On the road to Universal Health Coverage: measuring socioeconomic inequalities in access to and use of high quality care in Indonesia

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Abstract

The objective of Universal Health Coverage (UHC) is to ensure that everyone, regardless of their socio-economic background or ability to pay, has access to high quality health services without financial hardship. In countries that are on the path to achieving UHC, such as Indonesia, monitoring progress on key outcomes, including access to quality care and financial protection, is critical. Using several primary and secondary datasets at the household and facility level, this PhD aims to inform policy decisions about the current state of UHC by measuring and assessing the socioeconomic disparities in access to and use of quality care in Indonesia.

Using multiple methods from the discipline of health economics, I find that inequalities in the quality of care exist in Indonesia, especially between provinces and between rural and urban areas. Some aspects of quality of care are shown to influence provider choice, implying that individuals are likely to respond to quality of care improvement initiatives. My research also shows that following the introduction of the national health insurance program, the *Jaminan Kesehatan Nasional*, health care utilisation has increased, especially at the secondary care level, though the amount of out-of-pocket (OOP) payments remains high. Importantly, the impact of the national health insurance has not been significant in improving financial protection among the Indonesian population.

Indonesia is an ideal setting for this research especially in light of growing concerns that in the rush to achieve UHC, some aspects of quality of care and financial protection have been overlooked. This thesis highlights the need for the Government of Indonesia to realise its intended goal: to establish an insurance scheme that protects its members from the financial burden of health care costs. Globally, this thesis calls for a greater integration of quality of care into measurement of progress towards UHC.

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This thesis is dedicated to my mother, my father, mon juju, ma paola et mon loulou.

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List of abbreviations

BIA:	Benefit-incidence analysis
BPJS-Health:	Social Security Management Corporation for the Health Sector
CC:	Concentration curve
CI:	Concentration index
GP:	general practitioner
IFLS:	Indonesian family life survey
JKN:	*Jaminan Kesehatan Nasional*
JSY:	*Janani Suraksha Yojana*
LMICs:	Low-and middle-income countries
MMR:	maternal mortality ratio
OECD:	Organisation for Economic Cooperation and Development
OOP:	out-of-pocket
PCA:	Principal component analysis
PHC:	Primary health care
P4P:	pay-for-performance
SAH:	Self-assessed health
SARA:	Service Availability and Readiness Assessment
SDGs:	Sustainable Development Goals
SES:	Socio-economic status
SHI:	Social Health Insurance
SSR:	Supply-side readiness
UHC:	Universal Health Coverage
WHO:	World Health Organization

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1 Introduction

1.1 Universal Health Coverage

In the past decade, many low- and middle-income countries have adopted Universal Health Coverage (UHC) as a central national policy goal (Reich et al., 2016). UHC aspiration is rooted in the World Health Organization (WHO) constitution of 1948, as well as in the Alma Ata declaration in 1978 stating that health "is a fundamental human right and that the attainment of the highest possible level of health is a most important world-wide social goal whose realization requires the action of many other social and economic sectors in addition to the health sector" (The International Conference on Primary Health Care, 1978). UHC was later included in the Sustainable Development Goals (SDGs) process as one of the key development targets to be achieved by 2030. A total of 193 member states of the United Nations have pledged their commitment to achieve this goal. Although the definition of UHC has evolved over time, the WHO definition is the most widely cited: "UHC means that all people receive the health services they need without suffering financial hardship when paying for them. The full spectrum of essential, quality health services should be covered including health promotion, prevention and treatment, rehabilitation and palliative care" [https://www.who.int/news-room/fact-sheets/detail/universal-health-coverage-(uhc)].

In September 2019, the world's leaders reaffirmed their commitment to achieve UHC at the United Nation General Assembly (United Nations, 2019). This political declaration represents a significant milestone in the UHC agenda globally:

"[Heads of State and Government] recognize that universal health coverage implies that all people have access, without discrimination, to nationally determined sets of the needed promotive, preventive, curative, rehabilitative and palliative essential health services, and essential, safe, affordable, effective and quality medicines and vaccines, while ensuring that the use of these services does not expose the users to financial hardship, with a special emphasis on the poor, vulnerable, and marginalized segments of the population;"

During this meeting, leaders committed to UHC not only as an aspirational goal, but also as an achievable and actionable target, as they committed to a wide range of actions and investments in the health sector (UHC2030, 2020). Four months later, the Covid-19 pandemic took hold as an unprecedented challenge to global health and human security. This pandemic has put an enormous strain on health systems worldwide, and brought to the fore the staggering fact that most health systems, even in richer regions, are not well prepared to protect their population from major health crises. It has also tested every country's ability to reach everyone with high-quality essential health services without financial burden (UHC2030, 2020). In many places, Covid-19 has exacerbated deep inequities and gaps that existed long before the virus hit. Overall this crisis has highlighted the need for UHC as a long-term policy goal and for political leaders to invest in solid institutional foundations, administrative capacity and good governance (Reich et al., 2016).

1.2 Integrating quality of care into UHC goals

One prominent strategy to promote UHC is by expanding health insurance, with the idea that increased health utilisation would reduce mortality and morbidity (Kruk, Gage, Joseph, et al., 2018). Studies have shown that the link between health insurance and improved health outcomes is not so straightforward (Erlangga, Suhrcke, Ali, & Bloor, 2019; Escobar, Griffin, & Shaw, 2010). Aside from the difficulty in establishing a causal link between health insurance and improved health outcomes, evidence is emerging that improving access to health services will not be successful in improving population health if the quality of the care received is poor (Kruk, Gage, Joseph, et al., 2018). A famous example is the *Janani Suraksha Yojana* (JSY) programme established in India in 2005, aimed at providing cash incentives for women to give birth in health facilities (Ministry of Health and Family Welfare, 2006). Although it is estimated that about 50 million women have received the cash incentive from this programme, maternal and newborn survival rates have not improved despite the increase in institutional deliveries (Powell-Jackson, Mazumdar, & Mills, 2015). Moreover, low levels of competency were reported among birth attendants in the JSY facilities, especially in relation to managing maternal and newborn complications (Chaturvedi, Upadhyay, & De Costa, 2014). This suggests that gains in institutional deliveries did not translate into reductions in maternal and neonatal mortality under the JSY. Another recent study quantifying the relationship between poor quality care and mortality figures worldwide, concluded that out of 8,6 million excess deaths amenable to health care globally, 3,6 million were due to a lack of access to health care, while 5 million were estimated to be due to receipt of poor-quality care (Kruk, Gage, Joseph, et al., 2018).

The importance of quality of health care in low- and middle-income countries (LMICs) has been re-emphasised in recent years. The Lancet Global Health commission's report on High Quality Health Systems in the SDG era has been central into the quality of care debate (Kruk, Gage, Arsenault, et al., 2018). The Commission has argued that "Quality should not be the purview of the elite or an aspiration for some distant future; it should be the DNA of all health systems. Furthermore, the human right to health is meaningless without good quality care because health systems cannot improve health without it." (Kruk, Gage, Arsenault, et al., 2018). Major institutions such as the WHO, the Organisation for Economic Cooperation and Development (OECD) and the World Bank also recognise quality of care as a global imperative for UHC. In their joint report titled *Delivering quality health services*, they acknowledge that "optimal health care cannot be delivered by simply ensuring coexistence of infrastructure, medical supplies and health care providers", and that "Improvement in health care delivery requires a deliberate focus on quality of health services, which involves providing effective, safe, people-centered care that is timely, equitable, integrated and efficient" (WHO, World Bank, & OECD, 2018). Quality of care is therefore gaining important momentum in the UHC debate, as it is now recognised that equal access to health care will have only a limited impact on health outcomes unless everyone has access to high quality services (Das, 2018).

1.3 The path to UHC in Indonesia

In 2004, Indonesia defined its ambitions for comprehensive UHC with the passage of the National Social Security law. A first step towards this goal was the introduction of subsidized Social Health Insurance (SHI) for the poor in 2005 (Sparrow, Suryahadi, & Widyanti, 2013). Initially introduced as *Askeskin*, the program expanded in 2008 under the name *Jamkesmas*, aiming to extend coverage to the poor and near poor, representing 76 million individuals, or 30% of the population (Sparrow et al., 2017). Prior to 2014, the health system was highly fragmented with multiple insurance schemes: the SHI for Civil Servants scheme (referred to as *Askes*), the public health insurance for the poor (*Jamkesmas*), the Social Security Programme for Employees (*Jamsostek*), as well as various Regional Insurance schemes (*Jamkesda*). This fragmented system left more than half of the population of Indonesia uncovered (Sparrow et al., 2017). With about 60% of the population in the informal sector, many households that could not be enrolled through formal sector payroll contributions but also fell outside the poorest segment eligible for subsidized contributions, did not enrol into SHI. Additionally, issues of mistargeting were reported, mostly due to the arbitrary nature of defining a poverty line and the sensitivity of the poverty headcount to the choice of the poverty line (Sparrow et al., 2017).

In 2014 Indonesia took another significant step towards UHC and implemented a comprehensive national SHI scheme, known as the *Jaminan Kesehatan Nasional* (JKN), to address growing disparities in health-care, to reduce the financial burden of paying for health services, and more generally to make comprehensive health care available to its entire population by 2019 (National Team for the Acceleration of Poverty Reduction, 2015). Although the target was not reached by 2019, Indonesia has made steady progress in terms of participant registration; rising from 60% in 2016 to 82% of the national population in 2020, making it one of the biggest single-payer health system in the world (World Bank Group, 2020). The JKN brings together all major health insurance schemes under a single agency - the Social Security Management Corporation for the Health Sector (BPJS-Health). As the JKN continues to expand, significant challenges are emerging.

First, although people who work in the informal sector are required to self-enrol, many do not, meaning that a sizeable "missing-middle" has emerged in terms of enrolment across income groups (Agustina et al., 2019). Second, the financial sustainability of the JKN has been an issue since its early implementation. This is mainly due to the fact that sustainability relies heavily on members' contributions and a significant share of the JKN members (around 28%) do not routinely pay their contributions as they should (Agustina et al., 2019). The ability to collect contributions has been significantly impacted by the Covid-19 pandemic. As of 31st of July 2020, active JKN memberships had already fallen by 5.4 million as contributions were withdrawn for workers, especially in the informal sector (Sparrow, Dartanto, & Hartwig, 2020). Third, the equity gap in health insurance coverage remains important, with lower income groups being less likely to take up insurance than their richer counterparts (Agustina et al., 2019). High out-of-pocket (OOP) costs have been reported among the insured population, which goes against the initial goal of the JKN and which is likely to widen the equity gap (Hidayat, 2015; Pratiwi et al., 2021).

Researchers have widely hypothesized that insured patients are more likely to seek services that are not fully covered, including branded medicines, laboratory tests and consultation with specialists without referral, which contribute to OOP costs (Hidayat, 2015; Pratiwi et al., 2021). Finally, recent evidence highlights that the readiness of health facilities to deliver quality care is suboptimal in Indonesia (World Bank Group, 2020). Infrastructure, availability of medicines, staff and equipment remain areas of concern. In such a context, membership of the national insurance program may not translate into effective coverage (Pratiwi et al., 2021).

1.4 Overarching framework of this thesis

Assessing progress towards UHC traditionally encompasses three dimensions: 1) the proportion of the population that is covered by pooled funds; 2) the proportion of direct health care costs covered by pooled funds; and 3) the health services covered by those funds (World Health Organization, 2010). These three dimensions are typically represented in the UHC "Cube Diagram", which illustrates the difference between the current averages of each dimension and the policy goal of reaching UHC, therefore highlighting any gaps in a country's path to UHC (Fig 1.1). Thanks to its simplicity, the UHC cube has become a globally recognized visual representation and an effective advocacy tool for health system reform choices (Roberts, Hsiao, & Reich, 2015).

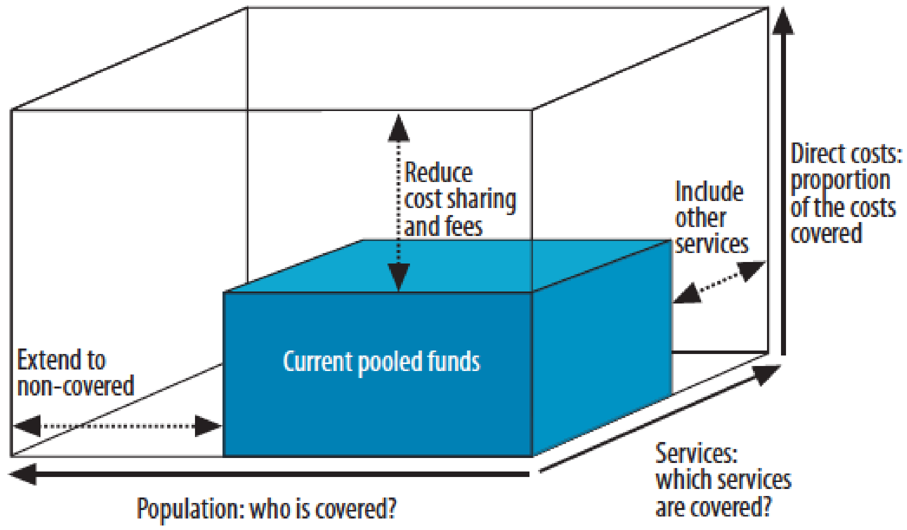

Figure 1.1: UHC cube diagram. Source: World Health Report 2010, WHO 2010

Despite being useful, particularly in terms of focusing attention on the key components of UHC, the simplicity of the framework comes at a cost as it overlooks important nuances.

First, by considering national averages, it fails to call attention to existing disparities in coverage across population groups. Gwatkin et al (2004) have pointed to the fact that health systems are consistently inequitable, they provide more and higher quality services to those who can afford them and need them less (Gwatkin, Bhuiya, & Victora, 2004). Therefore, the UHC cube in its original form is unable to account for these variations that are central to the UHC concept. Recognising this important gap, Roberts et al have suggested a visual representation of this gap to help clarify and bring attention on the equity aspect (Roberts, Hsiao, & Reich, 2015). Their revised UHC cube shows how health care financed by pooled resources varies by type of service and across different population groups.

Second, the UHC cube (as well as the revised UHC cube) fails to represent inadequacies in the quality of care received. Health care coverage is unlikely to translate into improved health outcomes if the quality of care received is not adequate, something that the UHC cube does not explicitly capture. Finally, the UHC cube in its present form does not capture interactions between inequalities and quality of care, or in other words, fails to account for existing inequalities in the quality of care. The Lancet Global Health Commission on High Quality Health Systems highlights three dimensions that might make people vulnerable to poor-quality care: setting of care (those in the margins of health services, such as displaced populations), conditions (people with stigmatised conditions) and demographic factors (such as age, gender, socio-economic group, ethnic group, sexual orientation, disability or insurance coverage) (Kruk, Gage, Arsenault, et al., 2018).

In this thesis, I use the UHC cube diagram as an overarching framework. Recognizing the limitations of the UHC cube mentioned above, I give special attention to quality of care and disparities between population groups. The concept of quality of care, central in this thesis, is further explored in Chapters 5, 6 and 8, where access to care is measured in terms of availability of quality care (Chapter 5) and actual use of quality care (Chapter 6). In Chapter 8, quality of care is introduced into measures of equity in health financing. Inequality is the other central theme in this thesis; inequalities are measured in terms of socioeconomic inequalities in the availability of quality care (Chapter 5), in use of quality care (Chapter 6), in financial protection (Chapter 7) and in the receipt of public health subsidies (Chapter 8).

1.5 Aims and objectives

The overall aim of this thesis is to measure and assess the socioeconomic disparities in access to and use of quality care in Indonesia. The specific objectives are to:

1) Investigate the extent of inequalities in the availability of quality health services across the Indonesian primary health care system;
2) Explore whether the quality of public and private primary health care facilities in Indonesia affects provider choice;
3) Measure the impact of the Indonesian SHI scheme on health service utilisation and financial protection; and
4) Adapt benefit-incidence analysis, a widely used method for measuring equity in health financing, by incorporating a quality of care weighting.

1.6 Scope and outline of the thesis

This thesis presents work that deepens our understanding of progress towards UHC in Indonesia. From a methodological perspective, this thesis focuses on equity and quality of care, and suggests ways to further incorporate these two central policy goals into the measurement of UHC. From a policy perspective, it provides updated evidence on the state of UHC in Indonesia, by using large-scale primary and secondary household datasets from Indonesia. Methods presented in this thesis mostly come from the field of health economics. There are four research questions in this thesis, each addressing one or more dimensions of the UHC cube, with a specific focus on equity and quality. This is a research paper style thesis, with nine chapters including four research papers, linked by short pieces of supporting material and sections of additional contextual information. Some material will be repeated between research paper chapters in the thesis, although I have tried to keep this to a minimum. References are listed at the end of each chapter and supplementary material is available at the end of the thesis. The latter includes survey instruments, additional analyses and information on methods, published papers and ethical approvals.

This introduction chapter (chapter 1) presents the current UHC global agenda, and how the topic of quality of care has gained momentum in the UHC debate over the past decade. It also describes the specific case of Indonesia, which is the focus of this thesis. Indonesia, a country of over 273 million people, has introduced a series of UHC reforms including the introduction of a SHI scheme for all in 2014, which is well recognised around the world. This chapter also presents the conceptual framework that is used in this thesis, outlines the overall objectives of the thesis, and lists the aims of each research paper.

Chapter 2 contains reviews of the literature that cover the main themes of this thesis. It starts with a methodological literature review of definition, measurement and key concepts central to this thesis including: inequalities; socioeconomic status (SES); quality of care and demand for health services. The second part of this chapter is an empirical literature review that provides background and contextual information relevant to each of the results chapters.

Chapter 3 provides an overview of the country under study, the Republic of Indonesia. It presents the necessary elements to understand the context in which this research is undertaken, including the ENHANCE study. Chapter 4 presents the various data sources used as well as the overall methods used in this thesis. There is intentionally some overlap with the methods described under each research papers (i.e. chapters 5-8), but the focus of Chapter 4 is to provide a more in-depth description of the methods, including the theoretical foundations and assumptions. Ethical considerations are also discussed in this chapter.

Chapters 5 to 8 present the empirical results, which are organised by research paper. The first research paper (chapter 5) is a descriptive analysis of inequalities in the availability of quality primary health care (PHC) in Indonesia. The second paper (chapter 6) presents the results of a choice model where quality of care is analysed as a potential determinant of provider choice. Chapter 7 is an impact evaluation of the recent SHI scheme in Indonesia, and looks at its effect on health care utilisation and financial protection. In

Chapter 8, I suggest an adaptation of a popular quantitative method for measuring equity in health financing, BIA, by incorporating quality of care weightings.

The final chapter synthesises and discusses the key empirical and methodological contributions of the thesis. I reflect on the strengths and limitations of the approaches taken in the thesis, before discussing the implications of the findings for further research and policy. The thesis ends with a conclusion.

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2 Literature review

2.1 Methodological literature review

In this section, methodological literature reviews covering theory, concepts and measurement are presented concerning: SES; health inequalities; quality of care; modelling demand for health services; and measuring equity in health financing.

2.1.1 Conceptualising and measuring socio-economic status

Developing measures of SES for households and individuals is a priority for many researchers and analysts, since not only is SES key to understanding the social determinants of health, but also it is likely to confound many relationships in observational health research studies (Howe et al., 2012). Measuring SES is also key to making decisions on resource allocation for the poorest segment of a population (Kolenikov & Angeles, 2009).

Broadly, SES is a construct that reflects one's access to collectively desired resources, be they material goods, money, power, friendship networks, health care, leisure time, or educational opportunities (Oakes & Rossi, 2003). It includes both *resource-based measures*, which refer to material and social resources and assets, including income, wealth and educational credentials; and *prestige-based measures*, typically evaluated with reference to people's access to and consumption of goods, services, and knowledge, as linked to their occupational prestige, income, and educational level (Krieger, 2001). SES is therefore a multi-faceted concept for which it is difficult to find a definition with which all agree. Many of the concepts underlying SES have their origin in the work of two social theorists, Karl Marx and Max Weber, whose work on social class has been key in shaping SES research in various areas (Galobardes, Shaw, Lawlor, Lynch, & Smith, 2006). From an economics perspective, SES measurement has traditionally focused on living standards (Deaton, 2003), where the emphasis has been less on prestige-based aspects such as education or occupation than on resource-based aspects. Common measures of living standards in health research are summarised below and Table 2.1 provides a detailed list of these measures with their key strengths and weaknesses.

2.1.1.1 Direct measures of living standards: Income and consumption

Income and consumption are widely used measures of SES. Income is defined by "the amount of money received during a period of time in exchange for labour or services, from the sale of goods or property, or as a profit from financial investments" (O'Donnell & Doorslaer, 2008). Income therefore refers to the earnings from productive activities and current transfers. Consumption refers to the resources actually consumed. Although consumption is often measured through household expenditures, there are some important differences between the two concepts: 1) expenditure excludes consumption that is not based on market transactions, such as home production, particularly important in LMICs; and 2) expenditure captures the purchase of goods or services that might have lasting benefits or not be consumed immediately (O'Donnell & Doorslaer, 2008).

There has been a long-standing debate about whether income or consumption is the most appropriate measure of SES. In high-income countries, income has been the primary method to measure SES but for LMICs, consumption has been recommended as the preferred measure for practical and conceptual reasons (Deaton & Grosh, 1998). One of the main reasons is that "although there are random irregularities and seasonal patterns in consumption, they are typically smaller than those in income, because consumption is less tied to seasonal and weather-related patterns in agriculture than is income' (Deaton & Grosh, 1998). Also, in LMICs, the extent of the informal sector, the share of home production and the reluctance to disclose income information often make consumption a better indicator to represent current living standards than current income (Deaton & Grosh, 1998). In practice however, household expenditure data are expensive and time-consuming to collect, and even then, may be affected by recall bias, observer bias, and high attrition rates (Bollen, Glanville, & Stecklov, 2002; Laura D. Howe et al., 2012). As it requires specialist surveys to collect data on expenditure, other types of surveys, such as demographic and health surveys, simply don't have the resources and time to devote to the collection of expenditure data (Montgomery, Gragnolati, Burke, & Paredes, 2000).

2.1.1.2 Proxy measures of living standards

In an attempt to ease the burden of measuring SES, the demographic and health surveys (DHS) have developed asset-based measures, or wealth indices. Despite their theoretical and computational complexity, wealth indices require data that are quick and easy to collect (Vyas & Kumaranayake, 2006), and are widely used today. These data relate to the ownership of a range of durable assets (e.g. car, refrigerator and television), housing characteristics (e.g. material of dwelling floor, roof and walls and main cooking fuel) and access to basic services (e.g. electricity supply, source of drinking water and sanitation facilities) (Howe, Hargreaves, & Huttly, 2008).

There are multiple ways of aggregating a set of asset indicators into a single wealth score (Howe et al., 2008). However Filmer and Pritchett have suggested what is now the most widely used approach in health research to deriving a wealth index, principal component analysis (PCA) (Filmer & Pritchett, 2001; Vyas & Kumaranayake, 2006). The basic idea of PCA is to replace a set of correlated variables with a set of uncorrelated "principal components" which represent unobserved characteristics of the population. The principal components are linear combinations of the original variables and the weights are derived from the correlation or covariance matrix (depending on whether the data have been standardised) (Howe et al., 2008). It is assumed that the first principal component, which explains the most variance among the data, represents household wealth.

Table 2.1: Summary of living standards measures in LMICs

Measure	Definition	Strengths	Weaknesses
Income	Income is composed of earnings from productive activities and transfers. Four main components should be included: (1) wage income from labor services; (2) rental income from the supply of land, capital, or other assets; (3) self-employment income; and (4) current transfers from government or nongovernment agencies or other households. Often measured at the household level. Absolute income or predefined categories can be recorded. Total income must be adjusted for household size.	Income is arguably the best indicator of material living standards since it directly measures the material resources component	Difficult to measure due to the informal economy, self-employment, seasonal activity, multiple activities, income in the form of goods. Using household income information to apply to all household members assumes an even distribution of income according to needs within the household. Sensitive question, there might be reluctance to report income. Income for young and older adults may be a less reliable indicator of their true SES

Measure	Definition	Strengths	Weaknesses
			because income is often lower at these stages of life.
Consumption	Consumption expenditure captures the extent to which a household can meet its material needs and access services. It is defined as personal expenditure on goods (durable, semi-durable and non-durable) and services. It does not include expenditure on buying a dwelling (i.e. capital expenditure), business expenses, tax payments or interest payments on loans or mortgages (i.e. transfer expenditure. (Howe et al., 2012) Consumption expenditure is measured by summing expenditures on a wide range of items to form an aggregate measure of total expenditure. Should be adjusted according to household size.	It reflects permanent income, and is sometimes preferred to current income because it is seen as being more stable over time.	Data collection is resource-intensive. Recall bias and misreporting issues. Difficult to estimate the value of home-produced goods and those received in kind. Consumption is unlikely to be equally distributed across household members, and some expenditures may be shared across the extended family. Seasonal variability in household consumption, especially in rural areas.
Asset-based index, or wealth index	General indicator of material living standards. Aggregate of a set of variables on durable assets (e.g. car, refrigerator and television), housing characteristics (e.g. material of dwelling floor, roof and walls and main cooking fuel) and access to basic services (e.g. electricity supply, source of drinking water and sanitation facilities).	Easy and quick to collect. The asset index has been claimed to provide a rational, simple and reliable alternative to consumption expenditure (Howe, Hargreaves, Gabrysch, & Huttly, 2009) Some argue that it is a more stable measure as it is less sensitive to fluctuations in income and expenditure and is resistant to economic shocks.	Interpretation depends on the variables included in the index. Cannot be used in cross-country comparisons, as it is a relative measure. There is some evidence that an asset index has only modest inter-observer and test–retest reliability. Asset quality is not taken into account. Has an urban bias: whereby many of the household durable goods require electricity, which tends to be more accessible in urban areas. Consequently, wealth indices are less useful for distinguishing between rural households. Assets such water supply provided at the community level do not reflect individual SES.

2.1.2 Conceptualising health inequalities

2.1.2.1 Defining health inequalities and health inequities

Health inequality is the generic term used to designate differences, variations, and disparities in the health achievements of individuals and groups (Kawachi, Subramanian, & Almeida-Filho, 2002). Although this term is ultimately about variations in health status, it also refers to the differences in the care that people receive as well as the opportunities that people have to live healthy lives (Williams, Buck, & Babalola, 2020). Health inequalities therefore relate to differences in health status (life expectancy or prevalence of disease for example), access to care, quality of care, behavioural risks to health (smoking) and the wider determinants of health (Marmot, 2005). These variations are usually measured in relation to socioeconomic characteristics related to ability to pay, such as income, consumption, education, deprivation and social class (Cookson, Propper, Asaria, & Raine, 2016). However, other factors such as ethnicity, geographical location, age, gender, type of illness or any other type of socio-economic disadvantage have also been explored (Hacking, Muller, & Buchan, 2011; Jardine et al., 2021; Raine et al., 2009).

Health inequity, however, refers to those inequalities in health that are deemed to be unfair or arising from some form of injustice. Traditionally, health inequities have been defined as “differences in health that are unnecessary, avoidable, unfair and unjust” (Whitehead, 1992). Various debates and expert contributions have led to more precise definitions over time, particularly to help measurement and accountability (Braveman & Gruskin, 2003). Although health inequalities and health inequities are sometimes mistakenly used in an interchangeable way in the literature, the two terms in fact differ in their normative assumptions. Health inequity implies distinguishing between “fair” and “unfair” sources of inequality. Inequalities can result from life choices, income, ethnic group, health status, as well as many other factors. While it seems reasonable to think that inequalities due to individual decisions will legitimately lead to inequalities in health status, differences due to socioeconomic factors should be avoided and considered illegitimate (Cookson, Propper, Asaria, & Raine, 2016; O’Donnell & Doorslaer, 2008).

2.1.2.2 Measurement of health inequalities

The simplest measure of health inequalities is to assess the variation in the mean of a health variable across groups with different levels of living standards, for example by comparing the health variable of those in the lowest socio-economic group with those in the highest group. This gap can be measured in absolute or relative terms, and the health variable can relate to health outcome (e.g. presence of chronic condition), health utilisation (e.g. number of health care visits), or health financing (e.g. total OOP payment for health). However, O'Donnell et al recognise that such grouped analyses provide an incomplete picture of how health varies across the full distribution of living standards (O'Donnell & Doorslaer, 2008). The most commonly used tool to formally assess health inequalities is the concentration curve (CC). The CC plots the cumulative percentage of the health variable against the cumulative percentage of the population, ranked by living standards (O'Donnell & Doorslaer, 2008). In other words, it displays the share of the health variable accounted for by cumulative proportions of individuals ranked from poorest to richest (Kakwani, Wagstaff, & Van Doorslaer, 1997; A Wagstaff, Paci, & van Doorslaer, 1991). It can be used to examine inequality not just in health outcomes but also in other variables such as health care utilisation and OOP payments. In the case of complete equality, that is where everyone has the same value of the health variable regardless of living standards, the CC will be a 45-degree line. In contrast, if poorer individuals take a higher (lower) share of the health variable, the CC will lie above (below) the line of equality, which represents an equal distribution of health outcomes across the population. The more the CC deviates from the equality line, the greater the level of inequality. Despite being useful for identifying the existence of inequalities and making cross-country comparisons, CCs have limitations since they do not *quantify* the extent of the inequalities. By contrast, the concentration index (CI) provides a measure of the *magnitude* of inequality (Wagstaff, Van Doorslaer, & Paci, 1989), defined as twice the area between the CC and the line of equality. In the case of perfect equality, the value of the CI will be zero. By convention, it takes a negative (positive) value when the curve lies above (below) the 45-degree line, indicating a disproportionate concentration of the health variable among the poor (rich).

2.1.2.3 Measurement of health inequities

To measure health inequities, a common approach is to measure associations between the health and the socio-economic variables, after adjusting for 'fair' differences that are usually linked to individual preferences and needs. However, Cookson et al recognise that this is challenging in practice for several reasons (Cookson, Propper, Asaria, & Raine, 2016).

First, a normative assumption needs to be made regarding the extent to which people with different needs should be treated differently. The first step requires determining which sources of inequality are legitimate and which are not. The next step requires quantifying the degree of inequality caused by unfair sources. Fleurbaey and Schokkaert have suggested two measures of unfair inequality: the first one is called 'direct unfairness', which refers to inequalities in health after one has removed the effect of all legitimate variables, and the second is the 'fairness gap', which measures the distance between the actual distribution and a fair distribution in which all the effects of illegitimate variables have been removed (Fleurbaey & Schokkaert, 2009). The two methods are reported to yield different results, as fair and unfair sources of inequalities are not independent.

Second, from a data perspective, measuring health inequities includes having data on health needs, which is often very limited. Health needs can be measured through household surveys, routine hospital data or primary care data, and are often constrained by a lack of detailed information on stage of illness and co-morbidities which are often more severe in deprived individuals (Cookson et al., 2016). Particularly in survey data, self-reported health measures can lead to reporting bias, since disadvantaged groups of people tend to report better subjective health despite having worse health from a clinical perspective (Black, Johnston, Shields, & Suziedelyte, 2017; Sen, 2002). Measuring health inequalities also requires having data on SES. A description of the issues related to the measurement of SES has been described in the previous sub-section.

2.1.3 Defining quality of care

Quality of care is a multi-dimensional construct and its measurement is not based on a single metric. The examination of quality of care was formalised in Donabedian's seminal paper in 1966, that presents a framework for the systematic assessment of quality of care

(Donabedian, 1966). In his paper, health care service delivery is described as a continuum that includes structures, processes, and outcomes. He asserted that quality of care is an end product when the structures are translated to outcomes through processes. Each 'quality' component of the framework is summarised below.

Structural quality consists of human and material resources such as infrastructure, equipment, drugs, commodities, communication, and transport, that together constitute the inputs in the production of health care. To deliver optimal quality of care, material resources need to be combined by motivated and appropriately trained health workers. Structural measures of quality have been extensively used primarily because they require information that is relatively easy and quick to collect. Drawing on the methodology used in health facility surveys such as the Service Provision Assessment (SPA), the Service Availability and Readiness Assessment (SARA), or the Service Delivery Indicators (SDI), the great majority of studies measuring structural quality collect a set of variables (usually related to health facility infrastructure, equipment and supplies) that are equally weighted to create an index of quality (Leslie, Spiegelman, Zhoub, & Kruka, 2017; Macarayan et al., 2018). Despite being necessary to deliver high quality care, there are some concerns that structural quality is poorly correlated with process quality and health outcomes (Donabedian, 1966; Hanefeld, Powell-jackson, & Balabanova, 2017; Leslie, Sun, & Kruk, 2017).

Process (or clinical) quality assesses whether what is recognised to be "good" medical care has been applied (Donabedian, 1966). The focus is on the interaction between health care providers and patients and less on the inputs of care used to measure structural quality. Process quality is often measured by whether patients receive evidence-based clinical interventions. Evidence-based care includes systematic patient assessment, accurate diagnosis, provision of appropriate treatment and technical competence in the provision of diagnostic and therapeutic procedures, continuity of care, and appropriate patient counselling (Kruk et al., 2018). Despite being highly informative about the care patients actually receive, process quality has been less explored compared with structural indicators of quality (Das & Leonard, n.d.). This is due to a range of conceptual and practical challenges in collecting this type of data, especially since it needs to be condition specific. A summary of the common tools to measure process quality and their challenges is presented in Table 2.2 below. Process quality is probably the best measure of the actual quality of care delivered to patients as it is closely tied to the behaviour and expertise of health care providers. However, it is much more difficult than structural quality for patients to evaluate.

Health outcomes refer to the ultimate improvement in health in terms of recovery, restoration of functions and survival. While the distinction between process and health outcomes might be the difference between means and ends, health outcomes are often difficult to measure and depend on patient adherence, patient's response to treatment, (Peabody, Taguiwalo, Robalino, & Frenk, 2006) and are subject to confounding, as health outcomes are determined by a very large number of socio-demographic factors (Marmot, 2005).

Table 2.2: Summary of common tools to measure process quality

Tool	Description	What is it trying to measure?	Strengths	Limitations
Medical vignettes	A medical vignette is a hypothetical medical case posed to health care providers, designed to elicit what they think is an appropriate course of medical history-taking and examination, their diagnostic ability, and proposals for treatment. (The World Bank, 2013)	It measures a provider's competence or medical knowledge, and what s/he would do in the best-case scenario.	By standardizing the cases used to judge quality, it allows us to abstract from the provider's case mix that may reflect unobserved selection criteria (Das & Hammer, n.d.) They are an inexpensive measurement tool for measuring provider quality (Peabody, Luck, Glassman, Dresselhaus, & Lee, 2000)	Existing evidence from both high and low-income countries, however, already suggests that competence and practice do diverge, which is most commonly known as the know-do gap. (Leonard & Masatu, 2005; Rethans, Sturmans, Drop, Vleuten, & Hobus, 1991)
Provider observations	Direct clinical observations are the most direct way to observe how a provider behaves with his real patients.	It measures provider's competence. The information obtained is similar to medical vignettes (history taking, examinations, diagnoses, and treatments) in addition to any fees charged in the clinic. It can also capture if the provider suggests to see the patient in a follow-up visit and the quality of communication (if providers mention a diagnosis, explain what it means, and provide dosage information	Effective way of assessing a range of practices.	Direct observation technique could encourage providers to perform better than they would in the absence of an observer in his/her clinic (Hawthorne effects) Because both the enumerator and potentially the provider do not know what the patient is suffering from, we are limited to estimating the average frequency of more process-oriented measures –

Tool	Description	What is it trying to measure?	Strengths	Limitations
		about medicines).		such as articulation of any diagnosis, number of physical examinations, injections, antibiotic prescriptions, etc. Thus, we cannot determine whether or not patients are leaving with the appropriate medical advice and treatment. Difficulty to compare quality across providers since we cannot control for variations in case mix and case loads. Some doctors may need to ask more questions or perform more tests because they see more complex cases. Relying on real patients also makes it difficult to assess how providers manage less prevalent, but important, illnesses and how they treat patients from minority populations.
Patient exit interviews	Interviews with patients immediately after they exit the clinic which ask about their interaction with the provider.	Can obtain information about patients, their illnesses, and their satisfaction with the type of care they received.	Can assess the extent to which patient characteristics vary across providers. Patient's perspective is obtained.	Cannot determine with much certainty what the patient was suffering from and therefore we can't evaluate providers' diagnostic ability or treatment prescriptions. Recall bias from the patient
Standardised patient	A standardized patient (SP) is an individual trained to consistently portray a medical case and all of its physical and psycho- social aspects and to accurately recall his/her interactions with providers. After the clinical interaction, details of the visit are recorded using a structured form similar to the form used to describe interactions	SPs have been argued to be the gold standard for measuring the quality of care patients actually receive when they enter a clinic (Rethans et al., 1991)	Since the patient identity is hidden, there is no Hawthorne effect Since the SPs represent specific medical cases, we know what the correct diagnosis and form of treatment should be. We can therefore make direct comparisons between a provider's performance on the vignettes and provider's behavior	Since the cases that the SPs present must be easily simulated, the cases are restricted. This restriction poses a challenge for extrapolating the quality measurements generated by SPs to the providers' normal patient pool. The one-time visit also precludes a proper assessment of providers' performance in managing chronic

Tool	Description	What is it trying to measure?	Strengths	Limitations
	during vignettes, which documents whether or not history questions and exams were completed, what diagnosis was offered, and what treatments were prescribed.		recorded from their interactions with SPs. Finally, the fixed cases and the standardization of case presentation across "patients" ensure equivalent case and patient mixes across providers. This makes it easier to compare the effort of different providers (or types of providers)	illnesses Ethical concerns, such as potential negative externalities on the real patients if time is devoted to "fake" patients that do not really require medical attention. Also the procedures could potentially be harmful to the SP. Difficult to implement, especially in facilities where there are no walk-ins and in remote villages where the community members know each other.
Record review	Use of medical records to evaluate provider performance	Reviewing medical records kept on each patient in the clinic is an option, especially if providers' diagnoses, treatments, and management strategies can be extracted from the charts rather than just basic information about the patient and presenting symptoms.	Avoids expensive data collection by using routine records (especially where electronic)	In most low-income settings, these kinds of records contain very little information, if they exist at all.

Since the introduction of the Donabedian framework, which has been criticised for its limited ability to pick up the complex interaction between the different constructs of quality of care and for failing to incorporate patient perspectives (Mitchell, Ferketich, & Jennings, 1998), the definition has evolved over time. The American Institute of Medicine (IOM) published two quality reports that influenced the investigation of quality of care in high-income countries. According to the IOM, quality of care represents "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Institute of Medicine (US) Committee to Design a Strategy for Quality Review and Assurance in Medicare., 1990). A later IOM report described good quality care as having six key attributes: safety; effectiveness; patient-centeredness; timeliness; efficiency; and equity (Institute of Medicine (US) Committee on Quality of Health Care in America, 2001).

More recently, the Lancet Global Health Commission suggested an updated framework for high quality health system which recognises that "a high-quality health system is one that optimises health care in a given context by consistently delivering care that improves or maintains health outcomes, by being valued and trusted by all people, and by responding to changing population needs" (Kruk et al., 2018). The proposed framework includes three key domains: 1) foundations, which are broader than material inputs and skilled workforce by including dimensions of good governance, adequate response to population's needs, knowledge and preferences, as well as appropriate health facilities that are connected to each other; 2) process of care, which includes user experience as a key indicator in addition to competent care, as it has been shown that a positive user experience can improve retention in care, adherence to treatments, and, ultimately, confidence in health systems; and 3) health impact, which is broader than improving health outcomes by including the economic benefit and confidence in the health system. The Commission examined the literature, undertook qualitative and quantitative research to evaluate the quality of care available to people in LMICs across a range of health needs, explored the ethical dimensions of high-quality care in resource-poor settings, reviewed available measures of quality care and improvement approaches. The authors reached five major conclusions: 1) ''The care that people receive is often inadequate, and poor quality care is common across conditions and countries, with the most vulnerable populations faring the worst'', 2) ''High-quality health systems could save over 8 million lives each year in LMICs'', 3) ''Health systems should measure and report what matters most to people, such as competent care, user experience, health outcomes, and confidence in the system'', 4) ''New research is crucial for the transformation of low-quality health systems to high-quality ones'' and 5) ''Improving quality of care will require system-wide action'' (Kruk et al., 2018).

With increasing interest in integrating quality of care as a central pillar of the UHC debate, several initiatives have emerged to inform the debate and discussion about what kind of health system we want for the 21st century as part of the global commitment to UHC. Among them, the Lancet series on "Right Care" examines the extent of overuse and underuse of health and health services worldwide (Kleinert & Horton, 2017). Authors of this series define right care as ''[care] that weighs up benefits and harms, is patient-centered (taking individual circumstances, values, and wishes into account), and is informed by evidence, including cost-effectiveness'' (Kleinert & Horton, 2017). The report highlights the drivers of inappropriate care and provides a framework to address overuse and underuse together to achieve the right care for health and wellbeing. The authors argue that these drivers fall into three important categories: money, finance, and organisations; knowledge, beliefs, assumptions, bias, and uncertainty; and power and human relationships (Kleinert & Horton, 2017).

2.1.4 Demand for health services

Researchers have long been interested in understanding what determines demand for health services, and particularly whether quality of care influences demand. There are a number of different approaches that have been used to study demand for health services. Analyses of household surveys using multivariate analysis have been widely used, and are often based on models of health behaviour such as the one developed by Andersen, which includes both individual and contextual determinants of health care utilisation which in turn are made up of predisposing, enabling and need factors (Andersen & Newman, 2005).

In economics, static economic models based on consumer theory have been widely used for the study of demand for medical care (Grossman, 1972). Most of these follow Gertler and Locay's framework, where utility derived from using health services depends on health status and on the consumption of goods other than medical care (Gertler et al, 1987). The assumption is that the benefit derived from using medical care is an expected improvement in health status, and the cost of using care is the reduction in the consumption of other goods. Individuals, when ill, decide whether to seek care or not. If they do, it is assumed that they are faced with a finite number of options, including self-care, public versus private care, primary or a higher level of care, etc. They ultimately will chose the alternative providing the highest expected utility considering their demographic, economic, social, and cultural characteristics, characteristics of their illness, and characteristics of available providers (Mariko, 2003).

The utility maximisation problem in its simple form has been formalised by Gertler et al. (Gertler et al., 1987). The utility of an individual i derived from using medical care at provider j is:

$$U_{ij} = U(H_{ij}, C_{ij})$$

Where H_{ij} is the expected health status after receiving care from provider j, and C_{ij} is the consumption of non-medical care. It is assumed that the health status after visiting provider j depends on characteristics of the provider Z_j (such as provider's knowledge, quality of care) and characteristics of the individual X_i. The health production function is given by:

$$H_{ij} = H(X_i, Z_j)$$

It is also assumed that the consumption of non-medical care, conditional on choosing provider j, is derived from the budget constraint. If Y is the total income and P_j the price of provider j, then we have:

$$C_{ij} = Y - P_j$$

With this in mind, each individual is faced with a set of discrete options, and will choose the alternative that yields the highest utility:

$$U^* = \max(\, U_{o,} U_1, \dots U_j)$$

From an analytical point of view, the econometrics models traditionally used to analyse provider choice (i.e, where the dependant variable takes the form of discrete and unordered outcomes) are multinomial models. These are founded on McFadden's random utility model where the probability of an individual choosing one alternative is based on both a deterministic and a random utility component (McFadden, 1981). These models include the multinomial logit, the nested multinomial logit or the multinomial probit. The multinomial logit has been used widely given its ease of computation (Bolduc et al, 1996), where the probability of choosing the alternative j is given by:

$$P(k = j|X, Z) = \frac{\exp\,(X\beta_j + Z_j\alpha)}{\sum_{k=1}^{J}(X\beta_k + Z_k\alpha)}$$

where X are alternative invariant independent variables (such as age or income) and Z are the alternative specific variables (such as distance to a public or private clinic).

The major issue with this model is that it relies on the Independence of Irrelevant Alternatives (IIA) assumption, which assumes that the correlation of the error terms for each pairing of alternatives is zero (Akin, Guilkey, & Denton, 1995). A major implication is that the relative probabilities of any two choices are unaffected by the addition of another choice. Alternatively, the relative probability of two choices of three is unaffected when the third choice is no longer available (Akin et al., 1995). To overcome this problem, the multinomial probit model is commonly used since there are no assumptions on the covariance of the error terms, but this method is computationally difficult and prevents the use of more than three or four dependant variables (Akin et al., 1995; Bolduc et al., 1996). Another approach that can be used to partly overcome the IIA assumption is the nested multinomial model, where the correlation between errors is allowed only between sub-categories of the dependant variables (for example, between different levels of facilities within the public sector, but not between private and public facilities) (Mariko, 2003).

2.1.5 Equity within UHC

Government subsidies for the provision of basic services have long been recognised as a key approach to addressing market failures linked to inefficiency and equity issues (Van de Walle, 1998). Indeed, government intervention is needed for the provision of services that the market would under-supply, leading to inefficiencies, or would not supply to a specific segment of the population, leading to inequities. To improve distributional outcomes and relieve poverty, states can either establish income transfers or supply services that may deliver greater benefits to the poorest segments of the population (Martinez-Vazguez, 2001). Therefore, measuring the distributional impact of public expenditures for services where equity concerns are paramount, such as health services, is crucial to inform policy debates and reforms (Demery, 2000). A common approach has been developed, known as benefit incidence analysis (BIA), which uses information on both costs and utilisation of public services in order to estimate how public spending is distributed across different socio-economic groups. This approach was originally developed in two World Bank studies by Selowsky for Colombia, and Meerman for Malaysia (Meerman, 1979; Selowsky, 1979). BIA seeks to answer the question: who benefits from public expenditures and by how much. In other words, it measures "by how much the income of a household would have to be raised if the household had to pay for the subsidized public services at full cost" (Martinez-Vazguez, 2001). In practice, BIA studies assign "benefits" to service users, who are ranked by some measure of current welfare, typically income level, geographical area, ethic group, gender, etc. When considering public health care, the BIA approach provides a profile of the distribution of public health care expenditure across the population ranked by the chosen indicator (Van de Walle, 1998).

One central assumption in BIA studies is that the cost of providing public health services approximates the value (or benefit) to service users, without trying to estimate directly the preferences of individuals (Martinez-vazguez, 2001). Therefore, several authors have pointed out that the term "benefit incidence" might be misleading and a more correct one would be "beneficiary incidence" instead, as the focus of such studies is on recipients of subsidies (Demery, 2000). The various steps and data requirements to conduct a BIA have been described in detail elsewhere (Mcintyre & Ataguba, 2011; Owen O'Donnell, Doorslaer, Wagstaff, & Lindelow, 2008) and are summarised below:

1) Estimate the unit cost or subsidy involved in the provision of public health services. This is usually disaggregated by type of health services (such as primary level clinics, district hospitals, regional hospitals and central hospitals), by regions, by urban or rural location, or generally any helpful disaggregation that the data permits. The data are usually obtained from National Health Accounts or Ministries of Health.
2) Assign subsidies to households who reported using health services
3) Derive the benefit incidence of public health services by ranking households according to their level of income (or any other measure of welfare) and estimating the distribution of the subsidies across income groups.
4) Compare the distribution of benefits to some target distribution (based for example on level of health need).

A key strength of a BIA is that it can provide a simple and transparent approach to assessing the extent to which public health spending benefits the poor. The approach, however, is not without its limitations. A key one that has been flagged by analysts is the failure to take account of variations in the quality of health services received by different individuals, leading to a potential under/over-estimation of the subsidy (Asante et al. 2020). There is increased evidence that the poorest segments of the population receive poorer quality of care (Kruk et al., 2018), implying that failing to take account of the quality of care in BIA could lead to a biased picture of who benefits most from government health spending. Recently, Asante et al. attempted to address this critical methodological gap by introducing a quality score into the computation of BIA (Asante et al., 2020). They developed a proxy measure for quality using area level deprivation indicators (availability of water, electricity, energy source for cooking, education, etc.) and incorporated this quality index into the BIA framework; their findings show that the distribution of subsidies for public health care facilities became less 'pro-poor' after accounting for area level deprivation. This is the only BIA study to date that has sought to account for quality of care, albeit through a proxy measure.

2.2 Empirical literature review

In this section, empirical literature covering the four research chapters of the thesis is presented. While I tried to capture the most important papers related to the topic, these literature reviews are not meant to be systematic as per the Cochrane criteria. Literature searches were conducted around the four objectives of this thesis: 1) What is the extent of the inequalities in the availability in quality of care in LMICs? 2) Is quality of care a determinant of provider choice? 3) What is the impact of health insurance on health service utilisation and financial protection? and 4) How can quality of care be accommodated in analyses of equity in health financing? Terms were applied to the EconLit, Medline, and EMBASE databases so that both economic and public health literatures were investigated. An iterative snowballing strategy was employed throughout where the references of relevant papers were examined for any potentially useful papers or search synonyms. Articles are synthesised through a narrative overview, where I first start with a general presentation of the topic, highlighting the systematic reviews (if any) and summarising the state of the evidence so far from LMICs. Then, I aim to provide a comprehensive description of the specific literature pertaining to Indonesia and to highlight the gaps that this thesis aims to fill in the Indonesian context.

2.2.1 Inequalities in the availability of quality health services in LMICs

The Lancet Global Health Commission argued that high quality health systems should exhibit an "absence of disparities in the quality of health services between individuals and groups with different levels of underlying social disadvantage" (Kruk et al., 2018). However, evidence on the inequalities in quality of care remains scarce. Although a few studies have shown that poorer groups are more likely to receive lower quality care (Benova et al., 2018; Kruk et al., 2018), questions remain regarding the underlying drivers of these inequalities. Das et al. laid out three ways in which inequalities in the quality of care can arise (Das & Gertler, 2007). First, inequalities can occur when health facilities located in poor communities provide worse quality care compared to health facilities located in richer communities (e.g. inadequate infrastructure, unqualified providers, etc.). Secondly, inequalities can arise when individuals of higher SES access and utilise better health services compared to poorer individuals. Travel costs and price of health services can be significant determinants of access to quality services, affecting people of varying SES differently. Finally, inequalities may arise when a health worker provides different quality of care based on the patients' SES.

As far as the first type of inequality is concerned, which I refer to as inequality in the availability of quality of health services and is the focus of chapter 5 of this thesis, evidence is relatively slim. This is perhaps reflecting the challenge of having data on both the quality of care of a health facility and the SES of its catchment population. Among those studies in LMICs that have used clinical competence to measure quality of care, all found provider competence was correlated with SES of the catchment area. Two studies from India linked households from two regions (Madhya Pradesh and Delhi) with a census of private and public providers in the same villages and found that in Madhya Pradesh, higher SES villages were positively associated with higher numbers of health care providers and better public and private provider competency (Das & Mohpal, 2016). In Delhi, similar results were found, as moving from the richest to the poorest neighbourhoods was associated with a decrease in the clinical competency of providers (Das & Hammer, 2007). In Tanzania, a study conducted in the Arusha region found that the competence of doctors in both private and public sectors was significantly lower in poorer regions (Leonard & Masatu, 2007). Another study conducted in the Democratic Republic of Congo found that women with lower SES tended to live in areas where the quality of care available was low compared to women of higher SES (Fink, Kandpal, & Shapira, 2019). Two studies looked at the effect of pay-for-performance (P4P) schemes on inequalities in the performance of providers in Tanzania and Brazil (Binyaruka, Robberstad, Torsvik, & Borghi, 2018; Kovacs et al., 2021). Prior to the introduction of the P4P scheme, both studies reported lower quality of care in deprived areas compared to richer areas, but these differences narrowed over time due to P4P. Among the studies using structural indicators of quality of care, evidence on the inequality in the availability of quality care is mixed. Two studies conducted in Kenya linked population data with health facility data. One found that all quality metrics for maternal health care in public and private health facilities were lowest for the most impoverished areas and increased significantly with greater wealth (Sharma, Leslie, Kundu, & Kruk, 2017). The second one found pro-rich inequalities in the availability of electricity, laboratory services, drug supply, and qualified staff in public health facilities (Toda et al., 2012).

In Indonesia, the population of more than 270 million individuals is scattered across approximately 6000 islands and the health system is highly decentralised. Ensuring that everyone has access to quality care is a challenging goal in such a context. Recently, the World Bank conducted an assessment of a nationally representative sample of 686 Indonesian public and private PHC facilities. This report highlights significant gaps in the readiness of PHC facilities to deliver a basic level of quality of health care (World Bank Group, 2020). While quality of care is reported to be a nationwide problem, large geographical inequalities in the quality of care have been reported. Only one study has analysed the extent of inequalities in provider knowledge across different wealth groups (Barber, Gertler, & Harimurti, 2007). They found no significant differences across these groups in performance for curative care, however, for prenatal care, the poor had access to health care providers with scores 5.9 percentage points higher than those of providers available to the wealthiest patients. This study is now more than a decade old and uses data from 1997.

So far, studies of inequalities in quality of care in Indonesia have almost exclusively focused on the gap between islands and between urban and rural areas. Additionally, most of these studies have focused on structural aspects of quality, with limited consideration of clinical processes of care. Given Indonesia's significant reforms designed to ensure financial protection to all citizens, it is essential that progress in terms of equitable availability of high-quality care is assessed. The first objective of this thesis is to understand the extent of inequalities in quality of care beyond the provincial and rural/urban divide, and to present evidence on socio-economic inequalities in the availability of quality care at public and private PHC facilities in Indonesia.

2.2.2 Effect of quality on provider choice in LMICs

There is convincing and consistent evidence from high-income countries showing that quality is correlated with provider choice across both primary care and hospital settings (Avdic, Moscelli, Pilny, & Sriubaite, 2019; Beckert, Christensen, & Collyer, 2012; Chandra, Finkelstein, Sacarny, & Syverson, 2016; Gaynor, Propper, & Seiler, 2016; Gutacker, Siciliani, Moscelli, & Gravelle, 2016; Varkevisser, Geest, & Schut, 2012). In LMICs, evidence on this topic is growing. Drawing on evidence pertaining to health care seeking behaviour in LMICs, Leonard developed his "active patient" model, in which "active patients do not automatically seek health care at the closest or lowest cost provider, but rather seek high-quality care (even at higher cost) when they estimate that such care will significantly improve outcomes" (Leonard, 2014). Recent evidence seems to support this idea that quality plays an important role in motivating or dissuading utilisation (Larson et al., 2019).

What is less clear from the LMIC literature is which dimensions of quality patients are responsive to. Much of the literature on the effect of quality on provider choice in LMIC focuses on observable dimensions of quality, which mainly relate to structural quality indicators and on patient experience and perceptions of quality (Hanson, Yip, & Hsiao, 2004; Sahn & Younger, 2002; Skordis-worrall, Hanson, & Mills, 2011; Wellay, Gebreslassie, Mesele, Gebretinsae, & Ayele, 2018). Hanson et al. show that patients place a high value on factors such as thoroughness of evaluation, staff attitudes and drug availability, suggesting that the more observable the attribute is, the more weight it holds in patient decision making (Hanson, McPake, Nakamba, & Archard, 2005).

The number of studies that have considered quality attributes beyond structural and observable measures is very limited. Among these, Mariko et al. calculated provider knowledge scores (a process measure of quality), and found that estimates of willingness to pay for quality care are significantly higher when provider knowledge increases (Mariko, 2003). Klemick et al found that households tend to bypass lower quality facilities and manage to improve the care that they receive by choosing more competent providers (Klemick, Leonard, & Masatu, 2009). Fe et al. found no correlation between doctor competence and patients' health care utilisation in China (Fe, Powell-Jackson, & Yip, 2017). In contrast, Leonard et al. found in Tanzania that patients appear to seek out facilities that provide high quality consultations, defined as facilities staffed by more knowledgeable physicians, facilities in which clinicians observe good prescription practices, and facilities in which the staff are polite (Leonard & Mliga, 2002).

In Indonesia, a recent study in East Java province found that education was a strong predictor of out-of-district bypassing, suggesting that richer patients are likely to seek higher quality services outside their area of residence (Putri, Wulandari, Syahansyah, & Grepin, 2021). However, evidence is lacking on this topic. At a time when quality of care is at the forefront of the political debate, evidence on whether individuals are responsive to such incentives is strongly needed. In paper 2 of this thesis (chapter 6), I provide evidence on whether quality of care is a determinant of provider choice, thereby contributing to the out-dated and small number of studies using quality of care in choice models.

2.2.3 Effect of health insurance on the utilisation of health services and financial protection

In 2015, the year the SDGs were adopted, 926.6 million people globally incurred catastrophic health spending, defined as OOP health spending exceeding 10% of the household budget, and 208.7 million people incurred OOP health spending exceeding 25% of the household budget (World Health Organization & World Bank Group, 2019). Often, these catastrophic payments hit poorer households the most, pushing them further below the poverty line. In order to prevent such health shocks, many countries sought to increase the coverage of public health insurance schemes (Erlangga, Suhrcke, Ali, & Bloor, 2019). Health insurance is defined as a way to distribute the financial risk associated with variable patient health care expenditure by pooling costs over time through pre-payment and over people by risk pooling (Acharya et al., 2012). If UHC is to be financed through insurance, the risk pool needs the following characteristics: i) compulsory contributions to the risk pool; ii) the risk pool has to have large numbers of people, as small pools cannot spread risk sufficiently and are too small to handle large health costs; and iii) where there is large number of poor, pooled funds will generally be subsidised from government revenue (World Health Organization, 2010).

Public health insurance can take various forms depending on specific design features. The dominant models are SHI schemes, financed primarily through mandatory earning-related contributions levied on formal sector workers, or tax-financed systems, where general revenue is used to finance a common level of cover for the entire population, with a single delivery system for everyone (Wagstaff, 2010). Community-based insurance (CBI) has also become increasingly popular in LMICs as an alternative in cases where the public sector has failed to provide access to health care for its entire population (Robyn, Sauerborn, & Ba, 2013). CBI collects contributions from individuals who voluntarily enrol and are often employed in the informal sector, thus offering an alternative to health insurance in settings where taxes represent only a small portion of national income (Robyn et al., 2013).

Public health insurance has two main goals. One is to improve health outcomes by increasing the use of appropriate health services, by making a person more likely to access new health technologies; and by equalising use among the rich and the poor (Escobar, Griffin, & Shaw, 2010). Second, health insurance is expected to protect individuals and households from catastrophic and impoverishing health spending. When OOP funding is the primary source of funding in a health care system, health emergencies can lead individuals to borrow, to sell assets, or not seek care at all (Escobar et al., 2010). Additionally, OOP payments are shown to lead households to spend a higher proportion of their income on health than richer households, making this type of payment regressive (Ataguba, Asante, Limwattananon, & Wiseman, 2018). Health insurance is expected to address these problems by preventing households from sliding into health-related poverty.

One major issue when aiming to measure the impact of health insurance on health outcomes is to overcome the selection effect (Acharya et al., 2013). For example, theory suggests ill individuals may be more likely to self-select into insurance than healthier ones who derive little benefit from health insurance. Information also can play a role; better-informed individuals are more likely to enrol, and they are also more likely to be more educated, wealthier, and to live closer to a health centre (Acharya et al., 2013). Many (unobserved) reasons can lead insured individuals to be fundamentally different from uninsured individuals with regards to factors that affect health outcomes (Gertler, Martinez, Premand, Rawlings, & Vermeersch, 2011). Thus, if one examines the average impact of insurance on those who adopt insurance, then a simple comparison of insured and uninsured individuals provides biased results. Acharya et al. suggest that studies ''must measure or report impact through a comparator, using either a contemporaneous control or a constructed control from data containing similar information collected over a similar time period'' (Acharya et al., 2013). These include randomised controlled trials, quasi-experimental studies in which methods of allocating are not random but create a matched control group, controlled before-and-after studies or difference-in-differences studies, regression studies that consider the probability of selection into treatment through the instrumental variable method (Acharya et al., 2013).

Evidence from systematic reviews display a mixed picture of the effect of public health insurance on utilisation of health services, financial protection and health status. Acharya et al reviewed the impact of SHI schemes targeting the informal sector in LMICs, and found no strong evidence of an impact on utilization, protection from financial risk, and health status (Acharya et al., 2013). Only a few insurance schemes have been shown to provide significant protection from high levels of OOP expenditures, but the impact on the poor was weaker. More recently, two systematic reviews have been published. Because of the heterogeneity of the studies, these two systematic reviews do not incorporate a mechanism for grading the quality of published studies. One systematic review reported a positive effect on health care use across all studies reviewed, while evidence on financial protection was mixed: the majority (70%) of the studies showed no impact on the reduction in OOP spending (Prinja, Chauhan, Karan, Kaur, & Kumar, 2017). Authors also found very limited evidence on the impact of insurance on health status, as only one study included health status measures. The other systematic review also found a significant effect on health care utilisation and on financial protection, although for the latter the evidence was mixed (Erlangga et al., 2019). They found little evidence for an effect of health insurance on health status.

In Indonesia, there have been impact evaluations of insurance schemes on the utilisation of health services and financial protection prior to the introduction of the JKN. Johar evaluated the earliest health insurance program for the poor in Indonesia (the health card program) using propensity score matching (Johar, 2009). The health card program of

1994 was one of the government's major efforts to improve the nation's health by promoting equality in access to PHC. The program targeted poor households and provided free care at public health facilities for all members of the household. The author found that the health card program was unsuccessful in encouraging households to use health services, and this was mainly due to supply constraints, as the network of primary care providers was very limited at the time. In 2010, an impact evaluation (using instrumental variable approach) of two insurance schemes, *Askes* (civil servant scheme) and *Jamsostek* (private employee scheme) found that both schemes had a positive impact on the utilisation of services, especially in private facilities (Hidayat & Pokhrel, 2010). Sparrow and colleagues evaluated the impact of the *Askeskin* program, the subsidized SHI scheme that was introduced in 2005 and targeted the informal sector and the poor (Sparrow, Suryahadi, & Widyanti, 2013). Using a combination of propensity score matching and difference-in-differences analysis, they found that social insurance improved access to health care by increasing the utilisation of outpatient services by the poor. However, they also found that OOP spending had increased for *Askeskin* members in urban areas. In 2017, the same authors evaluated the effect of the *Jamkesda* insurance schemes, which are local health financing schemes for the poor managed at the district level (Sparrow et al., 2017). Using fixed effects analysis, they found that these local insurance schemes helped in closing the coverage gap by increasing outpatient care use for poor households not covered by national subsidized programs, but again, they did not find the scheme had any major effect on financial protection or hospitalisation.

Since the birth of the JKN, a number of studies have evaluated its effects. Anindya et al found that enrolment in the JKN was associated with a higher prevalence of receiving ANC4+ visits, skilled birth attendance, facility-based delivery and PNC with a skilled provider (Anindya, Lee, & Agus, 2020). Erlangga et al found that the JKN increased the probability of inpatient admission for both the contributory and subsidised groups, and increased the probability of an outpatient visit for the contributory group (Erlangga et al., 2019). Johar et al found that the JKN led to a reduction in inequalities in the utilisation of outpatient and inpatient care (Johar, Soewondo, Pujisubekti, Satrio, & Adji, 2018). More recently, Pratiwi and colleagues found that inpatient care was higher among JKN members than those uncovered, suggesting that insurance removed a significant barrier to hospitalisation (Pratiwi et al., 2021). However, they also found that OOP spending was high among JKN members, with a 9% increase for inpatient services and 15% for outpatient services compared to the uninsured.

With the exception of Erlangga et al, none of these studies had credible study designs to establish a causal effect of the JKN on health care utilisation and financial protection. Instead, they tended to rely on cross-sectional datasets and descriptive analyses, raising issues of confounding and selection bias, which could mask the true impact of the JKN. The Erlangga et al study used data from 2014, the year in which the JKN was just being rolled out, therefore leaving little time for the JKN to display its full effects. For example, in 2014 few private providers were contracted with the BPJS-Health, and the information that the population had about the benefits of the JKN were limited (Agustina et al, 2019). Therefore, their estimates of the impact of the JKN on health care use may no longer reflect the current situation. Additionally, they did not disaggregate outpatient care by type of provider. Nor did they explore the causal impact of the JKN on financial protection. Since one of the major objectives of the JKN was to protect the insured from the financial burden of health care costs by reducing OOP health care payments, evidence on how the country is progressing is well overdue. In chapter 7, I aim to address this gap by exploring whether patients insured under the JKN are financially protected from catastrophic spending.

2.2.4 Evidence on health financing equity in LMICs and integration of quality of care into BIA studies

As UHC is becoming a major policy concern worldwide, measuring the equity impact of health care financing reforms has become a key focus for academics and policy makers (Wiseman et al., 2015). A systematic review of BIA studies was published in 2016 and found 18 studies using BIA between 1994 and 2013 (Asante, Price, Hayen, Jan, & Wiseman, 2016). Overall, the review found that total health financing is disproportionately distributed among the richest in both sub-Saharan Africa and Asia-Pacific, and this was mainly driven by the pro-rich distribution of hospital services. Although there has been a perception that PHC services were pro-poor due to their relative availability in rural areas, the review found that PHC were only marginally pro-poor in sub-Saharan Africa and the Asia-Pacific, suggesting that impact of health reforms seeking to strengthen PHC on the utilisation of services by the poor has been minimal. In recent years, some BIA studies have extended the scope of the traditional BIA to account for the utilisation of private services (Mills et al., 2012; Wiseman et al., 2017). In many LMICs, there is a significant proportion of public funding dedicated to the support of private health providers, and a number of authors have recognised the need to take this financing stream into account to complete the picture of health financing systems (Asante et al., 2016).

Indonesia has been the focus of a number of BIA studies conducted by the Word Bank at the time when the country made great effort to reduce poverty and invested considerably in PHC (World Bank, 1990). Using data from 1987, a study showed that PHC was mildly progressive but hospital care was clearly disproportionately used by the richest consumption groups (Van de Walle & Nead, 1995). These results were confirmed by later studies using data from 1995-1998 (Lanjouw, Pradhan, Saadah, Sayed, & Sparrow, 2001). In 2001, a comparative analysis of Asian countries found that in Indonesia, the richest 20% of the population received more than 30% of the total subsidies, and that health care utilisation distribution was more pro-poor than the subsidy distribution (for all types of services) (Owen O'Donnell et al., 2007). From 2001 to 2004, after Indonesia decentralized and districts were authorised to manage their own spending on health, a study by Kruse et al. (2012) was conducted to understand how the changes in public spending affected the distribution of benefits across different SES groups (Kruse, Pradhan, & Sparrow, 2012). They used a marginal benefit incidence methodology in order to assess the causal relationship between increased public spending and the utilisation of services by the poor. The authors found that increased public spending improved targeting of public funds to the poor by increasing their utilisation of services and also their share of public health expenditure.

More recently, Sambodo et al (2021) measured the benefit incidence of health care funding under the JKN, taking into account regional variation in unit costs across districts (Sambodo, Van Doorslaer, Pradhan, & Sparrow, 2021). As both primary and secondary care providers are paid prospectively and proportionally to the intensity of their activity under the JKN system, better-equipped service providers are more likely to receive larger provider payments. Sambodo et al (2021) found that the distribution of benefits favoured the wealthier groups, but most importantly that standard BIA using national unit costs underestimates regional disparities in health care funding, and therefore underestimates inequality in the benefit distribution. Recently, Asante et al. (2020) attempted to introduce a quality score into the computation of BIA (Asante et al., 2020) and found that the distribution of subsidies for public health care facilities became less 'pro-poor' after accounting for quality of care. This is the only BIA study to date that has tried to account for quality of care. Chapter 8 of this thesis seeks to bring evidence on this topic, by exploring who benefits from public health spending and how does the integration of quality of care into the analysis affect the level of inequalities in the distribution of public health subsidies.

2.4.5 Summary of the empirical literature review

This empirical literature covered the four research chapters of the thesis and sought to summarise the current evidence related to the main thesis objectives: 1) What is the extent of inequalities in the availability of quality health care in LMICs? 2) Is quality of care a determinant of provider choice? 3) What is the impact of health insurance on health service utilisation and financial protection? and 4) How can quality of care be accommodated in analyses of equity in health systems financing? The main take-away messages from the empirical literature review are summarised below.

First, it seems that the current evidence points towards a correlation between quality of care and socio-economic status of the geographical areas where health facilities are located. However, studies of inequalities in quality of care, globally as well as in Indonesia, remain scarce and have mostly focused on structural aspects of quality, with limited consideration of clinical processes of care. Assessing the quality of care is crucial for achieving any UHC goal. Second, while there is some evidence from LMICs that patients are responsive to observable measures of quality of care when choosing their health care providers, less is known about the effect of quality attributes beyond structural and observable measures on provider choice. In Indonesia, while evidence on bypassing health providers seems to suggest that richer patients are willing to travel further to find better quality of care (Putri, Wulandari, Syahansyah, & Grepin, 2021), it remains unclear what their motivations are and what aspect of quality they value most. Third, evidence from systematic reviews paints a mixed picture of the effect of public health insurance on utilisation of health services and financial protection (Acharya et al., 2013). This due to both the heterogeneity in study designs, where a causal effect is not always possible to establish, and the heterogeneity of health insurance schemes themselves since they vary in their design and implementation. Although health insurance seems to increase health care use, the effect on financial protection remains unclear. In Indonesia, one recent study using quasi-experimental study design has established a causal effect of the JKN on health care utilisation and financial protection. Robust evidence on the impact of JKN is overdue. Fourth, one of the main limitations of BIA studies is the failure to account for variations in quality of care. While it seems that the distribution of subsidies for public health care facilities are likely to be less 'pro-poor' after accounting for quality of care, there remain a need for studies to test this hypothesis with empirical data.

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3 Study setting

3.1 Country profile

Indonesia is a lower-middle income country with a GDP per capita of USD 3,869 in 2020. With a human development index (HDI) of 0.694, the country is placed in the upper ranks of countries with a medium human development index, and among the best performers in the Asia Pacific region (Agustina et al., 2019). Indonesia has made significant progress in economic growth and poverty reduction: in 2016, 6.8% of the population lived under the poverty line of $ 1.9 a day, down from 48% in 1998 and GDP per capita grew at 5.5% per year over the same period (Agustina et al., 2019). With a growing population of more than 270 million inhabitants spread over more than 6000 islands, Indonesia faces significant challenges in the health sector despite notable progress in the past decades. Among them, life expectancy has increased from 67 years in 2002 to 69 years in 2015, and the under-five mortality rate has declined from 46 to 32 per 1000 live births from 2002 to 2017 (World Bank Group, 2020). However, maternal and neonatal mortality ratios remain high with 126 deaths per 100 000 live births in 2015 and 13.7 deaths per 1000 live births respectively (World Health Organization, 2018). The equity gap with regards to health outcomes and access to health care continues to be a major challenge for Indonesia. Substantial variations in disease burden exist by wealth quintiles, between rural and urban areas, and by provinces (Agustina et al., 2019). In the eastern provinces of West Papua, Papua, Central Kalimantan, Central Sulawesi, and Maluku, the MMR is above 200 per 100 000 live births while in the Jakarta capital city region, Jambi, West Java, Bali, and Lampung the MMRs is below 100 (World Bank Group, 2017).

The Government of Indonesia has implemented several key reforms with the aim of improving health status and access to health services. A key part of these reforms is a SHI scheme designed to pave the way for the achievement of UHC. The path to UHC started in 2004, when Indonesia adopted a law to establish the National Social Security System (Law 40/2004), which was designed to provide comprehensive social protection to all Indonesians. More details on the key UHC goals for Indonesia are explained later in this chapter.

3.2 Health system structure

Indonesia has a mixed model of public and private provision of health services. Primary health centres or "*puskesmas*" form the backbone of Indonesia's public health system, with catchment areas of 25000-30000 individuals. The number of *puskesmas* has been gradually increasing since the late 1960s as the central element in the government's efforts to improve access to PHC; going from 8,737 in 2009 to 9,767 in 2016 (World Bank Group, 2020). They provide a set of mandatory services and tasks including curative, rehabilitative, preventive and promotive services delivered within the facility and through outreach programmes (World Health Organization, 2017b). *Puskesmas* are linked to a network of about 23,000 auxiliary health centres, called "*pustu*", that provide community outreach services in remote areas. At the secondary care level, there are approximately 2,400 hospitals in Indonesia–of which about two-thirds are private (World Bank Group, 2020).

The role of the private sector is important in Indonesia with around two thirds of outpatient care and half of all inpatient care is provided by the private sector (World Bank Group, 2020). The private PHC sector is diverse, and no systematic information is available at the central level on their number and distribution. Delivery of private PHC is provided most commonly through private clinics, private physicians, and private dentists. Private midwives and nurses are also permitted to run their own clinics.

3.3 Health financing

Health financing in Indonesia is marked by low government spending on health. Compared to countries in South-East Asia where health care spending averages at 5.1% of GDP in 2019, Indonesia is lagging behind with 2.8% of GDP spent on health (data.worldbank.org). Simultaneously, Indonesia is marked by a high share of OOP spending, which is recognised as an inefficient and inequitable source of financing (Ataguba, Asante, Limwattananon, & Wiseman, 2018). In 2019, the amount spent on OOP payments (IDR 157.5 trillion, USD 11 billion) was still bigger than the amount of money spent by the JKN in absolute terms (IDR 113.3 trillion, USD 7,8 billion) (Maulana, Soewondo, Adani, Limasalle, & Pattnaik, 2021). While there has been an increase in the portion of public spending from 32.1% to 52.1% of total health expenditure (THE) from

2013 to 2019, OOP spending still comprised 32.2% of THE in 2019 (data.worldbank.org). OOP expenditure in Indonesia is estimated to push around 8% of households (7 million households) into poverty each year (World bank group, 2017).

National Health insurance in Indonesia

In 2004, Indonesia laid out its ambitions for comprehensive UHC in the National Social Security Law No. 40 (Law of the Republic of Indonesia, 2004). After the introduction of various public health insurance schemes as described in section 1.3 that left the health financing system rather fragmented, Indonesia took a significant step towards UHC in 2014 by implementing a comprehensive national health insurance scheme, known as the *Jaminan Kesehatan Nasional,* aimed to address growing disparities in health care access and to strengthen financial protection (National Team for the Acceleration of Poverty Reduction, 2015). The JKN brought together all major pre-existing health insurance schemes under a single agency - the Social Security Management Corporation for the Health Sector (BPJS-Health), and was made mandatory for all Indonesians. The JKN consists of two types of membership: the contributing members and the non-contributing members. The contributing members consist of self-employed individuals, who must self-enrol and pay contributions, as well as formal sector employees, who need to contribute via their payroll. The non-contributing members, who are covered by the State, comprise people who are living in poverty, those living in near poverty, and those who are disabled. In 2017, non-contributing members included 94 million of the poorest individuals in Indonesia, representing approximately 40% of the population (Agustina et al., 2019). The sustainability of the scheme relies heavily on contributions, but a significant share of JKN members do not routinely pay their contributions (Muttaqien et al., 2021). If no payment is made, coverage is deactivated after a one-month grace period. It can be reactivated at a later date, on the condition that the household pays arrears (6 months maximum cap). For the first 4 years of the programme, monthly contributions started at IDR 25,500 (USD 1.80) for class III services (the basic benefit package), rising to IDR 80,000 (USD 5.52) for class I services that include better hospital rooms, special drugs and wider access to laboratory and diagnostic tests (Pratiwi et al., 2021).

Under the JKN scheme, households can register at any time of the year, and are required to register all family members, as listed on their official Family Card (*Karta Keluarga*)

(Banerjee et al., 2021). While insurance enrolment is legally mandatory, the mandate is hard to enforce in practice, and there are currently no penalties for households who do not enrol. JKN members must also register with a public or private primary care provider within three months of becoming a member and seek care from their chosen provider to benefit from insurance, thereby giving primary care providers an important gate-keeping role (Banerjee et al., 2021). In 2018, over 2300 hospitals, 1700 of them private, accepted JKN-funded patients (Pratiwi et al., 2021). Under the JKN scheme, a comprehensive basic benefit package is provided, covering outpatient and inpatient care at the primary care level up to the tertiary hospital level (World Health Organization, 2017b). According to the JKN regulation, there is no cost sharing under the scheme - in other words, the insured are not meant to be charged for any share of service costs at the point of health care use, although specific procedures (e.g., cosmetic surgery, infertility treatments, orthodontics, etc.) are excluded (Hidayat, 2015).

Provider payment under the JKN

Another major UHC reform linked to the JKN has been the introduction of a prospective capitation-based payment system for primary care facilities in 2014, designed to improve efficiency and effectiveness in service delivery and promoting access to health services across regions and income groups (National Team for the Acceleration of Poverty Reduction, 2015). Implemented by BPJS-Health, the capitation amount received per member per month ranges from IDR 3000 to IDR 6000 (USD 0.21 to 0.42) in public PHC facilities, while private sector facilities receive on average IDR 8000 (USD 0.56) (World Bank Group, 2020). The reason for this difference is that public health facilities also receive other government budgetary sources of revenue (World Bank Group, 2020). Hospitals are reimbursed by case following a tariff system called INA-CBG (Indonesia Case Base Groups), under which amounts are determined jointly by primary diagnosis and severity of the case (Banerjee et al., 2021). By the end of 2019, low premium contribution and generous coverage had led to a significant financing deficit of around IDR51 trillion (USD 3.7 billion), threatening the sustainability of the JKN (Pratiwi et al., 2021).

Additional health financing reforms

Responding to the challenges facing the JKN, the government has implemented several reforms alongside the JKN to better target the poor and maintain progress towards UHC.

On the supply-side, reforms include the integration of all remaining insurance schemes into the single-payer system, expanding the network of providers especially from the private sector, piloting P4P schemes in primary health-care, implementing a system for the assessment of new health technologies, and mandatory accreditation of all contracted health facilities. On the demand side, the government is increasing sensitisation among targeted beneficiaries to encourage enrolment. Proposed strategies for bringing in additional funds for health include increasing tobacco taxes and the phasing out of fuel subsidies.

Incentives for private providers

Contracting with private providers was expected to accelerate access to services, compared to working solely through the public sector. Latest figures show that 42% of private clinics, 60% of private hospitals and 14% of private general practitioners are contracted with BPJS-Health to provide services to JKN patients (Agustina et al., 2019). Evidence on the effect of the introduction of the JKN on the private health care market shows that the number of private hospitals in Indonesia has grown, indicating a desire for private hospitals to benefit from the JKN market (Health Policy Plus, 2018). Evidence seems to show that the INA-CBGs are not sufficient to incentivize private hospitals to offer additional services. Instead, BPJS-Health contracted facilities are focused on cutting costs and achieving efficiency (Health Policy Plus, 2018). Finally, few private hospitals perceive reimbursement rates to be sufficient to cover the direct and indirect costs of all services provided (Health Policy Plus, 2018).

3.4 Quality of care in Indonesia

Delivering affordable access to quality health services is challenging in Indonesia. Over 60% of the population is concentrated on 6% of the landmass, in the island of Java. The remaining 6000 inhabited islands have population densities ranging from 10/km2 in Papua to 1400 /km2 in West Java (Pratiwi et al., 2021). Health needs vary considerably across provinces and the supply of health services remains one of the most important constraints, since areas with lower income and greatest needs are typically those where supply is most lacking (Pratiwi et al., 2021).

Substantial geographical variations exist in the provision of care (World Health Organization, 2017a). Particularly, high regional heterogeneities exist in the readiness of health facilities to deliver high quality care: some regions suffer from drug shortages as well as a lack of trained health personnel and basic health facility equipment (World Bank, 2014a, 2014b). A 2014 World Bank survey of health facilities in the Eastern provinces of Indonesia showed that basic infrastructure like water supply was only present in 40% of *puskesmas* (public health centres) in Papua, referral transportation was only available in half of *puskesmas* in West Sulawesi, and referral communications only available in 40% of *puskesmas* in East Nusa Tenggara (World bank, 2014b). Recently, the World Bank (together with Australian Aid, GAVI and the Global Fund) conducted an assessment of a nationally representative sample of 686 Indonesian public and private PHC facilities. This report highlights significant gaps in the readiness of PHC facilities to deliver a basic level of quality of care (World Bank Group, 2020). Addressing geographical inequalities constitutes a major priority for current health reforms in Indonesia.

Since the launch of the JKN, multiple initiatives have been adopted to improve the quality of care in Indonesia. Some reforms have focused on improving facilities' infrastructure in deprived areas, increasing the supply of drugs and revising guidelines and regulations to expand the role of primary health centres in health promotion and prevention (Mboi, 2015). The Ministry of Health has also set up a primary care accreditation commission (Komisi Akreditasi Fasilitas Kesehatan Tingkat Primer – KAFKTP) to improve the quality of services by ensuring that the necessary inputs (such as infrastructure, equipment and human resources), clinical and managerial processes are in place. The commission also provides follow-up support to ensure continuous improvement and reaccreditation every three years. In 2018, BPJS-Health also implemented a performance-based capitation payment scheme that aims to measure the commitment of primary care providers to deliver primary care services comprehensively, based on the contact rate, percentage of chronic conditions visits, and non-specialised referral ratio (Eichler, Gigli, & LeRoy, 2018).

3.5 ENHANCE project

My PhD was undertaken with the support of the ENHANCE Project (Equity in Health Care Financing in Indonesia), funded by the MRC Health Systems Research Initiative scheme (MR/P013996/1). The ENHANCE project aims to evaluate the equity impact of UHC reforms in Indonesia and brings together a multi-disciplinary team from the Universitas Indonesia, London School of Hygiene and Tropical Medicine and the University of New South Wales. Using a before and after design, the combined effects of the UHC reforms are being evaluated on: 1) progressivity of the health care financing system (using financing incidence analysis); 2) pro-poorness of the health care delivery system (using BIA); 3) level of catastrophic and impoverishing health expenditure; and 4) self-reported health outcomes (Wiseman et al., 2018). From mid-2017 to the end of 2021, I have worked as a Research Fellow in Health Economics (20% full-time equivalent) for the EHANCE project. I worked on the design of the survey tools, assisted the research teams with the training of fieldworkers and with data collection, analysed the data for the BIA and quality of care assessment components, participated in the writing of research outputs and actively engaged in the dissemination of the study results to a diverse range of stakeholders in Indonesia and internationally, through the following:

- Quarterly presentations to investigator team
- Presentations at Congress of the International Health Economics Association
- Presentations to Global Health Economics Centre at LSHTM
- National-level workshops in Indonesia
- First author publication in *International Journal for Equity in Health* (Appendix 3.1)
- Co-authored publication in *International Journal for Equity in Health* (Appendix 3.2)
- Co-authored publication in *The Lancet Regional Health - Western Pacific* (Appendix 3.3)

This PhD builds on and extends the ENHANCE project through new analyses exploring the impact of the JKN on financial protection and access to care (paper 3) and novel methodological approaches where quality-weights are incorporated into measures of equity in health financing (paper 4). For all of my research papers, I received and benefited from advice, inputs, direction and training (Economics of health inequalities at the Erasmus University) through the project and from the entire ENHANCE team.

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4 Methods

4.1 Data sources

4.1.1 Indonesian Family Life Survey

The Indonesian Family Life Survey (IFLS) is a panel socioeconomic and health survey conducted by the RAND Corporation. It is based on a sample of households representing about 83% of the Indonesian population living in 13 of the nation's 26 provinces in 1993. The survey collects data on individual respondents, their families, their households, the communities in which they live, and the health and education facilities available to them. The first wave (IFLS1) was administered in 1993 to individuals living in 7,224 households. The most recent wave (IFLS5) was fielded in late 2014 and early 2015 on the same set of IFLS households.

One module of the IFLS collects information on health care utilization, including from whom and where medical care was received, how much it cost, who paid for it, how far the respondent travelled, and whether drugs were purchased. This includes detailed information from household members on the most recent outpatient visit during the previous four weeks and on the most recent inpatient visit during the previous 12 months.

In addition to individual- and household-level information, the IFLS collects detailed information from public health centres and private clinics located in the IFLS communities. From this survey, the quality of health facilities can be assessed through measures of: 1) structural quality (equipment, supplies and staff availability); and 2) medical vignettes. The medical vignettes represented four different cases: an adult presenting with cough and fever; an adult presenting with diabetes; a child presenting with diarrhea and vomiting; and a pregnant woman seeking antenatal care. The vignettes can be found in Appendix 4.1. If the facility did not provide the service corresponding to the vignette, the corresponding score was coded as a missing value. After the clinical case was described, the provider was asked what questions or activities they would ask or perform for history taking, physical examination, laboratory tests, and follow-up recommendations. Responses were either mentioned spontaneously or prompted against a prepared list of options. Not all the options were considered good practice and the correct answers were coded based on international guidelines. For each vignette, the provider who was trained in the related field and received most of the corresponding cases in the facility was eligible to answer the questions – this meant that the provider responding to each vignette could vary within a health facility. The vignettes used in the IFLS were piloted before implementation (Barber & Gertler, 2008).

4.1.2 ENHANCE surveys

As part of the ENHANCE study, a panel household survey was conducted at two time points: the baseline included 7555 households interviewed between February and April 2018; and at endline the same households were contacted again for the follow-up survey between September and December 2019. The mean follow-up time was 576 days between the two time points. We were able to re-interview 6352 households, therefore yielding a follow-up rate of 84%. The sampling procedure for these surveys first involved selecting a stratified sample of 10 provinces containing 74% of the population from 34 Indonesian provinces[1]. The stratification was done to maximise representation of the population, and capture the cultural and socioeconomic diversity of Indonesia. At the next stage, districts within the selected provinces were grouped into clusters based on population and SES, and enumeration areas were randomly chosen from within clusters. Detailed household level data on health service utilisation, household infrastructure and asset ownership, OOP expenditure on health care, and satisfaction with the care received was collected. In the second survey (end 2019), households that reported using outpatient services in either a public health centre or a private clinic in the month preceding the interview were asked about the name of the facility visited (if more than one facility was visited, the most recent visit was recorded). The ENHANCE household survey instrument can be found in Appendix 4.2.

In parallel to the household survey, a survey of 50 health facilities located in the same geographical area as the household survey was conducted. The sampling frame of the facility survey was based on the names of facilities households reported using. The supply-side readiness (SSR) survey consisted of module 1 of the SARA questionnaire (World Health Organization, 2005), which assesses the general service readiness of a health facility to provide a basic level of health services, and some additional context-

[1] The number of provinces has changed from 26 at the time of the first IFLS survey in 1993 to 34 today

specific questions developed with the study team in Indonesia. These additional questions related to whether a facility is contracted with the BPJS-Health and its accreditation status. The facility survey questionnaire can be found in Appendix 4.3.

Additional details regarding the ENHANCE study can be found in Appendix 3.2.

4.2 Overview of methods

4.2.1 Construction of quality scores

As quality of care is a recurring theme in this thesis, I provide a brief description of the construction of the quality scores using the IFLS (paper 1 and 2) and ENHANCE (paper 4) surveys.

In papers 1 and 2, which look at the inequalities in quality of care in Indonesia (chapter 5) and the effect of quality in provider choice (chapter 6), I used two measures of quality of care derived from the IFLS. The first is a SSR score used as a proxy for structural quality. The second is a provider clinical knowledge score used to proxy clinical process quality, as defined in chapter 2. The choice of indicators to measure structural quality was informed by the SARA tool. Among the many indicators collected as part of the SARA survey, the "*general service readiness*" module collects information on the potential of health facilities to provide basic health care interventions. I identified all overlapping indicators for the IFLS provider survey and the SARA survey (i.e. module 1 on general service readiness), which represented more than 80% of the SARA indicators. The SARA indicators were then classified into five general service readiness domains (basic amenities, basic equipment, infection prevention, essential medicines, and diagnostic capacity) and coded as binary variables, 1 indicating the presence of an item as reported by the provider and 0 otherwise. The full list of indicators is summarised in Appendix 4.4. For each domain, I calculated the percentage of items available, and took the unweighted mean across the five domains to generate an overall readiness score for each facility. For the knowledge score, I calculated the percentage of correct criteria the provider mentioned without any prompting by the interviewer, and took the unweighted mean across the four vignettes to generate an overall knowledge score for each facility.

In paper 4 which investigated the introduction of quality of care weighting in BIA (chapter 8), a similar methodology as that used in papers 1 and 2 was followed to compute the service readiness score, using the SARA survey as a reference. The indicators of service readiness were slightly different since the ENHANCE facility survey collected different information from the IFLS. The ENHANCE facility survey only collected structural indicators.

4.2.2 Measurement of socio-economic status

SES is another core concept in this thesis and was calculated differently depending on the survey used.

In papers 1 and 2 (chapters 5 and 6 respectively), I computed monthly household consumption expenditures based on[2]: food consumption, non-food consumption, durables, education and housing expenditures. Home production was included in the calculation of food and non-food consumption by estimating the market value of the total amount of home-produced goods consumed by a household. I computed per capita consumption by dividing total household consumption by household size. The SES of each community was computed using the mean per capita monthly consumption of households in that community. In papers 3 and 4, a standard asset-based measure of SES was constructed using data on the ownership of a range of durable assets (e.g. car, refrigerator and television), housing characteristics (e.g. material of dwelling floor, roof and walls and main cooking fuel) and access to basic services (e.g. electricity supply, source of drinking water and sanitation facilities) (Howe, Hargreaves, & Huttly, 2008). Principal components analysis (PCA) was used to estimate wealth levels using the asset indicators (Filmer & Pritchett, 2001; Vyas & Kumaranayake, 2006).

4.2.3 Econometrics methods

The econometrics methods used in this thesis are described in depth in the individual papers. They encompass Ordinary Least Square (OLS) regressions, equity analysis using CIs, choice models such as conditional logit models, policy evaluation methods such as propensity score matching and difference-in-differences analysis, as well as traditional

2 To compute household consumption, a template do-file was available in the IFLS website. I therefore used this template and adapted it to the relevant IFLS wave.

tools to measure health system equity such as BIA. In each paper, I have attempted to test the robustness of the key findings to alternative definitions and measurements of variables and to model specifications.

4.3 Ethical Considerations

Ethical support for the ENHANCE project was granted by the University of Indonesia (Reference: 503/H2.F10/PPM.00.02/2017), London School of Hygiene & Tropical Medicine (Reference: 13773) and the University of New South Wales (Reference: HC17709). The IFLS datasets are freely available in the public domain (https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS.html). Further ethical approval was obtained from the LSHTM for the use of these secondary data for the PhD (Reference: 18061). All ethical approvals can be found in Appendix 4.5.

4.4 References

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5 Poor quality for the poor? A study of inequalities in service readiness and provider knowledge in Indonesian primary health care facilities

5.1 Overview of Paper 1

Ensuring the availability of quality health care to everyone, irrespective of SES, is a necessary condition for UHC. This goal is particularly challenging in countries like Indonesia, where the large population is spread across a vast archipelago of more than 6000 inhabited islands. After the introduction of the JKN in 2014, coverage is progressing in Indonesia (now about 85% of the population is covered by the JKN); however concerns have been raised regarding the poor quality of care that individuals have access to. While quality of care is reported to be a nationwide problem, there are growing concerns that the poor have access to lower quality of care than richer individuals.

So far, studies of inequalities in quality of care in Indonesia have almost exclusively focused on the gap between islands and between urban and rural areas. Additionally, most of these studies have focused on structural aspects of quality, with limited consideration of clinical processes of care. The aim of this study is to understand the extent of inequalities in quality of care beyond the provincial and rural/urban divide, and to present evidence on socio-economic inequalities in the quality of care provided by PHC facilities in Indonesia.

This study contributes to the literature on quality of health care in three important ways. First, this study has considerable methodological strength since it links individual and facility data on quality, therefore enabling the direct estimation of the quality of care that individuals have access to in their neighbourhood. Most importantly, we use two quite different measures of quality, namely a facility SSR score (capturing structural elements of quality), and a provider clinical knowledge score, measured using clinical vignettes. Second, we provide important policy insights from Indonesia. As the government of Indonesia is currently implementing several reforms to improve quality of care (accreditation of health facilities, introducing P4P schemes among others), evidence on where improvements are needed most in Indonesia and where efforts should be focused is strongly needed for the success of the JKN. Third, we address the dearth of evidence on inequalities in quality of care in LMICs.

This paper is presented as accepted in the journal International *Journal for Equity in Health* in November 2021 (Appendix 3.1). It fulfils research objective 1.

RESEARCH PAPER COVER SHEET

Please note that a cover sheet must be completed for each research paper included within a thesis.

SECTION A – Student Details

Student ID Number	386492	**Title**	Miss
First Name(s)	Manon Yvonne		
Surname/Family Name	Haemmerli		
Thesis Title	On the road to Universal Health Coverage: measuring socioeconomic inequalities in access to and use of high quality care in Indonesia		
Primary Supervisor	Virginia Wiseman		

If the Research Paper has previously been published please complete Section B, if not please move to Section C.

SECTION B – Paper already published

Where was the work published?	International Journal for Equity in Health		
When was the work published?	November 2021		
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion			
Have you retained the copyright for the work?*	**No**	Was the work subject to academic peer review?	**Yes**

*If yes, please attach evidence of retention. If no, or if the work is being included in its published format, please attach evidence of permission from the copyright holder (publisher or other author) to include this work.

SECTION C – Prepared for publication, but not yet published

Where is the work intended to be published?	
Please list the paper's authors in the intended authorship order:	
Stage of publication	Choose an item.

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I designed the study and analysed the data. I wrote the drafts of the paper and incorporated co-authors' comments

SECTION E

Student Signature	Manon Haemmerli
Date	15 January 2022

Supervisor Signature	Virginia Wiseman
Date	10th April 2022

5.2 Paper 1

Title: Poor quality for the poor? A study of inequalities in service readiness and provider knowledge in Indonesian primary health care facilities

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Abstract

Background: For many low and middle-income countries poor quality health care is now responsible for a greater number of deaths than insufficient access to care. This has in turn raised concerns around the *distribution* of quality of care in LMICs: do the poor have access to lower quality health care compared to the rich? The aim of this study is to investigate the extent of inequalities in the availability of quality health services across the Indonesian health system with a particular focus on differences between care delivered in the public and private sectors.

Methods: Using the Indonesian Family Life Survey (wave 5, 2015), 15,877 households in 312 communities were linked with a representative sample of both public and private health facilities available in the same communities. Quality of health facilities was assessed using both a facility service readiness score and a knowledge score constructed using clinical vignettes. Ordinary least squares regression models were used to investigate the determinants of quality in public and private health facilities.

Results: In both sectors, inequalities in both quality scores existed between major islands. In public facilities, inequalities in readiness scores persisted between rural and urban areas, and to a lesser extent between rich and poor communities.

Conclusion: In order to reach the ambitious stated goal of UHC, priority should also be given to redressing current inequalities in the quality of care.

Background

In line with the Alma Ata declaration in 1978, health policymakers have long focused on improving access to health care, particularly in deprived areas (Das & Gertler, 2007). However, disparities in health outcomes remain wide (Asante, Price, Hayen, Jan, & Wiseman, 2016; Victora et al., 2017) and it has become increasingly clear that poor quality of care stands in the way of improved access translating into better health (Das, 2018). The Lancet Global Health commission argued that a high quality health system should exhibit an "absence of disparities in the quality of health services between individuals and groups with different levels of underlying social disadvantage" (Kruk et al., 2018). However, evidence on the inequalities in quality of care remains scarce. Although a few studies have shown that poorer groups are more likely to receive lower quality care (Benova et al., 2018; Kruk et al., 2018), questions remain regarding the underlying drivers of these inequalities. Das et al. laid out three ways in which inequalities in the quality of care can arise (Das & Gertler, 2007). First, inequalities can occur when health facilities located in poor communities provide worse quality compared to health facilities located in richer communities (e.g. inadequate infrastructure, unqualified providers, etc.). Secondly, inequalities can arise when individuals of higher socioeconomic status (SES) access and utilise better health services compared to poorer individuals. Travel costs and price of health services can be significant determinants of access to quality services, affecting people of varying SES differently. Finally, inequalities may arise when a health worker provides different health services based on the patients' SES (e.g. fewer procedures, fewer diagnostic tests, smaller consultation time).

This study focuses on the first aspect by measuring the extent to which health facilities located in poor communities provide lower quality compared to health facilities located in richer communities, which we refer to as 'inequality in the availability of quality services'. Relatively few studies have looked at this type of inequality, perhaps reflecting the rarity of having data on both quality of care and catchment population SES in the same geographical area. The available studies indicate consistent evidence that areas with low SES tend to be served by providers with lower competence (Binyaruka, Robberstad, Torsvik, & Borghi, 2018; Das & Hammer, 2007; Das & Mohpal, 2016; Fink, Kandpal, &

Shapira, 2019; Kovacs et al., 2021; Leonard & Masatu, 2007) and by facilities with limited equipment and infrastructure (Sharma, Leslie, Kundu, & Kruk, 2017; Toda et al., 2012).

In Indonesia, the population of more than 270 million individuals is scattered across approximately 6000 islands and the health system is highly decentralised. Ensuring that everyone has access to quality care is a challenging goal in such a context. Recently, the World Bank conducted an assessment of a nationally representative sample of 686 Indonesian public and private primary health care (PHC) facilities. This report highlights significant gaps in the readiness of PHC to deliver a basic level of quality of care (World Bank Group, 2020). While quality of care is reported to be a nationwide problem, large geographical inequalities in the quality of care have been reported. Variations in health outcomes between provinces remain significantly large: in the eastern provinces of West Papua, Papua, Central Kalimantan, Central Sulawesi, and Maluku, the maternal mortality ratio (MMR) is above 200 per 100 000 live births; but Jakarta capital city region, Jambi, West Java, Bali, and Lampung have MMRs below 100 (World Bank Group, 2017). Only one study has analysed the extent of inequalities in provider knowledge across different wealth groups (Barber, Gertler, & Harimurti, 2007). They found no significant differences across wealth groups in performance for curative care, however, for prenatal care, the poor had access to health care providers with scores 5.9 percentage points higher than those of providers available to the wealthiest patients. This study, which is now more than a decade old and uses data from 1997, is no longer up to date.

So far, studies of inequalities in quality of care in Indonesia have almost exclusively focused on the gap between islands and between urban and rural areas. Additionally, most of these studies have focused on structural aspects of quality, with limited consideration of clinical processes of care. Given Indonesia's significant reforms designed to ensure financial protection to all members of the public, it is essential that progress in terms of equitable availability of high-quality care is assessed. The aim of this study is to understand the extent of inequalities in quality of care beyond the provincial and rural/urban divide, and to present evidence on socio-economic inequalities in the availability of quality care at public and private PHC facilities in Indonesia.

Methods

Policy context in Indonesia

In 2014, Indonesia took a significant step towards Universal Health Coverage by implementing a comprehensive national social health insurance (SHI) scheme known as the *Jaminan Kesehatan Nasional* (JKN) to address growing disparities in health-care and to make comprehensive health care available to its entire population (National Team for the Acceleration of Poverty Reduction, 2015). The JKN brings together all major existing health insurance schemes under a single agency - the Social Security Agency for Health (BPJS-Health) - which was made mandatory for all Indonesians. JKN members must register with a primary care provider within three months of becoming a member, and can choose to register with either a public or a private provider contracted with BPJS-Health. Indonesia has made significant progress in JKN coverage, which has increased from 46.5% of the population in 2014 to 85% in March 2021, representing 223 million people (https://bpjs-kesehatan.go.id). This makes the JKN one of the biggest single payer health systems in the world.

In Indonesia's public sector, primary health centres or "*puskesmas*" form the backbone of the system, with catchment areas of 25000-30000 individuals. The number of *puskesmas* has been gradually increasing since the late 1960s as the central element in the government's efforts to improve access to PHC. In 2014, there were 9731 *puskesmas*, which provide a set of mandatory services and tasks that include curative, rehabilitative, preventive and promotive services delivered within the facility and through outreach programmes (World Health Organization, 2017). *Puskesmas* are linked to a network of auxiliary health centres, called "*pustu*", that provide community outreach services in remote areas.

The role of the private sector is important in Indonesia; two thirds of outpatient care and about one-half of inpatient care are provided by the private sector (World Bank Group, 2020). The private PHC sector is diverse, and no systematic information is available at the central level on their number and distribution. Delivery of PHC is provided in the great majority by private clinics, private physicians, and private dentists. Private midwives and nurses are also permitted to run their own clinics. Latest figures show that 42% of private clinics, 60% of private hospitals and 14% of private general practitioners (GPs) are contracted with BPJS-Health to provide services to JKN patients (Agustina et al., 2019).

Data and sample

We used the Indonesian Family Life survey (IFLS) 5 in this study. The fifth wave of this survey was fielded in 2014/2015 and contains information from 16,931 households living in 312 communities (enumeration areas) from 13 provinces, and is representative of 83% of the Indonesian population. An interesting feature of the IFLS is that the household survey can be linked with a health facility survey, containing detailed information on private and public primary health providers located in the same communities. The term "community" in the IFLS refers to the primary sampling unit. We used the IFLS data to link, at the community level, information on households' SES with information on the quality of their local PHC facilities.

The IFLS facility survey contains data on 959 primary public and 2544 private health care providers in the IFLS communities. The provider survey sampling frame was drawn from information reported by households on local providers they knew about within their communities. The list was not restricted to facilities that the respondents used, thus avoiding potential biases associated with a choice-based sample. Health facilities were divided into two strata: one stratum of public primary health facilities, including health centres (*puskesmas*) and sub-health centres (*pustu*), and one stratum of private primary health facilities, including private clinics, individual practices of general practitioners (GP), and nurses/midwives practices. Within each stratum, up to five private facilities and three public facilities were selected, reflecting typically higher numbers of private providers. A description of the two surveys can be found here:
https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS/ifls5.html

Measures of quality

We used two measures of quality of care in this study: one is a SSR score used as a proxy for structural quality, and the other is a provider clinical knowledge score used to proxy clinical process quality (Donabedian, 1996).

The choice of indicators to measure SSR was informed by the SARA tool (World Health Organization, n.d.). Among the many indicators collected as part of the SARA survey, the "*general service readiness"* section collects information on the potential of health facilities to provide basic health care interventions. The overlapping indicators between the IFLS provider survey and the SARA general service readiness section were identified (more than 80% of SARA indicators were found in the IFLS provider survey). The SARA indicators were then classified into five general service readiness domains (basic amenities, basic equipment, infection prevention, essential medicines and diagnostic capacity) and coded as binary variables, 1 indicating the presence of the item as reported by the provider and 0 otherwise. The full list of indicators is summarised in Appendix 5.1. For each domain, the percentage of items available was computed at the facility level, and the unweighted mean across the five domains was generated as an overall facility readiness score.

We developed a knowledge score using provider responses to medical vignettes, representing four different cases: an adult presenting with cough and fever, an adult presenting with diabetes, a child presenting with diarrhea and vomiting, and a pregnant woman coming for antenatal care. For each vignette, the provider who has trained in the related field and receives most of the corresponding cases in the facility was eligible to answer the questions – this meant that the provider responding to each vignette could vary within a health facility. If the facility did not provide the service corresponding to the vignette, the corresponding score was coded as a missing value. After the clinical case was described, the provider was asked what questions or activities they would ask or perform for history taking, physical examination, laboratory tests, and follow-up recommendations. Responses were either mentioned spontaneously or prompted against a prepared list of options. Not all the options were considered good practice and the correct answers were coded based on international guidelines. Details about the criteria are listed in Appendix 5.2. For each vignette, the percentage of correct criteria the provider mentioned without prompting was computed, and the unweighted mean across the four vignettes was generated as an overall facility knowledge score.

Measuring community socioeconomic status

Using the IFLS household survey, the monthly household consumption was computed based on food consumption, non-food consumption, durables, education and housing expenditures, and the per capita consumption was derived by dividing total household consumption by household size. The SES of each community was computed using the mean per capita monthly consumption of households in that community. Finally, the 312 IFLS communities were divided into 5 equal SES quintiles (Q5 representing the highest SES quintile) based on their mean level of monthly household per capita consumption.

Analysis

Using the IFLS unique community code, each health facility was linked to the corresponding community level information such as the SES quintile, the mean level of monthly household per capita consumption and type of location (urban or rural). Two main outcome variables were considered for each facility: the readiness score, and the mean knowledge score across the four vignettes. All analyses were weighted using facility sampling weights.

Descriptive numbers of facilities of each type (*Puskesmas*, *pustus*, private GP practices, private clinics and midwife/nurse practices) were presented by community SES quintile, location (rural/urban) and type of provider (JKN/non-JKN provider). Readiness and vignettes scores were computed for each facility and were summarised by facility type.

For each facility type, we examined bivariate associations between the readiness and knowledge scores, and community SES group, location, island and provider type. To harmonize the sample sizes across provinces, we recoded the province variable into larger groupings of provinces. The following islands (=grouping of provinces) were considered: Central Java (including Central Java and Yogyakarta city provinces), West Java (including Jakarta city, West Java and Banten), East Java (including East Java province only), Sumatera (including Aceh, North Sumatera, West Sumatera, South Sumatera, Lampung and Bangka Belitung Islands provinces), Lesser Sunda islands (including Bali and West Nusa Tenggara islands), Kalimantan (including South Kalimantan only) and Sulawesi (including South and West Sulawesi). To assess the extent of the inequalities in quality of care, equity gaps were computed to assess any significant difference in mean quality scores between communities belonging to Q5 (richest) and Q1 (poorest). T-tests were performed to assess any significant difference in quality scores between facilities located in rural and urban areas, as well as between facilities providing (or not) services to JKN patients.

We conducted multivariate analysis to examine differences in quality with respect to SES when controlling for other known drivers of quality, using the following linear model:

$$q_{ij} = \beta_0 + \beta_1 w_j + \gamma X_i + \varepsilon_{ij}$$

where q_{ij} is the readiness or knowledge score of facility i in community j, w_j is the main explanatory variable, i.e the SES quintile of community j, X a vector of control variables and ε the error term. For both readiness and knowledge scores, the model was estimated separately for public and private facilities using OLS regressions. Standard errors were clustered at the community level. Covariates included variables known to influence quality: location of the facility (rural/urban), provider type (*puskesmas* or *pustus* for the public sector, and GP practices, clinics and midwife/nurse practices for the private sector), a binary variable depending on whether the facility offered care to JKN patients, island fixed effects[3], and vignette dummies to control for the number and nature of the vignettes answered. In order to understand in more depth the drivers of inequality in readiness scores, the same regression model was estimated for each sub-domain of the readiness score.

Results

The sample consisted of 2544 health facilities, among which 959 were public health facilities (671 *puskesmas* and 288 *pustus*) and 1585 were private (304 individual private

[3] We ran a robustness test by including 'province' fixed effects instead of 'island' fixed effects. Results were unchanged and therefore not shown.

practices, 195 private clinics and 1086 midwife or nurse practices). Table 5.1 describes how these health facilities were distributed across community SES quintiles, location (rural/urban), as well as whether these facilities provided services for JKN members. Within public health facilities, both *puskesmas* and *pustus* were equally distributed across poor and rich communities. However, *puskesmas* and pustus were both more likely to be located in urban areas. At the time of the survey, 97% and 88.5% of the *puskesmas* and *pustus*, respectively, were providing services for JKN patients. Within the private sector, higher-level facilities (clinics and GP practices) were more likely to be found in richer areas than lower level facilities (midwife/nurse practices). Both private GP practices and clinics were also more likely to be located in urban areas, whereas midwife and nurse practices were equally distributed between urban and rural areas. Around 25% of private providers were providing services to JKN patients at the time of the survey.

Table 5.1: Descriptive statistics of sampled health facilities

	Public sector				**Private sector**					
	Puskesmas N=671		Pustus N=288		GP practices N=304		Private clinics N=195		Midwife/nurse practices N=1086	
Community SES quintile	**N**	%	N	%	N	%	N	%	N	%
Q1 Poorest (mean $50)	139	21.7	49	17.4	42	15.2	9	5.5	261	28.4
Q2 Poorer (mean $62)	131	19.5	58	21.1	41	15.9	23	12.9	249	24.7
Q3 Middle (mean $75)	124	17.6	71	23.0	64	21.4	43	21.5	215	18.8
Q4 Richer (mean $91)	127	18.9	62	23.0	66	20.0	58	27.3	191	15.6
Q5 Richest (mean $142)	150	22.3	48	15.5	91	27.6	62	32.8	170	12.5
Type of location										
Urban	510	74.6	178	61	262	85.4	177	88.4	663	54.0
Rural	161	25.4	110	39	42	14.6	18	11.6	423	46.0
JKN provider										
yes	650	97.1	256	88.5	66	22.0	55	25.9	266	24.4
no	21	2.9	32	11.5	238	78.0	140	74.1	820	75.6

In Table 5.2, the mean readiness and knowledge scores are presented by facility type. The overall readiness score varied between 53.5% in *pustus* to 83.2% in *puskesmas*. Scores of basic amenities and standard precautions for infection prevention were overall quite high across all facility types. However, basic equipment, availability of essential medicines and diagnostic capacity scores were low. This was particularly the case in midwife/nurse practices, GP practices and *pustus*, where the diagnostic capacity was all below 50%. Availability of essential medicines was below 60% in all but *puskesmas* and private clinics. The overall level of providers' knowledge was quite poor, with an average knowledge score below 50% for all provider types. Variation was observed across vignettes; with the curative care for children vignettes scoring the highest and the curative care for adult with diabetes vignette the lowest. Substantial variation was observed across providers as well, with *puskesmas* performing best on overall provider knowledge (48.8%) and midwife/nurse practices performing the worst (39.3%).

Table 5.2: Readiness and vignette scores by facility type

	Public sector		Private sector		
	Puskesmas N=671	Pustus N=288	GP practice N=304	Private clinics N=195	Midwife/nurse practices N=1086
Basic amenities (%)	88.3	72.3	88.3	87.8	86.2
Basic equipment (%)	79.5	40.6	46.0	60.3	52.4
Standard precautions for infection prevention (%)	98.0	82.7	85.0	93.7	88.1
Diagnostic capacity (%)	69.7	14.3	18.8	35.8	20.3
Essential medicines (%)	80.7	57.7	58.5	60.9	46
Overall readiness (%)	83.2	53.5	59.3	67.7	58.6
Number of observations	*671*	*288*	*304*	*195*	*1086*
Curative for adults					
Quality score (%)	52.5	38.8	47.2	41.9	35.9
Number of observations	*667*	*288*	*287*	*181*	*831*
Curative care for adults with diabetes					
Quality score (%)	32.3	24.4	30.9	27.7	20.5
Number of observations	*652*	*162*	*241*	*153*	*277*
Curative care for children					
Quality score (%)	61.4	51.8	56.6	52.3	47.1
Number of observations	*666*	*285*	*272*	*174*	*917*
Prenatal care					
Quality score (%)	48.7	43.9	32.6	35.2	40.1
Number of observations	*657*	*238*	*86*	*115*	*816*
All vignettes					
Quality score (%)	48.8	41.4	44.7	40.1	39.3
Number of observations	*670*	*288*	*287*	*191*	*1082*

Crude associations between facility readiness scores and community SES quintiles, location, islands and provider type are presented in Table 5.3. Inequalities in readiness scores were the greatest for *pustus*, where there was a 13 percentage-point difference in readiness scores between facilities located in quintile 1 communities and those located in quintile 5 communities, where the mean readiness score was the highest. Regarding the urban and rural divide, *puskesmas*, *pustus* and midwife/nurse practices located in urban areas were better equipped; this was especially the case for *pustus*. There was also substantial variation between islands; the readiness scores were generally highest in Java islands across all facility types. The biggest difference was seen between *puskesmas* located in Central Java and Sumatra, with an 11-percentage point difference in readiness scores. Private facilities that provided services to JKN patients had higher readiness scores than those that did not.

Crude associations between facility knowledge scores and community SES quintile, location, island and provider type are presented in Table 5.4. There was a slight inequality in the knowledge score with respect to community SES and location of puskemas, where those located in Q5 and in urban areas had on average better knowledge scores. There was no inequality in knowledge scores with respect to community SES and location for the other types of facilities. However, variations existed across islands, with the Java islands performing best in terms of knowledge scores. GP and midwife/nurse practices that provided services to JKN patients had on average higher knowledge scores than those who did not.

Table 5.3: Association between readiness scores and community quintile, location, islands, and provider type, by facility type

	Public sector				**Private sector**					
	Puskesmas N=671		Pustus N=288		GP practices N=304		Private clinics N=195		Midwife/nurse practices N=1086	
Community SES quintile	Score	95% CI	Score	95% CI	Score	95% CI	Score	95% CI	Score	95% CI
Poorest	83.7	(81.0-84.5)	47.4	(44.5-50.4)	61.9	(58.6-65.1)	65.6	(57.7-735)	57.8	(56.5-59.1)
Poorer	84.0	(82.4-85.5)	49.0	(46.3-51.7)	61.6	(58.5-65.6)	74.4	(69.6-81.3)	56.9	(55.8-58.5)
Middle	84.5	(82.8-86.2)	53.6	(51.3-56.0)	59	(56.6-61.8)	71.1	(67.3-74.5)	59.4	(57.6-60.4)
Richer	84.7	(83.0-86.4)	56.7	(53.5-59.8)	59.2	(56.9-60.9)	64.6	(61.0-67.8)	59.7	(58.4-61.2)
Richest	80.9	(79.0-82.9)	61.1	(58.0-64.2)	57.4	(54.8-59.2)	65.6	(62.6-68.6)	60.7	(59.0-62.2)
Equity difference (Q5-Q1)	-1.8		12.6***		-4.4*		0.0		3.1**	
Type of location										
Urban	84.2	(83.3-85.1)	56.7	(54.9-58.4)	58.6	(57.4-59.9)	67.3	(65.5-69.1)	59.5	(58.7-60.2)
Rural	80.2	(78.7-81.9)	48.5	(48.7-58.3)	63.8	(61.2-66.5)	70.7	(63.4-77.9)	57.4	(56.4-58.4)
Difference	4.0***		7.9***		-4.8**		-3.4		-2.1**	
Island										
Sumatra	78.1	(76.2-80.0)	50.4	(48.3-52.5)	65.3	(61.8-68.8)	70.9	(67.7-74.2)	59.9	(58.7-61.2)
West Java	80.1	(78.4-81.7)	60.1	(57.4-62.9)	57.9	(56.0-59.8)	64.4	(61.9-67.0)	61.6	(60.4-62.8)
Central Java	89.7	(88.8-90.7)	59.8	(55.8-63.9)	57.9	(55.6-60.2)	70.4	(65.5-75.3)	59.8	(58.4-61.2)
East Java	87.1	(85.4-88.7)	55.4	(53.2-57.6)	56.8	(53.3-60.4)	77.5	(70.8-84.2)	60.1	(58.8-61.4)
Lesser Sunda Islands	80.1	(77.5-82.8)	46.9	(43.6-50.2)	60.3	(56.8-63.9)	71.0	(42.2-99.8)	51.7	(49.5-54.0)
Kalimantan	86.3	(83.5-89.1)	49.4	(43.4-55.4)	61.9	(51.4-72.5)	76.8	(0-100)	56.7	(54.0-59.5)
Sulawesi	82.3	(79.5-85.2)	49.6	(44.5-54.7)	63.8	(58.8-69.0)	66.9	(56.7-77.2)	55.2	(52.1-58.3)
JKN providers										
yes	83.1	(82.3-83.9)	54.1	(52.7-54.6)	65.6	(63.1-66.1)	73.5	(70.5-76.5)	63.3	(62.4-64.2)
no	88.1	(84.7-91.4)	48.7	(45.1-52.3)	57.6	(56.4-58.9)	65.7	(63.6-67.8)	57.0	(56.2-57.7)
Difference	-5.0*		5.6*		8.0***		7.8***		6.3***	

*p < 0.05, **p < 0.01, ***p < 0.001.

Table 5.4: Association between knowledge scores and community quintile, location, islands, and provider type, by facility type

	Public sector				Private sector					
	Puskesmas N=671		Pustus N=288		GP practice N=304		Private clinics N=195		Midwife/nurse practice N=1086	
Community SES quintile	Score	95% CI	Score	95% CI	Score	95% CI	Score	95% CI	Score	95% CI
Poorest	46.7	(44.7-48.8)	38.8	(34.3-43.4)	46.6	(42.3-52.5)	37.1	(26.5-44.7)	38.8	(37.2-40.8)
Poorer	49.0	(46.6-51.4)	41.1	(36.1-44.1)	48.6	(46.3-55.5)	48.7	(40.3-52.6)	38.9	(37.0-41.0)
Middle	47.0	(44.8-49.5)	39.2	(37.4-43.8)	46.4	(41.4-48.9)	42.7	(38.7-49.5)	40.0	(37.6-42.1)
Richer	50.0	(47.5-52.1)	46.1	(42.0-48.8)	41.5	(37.2-45.7)	35.6	(31.7-40.2)	40.5	(38.5-42.4)
Richest	50.9	(48.8-53.2)	40.1	(36.6-44.9)	42.8	(38.8-45.9)	38.3	(34.5-42.8)	39.9	(36.5-40.9)
Equity difference (Q5-Q1)	4.2**		1.2		-3.8		1.2		1.1	
Type of location										
Urban	49.7	(48.5-50.9)	41.9	(39.8-44.0)	44.2	(42.2-46.2)	40.5	(38.3-43.3)	39.9	(38.7-41.2)
Rural	46.1	(44.2-48.1)	40.4	(37.6-43.2)	48.3	(43.4-53.1)	35.9	(27.8-39.7)	38.6	(37.2-40.0)
Difference	3.6*		1.5		-4.1		4.6		1.3	
Island										
Sumatra	44.3	(42.3-46.4)	35.1	(32.5-37.8)	42.8	(38.5-47.1)	35.3	(31.0-39.6)	34.5	(33.0-36.1)
West Java	52.6	(50.8-54.5)	44.7	(41.5-48.0)	41.2	(38.1-44.3)	40	(36.8-42.8)	42.3	(40.3-44.4)
Central Java	52.5	(50.2-54.9)	48.2	(42.7-53.8)	50.2	(45.7-54.8)	48.9	(43.4-54.4)	47.1	(44.8-49.5)
East Java	45.3	(43.6-47.0)	38.6	(34.7-42.7)	46.0	(42.1-50.0)	33.9	(28.2-40)	37.6	(35.7-39.5)
Lesser Sunda Islands	43.8	(40.3-47.4)	41.3	(36.7-47.0)	46.0	(39.9-52.3)	38.7	(16.9-60.5)	37.1	(34.1-40.1)
Kalimantan	46.4	(41.5-51.5)	46.1	(38.1-54.0)	57.3	(40.1-74.5)	57.0	(0-100)	41.3	(38.1-44.6)
Sulawesi	43.7	(38.8-48.5)	29.2	(23.3-35.2)	41.0	(32.4-50.0)	38.0	(19.2-56.8)	32.6	(28.8-36.4)
JKN providers										
yes	48.5	(47.7-49.7)	41.6	(39.9-43.2)	46.8	(43.8-52.2)	44.6	(40.2-48.3)	43.6	(41.4-44.7)
no	50.5	(46.6-57.6)	39.6	(33.6-46.0)	44.6	(41.9-46.0)	38.1	(35.6-41.2)	38.1	(37.1-39.2)
Difference	-2.0		2.0		2.2		6.5**		5.5***	

*p < 0.05, **p < 0.01, ***p < 0.001.

In order to understand whether the observed inequalities persisted when controlling for the combined effects of all covariates, regressions models for readiness and knowledge scores are presented in Table 5.5. In public facilities, we found a nonlinear, small but significant association between readiness scores and community SES. Public facilities located in quintile 3 and 4 communities had on average a 3.1 and 3.9 percentage point higher readiness score compared to facilities located in quintile 1 communities, respectively. Public facilities located in rural areas had readiness scores that were on average 4-percentage points lower than those located in urban areas. There were also disparities across islands, where facilities located in West Java, Sumatra, Lesser Sunda Islands and Sulawesi had significantly lower readiness scores compared to facilities located in Central Java, where the mean readiness score was the highest. In terms of knowledge scores, we did not find significant inequalities across SES groups or across urban and rural areas. Instead, we found that disparities remained across islands, with facilities located in East Java, Sumatra, Lesser Sunda Islands and Sulawesi having on average a lower knowledge score compared to facilities located in Central Java, where the mean knowledge score was the highest.

Among the private health facilities, there was no evidence of inequalities in readiness or knowledge scores with respect to SES but there were large geographical differences across islands. The highest variation was observed for facilities located in West Java, East Java, Sumatra, Lesser Sunda Islands and Sulawesi where there was a 4 to 11 percentage point difference in average knowledge scores compared with facilities located in Central Java, which scored most highly. We also found that private facilities providing services to JKN patients had better readiness and knowledge scores that those that did not. Results from the regression models using the sub-domains of readiness are presented in Appendix 5.3.

Table 5.5: OLS regressions for readiness and knowledge scores, by sector

	Public facilities		Private facilities	
	Readiness score	Vignette score	Readiness score	Vignette score
Community SES quintile				
Quintile 1	-	-	-	-
Quintile 2	1.1 (1.1)	2.0 (1.8)	-0.8 (1.1)	1.5 (1.8)
Quintile 3	3.1 (1.2)**	0.4 (1.5)	0.5 (1.0)	1.4 (1.7)
Quintile 4	3.9 (1.3)**	2.1 (2.8)	0.9 (1.2)	-1.2 (1.9)
Quintile 5	1.5 (1.5)	1.6 (1.7)	0.1 (1.2)	-2.3 (1.7)
Location				
rural	-4.3 (0.8)***	-0.21 (1.1)	-0.9 (0.9)	0.14 (1.4)
Provider type (public)				
Puskemas	-			
Pustu	-28.1 (1.0)***	-7.7 (1.2)***		
Provider type (private)				
Private physician	-	-	-	
Private clinics	-	-	7.2 (1.2)***	-4.9 (1.9)*
Midwife	-	-	-0.2 (0.8)	-8.3 (1.5)***
JKN provider				
yes	0.8 (1.5)	-1.4 (2.1)	7.1 (0.6)***	4.1 (1.0)***
Island				
Central Java	-		-	-
West Java	-6.4 (1.3)***	-0.6 (1.6)	0.6 (0.8)	-5.3 (1.8)**
East Java	-0.7 (1.1)	-7.1 (1.7)***	0.1 (0.8)	-8.4 (1.7)***
Sumatra	-8.8 (1.1)***	-9.6 (1.6)***	1.4 (0.9)	-11.0 (1.8)***
Lesser Sunda Islands	-9.4 (1.3)***	-7.2 (2.1)***	-6.3 (1.5)***	-7.9 (2.5)**
Kalimantan	-2.5 (1.2)*	-4.4 (2.7)	-2.0 (1.4)	-3.8 (2.5)
Sulawesi	-5.5 (1.9)**	-11.2 (2.4)***	-1.9 (1.2)	-11.7 (2.7)***
Number of observations	957	956	1584	1559
Vignettes dummies	NA	yes	NA	yes
R square	0.63	0.16	0.18	0.14

*p < 0.05, **p < 0.01, ***p < 0.001.

Standard errors are in parentheses

Discussion

Coverage is an important but insufficient goal for achieving a high quality health system as defined by the Lancet Commission (Kruk et al., 2018). Ensuring the availability of quality health care to everyone, irrespective of SES, is a necessary condition for UHC. This goal is particularly challenging in countries like Indonesia, where the large population is spread across a vast archipelago of more than 6000 inhabited islands. Results of this study suggest that inequalities in the quality of care exist across islands, where public and private facilities located in Central Java were more likely to meet basic standards of facility readiness and to have higher knowledge scores than facilities located in East Java, West Java, Sumatra, Sulawesi and Lesser Sunda islands. This is in line with previous findings showing that provinces outside the most populated islands of Java and Bali often suffer from shortages in trained health personnel and basic health facility equipment and essential drugs (World bank, 2014a, 2014b). This study also shows that inequalities in readiness scores, unlike knowledge scores, go beyond the provincial level and can be observed between urban and rural areas. This was particularly the case in public sector facilities, where we found that urban location was a strong determinant of facility readiness: both *puskesmas* and *pustus* located in rural areas were more likely to have lower readiness scores than in urban areas. This result is in line with a recent World Bank survey, which found that beyond the island divide, significant disparities exist between rural and urban areas, with facilities located in urban areas performing better on the service-readiness and service availability than rural facilities (World Bank Group, 2020).

The novelty of this paper lies in the analysis of inequalities beyond the geographical level and the rural/urban divide, by exploring the socio-economic inequalities in the readiness and clinical knowledge of PHC facilities in Indonesia. We found some evidence that public facilities located in richer communities had slightly higher readiness scores than those located in poorer communities. However, the size of the effect was relatively small and was not significant for quintile 5 communities. Among private sector facilities, we did not find variation in either score across poorer and richer communities. However, we did find that higher-level and better-equipped private facilities, such as private clinics, were more often located in richer areas.

Among studies in other low- and middle-income countries (LMICs) that used clinical competence as a measure of quality, all found a correlation between provider competence and SES of the catchment area. Two studies from India linked households from two regions (Madhya Pradesh and Delhi) with a census of private and public providers in the same villages and found that in Madhya Pradesh, higher village SES was positively associated with greater numbers of health care providers and better public and private provider competence (Das & Mohpal, 2016). In Delhi, similar results were found, as moving from the richest to the poorest neighbourhoods was associated with a decrease in the clinical competence of providers (Das & Hammer, 2007). In Tanzania, a study conducted in the Arusha region found that the competence of doctors in both private and public sectors was significantly lower in poorer regions (Leonard & Masatu, 2007). One study conducted in the Democratic Republic of Congo found that women with lower SES lived in areas where the quality of care available was low compared to women with higher SES (Fink et al., 2019). Two studies looked at the effect of pay-for-performance (P4P) schemes on inequalities in the performance of providers in Tanzania and Brazil. Prior to the introduction of the P4P scheme, both studies reported lower quality in deprived areas compared to richer areas, but these differences narrowed over time (Binyaruka et al., 2018; Kovacs et al., 2021). In Indonesia, results from this study suggest that such inequalities in provider knowledge related to the area SES did not occur, which is encouraging. However, inequalities did persist across islands and across provider types.

Among the studies that used structural indicators to measure quality, evidence is mixed. Two studies conducted in Kenya linked population data with Service Provision Assessment Surveys (USAID, 2014). One found that all quality metrics for maternal health care in public and private health facilities were lowest for the most impoverished areas and increased significantly with greater wealth (Sharma et al., 2017). The second one found little evidence of marked inequalities of inputs and service availability, although they did identify pro-rich inequalities in the availability of electricity, laboratory services, drug supply, and qualified staff in public health facilities (Toda et al., 2012). The extent of inequalities found in these studies is greater than those reported in our study where inequalities in quality of care were primarily determined by the island and to a smaller extent the type of location (urban/rural) where Indonesians live.

This study also demonstrates that there is much still to be done to address quality of care across primary care in Indonesia. First, the items assessed in the facility readiness score and knowledge tested by the vignettes, can both be considered essential for the management of cases at this level, meaning that the low levels of readiness and knowledge scores is very worrying. Basic equipment, availability of essential medicines and diagnostic capacity were areas of key concern. The low readiness and knowledge scores found in midwife/nurse practices were particularly striking and in line with previous studies (Barber et al., 2007). Second, we found that private facilities overall had worse scores than *puskesmas*, which is in line with the recent World Bank study, which found that on average, *puskesmas* had 6 extra components available compared to private GPs and clinics, and *puskesmas* outscored private clinics on all subdomains of general service readiness, with the difference most stark for diagnostic capacity (World Bank Group, 2020). In our study, we also found that *puskesmas* outscored private facilities on the basis of knowledge scores. Finally, we found that a key driver of readiness in private sector facilities (and to a lesser extent knowledge) was provider type, where facilities providing services to JKN patients had significantly higher readiness scores than those who did not. These results are in line with the Word Bank survey results, where facilities that were contracted by BPJS-Health were more likely to offer wider range of health services and have higher readiness scores than facilities that were not contracted (World Bank Group, 2020).

Our findings have important implications in terms of access to and utilisation of health care services. With sizable user fees remaining in the private sector, equal availability certainly does not translate into equal access to quality care. In the public sector, the limited SES-related inequalities in quality of care are encouraging. However, it has been shown that OOP payments are still incurred by patients in the public sector, even by members of the JKN (Hidayat, 2015). The major cost drivers of OOP payments are medicines that patients purchase privately. Therefore, even in the public sector, low level of inequalities in availability of quality care will not necessarily translate into equal access and utilisation. A recent study showed that the effects of JKN on access and use of services were greater among people on low incomes and those in rural areas than among people on high incomes (Agustina et al., 2019).

It is important to note that we focused on the notion of equality rather than equity. Equity implies distinguishing between “fair” and “unfair” sources of inequality. Inequalities can result from life choices, income, race, health status, as well as many other factors. While it seems reasonable to think that inequalities due to individual decisions will legitimately lead to inequalities in health utilisation, differences due to socio-economic factors should be avoided and considered illegitimate (Cookson, Propper, Asaria, & Raine, 2016; O’Donnell & Doorslaer, 2008). Theoretically, as poorer populations might actually have greater health care needs, ensuring the principle of equity would lead to improving the quality of care in poorer areas specifically, and therefore reversing the imbalance created by what has been referred to the inverse care law, or the trend that “the availability of good medical care tends to vary inversely with the need of the population served” (Tudor-Hart, 1971). In this study, we show that even without considering the population’s needs, SES-related inequalities exist, although small in magnitude. It implies that the level of inequity might actually be higher than observed in this study, therefore deepening the gap between rich and poor in Indonesia.

Our study contains some limitations. Quality of care is a multidimensional concept. By focusing on facility readiness and knowledge scores, we did not capture other important aspects of quality such as patient satisfaction, clinical processes and health outcomes. Our measures of quality also had their own limitations. First, some recent studies have shown that structural quality is poorly correlated with process quality and health outcomes (Leslie, Sun, & Kruk, 2017). Second, the use of vignettes has been questioned due to the “know-do gap” documented in provider behaviour studies (Das & Leonard, n.d.; Mohanan, Vera-hernández, Das, Giardili, & Seth, 2015; Rethans, Sturmans, Drop, Vleuten, & Hobus, 1991). While careful interpretation is needed when using readiness and knowledge scores as proxies for “quality”, they are nonetheless important prerequisites to provide good quality care (World Bank Group, 2020).

Another important limitation is the sampling strategy in this study. First, the IFLS is not representative of all Indonesian provinces, and therefore cannot produce a national estimate. IFLS 5 excluded most eastern Indonesian provinces, which are considered underdeveloped compared to their western counterparts, and where health facilities are often not even available (Erlangga, Ali, & Bloor, 2019). The implication of this would be an underestimation of the extent of inequalities in both readiness and knowledge scores. Additionally, the facilities' sampling frame was based on household responses to questions about known facilities in their local area. The list was not restricted to facilities that the respondents visited in order to limit any biases resulting from a choice-based sample. We cannot, however, exclude the possibility that respondents are more likely to know about facilities they used.

Policy implications

Since the launch of the JKN and since this data was collected, multiple initiatives have been adopted to improve the quality of care in Indonesia. Reforms focused on improving facilities' infrastructure in deprived areas, increasing supply of drugs and revising guidelines and regulations to expand the role of primary health centres in health promotion and prevention (Mboi, 2015). The Ministry of Health has also set up a primary care accreditation commission (Komisi Akreditasi Fasilitas Kesehatan Tingkat Primer – KAFKTP) to improve quality of services by ensuring that the necessary inputs (such as infrastructure, equipment and human resources), clinical and managerial processes are in place. The commission also provides follow-up support to ensure continuous improvement and reaccreditation every three years. In 2018, BPJS-Health also implemented performance-based capitation that aims to measure the commitment of primary care providers to deliver primary care services comprehensively, based on the contact rate, percentage of chronic conditions visits, and non-specialised referral ratio.

The consequences of these reforms are twofold. First, by focusing on rural and deprived areas, these reforms represent a unique opportunity to improve quality of care in Indonesia, and to redress the current inequalities between major islands, rural and urban areas, and to a lesser extent between deprived and richer areas. Second, as we found that private providers contracted by BPJS-Health tend to offer better quality of care, encouraging private providers to join the JKN program might improve access to quality care in this context. Private providers need to meet minimum criteria set by the BPJS-Health to be contracted and the receipt of the capitation payment from BPJS-Health has been shown to improve the service readiness of the contracted private facilities (World Bank Group, 2020). Engaging with private facilities to join the JKN program is a unique opportunity to potentially improve quality in the private sector, either through initial standards for joining the JKN or by encouraging private facilities to use their capitation fees for quality improvement.

Conclusion

As the policy landscape is changing in Indonesia, measurement of inequalities in quality of care is needed to monitor progress to UHC. In this study, we found that inequalities in facilities' readiness exist across major islands in Indonesia, across rural and urban areas for public sector facilities, and to a small but non-negligible extent across poorer and richer communities for public sector facilities. As cost barriers affect the poorest individuals, ensuring that all communities have access to well-equipped health facilities with competent providers is a minimum necessity for achieving UHC.

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6 Is good quality care a determinant of provider choice in Indonesia?

6.1 Overview of Paper 2

While there is convincing and consistent evidence from high-income countries showing that quality is correlated with provider choice in both primary care and hospital settings, evidence on this topic in LMICs remains scarce. However, recent evidence seems to point towards the same idea that quality plays an important role in motivating or dissuading utilisation. What is less clear from the LMIC literature is which dimension of quality patients are responsive to. In Indonesia, evidence is lacking on this topic. At a time where quality of care is at the forefront of the political debate, evidence on whether individuals are responsive to such incentives is needed. In this paper, I provide evidence on whether quality of care is a determinant of provider choice. I use a conditional logit choice model, with alternative specific variables including quality of care measures.

The novelty of this paper lies in two important features. First, I link households to their choice set of health facilities based on geographical information, therefore avoiding the need to impute quality data for the non-chosen alternatives, which is commonly done in choice models due to data limitations. Second, I use two quite different measures of quality that differ in how observable they are to patients, namely a facility SSR score, which measures more observable structural aspects of quality, and a provider clinical knowledge score, measured using clinical vignettes.

This paper fulfils objective 2 and I aim to submit this paper to the journal *Health Economics*.

RESEARCH PAPER COVER SHEET

Please note that a cover sheet must be completed <u>for each</u> research paper included within a thesis.

<u>SECTION A – Student Details</u>

Student ID Number	386492	**Title**	Miss
First Name(s)	Manon		
Surname/Family Name	Haemmerli		
Thesis Title	On the road to Universal Health Coverage: measuring socioeconomic inequalities in access to and use of high quality care in Indonesia		
Primary Supervisor	Virginia Wiseman		

If the Research Paper has previously been published please complete Section B, if not please move to Section C.

<u>SECTION B – Paper already published</u>

Where was the work published?			
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<u>SECTION C – Prepared for publication, but not yet published</u>

Where is the work intended to be published?	Health Economics
Please list the paper's authors in the intended authorship order:	Manon Haemmerli, Virginia Wiseman, Hasbullah Thabrany, Catherine Goodman and Timothy Powell-Jackson
Stage of publication	**Not yet submitted**

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I designed the study and analysed the data. I wrote the drafts of the paper and incorporated co-authors' comments

SECTION E

Student Signature	Manon Haemmerli
Date	15 January 2022

Supervisor Signature	Virginia Wiseman
Date	10th April 2022

6.2 Paper 2

Abstract

Enabling greater choice of health care provider has been at the forefront of recent reforms in high-income countries, with the idea that patients both recognise quality and act on this information when choosing care. In low and middle-income countries, evidence on whether quality influences provider choice is limited. In 2014, the Government of Indonesia introduced its national health insurance program *Jaminan Kesehatan Nasional* (JKN) with an initial aim of providing access to quality health services to the entire population by 2019. Under the JKN, public and private primary care providers are contracted and paid by capitation. Understanding how quality affects patients' choice of provider is crucial in this context. In this paper, we aim to address this gap by exploring whether quality of public and private PHC facilities in Indonesia affects individuals' choice of provider for outpatient care. We use data from the 2015 Indonesian Family Life Survey on the choice of health facility made by 1044 individuals and on the quality of 2549 public and private PHC facilities located in the same communities where individuals live. We used two proxy measures of quality of care: a SSR score (capturing availability of equipment, infrastructure and supplies); and a provider knowledge score measured using clinical vignettes. We estimated an alternative specific conditional logit model of provider choice. Our results show that facility readiness is a predictor of facility choice, although the magnitude of the effect was relatively small compared with distance and cost. Importantly, both rich and poor individuals were responsive to facility readiness. Provider knowledge was not associated with facility choice. While there are many dimensions to quality of care and we have only explored two in this study, these findings suggest that supply-side factors play a role in determining where people seek care, along with the more well-recognised determinants of cost and distance. Comprehensive assessment of gaps in SSR across different providers and geographic areas will help to target areas for intervention by the Indonesian government.

Introduction

Enabling greater choice of health care provider has been at the forefront of recent reforms in high income countries and is based on the idea that giving patients the power to decide where to seek care will incentivise providers to improve their quality of care (Santos, Gravelle, & Propper, 2015; Thomson & Dixon, 2006). The underlying assumption is that patients are responsive to quality differences in choosing a provider. There is convincing and consistent evidence from high-income countries showing that quality is correlated with choice across both primary care and hospital settings (Avdic, Moscelli, Pilny, & Sriubaite, 2019; Beckert, Christensen, & Collyer, 2012; Chandra, Finkelstein, Sacarny, & Syverson, 2016; Gaynor, Propper, & Seiler, 2016; Gutacker, Siciliani, Moscelli, & Gravelle, 2016; Varkevisser, Geest, & Schut, 2012). In low- and middle-income countries (LMICs), evidence on this topic is growing. Drawing on evidence on health care seeking behaviour in low income countries, Leonard introduced his "active patient" model, in which "active patients do not automatically seek health care at the closest or lowest cost provider, but rather seek high-quality care (even at higher cost) when they estimate that such care will significantly improve outcomes" (Leonard, 2014). Recent evidence seems to point towards the same idea that quality plays an important role in motivating or dissuading utilisation (Larson et al., 2019).

What is less clear from the LMICs literature is which dimension of quality patients are responsive to. Much of the literature on the effect of quality on provider choice in LMICs focused on observable dimensions of quality, such as infrastructure, availability of staff, drugs and equipment, and on patient experience and perception of quality (K Hanson, Yip, & Hsiao, 2004; Sahn & Younger, 2002; Skordis-worrall, Hanson, & Mills, 2011; Wellay, Gebreslassie, Mesele, Gebretinsae, & Ayele, 2018). Hanson et al. show that patients value, in order or importance, thoroughness of evaluation, staff attitudes and drug availability, suggesting that the more observable the attribute is, the more weight it has for patient decision making (Kara Hanson, McPake, Nakamba, & Archard, 2005). The number of studies that have considered quality attributes beyond structural and observable measures is very limited. While structural attributes seem to play a role in the choice of health care provider, it remains unclear whether other dimensions of quality, such as provider competence, influence individuals in their choice of health care (Fe, Powell-Jackson, & Yip, 2017; Leonard & Mliga, 2002; Mariko, 2003).

Other gaps in the literature on the effect of quality on provider choice in LMICs exist. First, for studies that are modelling choice with choice models, a major limitation is the selection bias arising from the need to impute the quality of the facilities that the respondent did not choose with quality information from those that were chosen (K Hanson et al., 2004). Some studies have tried to overcome this issue by collecting information on quality from a separate facility survey, with the idea that if quality measures are generated for facility options that were available to the individuals but not chosen, the resulting quality measures are exogenous to the choice of provider and consequently, will not suffer from selection bias. However, unless a census of all health facilities is conducted, the issue of having to impute a measure of quality still remains. Second, the current evidence on this topic strongly focuses on Sub-Saharan Africa region and very few studies on the Asia Pacific region, where efforts to improve quality of care are growing.

In this paper, we aim to address these important gaps by exploring whether the quality of public and private PHC facilities in Indonesia affects individuals' choice of health care facility for outpatient care. In Indonesia, a significant step towards UHC was taken in 2014 by implementing a comprehensive national social health insurance scheme known as the *Jaminan Kesehatan Nasional* (JKN) (National Team for the Acceleration of Poverty Reduction, 2015). The JKN brings together all major existing health insurance schemes under a single agency - the Social Security Management Corporation for the Health Sector (BPJS-Health) - and is mandatory for all Indonesians. Under the JKN scheme, BPJS-Health contracts both public and private primary care providers that are paid by capitation for outpatient services (Agustina et al., 2019). As JKN members need to register with either a public or private provider, understanding how quality affects patients' choice of provider is crucial in this context.

We use data on the choice of provider made by 1044 individuals and on quality of 2549 public and private PHC facilities. The novelty of this study lies in two important features: 1) we link individual and facility data on quality, therefore avoiding the need to impute quality data for the non-chosen alternatives, and 2) we use of two quite different measures of quality that differ in how observable they are to patients, namely a supply-side readiness (SSR) score, which measures more observable structural aspects of quality, and a provider clinical knowledge score, measured using clinical vignettes.

Methods

Primary health care in Indonesia

In Indonesia's public sector, primary health centres or *"puskesmas"* form the backbone of the health system, providing PHC to catchment areas containing 25000-30000 individuals (World Health Organization, 2017). The number of *puskesmas* has been gradually increasing since the late 1960s to support the government's efforts to improve access to PHC. In 2014, there were 9731 *puskesmas* performing a comprehensive set of mandatory services and tasks that include curative, rehabilitative, preventive and promotive services delivered within the facility and through outreach programmes (World Health Organization, 2017). Under the JKN, the majority of *puskesmas'* revenue comes from capitation payment for JKN members (World bank, 2016). *Puskesmas* are linked to a network of auxiliary health centres, called *"Pustu",* that provide community outreach services in remote areas.

The role of the private sector is important in Indonesia; two thirds of outpatient care and about one-half of inpatient care are provided by the private sector (World Bank Group, 2020). The private PHC sector is diverse, and no systematic information is available at the central level on their number or distribution. The delivery of private health care is provided in the great majority by private clinics, private physicians, and private dentists. Private midwives and nurses are also allowed to run their own clinics. Private primary care is mostly delivered by public sector providers, who engage in dual practice, of which 70% are doctors working in *puskesmas* (Harimurti, 2013). With important gaps in the availability of services, the number of hospital beds and health providers in the public sector, the poor rely substantially on private sector providers. Latest figures show that 42% of private clinics, 60% of private hospitals and 14% of general practitioners (GPs) have contracted with BPJS-Health to provide services to JKN patients (Agustina et al., 2019).

Patient choice in Indonesia

At the time of the study, a patient's choice of provider was influenced by whether they had health insurance and the constraints imposed by their specific scheme. Our data relate to the year of implementation of the JKN scheme, 2014, where pre-existing insurance schemes were progressively being integrated in the BPJS-Health. Insured individuals could either be part of JKN, or could still be covered by the various pre-existing health insurance schemes (National Team for the Acceleration of Poverty Reduction 2015). The main ones were: the SHI for civil servants scheme (referred to as *Askes*), the public health insurance for the poor (referred to as *Jamkesmas*), the Social Security Programme for Employees (referred to as *Jamsostek*), as well as various Regional Insurance schemes (referred to as *Jamkesda*). While the *Jamkesmas* and Askes schemes provided health insurance for all illnesses, *Jamsostek* did not cover costly illnesses (such as cancer, heart surgeries or haemodialysis for example). In terms of services providers, all schemes covered health services in public sector facilities, and only *Jamsostek* covered outpatient services from a private providers network. As for *Jamkesda*, the package of benefits offered varied from area to area with some offering packages equivalent to *Jamkesmas* and others only covering services from the local public health centre (Aji, Allegri, Souares, & Sauerborn, 2013).

Under the JKN scheme, a comprehensive basic benefit package is provided, covering outpatient and inpatient care at the primary level up to tertiary hospital level, with exclusion to a few types of care that are partially covered (World Health Organization, 2017). The law stipulates that the policy forbids co-payments and no upper ceiling can be applied under BPJS-Health in relation to treatment in accordance with protocol guidelines. JKN members must register with a public or private primary care provider within three months of becoming a member, and can change primary care provider on a quarterly basis. After registration, patients must seek care from their chosen provider, thereby giving primary care providers an important gate-keeping role. PHC facilities receive a monthly capitation amount based on the number of patients registered without taking into account the type and amount of services provided (Zahroh, Putri, Shima, Martaliza, & Anggoro, n.d.)

Data

We used the Indonesian Family Life survey (IFLS) 5, a longitudinal survey covering a wide range of social and economic topics. The fifth wave of this survey was fielded in 2014/2015 and contains information from 16,931 households living in 312 communities (which are the equivalent of the enumeration area) from 13 provinces, and is representative of 83% of the Indonesian population. An interesting feature of the IFLS is that the household survey can be linked with a health facility survey, containing detailed information on private and public primary health providers located in the same communities in which the households live. The term "community" in the IFLS refers to the primary sampling unit. We used the IFLS data to link, at the community level, information on households' SES with information on the quality of their local PHC facilities.

Household data

The fifth wave of the IFLS survey contains information from 16,931 households living in 312 communities from 13 provinces, and is representative of 83% of the Indonesian population. As part of the household survey, data on SES and health care seeking behaviour were collected. We focused on the subset of individuals above the age of 14 who responded to the health seeking behaviour questionnaire, and who reported that they had attended a primary health facility for outpatient care in the month preceding the survey. SES was computed as the mean monthly per capita expenditure of the households, using the detailed consumption questionnaire in the IFLS. Other individual variables included age, gender, educational level, insurance status, presence of a chronic condition, severity of disease, area of residence, time and distance to the health facility visited as reported by household members, as well as OOP payments made at the facility during the last visit.

Health facility data

The IFLS facility survey contains data on primary public and private health care providers in the IFLS communities. The provider survey sampling frame was drawn from information reported by households on local providers they knew about within their communities. The list was not restricted to facilities that the respondents used, thus avoiding potential biases associated with a choice-based sample. Health facilities were divided into two strata: one stratum of public primary health facilities, including health centres (*puskesmas*) and sub-health centres (*pustu*), and one stratum of private primary health facilities, including private clinics, individual GP practices, and nurses/midwives practices. Within each stratum, up to five private facilities and three public facilities were selected, reflecting typically higher numbers of private providers. A description of the two surveys can be found here: https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS/ifls5.html

Quality measures

We used two measures of quality of care in this study: one is a SSR score used as a proxy for structural quality, and the other is a provider clinical knowledge score used to proxy clinical process quality (Donabedian, 1996).

The choice of indicators to measure SSR was informed by the Service Availability and Readiness Assessment (SARA) tool (World Health Organization, n.d.). Among the many indicators collected as part of the SARA survey, the "*general service readiness"* section collects information on the potential of health facilities to provide basic health care interventions. We identified the indicators that the IFLS provider survey and the SARA general service readiness section had in common, which represented more than 80% of SARA indicators. The SARA indicators were then classified into five general service readiness domains (basic amenities, basic equipment, infection prevention, essential medicines and diagnostic capacity) and coded as binary variables, 1 indicating the presence of the item as reported by the provider and 0 otherwise. The full list of indicators is summarised in Appendix 6.1. For each domain, we calculated the percentage of items available, and took the unweighted mean across the five domains to generate an overall readiness score for each facility.

Second, we developed a knowledge score using provider responses to medical vignettes, representing four different cases: an adult presenting with cough and fever, an adult presenting with diabetes, a child presenting with diarrhea and vomiting, and a pregnant woman coming for antenatal care. For each vignette, the provider trained in the related field and who received most of the corresponding cases in the facility was eligible to answer the questions – this meant that the provider responding to each vignette could vary within a health facility. If the facility did not provide the service corresponding to the vignette, the corresponding score was coded as a missing value. After the clinical case was described, the provider was asked what questions or activities they would ask or perform for history taking, physical examination, laboratory tests, and follow-up recommendations. Responses were either mentioned spontaneously or prompted against a prepared list of options. Not all the options were considered good practice and the correct answers were coded based on international guidelines. Details about the criteria are listed in Appendix 6.2. For each vignette, we calculated the percentage of the correct criteria the provider mentioned without prompting, and took the unweighted mean across the four vignettes to generate an overall knowledge score for each facility.

Choice set and attributes

Within each community, the choice set of facilities that each individual faced was defined as all facilities surveyed in the community. Individuals who reported seeking care at a health facility that was not surveyed were excluded from the analysis, since no quality data was available for these. Of the 4155 individuals who attended a primary health facility for outpatient care in the month preceding the survey, 3111 (74.8%) were excluded. In other words, 1044 (25.1%) individuals sought care at a health facility that was surveyed and for which we have data on the quality of care.

By design, the choice set contains five private facilities and 3 public health facilities. While it is likely that facilities outside of the community were in the patient sample's choice set and that facilities not surveyed in the community were in this patient choice set, the sample is by design representative of public and private facilities in the community. Individuals living in different communities therefore face a different choice set. Although the household survey captures information about distance travelled and OOP payments made in the chosen health facility, such information is not available for the alternatives that were not chosen. In choice models, the difficulty lies in the computation of attributes from the non-chosen options. In our study, only data on distance and costs were missing for the non-chosen alternatives.

We imputed price of and distance to non-chosen alternatives using hedonic cost and distance equations (Gertler, Locay, & Sanderson, 1987). We implemented hedonic equations by running a regression of price or distance on attributes of the provider and individual characteristics. The estimated relationship can be used to predict values for price and distance for individuals if they had gone to any other non-chosen alternative facility in their choice set. From the household survey, we regressed the price of care and the distance to a health facility on the entire sample of individuals who sought care at public facilities, private clinic/GP practices and private nurse/midwife practices separately. Individuals who reported travelling more than 50km were excluded from the regression, since we assumed that they were not representative of the individuals who sought care within their community. Independent variables included age, per capita household income (in log), gender, area of residence, educational level, presence of chronic condition and severity of disease. Then, we predicted price and distance for individuals who had not sought care at the health facility within their choice set.

We assumed that the choice of a specific health facility depended on the two quality measures (i.e, provider knowledge and SSR), distance to the facility, cost of care, sector of care (public/private), mean opening hours of that facility, and on whether the provider offered services for JKN members. The choice of attributes was based on previously known determinants of health care use (distance, price and sector of care) and on determinants that are specific to the Indonesian context (opening hours and JKN service provision).

Empirical approach

We estimated an alternative specific conditional logit model of choice of health facility. There are 311 communities and their choice set contain 8 facilities j. For example, if u_{iaj} is the utility for individual i living in community a, and if he/she chooses practice j, this can be decomposed between an explainable systematic component $\boldsymbol{v}_{iaj}$ and a random component ε_{iaj} in the linear form:

$$u_{iaj} = \boldsymbol{v}_{iaj} + \varepsilon_{iaj} = \beta\, \boldsymbol{x}_{iaj} + \varepsilon_{iaj}$$

where x_{iaj} is a vector of observed variables, $\beta\, \boldsymbol{x}_{iaj}$ is the component of utility which is therefore captured by the vector of observed variables, and ε_{iaj} is a random error which represents the unobserved utility component. Each individual will choose the practice in their choice set that maximises their utility. Assuming that the errors are independently and identically distributed according to the type 1 extreme value distribution, then the probability of choosing practice j for the ith individual is (McFadden, 1974):

$$P_{iaj} = \frac{\exp{(\beta\, \boldsymbol{x}_{iaj})}}{\sum_j \exp{(\beta\, \boldsymbol{x}_{iaj})}}$$

Assuming that individuals' preferences are invariant across individuals, only variables that vary across communities and health facilities will affect the probability of choice, and therefore the probabilities will be the same across individuals within each community, leading to:

$$P_{aj} = \frac{\exp{(\beta\, \boldsymbol{x}_{aj})}}{\sum_j \exp{(\beta\, \boldsymbol{x}_{aj})}}$$

In our case, the x_{aj} will therefore include: 1) the two quality measures, i.e, the facility vignettes and SSR scores, measured as percentages; 2) the distance to the facility, measured in kilometres and log transformed as the data are skewed; 3) the price of care, measured in Indonesian rupiah (IDR) and log transformed as the data are skewed; 4) the sector of care (public/private); 5) the opening hours of that facility, measured in number of daily opening hours; and 6) on whether the provider offered services for JKN patients.

In order to give a sense of the trade-offs patients face, we reported the marginal rate of substitution (MRS) between practice quality (measured as the SSR and knowledge scores) and the distance and price that an individual in community *a* would be willing to travel and pay in practice j, when its quality is increased by one unit. The marginal rate of substitution can be written as follows for the distance variable d (Avdic et al., 2019):

$$\frac{\partial \mathrm{d}}{\partial \mathrm{q}} = -\frac{\partial \mathrm{u}/\,\partial \mathrm{q}}{\partial \mathrm{u}/\,\partial \mathrm{d}}$$

And for the cost variable c:

$$\frac{\partial \mathrm{c}}{\partial \mathrm{q}} = -\frac{\partial \mathrm{u}/\,\partial \mathrm{q}}{\partial \mathrm{u}/\,\partial \mathrm{c}}$$

Since utility depends on the log function of distance and cost, the MRS can be written as follows, with x_k being either distance or cost and $\bar{x}$ representing the mean of the x_k variable in the sample:

$$\frac{\partial x_k}{\partial \mathrm{q}} = -\frac{\frac{\partial \mathrm{u}}{\partial \mathrm{q}}}{\frac{\partial \mathrm{u}}{\partial x_k}} * ln10 * \overline{x_k}$$

Testing for heterogeneity

To test for heterogeneity in the effects across individuals, we estimated separate models by: 1) SES, 2) insurance status, 3) type of care, and 4) areas of residence (urban or rural). For SES, the population was categorised into wealth quintiles according to their level of monthly per capita consumption, as commonly used in LMIC context (O'Donnell & Doorslaer, 2008) . Individuals were classified as "rich" if their household's wealth quintile was comprised between 3 and 5, and poor otherwise. For insurance status, an individual was categorised as insured when holding any kind of insurance. For type of care, individuals were classified according to whether they sought care for preventative or curative reasons. We present the MRS for each subgroup, such that it gives information about differences in preferences.

Robustness checks

To test the robustness of the model to the imputation method for distance and cost measures of the non-chosen alternatives, we used the following alternative imputation strategies. First, we imputed distance values using community averages by facility type. In practical terms, from the household survey we computed the mean distance travelled separately to each type of health facility (public health facility, private clinic/GP practice, private nurse/midwife practice) reported by individuals within the same community (or within a district when no one visited a specific facility type at the community level). Before computing the mean distance, we first recoded the distance as a missing value each time an individual reported travelling more than 50km to the health facility. In that way, we excluded all individuals who travelled outside their community (since we are looking at the choice of providers within the community). Finally, for each individual we imputed distance to each non-chosen alternative as the community mean distance to a particular facility type (or district when missing at the community level). Second, the travel time to reach the health facility was used to proxy distance. For imputation of travel time for the non-chosen alternatives, we followed a similar strategy as for distance which involved computing the mean travel time reported by individuals by community (or by district when missing data at the community level) for each type of health facility (public health facility, private clinic/GP practice, private nurse/midwife practice). As we are interested in the travel time to reach facilities within the community, we excluded the individuals who reported travelling more than 60 minutes to the health facility. Finally, we imputed travel time to each of the non-chosen alternatives as the community mean travel time to a particular facility type (or district mean when missing at the community level).

We also tested for heterogeneity and the modelling approach by allowing the coefficients β in individual utility functions to vary randomly across individuals according to a normal distribution and we estimated mixed logit models of their mean and standard deviation (SD).

Results

The characteristics of the individuals from the matched sample are presented in Table 6.1. Most individuals lived in a rural area (61%), were females (71%), and had elementary or no education (45%). About half of the individuals had at least one chronic condition and had any kind of health insurance (public or private). In 75% of the cases, they visited a health facility for curative care rather than preventative care. They reported travelling on average 2.2 km or 12.3 minutes to reach the health facility, and paying on average 23000 IDR (£1.2), although this number varied greatly between insured and non-insured individuals. About half of the insured individuals reported using their insurance in the last outpatient visit, which represent roughly a quarter of all individuals.

In Appendix 6.3, we present the characteristics of the individuals who also sought care in the previous month, but for whom the chosen facility was not sampled, and therefore were excluded from the analysis (since no quality data existed for their choice). Their household's monthly per capita consumption was slightly higher, but they had similar characteristics in terms of area of residence, age, gender, education level, health status, reason for seeking care, and insurance status. As expected, they reported travelling further and longer to the reach health facility (5,3 km and 19,6 min), and paying more for health care (54162 IDR on average, equivalent to £2,7), suggesting that they travelled further than their local area.

Table 6.1: Descriptive statistics of matched individuals

	N	Mean	SD	min	max
Individual characteristics	N=1042				
Per capita monthtly expenditures	1042	963131	642866	109510	5823417
Area of residence is urban	1042	0.61		0	1
Age	1042	41.0	15	14	88
Gender is female	1042	0.71		0	1
Education (no school or elementary)	1042	0.45		0	1
Presence of chronic condition	1042	0.51		0	1
Type of care (0=preventative, 1=curative)	1042	0.75		0	1
Distance measures					
Distance to health facility (as reported in km)	986	4.4	25	0	500
Distance to health facility after removing those who reported travelling more than 50 km	974	2.2	3.5	0	50
Time to reach health facility (as reported in min)	1009	12.3	10.6	1	60
Cost measures					
Cost of care (as reported in IDR)	1042	23001	58,828	0	800000
Cost of care among non-insured individuals	461	29466	59391	0	700000
Cost of care among insured individuals (any)	581	17872	57917	0	800000
Insurance status					
JKN member	1042	0.07		0	1
Public insurance (other than JKN)	1042	0.49		0	1
Private insurance ownership	1042	0.03		0	1
Insurance ownership (any)	1042	0.55		0	1
Used insurance during last episode of care	581	0.55		0	1

In Table 6.2, the characteristics of health facilities are described by facility type. Readiness and knowledge scores were greatest in public health facilities (76% and 46% respectively) and were lowest in nurse/midwife practices (59% and 39%). Public health facilities were open on average about half the time of private facilities, and were nearly all contracted with BPJS-Health to provide services for JKN patients, while about 24% of private facilities were. When using community means, patients reported travelling 2.4 km, 2.5 km and 3.9 km to public health facilities, nurse/midwife practices and clinics/GP practices respectively. Using hedonic distance equations did not change these values significantly. Patients reported paying a mean of 14,927 IDR (~£0.7), 61,166 IDR (~£3) and 45,094 IDR (~£2.2) to public health facilities, to clinics/GP practices and to nurse/midwife practices respectively.

Table 6.2: Descriptive statistics of the facilities sampled

	Public health facilities N=936				Private GP/clinics N=483				Nurse/midwife practices N=1066			
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
Health facilities characteristics												
Readiness score (%)	76	15	29	100	62	12	35	94	59	11	19	93
Knowledge score (%)	46	13	1	87	43	16	1	100	39	15	4	91
Daily opening hours	5.4	2.1	0	24	10	8.0	0	24	11.3	7.9	0	24
JKN provider	0.94	0.23	0	1	0.24	0.43	0	1	0.24	0.42	0	1
Distance measures												
Distance in km (community mean)	2.4	2.6	0	26.9	3.9	4.1	0.1	30	2.5	3.6	0.1	40
Distance in km (hedonic equations)	2.8	1.1	0	5.7	4.4	1.7	0.8	9.3	2.1	0.83	0	4.1
Time in min (community mean)	13.5	7.7	1	60	14.6	8.8	1	60	11.7	6.9	1	44
Price measures (in IDR)												
Cost of care (hedonic equations)	14927	13013	0	66763	61166	61001	0	271254	45094	25639.	0	143871

Conditional logit model results are presented in Table 6.3a. The reported coefficients represent the marginal utility from the facility characteristics and have the same sign as the effect of an attribute on the probability of choice. For this reason, the coefficients can only be interpreted qualitatively. From left to right, facilities' attributes are added progressively without changing the significance of the quality, distance and price effects. Results show that individuals are more likely to choose a facility with a higher readiness score. However, distance and price attributes remained the major determinants of facility choice. To give a sense of the trade-offs individuals faced, the marginal rates of substitution suggest that for a percentage point increase in SSR score, individuals were willing to travel on average 50 metres further and pay an additional 2411 IDR (~£0.12). Going from facility percentile 25th to the 75th percentile in the SSR score, this would translate into people willing to travel 1km further and pay an additional IDR 48220 (~£2.4). Provider knowledge score did not seem to have an effect on individual choice. Sector of care was an important determinant of facility choice, with patients preferring to seek care from public health facilities. Mean daily opening hours and contract with BPJS-Health did not have an effect. In order to understand which element of the SSR score had the highest effect, conditional logit models were replicated using sub-domains of the SSR score. Results are presented in Appendix 6.4. It seems that all elements but infection prevention had an effect on provider choice, essential medicines score being the highest in magnitude.

In Table 6.3b, we examined the robustness of the results to a set of alternative imputation methods for distance of the non-chosen alternatives. We find that the significance level of the SSR coefficient is not robust to a set of alternative imputation methods, highlighting the small effect of SSR on provider choice compared to distance and cost.

Table 6.3a: Choice of Practice: marginal utility of quality scores, distance, cost and practice characteristics

	CLM			
	1	2	3	4
Main measures				
Readiness score	0.024 (0.005)***	0.017 (0.006)**	0.017 (0.006)**	0.018 (0.006)**
Vignette score	0.004 (0.005)	0.003 (0.005)	0.003 (0.005)	0.003 (0.005)
Distance in km (log scale)	-1.9 (0.65)***	-2.0 (0.16)***	-2.0 (0.16)***	-2.0 (0.16)***
Cost in IDR (log scale)	-0.41 (0.04)***	-0.39 (0.04)***	-0.39 (0.04)***	-0.39 (0.04)***
Other facility characteristics				
Sector of care (ref: public)		-0.43 (0.21)*	-0.45 (0.23)*	-0.47 (0.23)*
Daily opening hours			0.002 (0.01)	0.002 (0.01)
JKN provider				-0.04 (0.17)
MRS distance for SSR				0.05**
MRS cost for SSR				2411***
MRS distance for knowledge score				0.007
MRS cost for knowledge score				390
R square value	0.5	0.5	0.5	0.51
Number of observations (number of individuals * number of choices)	8210	8210	8142	8142

Notes. Conditional logit model of facility choice by individuals. Imputation method for distance and cost is hedonic equations. MRS is the coefficient on SSR or vignette score divided by the distance or cost coefficient. As the distance and costs coefficients are in log scale, the MRS is $\frac{\partial x_k}{\partial \mathrm{q}} = -\frac{\partial \mathrm{u}}{\partial \mathrm{q}} / \frac{\partial \mathrm{u}}{\partial x_k} * \ln 10 * \overline{x_k}$ where $\overline{x_k}$ is the average of either cost or distance for the whole sample. Standard errors clustered at the community level are in parentheses.

*p < 0.05, **p < 0.01, ***p < 0.001.

Table 6.3b: Choice of Practice: marginal utility of quality scores, distance, cost and practice characteristics using other measures of distance and cost- robustness checks

	CLM		
	Baseline model	2	3
Main measures			
Readiness score	0.018 (0.006)**	0.008 (0.007)	0.01 (0.007)
Vignette score	0.003 (0.005)	0.005 (0.006)	0.005 (0.005)
Distance measures			
Distance to facility (in log) using hedonic equations	-2.0 (0.16)***		
Distance to facility in km using community means (in log)		-0.52 (0.11)***	
Time to reach facility in min, using community means (in log)			-1.1 (0.15)***
Cost measures			
Cost in IDR(in log) using hedonic price equation	-0.39 (0.04) ***	-0.41 (0.03) ***	-0.42 (0.03) ***
Other facility characteristics			
Sector of care (ref: public)	-0.47 (0.23)*	0.05 (0.27)	0.08 (0.27)
Daily opening hours	0.002 (0.01)	0.002 (0.01)	0.005 (0.01)
JKN provider	-0.04 (0.17)	-0.04 (0.21)	0.01 (0.21)
MRS distance for SSR	0.05**	0.08	0.25
MRS cost for SSR	2411***	1082	1231
MRS distance for knowledge score	0.007	0.05	0.13
MRS cost for knowledge score	390	715	626
R square value	0.51	0.33	0.33
Number of observations	8142	8142	8146

Notes. Conditional logit model of facility choice by individuals. Imputation method varies from left to right. MRS is the coefficient on SSR or vignette score divided by the distance or cost coefficient. As the distance and costs coefficients are in log scale, the MRS is $\frac{\partial x_k}{\partial \mathrm{q}} = -\frac{\partial \mathrm{u}}{\partial \mathrm{q}} / \frac{\partial \mathrm{u}}{\partial x_k} * \ln 10 * \overline{x_k}$ where $\overline{x_k}$ is the average of either cost or distance for the whole sample. Standard errors clustered at the community level are in parentheses.
*p < 0.05, **p < 0.01, ***p < 0.001.

In Table 6.4, we examine heterogeneity in preferences across various population subgroups. From the coefficients, it seems that insured individuals, those living in urban areas, and those using curative care are more responsive to an increase in facility readiness. The readiness score did not affect the probability of facility choice for those not insured, those living in rural areas, and seeking preventative care. Importantly, it seems that both rich and poor individuals valued facility SSR, although the significance level was slightly greater for poorer individuals. In terms of distance and costs, subgroup analyses display some homogeneity in how individuals value these two factors. However, it seems that uninsured individuals and those living in rural areas were more sensitive to cost and distance factors, as coefficients were greater in magnitude. Poorer and insured individuals, as well as those living in rural areas preferred public to private facilities, other things being equal.

Appendix 6.5 compares the results from a mixed logit model, which allows for unobserved heterogeneity, with those from our baseline conditional logit specification. Standard deviations of the mixed logit coefficients are not significantly different from zero except for the distance, cost and sector of care variables. The mean mixed logit model coefficients on SSR score, distance and cost are larger than those from the conditional logit model. The mixed logit MRS between distance/cost and SSR shows the distance and cost an individual with average preferences would be willing to travel and pay for an additional SSR score. These are smaller than the estimate from the conditional logit model, suggesting some degree of heterogeneity in the sample.

Table 6.4: Choice model based on sample stratified by SES, insurance status, place of residence and type of care

	SES status		Insurance status (any)		Place of residence		Type of care	
	Poorer	Richer	Not insured	Insured	Rural	Urban	Preventative	Curative
Readiness score	0.02 (0.007)**	0.016 (0.008)*	0.016 (0.07)*	0.022 (0.07)**	0.005 (0.007)	0.029 (0.008)***	0.016 (0.001)	0.019 (0.007)**
Vignette score	0.003 (0.007)	0.001 (0.006)	0.005 (0.006)	0.001 (0.006)	0.005 (0.007)	0.005 (0.006)	-0.01 (0.008)	0.008 (0.005)
Distance in km (in log)	-2.0 (0.2)***	-2.0 (0.2)***	-2.3 (0.26)***	-1.6 (0.18)***	-2.1 (0.23)***	-1.8 (0.19)***	-1.9 (0.23)***	-2.1 (0.17)***
Cost in IDR (in log)	-0.41 (0.04)***	-0.39 (0.05)***	-0.54 (0.08)***	-0.36 (0.04)***	-0.50 (0.07)***	-0.35 (0.09)***	-0.32 (0.09)***	-0.42 (0.04)***
Sector of care (ref: public)	-0.77 (0.28)**	-0.16 (0.3)	-0.70 (0.3)*	0.06 (0.28)	-0.67 (0.32)*	-0.24 (0.29)	0.007 (0.43)	-0.71 (0.23)**
Daily opening hours	0.003 (0.01)	0.007 (0.01)	0.005 (0.01)	-0.003 (0.01)	0.005 (0.02)	0.001 (0.02)	0.01 (0.02)	0.001 (0.01)
JKN provider	0.25 (0.22)	-0.34 (0.19)	-0.3 (0.23)	-0.06 (0.22)	0.10 (0.25)	-0.20 (0.23)	0.33 (0.26)	-0.23 (0.19)
MRS distance for SSR	0.06**	0.10*	0.04*	0.09**	0.01	0.07***	0.04	0.05**
MRS cost for SSR	2154**	2474	2046*	2555*	741	3242**	2356	2500*
R square value	0.54	0.49	0.27	0.5	0.52	0.45	0.42	0.54
Number of observations	4268	3874	3588	4554	3493	4649	1992	6150

Notes. Conditional logit models of facility choice by subgroups of individuals. Individuals were classified as "rich" if their household's wealth quintile was comprised between 3 and 5, and poor otherwise. For insurance status, an individual was categorised as insured when holding any kind of insurance. For type of care, individuals were classified according to whether they sought care for preventative or curative reasons. Hedonic cost and distance equations are used as imputation method. MRS is the coefficient on SSR or vignette score divided by the distance or cost coefficient. As the distance and costs coefficients are in log scale, the MRS is $\frac{\partial x_k}{\partial \mathrm{q}} = -\frac{\partial \mathrm{u}}{\partial \mathrm{q}} / \frac{\partial \mathrm{u}}{\partial x_k} * \ln 10 * \overline{x_k}$ where $\overline{x_k}$ is the average of either cost or distance for the whole sample. Standard errors clustered at the community level are in parentheses. *p < 0.05, **p < 0.01, ***p < 0.001.

Discussion

In this study, we examined the effect of quality on the choice of public and private PHC facilities in Indonesia. Our results suggest that facility readiness, not provider knowledge is a predictor of facility choice, although the magnitude of the effect is relatively small. The marginal rates of substitution suggest that for one percentage point increase in SSR score, individuals were willing to travel on average 50 metres further and pay an additional IDR 2411. We found that distance and price remain the major determinants of facility choice. However, even a small but significant effect can have important consequences; indeed, with a relatively low basic level of quality in Indonesian facilities and therefore much room for improvement, one can argue that large improvements in quality can therefore lead to a high proportion of individuals choosing facilities that are readier to provide better quality care. We found that readiness scores varied between 29% and 100%, suggesting that the change in probability of choosing facilities at the extreme distribution of SSR scores is important.

Our results add to the scarce evidence on the effect of different dimensions of quality on provider choice in LMICs. Among these, Mariko et al. used process quality measures, using provider knowledge score, and found that estimates of the willingness to pay for quality are significantly understated when the model only considers structural quality (Mariko, 2003). Klemick et al. found that households tend to bypass lower quality facilities and manage to improve the care that they receive by choosing more competent providers (Klemick, Leonard, & Masatu, 2009). Fe et al. have found that show that there is no correlation between doctor competence and patients' health care utilisation (Fe et al., 2017). Leonard et al. show that patients appear to seek out facilities that provide high quality consultations, facilities staffed by more knowledgeable physicians, facilities in which clinicians observe good prescription practices, and facilities in which the staff are polite (Leonard & Mliga, 2002).

It does raise questions about what signals of quality are visible to patients in our study. Provider knowledge is not directly observable and patients are unlikely to have the expertise to evaluate the clinical performance of doctors. By contrast, structural aspects of quality – such as the availability of medicines – is more easily observed and patients are able to judge what is good and poor quality on this dimension. From previous literature, there is some evidence that the difficulty of discerning and reacting to quality remains a fundamental barrier to individuals seeking out the optimal amount of quality care (Bjorkman & Svensson, 2009; Björkman & Svensson, 2017). Therefore, we believe that a greater emphasis on providing quality information of health providers in Indonesia would help patients making informed choice and to maximise their probability of good outcome.

There are a number of limitations in this study. First, our sample was limited to the individuals we could match to their chosen facility, excluding those who reported seeking care in the previous month but for whom we did not have data from their chosen facility. Two kinds of individuals could not be matched to their facility of choice in this study, and therefore for which we do not have quality information : those who sought care inside the survey area but for whom their facility of choice was not sampled, and those who sought care outside the survey area. While the first category is unlikely to cause bias (since the sample of facilities is representative of the survey area), the second category is more of concern since those who travelled outside are likely to seek better quality services. When we looked at the characteristics of these individuals, we found that they reported travelling a bit further and paying a bit more, suggesting that they probably travelled outside their community to find better quality care. If this were the case, their exclusion would have led to an underestimation of the effect of quality on facility choice. A recent study in East Java province found that education was a strong predictor of out-of-district bypassing, suggesting that richer patients are likely to seek higher quality services outside their areas (Putri, Wulandari, Syahansyah, & Grepin, 2021).

Second, the choice set that individuals faced was assumed to only include those sampled facilities in the community. Although the choice set is certainly larger in reality than the number of surveyed facilities, we believe that the sample of facilities in each community reflects quite well the choice set that individuals face.

Third, as we did not have distance and cost information for the non-chosen alternatives, we had to impute them using hedonic equations. Despite taking individual characteristics into account, hedonic equations are biased in the sense that the predictions are made based on a choice-based sample, using observed distance and price faced by individuals who made a choice. Predicting variable values of non-chosen options based on choice-based values is problematic. We tested the robustness of the results to the imputation

method by using community averages. Using community averages can also be misleading since it does not take individual characteristics into consideration. For the cost variable, insured individuals are likely to face lower prices than non-insured individuals, and therefore using community averages will mask such variations. In our case, we found that the coefficients for distance and cost were robust to the imputation method used; although it was not the case for SSR score. We attribute this finding to the small magnitude of the marginal utility coefficient of SSR compared to distance and cost, which is therefore likely to become insignificant with a change of imputation method.
Fourth, endogeneity in the choice model may arise if quality is determined in part by greater utilisation, which would cause a reverse causation problem. In this case, the impact of quality in attracting patients to PHC facilities would be overestimated.

Our results have important policy implications today that the JKN coverage reaches 85% of the population. At the time of the study, JKN was in its first year of implementation and there was a low trust and utilisation of JKN (Agustina et al., 2019). Similar issue had been reported with the previous *Jamkesmas* scheme, where lack of public awareness about the programme lead to targeting issues and underused of the scheme (National Team for the Acceleration of Poverty Reduction, 2015). Since 2014, the utilisation of services has increased and therefore the importance of visiting a provider contracted with the BPJS-Health might be higher to what we observed. However, it is unlikely that the increase use of insurance has lead to decrease in the sensitivity to price. A study on financial protection among JKN patients reported that about 18% still incurred OOP payments at health care facilities (Hidayat, 2015). Everyone on the socio-economic gradient is affected, although the magnitude of the payments is higher among richer patients. The major driver of OOP payment incidence remains spending on medicines, where people tend to purchase branded drugs outside the treatment facility. It highlights the need for the Government of Indonesia to realise its intended goal to establish an insurance scheme that does not require additional OOP payments.

Finally, a greater emphasis on providing information on quality of health providers in Indonesia would help patients making informed choice and to maximise their probability of good outcome. Currently, JKN members must register with a public or private primary care provider within three months of becoming a member. In an effort to further expand membership and improve services, BPJS-Health launched ‘Mobile JKN’, a mobile application that allows people to register, view billing information, pay monthly contributions, select or change the PHC provider, set appointments with health care providers, and file complaints, all from their cellular devices (International Labour Office, 2020). In 2018, the highest utilisation of the app was for selecting and switching the PHC provider (around 80,000 to 160,000 transactions per month). Providing information on quality through this app could be a first step towards enabling patients to make informed choices.

Conclusion

In this study, we set out to measure the effect of quality of public and private PHC facilities in Indonesia on individuals’ choice of provider for outpatient care. Using an alternative specific conditional logit model of provider choice, our results show that, facility readiness is a predictor of facility choice, although the magnitude of the effect was relatively small compared with distance and cost. Importantly, both rich and poor individuals were responsive to facility readiness. Provider knowledge was not associated with facility choice. While there are many dimensions to quality of care and we have only explored two in this study, these findings suggest that supply-side factors play a role in determining where people seek care, along with more well recognised determinants of cost and distance. A greater emphasis on providing quality information of health providers in Indonesia would help patients making informed choice and to maximise their probability of good outcome.

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7 On the road to Universal Health Coverage: impact evaluation of the Indonesian Social Health Insurance scheme on utilisation of health services and financial protection

7.1 Overview of Paper 3

Since the birth of JKN, several studies showed a positive association between JKN membership and health service utilisation and financial protection, but only one study provides credible evidence of a causal relationship. However, it contains several limitations, as authors used data from 2014, the year in which the JKN was just being rolled out, therefore leaving little time for the JKN to display its full effects. Additionally, they did not disaggregate outpatient care by type of provider. Nor did they explore the causal impact of the JKN on financial protection.

Since one of the major objectives of the JKN is to protect the insured from the financial burden of health care costs by reducing OOP health care payments, evidence on how the country is progressing in this regard is overdue. This paper aims to address this gap by exploring whether insured patients are more likely to use health services and whether they are financially protected from catastrophic spending.

This study is the first to evaluate the causal impact of the JKN on health care utilisation and financial protection, therefore filling an important evidence gap in the Indonesian policy context and at a time where the future of the JKN is under immense scrutiny in the press and in parliament. Using propensity score matching combined with a difference-in-differences approach, this paper aims to overcome the well-known selection bias arising in health insurance.

If fulfils objective 3 of the thesis and I aim to submit it to the journal *Social Science and Medicine*.

RESEARCH PAPER COVER SHEET

Please note that a cover sheet must be completed <u>for each</u> research paper included within a thesis.

<u>SECTION A – Student Details</u>

Student ID Number	386492	**Title**	Miss
First Name(s)	Manon		
Surname/Family Name	Haemmerli		
Thesis Title	On the road to Universal Health Coverage: measuring socioeconomic inequalities in access to and use of high quality care in Indonesia		
Primary Supervisor	Virginia Wiseman		

If the Research Paper has previously been published please complete Section B, if not please move to Section C.

<u>SECTION B – Paper already published</u>

Where was the work published?			
When was the work published?			
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion			
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<u>SECTION C – Prepared for publication, but not yet published</u>

Where is the work intended to be published?	Social Science and Medicine
Please list the paper's authors in the intended authorship order:	Manon Haemmerli, Virginia Wiseman, Hasbullah Thabrany, Catherine Goodman and Timothy Powell-Jackson
Stage of publication	Submitted

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I designed the study and analysed the data. I wrote the drafts of the paper and incorporated co-authors' comments

SECTION E

Student Signature	Manon Haemmerli
Date	06 Jan 2022

Supervisor Signature	Virginia Wiseman
Date	10th of April 2022

7.2 Paper 3

Title: On the road to Universal Health Coverage: an evaluation of the impact of the Indonesian Social Health Insurance scheme on health service utilisation and financial protection

Abstract

Indonesia has made a commitment to deliver universal health coverage to its 275 million citizens by 2024. In 2014, the Indonesian government rolled out a comprehensive single-payer and compulsory national health insurance scheme known as the *Jaminan Kesehatan Nasional, or JKN.* By 2020 insurance coverage had reached around 82% of the population. The future of the JKN is under immense scrutiny in the press and in parliament in Indonesia, as a highly ambitious reform to address growing disparities in health-care, reduce the financial burden of paying for health services, and more generally to make comprehensive health care available to the entire population. Using a primary panel dataset on 7555 Indonesian households (early-2018 and late-2019), this study is the first to evaluate the impact of the JKN on health service utilisation and on financial protection. We used propensity score matching combined with the difference-in-differences method, and we compared households that enrolled in the JKN with households that remained uninsured over the study period. We found that overall, JKN membership led to a 0.69% point increase in the probability of using outpatient services in public hospitals, and to a 1.7% point increase in the probability of using inpatient care. It corresponds to a 172% and 42% absolute increase compared to the baseline outpatient public hospital and inpatient utilisation rate of the JKN group, respectively. Regarding financial protection, JKN membership had a protective effect against out-of-pocket payments for outpatient services (7.4% point decrease compared to the control group), but we did not find a similar protective effect for inpatient care. Significant progress has been made in a short period of time, but a lot remains to be done to ensure that OOP payments do not occupy a large share of health financing in Indonesia.

Introduction

In 2015, the year the Sustainable Development Goals were adopted, 926.6 million people incurred catastrophic health spending globally, defined as out-of-pocket (OOP) health spending exceeding 10% of the household budget, and 208.7 million people incurred OOP health spending exceeding 25% of the household budget (World Health Organization & World Bank Group, 2019). Often, these catastrophic payments hit poorer households the most, pushing them further below the poverty line. In order to protect households, and especially the poorest, from the economic risk of unexpected illnesses, the most promising policy option has been argued to be to introduce and increase the coverage of public health insurance schemes (Gertler & Gruber, 2002).

Health insurance provides a mechanism for distributing the financial risk associated with the variation in an individuals' health care expenditure by pooling costs over time and over people by risk pooling (A Acharya et al., 2012). The dominant models of public health insurance are social health insurance schemes, financed primarily through mandatory earnings-related contributions levied on formal sector workers, or tax-financed systems, where general government revenue is used to finance a common level of cover to the entire population, with a single delivery system for everyone (Wagstaff, 2010). Health insurance has two main goals. One is to improve health outcomes by: increasing the use of appropriate health services; making a person more likely to access new health technologies; creating incentives for providers to deliver the needed services; and by equalising use among the rich and the poor Second, health insurance is expected to protect individuals and households from catastrophic and impoverishing health spending. Health shocks can cause a significant decline in the level of household consumption on goods and services other than health care (Townsend, 1994). Studies have shown that the high level of OOP spending and the reduction in labour associated with illnesses prevent households from recovering their basic level of consumption, therefore leading to impoverishment (Gertler & Gruber, 2002). Additionally, OOP payments are shown to lead households to spend a higher proportion of their income on health than richer households, making this type of payment regressive (Ataguba, Asante, Limwattananon, & Wiseman, 2018). Public health insurance is expected to prevent households from sliding into health-related poverty by enhancing cross-subsidisation between the healthy and the sick, as well as between the rich and the poor.

In an attempt to reach UHC by 2019, Indonesia set up a social health insurance scheme, the *Jaminan Kesehatan Nasional* (JKN). It is currently one of the largest single-payer health insurance systems in the world with 223,5 million members enrolled in October 2020, representing 82% of the Indonesian population (Sambodo, Van Doorslaer, Pradhan, & Sparrow, 2021). As the JKN continues to expand, significant challenges are emerging. Among these, are reports of high OOP payments among the insured population (Hidayat, 2015; Nugraheni, Mubasyiroh, & Hartono, 2020; Pratiwi et al., 2021).

Several studies show a positive association between JKN membership on health service utilisation, including for maternal health services (Anindya, Lee, & Agus, 2020), and inpatient care (Pratiwi et al., 2021), with Johar et al finding that JKN reduced inequalities in the utilisation of outpatient and inpatient care between rich and poor (Johar, Soewondo, Pujisubekti, Satrio, & Adji, 2018). The evidence on the association between JKN and financial protection is scarce and mixed. While Pratiwi et al. showed that OOP spending was higher among JKN members, others found that the JKN was associated with reduced OOP spending for health services (Maulana et al., 2021; Nugraheni et al., 2020). However, none of these studies were able to establish a causal impact of the JKN on utilisation of health services and financial protection. Instead, they tended to rely on cross-sectional datasets with no control groups, raising issues of confounding and selection bias, which could mask the true impact of the JKN. Only one study established a causal effect of JKN on utilisation and found that the JKN increased the probability of inpatient admission (Erlangga, Suhrcke, Ali, & Bloor, 2019). However, authors used data from 2014, the year in which the JKN was just being rolled out, therefore leaving little time for the JKN to display its full effects. Additionally, they did not disaggregate outpatient care by type of provider. Nor did they explore the causal impact of the JKN on financial protection.

To our knowledge, this study is the first to evaluate the causal impact of the JKN on health care utilisation and on financial protection. The combination of a strong study design, the use of recent panel household data and a national geographical coverage, enable us to estimate the impact of the JKN, therefore filling an important evidence gap in the Indonesian policy context and at a time where the future of the JKN is under immense scrutiny in the press and in parliament (Trisnantoro, 2020). This study was conducted approximately four years after the start of the JKN, and therefore captures the impact of a mature SHI system.

Indonesia's health system

Structure of the health system

The Indonesian health system is based on a mixed model of public and private provision of health services. In the public sector, primary health centres or "*puskesmas*" form the backbone of the system, with catchment areas of 25000-30000 individuals. The number of *puskesmas* has been gradually increasing since the late 1960s as a central element in the government's efforts to improve access to primary health care. In 2014, there were 9731 *puskesmas*, which provide a set of mandatory services that include promotive, preventive, curative, and rehabilitative services delivered within the facility and through outreach programmes (World Health Organization, 2017). *Puskesmas* are linked to a network of auxiliary health centres, called "*pustu*", that provide community outreach services in remote areas.

The role of the private sector is important in Indonesia; two thirds of outpatient care and about one-half of inpatient care are provided by the private sector (World Bank Group, 2020). The private primary health care sector is diverse, and no systematic information is available at the central level on their number and distribution. Delivery of primary health care is provided in the great majority by private clinics, private physicians, and private dentists. Private midwives and nurses are also permitted to run their own clinics.

Social health insurance in Indonesia

Indonesia took a significant step towards UHC by implementing a comprehensive national social health insurance scheme known as the *Jaminan Kesehatan Nasional* in 2014 to address growing disparities in health-care and to strengthen financial protection (National Team for the Acceleration of Poverty Reduction, 2015). The JKN brings together all major pre-existing health insurance schemes under a single agency - the Social Security Management Corporation for the Health Sector (BPJS Health), and was made mandatory for all Indonesians. The JKN consists of two types of membership: the contributing members and the non-contributing members. The contributing members consist of self-employed individuals (the informal sector), who must self-enrol and pay contributions, as well as formal sector employees, who contribute via their payroll deduction. While the formal sector employees pay 5% of their monthly salary towards the JKN, informal sector workers pay a fixed amount of monthly premium. For the first 4 years of the programme, monthly premiums started at IDR25 500 (US$1.80) for class III services (the basic benefit package), rising to IDR80 000 (US$5.52) for class I services that include better hospital rooms, special drugs and wider access to laboratory and diagnostic tests (Pratiwi et al., 2021). The non-contributing members, who are covered by the State, comprise people who are living in poverty, those living in near poverty, and those who are disabled. In 2017, non-contributing members included 94 million of the poorest individuals in Indonesia, representing approximately 40% of the population (Agustina et al., 2019).

The sustainability of the scheme relies heavily on premium contributions, but a significant share of JKN members in the informal sector do not routinely pay (Muttaqien et al., 2021). Ensuring members of the informal sector comply paying contribution regularly has been a big challenge, which has worsened during the Covid-19 pandemic: as of 31st of July 2020, active JKN memberships had already fallen by 5.4 million as informal sector workers withdrew their premium contributions (Sparrow, Dartanto, & Hartwig, 2020). If no payment is made, coverage is deactivated after a one-month grace period. It can be reactivated at a later date, on the condition that the household pays arrears (6 months maximum cap).

Under the JKN scheme, informal sector workers can register at any time of the year, and are required to register all family members, as listed on their official Family Card (*Karta Keluarga*) (Banerjee et al., 2021). While insurance enrolment is legally mandatory, the mandate is hard to enforce in practice, and there are currently no penalties for households who do not enrol. JKN members must also register with a public or private primary care provider and seek care from their chosen provider to benefit from insurance, thereby giving primary care providers an important gate-keeping role (Banerjee et al., 2021). In 2018, over 2300 hospitals, 1700 of them private, accepted JKN-funded patients (Pratiwi et al., 2021). Under the JKN scheme, a comprehensive basic benefit package is provided, covering outpatient and inpatient care at the primary care level up to the tertiary hospital level (World Health Organization, 2017). According to the JKN regulation, there is no cost sharing applied under the scheme - in other words, the insured are not meant to be charged for a share of service costs at the point of health care use, although specific procedures (e.g., cosmetic surgery, infertility treatments, orthodontics, etc.) are excluded (Hidayat, 2015).

Primary care facilities are paid under a prospective capitation-based payment system which was introduced in 2014 with the goal of improving efficiency and effectiveness in service delivery and promoting access to health services across regions and income groups (National Team for the Acceleration of Poverty Reduction, 2015). The capitation amount received per member per month ranges from IDR 3000 to IDR 6000 in *puskesmas*, while private sector facilities receive on average IDR 8000 per capita per month (World Bank Group, 2020). The reason for this difference is that public health facilities also receive other government budgetary sources of revenue (World Bank Group, 2020). Hospitals are reimbursed by case following a tariff system called INA-CBG (Indonesia Casemix Base Groups), in which amounts are set by the government base on primary diagnosis and severity of the case (Banerjee et al., 2021). By the end of 2019, low premiums for a given benefit package had led to a significant financing deficit of around IDR51 trillion ($3.7 billion), threatening the sustainability of the JKN (Pratiwi et al., 2021).

Data

Data sources and study population

This analysis is based on primary survey data from the *Equity and Health Care Financing in Indonesia*, or the ENHANCE study (Wiseman et al., 2018). We conducted a panel household survey at two time points: the baseline included 7555 households interviewed between February and April 2018; and at endline the same households were contacted again for the follow-up survey between September and December 2019. The mean follow-up time was 576 days between the two time points. We were able to re-interview 6352 households, therefore yielding a follow-up rate of 84%. Multi-stage stratified random sampling was used. First, a stratified sample of 10 provinces containing 74% of the population was selected from Indonesia's 34 provinces. Two districts within each selected province were purposively selected based on population density and fiscal capacity. From each district, two sub-districts and four villages (two villages per sub-district) were chosen to ensure a mixed representation of rural and urban areas, and variation in socio-economic status. Within each village field teams randomly selected households to derive the final sample. In each selected household, the primary caregiver was interviewed using an interviewer-administered structured e-questionnaire covering household and individual characteristics, health service use and related expenditures, using the computer-assisted personal interview (CAPI) programme. The questionnaire was piloted in selected villages.

Linking of individuals

For some outcomes, such as health care utilisation, we required individual level data to analyse the impact of the JKN. As our unique identification number was at the household level, we used probabilistic matching to link individuals from the two survey waves. Probabilistic matching works by identifying and scoring pairs of records based on a defined number of blocking and matching variables (Kranker, 2018). While blocking variables need to be exactly the same for a pair of records to be formed, matching variables are those for which records that are not exactly the same can be paired if their overall score is above a defined threshold (Kranker, 2018). Pairs with higher scores have a higher probability of being a true match than pairs with lower scores. Our blocking variables were household ID and gender, and our matching variables were age and relation to the head of the household.

Outcome and control variables

We analysed the effect of the JKN on various outcomes. At the individual level, we looked at the utilisation of outpatient services in the last month, defined as any visit to a public health centre, a public hospital, a private GP/midwife practice, or a private clinic/hospital, analysing the effect on utilisation of each facility type separately. We analysed the effect of JKN membership on the utilisation of inpatient services in the last year, defined as any hospital stay in either a public or a private hospital. At the household level, we analysed the effect of JKN membership on total household OOP payments per capita made in the previous month for outpatient services and on the total household OOP payments per capita for inpatient services made over the previous year.

Control variables were chosen according to their plausible correlation with both insurance status and health care utilisation. We used Andersen's behavioural model of health care utilisation as a framework for exploring individual utilisation of health care services (Andersen & Newman, 2005). This model contains both individual and contextual determinants of health service use and focuses on three main categories of determinants: predisposing factors (socio-demographic factors); enabling factors (contextual factors enabling the use of health services); and need for health services. For the household level analysis, we controlled for the following variables measured for the household head: age; gender; occupation (unemployed, civil servant, self-employed, private company employee); and education (no education, primary education, secondary education, higher education). We also controlled for the following household variables: rural or urban location; number of household members; number of children; mean level of health need; wealth score; reception of government cash transfer; and district dummies to account for variations in JKN administration across districts.

An asset index was used as a proxy measure for wealth. The asset index was based on a number of household assets and characteristics as per the Demographic and Health Survey (DHS) for Indonesia, and principal component analysis was used to derive the wealth score (Filmer & Pritchett, 2001; Vyas & Kumaranayake, 2006). A household was categorised as a recipient of a government cash transfer if it benefited from at least one of the following: Family Hope Program (or *Program Keluarga Harapan*), a conditional cash transfer aimed to encourage poor families to use health and education services; the *Bantuan Langsung Tunai* (BLT) unconditional cash transfer aimed at supplementing consumption for poor households facing unprecedented price increases; *Rastra* program, a large food assistance program; and *Kartu Indonesia Pintar* program, a cash assistance for school-age children who come from poor families. We used self-assessed health status as a proxy for the level of need for health care. Individuals were asked to rank their health on a scale from 'very good' or 'good' to 'poor' or 'very poor'. Individuals who reported being in 'poor' or 'very poor' health were classified as in need of health care. We computed the mean level of health need at the household level. At the individual level, we controlled for the same variables as for the household analysis and we added the individual specific variables age, gender and need for health.

Empirical strategy

Defining treatment and control groups

In order to estimate a causal impact of the JKN on key outcomes, we identified within our panel of households two distinct groups: uninsured households in wave 1 that remained uninsured in wave 2; and uninsured households in wave 1 that became JKN members in wave 2 (either as a subsidised member or a contributory member). We identified 2096 households meeting the following criteria:

1) Treatment group, or JKN group (N=969 households): households with no of insurance coverage[4] in 2018 but then enrolled in the JKN in 2019. This group either enrolled as a contributory member, or qualified for subsidised premiums (eligible low-income household).
2) Uninsured group (N=1127 households): households with no insurance coverage in 2018 and who remained uninsured in 2019.

The panel of 2096 households contained 8983 individuals. After running the probabilistic individual matching described above, we were able to match 7982 individuals (89%) between the two waves. This may be due to household members leaving the household or deaths. Similarly, at the individual level, we identified the following groups within the 7982 individuals:

1) Treatment group, or JKN group (N=4488 individuals): individuals living in households with no insurance coverage in 2018 but enrolled in the JKN in 2019.
2) Uninsured group (N=3494 individuals): individuals with no insurance coverage in 2018 and who remained uninsured in 2019.

[4] In the definition of treatment and control groups, uninsured meant no insurance at all, including private insurance. Those with private insurance were excluded from the analysis.

Further details about the sample sizes as well as information about the full panel of households are presented in Appendix 7.1.

Propensity score matching

Our empirical strategy combined propensity score matching with difference-in-differences methods (DiD) (Abadie, 2005; Heckman, Ichimura, & Todd, 1997). The basic idea of DiD is to take out temporal changes in key outcomes which are unrelated to treatment by assuming a comparison group is subject to the same changes that the treatment group would have experienced in the absence of the intervention. The *difference* between treated and control groups captures differences that are assumed not to vary over time, while the *difference* between pre and post periods captures changes over time (time shocks) that are assumed to affect both groups to the same extent (in the absence of the intervention). In order to get an unbiased estimate of the average treatment effect on the treated (ATT), two assumptions are needed. First, it is assumed that in the absence of treatment, participants and non-participants would follow the same outcome trend, experience the same shocks on average and respond to these shocks in the same way, which is commonly known as the parallel trend assumption (Abadie, 2005). Another important assumption is that participation depends on individual observed characteristics and/or time-invariant unobserved characteristics, rather than transitory outcome shocks (Ashenfelter, 1997).

Formally, we have two sets of outcomes, Y_{it}^{I} being the outcome among the insured, and Y_{it}^{NI} the outcome in the non-insured group. It is assumed that:

$$Y_{it}^{I} = f(X_{it}) + G_{it}^{I} + \theta_t^{I} + \varepsilon_{it}^{I}$$

and

$$Y_{it}^{NI} = g(X_{it}) + \theta_t^{NI} + \varepsilon_{it}^{NI}$$

where G_{it}^{I} is the gain from enrolling in JKN, θ_t^{I} and θ_t^{NI} are period-specific unobservable effects, and ε_{it}^{I} and ε_{it}^{NI} are the error terms (Wagstaff, Lindelow, Jun, Ling, & Juncheng, 2009). The changes between the two periods can be expressed in the following way:

$$\Delta Y_{it}^{I} = f(\Delta X_{it}) + G_{i1} + \Delta\theta_t^{I} + \Delta\varepsilon_{it}^{I}$$

and $$\Delta Y_{it}^{NI} = g(\Delta X_{it}) + \Delta\theta_t^{NI} + \Delta\varepsilon_{it}^{NI}$$

We can retrieve the ATT by differentiating the two equations above:

$$E\left(\Delta Y_{it}^{I}\right) - E\left(\Delta Y_{it}^{NI}\right) = E(f(\Delta X_{it}) - E(g(\Delta X_{it})) + E(G_{i1}) + \Delta\theta_t^{I} - \Delta\theta_t^{NI} + E\left(\Delta\varepsilon_{it}^{I}\right) - E(\Delta\varepsilon_{it}^{NI})$$

The use of propensity score matching between insured and uninsured units will enable differences in changes in outcomes due to observed characteristics to be eliminated, and therefore cancel out the term $E(f(\Delta X_{it}) - E(g(\Delta X_{it}))$. Propensity score matching was adopted for its non-parametric nature and for making sure non-comparable controls are excluded from the analysis. In order to isolate the ATT, $E(G_{i1})$, we recall the two assumptions described above: (1) parallel trend assumption: we assume that the period-specific unobservable effects follow the same trend between the insured and uninsured, which cancels out the term $\Delta\theta_t^{I} - \Delta\theta_t^{NI}$; and (2) no Ashenfelter dip assumption: the expectation of the change in the error cancels out among both groups, or in other words the enrolment into insurance depends on time-invariant unobserved characteristics. An alternative identification method using the potential outcome framework is described in Appendix 7.2.

To implement propensity score matching, we first ran a probit regression for the probability of becoming insured using baseline control variables described in p.149. Propensity scores were predicted for both groups. We used the nearest neighbour matching method by matching each treated unit (insured household or individual) with the nearest control unit within a caliper of a size equal to 0.25 of the standard deviation of the mean propensity score, which sets the value of the maximum distance for controls. For each treated case, the nearest neighbour matching method averages the differences between the outcome values of the treated case and the nearest neighbour. We dropped treatment observations with a propensity score higher than the maximum or less than the minimum propensity score of the controls. We also allowed controls to be used without replacement, meaning they could not be controls for two different treated units to increase the precision of the estimates.[5]. Next, we used DiD on the matched sample to account for the time-invariant unobservable factors. The matching procedure was implemented in Stata 17 using the user-written command *psmatch2* (Leuven & Sianesi, 2003).

Robustness checks

We tested the robustness of our results to the matching methods and matching variables used. First on the matching method, we implemented kernel matching, which works by matching to each treated unit i a matched outcome given by the kernel-weighted w_{ij} average of the outcomes of comparable non-treated j, where weights given to non-treated units are proportional to the closeness (difference in propensity scores) between i and j, such as:

$$w_{ij} \propto K(\frac{p_i - p_j}{h})$$

where h represents the bandwidth and K the type of kernel. In our case, we chose the Epanechnikov kernel (the default) and h as being equal to 0.25 of the standard deviation of the mean propensity score. We also tested the robustness of the findings by varying the bandwidth of the caliper with nearest neighbour matching.

Second, we added month of interview at baseline as a matching variable in the main model. As the data collection period spanned a 3-month period and seasonality of illnesses is likely to vary, we checked the robustness of the findings when adding this matching variable.

Third, as our data contains only two waves of survey, we are not able to look at pre-trends as means of assessing the plausibility of the parallel trends assumption. If this assumption does not hold, because unobserved confounders have time-varying effects on health outcomes, our results might be biased. An alternative assumption is that in the absence of

5 There is a trade-off between precision and bias. By allowing controls to be used multiple times, the larger sample size enables to increase the precision of the estimates at the cost of increased bias, while by allowing controls to be used only once, we decrease bias at the cost of decreasing precision.

treatment, the expected outcomes for the treatment and control groups would have been the same, conditional on their baseline outcome value and covariates (Angrist & Pischke, 2014). Under this conditional independence assumption, we have:

$$E(Y_{0t}|\, D_1, Y_{o\tau}) = \; E(Y_{0t}|\, D_0, Y_{o\tau})$$

Where Y_0 is the potential outcome in absence of the intervention, D_1 and D_0 are indicators that the unit (or individual) received the intervention, or did not receive the intervention, respectively. t and τ denote the time after and before the intervention, respectively. Under this assumption, individuals and households with similar baseline outcomes would be expected to have similar potential outcomes at endline after conditioning on covariates. While the parallel trend assumption relies on the independence of the potential non-treated outcome with regards to treatment assignment conditional on covariates, the conditional independence assumption relies on the independence of the potential non-treated outcome with regards to treatment assignment conditional on covariates and outcome level at baseline (Angrist & Pischke, 2014). We therefore carried out a robustness check using a lagged dependent variable approach. To do so, we performed a propensity score matching combined with difference-in-differences analysis, in which the baseline outcome was added as a matching variable in the estimation of the propensity score.

Fourth in order to testing the plausibility of the parallel trends assumption, we conducted a falsification test by using a placebo "treatment" group. In this setup, the treatment group was composed of households and individuals who were enrolled in the JKN in both waves of the survey, while the control group remained the same, i.e, composed of households and individuals who were not enrolled in any insurance in both waves of the survey. It is assumed that while the placebo treatment group is not exposed to the change in insurance status, it remains exposed to all the potential confounders that might be correlated with the outcome. To provide convincing evidence that insurance alone is responsible for the significant effects found in the main model, it is therefore expected that running propensity score matching combined with difference-in-differences using the placebo treatment group yields insignificant treatment effects.

Results

Table 7.1 shows the baseline household characteristics of the treatment and the control groups. Households in the treatment group were slightly poorer, more likely to receive government cash transfers and more likely to live in an urban area, therefore highlighting the need for matching. Households receiving government cash transfers, poorer households, those with a higher number of household members, and those where the household head worked in the private sector and was more educated, were more likely to enrol into the JKN (Table 7.2).

Table 7.1: Descriptive characteristics of households

	Baseline 2018	
	Control group N=969	**Treatment group N=1127**
Household level covariates, mean (SD)		
Mean number of household members	4.1 (1.5)	4.5 (1.8)
Mean number of children under 5	0.4 (0.6)	0.5 (0.6)
% of households in wealth quintile		
1	0.17	0.22
2	0.22	0.22
3	0.20	0.21
4	0.21	0.18
5	0.20	0.17
Recipient of cash transfer	0.18 (0.38)	0.35 (0.48)
Household living in urban area	0.43 (0.5)	0.56 (0.5)
Occupation of household head		
Unemployed	0.16	0.19
Civil servant	0.002	0.005
Private company employee	0.04	0.08
Self employed	0.8	0.73
Education level of HH head		
No education	0.04	0.03
Primary education	0.45	0.44
Secondary education	0.22	0.22
College and higher education	0.29	0.31
Age of household head	48.0 (12.3)	47.8 (12.8)
Gender of household head head is male	0.85 (0.35)	0.85 (0.35)
Mean level of need in the household*	1.4 (0.5)	1.4 (0.5)

Notes: * We used self-assessed health status as a proxy for the level of need for health care. Individuals were asked to rank their health on a scale ('very good', 'good', 'poor', 'very poor I '). Individuals who reported being in 'poor' or 'very poor' health were classified as in need of health care

Table 7.2: Household determinants of insurance uptake

Household determinants of insurance uptake	
	Marginal effects (SE)
Age of household head	0.002 (0.001)*
Household head is male	-0.024 (0.03)
Mean number of children <5y	0.02 (0.02)
Household living in urban area	0.007 (0.03)
Occupation of household head	
Unemployed	-
Civil servant	0.20 (0.16)
Private employee	0.16 (0.05)***
Self employed	-0.023 (0.03)
Wealthscore of household	-0.017 (0.007)*
Recipient of cash transfer	0.20 (0.02)***
Number of household members	0.028 (0.007)***
Mean level of need in the household	-0.012 (0.02)
Education of HH head	
No education	-
Primary education	0.086 (0.6)
Secondary education	0.11 (0.6)
College and higher education	0.13 (0.06)*
N	**2076**
District fixed effects	**yes**

Notes: Standard errors (SE) are in parenthesis. *p < 0.05, **p < 0.01, ***p < 0.001.

Table 7.3 presents the descriptive statistics of the outcomes measured at the individual and household levels. At baseline, outcomes for the treatment and control groups were relatively similar (columns 2 and 3): about 12% of individuals had at least one outpatient visit to any type of provider in the month preceding the interview. The most striking difference was in the utilisation of inpatient care, with 4% of individuals in the treatment group having at least one inpatient visit in the previous year, while 2% of the individuals in the control group did. The largest share of outpatient visits was to GP/midwife private practices, while the share to public hospitals was small. For inpatient care, public and private hospitals shared the market more or less equally. Both treatment and control groups were equally likely to face OOP spending for outpatient and inpatient services at baseline, although the level of OOP spending per capita for inpatient care was slightly lower for the treatment group.

Looking at changes in the level of outcome over time (columns 6 and 7), it seems that while the control group faced a reduction in outpatient visits to public hospitals (0.1% point reduction) and in inpatient care at private hospitals (0.4% point reduction), the treatment group faced an increase in both of these outcomes. Both groups faced similar changes in the remaining utilisation outcomes. Regarding changes in OOP spending over time, although both groups faced a reduction in the probability of incurring OOP spending, the reduction was larger for the treatment group (14% point decrease compared to 9% point decrease for the control group). This reduction seems to be driven by a reduction in OOP spending for outpatient care for the treatment group. The treatment group also faced a larger reduction in total OOP spending per capita per year (mean reduction of IDR 123,000 for the treatment group versus IDR 94,000 for the control group).

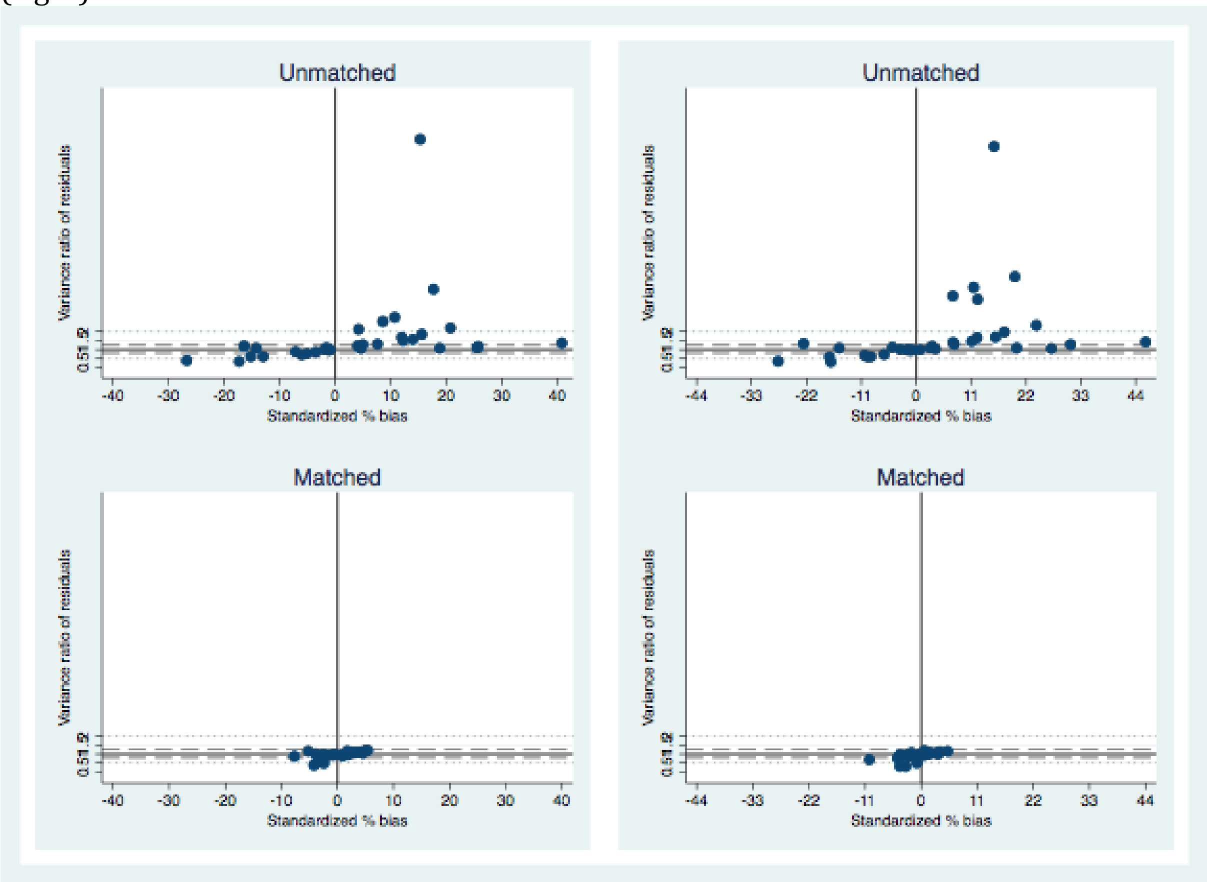
Table 7.3: Descriptive statistics of outcomes measures

	Baseline 2018		Endline 2019		Difference	
Individual-level outcomes	**Control group N=3494**	**Treatment group N=4486**	**Control group N=3494**	**Treatment group N=4486**	**Control group N=3494**	**Treatment group N=4486**
Outpatient care, mean (SD)						
Any OP visit	0.12 (0.33)	0.13 (0.34)	0.10 (0.29)	0.12 (0.32)	-0.03 (0.41)	-0.02 (0.43)
Public hospital	0.003 (0.06)	0.004 (0.06)	0.002 (0.06)	0.008 (0.09)	-0.001 (0.07)	0.003 (0.10)
Public health center	0.04 (0.18)	0.06 (0.23)	0.03 (0.15)	0.04 (0.20)	-0.01 (0.23)	-0.01 (0.30)
Private hospital	0.01 (0.12)	0.01 (0.14)	0.01 (0.10)	0.02 (0.13)	-0.001 (0.14)	0.001 (0.16)
GP/nurse/midwife practice	0.07 (0.26)	0.06 (0.24)	0.05 (0.22)	0.04 (0.21)	-0.02 (0.32)	-0.02 (0.30)
Inpatient care, mean (SD)						
Any IP visit	0.02 (0.14)	0.04 (0.19)	0.02 (0.12)	0.04 (0.20)	-0.004 (0.18)	0.006 (0.26)
Public hospital	0.009 (0.09)	0.02 (0.15)	0.009 (0.09)	0.02 (0.15)	0 (0.13)	0 (0.20)
Private hospital	0.01 (0.11)	0.02 (0.13)	0.007 (0.09)	0.02 (0.15)	-0.004 (0.13)	0.006 (0.18)
Household-level outcomes	**Control group N=969**	**Treatment group N=1127**	**Control group N=969**	**Treatment group N=1127**	**Control group N=969**	**Treatment group N=1127**
Any OOPE (SD)	0.41 (0.49)	0.44 (0.49)	0.32 (0.47)	0.30 (0.46)	-0.09 (0.61)	-0.14 (0.63)
OOPE for outpatient care	0.37 (0.48)	0.40 (0.49)	0.29 (0.45)	0.25 (0.43)	-0.08 (0.61)	-0.15 (0.61)
OOPE for inpatient care	0.07 (0.25)	0.08 (0.28)	0.05 (0.21)	0.07 (0.25)	-0.02 (0.31)	-0.02 (0.37)
Total OOPE per capita per year in IDR (SD)	236,083 (971,259)	215,331 (751,188)	141,990 (524,026)	91,667 (289,617)	-94,093 (1,050,982)	-123,582 (796,127)
OOPE for OP care per month	14,660 (64,128)	14,236 (55,914)	9,225 (37272)	5,413 (18,825)	-5,434 (70,001)	-8,818 (57,795)
OOPE for IP care per year	60,160 (396,519)	44,490 (314,450)	31,287 (250,436)	26,706 (175,620)	-28,873 (465,466)	-17,759 (362,192)

Notes on abbreviations: SD=standard deviation, OP=outpatient, IP=inpatient, GP=general practice, OOP=out-of-pocket, IDR=Indonesian rupiah. OOPE=out-of-pocket expenditures

Figure 7.1 illustrates the reduction in bias on observed characteristics as well as the variance ratio of residuals before and after matching at the individual and household levels, respectively. The standardised percentage of bias across covariates has been reduced considerably, by +/- 12% after matching. A summary of the matching quality is presented in Table 7.4 Caliper matching enabled a good balance between the two groups, since we achieved a 77% and 83% reduction in bias for the household and individual matching, respectively. In Table 7.4 we report the percentage change in the pseudo R2 statistics of the probit models of insurance uptake before and after matching. After matching, the R2 statistics were reduced considerably. Finally, the last two rows of Table 7.4 show the probability values of the likelihood ratio test of the joint insignificance of all the matching variables in the probit model before and after matching. The full descriptive statistics of the unmatched and matched sample with caliper matching can be found in Appendix 7.3.

Figure 7.1: Reduction in bias before and after matching households (left) and individuals (right).



Left side: Household matching, Right side: individual matching.

Use of caliper matching, without replacement and with common support, choice of caliper=0.25*SD. It is desirable to have both standardised percent bias and the variance ratio of residuals as low as possible (near zero)

Table 7.4: Summary of matching quality

	Household matching	Individual matching
Number of off-support treated units	386 (22%)	1828 (30%)
Pre matching bias	12.0	12.8
Post matching bias	2.7	2.2
%Change in bias through matching	-77%	-83%
Pre matching pseudo R2	0.109	0.133
Post-matching pseudo R2	0.007	0.008
%Change in pseudo R2 through matching	-93%	-94%
Prob value of Chi-squared before matching	0.000	0.000
Prob value of Chi-squared after matching	0.996	0.016

Table 7.5 shows the main impact estimates using propensity score matching combined with difference-in-differences, and we refer to this as the main model. Compared to the control group, the treatment group had a 0.69% point higher probability of using any outpatient care in public hospitals, which represents nearly a two-fold relative increase compared to the baseline level of the treatment group. We did not find significant increases in utilisation in any other outpatient provider types as a result of the JKN. Also, the treatment group had a 1.7% point higher probability of using any inpatient service compared to the control group, and this was driven by an increase in inpatient visits to private hospitals in the treatment group. The increase uptake of inpatient care in the treatment group represented a relative increase of 42% from baseline. In terms of OOP spending, the treatment group had a 7.5% point decrease in the probability of incurring OOP costs for outpatient care compared to the control group, and an increased probability of incurring OOP costs for inpatient care, although this result was not significant. Overall, we did not find any significant impact of the JKN on the overall level of OOP spending.

Table 7.5: Effect size: propensity score matching with DiD

	Effect size	SE	p-value	Relative effect
Utilisation of OP services				
Probability of any OP visit	0.0127	0.0117	0.275	9.8%
Probability of public health center visit	0.0046	0.0072	0.522	0.077%
Probability of public hospital visit	0.0069	0.0025	0.0065**	172.5%
Probability of private GP/midwife practice	-0.0046	0.0085	0.589	-7.7%
Probability of private hospital visit	0.0027	0.0045	0.555	27%
Number of observations	**6074**			
Utilisation of IP services				
Probability of any IP visit	0.0169	0.0062	0.0065**	42%
Probability of public hospital visit	0.0031	0.0042	0.509	15.5%
Probability of private hospital visit	0.0138	0.0043	0.0015**	69%
Number of observations	**6074**			
Probability of incurring OOPE				
Any OOPE	-0.0579	0.0330	0.0803	-13.1%
OOPE for outpatient care	-0.0745	0.0320	0.0204*	-18.6%
OOPE for inpatient care	0.0069	0.0179	0.704	8.6%
Total amount of OOPE per capita				
Total OOPE per year	-78295	54272	0.150	-36.3%
Total OOPE for outpatient care per month	-6779	3868	0.0803	-47.6%
Total OOPE for inpatient care per year	9998	21841	0.645	22.4%
Number of observations	**1687**			

Notes: loss of sample size is due to common support applied when doing caliper matching. Relative effect is the effect size divided by the baseline outcome level of the treatment group presented in Table 1.
*p < 0.05, **p < 0.01, ***p < 0.001.

In Table 7.6, we present the impact estimates using the lagged dependant variable approach. Under this model, the JKN had a highly significant positive impact on all types of inpatient service use. We also found a positive impact on outpatient service use in public health centres (1% point increase) and a negative impact on outpatient service use in private practices (1.3% point decrease). The impact of JKN membership on outpatient service use in public hospitals was similar as in the main model. Regarding the impact on financial protection, we found that the treatment group had significantly higher probability of incurring OOP spending for inpatient care (2.4% point increase compared to the control group). Overall, the JKN had a protective effect on the level of total OOP spending per capita (mean decrease of IDR 39492), and this result seems to be driven by a reduction in OOP spending for outpatient care.

Table 7.6: Effect size estimated with lagged dependant variable approach

	Effect size	SE	p-value	Relative effect
Utilisation of OP services				
Probability of any OP visit	0.0146	0.0084	0.0836	11.2%
Probability of public health center visit	0.010	0.0049	0.0434*	16.7%
Probability of public hospital visit	0.0061	0.0019	0.0016**	152.5%
Probability of private GP/midwife practice	-0.0127	0.0061	0.037*	-21.1%
Probability of private hospital visit	0.0053	0.0034	0.109	53%
Utilisation of IP services				
Probability of any IP visit	0.0319	0.0048	<0.001***	79%
Probability of public hospital visit	0.0135	0.0036	<0.001***	67%
Probability of private hospital visit	0.0150	0.0032	<0.001***	75%
Number of observations	N/A*			
Probability of incurring OOPE				
Any OOPE	-0.0348	0.0244	0.155	-7.9%
OOPE for outpatient care	-0.0346	0.0231	0.133	-8.6%
OOPE for inpatient care	0.0247	0.0122	0.0435*	30.8%
Total amount of OOPE per capita				
Total OOPE per year	-39492	19259	0.040*	-18.3%
Total OOPE for outpatient care per month	-4125	1575	0.0088**	-28.9%
Total OOPE for inpatient care per year	-9072	12111	0.453	-20.4%
Number of observations	N/A*			

Notes: * The number of observations varies in this analysis, as we match on different lagged outcomes. Relative effect is the effect size divided by the baseline outcome level of the treatment group.
$^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

In Table 7.7, we test the robustness of the findings to the matching method (1) and to the matching variables (2). In (1), we used the kernel matching method, with a bandwidth equal to 0.25 times the standard deviation of the propensity score. Under this model, we obtain similar results as in the main model, except that the impact on the use of outpatient services in public hospitals is no longer significant. In (2), we add the month of interview as a matching variable. Results are also similar to the main model, except that the decrease in total OOP spending per capita for outpatient care becomes significant. In Appendix 7.5, we present the impact estimates obtained when varying the caliper size in nearest neighbour matching (0.1 and 0.5 times the SD of the propensity score). Results are similar to the main model, except that the impact on the use of outpatient services in public hospitals is no longer significant.

Table 7.7: Robustness checks

	1			2		
	Effect size	SE	p-value	Effect size	SE	p-value
Utilisation of OP services						
Probability of any OP visit	0.0071	0.0136	0.603	0.0116	0.117	0.327
Probability of public health center visit	0.0034	0.0082	0.674	0.0023	0.0074	0.756
Probability of public hospital visit	0.0029	0.0026	0.258	0.0069	0.0025	0.0054**
Probability of private GP/midwife practice	-0.0065	0.0102	0.522	-0.0019	0.0085	0.818
Probability of private hospital visit	0.0024	0.0049	0.0617	0.0019	0.0045	0.667
Number of observations	**7902**			**6060**		
Utilisation of IP services						
Probability of any IP visit	0.0128	0.0065	0.050*	0.0154	0.0063	0.015*
Probability of public hospital visit	0.0024	0.0047	0.617	0.0027	0.0048	0.568
Probability of private hospital visit	0.0104	0.0047	0.026*	0.0127	0.0044	0.0036**
Number of observations	**7902**			**6060**		
Probability of incurring OOPE						
Any OOPE	-0.0769	0.0371	0.038*	-0.0663	0.033	0.044*
OOPE for outpatient care	-0.0710	0.0363	0.050*	-0.0871	0.0323	0.0067**
OOPE for inpatient care	0.0021	0.0197	0.912	0.0096	0.0182	0.596
Total amount of OOPE per capita						
Total OOPE per year	-74,406	59,335	0.211	-10,308	54,062	0.061
Total OOPE for outpatient care per month	-6,091	4,013	0.129	-8,310	3,685	0.024*
Total OOPE for inpatient care per year	4,394	27,519	0.872	5,096	25,149	0.841
Number of observations	**2076**			**1685**		

Notes: (1) result estimates using kernel matching using a bandwidth size of 0.25 times the SD of the propensity score.
(2) result estimates using caliper matching as in the main model but using month of interview at baseline as a matching variable.
*p < 0.05, **p < 0.01, ***p < 0.001.

In Appendix 7.6, we present the results of the falsification test. We found 13 non-significant treatment effects, among which four were significant in the main model, suggesting that there are no unobserved variables driving the original results. We found that the probability of visiting a public hospital was significantly lower for the placebo treatment group compared to the control group. However, the effect was negative, so if anything, the original results are likely to underestimate the effects of insurance on utilisation.

Discussion

This study has analysed the impact of JKN on health care utilisation, and financial protection measured by OOP spending per capita per year. Findings on health care utilisation suggest that the most significant impact of the JKN was on inpatient use (1.7% point increase compared to the control group based on the main model), and this result was robust to the different model specifications. This impact seems to be driven by an increased probability of using private hospitals. At the time of our survey, the number of private hospitals contracted with BPJS-Health increased substantially; 42% of private clinics, 60% of private hospitals and 14% of general practitioners provided services to JKN patients (Agustina et al., 2019). As it is likely that the private sector is perceived as providing better quality services in Indonesia, this wider choice of private hospitals contracted with JKN might have enhance private hospital use among JKN patients. We also found that the treatment group had a higher probability of using any outpatient care in public hospitals than the control group. Although technically JKN members need a referral from a primary care provider to access higher levels of care, it is possible that insured households were more likely to bypass their primary care provider. These results are in line with previous findings from Indonesia. For example, Erlangga et al reported an impact of the JKN on inpatient care comprised between 1.8% and 8.2% points depending on the type of JKN membership (subsidised or contributory member) (Erlangga, Ali, & Bloor, 2019). More recently, Pratiwi and colleagues found in their cross-sectional survey that inpatient care was higher among JKN members than those uncovered, also suggesting that insurance removed a significant barrier to hospitalisation (Pratiwi et al., 2021). Future research should look at whether this increase in hospital care reflects previous underutilisation of care, or whether it is the result of supplier-induced demand. Outside the hospital setting, we did not find a consistent impact on outpatient utilisation.

Regarding financial protection, overall JKN members had a lower probability (7.4% points) of incurring any OOP spending for outpatient care compared to the control group. Overall, we did not find any impact on the overall level of OOP spending incurred at the household level, and it would appear that OOP spending remains prevalent among JKN patients. Potential reasons for this include: a growing private sector and a willingness among wealthier households to buy services from non-JKN contracted providers; a demand for services that are not covered by the JKN such as branded medicines, laboratory tests and consultation without referral; as well as providers charging for copayments as they perceive the current INA-CBG rates to be too low (Maulana, Soewondo, Adani, Limasalle, & Pattnaik, 2021; Pratiwi et al., 2021). In this study, given the significant positive impact of the JKN on inpatient utilisation in private hospitals and on outpatient utilisation in public hospitals, it is possible that the use of off-contract private providers and the incidence of copayments in public hospitals have played a role in the absence of a significant effect on financial protection.

Evidence from systematic reviews in LMICs reveals a mixed picture of the effect of public health insurance on the utilisation of health services and financial protection. Acharya et al reviewed the impact of social health insurance schemes offered to the informal sector in LMICs, and found no strong evidence of an impact on utilization, protection from financial risk, and health status (Acharya et al., 2013). A more recent review showed a positive effect of public health insurance on health care use in India, while the majority (70%) of the studies showed no impact on the reduction in OOP spending (Prinja, Chauhan, Karan, Kaur, & Kumar, 2017). Finally, in 2019, a review by Erlangga et al also reported a positive effect of public health insurance schemes in LMICs on health care utilisation (Erlangga et al., 2019). Evidence on financial protection was mixed.

It is important to note that our analysis relies on strong assumptions. Propensity score matching combined with difference-in-differences has been shown to provide unbiased estimates on the condition that the parallel trend assumption holds (Abadie, 2005). Despite being a strong quasi-experimental method, it remains vulnerable to time-varying unobserved confounding. In fact, one randomised experiment evaluating the JKN (Barnejee et al, 2021), found that "time-limited subsidies increased enrolment and attracted lower-cost enrolees, in part by reducing the strategic timing of enrolment to correspond with health needs." (Barnejee et al, 2021). According to the authors, households have a tendency to buy JKN coverage 'strategically' when health care needs arise. In our study, we have tried to capture variations in health needs and therefore minimise the selection effect as much as possible. We also found that our results were largely robust to the falsification test.

To test the robustness of our findings, we used a lagged dependant variable method that relies on an alternative assumption, which is that the average treatment-free outcome for the treatment and the control groups would have been the same conditional on past outcomes and observed covariates. Under this assumption, the level of significance and the magnitude of the inpatient estimates increased, pointing towards a higher impact of the JKN on inpatient use. We also found a positive impact of the JKN on outpatient utilisation in public hospitals, public health centres, and a decreased probability of using private practices. Under this model, the treatment group had a significant increase in the probability of incurring OOP spending for inpatient care and a lower level of total OOP spending per capita. However, this method also has some limitations. Matching on past outcomes may bias the ATT due to regression to the mean effect (Daw & Hatfield, 2018). Regression to the mean occurs when treated and controls are matched based on extreme values for one variable, in this case the outcome variable (equivalent to "matching on noise"). As in subsequent measurements the outcome variable in both groups will come closer to the group mean, it could lead to the false conclusion that the intervention had an effect. In summary, both assumptions take alternative views of what is sufficient to condition upon in order to ensure that the treatment-free outcomes are independent of treatment assignment. In practice, because these assumptions are untestable, we are not able to know which method is likely to provide the least biased estimate of the ATT. In our study both methods point towards an effect of the JKN on inpatient utilisation and on outpatient service use in public hospitals, and therefore we can be confident that the true ATT might not lie far from both sets of results. However, we cannot draw firm conclusions regarding financial protection; while the direction of the effect seems to be consistent, the level of significance and the magnitude of the effect varied from one model specification to another.

The main limitation from our study lies in the fact that the ENHANCE survey is not representative of all Indonesian provinces, and excluded most eastern Indonesian provinces, which are considered to be relatively underdeveloped compared to the western provinces, and where health facilities are often not available (World Bank Group, 2020). Recent data show that JKN coverage is highest in East Nusa Tenggara, Maluku and Papua regions, where physical access to health services is the lowest (Pratiwi et al., 2021).

The implication of this would be an overestimation of our impact estimates at the national level.

Implications for policy

The core objective of the JKN is to protect members from the financial burden of health care costs by reducing OOP payments. In 2019, the amount spent on OOP payments (IDR 157.5 trillion) was still bigger than the amount spent by BPJS-K in absolute terms (IDR 113.3 trillion) (Maulana et al., 2021). While the JKN has increased the portion of public spending from 32.1% to 52.1% of total health expenditure (THE) from 2013 to 2019, OOP spending still comprised 34.8% of THE in 2019 (data.worldbank.org). This level of OOP spending is around the average of all Southeast Asian countries in the region (35.8% of THE) and is higher than Thailand (11% of THE) and Timor-Leste (7.1% of THE). It highlights the need for the Government of Indonesia to realise its intended goal: to establish an insurance scheme that does not require additional OOP payments, and to protect its members from the financial burden of health care costs. Specific actions could help achieve this goal. One is to harness the growing private sector by contracting private hospitals where a large proportion of OOP spending is incurred, and by contracting private PHC where only 16.8% of JKN members are registered (Maulana et al., 2021). Second, concerns have been raised that the INA-CBG payment rates are inadequate to meet health care costs, which could drive providers to charge patients. As capitation and INA-CBG payment rates have not been adjusted since the inception of the JKN in 2014, the Indonesian government should consider reviewing these rates to ensure that JKN members are fully protected. Third, the lack of enforcement of mandatory enrolment in the JKN, sometimes referred to as the "toothless insurance mandate" of the JKN, undermines the protective effect and the affordability of the insurance scheme as enrolment is driven by expected health care needs and use. Greater attention must be paid to designing supplemental policies to mitigate these challenges and boost national health insurance enrolment.

Conclusion

This study is the first to evaluate the impact of the JKN on both? health service utilisation and on financial protection. By combining propensity score matching with difference-in-differences, we found that overall JKN membership led to an increase in the probability of using outpatient services in public hospitals and in the probability of using inpatient care in both sectors. Findings from this study confirm that JKN members are still incurring high levels of OOP spending for health care. This was particularly the case for inpatient care, where the JKN did not have a protective effect in terms of the probability of incurring OOP spending. Overall, the introduction of the JKN in Indonesia has been a major step forward in the pursuit of UHC. Significant progress has been made in a short period of time, but a lot remains to be done to ensure that OOP payments are curbed for the most at risk of catastrophic health care cost.

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8 Using measures of quality of care to assess equity in health care funding for primary care: analysis of Indonesian household data

8.1 Overview of Paper 4

Many countries implementing pro-poor reforms to expand subsidized health care, especially for the poor, recognize that high-quality health care, and not just access, is necessary to meet the SDGs. As the poor are more likely to use low quality health services, measures to improve access to health care need to emphasise quality as the cornerstone to achieving equity goals. Current methods to evaluate health systems financing equity, such as benefit-incidence analysis (BIA) fail to take into account measures of quality. This issue has been raised in a recent publication in the Applied Health Economics and Policy journal (Asante et al. 2020), in which authors flagged the failure of BIA studies to take account of variations in the quality of health services received by different individuals, leading to a potential under/over-estimation of the subsidy.

This paper aims to build on Asante et al. by providing a worked example of how to adapt BIA to incorporate a quality weighting into the computation of public subsidies for health care. Our study contributes to what is already known in the field of equity measurement in three ways. First, by linking individual and facility data on quality, we enable the direct estimation of the quality of care that individuals have access to in their neighbourhood. Second, this paper is the first to apply the quality-weighted BIA as suggested in Asante et al, and we expect that this will influence other researchers working in health system equity to adapt their method to include quality of care. Third, we provide important policy insights for Indonesia. As the government of Indonesia is currently implementing several reforms to improve quality of care (accreditation of health facilities, introducing P4P schemes among others), evidence on the equity in the distribution of public subsidies is strongly needed for the success of the JKN.

This paper has been submitted to *BMC health services research* journal and is part of the ENHANCE research output.

RESEARCH PAPER COVER SHEET

Please note that a cover sheet must be completed <u>for each</u> research paper included within a thesis.

<u>SECTION A – Student Details</u>

Student ID Number	386492	**Title**	Miss
First Name(s)	Manon		
Surname/Family Name	Haemmerli		
Thesis Title	On the road to Universal Health Coverage: measuring socioeconomic inequalities in access to and use of high quality care in Indonesia		
Primary Supervisor	Virginia Wiseman		

If the Research Paper has previously been published please complete Section B, if not please move to Section C.

<u>SECTION B – Paper already published</u>

Where was the work published?			
When was the work published?			
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion			
Have you retained the copyright for the work?*	Choose an item.	Was the work subject to academic peer review?	Choose an item.

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<u>SECTION C – Prepared for publication, but not yet published</u>

Where is the work intended to be published?	BMC health services research
Please list the paper's authors in the intended authorship order:	Manon Haemmerli, Augustine Asante, Dwidjo Susilo, Aryana Satrya, Fattah Rifqi Abdul, Qinglu Cheng, Soewarta Kosen, Danty Novitasari, Gemala Chairunnisa Puteri, Eviati Adawiyah, Andrew Hayen, Lucy Gilson, Anne Mills, Viroj Tangcharoensathien, Stephen Jan, Hasbullah Thabrany, Virginia Wiseman
Stage of publication	**Submitted**

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I co-designed the study, co-supervised the data collection with the entire research team and analysed the data. I wrote the drafts of the paper and incorporated co-authors' comments

SECTION E

Student Signature	Manon Haemmerli
Date	06 Jan 2022

Supervisor Signature	Virginia Wiseman
Date	10th of April 2022

8.2 Paper 4

Title: Using measures of quality of care to assess equity in health care funding for primary care: analysis of Indonesian household data

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Abstract

Many countries implementing pro-poor reforms to expand subsidized health care, especially for the poor, recognize that high-quality health care, and not just access alone, is necessary to meet the Sustainable Development Goals. As the poor are more likely to use low quality health services, measures to improve access to health care need to emphasise quality as the cornerstone to achieving equity goals. Current methods to evaluate health systems financing equity fail to take into account measures of quality. This paper aims to provide a worked example of how to adapt a popular quantitative approach, Benefit Incidence Analysis (BIA), to incorporate a quality weighting into the computation of public subsidies for health care.

We used a dataset consisting of a sample of households surveyed in 10 provinces of Indonesia in early-2018. In parallel, a survey of public health facilities was conducted in the same geographical areas, and information about health facility infrastructure and basic equipment was collected. In each facility, an index of service readiness was computed as a measure of quality. Individuals who reported visiting a PHC facility in the month before the interview were matched to their chosen facility. Standard BIA and an extended BIA that adjusts for service quality were conducted.

Quality scores were relatively high across all facilities, with an average of 82%. Scores for basic equipment were highest, with an average score of 99% compared to essential medicines with an average score of 60%. Our findings from the quality-weighted BIA show that the distribution of subsidies for public PHC facilities became less ‘pro-poor’ while private clinics became more ‘pro-rich’ after accounting for quality of care. Overall the distribution of subsidies became significantly pro-rich (CI=0.037).

Routine collection of quality indicators that can be linked to individuals is needed to enable a comprehensive understanding of individuals’ pathways of care. From a policy perspective, accounting for quality of care in health financing assessment is crucial in a context where quality of care is a nationwide issue. In such a context, any health financing performance assessment is likely to be biased if quality is not accounted for.

Background

Almost without exception, health systems worldwide provide health services that vary in terms of quality and access in ways that invariably favour higher income groups (Gwatkin, Bhuiya, & Victora, 2004). This occurs even in countries which have ostensibly achieved universal health coverage (UHC) and against a background of longstanding recognition of this type of disparity, countries are urged to 'aim for affordable UHC and access for all citizens on the basis of equity and solidarity' (World Health Assembly, 2011; World Health Organization, 2010). Nonetheless many low- and middle-income countries (LMICs) are implementing reforms to promote equity in health financing and delivery as a pathway towards UHC (Reich et al., 2016). Measuring the distributional impact of these reforms is a high priority for these countries (Wiseman et al., 2015).

'Benefit Incidence Analysis', or BIA, is the traditional approach to estimating the distributional impact of government spending on health care (Selowsky, 1979). It uses information on costs and the utilisation of health services to estimate the distribution of public spending across different socio-economic groups. BIA seeks to answer the question: who benefits from public expenditures on health care and by how much? Put differently, BIA measures by how much the income of a household would have to be raised if the household had to pay for the subsidized health services at full cost (Martinez-vazguez, 2001). In practice, BIA studies estimate "benefits" or "public subsidies" to service users, who are typically ranked by socio-economic status (SES) or some other variable of interest including geographical area, ethnic group or gender (Van de Walle, 1998). While BIA has traditionally focused on distribution of public sector subsidies, the analysis is increasing being extended to the private sector because of the growing and important role of the private health sector.

A key strength of a BIA is that it can provide a simple and transparent approach to assessing the extent to which public health spending benefits the poor. The approach, however, is not without its limitations. A key one that has been flagged by analysts is the failure to take account of variations in the quality of health services received by different individuals, leading to a potential under/over-estimation of the subsidy (Asante, Man, & Wiseman, 2020). Increased evidence that the poorest segments of the population receive poorer quality of care (Kruk et al., 2018), means that failing to take account of the quality of care in BIA could lead to a biased picture of who benefits most from government health spending.

Recently, Asante et al. attempted to address this critical methodological gap by introducing a quality score into the computation of BIA (Asante et al., 2020). They developed a proxy measure for quality using area level deprivation indicators (availability of water, electricity, energy source for cooking, education, etc.). One limitation of their approach (acknowledged by the authors) is the use of deprivation indicators that are not directly related to health care quality. Second, they used area-level indicators by averaging the quality measures at the district level; this could not only mask variations in the quality of health services at the sub-district level, but most importantly across facilities used by individuals with varying SES. In this paper, we address this important issue using data from linked household and PHC facility surveys in Indonesia. We aim to provide a worked example of how to apply the quality-weighted BIA methodology using facility-level quality measures linked to individual utilization data.

Methods

Study setting

In 2014, Indonesia took a significant step towards UHC by implementing a comprehensive national SHI scheme, known as the *Jaminan Kesehatan Nasional* (JKN), to make health care available to its entire population (National Team for the Acceleration of Poverty Reduction, 2015). The JKN brings together all major existing health insurance schemes under a single agency - the Social Security Agency for Health (BPJS-Health) - and was made mandatory for all Indonesians. Since the introduction of the JKN, Indonesia has made significant progress, moving from 46.5% of the population covered in 2014 to 83% as of May 2019 (Agustina et al., 2019). This makes the Indonesian Social Health Insurance (SHI) scheme one of the biggest single payer system in the world. Under the JKN, members must register with a contracted public and private primary care provider. The BPJS-Health pays these providers by capitation for outpatient services (Agustina et al., 2019), and the capitation amount differs based on the total number of practitioners, the ratio of practitioners to beneficiaries, and operating hours.

Utilisation data

We used data from a cross-sectional household survey (ENHANCE Survey) of 7500 households conducted in 10 provinces of Indonesia at the beginning of 2018. Details of the sampling methodology have been published elsewhere (https://equityhealthj.biomedcentral.com). Individuals were asked about their health seeking behaviour, including the name of the private or public outpatient facilities they have visited in the previous month, their socio-economic background, as well as their health insurance status. Those who reported being enrolled in health insurance could fall into either of these categories: individuals considered poor whose insurance contribution is fully subsidised (JKN-PBI group), individuals who need to contribute either via their payroll or to self-enrol and pay premium contributions (JKN non-PBI group) and those enrolled in insurance schemes administered by the local government (Jamkesda group).

Health facility data

The sampling frame for the health facility survey was drawn from information provided by households in the ENHANCE Survey on the name of the PHC facilities they visited in the previous month. Due to limited time and budget constraints, we could not collect information from all the facilities mentioned in the ENHANCE Survey. Instead, in each sub-district, we selected up to three facilities that were most frequently mentioned by respondents. All the facilities selected were under contract with BPJS-Health and receiving public subsidies (in the form of capitation payments) to provide services to JKN patients. These were either public health centres (*Puskesmas*), or private clinics. In each facility, the person in-charge was interviewed about general characteristics, infrastructure, and availability of supplies, equipment and drugs.

Cost data

To estimate the unit cost of health services, we used the JKN claims data for 2018 obtained from BPJS-Health and data on capitation payments made to PHC facilities for the same year. We estimated that the unit cost of one visit in a public health centre was Rp 40,000 (~US$2.8), while a visit in a private clinic was Rp 60,000 (~US$4.2). Out-of-pocket (OOP) payments were derived from the household survey, where individuals were asked about the amount they spent during their last outpatient visit.

Measures of socio-economic status

We developed a standard asset-based measure of SES, using data on the ownership of a range of durable assets (e.g. car, refrigerator and television), housing characteristics (e.g. material of dwelling floor, roof and walls and main cooking fuel) and access to basic services (e.g. electricity supply, source of drinking water and sanitation facilities) (Howe, Hargreaves, & Huttly, 2008). Principal component analysis (PCA) was used to estimate wealth levels using the asset indicators (Filmer & Pritchett, 2001; Vyas & Kumaranayake, 2006). The basic idea of PCA is to replace a set of correlated variables with a set of uncorrelated "principal components" which represent unobserved characteristics of the population. The principal components are linear combinations of the original variables and the weights are derived from the correlation or covariance matrix (depending on whether the data have been standardised) (Howe et al., 2008). It is assumed that the first principal component, which explains the most variance among the data, represents household wealth.

Measure of health care quality

Donabedian's framework for assessing quality of care describes health care service delivery as a continuum that includes structure, process and outcomes (Donabedian, 1966). According to Donabedian, *structural quality* consists of human and key material resources such as infrastructure, equipment, drugs, medical supplies, communication, and transport. *Process quality* assesses whether what is known to be "good" medical care has been applied. Evidence-based care includes systematic patient assessment, accurate diagnosis, provision of appropriate treatment and technical competence in the provisions of diagnostic and therapeutic procedures, continuity of care, and appropriate patient counselling. *Health outcomes* refer to the ultimate improvement of health in terms of recovery, restoration of functions and survival.

In this study, we measured structural quality through the use of a supply-side readiness (SSR) index. The indicators of SSR were derived from the Service Availability and Readiness Assessment (SARA) tool (World Health Organization, 2005). Among the many indicators collected as part of the SARA survey, the "*general service readiness*" section collects information on the potential of health facilities to provide basic health care interventions. Following the SARA methodology, indicators were classified into five general service readiness domains (basic amenities, basic equipment, infection prevention, essential medicines and diagnostic capacity) (Table 8.1) and coded as binary variables, 1 indicating the presence of the indicator as reported by the provider, and 0 indicating non-availability. Each domain was associated with a score based on the percentage of items available. For each facility, an overall SSR score comprised between 0 and 1 was calculated based on the mean score across the five domains.

Table 8.1: Indicators for general service readiness

Domains	*Indicators*
Basic amenities (8)	Physical access, toilet facilities, examination room with air conditioning, waiting room, internet connection, computer, running water, emergency room
Infection prevention (4)	Safe storage and disposal of infectious waste, safe storage and disposal of sharps, latex gloves, single use syringes.
Basic equipment (5)	Blood pressure meter, thermometer, baby scale, adult scale, and stethoscope.
Essential medicines (21)	Amlodipine tablet or alternative calcium channel blocker, Amoxicillin, Ampicillin, Aspirin, Beta blocker, Beclometasone inhaler, Carbamazepine, Enalapril tablet or alternative ACE inhibitor, Fluoxetine, Gentamicin injection, Glibenclamide tablet, Haloperidol, Insulin regular injection, Magnesium sulphate injectable, Metformin, Omeprazole or alternative, Oral rehydration solution, Salbutamol inhaler, Simvastatin or other statin, Thiazide, Zinc sulphate.
Diagnostic capacity (8)	Malaria rapid test, syphilis rapid test, HIV rapid test, pregnancy test, haemoglobin and blood count, blood glucose estimation, urine glucose test strips, urine protein test strips.

Quality-weighted BIA

In this analysis, we restricted our sample to the individuals who could be linked to their health facility of choice, in which facility data was collected. The various steps and data required to conduct a BIA have been described in detail elsewhere (Mcintyre & Ataguba, 2011; O'Donnell, Doorslaer, Wagstaff, & Lindelow, 2008). In traditional BIA, the unit subsidy received by each individual is represented by the unit cost incurred by the provider in delivering the service minus any fees paid by the user to the provider in using the service, that is:

$$S_i = (C_i - F_i) = (c_i q_i - f_i q_i) = q_i(c_i - f_i) = q_i s_i \qquad (1)$$

Where S_i is the subsidy captured by individual i at the facility visited, C_i is the unit cost incurred by the provider at the facility in providing the services to individual *i*, F_i is the total fee paid by individual *i* to the provider, q_i is the quantity of services consumed within a month and c_i, f_i, s_i are the unit cost, fee and subsidy, respectively (Wagstaff, 2010). As unit costs vary between public and private facilities, individual subsidies must first be computed separately, and then the total subsidy computed as the sum of the subsidies for public and private health visits. Total subsidies were annualised by multiplying the monthly figures by 12. We first ran standard BIA using unadjusted subsidies by ranking households according to their level of wealth, and by estimating the distribution of the subsidies across income groups. Concentration curves (CCs) and concentration indices (CIs) were used to summarise the degree of inequality in the distribution of public health subsidies.

According to the Asante et al framework, the quality-adjusted subsidies WS_i can be expressed in the following way:

$$WS_i = S_i x_i \qquad (2)$$

Where x_i is the SSR score of the facility that individual *i* visited, and S_i is the unadjusted subsidy from (1). The quality-weighted BIA was run using the quality-adjusted subsidies as above, and results were compared with the standard BIA approach.

Comparison with level of need

In traditional BIA, the distribution of public subsidies for health services is usually compared with the distribution of the need for health care in order to have a more complete picture of the degree of equity in the system (McIntyre & Ataguba, 2011). Several national surveys in LMICs include questions on self-assessed health (SAH) that can be used to proxy health care need (Asante, Price, Hayen, Jan, & Wiseman, 2016). We therefore used a similar approach. In the ENHANCE survey, individuals were asked to rate their general health status. A four-point scale was developed with the following response options: “very good”, “good”, “bad” and “very bad”. Anyone who rated his/her health as ‘bad’ or ‘very bad’ was considered to be in need of health care. The distribution of unadjusted and quality-adjusted subsidies was then compared with the distribution of the need for health care, using SAH as a proxy for need.

Results

Table 8.2 describes the basic characteristics of individuals in our sample. In total, we managed to link 784 individuals with 51 health facilities they visited, which represents about 19% of all the individuals in the sample who reported seeking PHC in the previous month. Table 8.3 describes the health facilities surveyed: 84% were public health centres, and 16% private clinics. 37% offered inpatient services, and about half were open 24 hours a day. The average catchment of a health facility was 35000 persons. All facilities were contracted with the BPJS-Health and therefore provided subsidised services to JKN patients. Quality scores were relatively high across all facilities, with an average of 82%. Scores for basic equipment were highest, with an average score of 99% (range 60% to 100%) compared to essential medicines with an average score of 60% (range 20% to 85%).

Table 8.2: Characteristics of individuals

Variable	Mean	SD	min	max
Individual characteristics	N=645			
Area of residence is urban	68.6%			
Age (years)	30	24	1	96
Gender is female	59.2%			
Wealth quintile				
1	24.8%			
2	25%			
3	18.1%			
4	16.4%			
5	15.7%			
Number of people in the household	4.8	1.8	1	12
Insurance ownership				
JKN (PBI)	39%			
JKN (non-PBI)	23%			
Jamkesda	7%			
Private	1%			
No insurance	29%			
Health seeking behaviour				
Distance to health facility (as reported in km)	2.0	2.1	0.01	15
Time to reach health facility (as reported in min)	11.6	6.9	1	60
Out-of-pocket payments (as reported in IDR)	12,852	68,863	0	1,000,000

*IDR=Indonesian rupiah. 1$ ~ 14000 IDR in 2018, PBI=insurance for the poor

Table 8.3: Characteristics of the health facilities

Variable	N	Mean	SD	min	max
Health facilities characteristics	N=51				
Sector of care is public	43	84%			
Inpatient facility available	19	37%			
Catchment area	51	35,874	22,155	1995	103,904
Open 24h on weekdays	24	47%			
Accreditation status					
No accreditation	15	27.4%			
Basic	11	21.6%			
Intermediate	15	29.4%			
Advanced	8	15.7%			
Full	2	3.9%			
Contract with BPJS	51	1			
Quality scores					
Basic amenities	51	77%	0.15	0.37	1
Infection prevention	51	98%	0.08	0.5	1
Basic equipment	51	99%	0.06	0.6	1
Essential medicines	51	60%	0.15	0.2	0.85
Diagnostic capacity	51	76%	0.26	0	1
Overall readiness score	51	82%	0.09	0.43	0.92

Table 8.4 presents the distribution of unadjusted and quality-adjusted subsidies. For the unadjusted subsidies, we found that the distribution of subsidies in the public sector was significantly pro-poor (CI=-0.04), while the distribution of subsidies in the private sector was significantly pro-rich (CI=0.37). The overall distribution of subsidies was slightly pro-rich, but the CI was not significant (0.032). When adjusting for quality, we found that the distribution of subsidies in the public sector became slightly less pro-poor (CI=-0.03), while the distribution of subsidies in the private sector became more pro-rich (CI=0.48). Overall the distribution of subsidies became significantly pro-rich (CI=0.037).

Table 8.4: Distribution of unadjusted (top) and quality-adjusted subsidies (bottom) across wealth groups

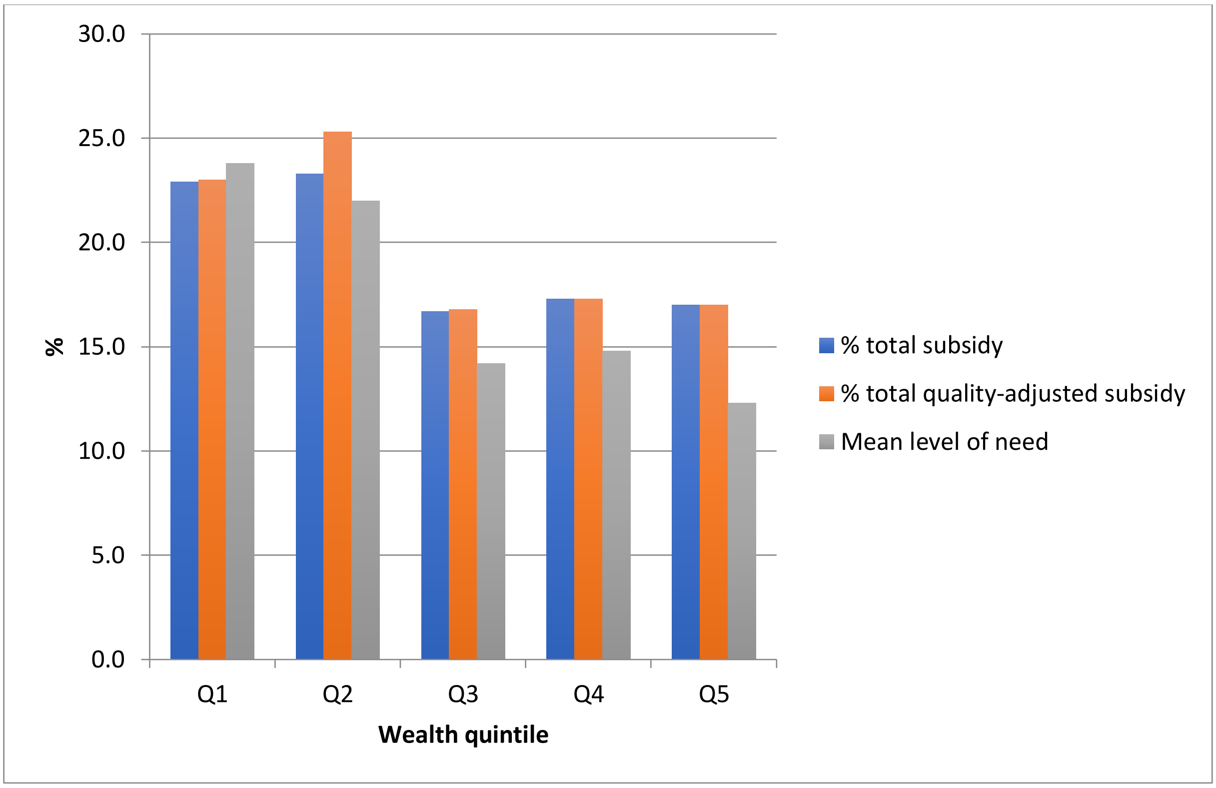
		Unadjusted subsidies by wealth group					
Wealth group	Mean quality score	Total amount of subsidy in public sector	% total subsidy in public sector	Total amount of subsidy in private sector	% total subsidy in private sector	Total unadjusted subsidies	% of total subsidies
Q1	0.81	110,000,000	25.1	4,320,000	6.9	114,320,000	22.9
Q2	0.82	117,000,000	26.9	10,100,000	16.3	127,100,000	25.6
Q3	0.82	77,600,000	17.8	5,760,000	9.3	83,460,000	16.7
Q4	0.83	74,800,000	17.1	11,500,000	18.6	86,300,000	17.3
Q5	0.84	54,200,000	12.4	30,200,000	48.8	84,400,000	17.0
Concentration index			-0.04*		0.37***		0.032

		Quality- adjusted subsidies by wealth group					
Wealth group	Mean quality score	Total amount of subsidy in public sector	% total subsidy in public sector	Total amount of subsidy in private sector	% total subsidy in private sector	Total quality-adjusted subsidies	% of total subsidies
Q1	0.81	90,200,000	24.9	2,900,000	7.6	93,100,000	23.3
Q2	0.82	97,000,000	26.8	3,970,000	10.5	101,000,000	25.3
Q3	0.82	63,900,000	17,6	3,348,000	8.8	67,200,000	16.8
Q4	0.83	62,400,000	17.2	3,966,000	10.4	66,400,000	16.6
Q5	0.84	46,400,000	12.8	23,800,000	62.7	70,200,000	17.5
Concentration index			-0.03		0.48*		0.037*

* p<0.05 **p<0.01 ***p<0.005

Figure 8.1 compares the mean level of need with the distribution of subsidies across wealth quintiles. It shows that the level of need was inversely proportional to the distribution of public subsidies. The level of inequality was slightly higher when using quality-adjusted subsidies, but the magnitude was small.

Figure 8.1: Overall public adjusted- and unadjusted subsidies in both sectors and level of health need



Discussion

This study provides a worked example of how to apply a quality-weighted BIA methodology, and we summarise the main steps in Box 2 below. Our findings from Indonesia show that the distribution of subsidies for public PHC facilities became less 'pro-poor' and subsidies for private PHC facilities became more pro-rich after accounting for quality of care. The magnitude or the difference between the distributions of quality-adjusted and unadjusted subsidies was not large, and we believe that the gap between the two distributions is likely to be underestimated. As our measures of quality remain limited to self-reported structural indicators and do not include process or outcomes measures, we did not find large variations in quality across study sites though availability of essential medicines has the lowest score. More sensitive measures of quality and/or the inclusion of higher-level facilities such as tertiary care hospitals into the sample would have displayed a more realistic picture of quality adjusted subsidies in Indonesia, and therefore the difference between the distributions of quality-adjusted and unadjusted subsidies would likely have been larger. Additionally, recent efforts to increase quality of care in Indonesia, such as accreditation of PHC facilities, have certainly led to a standardisation of the basic level of infrastructure and equipment However, this study is aimed at illustrating in practice how to apply quality weights in BIA studies rather than producing precise quantitative estimates.

Indonesia has been the focus of few BIA studies (Asante et al., 2016). The first study, published over 30 years ago, showed that PHC was mildly progressive but hospital care was disproportionately used by the better-off (Van de Walle & Nead, 1995). Similar results were reported in 2001 (Lanjouw, Pradhan, Saadah, Sayed, & Sparrow, 2001). A comparative analysis of Asian countries found that in Indonesia, the richest 20% of the population received more than 30% of the total subsidies, and that the distribution of health care utilisation was more pro-poor than the subsidy distribution (O'Donnell et al., 2007). The fourth study examined the marginal effects of decentralized public health spending on the benefit incidence, when the authority to manage public spending for health and other sectors was devolved to the district level (Kruse, Pradhan, & Sparrow, 2012). This study found that increased public spending at the district level improved the targeting of public funds to the poor by increasing their utilisation of services and also their share of public expenditure. However, Kruse et al concluded that effort to increase the use of health services by the poor was necessary, and that demand-side interventions, such as price subsidies or SHI, were needed.

To our knowledge, none of these studies took into account the quality of care that patients received. More recently, Sambodo et al. measured the benefit incidence of health care funding under JKN, taking into account regional variation in unit costs across districts (Sambodo, Van Doorslaer, Pradhan, & Sparrow, 2021). As both primary and secondary care providers are paid prospectively and proportionally to the intensity of their activity under the JKN system, better-equipped service providers are more likely to receive larger provider payments. Sambodo et al. found that the distribution of benefits favoured the wealthier groups, but most importantly that standard BIA using national unit costs underestimates regional disparities in health care funding, and therefore underestimates the inequality in the benefit distribution. If one assumes that the variation in unit costs reflects the variations in quality of care (especially availability of basic amenities, basic medical equipment, essential medicines and diagnostic tools), then our findings are consistent with theirs in the sense that the level of inequality in the benefit distribution is underestimated if quality is not accounted for. However, this assumption is unlikely to hold if higher provider payments are not correlated with higher quality, but instead are reflective of higher level of inefficiency; hence the need to account for quality using robust measures.

A major strength of our analysis lies in the fact that we were able to link individuals with the facilities they visited. In most studies, data linkage is not possible at the individual level, since conducting a facility survey alongside a household survey can be resource-intensive. Some limitations should also be acknowledged. Due to time and budget constraints, only 51 PHC facilities could be surveyed, and therefore data on quality was collected in only a fraction of health facilities that individuals in our survey visited in the previous month, making the picture incomplete. However, this study represents a methodological advancement by introducing quality weights into the BIA framework and we hope future studies will be able to validate these results with larger datasets. Another limitation is the use of SSR scores as a proxy for quality which do not take into account e.g. health systems responsiveness and people's expectations (Mirzoev & Kane, 2017). Careful interpretation is needed since the concept of quality of care is considerably broader and more complex than the measure used here (Hanefeld, Powell-jackson, & Balabanova, 2017). Inputs such as infrastructure, equipment, medicines, and diagnostic tests, are just one element or prerequisite to the provision of good quality care (Leslie, Sun, & Kruk, 2017).

From a methodological perspective, one of the challenges of accounting for quality of care in BIA is the lack of adequate data from LMIC settings or standardized measurement of quality, since incomplete and unreliable quality data are common, and they often poorly capture process and outcome measures of care (Akachi & Kruk, 2017). Researchers often rely on secondary datasets made available through global agencies such as the WHO, World Bank or United States Agency for International Development. The IFLS, for example, conducts health facility surveys that incorporate various indicators, including structural and process indicators, which can be used to assess quality of care. However, quality data is collected in only a fraction of health facilities that individuals visited in the previous month, making the picture incomplete. Routine collection of quality indicators that can be linked to individuals are needed to enable a more comprehensive understanding of individuals' pathways of care, including the quality of services they receive.

The implications of this study go beyond the methodological aspect. From a policy perspective, accounting for quality of care in health financing assessment is crucial in a context where quality of care is a nationwide issue. Recently, the World Bank conducted an assessment of a nationally representative sample of 686 Indonesian public and private PHC facilities. Their report highlights significant gaps in the readiness of PHC facilities to deliver a basic level of quality of care (World Bank Group, 2020). Additionally, large geographical inequalities in the quality of care were detected. In such a context, any health financing performance assessment is likely to be biased if quality is not accounted for.

Conclusion

Through this analysis, we have shown that accounting for quality in BIA studies may provide a more accurate picture of the level of inequality, since poor households may have no choice except to visit the lower quality health facilities in their communities. We recommend that future analysis looking at the level of inequality in the distribution of public health care subsidies should incorporate quality of care in order to get the most accurate picture of the health financing system. Table 8.5 provides 'how to' for future assessment of quality-adjusted BIA. Improvement of the method will lie in the scope of measurement (structural, process or outcomes) of quality of care using standardized indicators, as well as in the accuracy of linking individuals to the very facilities they reported visiting to avoid using area-level information. Policy should focus on strengthening and equalizing quality of care across all PHC facilities, as recommended by the World Bank (World Bank Group, 2020).

Table 8.5: Step-by-step procedure to run a quality-weighted BIA: adapted from (McIntyre & Ataguba, 2011).

Step	*Description*
1: Preparing household data	Select a measure of living standard or socio-economic status (SES) and rank the population from poorest to richest; Estimate the utilization of different types of health service by individuals/different socio-economic groups (services such as primary level clinics, district hospitals, regional hospitals and central hospitals in the case of public sector services; if considering private sector services as well, categories such as general practitioners, specialists, retail pharmacies and private hospitals); Register and list the names of the health facilities individuals visited, and use this list as a sampling frame for the facility survey.
2: Preparing facility data	Quality indicators should be as detailed as possible and should include structural, process and outcome measures of quality. Observed quality indicators are preferred over self-reported indicators. Develop a quality score: quality indicators should be aggregated into a single measure. Different weighting schemes are possible, although equal weights are easier to interpret.
3: Linking both datasets	Household and facility data should be linked by using a unique facility identifier number
4: Estimate quality-adjusted subsidies	Unadjusted subsidies are computed as in traditional BIA. For each individual, estimate the quality-adjusted subsidy by multiplying the unit subsidy by the quality score of the facility visited.
5: Assess equity in distribution of health subsidies	Aggregate the distribution of both unadjusted and quality-adjusted subsidies expressed in monetary terms, across different types of health service for each individual/socio-economic group.
6: Comparison with level of need	Compare the distributions of both unadjusted and quality-adjusted subsidies to some target distribution (e.g. relative to need for health care).

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9 Discussion

The goals of UHC are to ensure that all people, regardless of their socio-economic background or ability to pay, have equal access to high quality health services (Kruk, Gage, Arsenault, et al., 2018). While considerable progress has been made in accelerating the coverage of many essential health services over the past decade, concerns have been raised in many countries that the poor are being left behind. Despite a plethora of UHC reforms in LMIC including Indonesia, many poorer and vulnerable populations continue to experience a lack of access to quality and affordable health services, culminating in worse health outcomes than their wealthier counterparts (Gwatkin, Bhuiya, & Victora, 2004; Khullar & Chokshi, 2018). Increasing calls have been made to look beyond simple measures of coverage to assess how key outcomes such as quality of care received and financial protection vary across socioeconomic groups (Kruk, Gage, Arsenault, et al., 2018).

My PhD aimed to address this knowledge gap by linking multiple sources of primary and secondary data to measure socioeconomic inequalities in access to and use of high quality health care in Indonesia. I used the UHC cube diagram developed by the WHO as an overarching framework to guide my approach. The framework represents progress towards UHC across three dimensions: 1) the proportion of the population that is covered by pooled funds; 2) the proportion of direct health care costs covered by pooled funds; and 3) the health services covered by those funds (World Health Organization, 2010). Giving special attention to the concept of equity and quality of care under each dimension of the cube, I sought to highlight the gaps in Indonesia's path to UHC. Indonesia is an ideal setting for research as UHC is at the forefront of the political agenda. The future of one of the country's most well-known UHC reforms, the national health insurance scheme or "JKN", is under immense scrutiny in the press and in parliament (Trisnantoro, 2020).

This chapter summarises the key findings from my PhD research, discusses their implications for policy and research, and reflects on any strengths and limitations of the research including methodological approaches used. This discussion reflects on the broad findings of the PhD and therefore is higher level than the research paper chapters. For example, specific limitations of the data and methods used in each research paper are to be found in the relevant chapters.

9.1 Key findings

Objective 1: To measure the extent of inequalities in the availability of quality health services across the Indonesian primary health care system

I used the fifth wave of the Indonesia Family Life Survey for this objective (2014-2015). The IFLS is a panel socioeconomic and health survey in Indonesia, based on a sample of households representing about 83% of the Indonesian population living in 13 of the nation's 26 provinces in 1993. The survey collects data on individual respondents, their families, their households, the communities in which they live, and the health and education facilities available to them. For the purpose of objective 1, the fifth wave of the IFLS data was used, and the 15,877 households from 312 communities were linked with a representative sample of both public and private health facilities available in the same communities to assess the quality of health facilities. Two measures of quality of care were constructed: a measure of structural quality using facility service readiness indicators (such as infrastructure, medical equipment and availability of drugs); and a measure of process quality (provider knowledge) using clinical vignettes.

One of the main findings from this study was that quality of care remains worryingly low in Indonesia. In terms of health facility readiness, I found that basic equipment, essential medicines and diagnostic capacity were lacking across all types of health facilities[6]. The overall level of provider knowledge was quite low, with an average knowledge score below 50% for all provider types. The low facility readiness and provider knowledge scores were particularly striking in midwife/nurse practices. Private facilities, which are a major provider of PHC in Indonesia, had worse scores than public sector facilities. Additionally, results suggest that major geographical inequalities in the quality of care exist. The main difference was seen between islands (or grouping of provinces), where public and private facilities located in Central Java were more likely to meet basic standards of facility readiness and be staffed by more knowledgeable providers than facilities located in all other provinces. Further, inequalities in readiness scores, but not knowledge scores, went beyond the provincial level and were observed between urban and rural areas. This was

[6] In chapter 8, I found that some of the scores for structural quality were high. It is important to note that the analyses are based on different surveys and sampling strategies, the IFLS for example was more comprehensive in terms of the number of indicators and sample size compared to the ENHANCE facility survey.

particularly the case in public sector facilities, where it was found that urban location was a strong determinant of facility readiness: both *puskesmas* and *pustus* located in rural areas were more likely to have lower readiness scores than in urban areas. Finally, I discovered that public facilities located in richer communities had slightly higher readiness scores than those located in poorer communities, other things being equal. However, the size of the association was relatively small and was limited to public facilities.

Objective 2: To explore the extent to which the quality of public and private primary health care in Indonesia affects provider choice

I used two IFLS data sets to analyse the relationship between quality of care and provider choice. For this purpose, I linked information on household SES with information on the quality of their local PHC facilities. Within each community, the choice set of facilities that each individual faced was defined as all facilities surveyed in the community. I analysed the choice of health facility made by 1044 individuals and the quality of 2549 public and private PHC facilities located in the same communities where those individuals live. Similar to my first paper, two proxy measures of quality of care were calculated: a supply-side readiness (SSR) score (capturing availability of equipment, infrastructure and supplies); and a provider knowledge score measured using clinical vignettes. I estimated an alternative specific conditional logit model of provider choice.

Results suggest that facility readiness is a predictor of facility choice by patients, although the magnitude of the effect was relatively small. The marginal rates of substitution suggest that for one percentage point increase in the readiness score, individuals were willing to travel on average 50 metres further and pay an additional IDR 2411 (USD 0.2). Distance and price remained the major determinants of facility choice. Provider knowledge scores did not seem to have an effect on facility choice. In contrast, sector of care was an important determinant of facility choice, with patients preferring to seek care from public health facilities, all else being equal. All components of facility readiness except infection prevention had an effect on facility choice with essential medicines having the greatest effect. Insured individuals, those living in urban areas, and those using curative care were more responsive to an increase in facility readiness. Readiness scores did not affect the probability of facility choice for the uninsured, those living in rural areas, and those seeking preventative care. Importantly, both rich and poor individuals were responsive to facility readiness.

Objective 3: To evaluate the impact of the Indonesian Social Health Insurance scheme on health service utilisation and financial protection

This analysis is based on primary survey data from the *Equity and Health Care Financing in Indonesia study*, also known as the ENHANCE study, that included a panel household survey at two time points (February-April 2018 and September-December 2019). I used a panel of 2096 households and 7982 individuals from this survey to evaluate the impact of the JKN on health care utilisation and to measure financial protection using propensity score matching combined with difference-in-differences methods. Findings on health care utilisation suggest that the highest impact of the JKN was on inpatient use (1.7% point increase compared to the control group), and this result was robust to the different model specifications. This impact was driven by an increased probability of using private hospitals. I also found that the JKN group had a higher probability of using any outpatient care in public hospitals than the control group. These results are in line with previous findings from Indonesia, despite the fact that these earlier studies relied on less rigorous study designs (Erlangga, Ali, & Bloor, 2019; Pratiwi et al., 2021).

Regarding financial protection, JKN members had a 7.4% point lower probability of incurring OOP spending for outpatient care compared to the control group. They also had an increased probability of incurring OOP costs for inpatient care, although this result was not significant. Overall, it seems that the JKN had a protective effect on the total level of yearly OOP spending per capita (mean decrease of IDR 78295 or USD 5.5), although this result did not reach the standard significance level. These results are in line with the existing few studies indicating that OOP payments remain an issue for the JKN (Pratiwi et al., 2021).

Objective 4: To explore the adaptation of a popular quantitative method for measuring equity in health financing, benefit incidence analysis (BIA), by incorporating a quality of care weighting.

The first wave of the ENHANCE dataset, consisting of a sample of 7020 households surveyed in 10 provinces of Indonesia in early-2018, was used to conduct a conventional BIA. This research was a pre-defined aim of the overall ENHANCE study. For my PhD, I extended the method by incorporating quality of care weighting into the BIA framework. This involved linking the ENHANCE household dataset to a survey of 50 public health facilities conducted in the same geographical areas, where information about health facility infrastructure and basic equipment was collected. In each facility, an index of service readiness was computed as a measure of quality of care. Individuals who reported visiting a PHC facility in the month before the interview were matched to their chosen facility, thereby enabling quality indicators to be linked to those individuals. In this study, I integrated the quality scores into the BIA computation, thereby enabling the estimation of quality-adjusted subsidies for PHC.

Results showed that the distribution of subsidies for public PHC facilities became less 'pro-poor' and subsidies for private PHC facilities became more pro-rich after accounting for quality of care. While the magnitude of the difference between the distributions of quality-adjusted and unadjusted subsidies was not large in this instance, the gap between the two distributions is likely to be underestimated since the data contained important limitations such as the small health facility sample size. A key contribution of the study was to advance methods in the field, that can in turn be applied and tested by other researchers seeking to assess whether integrating quality of care into BIA affects the level of inequality in the distribution of public health expenditure.

9.2 Contribution to knowledge

Data linkage and the measurement of quality of care

In papers 1, 2 and 4, individual and facility data on quality of care have been carefully linked. In paper 1, the linkage was done at the community level (i.e. individuals were linked to the facilities available in their community) and in papers 2 and 4, it was done at the individual level (i.e. individuals were linked to the facility they actually visited). This data linkage represents a major strength of these analyses since it enabled the direct estimation of quality of care in the facilities that individuals accessed. Although the quality of care measured at the facility level is a proxy for the quality of care that a patient actually receives, it provides an important contribution to the current literature. Specifically, in most studies, data linkage is not possible at the individual level, since conducting a facility survey alongside a household survey can be resource-intensive. Instead, such linkage is done at a higher geographical level, such as the district level, which is likely to be an over-simplification that masks important variations in the quality of care that different individuals experience. For example, one recent study looked at the effect of the *Janani Suraksha Yojana* (JSY) program in India on multiple maternal and new-born health outcomes, and explored whether this effect varied depending on the pre-existing level of quality of care in health facilities where women gave birth (Andrew & Vera-Hernández, 2020). In their study, the authors used district-level measures of quality of care. Although these aggregate measures can be reflective of the average capacity of the health system at the district-level, they might not reflect the quality that the woman actually received, which strongly influences health outcomes. In studies using choice models to analyse the effect of quality on provider choice in LMICs, quality information is necessary for every single health facility option in the defined choice set of an individual; or in other words, the linkage between facility and individual data is critical to the analysis. Due to data limitations, choice models often rely on aggregate measures of quality at the district level (Akin, Guilkey, & Denton, 1995; Mariko, 2003; Sahn & Younger, 2002), which can lead to a biased estimate of the effect of quality in provider choice. As a last example, the only study that has integrated measures of quality into the BIA framework, weighted benefits received using district-level measures of quality, which again (as the authors note) can lead to a biased estimate of the quality of care that individuals actually receive (Asante, Man, & Wiseman, 2020).

As quality of care continues to gain momentum in the UHC debate, I was able to undertake a more comprehensive and robust assessment of the care that people received by linking utilisation and quality of care data. In Chapter 1, the linkage of individuals to the facilities available in their community led to a better understanding of the availability of quality care to Indonesians. In chapter 2, I was able to integrate quality of care measures into provider choice models, where quality is rarely considered despite it being recognised as an important determinant of seeking care. In Chapter 4, the consequence of linking individual and facility data is important since not only does it provide a more accurate picture of the care that people received, but also ultimately it enabled the integration of quality of care into techniques such as BIA that have traditionally overlooked this important dimension of UHC.

Going beyond structural measures of quality of care to integrate process measures into the monitoring and evaluation of UHC

In papers 1 and 2, I used two measures of quality of care, namely a facility SSR score (capturing structural elements of quality), and a process quality score based on clinical vignettes (capturing provider clinical knowledge). Kruk et al conducted an assessment of health system quality indicators used in global, cross-national and national surveys from LMICs; they found that the foundations of care was the major focus of these surveys and that 'inputs, such as tools and workforce, were the most commonly assessed subdomains and formed the entirety or bulk of the SARA, Service Delivery Indicators, and Service Provision Assessments' (Kruk et al., 2018). However, the main issue with structural quality measurement is that it is shown in many settings to be poorly correlated with other dimensions of quality of care (Leslie, Sun, & Kruk, 2017). Kruk et al concluded that the available measures of quality do not promote accountability for high quality care, are insufficient to assess health system performance, and are inadequate for holding the system accountable for the user experience or for the effect on impacts that matter to people (Kruk et al., 2018).

In paper 1, the inclusion of provider knowledge provides a richer understanding of inequalities in the distribution of qualified health care workers across Indonesia. Among those studies exploring inequalities in the quality of care, very few have focused on quality care beyond structural measures (Binyaruka, Robberstad, Torsvik, & Borghi, 2018; Das & Hammer, 2007; Das & Mohpal, 2016; Fink, Kandpal, & Shapira, 2019; Kovacs et al., 2021; Leonard & Masatu, 2007). In paper 2, I sought to understand which elements of quality individuals are responsive to. Previous studies looking at the effect of quality on provider choice in LMICs have focused on structural aspects of quality (K Hanson, Yip, & Hsiao, 2004; Sahn & Younger, 2002; Skordis-worrall, Hanson, & Mills, 2011; Wellay, Gebreslassie, Mesele, Gebretinsae, & Ayele, 2018). By including provider knowledge as a measure of quality, papers 1 and 2 contribute to a better understanding of the inequalities in quality of care in Indonesia, as well as what dimensions of quality are important to patients when choosing their provider.

Generation of new evidence on the impact of the JKN

This thesis evaluates the impact of the JKN on health care utilisation and on financial protection, providing robust evidence on the state of UHC in Indonesia. This impact evaluation was conducted four years after the start of the JKN, and therefore at the time of the study, the SHI system was fully functioning with potential to show impact. It is also the first evaluation to establish the causal impact of the JKN on financial protection. So far, only one study established a causal effect of the JKN on utilisation (Erlangga, Suhrcke, Ali, & Bloor, 2019). However, these authors used data from 2014, the year in which the JKN was just being rolled out, therefore leaving little time for the JKN to display its full effects. Additionally, they did not disaggregate outpatient care by type of provider. Nor did they explore the causal impact of the JKN on financial protection. Since one of the major objectives of the JKN was to protect the insured from the financial burden of health care costs by reducing OOP health care payments, evidence on how the country is progressing was well overdue. Through the combination of a strong study design and the use of recent panel household data, I was able to address an important evidence gap in the Indonesian policy context.

I found that overall, JKN membership led to a 0.69% point increase in the probability of using outpatient services in public hospitals, and to a 1.7% point increase in the probability of using inpatient care. Regarding financial protection, JKN membership had a protective effect against OOP payments for outpatient services (7.4% point decrease compared to the control group), but no protective effect was identified for inpatient care. Significant progress has been made in a short period of time, but a lot remains to be done to ensure that OOP payments do not occupy a large share of health financing among the poor in Indonesia.

9.3 Limitations

This thesis contains several limitations that are worthy of note.

Generalisability: none of the IFLS or ENHANCE surveys are representative of all Indonesian provinces, and therefore cannot produce national estimates. IFLS 5 and ENHANCE surveys excluded most eastern Indonesian provinces (covering the provinces of East Nusa Tenggara, Maluku, North Maluku, West Papua and Papua)[7], which are considered to be less developed than many western provinces (World Bank Group, 2020). A recent comprehensive study of the Indonesian health system showed that the poorer provinces of eastern Indonesia (East Nusa Tenggara, Maluku, Papua) have the highest health needs and insurance membership, but the lowest levels of service use, OOP spending and insurance claims (Pratiwi et al., 2021). In this eastern part of Indonesia, only a quarter of villages have easy access to a hospital in contrast with 93% in Java and Bali (Pratiwi et al., 2021). This has important implications for the findings from my PhD. First, the extent of inequalities in both readiness and knowledge scores are likely to be underestimated since in these provinces, the level of quality of care is likely to be poorer than observed in the IFLS sample of facilities (Paper 1). Second, in terms of the impact of the JKN on health care use and financial protection (Paper 2), it is likely that the impact has been overestimated since coverage is unlikely to translate into increased health utilisation in places where the supply of health services is limited. Third, the difference between the traditional BIA method and the quality-weighted BIA method is likely to be underestimated since excluding the provinces where quality of care is known to be particularly low will bias the quality-weighted BIA towards a more equitable health system than is likely to be the case (Paper 4).

One needs to be cautious in generalising beyond the study setting. That said, findings from this thesis might have relevance to other settings. For example, it is plausible and reasonable that results from paper 2, suggesting that patient choice is driven by observable quality and less so by provider knowledge, are generalizable to other study settings. Results from paper 3 align with other studies showing that the impacts of SHI on financial protection can be disappointing – possibly due to substantial cost-sharing (Erlangga, Ali, et al., 2019). Paper 4, as a methodological piece, will encourage debate and may be tested in other settings where there may be better data on quality of care for BIA.

Other dimensions of quality of care: Quality of care is a multidimensional concept. By focusing on facility readiness and knowledge scores, other important aspects of quality

[7] These provinces include some of the most remote and less densely populated areas of Indonesia, which would make data collection highly resource-intensive.

such as patient satisfaction, clinical processes and health outcomes were not captured due to a lack of data. Health outcomes are often difficult to measure and depend on patient adherence, and patient responses to treatment (Peabody, Taguiwalo, Robalino, & Frenk, 2006), and are subject to confounding, as health outcomes are determined by a very large number of socio-demographic factors (Marmot, 2005). The measures of quality used in this study had their own limitations. First, some recent studies have shown that structural quality is not always closely correlated with process quality and health outcomes (Leslie et al., 2017). Second, the use of vignettes has been questioned due to the gap between provider knowledge and provider practice, also known as the "know-do gap" (Das & Leonard, n.d.; Leonard & Masatu, 2005; Mohanan, Vera-hernández, Das, Giardili, & Seth, 2015; Rethans, Sturmans, Drop, Vleuten, & Hobus, 1991). Also, it was assumed that the provider competence score measured with vignettes on selected health providers is representative of the competence of all providers at one facility, which might not be the case. While careful interpretation is needed when using readiness and knowledge scores as proxies for "quality", they are nonetheless widely recognised as important prerequisites for the provision of good quality health care (World Bank Group, 2020).

Other dimensions of inequalities: In this thesis, inequalities were primarily measured with regards to SES, proxied with consumption and asset indexes. However, inequalities can be measured in much broader terms, notably with regards to gender. Recently, a series of articles were published on women's health and gender inequalities, commissioned by the *BMJ* and co-authored by researchers from the United Nations University-International Institute for Global Health (UNU-IIGH) and the WHO (Amin, Remme, Allotey, & Askew, 2021). The series showed that progress towards UHC requires financing systems that ensure women have access to equitable, appropriate, affordable and quality health care throughout their lives. In particular, the authors argue that when health care is linked to employment status (through payroll contributions for example), women's access to health care can be threatened since they face more employment insecurity (Vijayasingham, Govender, Witter, & Remme, 2020). Therefore, this thesis could have been further strengthened by analysing the gender gap in access to high quality care in Indonesia. While this was beyond the scope of the thesis, future studies in this field could benefit from incorporating gender into their assessments of inequality.

Qualitative methods: My research is likely to have benefited from the use of qualitative methods, to help unpack the complex nature of quality of care and health seeking patterns in the different studies. Specifically, a qualitative component would have been helpful in gaining a more in-depth understanding of the determinants of provider choice (Paper 2), by for example exploring patient perceptions of quality of care. In Paper 3, a qualitative component including interviews with JKN members and health care providers would have provided useful insights into the reasons for enrolling (or not) into the JKN and the perceived benefits of doing so. This in turn would have enabled an assessment of the extent of selection bias in the analysis. While the sub-discipline of health economics is firmly rooted in quantitative methods, over the past decade there has been a strong move towards integrating qualitative approaches (Coast & Allegri, 2021). In particular, health-financing interventions rely on multiple actors, and aim to generate change at the health system level, and therefore qualify as complex interventions that are difficult to monitor and evaluate using exclusively quantitative methods. It is now recognised that qualitative methods can provide important insights in the field of health economics and health financing. In this thesis, I was not in a position to pursue such methods since I was already learning and applying a number of new quantitative methodologies including econometrics methods and inequality measures, however their value is well recognised.

Addressing causality:

In most tests of economic theory, and certainly for evaluating public policy, the economist's goal is to infer that one variable has a causal effect on another variable. Simply finding an association between two or more variables might be suggestive, but association does not imply causality (Wooldridge, 2012). While randomized experiments, such as randomized controlled trials, are considered the "gold standard" for causal inference, manipulation of the independent variable of interest is often unfeasible, unethical, or impossible (Rohrer, 2018). Sources of endogeneity often prevent the establishment of causality, i.e when an explanatory variable in a multiple regression model is correlated with the error term, therefore violating one of the fundamental assumptions for an unbiased parameters' estimate in a basic linear regression model. There are potentially three sources of endogeneity of explanatory variables (Wooldridge, 2012). First, when one or more explanatory variables are omitted, the causal effect of other observed explanatory variables cannot be assessed since the omitted variables would need to be held constant.

This leads to correlation between the error term and the observed explanatory variables, biasing the estimated coefficients. Second, measurement error where one or more explanatory variables are measured incorrectly, can also bias the estimated coefficients and the only way to address this issue is to collect more accurate data. Finally, an important form of endogeneity of explanatory variables is simultaneity. This situation arises when one or more of the explanatory variables are jointly determined with the dependent variable, through an equilibrium mechanism (Wooldridge, 2012). The issue in this situation is that it is practically impossible to vary both variables exogenously and therefore assess the causal effect of each variable on the other, which leads to endogeneity and biased estimates (Wooldridge, 2012).

Papers 1 and 2 of this thesis present associations. While I showed that the mean level of SES in a defined geographical area is correlated with the mean level of quality of care, and that quality of care can have an effect on provider choice, these associations are not to be interpreted in a causal way, as assessing causality was not the purpose of these studies. Paper 3, however, does try to address endogeneity by using quasi-experimental methods to assess the impact of health insurance on various health outcomes; as propensity score matching combined with difference-in-differences has been shown to provide unbiased estimates on the condition that the parallel trend assumption holds (Abadie, 2005). This approach assumes that the average treatment-free outcome for the treatment and the control groups would have followed parallel trends over time, which is ultimately untestable. As it is conceivable that time-varying unobserved characteristics or transitory shocks affected the parallel trends assumption, there is a potential threat to the estimates of the impact of the JKN.

9.4 Implications for policy

Need for quality improvement in Indonesia, and greater emphasis of UHC reforms on the remote and poorest regions of the country

Countless studies and reports have emphasised that there are still many regions in Indonesia where health care services do not meet the needs of communities (Pratiwi et al., 2021; World Bank Group, 2020). This affects especially marginalized groups such as poor people and residents of remote areas, creating substantial inequalities in access to health care. In these regions, the availability of health facilities, technology and personnel who can provide specialist medical services, remains limited. As a result, many poor people who become JKN participants cannot access care because of a lack of adequate health facilities to meet their needs. Results from this thesis show that beyond coverage, access to high quality services is also a challenge in Indonesia, highlighting the need for continued efforts in improving quality of care, especially in disadvantaged areas. There are several potential ways in which this can be achieved.

First, there is a need to prioritise investment and budget allocation for PHC. Under-funded PHC can result in poor quality care and patients bypassing PHC to access hospital care. Recently, the Lancet Global Health Commission on Financing Primary Health Care has emphasized the central role of PHC in health systems in improving health outcomes worldwide (Hanson et al., 2022). Authors identify five key principles: 1) public resources should provide the core of PHC funding, 2) pooled funds should be used to allow all people to receive PHC that is provided free at the point of use, 3) resources for PHC should be allocated equitably across levels of service delivery and geographic areas, and 5) PHC provider payment mechanisms should support the allocation of resources based on people's health needs, create incentive environments that promote people-centred PHC and foster continuity and quality of care. In Indonesia, between 2014 and 2016, almost 80% of BPJS annual spending went into secondary and tertiary services, mostly for chronic diseases treatment that should be prevented at the PHC level (Sutarsa, Prastyani, & Al Adawiyah, 2020). The Ministry of Health needs to invest in PHC and make it the backbone of the health care system as it has the potential not only improve quality but also to redress current geographical and socio-economic inequalities in access to high quality care in Indonesia.

Second, there is a need to strengthen the accreditation process. Since the birth of the JKN, the BPJS-Health agency has been responsible for awarding and renewing the accreditation of primary care organizations available to JKN members. The reality is that accreditation is only a formality in public health facilities, as they must participate in the JKN programme whatever their quality status is (Honda, Mcintrye, Hanson, & Tangcharoensathien, 2016). In the private sector, encouraging providers to join the JKN has the potential to raise the quality of private PHC facilities by requiring them to meet the initial accreditation standards at the time of joining. Furthermore, the current accreditation standards are focused greatly on structural aspects rather than processes of care or health outcomes. Incorporation of these other dimensions of quality of care into the accreditation of health facilities in Indonesia would help address quality in a more comprehensive way.

Third, provider payment mechanisms could be modified to promote a higher level of quality. Health financing provides the best lever to integrate both the public and the private sector into the quality of care regulatory environment, by establishing payment systems that incentivise health facilities to raise their standard of care. At the secondary care level, this could be done by adjusting the INA-CBG rates depending on quality gaps, therefore making infrastructure investment more attractive. At the primary care level, combining capitation with other payment mechanisms, such as performance-based payments for specific activities, could enable additional quality objectives to be achieved. One initiative has been in place for primary care in the *Dana Kapitasi Khansus* policy, where a higher capitation rate for primary care is paid in remote districts (Sambodo, Van Doorslaer, Pradhan, & Sparrow, 2021). However, there is currently no indicator of performance for primary care services.

Providing information on quality of care can enable patients to make more informed choices about which provider to visit

It is promising that individuals are likely to respond to quality improvement, as demonstrated in Chapter 6 where facility readiness was found to be a determinant of provider choice. There is some evidence that poor quality of care remains a fundamental barrier to individuals seeking out quality care (Bjorkman & Svensson, 2009; Björkman & Svensson, 2017). Results from this thesis suggest that structural aspects of quality – such as the availability of medicines – is more easily observed and patients are able to judge what is good and poor quality in relation to this dimension. By contrast, provider competence is not directly observable, and patients are unlikely to have the expertise to evaluate the clinical performance of doctors.

A greater emphasis on providing information on quality of health care providers in Indonesia would help patients make more informed choices and to maximise their probability of a good health outcome. Currently, JKN members must register with a public or private primary care provider within three months of becoming a member. In an effort to further expand membership and improve services, BPJS-Health launched 'Mobile JKN', a mobile application that allows people to register, view billing information, pay monthly contributions, select or change the primary health care provider, set appointments with health care providers, and file complaints, using their cellular devices (International Labour Office, 2020). In 2018, the highest utilisation of the app was for selecting and switching the PHC provider (around 80,000 to 160,000 transactions per month). Providing information on quality through this app could be a first step towards enabling patients to make informed choices.

OOP spending remains a major barrier to the pursuit of UHC

Overall, the introduction of the JKN in Indonesia has been a major step forward in the pursuit of UHC. Significant progress has been made in a short period of time, but a lot remains to be done to ensure that OOP payments are curbed. In 2019, the amount spent on OOP payments (IDR 157.5 trillion) was still bigger than the amount of money spent by the JKN in absolute terms (IDR 113.3 trillion) (Maulana, Soewondo, Adani, Limasalle, & Pattnaik, 2021). While the introduction of the JKN has led to an increase in the portion of public spending from 32.1% of total health expenditure (THE) in 2013 to 52.1% in 2019, OOP spending still comprised 32.2% of THE in 2019 (data.worldbank.org).

Findings from this thesis confirm that JKN members are still incurring high levels of OOP spending for health care. It was particularly the case for inpatient care, where the JKN did not have a protective effect in terms of probability of incurring OOP spending. Although my research was not able to identify the drivers of OOP spending, findings from the ENHANCE study found that OOP payments were progressive- meaning that the share of OOP payment was disproportionally affecting the richest segment of the population (Cheng et al., 2022). This could be interpreted in two ways, not necessarily in a mutually exclusive manner. First, it is possible that the poor are not seeking care because of their inability to pay, implying unmet need. The ENHANCE study did not collect data on unmet need and therefore is not in a position to assess the role this plays in the progressivity of OOP payments. Second, progressive OOP payments may be because the rich pay more OOP for more comfortable services (hotel type services), as JKN enables participants to upgrade their hospital class to "VIP class". In Indonesia participants pay only the difference between their existing entitlement and the VIP price (Honda et al., 2016). Not only does this increase the reliance on OOP spending overall, but also it ultimately makes the system more inequitable as the rich will obtain more benefits through increased access to high-end technology.

One promising option to curb OOP payments is to harness the growing private sector by contracting private hospitals where a large proportion of OOP spending is incurred, and by contracting private health facilities where only 16.8% of JKN members are registered (Maulana et al., 2021). Contracts between BPJS and hospitals are based on a prospective payment system in which INA-CBG rates do not fully reflect actual hospital rates. INA-CBG was set by government and does not differentiate between public and private hospitals. Some private hospitals have tariffs that are much higher than INA-CBG figures and this makes some private hospitals reluctant to cooperate with BPJS (Honda et al., 2016). Concerns have been raised that the INA-CBG payment rates are inadequate to meet health care costs, which could also drive providers to charge co-payment to patients (Cheng et al., 2022; Maulana et al., 2021). As capitation and INA-CBG payment rates have not been adjusted since the inception of the JKN in 2014, the Indonesian government should review these rates to ensure that JKN members are fully protected. Reviewing the INA-CBG tariffs would ensure they reflect the true cost of service delivery and incentivise more private participation in the delivery of health care to JKN members. Second, revising the INA-CBG payment system also has the potential to improve quality of care. There is currently no ceiling on the budget for hospital claims by INA-CBG; this leads to a high level of inefficiency and health care costs since there is no incentive for hospitals to reduce readmission rate (Honda et al., 2016).

Previous studies have also hypothesized that insured patients are more likely to seek services that are not fully covered, including branded medicines, laboratory tests and specialist consultations without referral (Pratiwi et al., 2021). Overall, contracting with private providers, revising current payment systems and promoting the use of generic drugs are likely to be efficient measures to reduce OOP spending in Indonesia.

9.5 Implications for data and research

Need for routine data collection on quality of health care in Indonesia and other LMICs

One of the challenges of accounting for quality of care in UHC measurement is the lack of adequate data from LMIC settings on quality measures (Akachi & Kruk, 2017). Incomplete and unreliable quality data are common, and they often poorly capture process and outcome measures of care. Researchers often rely on secondary datasets made available through global agencies such as the WHO, World Bank or United States Agency for International Development (USAID). The IFLS, for example, is conducted by the RAND Corporation and incorporates various indicators, including structural and process indicators, which can be used to assess quality of care. However, the facility sample includes only a fraction of health facilities that individuals visited in the previous month, leading to an incomplete picture of the quality of care that people receive. In terms of quality indicators, measures of quality of care remain limited in this survey and there is no measurement of the actual clinical quality of care given to patients for example. Also, SSR indicators do not overlap perfectly with major surveys such as the Service Provision Assessment (SPA), which undermines comparability with other studies and settings. Although process measures are collected through clinical vignettes, only four conditions are represented and patient experience is not captured, despite the latter being a crucial aspect of treatment adherence and follow-up visit (Akachi & Kruk, 2017). Moreover, the latest round of data collection was in 2014-2015.

The routinely collected measures of quality of care that can be linked to individuals are needed to enable a more comprehensive understanding of pathways of care. These indicators can be collected through facility surveys and routine health information systems. Integrating the patient experience into measures of quality would enable better patient-centred care. Routine health information systems as well should be strengthened to collect accurate health outcomes data that can be used to track quality over time and to evaluate improvement efforts. Ideally, the collection of quality data should be at the national level and include the entire health system. Not only would this help track progress but it would also be more efficient since multiple surveys linked to individual projects is not only inefficient but can also lead to fatigue among survey respondents.

Going forward, there are two potential ways in which quality of care data can be generated. Introducing P4P schemes can be an effective opportunity to generate data on quality of care. P4P involves 'the allocation of funds to health facilities and to health workers based on the achievement of performance targets related to service utilisation and quality of care. It is expected that health workers will respond to financial incentives by being more motivated to deliver quality care and attract patients to the facility (Binyaruka et al., 2015). Although evidence on the effect of P4P on quality of care is mixed, it does at least generate data on quality of care that can be important for accountability (Witter, Fretheim, Kessy, & Lindahl, 2012). Second, the introduction of SHI can also be the lever to gather data on quality of care by making reimbursement conditional on providing such data.

Measurement of UHC should include *effective* coverage with high quality care for *everyone.*

Large geographical inequalities in the availability of high-quality care exist in Indonesia and supply-side constraints seriously limit access to quality care. From a measurement perspective, insurance coverage does not necessarily translate into effective coverage in this context. Without equal access to high quality services, indicators of patient registration, health care utilisation and financial protection will not provide accurate measures of the success of the JKN. Recently, Wagstaff and Neelsen assessed the state of UHC in 111 countries using a UHC-index comprising measures of service coverage (encompassing both preventative care and curative care indicators), financial protection, and socioeconomic inequality in service coverage (Wagstaff & Neelsen, 2020). However, the authors did not include any measure of quality of care, potentially overestimating the state of UHC worldwide. Quality should be at the core of any UHC initiative, alongside coverage and financial protection. Progress towards UHC should be tracked through *effective* coverage, defined as access and coverage of high quality health services.

Potential research questions for future studies

Given the gaps in knowledge emerging from this thesis, I am well positioned to suggest potential topics to be addressed in the future, both for the Indonesian context and for other countries on their path to UHC. First, there is a need to understand if the incidence of OOP payments is driven by unmet need for health care by the poor. Embedding a module of unmet health care needs in the existing national household surveys, especially the

SUSENAS, would facilitate regular monitoring. Second, an evaluation of whether a higher INA-CBG rates leads to improved quality of care and reduced OOP payments could be explored in Indonesia. At a time where INA-CBG rates are to be revised, the opportunity for research is important. Third, an evaluation of whether giving public information on the quality of care delivered by different providers leads to changes in care seeking behaviour and outcomes would be valuable in the Indonesian context. Finally, developing better measures of quality of care in the Indonesian context would be helpful to track progress to UHC. Currently measures of quality of care do not include most dimensions of quality, including patient experience. Qualitative research could help inform what people value and what matters to them. Such research could in turn inform the development of future quality of care surveys and indicators.

10 Conclusion

Using various methods popular in the field of health economics, this PhD aimed to measure and assess the socioeconomic inequalities in access to high quality health care in Indonesia. I found that despite strong progress towards UHC, access to quality and affordable care still needs to be improved. Following the introduction of the SHI program in Indonesia, health care utilisation has increased, but financial protection lags behind despite being at the core of UHC. This thesis has highlighted the urgent need to monitor more closely the 'quality gap' in health care, as well as to ensure that the reliance on OOP payments decreases in the overall share of total health expenditures in Indonesia and other LMICs. The Covid-19 crisis has put health systems like Indonesia's under enormous pressure. Tracking financial protection and quality of care, especially that which is available to the poor, is an essential component of building stronger and more resilient health systems in the future.

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Supplementary files

APPENDICES

Appendix 3.1 : First author publication

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RESEARCH

Open Access

Poor quality for the poor? A study of inequalities in service readiness and provider knowledge in Indonesian primary health care facilities

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Abstract

Background: For many low and middle-income countries poor quality health care is now responsible for a greater number of deaths than insufficient access to care. This has in turn raised concerns around the *distribution* of quality of care in LMICs: do the poor have access to lower quality health care compared to the rich? The aim of this study is to investigate the extent of inequalities in the availability of quality health services across the Indonesian health system with a particular focus on differences between care delivered in the public and private sectors.

Methods: Using the Indonesian Family Life Survey (wave 5, 2015), 15,877 households in 312 communities were linked with a representative sample of both public and private health facilities available in the same communities. Quality of health facilities was assessed using both a facility service readiness score and a knowledge score constructed using clinical vignettes. Ordinary least squares regression models were used to investigate the determinants of quality in public and private health facilities.

Results: In both sectors, inequalities in both quality scores existed between major islands. In public facilities, inequalities in readiness scores persisted between rural and urban areas, and to a lesser extent between rich and poor communities.

Conclusion: In order to reach the ambitious stated goal of reaching Universal Health Coverage in Indonesia, priority should be given to redressing current inequalities in the quality of care.

Keywords: Inequalities, Quality of care, Universal health coverage, Health insurance, Indonesia

Background

In line with the Alma Ata declaration in 1978, health policymakers have long focused on improving access to health care, particularly in deprived areas [8]. However, disparities in health outcomes remain wide [2, 29] and it has become increasingly clear that poor quality of care stands in the way of improved access translating into better health [7]. The Lancet Global Health commission argued that a high quality health system should exhibit an "absence of disparities in the quality of health services between individuals and groups with different levels of underlying social disadvantage" [17]. However, evidence on the inequalities in quality of care remains scarce. Although a few studies have shown that poorer groups are more likely to receive lower quality care [4,

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17], questions remain regarding the underlying drivers of these inequalities. Das et al. laid out three ways in which inequalities in the quality of care can arise [8]. First, inequalities can occur when health facilities located in poor communities provide worse quality compared to health facilities located in richer communities (e.g. inadequate infrastructure, unqualified providers, etc.). Secondly, inequalities can arise when individuals of higher socio-economic status (SES) access and utilise better health services compared to poorer individuals. Travel costs and price of health services can be significant determinants of access to quality services, affecting people of varying SES differently. Finally, inequalities may arise when a health worker provides different health services based on the patients' SES (e.g. fewer procedures, fewer diagnostic tests, smaller consultation time).

This study focuses on the first aspect by measuring the extent to which health facilities located in poor communities provide lower quality compared to health facilities located in richer communities, which we refer to as 'inequality in the availability of quality services'. Relatively few studies have looked at this type of inequality, perhaps reflecting the rarity of having data on both quality of care and catchment population SES in the same geographical area. The available studies indicate consistent evidence that areas with low SES tend to be served by providers with lower competence [5, 9, 11, 14, 16, 18] and by facilities with limited equipment and infrastructure [25, 26].

In Indonesia, the population of nearly 276 million individuals is scattered across approximately 6000 islands and the health system is highly decentralised. Ensuring that everyone has access to quality care is a challenging goal in such a context. Recently, the World Bank conducted an assessment of a nationally representative sample of 686 Indonesian public and private primary health care facilities. This report highlights significant gaps in the readiness of primary health care facilities to deliver a basic level of quality of care [33]. While quality of care is reported to be a nationwide problem, large geographical inequalities in the quality of care have been reported. Variations in health outcomes between provinces remain significantly large: in the eastern provinces of West Papua, Papua, Central Kalimantan, Central Sulawesi, and Maluku, the maternal mortality ratio (MMR) is above 200 per 100,000 live births; but Jakarta capital city region, Jambi, West Java, Bali, and Lampung have MMRs below 100 [32]. Only one study has analysed the extent of inequalities in provider knowledge across different wealth groups [3]. They found no significant differences across wealth groups in performance for curative care, however, for prenatal care, the poor had access to health care providers with scores 5.9 percentage points higher than those of providers available to the wealthiest patients. This study, which is now more than a decade old and uses data from 1997, is no longer up to date.

So far, studies of inequalities in quality of care in Indonesia have almost exclusively focused on the gap between islands and between urban and rural areas. Additionally, most of these studies have focused on structural aspects of quality, with limited consideration of clinical processes of care. Given Indonesia's significant reforms designed to ensure financial protection to all members of the public, it is essential that progress in terms of equitable availability of high quality care is assessed. The aim of this study is to understand the extent of inequalities in quality of care beyond the provincial and rural/urban divide, and to present evidence on socio-economic inequalities in the availability of quality care at public and private primary health care facilities in Indonesia.

Methods

Policy context in Indonesia

In 2014, Indonesia took a significant step towards Universal Health Coverage by implementing a comprehensive national social health insurance scheme known as the Jaminan Kesehatan Nasional (JKN) to address growing disparities in health-care and to make comprehensive health care available to its entire population [22]. The JKN brings together all major existing health insurance schemes under a single agency - the Social Security Agency for Health (BPJS Health) - which was made mandatory for all Indonesians. JKN members must register with a primary care provider within 3 months of becoming a member, and can choose to register with either a public or a private provider contracted with BPJS-Health. Indonesia has made significant progress in JKN coverage, which has increased from 46.5% of the population in 2014 to 85% in March 2021, representing 223 million people (https://bpjs-kesehatan.go.id). This makes the JKN one of the biggest single payer health systems in the world.

In Indonesia's public sector, primary health centres or "puskesmas" form the backbone of the system, with catchment areas of 25,000–30,000 individuals. The number of puskesmas has been gradually increasing since the late 1960s as the central element in the government's efforts to improve access to primary health care. In 2014, there were 9731 puskesmas, which provide a set of mandatory services and tasks that include curative, rehabilitative, preventive and promotive services delivered within the facility and through outreach programmes [35]. Puskesmas are linked to a network of auxiliary health centres, called "pustu", that provide community outreach services in remote areas.

The role of the private sector is important in Indonesia; two thirds of outpatient care and about one-half of inpatient care are provided by the private sector [33]. The private primary health care sector is diverse, and no systematic information is available at the central level on their number and distribution. Delivery of primary health care is provided in the great majority by private clinics, private physicians, and private dentists. Private midwives and nurses are also permitted to run their own clinics. Latest figures show that 42% of private clinics, 60% of private hospitals and 14% of private general practitioners are contracted with BPJS-Health to provide services to JKN patients [1].

Data and sample

We used the Indonesian Family Life survey (IFLS) 5 in this study. The fifth wave of this survey was fielded in 2014/2015 and contains information from 16,931 households living in 312 communities (enumeration areas) from 13 provinces, and is representative of 83% of the Indonesian population. An interesting feature of the IFLS is that the household survey can be linked with a health facility survey, containing detailed information on private and public primary health providers located in the same communities. The term "community" in the IFLS refers to the primary sampling unit. We used the IFLS data to link, at the community level, information on households' SES with information on the quality of their local primary health care facilities.

The IFLS facility survey contains data on 959 primary public and 2544 private health care providers in the IFLS communities. The provider survey sampling frame was drawn from information reported by households on local providers they knew about within their communities. The list was not restricted to facilities that the respondents used, thus avoiding potential biases associated with a choice-based sample. Health facilities were divided into two strata: one stratum of public primary health facilities, including health centres (puskesmas) and sub-health centres (pustu), and one stratum of private primary health facilities, including private clinics, individual practices of general practitioners (GP), and nurses/midwives practices. Within each stratum, up to five private facilities and three public facilities were selected, reflecting typically higher numbers of private providers. A description of the two surveys can be found here: https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS/ifls5.html

Measures of quality

We used two measures of quality of care in this study: one is a supply-side readiness score used as a proxy for structural quality, and the other is a provider clinical knowledge score used to proxy clinical process quality [12].

The choice of indicators to measure supply-side readiness was informed by the Service Availability and Readiness Assessment (SARA) tool [34]. Among the many indicators collected as part of the SARA survey, the *"general service readiness"* section collects information on the potential of health facilities to provide basic health care interventions. The overlapping indicators between the IFLS provider survey and the SARA general service readiness section were identified (more than 80% of SARA indicators were found in the IFLS provider survey). The SARA indicators were then classified into five general service readiness domains (basic amenities, basic equipment, infection prevention, essential medicines and diagnostic capacity) and coded as binary variables, 1 indicating the presence of the item as reported by the provider and 0 otherwise. The full list of indicators is summarised in Appendix 1. For each domain, the percentage of items available was computed at the facility level, and the unweighted mean across the five domains was generated as an overall facility readiness score.

We developed a knowledge score using provider responses to medical vignettes, representing four different cases: an adult presenting with cough and fever, an adult presenting with diabetes, a child presenting with diarrhea and vomiting, and a pregnant woman coming for antenatal care. For each vignette, the provider who has trained in the related field and receives most of the corresponding cases in the facility was eligible to answer the questions – this meant that the provider responding to each vignette could vary within a health facility. If the facility did not provide the service corresponding to the vignette, the corresponding score was coded as a missing value. After the clinical case was described, the provider was asked what questions or activities they would ask or perform for history taking, physical examination, laboratory tests, and follow-up recommendations. Responses were either mentioned spontaneously or prompted against a prepared list of options. Not all the options were considered good practice and the correct answers were coded based on international guidelines. Details about the criteria are listed in Appendix 2. For each vignette, the percentage of correct criteria the provider mentioned without prompting was computed, and the unweighted mean across the four vignettes was generated as an overall facility knowledge score.

Measuring community socioeconomic status

Using the IFLS household survey, the monthly household consumption was computed based on food consumption, non-food consumption, durables, education and housing expenditures, and the per capita consumption was derived by dividing total household consumption by household size. The SES of each community was computed using the mean per capita monthly consumption of households in that community. Finally, the 312 IFLS communities were divided into 5 equal SES quintiles (Q5 representing the highest SES quintile) based on their mean level of monthly household per capita consumption.

Analysis

Using the IFLS unique community code, each health facility was linked to the corresponding community level information such as the SES quintile, the mean level of monthly household per capita consumption and type of location (urban or rural). Two main outcome variables were considered for each facility: the readiness score, and the mean knowledge score across the four vignettes. All analyses were weighted using facility sampling weights.

Descriptive numbers of facilities of each type (Puskesmas, pustus, private GP practices, private clinics and midwife/nurse practices) were presented by community SES quintile, location (rural/urban) and type of provider (JKN/non-JKN provider). Readiness and vignettes scores were computed for each facility and were summarised by facility type.

For each facility type, we examined bivariate associations between the readiness and knowledge scores, and community SES group, location, island and provider type. To harmonize the sample sizes across provinces, we recoded the province variable into larger groupings of provinces. The following islands (=grouping of provinces) were considered: Central Java (including Central Java and Yogyakarta city provinces), West Java (including Jakarta city, West Java and Banten), East Java (including East Java province only), Sumatera (including Aceh, North Sumatera, West Sumatera, South Sumatera, Lampung and Bangka Belitung Islands provinces), Lesser Sunda islands (including Bali and West Nusa Tenggara islands), Kalimantan (including South Kalimantan only) and Sulawesi (including South and West Sulawesi). To assess the extent of the inequalities in quality of care, equity gaps were computed to assess any significant difference in mean quality scores between communities belonging to Q5 (richest) and Q1 (poorest). T-tests were performed to assess any significant difference in quality scores between facilities located in rural and urban areas, as well as between facilities providing (or not) services to JKN patients.

We conducted multivariate analysis to examine differences in quality with respect to SES when controlling for other known drivers of quality, using the following linear model:

$$q_{ij} = \beta_0 + \beta_1 w_j + \gamma X + \varepsilon$$

where q_{ij} is the readiness or knowledge score of facility i in community j, w_j is the main explanatory variable, i.e. the SES quintile of community j, X a vector of control variables and ε the error term. For both readiness and knowledge scores, the model was estimated separately for public and private facilities using OLS regressions. Standard errors were clustered at the community level. Covariates included variables known to influence quality: location of the facility (rural/urban), provider type (puskesmas or pustus for the public sector, and GP practices, clinics and midwife/nurse practices for the private sector), a binary variable depending on whether the facility offered care to JKN patients, island fixed effects,[1] and vignette dummies to control for the number and nature of the vignettes answered. In order to understand in more depth the drivers of inequality in readiness scores, the same regression model was estimated for each subdomain of the readiness score.

Results

The sample consisted of 2544 health facilities, among which 959 were public health facilities (671 puskesmas and 288 pustus) and 1585 were private (304 individual private practices, 195 private clinics and 1086 midwife or nurse practices). Table 1 describes how these health facilities were distributed across community SES quintiles, location (rural/urban), as well as whether these facilities provided services for JKN members. Within public health facilities, both puskesmas and pustus were equally distributed across poor and rich communities. However, puskesmas and pustus were both more likely to be located in urban areas. At the time of the survey, 97 and 88.5% of the puskesmas and pustus, respectively, were providing services for JKN patients. Within the private sector, higher level facilities (clinics and GP practices) were more likely to be found in richer areas than lower level facilities (midwife/nurse practices). Both private GP practices and clinics were also more likely to be located in urban areas, whereas midwife and nurse practices were equally distributed between urban and rural areas. Around 25% of private providers were providing services to JKN patients at the time of the survey.

In Table 2, the mean readiness and knowledge scores are presented by facility type. The overall readiness score varied between 53.5% in pustus to 83.2% in puskesmas. Scores of basic amenities and standard precautions for infection prevention were overall quite high across all facility types. However, basic equipment, availability of essential medicines and diagnostic capacity scores were

[1] We ran a robustness test by including 'province' fixed effects instead of 'island' fixed effects. Results were unchanged and therefore not shown.

Table 1 Descriptive statistics of sampled health facilities

	Public sector				Private sector					
	Puskesmas *N* = 671		Pustus *N* = 288		GP practices *N* = 304		Private clinics *N* = 195		Midwife/nurse practices *N* = 1086	
Community SES quintile	**N**	%	N	%	N	%	N	%	N	%
Q1 Poorest (mean $50)	139	21.7	49	17.4	42	15.2	9	5.5	261	28.4
Q2 Poorer (mean $62)	131	19.5	58	21.1	41	15.9	23	12.9	249	24.7
Q3 Middle (mean $75)	124	17.6	71	23.0	64	21.4	43	21.5	215	18.8
Q4 Richer (mean $91)	127	18.9	62	23.0	66	20.0	58	27.3	191	15.6
Q5 Richest (mean $142)	150	22.3	48	15.5	91	27.6	62	32.8	170	12.5
Type of location										
Urban	510	74.6	178	61	262	85.4	177	88.4	663	54.0
Rural	161	25.4	110	39	42	14.6	18	11.6	423	46.0
JKN provider										
yes	650	97.1	256	88.5	66	22.0	55	25.9	266	24.4
no	21	2.9	32	11.5	238	78.0	140	74.1	820	75.6

Table 2 Readiness and vignette scores by facility type

	Public sector		Private sector		
	Puskesmas *N* = 671	Pustus *N* = 288	GP practice *N* = 304	Private clinics N = 195	Midwife/nurse practices *N* = 1086
Basic amenities (%)	88.3	72.3	88.3	87.8	86.2
Basic equipment (%)	79.5	40.6	46.0	60.3	52.4
Standard precautions for infection prevention (%)	98.0	82.7	85.0	93.7	88.1
Diagnostic capacity (%)	69.7	14.3	18.8	35.8	20.3
Essential medicines (%)	80.7	57.7	58.5	60.9	46
Overall readiness (%)	83.2	53.5	59.3	67.7	58.6
Number of observations	*671*	*288*	*304*	*195*	*1086*
Curative for adults					
Quality score (%)	52.5	38.8	47.2	41.9	35.9
Number of observations	*667*	*288*	*287*	*181*	*831*
Curative care for adults with diabetes					
Quality score (%)	32.3	24.4	30.9	27.7	20.5
Number of observations	*652*	*162*	*241*	*153*	*277*
Curative care for children					
Quality score (%)	61.4	51.8	56.6	52.3	47.1
Number of observations	*666*	*285*	*272*	*174*	*917*
Prenatal care					
Quality score (%)	48.7	43.9	32.6	35.2	40.1
Number of observations	*657*	*238*	*86*	*115*	*816*
All vignettes					
Quality score (%)	48.8	41.4	44.7	40.1	39.3
Number of observations	*670*	*288*	*287*	*191*	*1082*

Table 3 Association between readiness scores and community quintile, location, islands, and provider type, by facility type

	Public sector				Private sector					
	Puskesmas N = 671		Pustus N = 288		GP practices N = 304		Private clinics N = 195		Midwife/nurse practices N = 1086	
Community SES quintile	Score	95% CI	Score	95% CI	Score	95% CI	Score	95% CI	Score	95% CI
Poorest	83.7	(81.0–84.5)	47.4	(44.5–50.4)	61.9	(58.6–65.1)	65.6	(57.7–735)	57.8	(56.5–59.1)
Poorer	84.0	(82.4–85.5)	49.0	(46.3–51.7)	61.6	(58.5–65.6)	74.4	(69.6–81.3)	56.9	(55.8–58.5)
Middle	84.5	(82.8–86.2)	53.6	(51.3–56.0)	59	(56.6–61.8)	71.1	(67.3–74.5)	59.4	(57.6–60.4)
Richer	84.7	(83.0–86.4)	56.7	(53.5–59.8)	59.2	(56.9–60.9)	64.6	(61.0–67.8)	59.7	(58.4–61.2)
Richest	80.9	(79.0–82.9)	61.1	(58.0–64.2)	57.4	(54.8–59.2)	65.6	(62.6–68.6)	60.7	(59.0–62.2)
Equity difference (Q5-Q1)	−1.8		12.6***		−4.4*		0.0		3.1**	
Type of location										
Urban	84.2	(83.3–85.1)	56.7	(54.9–58.4)	58.6	(57.4–59.9)	67.3	(65.5–69.1)	59.5	(58.7–60.2)
Rural	80.2	(78.7–81.9)	48.5	(48.7–58.3)	63.8	(61.2–66.5)	70.7	(63.4–77.9)	57.4	(56.4–58.4)
Difference	4.0***		7.9***		−4.8**		−3.4		−2.1**	
Island										
Sumatra	78.1	(76.2–80.0)	50.4	(48.3–52.5)	65.3	(61.8–68.8)	70.9	(67.7–74.2)	59.9	(58.7–61.2)
West Java	80.1	(78.4–81.7)	60.1	(57.4–62.9)	57.9	(56.0–59.8)	64.4	(61.9–67.0)	61.6	(60.4–62.8)
Central Java	89.7	(88.8–90.7)	59.8	(55.8–63.9)	57.9	(55.6–60.2)	70.4	(65.5–75.3)	59.8	(58.4–61.2)
East Java	87.1	(85.4–88.7)	55.4	(53.2–57.6)	56.8	(53.3–60.4)	77.5	(70.8–84.2)	60.1	(58.8–61.4)
Lesser Sunda Islands	80.1	(77.5–82.8)	46.9	(43.6–50.2)	60.3	(56.8–63.9)	71.0	(42.2–99.8)	51.7	(49.5–54.0)
Kalimantan	86.3	(83.5–89.1)	49.4	(43.4–55.4)	61.9	(51.4–72.5)	76.8	(0–100)	56.7	(54.0–59.5)
Sulawesi	82.3	(79.5–85.2)	49.6	(44.5–54.7)	63.8	(58.8–69.0)	66.9	(56.7–77.2)	55.2	(52.1–58.3)
KN providers										
yes	83.1	(82.3–83.9)	54.1	(52.7–54.6)	65.6	(63.1–66.1)	73.5	(70.5–76.5)	63.3	(62.4–64.2)
no	88.1	(84.7–91.4)	48.7	(45.1–52.3)	57.6	(56.4–58.9)	65.7	(63.6–67.8)	57.0	(56.2–57.7)
Difference	−5.0*		5.6*		8.0***		7.8***		6.3***	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

low. This was particularly the case in midwife/nurse practices, GP practices and pustus, where the diagnostic capacity was all below 50%. Availability of essential medicines was below 60% in all but puskesmas and private clinics. The overall level of providers' knowledge was quite poor, with an average knowledge score below 50% for all provider types. Variation was observed across vignettes; with the curative care for children vignettes scoring the highest and the curative care for adult with diabetes vignette the lowest. Substantial variation was observed across providers as well, with puskesmas performing best on overall provider knowledge (48.8%) and midwife/nurse practices performing the worst (39.3%).

Crude associations between facility readiness scores and community SES quintiles, location, islands and provider type are presented in Table 3. Inequalities in readiness scores were the greatest for pustus, where there was a 13 percentage-point difference in readiness scores between facilities located in quintile 1 communities and those located in quintile 5 communities, where the mean readiness score was the highest. Regarding the urban and rural divide, puskesmas, pustus and midwife/nurse practices located in urban areas were better equipped; this was especially the case for pustus. There was also substantial variation between islands; the readiness scores were generally highest in Java islands across all facility types. The biggest difference was seen between puskesmas located in Central Java and Sumatra, with an 11-percentage point difference in readiness scores. Private facilities that provided services to JKN patients had higher readiness scores than those that did not.

Crude associations between facility knowledge scores and community SES quintile, location, island and provider type are presented in Table 4. There was a slight inequality in the knowledge score with respect to community SES and location of puskemas, where those located in Q5 and in urban areas had on average better knowledge scores. There was no inequality in knowledge scores with respect to community SES and location for the other types of facilities. However, variations existed across islands, with the Java islands performing best in terms of knowledge scores. GP and midwife/nurse

Table 4 Association between knowledge scores and community quintile, location, islands, and provider type, by facility type

	Public sector				Private sector					
	Puskesmas $N=671$		Pustus $N=288$		GP practice $N=304$		Private clinics $N=195$		Midwife/nurse practice $N=1086$	
Community SES quintile	Score	95% CI	Score	95% CI	Score	95% CI	Score	95% CI	Score	95% CI
Poorest	46.7	(44.7–48.8)	38.8	(34.3–43.4)	46.6	(42.3–52.5)	37.1	(26.5–44.7)	38.8	(37.2–40.8)
Poorer	49.0	(46.6–51.4)	41.1	(36.1–44.1)	48.6	(46.3–55.5)	48.7	(40.3–52.6)	38.9	(37.0–41.0)
Middle	47.0	(44.8–49.5)	39.2	(37.4–43.8)	46.4	(41.4–48.9)	42.7	(38.7–49.5)	40.0	(37.6–42.1)
Richer	50.0	(47.5–52.1)	46.1	(42.0–48.8)	41.5	(37.2–45.7)	35.6	(31.7–40.2)	40.5	(38.5–42.4)
Richest	50.9	(48.8–53.2)	40.1	(36.6–44.9)	42.8	(38.8–45.9)	38.3	(34.5–42.8)	39.9	(36.5–40.9)
Equity difference (Q5-Q1)	4.2**		1.2		−3.8		1.2		1.1	
Type of location										
Urban	49.7	(48.5–50.9)	41.9	(39.8–44.0)	44.2	(42.2–46.2)	40.5	(38.3–43.3)	39.9	(38.7–41.2)
Rural	46.1	(44.2–48.1)	40.4	(37.6–43.2)	48.3	(43.4–53.1)	35.9	(27.8–39.7)	38.6	(37.2–40.0)
Difference	3.6*		1.5		−4.1		4.6		1.3	
Island										
Sumatra	44.3	(42.3–46.4)	35.1	(32.5–37.8)	42.8	(38.5–47.1)	35.3	(31.0–39.6)	34.5	(33.0–36.1)
West Java	52.6	(50.8–54.5)	44.7	(41.5–48.0)	41.2	(38.1–44.3)	40	(36.8–42.8)	42.3	(40.3–44.4)
Central Java	52.5	(50.2–54.9)	48.2	(42.7–53.8)	50.2	(45.7–54.8)	48.9	(43.4–54.4)	47.1	(44.8–49.5)
East Java	45.3	(43.6–47.0)	38.6	(34.7–42.7)	46.0	(42.1–50.0)	33.9	(28.2–40)	37.6	(35.7–39.5)
Lesser Sunda Islands	43.8	(40.3–47.4)	41.3	(36.7–47.0)	46.0	(39.9–52.3)	38.7	(16.9–60.5)	37.1	(34.1–40.1)
Kalimantan	46.4	(41.5–51.5)	46.1	(38.1–54.0)	57.3	(40.1–74.5)	57.0	(0–100)	41.3	(38.1–44.6)
Sulawesi	43.7	(38.8–48.5)	29.2	(23.3–35.2)	41.0	(32.4–50.0)	38.0	(19.2–56.8)	32.6	(28.8–36.4)
JKN providers										
yes	48.5	(47.7–49.7)	41.6	(39.9–43.2)	46.8	(43.8–52.2)	44.6	(40.2–48.3)	43.6	(41.4–44.7)
no	50.5	(46.6–57.6)	39.6	(33.6–46.0)	44.6	(41.9–46.0)	38.1	(35.6–41.2)	38.1	(37.1–39.2)
Difference	−2.0		2.0		2.2		6.5**		5.5***	

*$p<0.05$, **$p<0.01$, ***$p<0.001$

practices that provided services to JKN patients had on average higher knowledge scores than those who did not.

In order to understand whether the observed inequalities persisted when controlling for the combined effects of all covariates, regressions models for readiness and knowledge scores are presented in Table 5. In public facilities, we found a nonlinear, small but significant association between readiness scores and community SES. Public facilities located in quintile 3 and 4 communities had on average a 3.1 and 3.9 percentage point higher readiness score compared to facilities located in quintile 1 communities, respectively. Public facilities located in rural areas had readiness scores that were on average 4-percentage points lower than those located in urban areas. There were also disparities across islands, where facilities located in West Java, Sumatra, Lesser Sunda Islands and Sulawesi had significantly lower readiness scores compared to facilities located in Central Java, where the mean readiness score was the highest. In terms of knowledge scores, we did not find significant inequalities across SES groups or across urban and rural areas. Instead, we found that disparities remained across islands, with facilities located in East Java, Sumatra, Lesser Sunda Islands and Sulawesi having on average a lower knowledge score compared to facilities located in Central Java, where the mean knowledge score was the highest.

Among the private health facilities, there was no evidence of inequalities in readiness or knowledge scores with respect to SES but there were large geographical differences across islands. The highest variation was observed for facilities located in West Java, East Java, Sumatra, Lesser Sunda Islands and Sulawesi where there was a 4 to 11 percentage point difference in average knowledge scores compared with facilities located in Central Java, which scored most highly. We also found that private facilities providing services to JKN patients had better readiness and knowledge scores that those that did not. Results from the regression models using the sub-domains of readiness are presented in Appendix 3.

Table 5 OLS regressions for readiness and knowledge scores, by sector

	Public facilities		Private facilities	
	Readiness score	Vignette score	Readiness score	Vignette score
Community SES quintile				
Quintile 1	–	–	–	–
Quintile 2	1.1 (1.1)	2.0 (1.8)	−0.8 (1.1)	1.5 (1.8)
Quintile 3	3.1 (1.2)**	0.4 (1.5)	0.5 (1.0)	1.4 (1.7)
Quintile 4	3.9 (1.3)**	2.1 (2.8)	0.9 (1.2)	−1.2 (1.9)
Quintile 5	1.5 (1.5)	1.6 (1.7)	0.1 (1.2)	−2.3 (1.7)
Location				
rural	−4.3 (0.8)***	−0.21 (1.1)	−0.9 (0.9)	0.14 (1.4)
Provider type (public)				
Puskemas	–			
Pustu	−28.1 (1.0)***	−7.7 (1.2)***		
Provider type (private)				
Private physician	–	–	–	
Private clinics	–	–	7.2 (1.2)***	−4.9 (1.9)*
Midwife	–	–	−0.2 (0.8)	−8.3 (1.5)***
JKN provider				
yes	0.8 (1.5)	−1.4 (2.1)	7.1 (0.6)***	4.1 (1.0)***
Island				
Central Java	–		–	–
West Java	−6.4 (1.3)***	−0.6 (1.6)	0.6 (0.8)	−5.3 (1.8)**
East Java	−0.7 (1.1)	−7.1 (1.7)***	0.1 (0.8)	−8.4 (1.7)***
Sumatra	−8.8 (1.1)***	−9.6 (1.6)***	1.4 (0.9)	−11.0 (1.8)***
Lesser Sunda Islands	−9.4 (1.3)***	−7.2 (2.1)***	−6.3 (1.5)***	−7.9 (2.5)**
Kalimantan	−2.5 (1.2)*	−4.4 (2.7)	−2.0 (1.4)	−3.8 (2.5)
Sulawesi	−5.5 (1.9)**	−11.2 (2.4)***	−1.9 (1.2)	−11.7 (2.7)***
Number of observations	957	956	1584	1559
Vignettes dummies	NA	yes	NA	yes
R square	0.63	0.16	0.18	0.14

*$p<0.05$, **$p<0.01$, ***$p<0.001$

Standard errors are in parentheses

Discussion

Coverage is an important but insufficient goal for achieving a high quality health system as defined by the Lancet Commission [17]. Ensuring the availability of quality health care to everyone, irrespective of socioeconomic status, is a necessary condition for Universal health coverage (UHC). This goal is particularly challenging in countries like Indonesia, where the large population is spread across a vast archipelago of more than 6000 inhabited islands. Results of this study suggest that inequalities in the quality of care exist across islands, where public and private facilities located in Central Java were more likely to meet basic standards of facility readiness and to have higher knowledge scores than facilities located in East Java, West Java, Sumatra, Sulawesi and Lesser Sunda islands. This is in line with previous findings showing that provinces outside the most populated islands of Java and Bali often suffer from shortages in trained health personnel and basic health facility equipment and essential drugs [30, 31]. This study also shows that inequalities in readiness scores, unlike knowledge scores, go beyond the provincial level and can be observed between urban and rural areas. This was particularly the case in public sector facilities, where we found that urban location was a strong determinant of facility readiness: both puskesmas and pustus located in rural areas were more likely to have lower readiness scores than in urban areas. This result is in line with a recent World Bank survey, which found that beyond the island divide, significant disparities exist between rural and urban areas, with facilities located in urban areas performing better on the service-readiness and service availability than rural facilities [33].

The novelty of this paper lies in the analysis of inequalities beyond the geographical level and the rural/urban divide, by exploring the socio-economic inequalities in the readiness and clinical knowledge of primary health care facilities in Indonesia. We found some evidence that public facilities located in richer communities had slightly higher readiness scores than those located in poorer communities. However, the size of the effect was relatively small and was not significant for quintile 5 communities. Among private sector facilities, we did not find variation in either score across poorer and richer communities. However, we did find that higher-level and better-equipped private facilities, such as private clinics, were more often located in richer areas.

Among studies in other low- and middle-income countries (LMICs) that used clinical competence as a measure of quality, all found a correlation between provider competence and SES of the catchment area. Two studies from India linked households from two regions (Madhya Pradesh and Delhi) with a census of private and public providers in the same villages and found that in Madhya Pradesh, higher village SES was positively associated with greater numbers of health care providers and better public and private provider competence [11]. In Delhi, similar results were found, as moving from the richest to the poorest neighbourhoods was associated with a decrease in the clinical competence of providers [9]. In Tanzania, a study conducted in the Arusha region found that the competence of doctors in both private and public sectors was significantly lower in poorer regions [18]. One study conducted in the Democratic Republic of Congo found that women with lower socio-economic status lived in areas where the quality of care available was low compared to women with higher SES [14]. Two studies looked at the effect of pay-for-performance (P4P) schemes on inequalities in the performance of providers in Tanzania and Brazil. Prior to the introduction of the P4P scheme, both studies reported lower quality in deprived areas compared to richer areas, but these differences narrowed over time [5, 16]. In Indonesia, results from this study suggest that such inequalities in provider knowledge related to the area SES did not occur, which is encouraging. However, inequalities did persist across islands and across provider types.

Among the studies that used structural indicators to measure quality, evidence is mixed. Two studies conducted in Kenya linked population data with Service Provision Assessment Surveys [28]. One found that all quality metrics for maternal healthcare in public and private health facilities were lowest for the most impoverished areas and increased significantly with greater wealth [25]. The second one found little evidence of marked inequalities of inputs and service availability, although they did identify pro-rich inequalities in the availability of electricity, laboratory services, drug supply, and qualified staff in public health facilities [26]. The extent of inequalities found in these studies is greater than those reported in our study where inequalities in quality of care were primarily determined by the island and to a smaller extent the type of location (urban/rural) where Indonesians live.

This study also demonstrates that there is much still to be done to address quality of care across primary care in Indonesia. First, the items assessed in the facility readiness score and knowledge tested by the vignettes, can both be considered essential for the management of cases at this level, meaning that the low levels of readiness and knowledge scores is very worrying. Basic equipment, availability of essential medicines and diagnostic capacity were areas of key concern. The low readiness and knowledge scores found in midwife/nurse practices were particularly striking and in line with previous studies [3]. Second, we found that private facilities overall had worse scores than puskesmas, which is in line with the recent World Bank study, which found that on average, puskesmas had 6 extra components available compared to private GPs and clinics, and puskesmas outscored private clinics on all subdomains of general service readiness, with the difference most stark for diagnostic capacity [33]. In our study, we also found that puskesmas outscored private facilities on the basis of knowledge scores. Finally, we found that a key driver of readiness in private sector facilities (and to a lesser extent knowledge) was provider type, where facilities providing services to JKN patients had significantly higher readiness scores than those who did not. These results are in line with the Word Bank survey results, where facilities that were contracted by BPJS-Health were more likely to offer wider range of health services and have higher readiness scores than facilities that were not contracted [33].

Our findings have important implications in terms of access to and utilisation of health care services. With sizable user fees remaining in the private sector, equal availability certainly does not translate into equal access to quality care. In the public sector, the limited SES-related inequalities in quality of care are encouraging. However, it has been shown that out-of-pocket (OOP) payments are still incurred by patients in the public sector, even by members of the JKN [15]. The major cost drivers of OOP payments are medicines that patients purchase privately. Therefore, even in the public sector, low level of inequalities in availability of quality care will not necessarily translate into equal access and utilisation. A recent study showed that the effects of JKN on access and use of services were greater among people on low incomes and those in rural areas than among people on high incomes [1].

It is important to note that we focused on the notion of equality rather than equity. Equity implies distinguishing between "fair" and "unfair" sources of inequality. Inequalities can result from life choices, income, race, health status, as well as many other factors. While it seems reasonable to think that inequalities due to individual decisions will legitimately lead to inequalities in health utilisation, differences due to socio-economic factors should be avoided and considered illegitimate [6, 23]. Theoretically, as poorer populations might actually have greater health care needs, ensuring the principle of equity would lead to improving the quality of care in poorer areas specifically, and therefore reversing the imbalance created by what has been referred to the inverse care law, or the trend that "the availability of good medical care tends to vary inversely with the need of the population served" [27]. In this study, we show that even without considering the population's needs, SES-related inequalities exist, although small in magnitude. It implies that the level of inequity might actually be higher than observed in this study, therefore deepening the gap between rich and poor in Indonesia.

Our study contains some limitations. Quality of care is a multidimensional concept. By focusing on facility readiness and knowledge scores, we did not capture other important aspects of quality such as patient satisfaction, clinical processes and health outcomes. Our measures of quality also had their own limitations. First, some recent studies have shown that structural quality is poorly correlated with process quality and health outcomes [19]. Second, the use of vignettes has been questioned due to the "know-do gap" documented in provider behaviour studies ([10] [21, 24];).. While careful interpretation is needed when using readiness and knowledge scores as proxies for "quality", they are nonetheless important prerequisites to provide good quality care [33].

Another important limitation is the sampling strategy in this study. First, the IFLS is not representative of all Indonesian provinces, and therefore cannot produce a national estimate. IFLS 5 excluded most eastern Indonesian provinces, which are considered underdeveloped compared to their western counterparts, and where health facilities are often not even available [13]. The implication of this would be an underestimation of the extent of inequalities in both readiness and knowledge scores. Additionally, the facilities' sampling frame was based on household responses to questions about known facilities in their local area. The list was not restricted to facilities that the respondents visited in order to limit any biases resulting from a choice-based sample. We cannot however, exclude the possibility that respondents are more likely to know about facilities they used.

Policy implications

Since the launch of the JKN and since this data was collected, multiple initiatives have been adopted to improve the quality of care in Indonesia. Reforms focused on improving facilities' infrastructure in deprived areas, increasing supply of drugs and revising guidelines and regulations to expand the role of primary health centres in health promotion and prevention [20]. The Ministry of Health has also set up a primary care accreditation commission (Komisi Akreditasi Fasilitas Kesehatan Tingkat Primer – KAFKTP) to improve quality of services by ensuring that the necessary inputs (such as infrastructure, equipment and human resources), clinical and managerial processes are in place. The commission also provides follow-up support to ensure continuous improvement and reaccreditation every 3 years. In 2018, BPJS-Health also implemented performance-based capitation that aims to measure the commitment of primary care providers to deliver primary care services comprehensively, based on the contact rate, percentage of chronic conditions visits, and non-specialised referral ratio.

The consequences of these reforms are twofold. First, by focusing on rural and deprived areas, these reforms represent a unique opportunity to improve quality of care in Indonesia, and to redress the current inequalities between major islands, rural and urban areas, and to a lesser extent between deprived and richer areas. Second, as we found that private providers contracted by BPJS tend to offer better quality of care, encouraging private providers to join the JKN program might improve access to quality care in this context. Private providers need to meet minimum criteria set by the BPJS-Health to be contracted and the receipt of the capitation payment from BPJS-Health has been shown to improve the service readiness of the contracted private facilities [33]. Engaging with private facilities to join the JKN program is a unique opportunity to potentially improve quality in the private sector, either through initial standards for joining the JKN or by encouraging private facilities to use their capitation fees for quality improvement.

Conclusion

As the policy landscape is changing in Indonesia, measurement of inequalities in quality of care is needed to monitor progress to UHC. In this study, we found that inequalities in facilities' readiness exist across major islands in Indonesia, across rural and urban areas for public sector facilities, and to a small but non-negligible extent across poorer and richer communities for public sector facilities. As cost barriers affect the poorest individuals, ensuring that all communities have access to well-equipped health facilities with competent providers is a minimum necessity for achieving UHC.

Abbreviations

SES: Socio-economic status; MMR: Maternal mortality ratio; UHC: Universal health coverage; LMIC: Low- and middle-income country; P4P: Pay for performance; JKN: Jaminan Kesehatan Nasional; IFLS: Indonesian family life survey; GP: General practitioner; SARA: Service availability and readiness assessment; OOP: Out-of pocket.

Supplementary Information

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Additional file 1.

Additional file 2.

Additional file 3.

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Authors' contributions

All authors contributed to the design of the study. MH drafted the manuscript which all authors commented on. All authors read and approved the final manuscript.

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Availability of data and materials

The IFLS data that support the findings of this study are available from RAND https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS/ifls5.html

Declarations

Ethics approval and consent to participate

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Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Appendix 3.2 : Co-authored publication

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International Journal for Equity in Health

STUDY PROTOCOL Open Access

An evaluation of health systems equity in Indonesia: study protocol

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Abstract

Background: Many low and middle income countries are implementing reforms to support Universal Health Coverage (UHC). Perhaps one of the most ambitious examples of this is Indonesia's national health scheme known as the JKN which is designed to make health care available to its entire population of 255 million by end of 2019. If successful, the JKN will be the biggest single payer system in the world. While Indonesia has made steady progress, around a third of its population remains without cover and out of pocket payments for health are widespread even among JKN members. To help close these gaps, especially among the poor, the Indonesian government is currently implementing a set of UHC policy reforms that include the integration of remaining government insurance schemes into the JKN, expansion of provider networks, restructuring of provider payments systems, accreditation of all contracted health facilities and a range of demand side initiatives to increase insurance uptake, especially in the informal sector. This study evaluates the equity impact of this latest set of UHC reforms.

Methods: Using a before and after design, we will evaluate the combined effects of the national UHC reforms at baseline (early 2018) and target of JKN full implementation (end 2019) on: progressivity of the health care financing system; pro-poorness of the health care delivery system; levels of catastrophic and impoverishing health expenditure; and self-reported health outcomes. In-depth interviews with stakeholders to document the context and the process of implementing these reforms, will also be undertaken.

Discussion: As countries like Indonesia focus on increasing coverage, it is critically important to ensure that the poor and vulnerable - who are often the most difficult to reach – are not excluded. The results of this study will not only help track Indonesia's progress to universalism but also reveal what the UHC-reforms mean to the poor.

Keywords: Universal health coverage, Financing, Equity, Benefit incidence, Financing incidence, Catastrophic health spending, Impoverishing health spending

Introduction

Concerns about the poor and most vulnerable not getting adequate access to quality health care are widespread in low and middle-income countries (LMICs) and have led to an intense advocacy for universal health coverage (UHC). Equity, defined by the World Health Organization as 'the absence of avoidable or remediable differences among groups of people, whether those groups are defined socially, economically, demographically, or geographically' [1] - is fundamental to UHC. However, emerging evidence is showing that without adequate focus on the measurement of equity, vulnerable populations may continue to receive inadequate or inferior health care [2].

Financial barriers are a major hindrance to accessing quality health services [3–5]. The World Health Report 2000 emphasises that a key dimension of a health system's performance is the fairness of its financing system [1]. Globally, some 100 million people fall below the poverty line every year as a result of out-of-pocket expenditures on health, and a further 1.2 billion, already living in poverty, are pushed deeper into it [1]. In countries such as Pakistan, Laos, The Philippines, Bangladesh, Indonesia and Vietnam, out-of-pocket payments represent around 50% or more of total health expenditure [1].

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Moreover, some countries reported to have achieved universal coverage by prepayment schemes, such as China and Brazil, still experience high prevalence of catastrophic health spending and medical impoverishment [6, 7].

UHC has been defined by the 2005 World Health Assembly as "access to key promotive, preventive, curative and rehabilitative health interventions for all at an affordable cost, thereby achieving equity in access" [8]. Effective implementation of UHC requires equity in health care, defined as payment for health services according to capacity to pay and the receipt of benefits according to need [9]. This implies that the allocation of government health spending needs to be focused on the poor, and recognises differences in the cost of accessing health care by different geographic, demographic and socio-economic groups. There is evidence that primary health care is pro-poor, suggesting a greater investment in these services, along with the removal of barriers to accessing care, can enhance equity [10]. In many LMICs, however, government health spending tends to concentrate on inpatient hospital services, most of which is urban-based and often too costly to be accessed by the poor [10].

A pro-poor publicly financed health-care system is particularly important given the growing pluralism of health-care systems in LMICs [11]. Households in LMICs use a wide range of public and private health-care providers, many of whom are not regulated by national health authorities [12] and may be paid for directly by out-of-pocket payments [13]. Such direct payments affect the poor more than the rich and tax financed health-care may protect the most vulnerable against the risk of financial catastrophe in times of illness [14, 15]. Dual practice – whereby health workers combine salaried, public-sector clinical work with a fee-for-service private clientele - is common in LMICs such as Indonesia and is reported to play a key role in undermining access to public services, especially by the poor [16]. Other motivations for universal health-care include redressing historical inequities in the distribution of health-care, reducing health inequality and raising the human capital of the poor and thereby the growth potential of the economy [17]. Governments worldwide are seeking to develop their health financing systems in ways that ensure - and, critically, sustain - universal coverage [18, 19].

The Indonesian context

Indonesia is a lower middle-income country with a Gross National Income (GNI) per capita of US$3630 [20] with high Gross Domestic Product (GDP) growth, averaging 5.6% between 2007 and 2016 [21]. It is the third most populous country in Asia and the fourth largest in the world with around 255 million people [20]. Like other LMICs, Indonesia faces significant challenges in the health sector despite notable progress in the past decades especially in relation to improved life expectancy. Indonesia's maternal mortality ratio (MMR) remains one of the highest in Southeast Asia, estimated at 359 per 100,000 live births in 2012 [22]; this is significantly higher than the MMR in neighbouring countries - Malaysia (29 per 100,000 in 2013) and Thailand (26 per 100,000 in 2013) [23]. With neonatal mortality remaining high at 19 per 1000 live births [21], Indonesia has the 8th highest number of neonatal deaths in the world and large disparities between the wealthiest (10 neonatal deaths per 1000 live births) and poorest quintiles (29 per 1000) [23, 24]. Malnutrition is a major problem with around 37% (8.4 million) of children under five years being stunted while overweight and obesity in adults has doubled in the past decade [25, 26]. Indonesia also faces a double burden of disease characterised by rising non-communicable diseases and a high incidence of communicable diseases [27].

Underpinning these problems are significant disparities in access to quality health services across geographic regions and socioeconomic groups. For example, health outcomes are lower in many Eastern Indonesian provinces as well as in rural areas and among people from the lowest wealth quintile [22]. The child mortality rate is less than 10 per 1000 live births in most provinces of Java and Sumatera but the rate is 2.5 times higher in the Eastern province of Maluku and North Maluku [22]. Rural households are reported to have an under-five mortality rate one-third higher than that in urban households [22]. High government funding allocations to hospitals (less frequently utilised by poor and disadvantaged communities) and elevated government spending on pharmaceuticals has also reduced investment in primary and promotive health services [27]. Indonesia spends only slightly more than 2% of its GDP on health, approximately half the level of other comparable income countries [28]. About half of all health spending is public and one-third comes directly from of out of pocket payments by households [28].

A key response by the Government has been the development of a compulsory national health insurance scheme designed to pave the way for the achievement of universal coverage [29]. This scheme, known as *Jaminan Kesehatan Nasional* (JKN), seeks to make comprehensive care available to the entire population by 2019. The JKN brings together all major health insurance schemes (*Askes, Jamkesmas, Jamsostek and Jamkesda*) under a single agency - the Social Security Management Corporation for the Health Sector (BPJS Kesehatan) [30]. Prior to this, Indonesian healthcare was highly fragmented with private insurance schemes for those who could afford it, basic state provision for the very poorest, and

NGOs in specialised areas providing support in between. Through the JKN, the Indonesian Government sought to improve the situation for the 'missing middle', those citizens too poor to afford health insurance but deemed not poor enough for government support (7).

Indonesia has made steady progress with around 165 million people now members of the JKN, making it the biggest single-payer health system in the world [31]. There is however mounting evidence of areas where the JKN is underperforming and without action, the JKN is unlikely to reach expected levels of population coverage, service coverage or financial protection by 2019. It is estimated that 90 million (40% of the population) remain uncovered, most of these working in the informal sector [32]. JKN members continue to incur high out-of-pocket health expenditures [33]. Moreover, Indonesia's public health financing remains at roughly half the estimated requirement for UHC [32].

Responding to the current challenges facing the JKN, the Indonesian government is initiating and strengthening several important reforms ranging from re-structuring provider payment schemes through to socialization campaigns to raise awareness of the scheme and its benefits [34]. Strategies for increasing fiscal space for health through increasing tobacco tax and the phasing out of subsidies on fuel are also proposed [30]. Our study investigates the equity impact of this latest phase of UHC-reforms that are designed to provide affordable health care to all citizens by 2019.

Research objectives

The over-arching goal of this study is to assess the equity impact of the most recent package of UHC reforms implemented by the Indonesian government to support universal coverage. Specific study objectives are to:

1) Measure and compare key equity outcomes - including health care utilisation, subsidies received through the use of health services, payments people make for health care, andself-assessed health – in early 2018 (study baseline) and end of 2019 (target of JKN full implementation);
2) Develop and apply 'quality-weightings' to the benefits of health spending, to account for variation in the quality of health services utilised;
3) Document the changing context and processes for implementing UHC-reforms in Indonesia.

Methodological approach

Health equity research is typically concerned with four broad sets of outcomes: health care utilisation; subsidies received through the use of services; payments people make for health care (through for example, out-of-pocket payments, insurance premiums and direct and indirect taxes) [35, 36] and health status. In the case of health status, utilisation, and subsidies, the focus is on inequality, often defined as inequalities between the poor and the better-off [36]. In the case of health care payments, analysis tends to focus on progressivity (how much larger payments are as a share of income for the poor than for the better-off), the incidence of catastrophic payments (those that surpass a certain threshold), or the incidence of impoverishing payments (those that push a household over the poverty line). This methodological approach and associated outcomes to be measured in this study are summarised in Fig. 1.

The study will use a before and after design that employs both quantitative and qualitative methods. Outcomes will be evaluated at baseline (early 2018) and at end of target year of JKN full implementation (end 2019). The UHC reforms, consisting of multiple measures being progressed simultaneously over the next 2 years, will be evaluated as a 'package'. While it will not be possible to draw conclusions concerning individual components, the study will disaggregate results by socioeconomic status, gender, levels of care and types of health care providers.

Health care utilisation and distribution of health-care benefits (objective 1)

Benefit incidence analysis (BIA) measures the extent to which different groups benefit from public financing for health through their use of health services [37]. Operationalisation of the technique involves ranking the study population by a living standard measure, assessing the rate of utilisation of different health services, estimating the unit cost of each service, and multiplying the utilisation rates and unit costs to determine the amount of subsidy [38]. Direct payments by users are deducted before arriving at the final amount of government subsidy [38].

BIA requires data on health service utilisation, the cost of accessing health-care and socioeconomic status [15]. A cross-sectional household survey will be conducted at baseline and 18 months into implementation. Indonesia comprises approximately 17,000 islands divided into 34 provinces and 514 districts and municipalities [22]. The sampling for the ENHANCE household survey will be done in stages. First, a stratified sample of 10 provinces containing 74% of the population will be selected from 34 Indonesian provinces. Stratification of provinces will maximise representation of the population, capture the cultural and socioeconomic diversity, and be cost-effective to survey given the size and terrain of the country. At the next stage, two districts within each selected province will be purposively selected based on population density and fiscal capacity. From each district, two sub-districts and

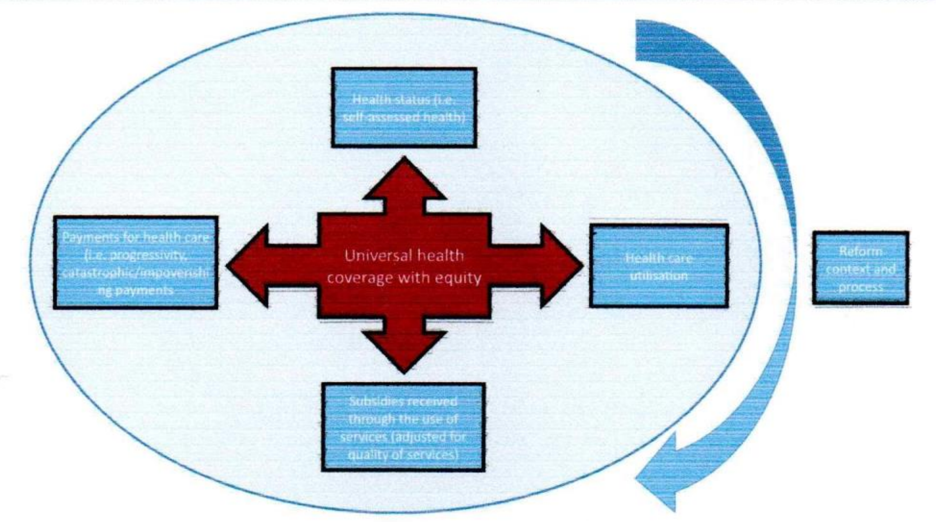

Fig. 1 Methodological approach

four villages (two villages per sub-district) will be chosen to ensure a mixed representation of rural and urban areas, and varying socio-economic status. Two enumeration areas (EAs) will then be selected from the villages (total of 80 EAs) using a nationally representative sample frame from the 2013 SUSENAS, a large-scale multi-purpose socioeconomic survey that covers a nationally representative sample typically composed of 200,000 Indonesian households [39]. Within each EA, field teams will randomly select 88 households based upon listings from the Central Bureau of Statistics to derive a final sample of 7040 households. In each selected household, one woman (the primary caregiver) or in her absence, the male head will be interviewed. The sample size will enable the determination of prevalence for characteristics with a 95% confidence interval and a precision of +/− 1%. Assuming that 12% of households [40] will exceed the threshold of 25% of total consumption expenditure on health (a commonly used indicator of payments for health that may have a catastrophic effect on household wellbeing [41]), we will be able to detect differences of 5% in characteristics between households that exceed the threshold and those that do not, with approximately 80% power and a type 1 error of 5.

Data will be collected electronically using laptops. An e-questionnaire will be designed using the NOVA Research Company's Questionnaire Development System (QDS) 3.0 and administered with the computer-assisted personal interview (CAPI) program. The questionnaire will be piloted in selected EAs to test logistics and gather information to improve the quality and efficiency of the main survey. Field teams will be trained in e-data collection and administrative procedures including the content of the questionnaire, how to save completed interviews and how to transfer data to the Central Data Processing Centre for the study. National Health Accounts (NHA) will be used to estimate the unit cost of different health-care services, supplemented by Health Facility Costings [42]. NHA provide a detailed record of how Indonesia's health resources are spent, on what services, and who pays for them. A critique of different national data sets for equity analysis in the health sector has been previously published [43].

The population will be ranked by the index and grouped into quintiles of equal size. Results will be presented in the form of bar charts indicating the relative share of total benefits received by socioeconomic quintiles. In addition, the distribution of benefits as depicted by the concentration curve (which plots the cumulative percentage of individuals ranked in ascending order of living standard against cumulative percentage of health-care utilisation or payment) will be compared against the 45° line of perfect equality [36, 38]. Dominance tests will be carried out to ascertain whether the differences are significant [36]. In addition to socioeconomic status, the distribution of health spending will also be explored by geographic location and by gender. The gender dimension of benefit from health spending is particularly important given the role of women as primary caregivers in times of illness or disability [44].

Socioeconomic status

The ENHANCE household survey will also collect information on household asset ownership to enable the construction of an asset index. This type of proxy measure of socio-economic status has been widely used by international development agencies such as the World Bank to assess and monitor health inequalities in LMICs [45].

The asset index will be constructed using principal component analysis [46] and based on a range of assets reflecting housing, utilities and livestock ownership.

Distribution of the burden of paying for health-care (objective 1)

Financing incidence analysis (FIA), also known as progressivity analysis, will be used to assess how the burden of health financing is distributed in relation to household ability to pay (ATP) [47]. We will measure the progressivity of each individual source of financing and for the health financing system as a whole [47]. Financing sources are deemed progressive (regressive) if the rich contribute a relatively higher (lower) proportion of their income to health-care financing than the poor [48].

The 2012 National Socioeconomic Survey (SUSENAS) of Indonesia and the 2014 National Health Account (NHA) data will be used to estimate the baseline health-care financing mix and household contributions to health financing through direct and indirect taxation, out-of-pocket payments and payment of health insurance premiums. Evaluation in 2019 will use data from the 2016 NHA (available in early 2019) and the 2018SUSENAS. District Health Account Data (DHA), and other relevant cost data produced by BPS-Statistics will also be used for selected districts where appropriate. Tax thresholds and actual revenue generated through different forms of taxation will be obtained from the National Taxation Directorate and the Ministry of Finance and will in turn be triangulated with estimated tax revenue from the NHAs.

Progressivity of health care payments will be assessed by calculating the Kakwani Index [49], which is the difference between the concentration coefficient of health care payments and the Gini coefficient of household expenditure [47, 49]. The value of this index ranges from − 2 to 1 with a positive Kakwani index indicating that the health care financing system is progressive, or regressive if negative. A Kakwani index of zero indicates proportionality of health care payments [49]. The Kakwani Index will be calculated for each source of finance. The progressivity of the overall health financing system will be calculated by taking a weighted average of the Kakwani indices of the individual financing sources, where the weights are the shares of total revenues coming from each source.

Ability to pay

Adult equivalent consumption expenditure will be used as the measure of ability to pay. Consumption expenditure is generally considered a better measure of ability to pay than income in LMICs with a large informal sector, as consumption expenditure is smoothed over time and so better reflects long-term average well-being [50, 51]. For a detailed critique of different approaches to measuring ability to pay see O'Donnell et al. [36]. Household consumption expenditure will be translated into per adult equivalent household consumption, using the following formula:

$AE = (A + \alpha K)^{\theta}$ Where A is the number of adults in the household, θ is the cost of children, K is the number of children and the degree of economies of scale [36, 51]. The values of α and θ were assumed to be 0.5 and 0.75, respectively [51, 52].

Catastrophic and impoverishing health care payments (objective 1)

Out-of-pocket health expenditure exposes households to the risk of incurring large medical bills that can push households into financial catastrophe [53]. This is of major concern to countries such as Indonesia where more than 28 million people currently live below the poverty line and around 100 million remain vulnerable to falling into poverty, as their income hovers marginally above the national poverty line [54]. Measuring the catastrophic and impoverishing effects of out-of-pocket spending is therefore another important area of health equity research [36]. In line with other equity analyses [17, 53], households in this study will be considered to have incurred catastrophic health expenditure if the share of health expenditure in the household's non-food expenditure is greater than a given threshold often around 25% [4] or within a range of 10 and 40% [54–56]. Indicators of catastrophic health expenditure will include catastrophic head count (share of households in the population whose health care costs expressed as a proportion of income exceed the threshold), catastrophic payment overshoot (average level by which payments, as a proportion of income, exceed the threshold) and the mean positive gap (payments in excess of the threshold average over all households) [36]. The data for this analysis will come from the 2013 SUSENAS Socioeconomic Survey conducted by the national Bureau of Statistics and the ENHANCE cross-sectional survey of Indonesian households (see section ii). Impoverishment will be assessed using both national and international poverty lines of US$1.90 and US$3.10 per day, respectively.

Self-assessed health outcomes (objective 1)

While there is scepticism about the use of subjective health measures rather than more objective measures [57, 58], the former are much more readily available to researchers but more importantly, there exist robust findings of positive correlations between subjective assessments of health (SAH) and actual health and mortality [59, 60]. SAH has also been shown to be a good proxy for health service use in several countries [61]. The ENHANCE cross-sectional household survey (see section ii) will ask households to evaluate the general health condition of individual household members. A five-point scale with the following response options: 'very good, good, fair, bad, and very bad' will be piloted for use in this study [62]. SAH will be assessed at baseline in 2017 and 2 years into implementation in 2019. The measurement of SAH will be designed to enable comparison with existing measures used in other national health surveys in Indonesia such as the Basic Health Research Survey (Riskesdas). In addition to using SAH as one of the key outcome measures for this study, it will also be used in the BIA - whereby the distribution of benefits from using services will be compared with the distribution of the need for health care, using SAH as a proxy for need [38]. Several national surveys in LMICs include questions on SAH as proxies of health-care need [10].

Socio-economic status

As for the BIA, an asset index will be used to rank households according their socioeconomic status.

Weighting the benefits of health spending to reflect quality of services (objective 2)

A recent systematic review of BIA studies in LMICs found that few studies account for variation in the quality of services received [10]. This is despite repeated calls for more precise measures of benefit/subsidy distribution that reflect the quality of services received [10, 37, 63].In this study benefits received by individuals will be weighted to reflect the quality of health services utilised, thereby providing a more precise measure of subsidy distribution. This is especially important in LMICs where it is recognised that the poor typically utilise lower quality health services compared to the rich [64]. The Institute of Medicine defines quality of care as the 'degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge' [65]. Measures of healthcare quality have been divided into 3 domains: structure or inputs to care, process or content of care, and outcomes of care [66]. According to Leslie and colleagues, each domain has its pros and cons: inputs are the necessary foundations for care but are not sufficient to describe its content or effects, process measures pertain directly to care delivery but are challenging to collect, and outcome measures assess the ultimate goal of the health system but reflect many factors beyond the health system itself [67]. Information on healthcare quality is sparse in LMICs and many analysts rely on standardised facility surveys that focus on inputs such as equipment, medicine supplies, and health workers [67–69]. A recent review of 8500 quality indicators used to assess performance-based financing programmes showed that over 90% measured structural aspects of quality [70]. For this study, data on the utilisation of different health facilities derived from our own cross-sectional household surveys (see objective 1a) will be linked to national health facility data on structural quality and staffing of public and private facilities. Two national surveys will be used: the PODES Infrastructure Census 2012 and the Health Facility Survey (Rifaskes) 2011. Scores for different structural quality domains will be derived from these national surveys and combined to develop a quality of care index from 0 to 1 for each facility.

Understanding the context and process of implementing UHC-reforms in Indonesia (objective 3)

Document analysis and interviews will be used to understand the UHC policy adoption process. Specifically, we will develop a chronology of key events in the reform process and assess stakeholder support and political feasibility of the UHC-reforms [71, 72]. Key organisational and institutional documents from the Ministries of Health and Finance, local government planning and health offices, the private sector, the national social health insurance agency, and multilateral and bilateral agencies operating in Indonesia will be examined and interpreted in order to elicit meanings, gain understanding and develop empirical knowledge about the context within which UHC reforms have been pursued. In addition, in-depth interviews with approximately 15–20 key stakeholders will be conducted annually to understand the shifting power and positioning of different stakeholders around key elements of the UHC-reforms [72]. Stakeholders will be purposively sampled from Ministries of Health and Finance, health-care managers, professional associations, donors and private providers of health-care. Especially important will be the inclusion of members of the National Social Security Council (DJSN) which has legal authority to harmonise the JKN [73]. Interviewees will be chosen from two provinces facing distinctly different types of UHC implementation challenges including different levels of technical skills and management capabilities. These indicators will be obtained from the PODES Infrastructure Census 2012.

Discussion

This study, evaluating pro-poor health care reforms in Indonesia, comes at an opportune time given the centrality of equity to the Sustainable Development Goals (SDGs). It will not only provide evidence on the equity-impact of Indonesia's latest UHC-reforms but it will also help to advance metrics for UHC measurement. A variety of data sources (primary and secondary) are being pooled for this analysis. Drawing from a broader range of data will strengthen country estimates and better represent progress to UHC. Furthermore, this study will be one of the first to reflect the quality of services when calculating the distribution of public subsidies for health; an important methodological development in the field of health equity analysis. Taking account of the variation in the value of subsidies is especially important in countries such as Indonesia where around half of the population live in rural areas with limited access to skilled health workers and quality medicines. Moreover, like many other countries in the region Indonesia has a thriving private sector with two-thirds of health financing and more than half of all health services in private hands [74]. For the poor, this translates into high out-of-pocket payments that in turn limits access to health care and pushes many into poverty [1]. It may also place a disproportionate burden on them as they contribute a high proportion of their income towards health care financing compared to the rich. By taking a whole of system approach to the evaluation of UHC reforms, our financial and benefit incidence analyses will provide a comprehensive picture of the burden for paying for health services and the extent to which this 'mixed' public-private health system is meeting its equity goals. Also through our interviews with stakeholders we will gain insights into the political viability of the Indonesian UHC-reforms, an important but often neglected dimension of health system reform [72]. Apotential limitation of this study is that our cross-sectional household survey, designed to measure health care utilisation for the benefit incidence analysis, does not represent the entire population. We will empirically explore differences in health care utilisation between our sample and larger household surveys such as the Indonesian Demographic Health Survey (which collect less detailed utilisation data) to better understand the representativeness of our sample and generalisability of our findings. Finally, there is continued debate over the most useful and appropriate measures to assess the equity impact of UHC reforms. While this study measures a comprehensive suite of outcomes, such a detailed analysis will not be feasible, nor necessarily appropriate, for all health systems. We expect this study will help to prioritise outcome measures for assessing equity in health systems reform.

Abbreviations
ATP: Ability to Pay; BIA: Benefit Incidence Analysis; BPJS: Badan Penyelenggara Jaminan Sosial (Social Insurance Administration Organization); CAPI: Computer-Assisted Personal Interview; DHA: District Health Accounts; DJSN: Dewan Jaminan Sosial Nasional (National Social Security Council); EA: Enumeration Area; FIA: Financing Incidence Analysis; GDP: Gross Domestic Product; GNI: Gross National Income; JKN: Jaminan Kesehatan Nasional (Indonesian national health insurance); LMICs: Low and Middle Income Countries; MMR: Maternal Mortality Ratio; NHA: National Health Accounts; PODES: Potensi Desa (Infrastructure Supply Readiness Survey); QDS: Questionnaire Development System; Rifaskes: Riset kesehatan dasar (Primary health care survey); SDG: Sustainable Development Goals; SEG: Socio Economic Group; SHA: Self-Assessed Health; SUSENAS: Socioeconomic Survey; UHC: Universal Health Coverage

Availability of data and supporting materials
Data sharing is not applicable to this protocol as no datasets were generated or analysed.

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Authors' contributions
All authors contributed to the design of the study. VW drafted the manuscript which all authors commented on. All authors read and approved the final manuscript.

Ethics approval and consent to participate
Ethical support has been granted by all relevant bodies including: the University of Indonesia (Reference: 503/H2.F10/PPM.00.02/2017); London School of Hygiene & Tropical Medicine (Reference: 13773); and the University of New South Wales (Reference: HC17709).

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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Equity of health financing in Indonesia: A 5-year financing incidence analysis (2015−2019)

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Summary

Background In 2014, Indonesia launched a single payer national health insurance scheme with the aim of covering the entire population by 2024. The objective of this paper is to assess the equity with which contributions to the health financing system were distributed in Indonesia over 2015 − 2019.

Methods This study is a secondary analysis of nationally representative data from the National Socioeconomic Survey of Indonesia (2015 − 2019). The relative progressivity of each health financing source and overall health financing was determined using a summary score, the Kakwani index.

Findings Around a third of health financing was sourced from out-of-pocket (OOP) payments each year, with direct taxes, indirect taxes and social health insurance (SHI) each taking up 15 − 20%. Direct taxes and OOP payments were progressive sources of health financing, and indirect tax payments regressive, for all of 2015 − 2019. SHI contributions were regressive except in 2017 and 2018. The overall health financing system was progressive from 2015 to 2018, but this declined year by year and became mildly regressive in 2019.

Interpretation The declining progressivity of the overall health financing system between 2015 − 2019 suggests that Indonesia still has a way to go in developing a fair and equitable health financing system that ensures the poor are financially protected.

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Introduction

Moving towards Universal Health Coverage (UHC) requires a sustainable and equitable health financing system. Health financing should not only seek to raise sufficient funds and use them efficiently but do so in an equitable manner.[1] There is a consensus among

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Research in context

Evidence before this study

The only study to have assessed equity in health financing in Indonesia was published in 2008. This study was identified through Google Scholar and PubMed using search terms (Indonesia) AND (financing incidence OR financing incidence analysis OR progressiv* OR regressiv* OR proportio*) AND (health OR health care OR health system financ*). This study, now 13 years old, reported that the overall financing of health care in Indonesia was progressive in 2001, a time when social health insurance (SHI) in the country covered only formal sector employees and over half of the total health expenditure was sourced from out-of-pocket (OOP) payments. Due to limited data, only the four largest sources of health financing (i.e. direct taxes, indirect taxes, SHI and OOP payments) were included in the analysis. No study has assessed the changing health financing structure in Indonesia, after the launch of its National Health Insurance scheme (Jaminan Kesehatan Nasional, JKN) in 2014.

Added value of this study

To our knowledge, this is the first multi-year study to investigate the equity of health financing in Indonesia after implementation of the JKN. The 5-year (2015 – 2019) analysis provides vital information on how the burden of health funding has shifted among socio-economic groups in Indonesia. We assessed six separate health financing sources including direct taxes, indirect taxes, SHI, company health coverage (CHC), private health insurance (PHI) and OOP payments. Prior to this study, there was no evidence on the progressivity of CHC and PHI in Indonesia.

Implications of all the available evidence

As countries like Indonesia focus on reaching universal health coverage, increased attention must be paid to improving equity in health financing. While the observed progressivity of OOP payments is consistent with findings from the 2008 study, further research is needed to determine the extent to which this simply reflects the poor forgoing necessary health care. Monitoring unmet need for health care in the population is highly recommended.

policymakers and health financing experts that payment for health care should be based on ability to pay (ATP) rather than utilization of health care.[2,3] The relationship between health care payments and ATP, or progressivity of health financing, is a common measure of the performance of a health system in terms of equity and financial protection.[4,5] In a progressive health system, the proportion of income contributed to financing health care increases with income. A regressive health system is considered to be inequitable, as people with lower income contribute a higher proportion of their income than those with higher income.[6]

Given the importance of equitable health financing in achieving the goal of UHC, it is critical that financing incidence is monitored frequently to ensure that the poor do not bear a disproportionate burden of financing the health system, and that progress is being made in reducing any excessive burden. Financing incidence analysis (FIA), sometimes referred to as progressivity analysis, is one of the tools for assessing the fairness of health financing systems. FIA assesses the distribution of the burden of financing the health system across socioeconomic groups relative to income.[6]

Health systems in low- and middle- income countries (LMICs) rely on many different sources of revenue for health financing, the most common ones being taxation (direct and indirect) and out-of-pocket (OOP) payments.[7] Other major sources include social health insurance (SHI) contributions, private health insurance (PHI) premiums, community-based health insurance and donations. Several FIA studies have been conducted in LMICs and provide data on progress towards UHC and equity in health financing.[8–12] In LMICs where compulsory SHI schemes are implemented, most have reported SHI as a progressive source of health financing.[8]

Indonesia is a middle-income country with the largest economy in Southeast Asia. It has a population of over 270 million, making it the world's fourth most populous nation. The overall health of Indonesians has improved significantly over the past three decades. Life expectancy in Indonesia has increased from 62.3 to 71.5 years between 1990 and 2018.[13] Morbidity and mortality due to communicable, maternal, neonatal and nutritional causes have also decreased significantly.[14] However, the state of health and access to health services vary throughout the country.[15,16] For example, the World Health Organization (WHO) has reported large inequalities across provinces in access to maternal and child healthcare and availability of healthcare infrastructure.[17]

Indonesia is also moving towards UHC with its National Health Insurance scheme (Jaminan Kesehatan Nasional, JKN). Indonesia launched the JKN in 2014 with a target of covering 98% of its population by 2024.[18] The scheme collects contributions from formal/informal/non-salaried workers and pays full or partial premiums for low-income members. By the end of 2019, about 84% of Indonesia's population was covered by the JKN.[19] Apart from SHI, Indonesia's health system includes other government schemes financed through taxes and non-public schemes such as company health coverage (CHC), PHI and OOP payments. In 2019, the government's spending on health amounted to 113·6 trillion rupiah (7·9 billion USD) which was almost double the amount in 2015.[20,21] The reliance on OOP payments has decreased in recent

	2015	2016	2017	2018	2019
Social health insurance	17·6%	19·3%	22·2%	22·8%	23·1%
Other public schemes	25·5%	29·5%	28·2%	29·0%	29·1%
Private health insurance	2·8%	3·1%	3·2%	3·1%	3·5%
Company health coverage	13·0%	11·3%	11·6%	11·0%	11·1%
Household out-of-pocket	40·2%	35·8%	33·7%	33·0%	32·1%
Non-Profit schemes	0·9%	1·1%	1·1%	1·1%	1·0%

***Table 1*: Health sector funding sources as a proportion of total health expenditure 2015—2019.**
Source: National Health Accounts Indonesia 2019.

years, but about one third of health expenditure still comes from OOP payments. According to Indonesia's National Health Accounts (NHA) data in 2019, OOP payments were the largest contributor to total health expenditure, accounting for 32·1% (Table 1).[22] This is followed by various government schemes and the JKN, which represented 29·1% and 23·1% of total health expenditure respectively. Health expenditure through PHI is low with a share of only 3·5%.

While one study has explored progressivity of financing in Indonesia in 2001,[23] no further FIA studies have been undertaken to assess the equity of the health financing system subsequent to the introduction of the JKN. Such analysis is valuable to policymakers in understanding the impact of recent reforms on progressing towards UHC.[6] Thus, this paper aims to assess how the equity of health financing in Indonesia has changed over a five-year period from 2015 to 2019 and to provide evidence for future health policies.

Methods

Data sources

The sources of health financing analysed in this study included direct taxes, indirect taxes, SHI, CHC, PHI and OOP payments. Our study drew on three key national datasets: the National Socioeconomic Survey (SUSENAS) for the years 2015 to 2019; the Indonesian Family Life Survey (IFLS) 2014; and the Indonesian National Health Accounts 2019.

The SUSENAS is a multi-purpose household survey covering a nationally representative sample of at least 200,000 households.[24] In SUSENAS 2015 — 2019, samples were drawn from all 34 provinces in Indonesia. The core questionnaire collects basic socioeconomic information for all household members. Since the SUSENAS surveys in 2015 — 2019 did not collect income data, we used income data from the fifth wave of the IFLS (IFLS5) and mapped it to the SUSEANS surveys. The IFLS is a longitudinal socioeconomic and health survey which collects individual, household and community level data using multistage stratified sampling. The sampling frame is based on households from 13 Indonesian provinces, representative of about 83% of the population.[25] Within each of the 13 provinces, enumeration areas (EAs) were randomly chosen from a sample frame used in the 1993 SUSENAS survey. IFLS5 was conducted in 2014 and included over 30 modules. It was completed by 50,148 individuals (51% women) of all ages from 16,204 households located in both urban and rural areas.[25]

Data analysis

Ability to pay (ATP). ATP was measured using non-food consumption (including alcohol and tobacco) in the SUSENAS and IFLS5 datasets. Monthly home rental cost (actual or estimated) was also included. Where no home rental was paid (e.g. household owned their home), the householder was asked to estimate the rent they would have had to pay if they rented it. Survey weights were used for analysis of the SUSENAS and IFLS5 datasets to account for over- or under-representation of population strata in the sample.[3]

Health financing sources. In this study, direct tax payments included personal income tax and corporate income tax. To estimate personal income tax, we first calculated the ratios of household expenditure to personal income in the IFLS5. These ratios were then mapped to the SUSENAS datasets using ATP rankings (50 quantiles), so households with the same ATP ranking would have the same expenditure-personal income ratio. Household personal income in the SUSENAS datasets (2015 — 2019) was predicted using expenditure data from the SUSENAS datasets and the ratios of expenditure to personal income from the IFLS5. The information on marginal tax rates obtained from the Ministry of Finance was used to estimate the amount of personal income tax paid by households.[26] In this analysis, we only included expenditure-personal income ratios smaller than one. For corporate income tax, we first calculated the average gross business income and net profit in IFLS5 by taxable personal income categories. We then mapped the average business income and

Index type	Description
Gini index	The Gini index is derived from the Lorenz curve which shows the distribution of income across households, ranked in ascending order. The Gini ranges from 0 to 1, with 0 representing perfect equality in the distribution of ATP and 1 representing perfect inequality.[6]
Concentration index	The concentration index is derived from the concentration curve that plots the cumulative percentage share of health care payments for each household in the same ascending order as the Lorenz curve.[3] The concentration index ranges from -1 (all health care payments are made by the poorest households) to 1 (all health care payments are made by the richest households).[31,52]
Kakwani index	The Kakwani index is obtained as the difference between the concentration and the Gini index.

***Table 2*: Indices for assessing equity in health financing.**

net profit from the IFLS5 to the SUSENAS based on personal income categories. Whether the households received any business credit was used as an indicator for owning a business in the SUSENAS datasets.

Indirect tax payments by households in the SUSENAS datasets (value-added tax, sales tax on luxury goods, excise tax and import duties) were calculated using the expenditure data and tax rates sourced from Indonesian law and regulatory documents.[27−29] The SHI contributions in the SUSENAS datasets were calculated based on the predicted income and the SHI premium rates defined by the National Health Insurance Agency (Badan Penyelenggara Jaminan Sosial Kesehatan, BPJS).[30] After comparing health expenditure on the JKN using the NHA reports with the revenue collected from JKN members using the BPJS annual financial reports, we found that the JKN was in deficit throughout 2015 − 2019. We have assumed that the Indonesian government was paying the deficit through taxation (indirect and direct taxes). For CHC, regulations require that contributions are made by both employers (4% of monthly salaries) and employees (1% of monthly salaries). As the 4% would have been part of the employees' benefit package, we assumed that 5% of predicted household income would be contributed to CHC by relevant households in the SUSENAS datasets. The ownership of SHI and CHC was informed by respondents' answers to survey questions in the SUSENAS. Both PHI and OOP payments were directly derived from SUSENAS survey responses.

Financing incidence analysis. The assessment of health financing incidence involved, first, assessing the progressivity of each financing source, and second, assessing the progressivity of the health financing system as a whole. We used the Kakwani index (KI) to assess the relative progressivity of various financing schemes - taxation (direct and indirect taxes), SHI, PHI, CHC and OOP payments - from 2015 to 2019.[31] The KI is a summary measure of progressivity and ranges from −2 to 1; a positive value indicates a progressive financing source and a negative value the opposite.[32] The calculation of KI is based on two underlying indices, the Gini index and the concentration index (details in Table 2). The Gini index is derived from the Lorenz curve which shows the distribution of income across households, ranked in ascending order. The concentration index is derived from the concentration curve that plots the cumulative percentage share of health care payments for each household in the same ascending order as the Lorenz curve.[3] Households with missing data on consumption (food and non-food) were excluded from the analysis. If the household reported consumption but no data was available on certain variables such as PHI payment, the household would still be included in the calculation of the Gini Index, but would not be included in the calculation of the concentration index and the KI for PHI. In this study, missing data constituted less than 1% of the data. Dominance tests were conducted to examine the consistency of progressivity along the distribution of ATP.[3] If the Lorenz curve dominates (lies above the concentration curve), it means those with a lower income contribute a smaller proportion of their income to health care payments than those with higher income, and is progressive across all income levels (and vice versa).

The progressivity of the whole health financing system was estimated by taking the weighted sum of the KI of each financing source. National Health Accounts data from the Ministry of Health,[22] JKN contributions from the Social Security Agency for Health,[33,34] and government revenue reports from the Ministry of Finance[20,21] were used to derive the proportional contributions or weightings for each source of health financing for years 2015 − 2019 (Appendix Table A2).

Adjustment for household members. To account for household size and age of household members, all key variables were adjusted using an adult equivalent (AE) scale based on the following formula: $AE = (A + \alpha K)^{\theta}$ where A is the number of adults in the household, K is the number of children, α is the cost of a child relative to that of an adult, and θ the degree of economies of scale.[3,35] Children are defined as those under 15 years old.[36] The values of α and θ were assumed to be 0·5 and 0·75 respectively in the base case analysis.[35,37] In the analysis, we first calculated the direct taxes, indirect taxes, SHI, PHI, CHC and OOP payments at the household level. We then divided the total household payments by the AE scale to obtain individual-level estimates.

Sensitivity analysis. Sensitivity analyses were conducted to assess the impact of using different AE scales and different measures of ATP. The alternative AE scales used were $AE = A + 0.3K$ and $AE = (A + K)^{0.5}$. Total consumption (food and non-food) was used as the alternative measure for ATP. We also conducted sensitivity analysis around the proportional contributions of individual health financing sources towards overall health financing. The proportional contributions of direct taxes were increased by 10%, 25% and 50%. The weightings of indirect taxes were reduced accordingly, and the proportions of other financing sources remain unchanged. In the baseline analysis, we only included expenditure-income ratios smaller than one from the IFLS5 when we predicted personal income in the SUSENAS datasets. In the sensitivity analysis, we relaxed this constraint by including all ratios. All analyses were conducted using STATA 15.1.[38]

Role of the funding source

The funding source had no role in the design of this study, analyses of the data, interpretation of the data, writing of the report or decision to submit the results.

Results

Baseline analysis

Table 3 presents the Gini indices (non-food consumption), concentration indices and KIs for each source of financing and the health system as a whole. The Gini indices ranged between 0·470 and 0·509, indicating an unequal distribution of wealth among the whole population. We found that the poorest 20% of all households held a share of non-food consumption that was less than 5%, while the richest 20% of households held a share that exceeded 50% (Appendix Table A3). The concentration indices for health care payments through various funding schemes were all positive, indicating that health care payments were also concentrated in the wealthy population.

For indirect taxes, direct taxes and SHI, the proportion of payments by each quintile group were similar across the five-year period (Appendix Tables A4–A6). On the other hand, relatively few of those in the poorest 20% of households were part of CHC, but their share of CHC payments greatly increased to 6·8% in 2019 compared with 0·5% in 2015 (Appendix Table A7). Meanwhile, the proportion of CHC payments among the richest 20% of households declined. The proportion of PHI payments from lower ATP quintiles also increased since 2015 but dropped among the richer population (Appendix Table A8). In terms of OOP payments, the burden was largely borne by the higher income groups (Appendix TableA9). The share of OOP payments by the poorest 20% of households remained below 5% over the 5-year period. In contrast, there was an increase in the share of OOP payments paid by the middle quintile groups over the same period.

The KIs for direct taxes and OOP payments were positive throughout the 5-year period, indicating that these two sources of funding were progressive (Table 3 and Figure 1). Indirect taxes were regressive with negative KIs. SHI was regressive except in 2017 and 2018. CHC was the most progressive source of financing before 2019, but became regressive in 2019. PHI was progressive in 2015 and 2016 and regressive after that time. Overall, health financing in Indonesia was slightly progressive between 2015 and 2018, as measured by the KI. However, the level of progressivity declined year by year and became regressive in 2019.

Dominance tests

The Lorenz curve of consumption (ATP) and concentration curves for the various sources of health financing for 2015-2019 are shown in Figures 2–6. For each year, the concentration curves for OOP payments lay below the Lorenz curve, indicating that the progressivity of this source of health financing was consistent along the entire distribution of ATP (Table 4). With the exception of 2018, the concentration curve for indirect tax payments crossed the Lorenz curve indicating that while indirect taxes were regressive overall, they tended to be progressive at lower ATP quantile points. The concentration curve for direct tax payments also crossed the Lorenz curve at lower ATP quantile points for each year, indicating that this source of financing was regressive for poorer households despite a positive KI. The curves for SHI crossed the Lorenz curve in years 2015, 2017, and 2018, suggesting that its progressivity was not consistent along the ATP distribution. For CHC, the concentration curves were well below the Lorenz curve in years 2015 – 2018 but then moved above the Lorenz curve in 2019, which corresponds to a change from the most progressive financing source before 2019 to a regressive health financing source in 2019. The concentration curves for PHI payments were dominated by the Lorenz curve in 2015 and 2016 but after that fell below the Lorenz curve, indicating that this source of payment became regressive.

Sensitivity analysis

Concentration and Kakwani indices using alternative AE scales and total consumption (food and non-food) as

	2015		2016		2017		2018		2019	
	Concentration index	Kakwani index	Concentration index	Kakwani index	Concentration index	Kakwani index	Concentration index	Kakwani index	Concentration index	Kakwani index
Indirect taxes	0·426	-0·077	0·407	-0·064	0·409	-0·066	0·417	-0·06	0·461	-0·049
Value-added tax	0·486	-0·017	0·457	-0·014	0·457	-0·019	0·462	-0·015	0·499	-0·01
Luxury goods tax	0·881	0·378	0·861	0·39	0·856	0·381	0·861	0·385	0·860	0·351
Excise tax	0·162	-0·341	0·175	-0·296	0·166	-0·309	0·164	-0·313	0·268	-0·241
Import tax	0·616	0·113	0·569	0·098	0·579	0·104	0·605	0·129	0·623	0·114
Others	0·563	0·060	0·532	0·061	0·549	0·073	0·551	0·074	0·585	0·075
Direct taxes	0·556	0·053	0·526	0·055	0·508	0·033	0·505	0·028	0·557	0·048
Personal income tax	0·557	0·054	0·527	0·056	0·510	0·034	0·506	0·030	0·559	0·049
Corporate income tax	0·276	-0·227	0·241	-0·230	0·311	-0·164	0·294	-0·183	0·175	-0·334
Social health insurance (JKN)	0·491	-0·012	0·421	-0·050	0·476	0·000	0·482	0·006	0·393	-0·116
Company health coverage	0·791	0·288	0·786	0·315	0·637	0·161	0·635	0·159	0·402	-0·107
Private health insurance	0·669	0·167	0·551	0·080	0·425	-0·051	0·393	-0·084	0·443	-0·066
Out-of-pocket	0·562	0·059	0·538	0·067	0·531	0·055	0·526	0·049	0·543	0·034
Overall	0·573	0·070	0·534	0·063	0·512	0·037	0·510	0·034	0·479	-0·030
Gini	0·503		0·471		0·476		0·477		0·509	

***Table 3*: Progressivity of individual financing source and overall health financing in Indonesia 2015 – 2019 (ATP based on non-food consumption).**
All indices are significant with $p<0.05$. The p-value is for a test where the index equals 0.
A positive Kakwani index indicates progressivity and a negative value the opposite.
A positive concentration index indicates that the rich contribute more to health care payments.
The proportional contributions of each source of health financing towards overall health financing are summarized in Appendix Table A3.

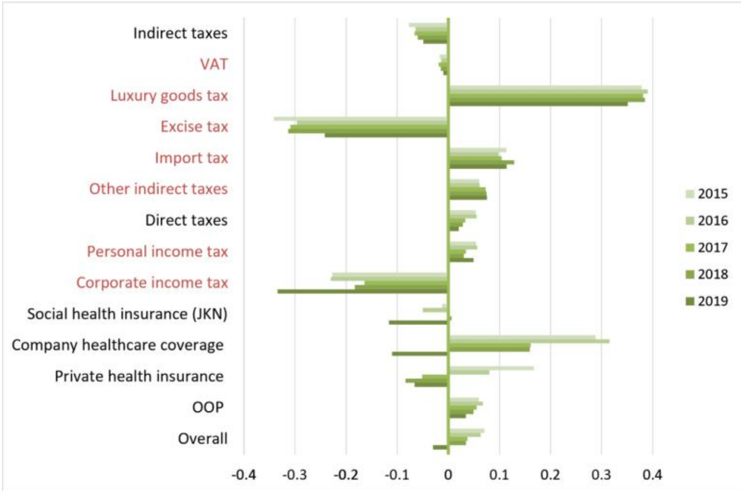

Figure 1. Progressivity of each health financing source (Kakwani index).

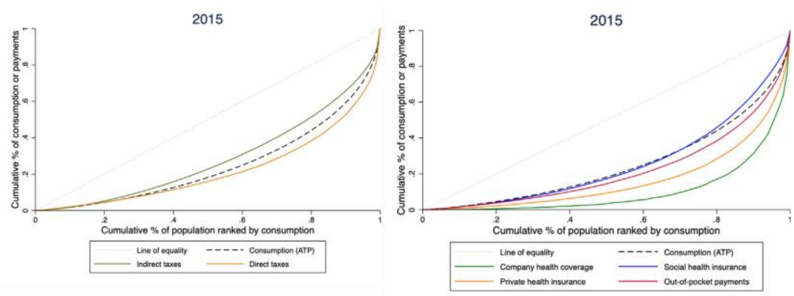

Figure 2. Lorenz curve and concentration curves by financing source in 2015.

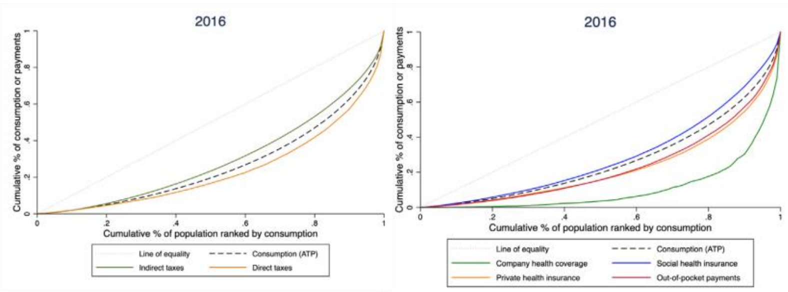

Figure 3. Lorenz curve and concentration curves by financing source in 2016.

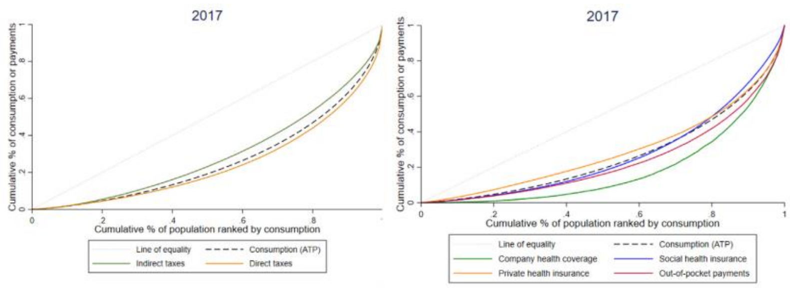

Figure 4. Lorenz curve and concentration curves by financing source in 2017.

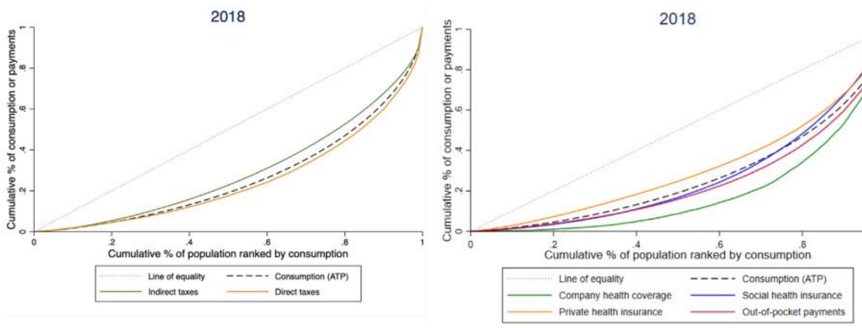

Figure 5. Lorenz curve and concentration curves by financing source in 2018.

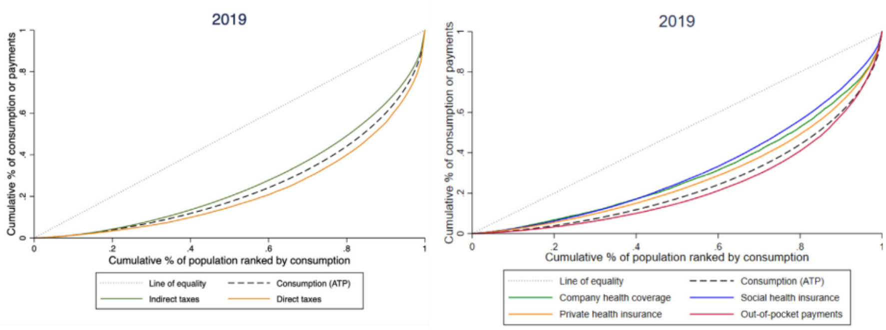

Figure 6. Lorenz curve and concentration curves by financing source in 2019.

a measure of ATP are presented in Appendix Tables A10–A12. Using alternative AE scales has little effect on the progressivity of individual health financing sources and the overall health financing system, as the indices are almost identical to the baseline results. When total consumption was considered as a measure of ATP, the concentration indices remained similar to the baseline concentration indices, whereas the Gini indices dropped to around 0·4 (range 0·37 – 0·43) compared to 0·5 (range 0·47 – 0·51) in the baseline analysis (using

	Dominance†				
	2015	2016	2017	2018	2019
Indirect tax	*	*	*	-	*
Direct tax	*	*	*	*	*
Social health insurance	*	-	*	*	-
Company health coverage	+	+	+	+	-
Private health insurance	+	+	-	-	-
Out-of-pocket	+	+	+	+	+

***Table 4*: Dominance test results by source of health financing.**

† Dominance test is based on the multiple comparison approach that tests differences at 19 evenly spaced quantiles.+Lorenz curve dominates; -concentration curve dominates; *curves cross.

non-food consumption expenditure). As a result of the more equitable Gini index using total consumption expenditure, the progressivity of individual health financing sources and overall health financing was higher each year than when non-food consumption was used for ATP, with overall health financing becoming progressive in 2019. Increased proportional contributions of direct taxes and decreased proportions of indirect taxes would slightly improve overall progressivity (Appendix Table A13). When we used expenditure-income ratios both greater than one and smaller than one from the IFLS5 to predict personal income in the SUSENAS datasets, the progressivity of all income-related health financing sources fell (Appendix Table A14). Direct tax payments and SHI became regressive throughout 2015 – 2019. The overall health financing system also became regressive after 2015. But no matter which AE scale, measure of ATP, or set of proportional contributions was used, and how income in the SUSENAS datasets was predicted, the progressivity of overall health financing displayed a downward trend over the study period.

Discussion

This is the first multi-year study to investigate the equity of health financing in Indonesia after implementation of the JKN. Our analysis shows that the Indonesian health financing system was progressive between 2015 and 2018, with a declining trend. In 2019, health financing in Indonesia became regressive.

Our study has shed some light on how the implementation of the JKN has impacted the equity of health financing in Indonesia. In our analysis, the SHI was mildly progressive in 2017 and 2018. The Kakwani indices for SHI in 2017 and 2018 were close to zero, which means that the poor and the rich were contributing almost the same share of their non-food expenditure towards SHI contributions. As a result, the SHI appears to have had minimal impact on the progressivity of the overall health system in Indonesia in 2017 and 2018. While the SHI was regressive in 2015 and 2016, due to the small share of SHI in total health funding (less than 18%), the overall progressivity was not affected. However, in 2019, as the share of SHI revenue increased to 23%, overall health financing in Indonesia became regressive as a result of a regressive SHI. The concentration index for SHI in 2019 would need to have been at least 0.53 (Kakwani index 0.021) to generate a positive Kakwani index for the overall health financing system. Given that SHI is designed to relieve the financial burden on the poor, the regressive nature of SHI in 2019 suggests that more needs to be done to ensure the poor are financially protected. Since the low-income population in Indonesia receive subsidies under the JKN scheme, it is not surprising to see that the population with lower ATP contributed a relatively smaller share towards SHI payments, as shown in the dominance tests for years 2015, 2017 and 2018. However, SHI still displayed an overall trend of being either regressive or proportional. This finding reflects the nature of the JKN levy. During the study period, the government charged a fixed rate for employees from both public and private sectors (5% of monthly income) with a ceiling of Rp 8 million monthly salary[30] for assessed contributions, which means the burden of JKN premiums was disproportional to household ATP. Although the Indonesian government raised the monthly salary ceiling to Rp 12 million (USD 827) in 2020, the ceiling is low for high-income populations.

Another important finding of our study is that OOP payment is a progressive source of health financing in Indonesia. Although a positive KI indicates some degree of equity in health financing, the progressivity of OOP is likely to be partly driven by unmet need.[39] This is because low-income households may forgo health care and avoid OOP payments simply because they cannot afford the cost; conversely those at the upper end of the income scale may choose to incur higher OOP payments for higher quality or amenity services. Our analysis also found that as Indonesia's reliance on OOP payments decreased year by year (41% of total health expenditure in 2015 to 33% in 2019), the progressivity of OOP payments also fell. Although the burden of OOP payments was still largely borne by the richest 20% of the population, their share of OOP payments dropped slightly (Appendix Table A9). In contrast, the poorest 20% of the population contributed a similar share of OOP payments across the five years. The JKN was designed to provide financial protection by reducing OOP payments for the insured. It is possible that people in higher socio-economic groups have better access to information on how the JKN operates including which services are covered, giving them an advantage over poorer groups. Limited awareness among the poor of the benefits provided by health insurance schemes has considered to allow the burden of SHI to be shifted more towards the rich. Third, the finding that OOP payments fell as a share of total health expenditure and were progressive between 2015 and 2019, gives reason to be optimistic. Nonetheless, OOP payments must be closely monitored as they appear to be becoming less progressive overtime. Also, it is likely that the progressivity of OOP payments is driven by unmet need among the low-income population and a preference for higher cost care amongst the wealthy. Further studies, such as benefit incidence analyses, are warranted to ensure that the poor are not simply forgoing health care. To further reduce OOP payments, the capitation and INA-CBG tariffs need to be reviewed to match real health care costs. Finally, we recommend that future SUSENAS surveys include household income questions to facilitate direct estimates of financing incidence.

Declaration of interests

The authors declare no conflicts of interest.

Author contribution

VW, HT, AA, SK, LG, AM, AH, VT conceived and designed the study. VW and HT co-supervised the study. DS, RAF, DN, GC, EA contributed to data curation. QC and NM conducted the data analysis. All authors contributed to the interpretation of the results. QC drafted the manuscript which all authors commented on. All authors critically reviewed and approved the final manuscript.

Data sharing

Post-processing source data and supplementary data are presented within this study. Access to the SUSENAS datasets can be requested from the Central Bureau of Statistics of Indonesia. IFLS-5 Survey data is publicly available at https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS/ifls5.html.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.lanwpc.2022.100400.

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Appendix 4.1: IFLS vignettes

SECTION H: FACILITY VIGNETTES

VIGNETTE FOR PRIVATE PRACTICE

- Curative Care for Adult
- Curative Care for Adult with Diabetes
- Curative care for children
- Prenatal Care

SECTION H: FACILITY VIGNETTES

Curative Care for Adult

H1.	Does this health facility provide curative care for adults?	No ....3 → H15 Yes..1
H2.	Name of Respondent : ____________________	
H3.	Can you please tell me your qualifications?	Medical doctor: GP ....01 Medical doctor: specialist................02 Nurse ....03 Midwife..04 Paramedic 05
H3a	Where did you complete your studies ?	Indonesia University .... 01 Gadjah Mada University .... 02 Airlangga University .... 03 Diponegoro University .... 04 Padjadjaran University........................ 05 Others State University........................ 06 Private University .... 07 Others ____________...................... 95
H4.	In what year did you complete your studies?	⎿⏊⏊⏊⏌
H5.	Have you received additional training since you graduated?	No ....3 → H9 Yes..1

Can you tell me, for each of the following areas, whether you received additional training and, if so, when this training occurred?

		H6. Have you ever received training of [...] after you finished the study?	**H7.** In the last 12 months?	**H8.** In the last 5 years?
1.	Diagnostic algorithm for adult diseases	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
2.	Non-communicable disease	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
3.	Respiratory disease	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
4.	Antibiotic for respiratory disease	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes

H9. For the rest of the interview, we would like to understand the process by which you examine an adult person suffering from cough and fever. We would like to know everything you do, beginning with the arrival of the patient, waiting upon the patient and ending when he/she goes home. I shall describe the patient, and I will ask you a series of questions about activities you perform regularly. Once a section is complete, we are unable to go back and change answers. Now I will read out the case.

INSTRUCTIONS TO INTERVIEWER:

1. **READ OUT CASE 2 TIMES, AND THEN ASK QUESTIONS H11 – H14.**
2. **FIRST LISTEN TO THE RESPONDENT. ANY RESPONSE THAT HE OR SHE MENTIONS SPONTANEOUSLY SHOULD BE MARKED WITH CODE 1.**
3. **AFTER THE RESPONDENT IS FINISHED WITH THE WHOLE QUESTIONNAIRE, TELL THE RESPONDENT THAT YOU ARE GOING TO REVIEW THE CASE AGAIN.**
4. **START FROM THE BEGINNING AND READ THE CASE A SECOND TIME. ASK QUESTIONS H11 – H14.**
5. **READ OUT ANY RESPONSES THAT HE/SHE DID NOT MENTION SPONTANEOUSLY THE FIRST TIME. CODE THE APPROPRIATE RESPONSE.**

H10. **Mr.Widyono came to this facility with a complaint of coughing and a fever. Now I would like to ask you exactly what you would do for this patient.**

H11.	**What questions do you ask the patient about his cough and fever, and current health?**	**Mentioned spontaneously**	**Prompted**	
	a. How long have you suffered from this condition?	1	2	3
	b. Any shortness of breath?	1	2	3
	c. Is there any blood when you cough?	1	2	3
	d. What was the color of the sputum?	1	2	3
	e. Do you have any pain in the chest?	1	2	3
	f. Any weight loss?	1	2	3
	g. Is cough productive?	1	2	3
	h. Any contact with others with respiratory problems/TB?	1	2	3

SECTION H: FACILITY VIGNETTES

H11.	What questions do you ask the patient about his cough and fever, and current health?	Mentioned spontaneously	Prompted	
	i. Any night sweats?	1	2	3
	j. What medicine have been taken?	1	2	3
	k. Any fever?	1	2	3
	l. Feeling weak?	1	2	3
	m. Any headache	1	2	3
	n. Losing appetite?	1	2	3
	o. Nauseous?	1	2	3
H12.	**What questions do you ask the patient about his medical history and behavior?**	**Mentioned spontaneously**	**Prompted**	
	a. Previous TB case or took TB medicine?	1	2	3
	b. BCG immunization or ever positive PPD? **Note: PPD = Purified Protein Derivative or Mantoux, examination of TBC*	1	2	3
	c. History of asthma or COPD? **Note: COPD = Chronic Obstructive Pulmonary Disease, chronic lungs disease*	1	2	3
	d. History of cardiac problems?	1	2	3
	e. History of malignancy or gastric surgery?	1	2	3
	f. Medications recently or currently taking?	1	2	3
	g. Drug allergies?	1	2	3
	h. Smoking history?	1	2	3
	i. Number of packages/quantity of smoking?	1	2	3
	j. Alcohol use?	1	2	3
	k. Live alone or with others?	1	2	3
	l. Employment?	1	2	3
	m. Family health history?	1	2	3
	n. Sanitation, ventilation at home?	1	2	3
H13.	**What do you do when you conduct a physical examination of the patient?**	**Mentioned spontaneously**	**Prompted**	
	a. Examine general appearance?	1	2	3
	b. Take temperature?	1	2	3
	c. Listen to respiration?	1	2	3
	d. Check for sore throat?	1	2	3
	e. Palpitate / feel throat / lymph nodes?	1	2	3
	f. Is chest indrawing?	1	2	3
	g. Palpate abdomen? **Note: palpation = examination by palpating and pressing*	1	2	3
	h. Pulse **Note: vital signs = breath, pulse* **Note: IPPA = Inspection, Palpation, Percussion, Auscultation*	1	2	3
	i. Blood pressure	1	2	3
H14.	**What laboratory examinations would you conduct?**	**Mentioned spontaneously**	**Prompted**	
	a. Chest x-ray	1	2	3
	b. PPD ormantoux test	1	2	3
	c. Sputum exam for TB	1	2	3
	d. Routine bloodwork	1	2	3
	e. Liver function	1	2	3
	f. CD4/cell count **Note: blood test to see the immune system*	1	2	3
	g. Urinalysis	1	2	3

SECTION H: FACILITY VIGNETTES

Curative Care for Adult with Diabetes

H15.	Does this health facility provide curative care for adults with diabetes?	No ....3 → **H30** Yes..1
H16.	Name of respondent________________________________	
H17.	Can you please tell me your qualifications?	Medical doctor: GP ....01 Medical doctor: specialist................02 Nurse ....03 Midwife..04 Paramedic 05
H17a	Where did you complete your studies ?	Indonesia University .... 01 Gadjah Mada University .... 02 Airlangga University .... 03 Diponegoro University .... 04 Padjadjaran University......................... 05 Others State University........................ 06 Private University .... 07 Others ____________.......................... 95
H18.	In what year did you complete your studies?	|__|__|__|__|
H19.	Have you received additional training since you graduated?	No ....3 → **H23** Yes..1

		H20. Have you ever received training of [...] after you finished the study?	**H21.** In the last 12 months?	**H22.** In the last 5 years?
1.	Diagnostic algorithm for adult diseases	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
2.	Non-communicable disease	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
3.	Mengenaipenyakit diabetes	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
4.	Mengenai obat untuk penyakit diabetes	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes

H23.	For the rest of the interview, we would like to understand the process by which you examine an adult person suffering from diabetes. We would like to know everything you do, beginning with the arrival of the patient, waiting upon the patient and ending when he/she goes home. I shall describe the patient, and I will ask you a series of questions about activities you perform regularly. Once a section is complete, we are unable to go back and change answers. Now I will read out the case

INSTRUCTIONS TO INTERVIEWER:

1. **READ OUT CASE 2 TIMES, AND THEN ASK QUESTIONS H25 – H29.**
2. **FIRST LISTEN TO THE RESPONDENT. ANY RESPONSE THAT HE OR SHE MENTIONS SPONTANEOUSLY SHOULD BE MARKED WITH CODE 1.**
3. **AFTER THE RESPONDENT IS FINISHED WITH THE WHOLE QUESTIONNAIRE, TELL THE RESPONDENT THAT YOU ARE GOING TO REVIEW THE CASE AGAIN.**
4. **START FROM THE BEGINNING AND READ THE CASE A SECOND TIME. ASK QUESTIONS H25 – H29.**
5. **READ OUT ANY RESPONSES THAT HE/SHE DID NOT MENTION SPONTANEOUSLY THE FIRST TIME. CODE THE APPROPRIATE RESPONSE.**

H24.	**Mr. Widyono came to this facility, and presents to you "to get my sugar checked." He has just moved to the community and has never visited the facility. Now I would like to ask you exactly what you would do for this patient.**

H25	**What questions do you ask the patient about his present physical condition, high blood sugar, and medications?**	**Mentioned spontaneously**	**Prompted**	
a.	How long have you suffered from this condition?	1	2	3
b.	Medications recently or currently taking?	1	2	3
c.	Do you have to urinate frequently?	1	2	3
d.	Frequent thirst?	1	2	3
e.	Any weight loss?	1	2	3
f.	Any sweating?	1	2	3
g.	Any anxiety or heart palpitations?	1	2	3
h.	Abdominal fullness prematurely after meals?	1	2	3
i.	Edema or weight retention?	1	2	3
j.	Current treatment for hypertension?	1	2	3

SECTION H: FACILITY VIGNETTES

H25	What questions do you ask the patient about his present physical condition, high blood sugar, and medications?	Mentioned spontaneously	Prompted	
k.	Often feel tingling?	1	2	3
l.	Wound that stays?	1	2	3
m.	Often have ulcer?	1	2	3
n.	Family history	1	2	3
o.	Feel weary	1	2	3
p.	Have check blood sugar?	1	2	3

H26	What questions do you ask Mr. Widyono about his medical history and behavior?	Mentioned spontaneously	Prompted	
a.	History of hypertension?	1	2	3
b.	History of high cholesterol?	1	2	3
c.	Co-existing or prior heart condition?	1	2	3
d.	Prior eye examination?	1	2	3
e.	Prior hospitalization?	1	2	3
f.	Prior diabetic coma?	1	2	3
g.	Prior renal failure?	1	2	3
h.	Does he smoke regularly?	1	2	3
i.	Number of packages/quantity of smoking?	1	2	3
j.	Alcohol use?	1	2	3
k.	Immunization history?	1	2	3
l.	Regular exercise?	1	2	3
m.	Questions about nutrion/eating habits?	1	2	3
n.	Is there any family member with this disease?	1	2	3

H27	What do you do when you conduct a physical examination of the patient?	Mentioned spontaneously	Prompted	
a.	Blood pressure in one arm	1	2	3
b.	Blood pressure in both arms	1	2	3
c.	Listen to chest/heart?	1	2	3
d.	Listen to abdomen?	1	2	3
e.	Examine the feet?	1	2	3
f.	Examine peripheral vascular system?	1	2	3
g.	Check for edema?	1	2	3
h.	Examine prostate?	1	2	3
i.	Pulse	1	2	3
j.	Respiration	1	2	3

H28	What laboratory examinations would you conduct?	Mentioned spontaneously	Prompted	
a.	Chest x-ray?	1	2	3
b.	Blood chemistry: creatinine, glucose?	1	2	3
c.	Sputum exam?	1	2	3
d.	CBC (Complete Blood Count)? **Note: blood examination to count the red blood cells, white blood cells, and blood platelet*	1	2	3
e.	Test for triglycerides? **Note: examination to check the lipid excess in the blood*	1	2	3
f.	Ultrasound?	1	2	3
g.	Liver function?	1	2	3
h.	HgbA1c? **Note: examination to check the glucose amount in the haemoglobyn*	1	2	3
i.	Hepatic enzymes?	1	2	3

SECTION H: FACILITY VIGNETTES

H29	What advice or future examinatios would you offer for the patient?	Mentioned spontaneously	Prompted	
a.	Recommend stop smoking?	1	2	3
b.	Nutritional advice?	1	2	3
c.	Advice about exercise?	1	2	3
d.	Examine the feet?	1	2	3
e.	Refer to other specialist (eye,foot, or heart)?	1	2	3
f.	Prescribe anti-hypertensives? **Note: medicine to control high blood pressure*	1	2	3
g.	Prescribe Metformin? **Note: medicine for diabetes*	1	2	3
h.	Make an appointment for the next visit?	1	2	3

SECTION H: FACILITY VIGNETTES

Curative care for children

H30	Does this health facility provide curative care for children?	Yes............ 1 No............ 3→**H45**
H31	Name of respondent:_______________	
H32	Can you please tell me your qualifications?	Medical doctor: GP............01 Medical doctor: specialist............02 Nurse............03 Midwife............04 Paramedic............05
H32a	Where did you complete your studies ?	Indonesia University............ 01 Gadjah Mada University............ 02 Airlangga University............ 03 Diponegoro University............ 04 Padjadjaran University............ 05 Others State University............ 06 Private University............ 07 Others ________............95
H33	In what year did you complete your studies?	|_|_|_|_|
H34	Have you received additional training since you graduated?	No............3→**H38** Yes............1

		H35	**H36**	**H37**
		Have you ever received training of [...] after you finished the study?	**In the last 12 months?**	**In the last 5 years?**
1.	Child immunization	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
2.	Treatment of Acute Respiratory Infection	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
3.	Treatment of diarrhea	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
4.	Treatment of malaria	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
5.	Nutrition	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
6.	HIV transmission in pregnancy	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
7.	Prenatal care	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes

H38	For the rest of the interview, we would like to understand the process by which you provide curative care for children. We would like to know everything you do, beginning with the arrival of the patient, waiting upon the patient and ending when he/she goes home. I shall describe the patient, and I will ask you a series of questions about activities you perform regularly. Once a section is complete, we are unable to go back and change answers. Now I will read out the case

INSTRUCTIONS TO INTERVIEWER:

1. **READ OUT CASE 2 TIMES, AND THEN ASK QUESTIONS H40 – H44.**
2. **FIRST LISTEN TO THE RESPONDENT. ANY RESPONSE THAT HE OR SHE MENTIONS SPONTANEOUSLY SHOULD BE MARKED WITH CODE 1.**
3. **AFTER THE RESPONDENT IS FINISHED WITH THE WHOLE QUESTIONNAIRE, TELL THE RESPONDENT THAT YOU ARE GOING TO REVIEW THE CASE AGAIN.**
4. **START FROM THE BEGINNING AND READ THE CASE A SECOND TIME. ASK QUESTIONS H40 – H44.**
5. **READ OUT ANY RESPONSES THAT HE/SHE DID NOT MENTION SPONTANEOUSLY THE FIRST TIME. CODE THE APPROPRIATE RESPONSE:.**

H39	**Mrs. Nani comes to this facility with her daughter, an 8 month old baby. She says that her daughter has had diarrhea for 2 days with vomiting.**

SECTION H: FACILITY VIGNETTES

H40	What are the 13-14 most important questions you ask about the diarrhea and vomiting?	Mentioned spontaneously	Prompted	
	a. When did the diarrhea start?	1	2	3
	b. How frequently does diarrhea occur?	1	2	3
	c. What do the feces/vomit look like of smell like	1	2	3
	d. Any blood in vomit?	1	2	3
	e. Any blood in stools?	1	2	3
	f. Any fever?	1	2	3

H40.	What are the 13-14 most important questions you ask about the diarrhea and vomiting?	Mentioned spontaneously	Prompted	
	g. Level of activity (active vs listless)?	1	2	3
	h. Is the child feeding and drinking?	1	2	3
	i. Given any medication already?	1	2	3
	j. Any evidence of dehydration?	1	2	3
	k. Vomits everything?	1	2	3
	l. Has convulsions?	1	2	3
	m. Eaten anything unusual?	1	2	3
	n. Any ill contacts?	1	2	3
	o. Urinating?	1	2	3
H41	**What do you ask about the baby's medical history and environment?**	**Mentioned spontaneously**	**Prompted**	
	a. History of similar disease?	1	2	3
	b. Drug allergies?	1	2	3
	c. Any other medical or surgical problems or HIV?	1	2	3
	d. Any complications at delivery or prematurity?	1	2	3
	e. Access to water or sanitation?	1	2	3
	f. Immunization history?	1	2	3
	g. Breastfeeding/other fluids?	1	2	3
	h. Digestive system normal?	1	2	3
	i. Ever had surgery on digestive organs?	1	2	3
	k. Eating	1	2	3
	l. Baby care	1	2	3
H42	**What do you do when you conduct a physical examination of the child?**	**Mentioned spontaneously**	**Prompted**	
	a. Check appearance / alertness?	1	2	3
	b. Take her temperature?	1	2	3
	c. Examine the crown of the head? **Note: is it concave?*	1	2	3
	d. Check pulse?	1	2	3
	e. Weigh?	1	2	3
	f. Check height?	1	2	3
	g. Determine capillary refill time/check nailbeds?	1	2	3
	h. Examine eyes?	1	2	3
	i. Check skin turgor/elasticity?	1	2	3
	j. Auscultate abdomen for bowel sounds?	1	2	3
	k. Palpitate abdomen? **Note: examination of stomach by palpating and pressing*	1	2	3
	l. Check feces for blood or mucous	1	2	3
	m. Check palms of hands?	1	2	3
	n. Check for edema in feet?	1	2	3
	o. Breathing normally?	1	2	3
	p. Blood pressure?	1	2	3

SECTION H: FACILITY VIGNETTES

H43	What laboratory examinations would you conduct?	Mentioned spontaneously	Prompted	
	a. Routine bloodwork/CBC? **Note: CBC = Complete Blood Count*	1	2	3
	b. Stool culture?	1	2	3
	c. Blood smear/dipstick for malaria? **Note: quick test for malaria*	1	2	3

H44	If this child has mild dehydration of viral etiology, what would you do?	Mentioned spontaneously	Prompted	
	a. Recommend to increase fluids?	1	2	3
	b. Provide rehydration solution in clinic?	1	2	3
	c. Show how/recommend rehydration solution for home?	1	2	3
	d. Recommend vitamin supplements?	1	2	3
	e. Recommend medicine for fever?	1	2	3
	f. Instruct about returning to clinic if health worsens?	1	2	3
	g. Update immunizations?	1	2	3
	h. Administrate IV fluids?	1	2	3
	i. Recommend antibiotics?	1	2	3
	j. Hospitalize?	1	2	3
	k. Continue to breastfeed?	1	2	3

SECTION H: FACILITY VIGNETTES

Prenatal Care

H45	Does this health facility provide prenatal care?	Yes .... 1 No .... 3→CP
H46	Name of respondent :_______________	
H47	Can you please tell me your qualifications?	Medical doctor: GP .... 01 Medical doctor: specialist .... 02 Nurse .... 03 Midwife .... 04 Paramedic 05
H47a	Where did you complete your studies ?	Indonesia University .... 01 Gadjah Mada University .... 02 Airlangga University .... 03 Diponegoro University .... 04 Padjadjaran University .... 05 Others State University .... 06 Private University .... 07 Others _________ 95
H48	In what year did you complete your studies?	|_|_|_|_|
H49	Have you received additional training since you graduated?	No .... 3→H53 Yes 1

		H50 **Have you ever received training of [...] after you finished the study?**	**H51** **In the last 12 months?**	**H52** **In the last 5 years?**
1.	Safe delivery	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
2.	High risk pregnancies	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
3.	Assistance during labor	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
4.	HIV in pregnancy	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
5.	Obstetrical emergencies	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
6.	Family planning	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes
7.	Other _______________	1. Yes 3. No ↓	3. No 1. Yes↓	3. No 1. Yes

H53	For the rest of the interview, we would like to understand the process by which you provide a pregnancy examination. We would like to know everything you do, beginning with the arrival of the patient, waiting upon the patient and ending when she goes home. I shall describe the patient, and I will ask you a series of questions about activities you perform regularly. Once a section is complete, we are unable to go back and change answers. Now I will read out the case

INSTRUCTIONS TO INTERVIEWER:

1. **READ OUT CASE 2 TIMES, AND THEN ASK QUESTIONS H55 – H60.**
2. **FIRST LISTEN TO THE RESPONDENT. ANY RESPONSE THAT HE OR SHE MENTIONS SPONTANEOUSLY SHOULD BE MARKED WITH CODE 1.**
3. **AFTER THE RESPONDENT IS FINISHED WITH THE WHOLE QUESTIONNAIRE, TELL THE RESPONDENT THAT YOU ARE GOING TO REVIEW THE CASE AGAIN.**
4. **START FROM THE BEGINNING AND READ THE CASE A SECOND TIME. ASK QUESTIONS H55 – H60.**
5. **READ OUT ANY RESPONSES THAT HE/SHE DID NOT MENTION SPONTANEOUSLY THE FIRST TIME. CODE THE APPROPRIATE RESPONSE:**

H54	**Mrs. Ani, a married woman of 26, has not had her period for 3 months. She has come to you for a pregnancy examination. This is her first visit. Please recount everything you would do during the pregnancy examination..**

SECTION H: FACILITY VIGNETTES

H55	What are most important questions you would ask Mrs. Ani about her previous pregnancies and labor?	Mentioned spontaneously	Prompted	
	a. Number of prior pregnancies?	1	2	3
	b. Number of living children	1	2	3
	c. Number of miscarriages/abortions/stillbirths?	1	2	3
	d. Any bleeding during previous labor?	1	2	3

H55	What are most important questions you would ask Mrs. Ani about her previous pregnancies and labor?	Mentioned spontaneously	Prompted	
	e. How the last child was delivered?	1	2	3
	f. Birth weight of previous child?	1	2	3
	g. History of genetic anamolies?	1	2	3
	h. Gynecological history (STIs, pap smear, contraceptive use, etc.)	1	2	3
H56	**What are themost important questions you ask Mrs. Ani about her current pregnancy?**	**Mentioned spontaneously**	**Prompted**	
	a. Last menstrual date?	1	2	3
	b. Any health problems now?	1	2	3
	c. Any obstetric symptoms (contractions, vaginal bleeding, etc)?	1	2	3
	d. Any weight loss/gain, nausea, vomiting?	1	2	3
	e. Taking any medications now?	1	2	3
H57	**What are the most important questions you want to ask about her medical and social/behavioral history?**	**Mentioned spontaneously**	**Prompted**	
	a. Any history of high blood pressure?	1	2	3
	b. Any history of diabetes?	1	2	3
	c. Any previous STI, including HIV+?	1	2	3
	d. Any previous IUD or contraceptive use?	1	2	3
	e. Tetanus shot in previous pregnancy?	1	2	3
	f. Any previous heart disease?	1	2	3
	g. Family history of hereditary disease?	1	2	3
	h. Ever had malaria?	1	2	3
	i. Present or previous smoker?	1	2	3
	j. Any history of alcohol use?	1	2	3
	k. Assess whether pregnancy is high risk?	1	2	3
	l. Ever had surgery?	1	2	3
	m. Any history of asthmatism?	1	2	3
	n. Any history of kidney disease?	1	2	3
H58	**What would you do when you conduct a physical examination of Mrs. Ani?**	**Mentioned spontaneously**	**Prompted**	
	a. Body height?	1	2	3
	b. Body weight?	1	2	3
	c. Take blood pressure?	1	2	3
	d. Palpitate abdomen/measure uterine height?	1	2	3
	e. Listen to fetal heartbeat?	1	2	3
	f. Pelvic examination? **Note: internal examination*	1	2	3
	g. Check for edema? **Note: swelling or 'odim'*	1	2	3
	h. Upper arm measurement	1	2	3
	i. Facial appearance, paleornot	1	2	3

SECTION H: FACILITY VIGNETTES

H59	What laboratory examinations would you conduct?	Mentioned spontaneously	Prompted	
	a. Pregnancy test?	1	2	3
	b. Hemoglobin test?	1	2	3
	c. Urine examination for	1	2	3
	d. Urine protein?	1	2	3
	e. Ultrasound?	1	2	3
	f. Platelets?	1	2	3
	g. Liver enzymes	1	2	3
	h. Chem 7/BUN/creatinine **Note:* *Chem 7 test is a 7 chemical testing to attain information on body metabolism.* *BUN test = blood urea nitrogen to measure the amount of urea nitrogen in the blood and to attain information on the metabolism and liver function.* *Creatinine test is to measure the level of creatinine in the blood, to attain information on the function of the kidney.*	1	2	3
	i. HIV screen	1	2	3
	j. STI test: syphillis o	1	2	3
	k. Rubella antibodies **Note: to examine if body has had antibody for rubella virus*	1	2	3
	l. Blood type and rhesus	1	2	3
	m. Dental test	1	2	3
H60	**What procedures or advice would you give Mrs. Ani before sending her home?**	**Mentioned spontaneously**	**Prompted**	
	a. Advice about nutrition?	1	2	3
	b. Administer tetanus toxiod?	1	2	3
	c. Supply iron/ folic acid supplementation?	1	2	3
	d. Schedule her for another prenatal visit?	1	2	3
	e. Make a plan for delivery?	1	2	3
	f. Advice about danger signs for emergency	1	2	3
	g. Recommendations for lactation / contrace	1	2	3
	h. HIV voluntary counseling/test?	1	2	3
	i. Complete prenatal card?	1	2	3
	j. Rest	1	2	3
	k. Maintain cleanliness	1	2	3

Appendix 4.2: ENHANCE household survey instrument

Equity and Health Care Financing in Indonesia (ENHANCE) study

QUESTIONNAIRE FOR HOUSEHOLD SURVEY

BACKGROUND DATA

Q1. Household ID: _____ (4 digits starting from 0001)

Q2. Village unique ID: _______

Q3. Enumerator ID: ________

Q4. Location of house

1 Urban area

2 Rural area

===

Enumerator Introduction [Hello, my name is__________and I am from______. Your household has been randomly selected to participate in a study on the use of health services.
We would like to speak with the person responsible for health care decisions in this household. The information you give will be kept confidential and no personal details will appear in any records. The interview will take about 45 minutes. You do not have to answer a question if you don't want to and you can stop the interview at any time. Please feel free to have another member of this household with you, if you like. We appreciate your assistance].

Enumerator, please be sure that the person you're interviewing is the head of household and/or his/her spouse or any adult member of the household.

Household members are all usual residents of the household (i.e. they live most of the year under the same roof and share meals). This person should be very familiar with each family members health status and their use of health services.

Q5. Are you willing to take part?

1 Yes

0 No **(Stop the interview and go to the next closest household)**

Q6. If yes, do you have any questions before we start?

1 Yes (**Take note of any questions they have on paper and if you are unable to answer then ask to suspend the interview so you can call your supervisor for help**)

0 No

SECTION 1: HOUSEHOLD LIVING STANDARD INFORMATION

Q7. What are the outer walls of the home mainly made of? (Can enter by observation) (**Choose one**)

1 Bamboo
2 Wood stem
3 Bamboo matting
4 Wood
5 Brick
6 Other **(If not other, skip next Q)**

Q7a. If other, please specify what the outer walls are mainly made of

— —
— —

Q8. What is the main material of the roof? (Can enter by observation) (**Choose one**)

1. Thatch/palm leaf/sod
2 Wood/sirap
3 Bamboo
4 Zink
5 Asbestos
6 Tile
7 Concrete
8 Metal tiles
9 Other **(If not other, skip next Q)**

Q8a. If other, please specify what the main material of the roof is

— —
— —

Q9. How many rooms in the dwelling unit are used by the household (other than kitchen, toilet and bathrooms)?

____________rooms (If the house has no separate room, consider as having one room)

Q10. What is the main source of drinking water for your household? (**Choose one**)

1 Piped in dwelling or on premises
2 Public tap
3 Open well in dwelling or on premises
4 Open public well
5 Protected well in dwelling or on premises
6 Protected public well
7 Spring
8 Rivers/stream
9 Pond/lake
10 Dam

11 Rain water
12 Tanker truck
13 Bottled water
14 Refill water
15 Other **(If not other, skip next Q)**

Q10a. If other, please specify source of drinking water

_ _

Q11. What toilet facility does your household have within the premises? (In the area close to the dwelling) (**Choose one**)

1 Private with septic tank
2 Private without septic tank
3 Shared/public
4 River/stream/creek
5 Pit
6 Yard/bush/forest
7 Other **(If not other, skip next Q)**

Q11a. If other, please specify

_ _

_ _

Q12. What toilet facility does your household usually use?

1 Toilet that we have
2 Public toilet/pit latrine or shared with others (any type)
3 Open land
4 Other **(If not other, skip next Q)**

Q12a. If other, please specify

_ _

_ _

Q13. What is your main energy source for cooking? (Choose one)

1 Electricity
2 Liquefied petroleum gas LPG/natural gas
3 Biogas
4 Kerosene
5 Coal/lignite
6 Charcoal
7 Firewood
8 Straw/shrubs/grass
9 Agricultural crop
10 Animal dung
11 No food cooked in household
12 Other **(If not other, skip next Q)**

Q13a. If other, please specify main energy source

_ _

I am going to read out a list of things that are found in some households, please tell me whether you have them in this household and whether they are in a working order.

Q14a. Does your household have?

a. Electricity	1. Yes	0. No
b. Radio	1. Yes	0. No
c. TV	1. Yes	0. No
d. Telephone	1. Yes	0. No
e. Hand phone	1. Yes	0. No
f. Refrigerator	1. Yes	0. No
g. Bicycle	1. Yes	0. No
h. Motorcycle	1. Yes	0. No
i. Rowboat	1. Yes	0. No
j. Motorboat	1. Yes	0. No
k. Animal-drawn cart	1. Yes	0. No
l. Car/van/truck	1. Yes	0. No
m. Ship	1. Yes	0. No
n. Bank account	1. Yes	0. No
o. Agricultural land	1. Yes	0. No

If yes to o), How many meter squared of agricultural land do members of this household own?

____ Meter squared (97 if don't know)

Q14b. How many of the following animals does this household own?

a. Cattle?

b. Milk cows/bulls?

c. Horses, donkeys or mules?

d. Goat, sheep?

e. Pig?

f. Poultry?

Q15. Health Insurance ownership of person 01

1 PBI/KIS (insurance for the poor)

2 Non PBI (PPU) (termasuk kartu Askes/*gov't employee, formal workers*

3 Non PBI (mandiri/PBPU)/*personally paid*

4 Non PBI (Bukan Pekerja) termasuk pensiunan,/include retiree

5 Jamkesda *(Local govt insurance)*

6 Asuransi swasta *(private Insurance*)

7 Perusahaan kantor /self-managed insurance (jaminan kesehatan dikelola sendiri)

8 None

9 Other

Q15a. If other, please specify the type of the insurance

— —

— —

Q16 Are there members of this household currently receiving any of the following government grants or income? (Multiple answers possible)

1 PKH (Family Hope program = CCT)

2 BLT (Unconditional cash transfer)

3 Rastra (Food assistance)

4 Kartu Indonesia Pintar (Education assistance)

5 Other **(If not other, skip next Q)**

6 Don't know

Q16a. If other, please specify the type of grant/scheme

— —

Q17. Approximately, how much did this household spend in the past month on the following items (*referring to the expenses for daily need of household, not for business, e.g. expenses for fuel used for moto-taxi/taxi are not included*)?

a-Food	IDR.......................... (put 97 if don't know)
b-Schooling	IDR........................... (put 97 if don't know)
c-Electricity	IDR............................(put 97 if don't know)
d-Water	IDR............................(put 97 if don't know)
e-Transportation	IDR............................(put 97 if don't know)
f-Fuel (if own transport)	IDR............................(put 97 if don't know)
g-Health care	IDR............................(put 97 if don't know)
h-Social events (e.g. weddings & funerals)	IDR............................(put 97 if don't know)

Q18. How well-off do you think this household is compared to other households in your neighborhood ? (Choose one)

1 Well-off

2 Comfortable

3 Just managing

4 Struggling

97 Don't Know

SECTION 2: BASIC DEMOGRAPHIC AND SOCIOECONOMIC INFORMATION

***(Start with the respondent and then move to other members of the household)*.**

Q19. How many people are in this household - including you? __ __

Q20. Please provide the name of every member of this household starting with you? *Prompt: people who live most of the year under the same roof and share meals)* (WRITE THE FULL NAME)

PERSON CODE **FULL NAME**

01…………………………………………
02…………………………………………
03…………………………………………
04…………………………………………
05…………………………………………
06…………………………………………
07…………………………………………
08………………………………………….
09………………………………………….
10………………………………………….
11…………………………………………
12………………………………………….
13…………………………………………
14…………………………………………
15…………………………………………

— —

Q21. Where was Person 01… born? (**Choose one**)

1 Indonesia

2 Another Asian country

3 Other **(If not other, skip next Q)**

Q21a. If other, please specify where you were born

— —

Q22. What is the marital status of Person 01…? (**Choose one**)

1 Married

2 Living with partner

3 Widow/widower

4 Divorced or separated

5 Single (never married)

6 Other **(If not other, skip next Q)**

Q22a. If other, please specify your marital status

— —

— —

Q23. What is the age at the next birthday of Person 01…?

_____(97 if Don't Know)

Q24. What is the gender of Person 01…? **(Choose one**)

1 Male

2 Female

Q25. What is the highest level of education of Person 01…? (**Choose one**)

1 Without school experience

2 Some elementary school

3 Completed elementary school

4 Junior high school graduate

5 Senior high school graduate

6 University graduate

7 Other

Q25a. If other, please specify your highest level of education

— —

— —

Q26. What is the current main occupation of Person 01…? (**Choose one**)

1 Self-employed in small business
2 Self-employed with unpaid family/temporary worker
3 Self-employed with permanent worker
4 Government worker
5 Private worker
6 Casual worker in agriculture
7 Casual worker not in agriculture
8 Unemployed
9 Retiree/pensioner
10 Student/learner
11 Child
12 Other **(If not other, skip next Q)**

Q26a. If other please specify your current occupation

— —
— —

Q27. What is the relationship of Person 01… to the head of this household? (**Choose one**)

1 Head of Household
2 Husband/wife/partner
3 Son/daughter/step/adopted child
4 Brother/sister/stepbrother/stepsister
5 Father/mother/stepfather/stepmother
6 Grandparent/ great grandparent
7 Grandchild/ great grandchild
8 Other relative (e.g. in-law, aunt or uncle)
9 Non-relative (lodger, tenant, friend)
10 Other **(If not other, skip next Q)**

Q27a. If other, please specify relationship to head of household

— —
— —

SECTION 3: MORBIDITY, HEALTH SERVICE USE AND HEALTH EXPENDITURE

SECTION 3.1: MORBIDITY AND HEALTH SERVICE USE IN THE PAST MONTH AND RELATED EXPENDITURE

Q28. In the **past month,** were you or any member of the household ill or injured? (PROBE)

1 Yes

0 No (***Skip to Q50***)

97 Don't Know (***Skip to Q50***)

Q29. If yes**, how many persons,** including you? __________(97 if Don't Know)

Now let me ask you about health service use in the past month as an outpatient by these ill/injured members. You'd first respond for yourself and then for any other members of this household.

[Outpatient is where you normally get treated and come home the same day without staying overnight].

Q30. What is the name of this household member [Person 1...] who has received outpatient care in the **past month**? (Write Person ID ONLY: 01, 02…15)

____

____

Q31. Did - [Person 1...] visit a **public hospital** in the past month as an outpatient?

1 Yes

0 No **(Skip next Q)**

97 Don’t know **(Skip next Q)**

Q31a. If yes, how many times has - [Person 1...] visited a public hospital in the past month as an outpatient?

_____(97 if Don't Know)

Q32. Did [Person 1...] visit a **health centre/health post** in the past month as an outpatient?

1 Yes

0 No **(Skip next Q)**

97 Don't Know **(Skip next Q)**

Q32a. If yes, how many times has [Person 1...] visited a health centre/health post in the past month as an outpatient?

_____(97 if Don't Know)

Q33. Did - [Person 1...] visit a **private hospital/clinic** in the **past month** as an outpatient?

1 Yes

0 No **(Skip next Q)**

97 Don't Know **(Skip next Q)**

Q33a. If yes, how many times has [Person 1...] visited a private hospital/clinic in the past month as an outpatient?

_____(97 if Don't Know)

Q34. Did [Person 1...] visit a **private pharmacy/drug store** in the past month as an outpatient?

1 Yes

0 No **(Skip next Q)**

97 Don't Know **(Skip next Q)**

Q34a. If yes, how many times has [Person 1...] visited a private pharmacy in the past month as an outpatient?

______(97 if Don't Know)

Q35. Did [Person 1...] visit a private GP**/nurse/midwife** in the past month?

1 Yes

0 No **(Skip next Q)**

97 Don't Know **(Skip next Q)**

Q35a. If yes, how many times has [Person 1...] visited this trained health worker in the past month?

______(97 if Don't Know)

Q36. Did [Person 1...] visit a **private dentist** in the past month?

1 Yes

0 No **(Skip next Q)**

97 Don't Know **(Skip next Q)**

Q36a. If yes, how many times has **-** [Person 1….] visited a private dentist in the past month?

______(97 if Don't Know)

Q37. Did [Person 1...] receive any treatment/care provided by a visiting provider at your home in the past month?

1 Yes

0 No **(Skip next Q)**

97 Don't Know **(Skip next Q)**

Q37a. If yes, how many times has [Person 1...] received such treatment/care provided by a visiting provider at your home in the past month?

______(97 if Don't Know)

Q38. Where is the **MOST RECENT** treatment/care of [Person 1...] received from (**Choose one**):

1 Public hospital (National/Provincial/District)

2 Health centre/health post

3 Private hospital/clinic

4 Private pharmacy/drug store

5 Private GP/Nurse/midwife

6 Private dentist

7 Treatment/care provided at your home by a visiting provider

97 Don’t know

Q38a. What is the name of the health facility?

____

Q38b. How far is the health facility located? (in km)

____

Q39. How did [Person 1...] travel to see the provider/facility? (**Choose one**)

1 Walking
2 Cycling
3 Cart
4 Motorcycle
5 Car
6 Bus/
7 Boat
8 No travel (in case of treatment/care at home only) (**Skip next Q**)
97 Don't Know

Q40. How long did it take [Person 1...] to travel from home to the facility?
(in mintutes)

__ __

(97 if Don't Know)

Q41. Did [Person 1...] have to pay anything (including payment to the provider/facility, transportation and food…) for this visit out-of-own pocket? Probe: any kind of out-of-pocket payments (expenses for medical care that aren't reimbursed by insurance. **Out**-of-**pocket costs** include deductibles, coinsurance, and copayments for covered services plus all **costs** for services that aren't covered)

0 No **(Skip next Q47)**

1 Yes

97 Don't Know **(Skip next Q47)**

Q42. If yes, how much **IN TOTAL** did [Person 1...] or the household pay out-of-pocket for this most recent treatment/care?

IDR____________.______(*97 if Don't Know and convert in-kind payment into monetary value*)

Q43. How much was spent on each of the following:

1 Formal payment for service fees

2 Informal payment (gratitude, etc.)

3 Medicines/Lab tests/x-ray… additional to service fees

4 Transportation

5 Other **(If not other, skip next Q)**

97 Don't Know

Q46a. If other, please specify any other items the money paid for

— —

If more than one person ill/injured in the past month, continue to [Person 2, 3…] by starting with question on name as in Q31

SECTION 3.2: HOSPITAL ADMISSION (INPATIENT CARE) IN THE PAST 12 MONTHS AND RELATED EXPENDITURE

[I'd like to ask few questions about any hospital admissions in the past 12 months for all members of this household including you].

Q44. Has anybody in this household been admitted to a hospital or any health facility in the past 12 months?

1 Yes

0 No (**Skip to Q64**)

97 Don't Know (**Skip to Q64**)

Q45. If yes, how many people in this household have been hospitalised in the past 12 month?

______(97 if Don't Know)

Q46. What is the name of this household member who has been hospitalised in the past 12 months- [Person 1...]? (Write Person ID ONLY: 01. 02,…15)

— —

Q47. How many times in the past 12 months has [Person 1….] been hospitalised for at least one night?

______(97 if Don't Know)

If many admissions in the past 12 months, identify the MOST RECENT admission, and ask more questions about it as follows

Q48. Was [Person 1...] admitted to a public or private facility? (**Choose one**)

1 Public facility (national/provincial/district hospital/health center)

2 Private facility

97 Don't Know

Q48a. What is the name of the hospital for the most recent admission?

____

Q48b. How far is the health facility located from home? (in km)?

____

Q49. How long did [Person 1...] stay in the hospital? [No. of nights spent in the hospital]

________days (97 if Don’t Know)

Q49. Did [Person 1...] have to pay anything out-of-pocket for this hospitalization (including payment to the provider/facility, transportation and food…)?

1 Yes

0 No (**Skip to Q61**)

97 Don't know (Skip to 61)

Q50. If yes, how much **IN TOTAL** did [Person 1...] pay out-of-pocket for this hospitalization?

IDR____________.______(*97 if Don't Know and convert in-kind payment into monetary value*)

Q51. How much was spent on each of the following:

1 Formal payment for service fees

2 Informal payment (gratitude, etc.)

3 Medicines/Lab tests/x-ray… additional to service fees

4 Transportation

5 Other **(If not other, skip next Q)**

97 Don't Know

Q51a. If other, please specify any other items the money paid for

— —

Q52. How did [Person 1...] travel to the hospital? (**Choose one)**

1 Walking

2 Cycling

3 Cart

4 Motorcycle

5 Car/taxi

6 Bus

7 No travel (in case of treatment/care at home only) (**Skip next Q**)

97 Don't Know

Q53. How long did it take [Person 1...] to travel from home to the facility?

__ __ Minutes

(97 if Don't Know)

If more than one person hospitalized in the past 12 months, continue to [Person 2, 3…] by starting with question on name as in Q51

SECTION 3.3: DELAYED TREATMENT AND NON-USE OF HEALTH CARE

Q54. In the **last 12 months**, have you or any members of this household **NOT sought** health care when being sick and then the sickness got worse?

1 Yes

0 No (**Skip to Q67**)

97 Don't Know (**Skip to Q67**)

Q55. What is the name of this household member who did not seek health care when he/she was first ill and the illness got worse - [Person 1...]? (Write Person ID ONLY: 01, 02,…15)

— —
— —

Q56. Why did [Person 1...] not seek health care immediately? (**Choose one**)

1 Thought it was not serious

2 Could not afford health service and other related costs

3 Could not afford the transportation costs

4 Busy/could not get time off work

5 No wanted/trusted health facility/provider around or the trusted/wanted health facility/provider too far

6 Other (**If not other, skip next Q**)

97 Don't Know

Q56a. Please specify any other reason for [Person 1...] not seeking care immediately

— —
— —

If more than one person delayed or did not seek care in the past 12 months, continue to [Person 2, 3…] by starting with question on name as in Q65

SECTION 3.4: PREVENTIVE MATERNAL AND CHILD HEALTH SERVICE USE IN THE PAST 12 MONTHS AND RELATED EXPENDITURE

[I'd like to ask few questions about preventive maternal and child health service used by any members of this household including you. This includes any services not captured by inpatient and outpatient services such as immunizations.]

Q57. Has anybody in this household used any of the following services in the past 12 months?

a.	Family planning services	1. Yes 0. No
b.	Antenatal care	1. Yes 0. No
c.	Normal delivery and associated services	1. Yes 0. No
d.	Postnatal care	1. Yes 0. No
e.	Vaccination services for women and children	1. Yes 0. No

If No or Don't Know for all the services skip to SECTION 4

Q58. If yes, how many people in this household have used at least one of these services in the past 12 month?

______(97 if Don't Know)

Q659. What is the name of this household member who has used at least one of these services in the past 12 months- [Person 1...]? (Write Person ID ONLY: 01, 02,…15)

— —

Q60. Where is the **MOST RECENT** treatment/care of [Person 1...] received from (**Choose one**):

8 Public hospital (National/Provincial/District)

9 Health centre/health post

10 Private hospital/clinic

11 Private pharmacy/drug store

12 Private GP/Nurse/midwife

13 Private dentist

14 Treatment/care provided at your home by a visiting provider

97 Don't know

Q60a. What is the name of the provider/facility?

____

Q60b. How far is the health facility located? (in km)?

____

Q61. Did [Person 1...] have to pay anything out-of-pocket for these services (including payment to the provider/facility, transportation and food…)?

1 Yes

0 No (**Skip to Q76**)

97 Don't Know (**Skip to Q76**)

Q62. If yes, how much **IN TOTAL** did [Person 1...] pay out-of-pocket for these services?

IDR____________.______(*97 if Don't Know and convert in-kind payment into monetary value*)

Q63. How much was spent on each of the following:

1 Formal payment for service fees

2 Informal payment (gratitude, etc.)

3 Medicines/Lab tests/x-ray… additional to service fees

4 Transportation

5 Other **(If not other, skip next Q)**

97 Don't Know

If more than one person using these preventive services in the past 12 months, continue to [Person 2, 3…] by starting with question on name as in Q68

SECTION 4: HEALTH CARE RELATED BORROWING AND DEBT

Q64. For households whose member(s) have used health care services as recorded in SECTION 3, did your household have to borrow money or make use of loan for other purposes to pay for health care related costs?

1 Yes

0 No

Q64a. If Yes, was it:

1 A loan purposively for health care related payments?

0 A loan for other purposes but partly or totally used for health care related payments?

Q65. Was it used for payments related to:

1 Treatment/care in the past month?

2 Hospitalization (inpatient care) in the past 12 month?

3 Preventive maternal and child care in the past 12 months?

Q66. What was the amount of the loan used for health care related payments?

IDR____________. _ (97 if don't know and convert the loan in kind into monetary value)

Q67. Was the loan with interests?

1 Yes

0 No (**Skip to Q81**)

Q67a. If with interests, how much was the interest?

IDR____________ . (97 if don't know)

Q68. For what period of time does your household have to pay off the loan?____________Months
_____________Days.

Q69. Does your household still currently owe money (have any debt) to other households or any financial institutions because of payment for health care of your household members?

1 Yes

0 No

Q69a. If yes, how much? IDR____________________________(97 if don't know)

SECTION 6: SELF-RATED HEALTH (for respondent)

Q70. In general, how is your health? (**Choose one**)

1 Very healthy

2 Somewhat healthy

3 Somewhat unhealthy

4 Unhealthy

Q71. During the last 4 weeks, how many days of your primary daily activities did you miss due to poor health?

Days_______ (97 if don’t know)

Q72. In the last 4 weeks, how many days have you stayed in bed due to poor health?

Days_______ (97 if don’t know)

Q73. Compared with your health 12 months ago, would you say that your health is [...] ? (**Choose one**)

1 Much better now

2 Somewhat better now

3 About the same

4 Somewhat worse

5 Much worse

Q74. How do you expect your health to be in next year ? (**Choose one**)

1 Much better

2 Somewhat better

3 About the same

4 Somewhat worse

5 Much worse

Q75. Compared to another person of your age and sex, would you say that your health is [...] ? (**Choose one**)

1 Very healthy

2 Somewhat healthy

3 Somewhat unhealthy

4 Unhealthy

Q77. Knowing your current condition, do you expect you will be able to do the same activities as you do today in the next 5 years ? (**Choose one**)

1 Yes

0 No

END OF SURVEY - THANK YOU!

Appendix 4.3: ENHANCE facility survey instrument

Equity and Health Care Financing in Indonesia (ENHANCE) study

QUESTIONNAIRE FOR HEALTH FACILITY SURVEY

Hello, my name is _______ and I am from _________. Your health care facility has been selected to participate in a study on the impact of JKN jointly conducted by the University of Indonesia, the University of New South Wales in Australia and the London School of Hygiene and Tropical Medicine in the UK. The information you give will be kept confidential and the interview will take about 30 minutes. You do not have to answer a question if you don't want to and you can stop the interview at any time. We appreciate your kind assistance.

Name of facility:
Type of facility: Public/Private
Address:
Total floor area of the facility: .....m^2
Head/Principal/Director of the facility:
Phone number of the head of the facility:

No	Name	Definition	Measurement 2019	Measurement 2017
1	Physical Access	Is this facility accessible by public transport (angkot)	Yes No	Yes No
2	Distance to hospital	Distance to the nearest hospital. Measured by GPS	---KM	---KM

No	Name	Definition	Measurement 2019	Measurement 2017
3	Electricity	How many watt does this facility have for electricity?	.....watts	.....watts
4	Examination rooms	How many examination rooms are available?	.....rooms	.....rooms
5	AC	How many examination rooms are with air conditioned?	....rooms	....rooms
6	AC	How many waiting rooms are with air conditioned?	.....rooms	.....rooms
7	Sevice access	How many hours does this facility provide services on <u>weekdays</u>?	Less than 8 hours a day (..) 8-17 hours (..) 17-22 hours (..) 24 hours (..)	Less than 8 hours a day (..) 8-17 hours (..) 17-22 hours (..) 24 hours (..)
8	Sevice access	How many hours does this facility provide services on <u>weekends</u>?	Less than 8 hours a day (..) 8-17 hours (..) 17-22 hours (..) 24 hours (..)	Less than 8 hours a day (..) 8-17 hours (..) 17-22 hours (..) 24 hours (..)
	Staffing			
9	Number of doctors	How many licensed doctors (GP) provide services full time (minimum 8 hrs a day)?	....dr (GPs)	....dr (GPs)
10	Number of doctors	How many licensed doctors (GP) provide services part time?	.... dr (GPs)	.... dr (GPs)
11	Number of dentist	How many full time dentists are practicing in this facility?	....drg	...drg
12	Number of Specialist doctors (in staff hours)	How many staff hours are specialists providing services in this facility per week (rank form 0, no specialist)?	.....hours	.....hours
13	Number of nurses	How many licensed-full time nurses are working in this facility?	....persons	....persons
14	Number of midwives	How many licensed-full time midwives are working in this facility?	....persons	....persons
15	Real access	How many patients/visits this facility in July and in the year?	.....patients in July ......patients in 2018	.....patients in July ......patients in 2018
	Basic Equipment			
16	Internet access	Does this facility have access to computer & internet access?	--- no Yes ....computer	--- no Yes ....computer
17	Running water	Does this facility have running water?	Yes own well Yes public water supply (PAM) No	Yes own well Yes public water supply (PAM) No

No	Name	Definition	Measurement 2019	Measurement 2017
18	Emergency room	Does this facility have emergency room observation?	No Yes ....beds	No Yes ....beds
19	Stethoscopes	How many functional stethoscopes does this facility have?	.... stethoscopes	.... stethoscopes
20	Adult scale	How many functional adult scales does this facility have?	....scales	....scales
21	Child scale	How many functional child scales does this facility have?	....scales	....scales
22	Thermometer	How many functional thermometers does this facility have?	....thermometers	....thermometers
23	Blood pressure	How many funtional blood pressure gauge (tensimeters) does this facility have?	....tensimeters	....tensimeters
24	Single use syringe	Does this facility only use single use syringes?	No Yes	No Yes
25	Latex gloves	Does this facility have latex gloves?	No Yes	No Yes
26	Safe storage and disposal of sharps	Does this facility have equipment and services for safe disposal of sharps?	No Yes	No Yes
27	Safe storage and disposal of infectious waste	Does this facility have equipment and services for safe disposal of infectious wastes?	No Yes	No Yes
28	Pharmacy	Does this facility have a pharmacy section?	No Yes	No Yes
	Diagnostic capacity			
29	I would like to know if the following diagnostic tests and associated equipment are available in this facility.			
a	Haemoglobin and blood count	--		
30	Blood glucose	--		
31	Urine dipstick - protein	--	No Yes	No Yes
32	Urine dipstick - glucose	--	No Yes	No Yes
33	Urine test for pregnancy	--	No Yes	No Yes
35	HIV rapid test	--	No Yes	No Yes
36	Syphilis rapid test	--	No Yes	No Yes

No	Name	Definition	Measurement 2019	Measurement 2017
37	Malaria rapid test	--	No Yes	No Yes
34	Laboratory	Does this facility have simple lab section?	No Yes	No Yes
38	Essential medicines – Does this facility have the following medicine in stock?			
A		Amlodipine tablet or alternative calcium channel blocker	No Yes	No Yes
B		Amoxicillin tablet	No Yes	No Yes
C		Ampicillin powder for injection	No Yes	No Yes
D		Aspirin cap/tab		
E		Beta blocker (e.g.bisoprolol, metoprolol, carvedilol, atenolol)		
F		Beclometasone inhaler		
G		Carbamazepine tablet		
H		Enalapril tablet or alternative ACE inhibitor e.g. lisinopril, ramipril, perindopril		
I		Fluoxetine tablet		
J		Gentamicin injection		
K		Glibenclamide tablet		
L		Haloperidol tablet		
M		Insulin regular injection		
N		Magnesium sulphate injectable		
O		Metformin tablet		
P		Omeprazole tablet or alternative such as pantoprazole, rabeprazole		
Q		Oral rehydration solution		
R		Salbutamol inhaler		
s		Simvastatin tablet or other statin e.g. atorvastatin, pravastatin, fluvastatin		
T		Thiazide (e.g. hydrochlorothiazide)		
U		Zinc sulphate tablets, dispersible tablets or syrup		
	Accreditation status			
37	Accreditation	Is this facility accreditted by the MoH?	No Yes..., category....	No Yes..., category....
38	BPJS contract	Is this facility contracted by BPJS?	No Yes, since...year	No Yes, since...year

Appendix 4.4: Indicators for general service readiness used in analysis

Domains	*Indicators*
Basic amenities (8)	Physical access, toilet facilities, examination room with air conditioning, waiting room, internet connection, computer, running water, emergency room
Infection prevention (4)	Safe storage and disposal of infectious waste, safe storage and disposal of sharps, latex gloves, single use syringes.
Basic equipment (5)	Blood pressure meter, thermometer, baby scale, adult scale, and stethoscope.
Essential medicines (21)	Amlodipine tablet or alternative calcium channel blocker, Amoxicillin, Ampicillin, Aspirin, Beta blocker, Beclometasone inhaler, Carbamazepine, Enalapril tablet or alternative ACE inhibitor, Fluoxetine, Gentamicin injection, Glibenclamide tablet, Haloperidol, Insulin regular injection, Magnesium sulphate injectable, Metformin, Omeprazole or alternative, Oral rehydration solution, Salbutamol inhaler, Simvastatin or other statin, Thiazide, Zinc sulphate.
Diagnostic capacity (8)	Malaria rapid test, syphilis rapid test, HIV rapid test, pregnancy test, haemoglobin and blood count, blood glucose estimation, urine glucose test strips, urine protein test strips.

Appendix 4.5: Ethical approvals (LSHTM, University of New South Wales and University of Indonesia)

Appendix 5.1: Indicators for general service readiness

Domains	*Indicators*
Basic amenities (8)	Power, internal water source, curtain to close of examination room (observed), clean examination floor and walls (observed), running water to wash hands in the examination room (observed), garbage can in the examination room (observed), examination table (observed), toilet facilities
Infection prevention (4)	Sterilisation/autoclaves, alcohol, Betadin, gloves
Basic equipment (17)	Regular stethoscope, stethoscope for pregnant mothers, blood pressure meter, adult scale, infant scale, thermometer, measure for body height, communication equipment. **Lab specific:** Sahli set, giemsa stain solution, benedict solution, wright solution, strips for pregnancy test, urine protein test strips, urine glucose test strips, microscope, centrifuge
Essential medicines (15)	Oral antibiotic, eye antibiotic, analgesic, antipyretic, anti-fungal, anthelmintics, anti-TB, anti-malarial, ORS, iron tablets, vitamin A, medicine for BP, anesthetic, medicine for cholesterol, medicine for blood sugar
Diagnostic capacity (8)	Haemoglobin, leucocyte estimation, blood type estimation, erythrocyte estimation, urine analysis, pregnancy test, faeces examination, sputum examination

Notes: All indicators were coded as 1 if the interviewee reported the presence of the items. If not, the indicator was recoded as 0.

Appendix 5.2: Details on the criteria used in the medical vignettes

For prenatal care, nineteen criteria were identified based on international guidelines for routine pregnancies (Villar & Bergsjo, 1997). For the adult presenting with cough and fever, eleven criteria corresponding with guidelines for the integrated management of adult illness for environments of high tuberculosis prevalence were selected (World Health Organization, 2004). For the scenario of a child with diarrhea and vomiting, the twelve criteria were coded against guidelines for the integrated management of childhood illnesses (World Health Organization, 2002). For the scenario of an adult with diabetes, the IFLS indicated the criteria to include but did not mention the guideline used.

Prenatal case	Adult curative care	Child curative care	Adult care with diabetes
Evaluate hypertensive disorders 1. Ask history of high blood pressure 2. Take blood pressure 3. Test urine protein 4. Ask about smoking habit **Take History and Physical** 5. Ask about history of heart disease 6. Ask about history of diabetes 7. Ask about family history of illnesses 8. Take height measurements 9. Weigh patient 10. Measure uterine height 11. Assess whether high-risk pregnancy **Perform diagnostics and prevention** 12. Determine tetanus immunization status 13. Test for sexually transmitted infections 14. Test hemoglobin levels 15. Advise on nutrition 16. Give iron-folate **Establish care management system** 17. Date the pregnancy 18. Plan for delivery 19. Plan for follow-up visits	**Take history** 1. Ask about duration of illness 2. Ask about previous respiratory illness 3. Ask about blood in cough 4. Ask about color of sputum 5. Ask about chest pain **Conduct physical, sputum** 6. Take temperature 7. Listen to respiration 8. Examine throat 9. Assess chest in drawing 10. Assess for cyanosis 11. Test sputum	**Take history** 1. Ask about duration of illness 2. Ask about frequency of illness 3. Ask about appearance of stools/vomit 4. Ask about blood in stools 5. Ask about fever **Conduct physical** 6. Take temperature 7. Check for sunken fontanelles 8. Check skin turgor 9. Take pulse 10. Check alertness **Provide care and advice** 11. Administer oral rehydration fluids 12. Recommend when to return if worse	**Questions about present condition** 1- Ask about duration of illness 2-Ask about history of medication 3-Ask about frequency of urine 4- Ask about frequency of thirst 5- Ask about weigh loss 6- Ask about sweating 7-Ask about anxiety and heart palpitations 8- Ask about abdominal fullness after meals 9-Ask about edema or weigh retention 10-Ask about current treatment for hypertension 11-Ask about tingling feeling 12- Ask about wound that stays 13- Ask about ulcer 14- Ask about family history 15- Ask about weary feeling 16- Ask about blood sugar check **Take history** 17-History of hypertension? 18- History of high cholesterol? 19-Co-existing or prior heart condition? 20-Prior eye examination? 21-Prior hospitalization? 22-Prior diabetic coma? 23-Prior renal failure? 24-Does he smoke regularly? 25- Number of packages/quantity of smoking? 26-Alcohol use? 27-Immunization history? 28-Regular exercise? 29-Questions about nutrition/eating habits? 30-Is there any family member with this disease? **Physical examination** 31-Blood pressure in one arm 32-Blood pressure in both arms 33-Listen to chest/heart? 34-Listen to abdomen? 35-Examine the feet? 36-Examine peripheral vascular system? 37-Check for edema? 38-Examine prostate? 39-Pulse 40-Respiration **Laboratory exams** 41-Blood chemistry: creatinine, glucose? 42-Sputum exam? CBC (Complete Blood Count)? 43-Test for triglycerides? 44-Liver function? 45-HgbA1c? 46-Hepatic enzymes?

Appendix 5.3: OLS regressions based on the subdomains of readiness score

	Public facilities					Private facilities				
	Basic amenities	Basic equipment	Infection prevention	Diagnostic capacity	Essential medicine	Basic amenities	Basic equipment	Infection prevention	Diagnostic capacity	Essential medicine
Community SES quintile										
Quintile 1	-	-	-	-	-	-	-	-	-	-
Quintile 2	-0.1 (1.8)	2.0 (1.8)	-0.5 (1.4)	3.7 (2.7)	0.4 (1.7)	-0.4 (1.4)	0.08 (1.6)	2.0 (1.3)	0.0 (1.5)	-2.9 (1.6)
Quintile 3	2.9 (2.0)	3.0 (1.8)	1.1 (1.4)	8.1 (2.9)***	0.5 (1.6)	2.1 (1.4)	2.6 (1.4)	0.5 (1.5)	-0.6 (1.5)	-2.1 (1.5)
Quintile 4	3.1 (1.9)	4.0 (2.0)*	1.5 (1.4)	7.4 (3.4)*	3.8 (1.7)*	0.3 (1.3)	2.8 (1.7)	3.9 (1.4)**	-1.5 (1.7)	-1.1 (1.5)
Quintile 5	2.2 (1.9)	-1.4 (2.2)	2.6 (1.5)	2.1 (3.7)	2.2 (1.7)	0.7 (1.3)	2.4 (1.7)	2.7 (1.6)	-1.6 (1.8)	-3.4 (1.7)*
Location										
rural	-5.3 (1.3)***	-4.7 (2.0)***	-3.1 (1.0)***	-6.6 (2.1)**	-2.0 (1.2)	-4.3 (1.0)***	-1.2 (1.2)	-2.7 (1.0)**	0.22 (1.3)	3.4 (1.1)**
Provider type (public)										
Puskemas	-	-	-	-	-					
Pustu	-14.3 (1.4)***	-37.2 (1.4)***	-14.5 (1.4)***	-53.3 (2.1)***	-21.6 (1.2)***					
Provider type (private)										
Private physician						-	-	-	-	-
Private clinics						-1.3 (1.2)	12.6 (1.8)***	7.7 (1.5)***	16.6 (2.8)***	0.5 (1.5)
Midwife						-0.4 (0.9)	7.6 (1.3)***	4.6 (1.2)***	1.2 (1.5)	-14.1 (1.3)***
JKN provider										
yes	4.2 (2.6)	0.5 (2.1)	2.1 (1.9)	-6.9 (3.7)	4.1 (1.8)*	3.1 (0.8)***	.11.3 (0.9)***	6.3 (0.8)***	8.2 (1.2)***	6.4 (1.0)***
Island										
Central Java	-	-	-	-	-	-	-	-	-	-
West Java	-2.1 (1.5)	-8.8 (1.7)***	1.8 (1.4)	-23.4 (3.1)***	0.5 (1.4)	-0.7 (0.8)	-0.5 (1.2)	-1.7 (1.1)	0.0 (1.5)	5.9 (1.5)***
East Java	0.3 (1.7)	0.2 (1.5)	-0.6 (1.3)	-3.8 (3.2)	1.1 (1.5)	-1.0 (1.2)	-1.4 (1.2)	-0.4 (1.2)	0.4 (1.4)	3.1 (1.5)*
Sumatra	-7.5 (1.8)***	-10.4 (1.9)***	-0.7 (1.3)	-22.3 (3.1)***	-2.9 (1.6)	-0.5 (1.2)	0.3 (1.4)	-2.1 (1.0)*	1.0 (1.5)	8.8 (1.5)***
Lesser Sunda Islands	-6.6 (1.1)***	-11.3 (2.4)***	-2.4 (1.7)	-16.3 (3.7)***	-10.2 (2.2)***	-6.4 (1.8)***	-10.3 (2.1)***	-6.7 (2.0)***	-4.5 (1.9)*	-3.5 (1.8)
Kalimantan	0.5 (2.2)	-4.5 (2.0)*	0.3 (2.9)	-5.6 (3.4)	-2.3 (2.0)	-0.5 (1.8)	-4.6 (2.1)*	-3.8 (2.3)	-3.6 (1.8)	2.6 (2.1)
Sulawesi	-10.0 (2.7)***	-5.3 (3.0)	0.5 (1.7)	-10.1 (4.4)*	-2.8 (1.9)	-3.2 (1.9)	-2.9 (1.8)	-8.7 (1.7)***	2.9 (1.7)	2.3 (2.3)
Number of observations	**957**	**957**	**957**	**957**	**957**	**1584**	**1584**	**1584**	**1584**	**1584**
R square	**0.29**	**0.61**	**0.31**	**0.34**	**0.47**	**0.07**	**0.17**	**0.10**	**0.12**	**0.20**

*p < 0.05, **p < 0.01, ***p < 0.001. Standard errors are in parentheses

Appendix 6.1: Indicators for general service readiness

Domains	*Indicators*
Basic amenities	Power, internal water source, curtain to close off examination room (observed), clean examination floor and walls (observed), running water to wash hands in the examination room (observed), garbage can in the examination room (observed), examination table (observed), toilet facilities
Infection prevention	Sterilisation/autoclaves, alcohol, Betadin, gloves
Basic equipment	Regular stethoscope, stethoscope for pregnant mothers, blood pressure meter, adult scale, infant scale, thermometer, measure for body height, communication equipment. **Lab specific:** Sahli set, giemsa stain solution, benedict solution, wright solution, strips for pregnancy test, urine protein test strips, urine glucose test strips, microscope, centrifuge
Essential medicines	Oral antibiotic, eye antibiotic, analgesic, antipyretic, anti-fungal, anthelmintics, anti-TB, anti-malarial, oral rehydration solution tablets, iron tablets, vitamin A, medicine for BP, anesthetic, medicine for cholesterol, medicine for blood sugar
Diagnostic capacity	Haemoglobin, leucocyte estimation, blood type estimation, erythrocyte estimation, urine analysis, pregnancy test, faeces examination, sputum examination

Notes: All indicators were coded as 1 if the interviewee reported the presence of the items. If not, the indicator was recoded as 0.

Appendix 6.2: criteria contained in the vignettes

For prenatal care, nineteen criteria were identified based on international guidelines for routine pregnancies (Villar & Bergsjo, 1997). For the adult presenting with cough and fever, eleven criteria corresponding with guidelines for the integrated management of adult illness for environments of high tuberculosis prevalence were selected (World Health Organization, 2004). For the scenario of a child with diarrhea and vomiting, the twelve criteria were coded against guidelines for the integrated management of childhood illnesses (World Health Organization, 2002). For the scenario of an adult with diabetes, the IFLS indicated the criteria to include but did not mention the guidelines used.

Prenatal case	Adult curative care	Child curative care	Adult care with diabetes
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Appendix 6.3: Descriptive statistics of non-matched individuals

Variable	N	Mean	SD	min	max
Individual characteristics	N=1810				
Per capita monthtly expenditures	1810	1085968	796,984	109,51	9,223,750
Area of residence is urban	1810	0.55		0	1
Age	1,793	41.0	16	14	89
Gender is female	1810	0.69		0	1
Education (no school or elementary)	1810	0.42		0	1
Presence of chronic condition	1810	0.52		0	1
Type of care (0=preventative, 1=curative)	1810	0.75		0	1
Distance measures					
Distance to health facility (as reported in km)	1,589	5.3	19.0	0	300
Time to reach health facility (as reported in min)	1,676	19.5	77	0	1,800
Cost measures					
Cost of care (as reported in IDR)	1810	54162	179573	0	5000000
Cost of care among non-insured individuals	853	60209	197120	0	5000000
Cost of care among insured individuals (any)	955	48761	162220	0	2500000
Insurance status					
JKN member	1810	0.9		0	1
Public insurance (other than JKN)	1810	0.43		0	1
Private insurance ownership	1810	0.07		0	1
Insurance ownership (any)	1810	0.53		0	1

Appendix 6.4: Conditional logit models using sub-domains of the SSR score

	Basic amenities scores	Basic equipment score	Infection prevention score	Diagnostic capacity score	Essential medicine score
Main measures					
Readiness category	0.012 (0.005)*	0.008 (0.004)*	0.008 (0.005)	0.008 (0.005)**	0.013 (0.004)**
Vignette score	0.005 (0.005)	0.004 (0.005)	0.004 (0.005)	0.004 (0.005)	0.002 (0.005)
Distance in km (log scale)	-1.9 (0.15)***	-1.9 (0.15)***	-1.9 (0.15)***	-1.9 (0.15)***	-2.0 (0.15)***
Cost in IDR (log scale)	-0.40 (0.04) ***	-0.40 (0.04) ***	-0.40 (0.04) ***	-0.40 (0.04) ***	-0.40 (0.04) ***
Other facility characteristics					
Sector of care (ref: public)	-0.7 (0.2)***	-0.62 (0.2)**	-0.6 (0.2)***	-0.37 (0.24)	-0.43 (0.24)
Daily opening hours	0.005 (0.01)	0.003 (0.01)	0.006 (0.01)	0.002 (0.01)	0.004 (0.01)
JKN provider	0.05 (0.17)	-0.01 (0.17)	0.03 (0.17)	-0.001 (0.16)	0.02 (0.17)
R square value	0.50	0.50	0.50	0.50	0.50
Number of observations	8142	8142	8142	8142	8142

Notes. Conditional logit model of facility choice by individuals. Imputation method for distance and cost is hedonic equations. MRS is the coefficient on SSR or vignette score divided by the distance or cost coefficient. As the distance and costs coefficients are in log scale, the MRS is $\frac{\partial x_k}{\partial \mathrm{q}} = -\frac{\partial \mathrm{u}}{\partial \mathrm{q}} / \frac{\partial \mathrm{u}}{\partial x_k} * \ln 10 * \overline{x_k}$ where $\overline{x_k}$ is the average of either cost or distance for the whole sample. Standard errors clustered at the community level are in parentheses.
*p < 0.05, **p < 0.01, ***p < 0.001.

Appendix 6.5: Mixed logit model

	CLM	Mixed logit
Main measures		
Readiness score	0.018 (0.006)**	0.049 (0.022)**
Vignette score	0.003 (0.005)	0.016 (0.13)
Distance in km (log scale)	-2.0 (0.16)***	-12.8 (6.11)*
Cost in IDR (log scale)	-0.39 (0.04)***	-3.7 (1.5)**
Other facility characteristics		
Sector of care (ref: public)	-0.47 (0.23)*	-0.44 (0.84)
Daily opening hours	0.002 (0.01)	0.05 (0.05)
JKN provider	-0.04 (0.17)	-0.14 (0.46)
Standard deviations		
Readiness score		0.08 (0.06)
Vignette score		0.018 (0.013)
Distance in km (log scale)		19.6 (7.7)*
Cost in IDR (log scale)		-3.4 (1.5)*
Other facility characteristics		
Sector of care (ref: public)		2.7 (0.92)**
Daily opening hours		-0.16 (0.08)
JKN provider		-1.7 (2.2)
MRS distance for SSR	0.05**	0.02**
MRS cost for SSR	2411***	700*
MRS distance for knowledge score	0.007	0.005
MRS cost for knowledge score	390	242
R square value	0.51	
Number of observations	8142	8142

Notes. Conditional and mixed logit model of facility choice by individuals. Mixed logit model estimated with Stata mixlogit. Imputation method for distance and cost is hedonic equations. MRS is the coefficient on SSR or vignette score divided by the distance or cost coefficient. As the distance and costs coefficients are in log scale, the MRS is $\frac{\partial x_k}{\partial \mathrm{q}} = -\frac{\partial \mathrm{u}}{\partial \mathrm{q}} / \frac{\partial \mathrm{u}}{\partial x_k} * \ln 10 * \overline{x_k}$ where $\overline{x_k}$ is the average of either cost or distance for the whole sample. Standard errors clustered at the community level are in parentheses.
*p < 0.05, **p < 0.01, ***p < 0.001.

Appendix 7.1: Details on sample sizes

Panel of households- N= 2096 households meeting the criteria and re-interviewed

	Wave 1 N=2096	Wave 2 N=2096
Control group	969 (46.2%)	969 (46.2%)
Treatment group	1127 (53.8%)	1127 (53.8%)
Individuals	Wave 1 N=8983	Wave 2 N=8891
Control group	3926	3821
Treatment group	5057	5070

Panel of individuals - N=7982 individuals matched (89% from the total of 8983 individuals in the panel)

Individuals	Wave 1 N=7982	Wave 2 N=7982
Uninsured	3494 (43.8%)	3494 (43.8%)
Insured	4488 (56.2%)	4488 (56.2%)
Households	Wave 1 N=2090*	Wave 2 N=2090
Uninsured	966 (46.2%)	966 (46.2%)
Insured	1124 (53.8%)	1124 (53.8%)

Information about the entire panel of households (N=6477)

Type of insurance at baseline	**N**	**%**
JKN (contributory and non-contributory)	3909	60.4%
Jamkesda (regional health insurance)	238	3.7%
Private insurance	109	1.7%
No insurance	2141	33.1%

Appendix 7.2: Identification method using potential outcome framework

Let Y_1 and Y_0 being the potential outcomes in presence and in absence of the intervention, respectively. D_1 and D_0 are indicators that the unit (or individual) received the intervention, or did not receive the intervention, respectively. t and τ denote the time after and before the intervention, respectively. By definition, the ATT is given by the following expression:

$$E(Y_{1t} - Y_{ot}|\, D_1) = E(Y_{1t}|\, D_1) - E(Y_{ot}|\, D_1) \quad (1)$$

Which is equivalent to:

$$E(Y_{1t} - Y_{ot}|\, D_1) = E(Y_{1t}|\, D_1) - E(Y_{o\tau}|\, D_1) + E(Y_{o\tau}|\, D_1) - E(Y_{ot}|\, D_1) \quad (2)$$

The parallel trend assumption is the following:

$$E(Y_{0t} - Y_{o\tau}|\, D_1) = E(Y_{0t} - Y_{o\tau}|\, D_0) \quad (3)$$

Therefore if we apply (3) to (2) we get:

$$E(Y_{1t} - Y_{ot}|\, D_1) = \{E(Y_{1t}|\, D_1) - E(Y_{o\tau}|\, D_1)\} - \{E(Y_{ot}|\, D_0) - E(Y_{o\tau}|\, D_0) \quad (4)$$

Which is the equivalent of:

$$\beta_{ATT} = (Y_t - Y_\tau)_{D=1} - (Y_t - Y_\tau)_{D=0}$$

In other words, the ATT is equivalent to the average excess growth in outcome among the treated units minus the excess growth in outcome among the non-treated units.

Appendix 7.3: Descriptive statistics of the unmatched and matched samples after running caliper matching

	Unmatched	Mean		%reduct		t-test		V_e(T)/
Variable	Matched	Treated	Control	%bias	|bias|	t	p>|t|	V_e(C)
wealthscore	U	-.15115	.09856	-14.2		-3.22	0.001	1.08
	M	.03051	.01621	0.8	94.3	0.16	0.875	0.96
urban area	U	.55726	.43037	25.6		5.79	0.000	1.1
	M	.48686	.50622	-3.9	84.7	-0.74	0.462	1.03
number of people	U	4.4842	4.0597	25.8		5.81	0.000	1.17
	M	4.1176	4.1687	-3.1	87.9	-0.62	0.532	0.91
cash transfer	U	.35618	.17906	40.8		9.17	0.000	1.37*
	M	.17981	.213	-7.6	81.3	-1.59	0.112	0.87
2.educ_HH	U	.44184	.45131	-1.9		-0.43	0.666	1.00
	M	.43154	.44398	-2.5	-31.5	-0.48	0.634	1.00
3.educ_HH	U	.21731	.22094	-0.9		-0.20	0.843	0.99
	M	.22407	.22545	-0.3	61.9	-0.06	0.950	0.99
4.educ_HH	U	.30929	.28796	4.7		1.05	0.292	1.06
	M	.31812	.29737	4.5	2.7	0.85	0.393	1.05
2.occup_HH	U	.00451	.00209	4.2		0.94	0.347	2.13**
	M	.00138	.00277	-2.4	42.7	-0.58	0.564	0.49**
3.occup_HH	U	.07755	.04084	15.6		3.49	0.000	1.85*
	M	.05809	.05256	2.4	84.9	0.46	0.646	1.10
4.occup_HH	U	.72949	.79895	-16.4		-3.70	0.000	1.20
	M	.78423	.77732	1.6	90.0	0.32	0.751	0.99
age_HH	U	47.74	47.939	-1.6		-0.36	0.720	1.09
	M	47.339	47.993	-5.2	-228.8	-0.98	0.326	1.17
children1	U	.50225	.39058	18.8		4.26	0.000	1.07
	M	.42462	.41909	0.9	95.0	0.18	0.856	0.89
gend_HH	U	.84941	.8534	-1.1		-0.25	0.800	1.02
	M	.86169	.85477	1.9	-73.4	0.38	0.706	0.97

mean_sah	U	1.4049	1.4395	-7.1		-1.61	0.107	0.88
	M	1.4288	1.4327	-0.8	88.9	-0.15	0.882	0.97
1272.district	U	.02885	.03979	-6.0		-1.37	0.171	0.72*
	M	.04011	.04288	-1.5	74.7	-0.26	0.792	0.93
1607.district	U	.06943	.11309	-15.2		-3.47	0.001	0.62*
	M	.10512	.11203	-2.4	84.2	-0.42	0.673	0.93
1674.district	U	.09197	.05969	12.2		2.75	0.006	1.51*
	M	.07054	.07746	-2.6	78.6	-0.50	0.616	0.90
1801.district	U	.1037	.06492	14.0		3.14	0.002	1.56*
	M	.08437	.07607	3.0	78.6	0.58	0.562	1.09
1871.district	U	.08927	.03874	20.7		4.64	0.000	2.21**
	M	.04564	.05118	-2.3	89.1	-0.49	0.624	0.91
3174.district	U	.01803	.00628	10.7		2.39	0.017	2.80**
	M	.00415	.0083	-3.8	64.7	-1.00	0.316	0.49**
3175.district	U	.01443	.00105	15.3		3.36	0.001	12.73**
	M	0	.00138	-1.6	89.7	-1.00	0.317	.
3207.district	U	.08476	.08796	-1.1		-0.26	0.797	0.96
	M	.0982	.08714	3.9	-246.1	0.73	0.468	1.13
3278.district	U	.08025	.06073	7.6		1.72	0.086	1.31*
	M	.06639	.07469	-3.2	57.5	-0.62	0.538	0.87
3308.district	U	.01172	.03874	-17.3		-3.99	0.000	0.33**
	M	.01798	.01521	1.8	89.8	0.41	0.681	1.17
3371.district	U	.01353	.00524	8.6		1.92	0.055	2.57**
	M	.00415	.00692	-2.9	66.6	-0.71	0.479	0.60*
3507.district	U	.03156	.09634	-26.7		-6.16	0.000	0.39**
	M	.04703	.04841	-0.6	97.9	-0.12	0.902	0.97
3572.district	U	.04779	.0555	-3.5		-0.79	0.429	0.86
	M	.06639	.06777	-0.6	82.1	-0.11	0.916	0.98
3601.district	U	.04959	.08168	-13.0		-2.96	0.003	0.62*
	M	.07331	.06777	2.2	82.8	0.41	0.681	1.09
3672.district	U	.06402	.0377	12.0		2.69	0.007	1.68*

	M	.05947	.04841	5.0	58.0	0.93	0.352	1.22
6471.district	U	.02976	.00628	17.7		3.92	0.000	4.36**
	M	.00277	.0083	-4.2	76.4	-1.42	0.156	0.39**
6472.district	U	.04689	.03874	4.0		0.91	0.364	1.21
	M	.04564	.04703	-0.7	83.0	-0.13	0.901	0.97
7305.district	U	.04779	.0377	5.0		1.13	0.261	1.28*
	M	.05256	.04564	3.2	31.5	0.61	0.543	1.12
7306.district	U	.03877	.04921	-5.1		-1.16	0.247	0.78*
	M	.05809	.04703	5.4	-6.0	0.94	0.346	1.21

Appendix 7.4: Descriptive statistics of OOP spending by sector

	Baseline 2018		Endline 2019		Difference	
Household-level outcomes	**Control group N=969**	**Treatment group N=1127**	**Control group N=969**	**Treatment group N=1127**	**Control group N=969**	**Treatment group N=1127**
OOPE for OP care in public facilities	2,273 (25,063)	2,499 (27,022)	1,427 (11,050)	1,056 (11,325)	-855 (27,467)	-1,443 (29,191)
OOPE for OP care in private facilities	8,672 (34,324)	9,472 (39,772)	5,722 (27,068)	3,894 (16,537)	-2,942 (43,185)	-5,593 (41,940)
OOPE for IP care in public facilities	36,758 (358657)	24,074 (266894)	11,006 (112830)	4,749 (46824)	-25,790 (374136)	-19,342 (271,293)
OOPE for IP care in private facilities	36,441 (279,764)	20,916 (168,077)	13,458 (107,696)	17,946 (142,387)	-23,020 (294,450)	-2,972 (222,027)

Appendix 7.5: Robustness checks using different caliper sizes

	(1)			(2)		
	Effect size	SE	p-value	Effect size	SE	p-value
Utilisation of OP services						
Probability of any OP visit	0.006	0.011	0.62	0.006	0.011	0.57
Probability of public health center visit	-0.002	0.007	0.75	0.002	0.007	0.79
Probability of public hospital visit	0.004	0.002	0.09	0.004	0.002	0.057
Probability of private GP/midwife practice	-0.004	0.008	0.67	-0.006	0.008	0.50
Probability of private hospital visit	0.003	0.004	0.44	0.002	0.004	0.60
Number of observations	**6074**			**6074**		
Utilisation of IP services						
Probability of any IP visit	0.013	0.006	0.035*	0.014	0.006	0.02*
Probability of public hospital visit	0.002	0.005	0.62	0.003	0.004	0.46
Probability of private hospital visit	0.01	0.004	0.01**	0.01	0.004	0.011*
Number of observations	**6074**			**6074**		
Probability of incurring OOPE						
Any OOPE	-0.065	0.033	0.050*	-0.07	0.033	0.03*
OOPE for outpatient care	-0.086	0.032	0.007**	-0.08	0.032	0.009**
OOPE for inpatient care	0.016	0.017	0.35	0.0	0.017	1
Number of observations	**1687**			**1687**		
Total amount of OOPE per capita						
Total OOPE per year	-79,100	54,405	0.14	-81,789	54,282	0.13
Total OOPE for outpatient care per month	-6655	3,889	0.08	-6,902	3,868	0.075
Total OOPE for inpatient care per year	10,75	21,824	0.62	7,978	21,798	0.71
Number of observations	**1687**			**1687**		

Notes: (1) result estimates using nearest neighbour matching using a bandwidth size of 0.1 times the SD of the propensity score. (2) result estimates using nearest neighbour matching using a bandwidth size of 0.5 times the SD of the propensity score.

Appendix 7.6: Results of the falsification test

	Effect size	SE	p-value
Utilisation of OP services			
Probability of any OP visit	-0.0003	0.01	0.97
Probability of public health center visit	0.008	0.006	0.19
Probability of public hospital visit	-0.009	0.003	0.0017**
Probability of private GP/midwife practice	-0.003	0.008	0.71
Probability of private hospital visit	-0.003	0.004	0.48
Number of observations	**6565**		
Utilisation of IP services			
Probability of any IP visit	-0.003	0.006	0.60
Probability of public hospital visit	-0.005	0.005	0.21
Probability of private hospital visit	0.002	0.004	0.55
Number of observations	**6565**		
Probability of incurring OOPE			
Any OOPE	0.01	0.03	0.72
OOPE for outpatient care	0.008	0.027	0.77
OOPE for inpatient care	-0.008	0.016	0.61
Number of observations	**1825**		
Total amount of OOPE per capita			
Total OOPE per year	-41,529	67,919	0.54
Total OOPE for outpatient care per month	-3,534	5,247	0.50
Total OOPE for inpatient care per year	2,884	18,937	0.88
Number of observations	**1825**		

Notes: Result estimates using caliper matching using a bandwidth size of 0.25 times the SD of the propensity score. *p < 0.05, **p < 0.01, ***p < 0.001.