370
Median Spend: Private	340	350	600	500	600	535
No treatment/ Self-treatment*	14%	22%	8%	25%	9%	19%
Why: not sick enough	77%	93%	89%	88%	87%	80%
Why: too expensive	14%	1%	7%	12%	8%	7%

Table A3.4.1: Comparing hospitalizations overall, by location and by gender

	Overall		Urban		Rural		Male		Female	
	NSSO	Harvard	NSSO	Harvard	NSSO	Harvard	NSSO	Harvard	NSSO	Harvard
	4%	4%	4%	4%	4%	5%	3%	3%	5%	6%
Private share	23%	23%	28%	42%	23%	20%	28%	30%	20%	20%
Median Total OOP	5000	4000	5400	5300	5000	3960	6500	5170	5000	3750
Drug OOP share	32%	25%	34%	23%	31%	25%	34%	25%	30%	25%
% Any reimb-urse-ment	5%	2%	5%	2%	4%	2%	6%	3%	4%	2%

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table A3.4.2: Comparing hospitalizations by Social Group

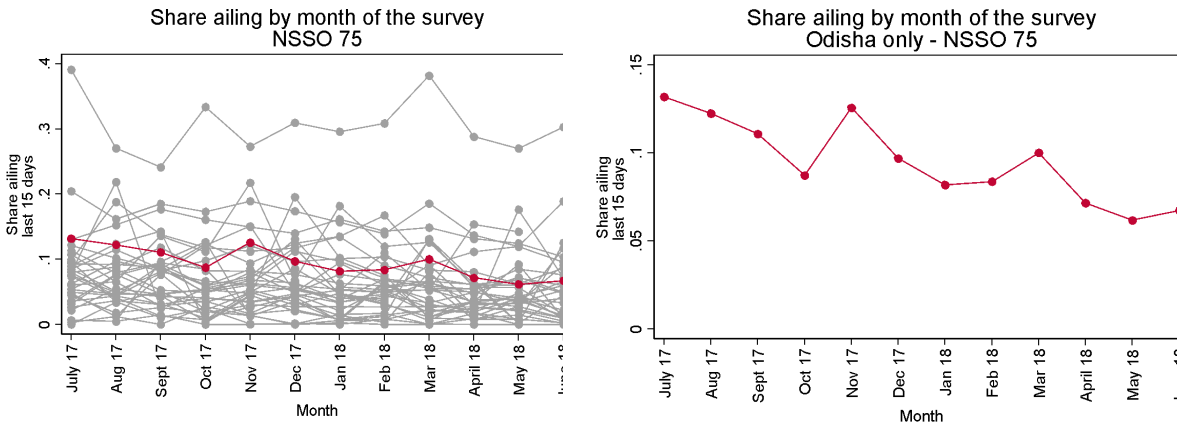
	Scheduled Tribe		Scheduled Caste		Other	
	NSSO	Harvard	NSSO	Harvard	NSSO	Harvard
Any hospitalization	2%	4%	5%	5%	4%	5%
Private share	14%	8%	18%	18%	27%	30%
Median Total OOP	2000	2550	4000	3420	6400	5330
Drug OOP share	21%	24%	34%	26%	34%	25%
% Any reimbursement	1%	2%	6%	2%	5%	2%

A3.2 Supplementary Information on Seasonality based on the National Sample Survey

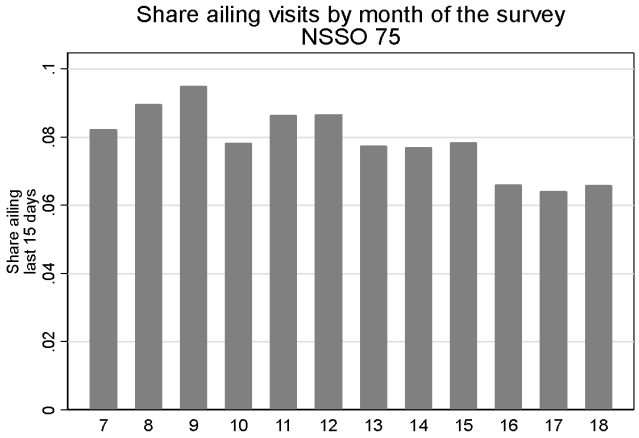
Using the 75th household survey from the National Sample Survey Organization (NSSO), we assessed the need to adjust for seasonality. The Harvard household survey was conducted between August and October 2019 whereas the NSSO spanned July 2017 to June 2018, capturing a full year and thus all seasons that could affect use of healthcare and consumption expenditure across Odisha. We depict below the results throughout the year for Odisha and other states in India, compare it to other states in India and collapse results for all states by month. Ultimately, because all other surveys were conducted over the same time period, and because results are not extremely different for the period of the Harvard household survey versus the rest of the year, we decided to not adjust for seasonality. Nonetheless, we present how seasonality might alter the results by depicting the trend throughout the year for Odisha based on the NSSO.

Ailing

Based on the NSSO, the share of individuals ailing in August- October was 11% whereas, for the year on the whole, the share ailing was 9%.

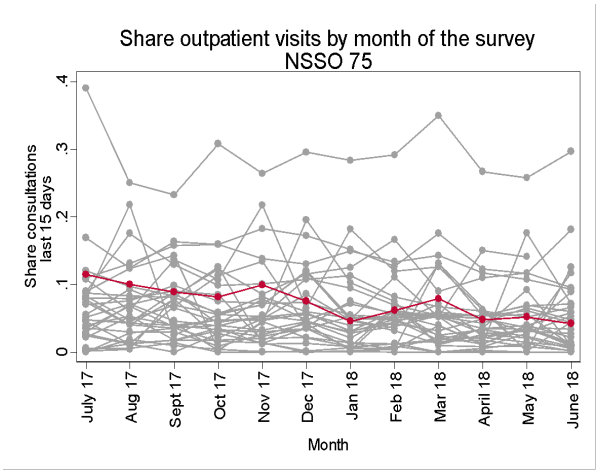


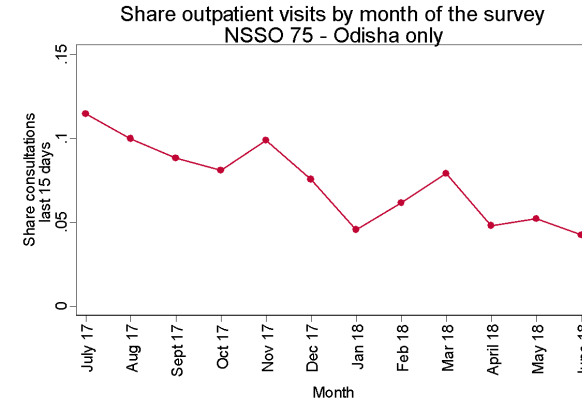
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

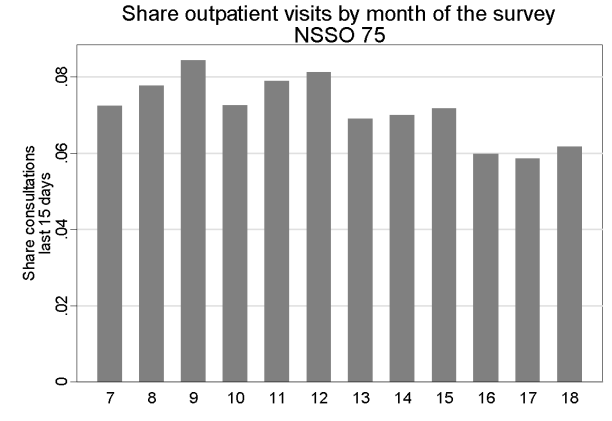


Outpatient visits

Based on the NSSO, the share of individuals using care in August- October in Odisha was 9% whereas, for the year on the whole, the share ailing was 7%.



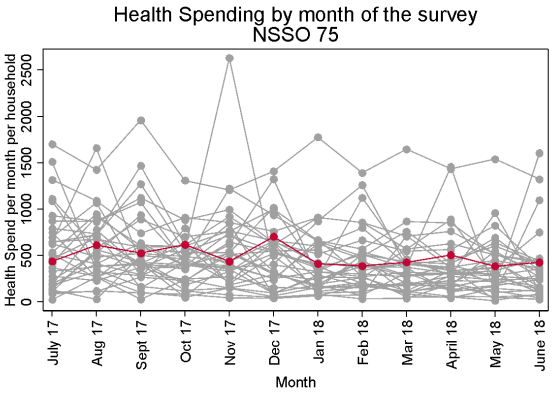


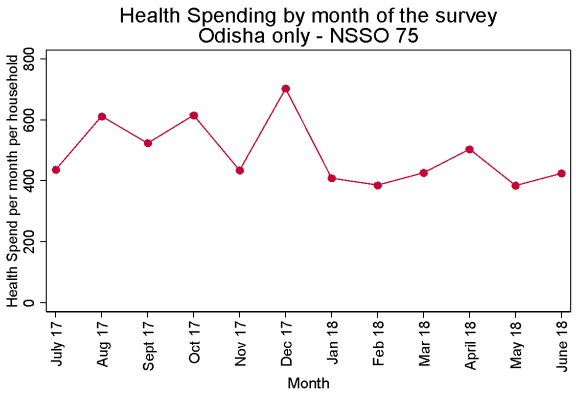


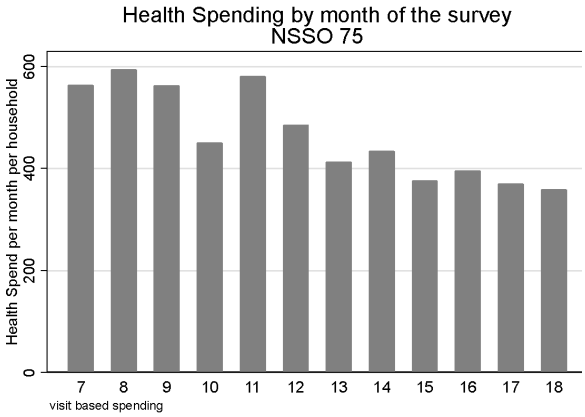
Health expenditure

Based on the NSSO, average health spend per month August- October was Rs. 563 whereas, for the rest of the year, the average health spend per month was Rs. 489.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

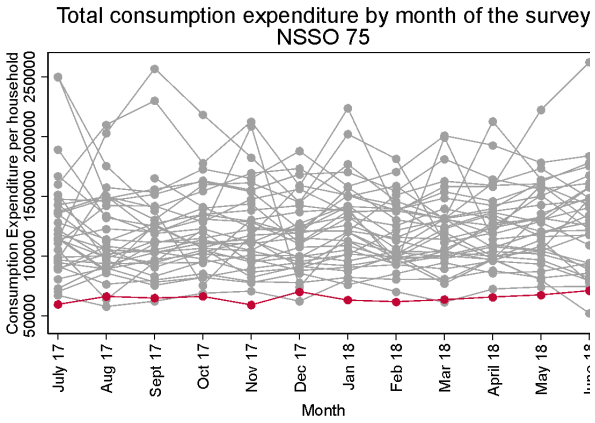


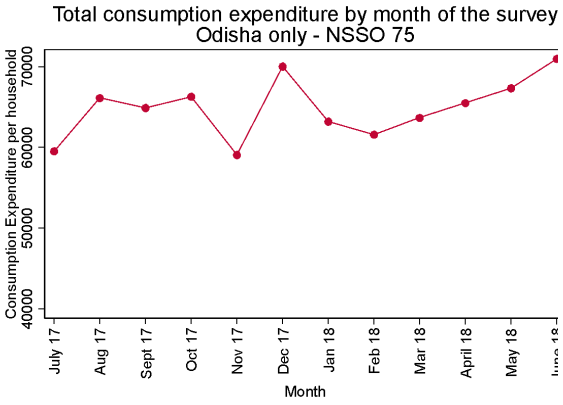




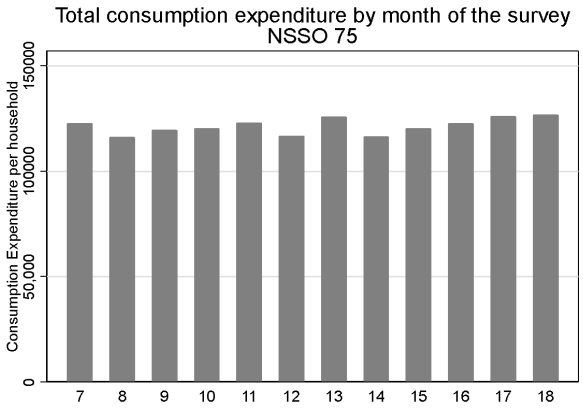
Consumption expenditure

Based on the NSSO, average consumption expenditure (using usual spending reported by households) in Odisha over August- October was Rs. 65,006 whereas, for the rest of the year, the average health spend per month was Rs. 64,693 on average in Odisha.



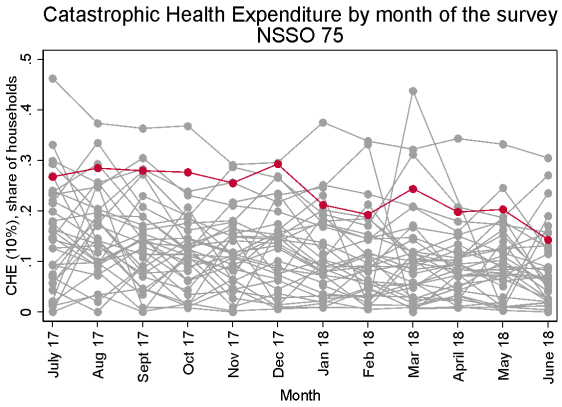


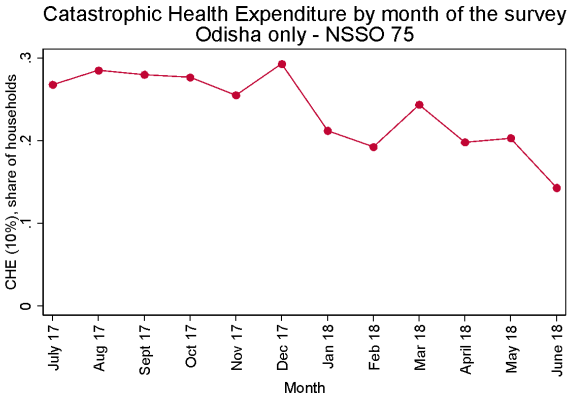
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

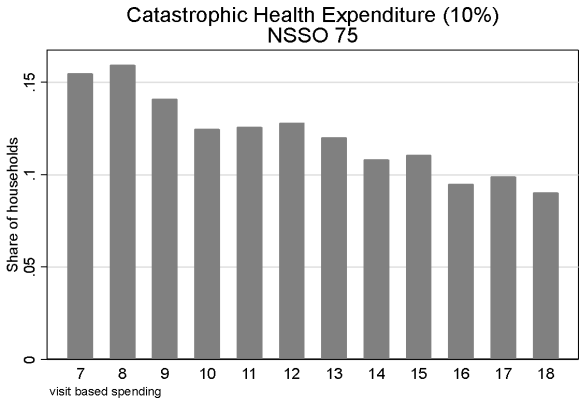


Catastrophic Health Expenditure

Based on the NSSO, catastrophic health expenditure over August- October was 28% in Odisha whereas, for the rest of the year, catastrophic health expenditure was 24% on average in the state.







Appendix 4
Market Analysis of Private Pharmacies in Odisha♦

A4.1 Summary

Private pharmacies are a vital part of the health system in India and in Odisha, a state with high out-of-pocket expenditures and catastrophic health expenditure. One reason behind it is the large share of patients who purchases drugs from private pharmacies, even when they seek care at public sector facilities. In this chapter, we explore the potential reasons patients choose private pharmacies using a survey data on public healthcare facilities and private pharmacies. The uniqueness of the data is the availability of global position system (GPS) data of both institutions in the data that allows the construction of markets around public facilities and identification of private pharmacies located in these markets. The availability of data on public facilities and private pharmacies further allows a descriptive analysis of their characteristics that captures the interaction of the facilities and pharmacies in a market.

We find that 93 percent of public secondary/tertiary healthcare facilities and 58 percent of public primary healthcare facilities have at least one private pharmacy with the three kilometer radius surround them. The mean number of private pharmacies with the three kilometers of a public secondary/tertiary healthcare facility is eight, the mean number for public primary healthcare facilities is two, indicating a heavier concentration of private pharmacies around secondary and tertiary care facilities. A frequently stated justification of the patients' choice is referral by the healthcare providers but only 29 percent of the surveyed private pharmacies report referral by physicians.

When asked the reasons for the preference of patients of private pharmacies over government ones, 55 percent of private pharmacies noted drug stocks as the primary reason, followed by availability of better variety of drugs (53 percent), and convenient store timings (47 percent). Our results indicate that the first reason is not necessarily true for all facilities since higher level facilities had better stock of essential medicines than the pharmacies at the time of the interview. However, availability of specific varieties of drugs, especially branded ones which represents 74 percent of their weekly sales, is a valid reason. Our results suggest that private pharmacies frequently order and stock select varieties of drugs. Finally, our results show that private pharmacies are open for two to four hours longer than public facilities, making them a more convenient choice for patients.

The preliminary results of this chapter begin to recognize some of the factors underlying patient's choice of purchasing drugs from private pharmacies after visiting public healthcare facilities. It also provides suggestive evidence of the

♦ This chapter was led by Bijetri Bose.

predominance of branded drugs at private pharmacies, which then leads to high out-of-pocket expenditures on drugs in Odisha.

A4.2 Introduction

Private pharmacies are a vital part of the health system in India. They are important sources of pharmaceutical drugs and medical advice across the country [1-5]. Commonly referred to as retail pharmacies, they are legally categorized as drug stores, chemists and druggists or pharmacies[6]. According to the Pharmacy Practice Regulations of 2015, registered pharmacists in a pharmacy business are entitled to dispense prescription drug orders and provide primary care for simple ailments[7] . Their duties also include disseminating advice on public health issues. Despite the relevance of private pharmacies in the country, their characteristics and position in the health system is not well understood. They do not figure in the policy debates and discussions around the provision of care in India, even among those arguing for greater public-private partnerships. They have also not received adequate attention of researchers, who have primarily focused on the irrational dispensing patterns at pharmacies [8-10].

In this chapter of the report, we attempt to address this gap in the literature with a preliminary analysis of private pharmacies in six districts of Odisha. The relevance of private pharmacies in Odisha resembles the national story, with 13 percent of individuals who sought outpatient care in the past 15 days of our survey reporting having first visited a pharmacy (Chapter 3 in this report). Further, 72 percent of those visiting public health facilities for outpatient care purchased drugs from the private sector (Chapter 3 in this report). These observations are the motivation underlying this analysis. Specifically, we investigate why patients predominantly rely on private pharmacies for their medicines, even when they choose to seek from providers in public healthcare facilities. This understanding is crucial in solving a big challenge facing Odisha, and India: high rates of catastrophic health expenditures. This can be explained in part by high drug spending (Chapter 3 in this report)[11, 12].

There are no studies that have examined the interaction of healthcare providers and private pharmacies in India. The study closest to ours is one by Sabde et al.[13], in which the authors conducted a cross-sectional survey to map the private pharmacies in one district of Madhya Pradesh. They find that private pharmacies are typically located in urban areas and close to healthcare providers. However, the survey concentrated on the mapping exercise and only a short questionnaire was fielded to the private pharmacies. Due to limited data on the pharmacies and no data on the healthcare providers in the districts, the authors were unable to draw conclusions on the role of private pharmacies in the district. By using large-scale surveys of private pharmacies and public healthcare facilities, we are able to provide deeper insights on the healthcare market in Odisha.

The analysis of private pharmacies starts with the identification of the markets in which they operate. We define a market as the defined as a fixed radius around a public healthcare facility. Using the global position system (GPS) of facilities and pharmacies, a unique feature of our data, we map the location of private pharmacies in relation to the public healthcare facilities. We then explore the characteristics of the private pharmacies clustered around the facilities to understand what attracts patients to them.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Section A4.2 provides a brief description of the primary data. A detailed account of the surveys and the sampling strategies is available in Appendix 2. This is followed by a discussion of the results in Section A4.3, where we first present the characteristics of the market along with the summary statistics of the facilities and pharmacies located in them. We then provide descriptive statistics that explain why patients choose to purchase drugs from private pharmacies. Section A4.4 concludes with the key takeaways of this chapter.

A4.3 Research Design

We use primary data from three surveys (Surveys 2, 3, and 6 in Table 1.1) that were carried out in six districts of Odisha as a part of the Odisha Health System Assessment Study (See Appendix 2 for details).

Data on pharmacies in six sampled districts of Odisha was collected through a survey of the owners or managers of the businesses (Survey 6 in Table 1.1). Since the universe of in the state is unknown, a list was compiled using three strategies: (1) pharmacies were identified by individuals in the household listing as ones they usually visit or have recently visited, (2) pharmacies located within a three kilometers (kms) radius of a healthcare facility till the PHC level were mapped, and (iii) a snowballing technique was further used to identify pharmacies. Every second pharmacy from the compiled list was then chosen for interview, with the target number of pharmacies surveyed being proportional to the population in every block. A total of 1036 pharmacies were surveyed, including both private and public pharmacies. The questionnaire included information on the location, registration, timings, ownership, customer load, stocking practices, and referrals patterns of the pharmacies. The interviewers also verified the stock of 61 frequently used medicines on the Odisha Essential Medicine List (EML), compiled through discussions with pharmacists and healthcare providers in Odisha.

Data was also collected from 518 public healthcare facilities, including facilities providing secondary/tertiary care and primary care (Survey 2 and 3 in Table 1.1).[41] For the secondary and tertiary care facilities, a census of the public hospitals, Community Health Centers (CHC), and other hospitals in the sampled districts was undertaken. Public hospitals included Medical College Hospitals, District Hospitals, and Sub-Divisional Hospitals. Other hospitals consisted of first referral units, municipal hospitals, and other government hospitals. The final sample size of public healthcare facilities at the secondary and tertiary levels is 122. A census of Primary Health Centers (PHC) was undertaken at the block level with the help of government records, with necessary updates due to the conversion of some PHCs into CHCs or Health and Wellness Clinics (HWC). The sample of public primary healthcare facilities also included Sub-centers (SC) and HWCs located in or close to the sampled primary sampling units for the household survey, along with those identified as a preferred health provider for outpatient care by the surveyed households. There are 396 primary care facilities in the sample. The medical or administrative officers in

[41] Data was also collected on private healthcare facilities but have been excluded from the analysis presented in this Appendix.

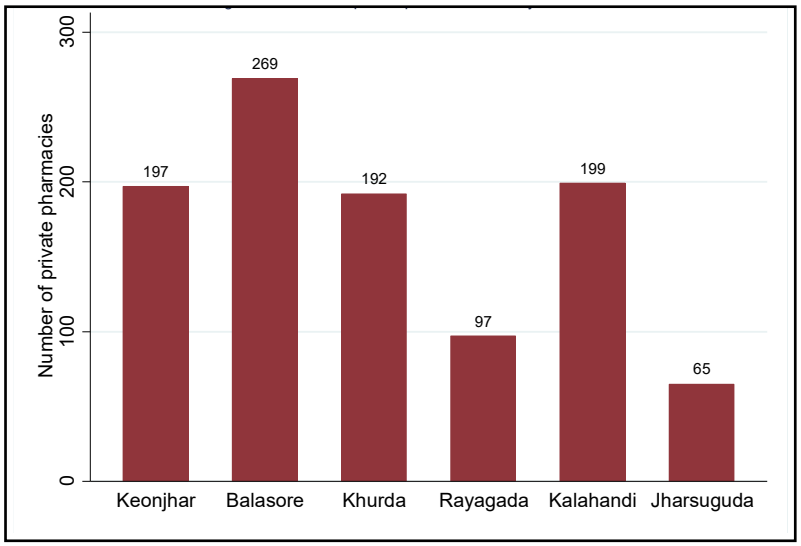
charge at these facilities were asked a wide range of questions, including several ones related to pharmaceutical services.

In all these three surveys (Survey 2, 3 and 5 in Table 1.1), the interviewers noted the global position system (GPS) coordinates of the surveyed healthcare facilities and pharmacies. This is the first health system related survey in India with geospatial data, making it ideal for an analysis of healthcare markets. The geospatial data has been de-identified using geographic masking to prevent the identification of the institutions. The coordinates for one private pharmacy was invalid and was, therefore, excluded from the analysis. We use the GPS coordinates to calculate geodesic distances, shortest path between two points, between facilities and pharmacies. This is essential for the identification of markets, a starting point of our analysis.

A4.4 Results

Of the 1035 surveyed pharmacies, 1019 were reported to be privately owned. In 82 percent of these private pharmacies, the owners of the establishment were interviewed, while managers and other employees were the respondents in the other surveyed private pharmacies. The district-wise distribution of the surveyed private pharmacies is presented in Figure A4.1.

Figure A4.1: Number of private pharmacies surveyed across districts

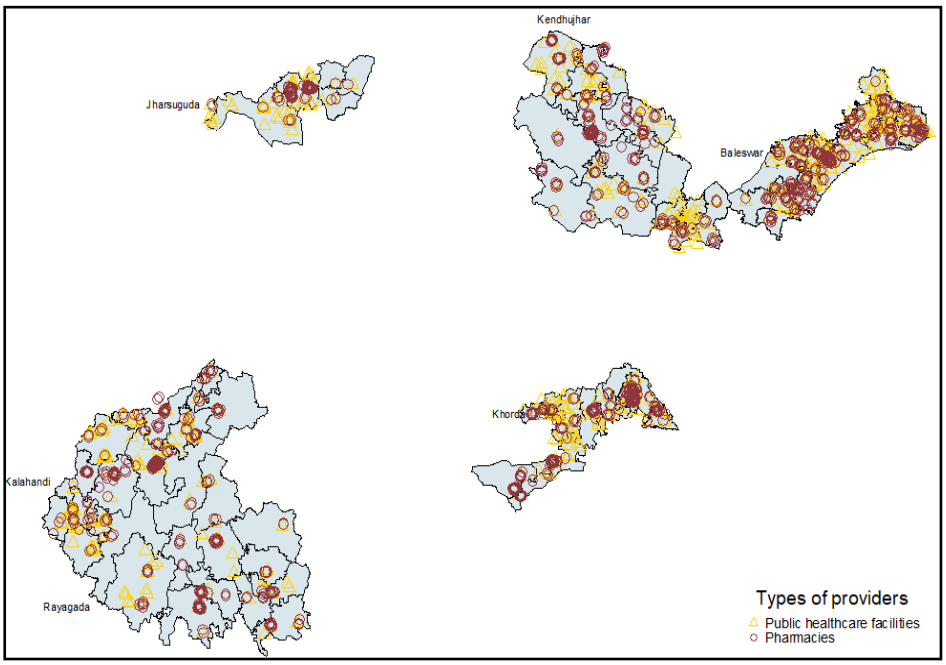


A4.4.1 Location of Public Facilities and Private Pharmacies

The mean distance between a private pharmacy and the closest public healthcare facility in our sample is 1.86 kms, with a standard deviation of 2.79 kms. Private pharmacies are significantly father away from public primary healthcare facilities (mean distance of 5.82 kms) than from public secondary and tertiary care facilities (mean distance of 3.95 kms). The spatial distribution of the surveyed public healthcare facilities and private pharmacies in the six sampled districts of Odisha is shown in Figure A4.2. This map which illustrates that the private pharmacies are clustered around public healthcare facilities.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Figure A4.2: Location of sampled pharmacies & facilities



We find that one-third of the 518 public healthcare facilities surveyed have at least one private pharmacy located within a three kilometer radius. Table A4.1 shows the number of public healthcare facilities with private pharmacies with circles of radii from one km to 50 or more kilometers. Most public secondary and tertiary healthcare facilities have private pharmacies located less than three kilometer away, while fewer primary care facilities have private pharmacies in their vicinity. We also find that there is a greater number of private pharmacies in the three kilometer radius around public secondary and tertiary care facility (eight pharmacies) than around public primary healthcare facilities (2.5 pharmacies), on average. The mean number of private pharmacies in the three kilometer radius of different types of public facilities is presented in Figure A4.3.

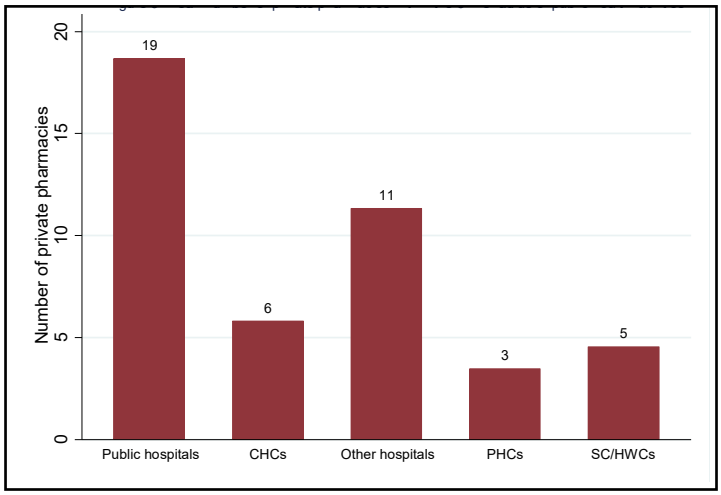
Table A4.1: Number of facilities with at least one private pharmacy located in circles of various radii

	Public hospitals	CHC	Other hospitals	PHC	SC/HWC	All
1 km	8 (80%)	52 (63%)	17 (59%)	30 (23%)	88 (33%)	195 (38%)
2 kms	8 (80%)	75 (90%)	24 (83%)	60 (47%)	126 (47%)	293 (57%)
3 kms	9 (90%)	77 (93%)	28 (97%)	69 (53%)	165 (62%)	348 (67%)
4 kms	9 (90%)	78 (94%)	29 (100%)	78 (60%)	193 (72%)	387 (75%)
5 kms	9 (90%)	79 (95%)	29 (100%)	91 (71%)	210 (79%)	418 (81%)
10 kms	10 (100%)	81 (98%)	29 (100%)	122 (95%)	256 (96%)	498 (96%)
20 kms	10 (100%)	82 (99%)	29 (100%)	129(100%)	266 (100%)	516 (100%)
≥50 kms	10 (100%)	83 (100%)	29(100%)	129(100%)	267 (100%)	518 (100%)

Based on these results, we define a market as a three kilometer radius around a public healthcare facility, with geodesic distances being calculated using the GPS coordinates. Given our objective of understanding why patients visiting public

healthcare facilities purchase drugs from private facilities, we focus our analysis on the public healthcare facilities and private pharmacies that are located within the three kilometer radius of each other. This includes 348 public healthcare facilities and 887 private pharmacies clustered around them.

Figure A4.3: Mean number of private pharmacies within 3 km radius of public healthcare facilities



A4.4.2 Summary Statistics

Table A4.2 presents the summary statistics of the surveyed public healthcare facilities and private pharmacies that are located in a market defined by a three kilometer circle around the facilities. We find that 78 percent of the private pharmacies are registered under various medical associations, primarily the Pharmacy Council of India. Twenty percent of the pharmacies are registered under the Shop and Establishments Act, while two percent are unregistered. Majority of the pharmacies are small with a mean number of employees of two.[42] These pharmacies report serving an average of 324 customers in a typical week, 66 percent of whom reportedly have prescriptions. Pharmacies advice an average of 96 customers in a week on what drugs they need, which is about 30 percent of their total customers. Most public healthcare facilities offer pharmacy services. The mean number of doctor positions filled in these facilities is two and there is an average of 82 outpatient visits per day. These statistics are significantly higher for public secondary and tertiary care facilities than the primary care ones.

As mentioned above, a large share of patients who seek outpatient care from public facilities go to private pharmacies to purchase drugs. This would be a reasonable action if the public facilities did not have pharmacies. However, the summary statistics indicate that most public healthcare facilities provide pharmacy services. In fact, all surveyed public secondary and tertiary care facilities with a cluster of private pharmacies provide pharmacy services, while 83 percent of the surveyed public primary care facilities offer pharmacy services. We, next, undertake a descriptive analysis of characteristics of pharmacies and facilities located in a market in search of reasons why patients choose private pharmacies for their drugs.

[42] Cleaners and other staff who do not sell drugs are excluded from the count of employees.

Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.

Table A4.2: Summary statistics of private pharmacies and public facilities

	Mean (SD)
Panel A: Private pharmacies	
Registered as pharmacies	77.68% (41.66)
Registered as shops	20.07% (40.07)
Number of employers	2.24 (1.43)
Number of customers served in a week#	324.26 (383.55)
Number of customers advised in a week	96.57 (134.16)
Number of customers with prescriptions in a week	226.96 (356.46)
Panel B: Public facilities	
Provides pharmacy services	88.79% (31.59)
Provides pharmacy services for walk-in patients#	45.28% (49.86)
Number of doctors#	2.24 (8.97)
Number of outpatients#	82.11 (115.79)

Notes: Standard deviations in parentheses. # indicates that there are missing data from a few institutions.

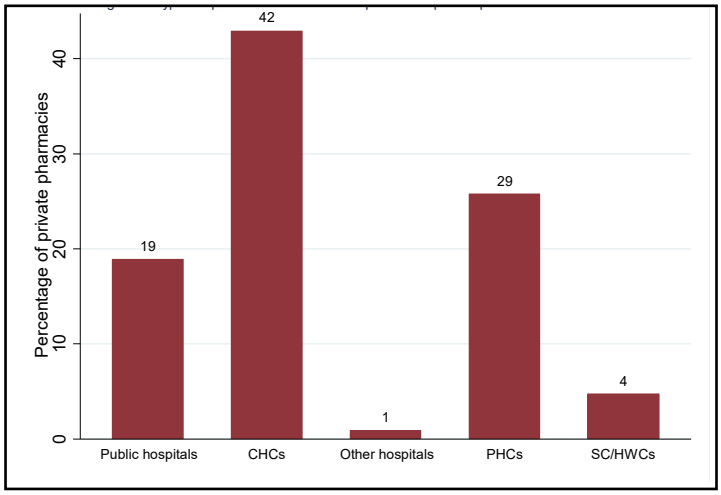
A4.4.3 Reasons Why Patients Purchase Drugs from Private Pharmacies

A4.4.3.1 Referral by physicians

Since patients trust their healthcare providers, they might choose specific private pharmacies if they were referred to them by the providers from whom they receive care. We find that only 29 percent of the private pharmacies located within the three kilometer radius of a public health facility report receiving referrals from providers. Most of the referrals are from CHCs and PHCs, as shown in Figure 4, both of which have fewer mean number of private pharmacies around them than public hospitals and other hospitals. Moreover, pharmacy owners and their family members or pharmacy managers at less than two percent of the private pharmacies report working in a healthcare facility, ruling out the possibility of referrals due to profit motives. Our findings, therefore, indicate that referrals by healthcare providers do not explain why patients buy drugs from private pharmacies.

Figure A4.4: Type of public healthcare facilities that refer patients to private pharmacies clustered around them

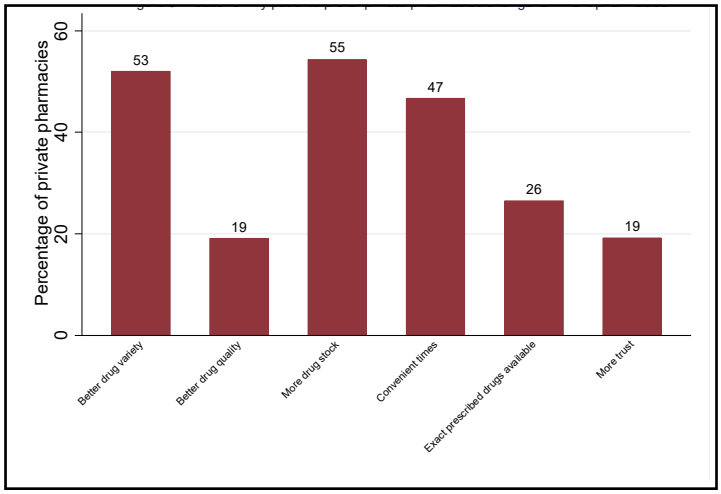
Please contact Prof. Winnie Yip (wyip@hsph.harvard.edu) and Dr. Anuska Kalita (akalita@hsph.harvard.edu) for permission to use/cite this report.



A4.4.3.2 Drug stock and variety

When the respondents at the surveyed private pharmacies located in the markets around public healthcare facilities were asked why patients prefer them over government pharmacies, 55 percent noted it was because they did not suffer from drug stock-outs (Figure A4.5). However, we do not find consistent evidence in support of this across all facility types. At the time of the interview, the private pharmacies had 48 percent of frequently used essential medicines in stocks, on average. Concurrently, public secondary and tertiary facilities had 62 percent of the level specific drugs in stock, while public primary facility had 31 percent of the level specific drugs in stock. That is, public secondary and tertiary care facilities, with the greatest concentration of private pharmacies around, have greater stocks of drugs than the pharmacies.

Figure A4.5: Reasons why patients prefer private pharmacies over government pharmacies

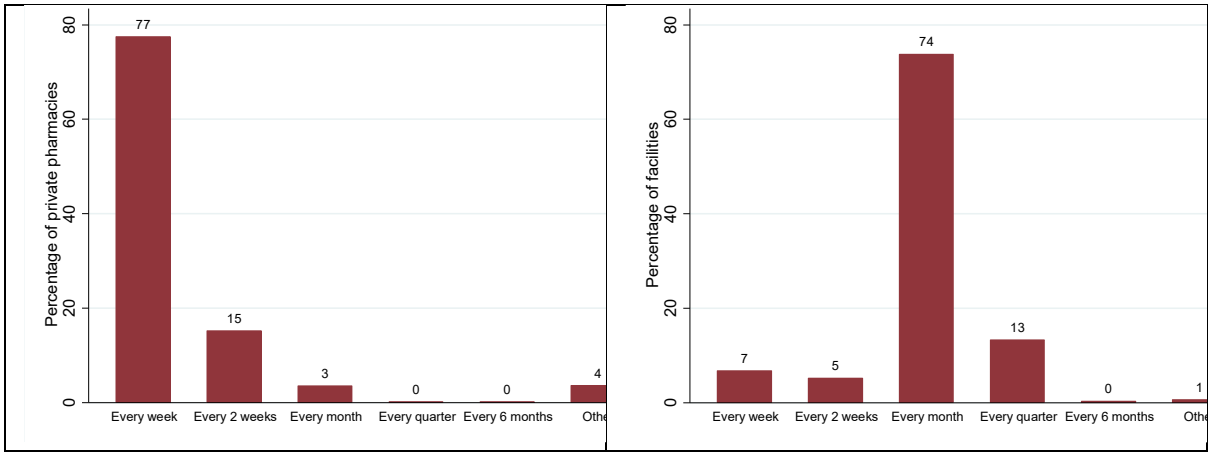


The second most common reason identified by the private pharmacies was the availability of a variety of drugs. The preference of physicians and patients for branded drugs over generics is well known in India [14]. We find that branded drugs make up 74 percent of the total drugs sold in a week, on average, at the surveyed private pharmacies located around public healthcare facilities. This is indicative of the importance of branded drugs and also suggests what drive the sales at the private pharmacies. The mean share of branded generics and fixed-dose combination drugs

sold are nine percent and 22 percent, respectively. Note that private pharmacies also acknowledged variety of drugs as the topmost reasons for providers referring patients to them.

Further, we find that the frequency of ordering drugs by private pharmacies is higher than by public healthcare facilities, as shown in Figure A4.6. 77 percent of private pharmacies report ordering drugs every week, while 74 percent of public healthcare facilities report monthly ordering. This along with evidence on the shortage of essential medicines at private pharmacies and the popularity of branded drugs indicates that the private pharmacies have stock of select drugs only.

Figure A4.6: Frequency of drug ordering by private pharmacies and public healthcare facilities



A4.4.3.3 Convenience

In addition to the close location of the private pharmacies to the public healthcare facilities, they are also open for longer durations. The surveyed pharmacies clustered around public facilities are open for 11 hours a day, on average. Public secondary/tertiary and primary care facilities are open for nine and seven hours a day on average, respectively. This finding shows that convenience of private pharmacies partially explains why patients purchase drugs from them.

A4.5 Conclusion

In this chapter, we examine some potential reasons behind the purchase of drugs from private pharmacies by patients who visit public healthcare providers. Similar analysis is absent in the literature in India, mainly due to the absence of data. The availability of primary data on public facilities and private pharmacies allows us to overcome this restriction. Moreover, information on the GPS coordinates of both institutions in the data also allows us to identify public healthcare facilities and private facilities that are located close to each other and constitute a market. A descriptive analysis of the characteristics of facilities and pharmacies located in the markets provides some interesting conclusions about what drives patients from public healthcare facilities to private pharmacies to buy drugs.

We find that one-third of the surveyed public healthcare facilities have private pharmacies clustered around them, with 93 percent of public secondary/tertiary

healthcare facilities and 58 percent of public primary healthcare facilities having at least one private pharmacy within the three kilometer radius surrounding them. The mean number of private pharmacies with the three kilometer of a public secondary/tertiary healthcare facility is 8, the mean number for public primary healthcare facilities is two, indicating a heavier concentration of private pharmacies around secondary and tertiary care facilities. The three kilometer radius forms the basis of our market definition.

By narrowing the analysis to the private pharmacies located within three kilometer of public healthcare facilities, we find minimal referral of pharmacies by healthcare providers, ruling it out as a primary reason for patients' choice of these pharmacies. The other commonly stated reasons for the preference of patients of private pharmacies over government ones are availability of drugs, better variety of drugs, and convenient timings. Since essential drug stock at public secondary and tertiary care facilities at the time of the interview was better than those of the private pharmacies clustered around them, the drug stock explanation does not hold for the higher-level facilities. However, high sales share of branded drugs along with the reporting of greater frequency of drug ordering suggests that private pharmacies order and stock select varieties of drugs. This makes them favorable to patients. Finally, our results show that longer timings of private pharmacies, relative to public healthcare facilities, make them a more convenient option.

While analysis is ongoing to gain a clearer understanding of the markets in which private pharmacies function, the preliminary results discussed in this chapter begins to explain why patients purchase drugs from private pharmacies after seeking care from public healthcare facilities. Consequently, appropriate evidence-based policy recommendations can be formulated to reduce out-of-pocket expenditures on drugs in Odisha.

A4.6 References

1. Kamat, V. and M. Nichter, *Pharmacies, self-medication and pharmaceutical marketing in Bombay, India*. Social Science and Medicine, 1998. **47**(6): p. 779-794.
2. Sharma, H., et al., *A survey for assessment of the role of pharmacist in community pharmacy services*. 2009.
3. Dua, V., C. Kunin, and W. LV, *The use of antimicrobial drugs in Nagpur, India. A window on medical care in a developing country*. Social Science & Medicine, 1994. **38**(5): p. 717-724.
4. Rajeswari, R., et al., *Private pharmacies in tuberculosis control—a neglected link*. 2002.
5. Van Sickle, D., *Management of asthma at private pharmacies in India*. 2006.
6. Basak, S.C., J.W.F.v. Mil, and D. Sathyanarayana, *The changing roles of pharmacists in community pharmacies: perception of reality in India*. Pharmacy World & Science, 2009. **31**(6): p. 612-618.
7. Pharmacy Council of India, G.o.I., *Pharmacy Practice Regulations, 2015*, in *No. 14-148/ 2012- PCI*. 2015.
8. Patel and V.R. Patel V, Naik D, Borker P, *Irrational drug use in India: A prescription survey from Goa*. 2005.
9. Kshirsagar, M., et al., *Prescribing patterns among medical practitioners in Pune, India*. Bulletin of the World Health Organization, 1998. **76**(3): p. 271-275.

10. Kotwani, A., et al., *Irrational use of antibiotics and role of the pharmacist: an insight from a qualitative study in New Delhi, India*. Journal of Clinical Pharmacy and Therapeutics, 2011. **37**(3): p. 308-312.
11. Pandey, A., et al., *Trends in catastrophic health expenditure in India: 1993 to 2014*. Bulletin of the World Health Organization, 2018. **96**(1): p. 18-28.
12. Selvaraj, S., H.H. Farooqui, and A. Karan, *Quantifying the financial burden of households' out-of-pocket payments on medicines in India: a repeated cross-sectional analysis of National Sample Survey data, 1994–2014*. 2018.
13. Sabde, Y.D., et al., *Mapping private pharmacies and their characteristics in Ujjain district, Central India*. BMC Health Services Research, 2011. **11**(1): p. 1-8.
14. Joshi, S., Y. Shetty, and S. Karande, *Generic drugs - The Indian Scenario*. Journal of Postgraduate Medicine, 2019. **65**(2): p. 67-69.