Which policy protects Indonesians from catastrophic health expenditure: demand-side or supply-side subsidy? A multilevel logistic analysis

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Abstract

This paper analyses the impact of demand-side subsidy in the form of social health insurance and supply-side subsidy in the form of decentralised public health spending on the risk of catastrophic health expenditure in Indonesia. A household's health expenditure is considered catastrophic when it exceeds 40% of household's non-food spending. This study uses multilevel logistic model to examine the association between catastrophic health expenditure with household and district characteristics. Household data are from the 2008 Indonesia socioeconomic survey (*Susenas*), while district data are from (1) the 2008 Village Potential Census, (2) the Ministry of Health and (3) the Ministry of Finance publications. The sample includes 189,163 households living in 456 districts. The finding shows that compared to those without health insurance, those with social health insurance (except health insurance for the poor) are protected against the risk of catastrophic health expenditure. However, district health spending increases the risk of catastrophic health expenditure. This counter-intuitive finding may be caused by lack of local government capacity. These results remain robust after controlling with various household and district characteristics. Health insurance for the poor lost its significance when analysed separately for inpatient and outpatient subpopulation which suggests catastrophic health expenditure is caused by other sources, for example medicine. Future studies should take into account the endogeneity of health insurance and public health budget allocation to provide a more accurate estimation.

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Chapter 1

Introduction

One of the objectives of health policy is to provide protection for households against excessive healthcare expenditure. Regardless of the actual amount spent on health, households can be prone to financial catastrophe depending on their capacity to pay - even comparatively low expenditures can be disastrous for low income households, while high expenditure may have little impact on the rich. In general, health expenditure is considered catastrophic when it forces individuals or households to reduce their essential outgoings and significantly lower their standard of living. Even worse, spending on healthcare can take a household below the poverty line, creating a situation where an unavoidable expenditure has an impoverishing effect. The Indonesian government has thus designed policies with the aim of protecting households from the risk of catastrophic health expenditure.

In Indonesia, the government provides a demand-side subsidy by implementing social health insurance on behalf of a certain section of the population. Until 2007, an estimated 105 million Indonesians (47% of the population) were covered by various health insurance schemes. However, the impact of these schemes in terms of the financial protection they provide for households during illness has not been evaluated. Such study is essential since financial protection is one of the objectives of health policy itself. Similar studies have taken place in other countries such as

Mexico (Galarraga et al., 2010), India (Shahrawat and Rao, 2012), and Zambia (Ekman, 2007), the majority of studies on Indonesia have however focused on the association between health insurance and health access (Pradhan et al., 2007; Johar, 2009; Hidayat et al., 2004; Erlyana et al., 2010).

Another significant policy which has affected Indonesia's health system is the decentralisation reform which occurred in 2001. This has delegated public funds and authority from central government to more than 450 district governments. These district governments were made responsible for managing healthcare and paying supply-side subsidies to cover the capital spending and staff salaries of public district hospitals. The aim was to encourage public health providers to operate more efficiently and to create a 'level playing field' with private health providers. Subsidising district healthcare providers, both public and private, is aimed at reducing the costs faced by patients and thus lowering self-payments.

One of the most influential studies of Indonesia's public health spending was conducted by Pradhan and Prescott (2002). They examined price subsidies for medical care and their effectiveness at reducing household risk of catastrophic health expenditure. The main finding suggests that the risk would be further reduced if the allocation of such subsidies were weighted more towards inpatient care. This study did not however take into account the health subsidy variation that now exists across districts in Indonesia, which is understandable since it was carried out before decentralisation. Today, the level of health subsidy varies across districts, and is likely to result in inequalities in the level of financial protection against catastrophic health expenditure.

Besides demand- and supply-side subsidies, the health characteristics of a specific district may also contribute to the risk of catastrophic health expenditure. Considerable variation in the incidence of disease outbreak, the incidence

of natural disaster and the incidence of pollution are among factors which may be associated with health outcomes and risk of individual spending on health. Moreover, healthcare resources are also unequally distributed, with most doctors and hospitals being located in major districts [1]. Previous studies suggest that unequal distribution of health resources may have negative impact on health status (Frankenberg, 1995; Frankenberg et al., 2005).

Despite the obvious significance of district characteristics, they are rarely considered as predictors of the risk of catastrophic health expenditure. Most studies are conducted at household level, with the risk of household health expenditure being solely determined by household characteristics (Limwattananon et al., 2007; Yardim et al., 2010; Ekman, 2007; Su et al., 2006; Lara and Gomez, 2011; Galarraga et al., 2010; Xu et al., 2003; Gotsadze et al., 2009; Xu et al., 2007). Very few studies examining the risk of catastrophic health expenditure (Boyer et al., 2011; Saksena et al., 2010; Su et al., 2006) have combined both household and district level characteristics.

This brief examination of Indonesia's health policy and health profile identifies four research gaps: 1) no studies have examined the impact of demand-side subsidies (in the form of social health insurance) in their provision of financial protection to their beneficiaries; 2) no studies have examined whether the provision of supply-side subsidies (in the form of decentralised public health spending) effectively provides the population with financial protection during illness; 3) no studies have included district characteristics as predictors of the risk of catastrophic health expenditure; 4) few studies have simultaneously combined household and district characteristics to predict the odds of household catastrophic health expenditure.

The first research question refers to the effectiveness of two social health in-

[1] There are more than 490 districts in Indonesia, covering an area of 1.9 million km2.

surance schemes available in Indonesia: one for civil servants, one for the poor [2]. I hypothesised that these two schemes have differing impacts on the risk of household catastrophic health expenditure, since each has distinct insurance features (including the level of premium, the target beneficiaries, the scheme benefits, and the level of cost-sharing). The second research question is whether decentralised public health spending effectively reduces the risk of household catastrophic health expenditure. I hypothesised that it does, because local governments can allocate such spending on the basis of local socioeconomic conditions. The third research question is whether district health characteristics have a significant impact on the risk of catastrophic health expenditure. I hypothesised that they increase such a risk because they have a negative impact on health status.

Additionally, this study uses a multilevel regression model which is an extension of previous studies. As mentioned earlier, most studies ignore the effect of district characteristics in explaining household catastrophic expenditure (Bredenkamp et al., 2010; Wagstaff and van Doorslaer, 2003; Sun et al., 2009; van Doorslaer et al., 2007, 2006; Shahrawat and Rao, 2012; Somkotra and Lagrada, 2008; Garg and Karan, 2009; O'Donnell et al., 2008), and studies that used multilevel models usually incorporate the odds of catastrophic health expenditure only at village (Shi et al., 2011), district (Boyer et al., 2011) and country (Saksena et al., 2010) levels. The multilevel approach taken by this study has political implications, since it directly assesses the performance of district governments in providing financial protection to their unwell citizens.

[2] In 2006, 69.8% of the population of Indonesia fell below the USD2.15/day poverty line (Rokx et al., 2009)

1.1 The predictors of catastrophic health expenditure

This section examines a number of previous studies of health expenditure and its predictors (health insurance, health subsidies, and contextual health characteristics). The association between health insurance and financial protection has been found to be inconsistent in several countries. There is also a lack of empirical evidence regarding the association between decentralised public health spending and a household's financial protection during illness. Finally, contextual health characteristics are strong predictors for the risk of catastrophic health expenditure, but are however ignored in most studies.

1.1.1 Does health insurance consistently protect households against financial risk of illness?

The ability of health insurance to provide an adequate cushion against the risk of catastrophic health expenditure has been inconsistent. Schemes such as *Rashtriya Swasthya Beema Yojna* in India (Shahrawat and Rao, 2012), and mandatory health insurance in Moldova (Richardson et al., 2011) and Zambia (Ekman, 2007) have failed to provide protection. Other schemes have however been successful: examples of these include health insurance in Mexico (Galarraga et al., 2010), and schemes under the tax-funded health system in Turkey (Yardim et al., 2010).

One reason for such inconsistencies is that each scheme contains different features, in terms of, for example, the benefits the insurance provides, the provider payment system, and target beneficiaries. Schemes that exclude certain health treatments (and thus provide only partial health coverage) provide less protection than those that cover all types of health treatment. Such is the case in India,

where health insurance covers only hospital expenses: the scheme thus fails to protect the poor from impoverishment since most of their health expenditure is on medicine (Shahrawat and Rao, 2012). Similarly, health insurance beneficiaries in Moldova remain exposed to high self-payment due to problems with depth of coverage, which again means that some items (such as medicines) are not covered by the scheme (Richardson et al., 2011). Finally, health insurance in Zambia also has a limited benefit package (Ekman, 2007) and thus fails to provide effective protection.

Schemes that offer comprehensive benefits are able to offer better protection. The *Seguro Popular* or 'Popular Health Insurance' in Mexico covers 250 types of illnesses and the drugs associated with them. It also covers nine types of health service groups: 1) early detection and prevention; 2) ambulatory medicine; 3) dentistry; 4) reproductive health; 5) pregnancy; 6) delivery and newborn care; 7) rehabilitation; 8) hospitalisation, and 9) urgent care and surgery. *Seguro Popular* beneficiaries are thus protected to a certain percentage point against the risk of catastrophic health expenditure (Galarraga et al., 2010). Similarly, advanced countries with social insurance or a tax-funded health system have a relatively low catastrophic headcount (Yardim et al., 2010).

Numerous studies examine the health insurance provider payment system and its association with the risk of catastrophic health expenditure. A scheme that pays the health provider with a fee-for-service (that is, separate payments for each health service it provides) may encourage them to offer more treatments than necessary, knowing that they will be reimbursed. Excessive treatments include providing the patients with unnecessary care or prescribing more medicines than is really needed. On many occasions, these extra treatments turn out to be not covered by the scheme, forcing beneficiaries to self-pay (Wagstaff and Linde-

low, 2008). Barros et al. (Barros et al., 2011), for example, find that private insurance in Brazil leads health providers to induce demand for specialised and costly medicine services which are not covered by the scheme. It thus fails to protect households from catastrophic health expenditure.

The fee-for-service system is also known as a retrospective payment system, where payment is made after health services are delivered. Conversely, the prospective payment system is designed to pay health providers a predetermined price up front. Under the latter, the provider's profit is no longer related to the number of health services they provide. In order to make a profit therefore, they are instead left with two obvious strategies: 1) induce demand for health services from the uninsured (Wagstaff and Lindelow, 2008), or 2) provide fewer services to the insured to reduce costs and increase profits (namely, the margin between actual health costs and the predetermined price). Under the prospective payment system, the insured is likely to suffer from the lack of quality of healthcare that they receive, but are relatively safe from financial risk. Under the retrospective payment system, however, the insured may incur additional payments. In short, schemes implementing the prospective payment system will provide a higher protective effect for the insured than the retrospective payment system.

Finally, different beneficiary targeting is also likely to impact the level of financial protection provided by a health insurance scheme. In developing countries, health insurance schemes for the poor have been misapplied to cover those with high expected health needs, even if they are not poor. This has resulted from three main factors: imperfect monitoring, corruption, and limitations in administrative capacity to identify eligible beneficiaries (Shahrawat and Rao, 2012; Sparrow et al., 2010; Trujillo et al., 2005). There is therefore a high probability that most of the scheme's beneficiaries will use the healthcare it provides, posing a risk to

the scheme's financial sufficiency. One possible result of this is that its predicted health costs may increase dramatically, forcing its beneficiaries to self-pay.

Health insurance for formal workers on the other hand is likely to be used less, since the majority of its beneficiaries have better health status. Formal workers (especially those in the public sector) in Indonesia must pass a physical and medical examination prior to recruitment; candidates with a long history of illness are likely to be excluded from the recruitment process. Health insurance for these workers thus covers individuals with better health status than those covered by insurance for the poor, and is likely to impact the level of financial protection. The differences in beneficiary targeting is also known as 'adverse selection'.

As explained above, the features of the various social health insurance schemes in Indonesia differ. This study believes it to be essential to disaggregate these features, as by doing so the performance of each scheme can be analysed more authentically. Based on its features (see Table 2.4, page 27), I hypothesise that *Askeskin* provides financial protection against catastrophic health expenditure while other schemes fail. *Askeskin* covers all health expenses without any self-payment, two characteristics that are likely to support the hypothesis. In other words, it is the specific features of the scheme have contributed to its ability to provide financial protection, and these therefore should be included in the analysis of the association between health insurance and catastrophic health expenditure.

1.1.2 Does decentralised health spending protects households from catastrophic health expenditure?

Most studies on healthcare in Indonesia focus on the situation prior to decentralisation (Pradhan and Prescott, 2002) or decentralised health treatment in Cameroon (Boyer et al., 2011); until recently, none examined the association

between public health spending and the risk of catastrophic health expenditure in Indonesia post-decentralisation. Pradhan and Prescott (2002) examined the association prior to decentralisation. They found that government subsidy reduced the risk of catastrophic health expenditure, but that further reduction would be possible if a greater proportion was allocated to inpatient care.

A study in Cameroon examined the decentralised HIV/AIDS services for patients diagnosed with HIV/AIDS and found that protection was successfully provided for households against the risk of catastrophic health expenditure. One of the key elements of this success is the authority given to local providers (both public and private) to manage user fees, enabling them to match their pricing to local household socioeconomic conditions. These local health providers are also able to correctly identify the indigent segments of the population (Boyer et al., 2011). Local providers develop a close relationship with the community, which increases the responsiveness towards local preferences. The finding supports the argument that adequate institutional capacity and accountability are prerequisites for effective decentralisation and to help improve the delivery of healthcare through making public choices consistent with local needs and capacity to pay (Boyer et al., 2011).

Indonesia decentralised public health spending in 2001; the effect of decentralisation on household financial risk during illness has however never been analysed. It is suggested that district governments in Indonesia still lack the institutional capacity required to maximise the effectiveness of decentralisation (Rokx et al., 2009). District governments also lack accountability, as indicated by the status of their financial report (Ministry of Finance, 2012) [3]. It is therefore hypothesised that decentralised health spending per se will not associate with household

[3]The financial report of most districts, produced by an independent auditor, relegates them to the lowest possible category. Further details are provided in the following chapter.

financial protection against health expenditure.

1.1.3 Do contextual characteristics matter?

A few studies of the predictors of catastrophic health expenditure include contextual characteristics. For example, a study in China includes village deprivation and the availability of village health posts (health centres) as predictors. The results suggest that village deprivation is positively associated with the probability of catastrophic health expenditure. Increase in deprivation score also increases a village's risk of financial health catastrophe. This finding can be associated with poor sanitation status, poor road conditions, limited transportation, and other geographical barriers which lead to an increasing likelihood of financial problems related to healthcare (Shi et al., 2011). At the same time, the presence of village level health posts is insignificant. This finding reflects the poor human resource capability and health facilities at village level, where simple treatment for healthcare and disease prevention is undertaken, and the payment charged is low. The importance of the the existence of village health posts may become more significant if the quality of care is increased (Shi et al., 2011).

Other contextual characteristics that are often excluded as predictors of catastrophic health expenditure are disease outbreak and natural disaster. Disease outbreak is proven to increase catastrophic health expenditure in India (Gopalan and Das, 2009). Additionally, natural disaster is also known to increase the risk of disease outbreak which may indirectly impact health status. Floods are associated with increased mortality, injuries and morbidity which include fecal-oral disease, vector-borne disease, rodent-borne disease, and mental health (Ahern et al., 2005). The risk factors for outbreaks of disease after disasters are also associated with population displacement and the lack of availability of clean water and sanitation

facilities (Watson et al., 2007).

Finally, pollution (particularly air pollution) is proven to affect population health. One of the main sources of air pollution is forest fire, which occurs repeatedly in Indonesia. In 1982, 3.5 million hectares of forest were burned, with similar incidents in 1987 (50,000 hectares), 1991 (120,000 hectares), 1994 (160,000 hectares), and 1997 (300,000 hectares). A study of the impact of forest fire in Indonesia on health concluded that it results in an increase in the incidence of respiratory problems and shortness of breath (Kunii et al., 2002). A further study compared the health of the population living in the areas affected by haze and those in areas not affected, and concluded that the former had a lower self-reported health status (Frankenberg et al., 2005).

These findings suggest that contextual characteristics are indeed associated with the population's health status and health expenditure. It is therefore important to include them in the analysis, and to pay attention to the fact that they may vary across districts. This study thus hypothesises that contextual characteristics at district level have a significant impact on the risk of household catastrophic health expenditure.

1.1.4 Is multilevel regression necessary?

Previous studies have shown the relevance of contextual health characteristics to the risk of catastrophic health expenditure. Since most studies focus on single-level analysis, the use of multilevel regression is limited. Studies in Cameroon (Boyer et al., 2011), China (Shi et al., 2011), and multiple countries (Saksena et al., 2010) are among the limited studies which factor multilevel regression into the analysis.

Boyer (2011) examines the impact of decentralised HIV/AIDS services on cata-

strophic health expenditure in Cameroon. The study generates dummy variables for those provinces and districts that have decentralised their HIV/AIDS services, and analyses the association between these and household health expenditure. It is concluded that decentralised HIV/AIDS services both at province and district significantly decrease the risk of catastrophic health expenditure (Boyer et al., 2011). Similarly, in 2010 World Health Organisation conducted a study of catastrophic health expenditure incorporating multilevel regression, combining household-level and country-level characteristics from 51 countries (Saksena et al., 2010). The result suggests that a household's catastrophic health expenditure may be associated with country-level characteristics. It also concludes that self-payment as a share of total country health expenditure has a positive relationship with the risk of catastrophic health expenditure. Income inequality was also associated with higher incidence of catastrophic health expenditure. However, there was no significant relationship with total country health expenditure as a share of GDP (Saksena et al., 2010). Finally, a study in rural China also used a multilevel model to analyse the effect of village characteristics on financial catastrophe resulting from healthcare spending, and found them to be significant predictors for household catastrophic health expenditure (Shi et al., 2011).

To recap, this section briefly explains four research gaps from previous studies on catastrophic health expenditure, finding that in every case, (1) health insurance was not disaggregated; (2) public health spending was not decentralised; (3) contextual characteristics were ignored, and (4) the multilevel model was mostly neglected. Throughout 44 studies over the past 26 years, these gaps have not been addressed thoroughly in a single study; this particularly applies to Indonesia (see Table 1.1).This study thus attempts to contribute to the literature by addressing those gaps in the context of Indonesia.

Table 1.1: Previous studies

Country and publication source	Catastrophic threshold	Health insurance	Public health spending	Contextual characteristics	Multilevel model
US (Berki, 1986)	5-20% family income	Yes	No	No	No
US (Wyszewianski, 1986)	5-20% family income	Yes	No	No	No
India (Ranson, 2002)	10% family income	Yes	No	No	No
Indonesia (Pradhan and Prescott, 2002)	10% family income	Yes	Yes	No	No
Vietnam (Wagstaff and van Doorslaer, 2003)	2-15% prepaid income and 10-40% non-food spending	No	No	No	No
59 countries	40% non-food spending	Yes	No	No	No

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Table 1.1 – *Continued from previous page*

Country and publication source	Catastrophic threshold	Health insurance	Public health spending	Contextual characteristics	Multilevel model
(Xu et al., 2003)					
US	10% family income	Yes	No	No	No
(Waters et al., 2004)					
Burkina Faso	40% non-food spending	No	No	No	No
(Su et al., 2006)					
Uganda	40% non-food spending	No	No	No	No
(Xu et al., 2006)					
Mexico	20-30% non-food	Yes	No	Yes	No
(Knaul et al., 2006)	spending				
89 countries	40% non-food spending	Yes	No	Yes	No
(Xu et al., 2007)					
5 East Asian countries	5-25% per-capita	No	No	No	No
(Wagstaff, 2007)	spending				

Continued on next page

Table 1.1 – *Continued from previous page*

Country and publication source	Catastrophic threshold	Health insurance	Public health spending	Contextual characteristics	Multilevel model
14 countries (van Doorslaer et al., 2007)	5-25% total spending and 15-40% non-food spending	Yes	No	No	No
Thailand (Limwattananon et al., 2007)	10% total spending	Yes	No	No	No
Zambia (Ekman, 2007)	10-20% non-food spending	Yes	No	No	No
China (Wagstaff and Lindelow, 2008)	5-25% monthly per-capita income	Yes	No	No	No
India (Flores et al., 2008)	5-20% total spending	No	No	Yes	No
Thailand (Somkotra and Lagrada, 2008)	5-15% total spending and 20-30% non-food	Yes	No	No	No

Continued on next page

Table 1.1 – *Continued from previous page*

Country and publication source	Catastrophic threshold	Health insurance	Public health spending	Contextual characteristics	Multilevel model
	spending				
Mozambique and South Africa (Castillo-Riquelme et al., 2008)	10% total income and 40% non-food spending	No	No	Yes	No
Georgia (Gotsadze et al., 2009)	40% non-food spending	No	No	No	No
China (Sun et al., 2009)	40% non-food spending	Yes	No	No	No
Iran (Karami et al., 2009)	40% non-food spending	Yes	No	No	No
Nepal (Adhikari et al., 2009)	5-25% total income	No	No	No	No
Ivory Coast	40% non-food spending	Yes	No	Yes	No

Continued on next page

Table 1.1 – *Continued from previous page*

Country and publication source	Catastrophic threshold	Health insurance	Public health spending	Contextual characteristics	Multilevel model
(Beauliere et al., 2010)					
Lebanon	25% per-adult	Yes	No	No	No
(Salti et al., 2010)	spending				
Palestine	10% total income	No	No	No	No
(Mataria et al., 2010)	and 40% non-food				
	spending				
Western Balkan	5-25% total income	No	No	No	No
(Bredenkamp et al., 2010)					
Mexico	30% non-food spending	Yes	No	Yes	No
(Galarraga et al., 2010)					
Turkey	40% non-food spending	Yes	No	No	No
(Yardim et al., 2010)					
51 countries	40% non-food spending	No	No	Yes	Yes

Continued on next page

Table 1.1 – *Continued from previous page*

Country and publication source	Catastrophic threshold	Health insurance	Public health spending	Contextual characteristics	Multilevel model
(Saksena et al., 2010)					
Cameroon	20% disposable income	Yes	No	Yes	Yes
(Boyer et al., 2011)					
South Korea	40% non-food spending	No	No	No	No
(Kim and Yang, 2011)					
Guatemala	40% non-food spending	Yes	No	No	No
(Bowser and Mahal, 2011)					
Iran	0-100% monthly income	Yes	No	No	No
(Hajizadeh and Nghiem, 2011)					
China	40% non-food spending	Yes	No	Yes	Yes
(Shi et al., 2011)					
Colombia	40% non-food spending	Yes	No	No	No
(Lara and Gomez, 2011)					

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Table 1.1 – *Continued from previous page*

Country and publication source	Catastrophic threshold	Health insurance	Public health spending	Contextual characteristics	Multilevel model
Brazil (Barros et al., 2011)	10-20% total spending and 40% non-food spending	Yes	No	No	No
Ghana (Nguyen et al., 2011)	5-10% total income and 10-20% non-food spending	Yes	No	No	No
Nigeria (Onoka et al., 2011)	40% capacity to pay	No	No	No	No
12 Latin America countries (Knaul et al., 2011)	30% non-food spending	Yes	No	No	No
India (Shahrawat and Rao, 2012)	40% non-food spending	Yes	No	No	No
India	10% family income	No	No	No	No

Continued on next page

Table 1.1 – *Continued from previous page*

Country and publication source	Catastrophic threshold	Health insurance	Public health spending	Contextual characteristics	Multilevel model
(Pal, 2012)	and 40% non-food spending				
Rwanda (Lu et al., 2012)	40% non-food spending	Yes	No	No	No
Poland (Luczak and Garcia-Gomez, 2012)	2-15% monthly income	No	No	No	No

1.2 Self-payment for health care in Indonesia

Self-payment represents a large proportion of healthcare financing in Indonesia and can be a significant burden on poor households. As a percentage of household budget, it accounts for about 1.8%. This relatively low percentage could be an indication of low expenditure on health or of excellent financial protection; for Indonesia, the former is more likely (van Doorslaer et al., 2007). Self-payments occur in other low and middle income countries globally. In the East Asia Pacific region for example, the share of the household budget spent on healthcare self-payment averages around just 2% in countries such as Malaysia, Sri Lanka, and Thailand where there is universal healthcare coverage (see Table 1.2).

Table 1.2: Self-payments for health care as a percentage of household consumption

Country	Average (%)
Vietnam	5.49
Bangladesh	5.10
India	4.84
China	4.11
Korea Rep.	3.83
Taiwan	3.74
Nepal	2.77
Kyrgyz Rep.	2.40
Hong Kong	2.29
Sri Lanka	2.11
Philippines	1.94
Indonesia	*1.83*
Thailand	1.71
Malaysia	1.37

Source: van Doorslaer et al., 2005

Self-payment is considered catastrophic if a household needs to reduce its normal spendings to cope with health costs. Catastrophic health expenditure is expressed by the ratio between household health expenditure and household financial resources. However, formal definitions of catastrophic health expenditure

have failed to reach consensus on the following two components: 1) the ratio threshold above which a household is categorised as incurring catastrophic health expenditure, and 2) the measure for household financial resources. Previous studies used thresholds ranging from 2.5% to 15% of total household spending (Berki, 1986). Another study suggests the bar should be set at at least 40% of a household's capacity to pay (Xu et al., 2003). These two definitions have been adopted by many studies in different countries.

An appropriate definition for Indonesia needs to be arrived at because each definition has different consequences. If total household spending is used as the denominator, it may be low for poor households in low-income countries because most of their resources are spent on basic necessities (such as food and rent), with little left over to spend on other necessities such as healthcare and education . Catastrophic payments may thus be better defined relative to net expenditure, or expenditure after basic necessities are subtracted. 'Basic necessity' has been defined as non-discretionary expenditure (Wagstaff and van Doorslaer, 2003) or capacity to pay (Xu et al., 2003). Both definitions assume that household expenditure after spending on food is an indicator of net household expenditure.

A study by Sparrow et al. (2012) may provide a more appropriate definition of catastrophic health expenditure for Indonesia. This analysed the effect of self-reported ill health on per capita food and non-food spending, and suggests that an ill health event significantly reduced non-food spending by 6.6% among the poorest households. However, it did not reduce food spending across expenditure quantiles, suggesting that Indonesian households prioritise food spending before paying for healthcare. This study indicates that Xu's definition is more appropriate for Indonesia.

Chapter 2

Indonesia's health profile

This section provides an overview of the different systems of health insurance provided by Indonesia for its citizens . It presents a profile of the beneficiaries, insurance premiums, and insurance benefits of two social health insurance schemes. It also describes the increasing role of district government since decentralisation in 2001, particularly in managing the health budget. It concludes by explaining the inequality in district health characteristics, which includes incidence of communicable diseases, pollution and natural disaster, and the range of available healthcare resources.

To enable a better description, Indonesia's health profile is examined alongside a number of neighbouring countries (Table 2.1), compared with which Indonesia has lower insurance coverage and a higher self-payment share. The end result is inadequate financial protection. Low health status is measured by low life expectancy and high infant mortality. Finally, access to healthcare is low as indicated by the low percentage of births attended by healthcare personnel, and a low immunisation rate. It is concluded that compared to its neighbours, and despite decentralisation, Indonesia still fails to fulfil three major health policy objectives: health financing, health status, and health access.

Table 2.1: Country comparison of health indicators

Indicator	Malaysia	Thailand	Indonesia
Self-payment (%)	1.37	1.71	1.83
Insurance coverage (%)	100	98	37
Life expectancy (years)	73	70	67
Under 5 mortality (per 1000 births)	6	14	41
Birth attended by personnel (%)	99	99	73
Measles immunisation (%)	95	98	83

Source: WHO Report 2010

2.1 Demand-side subsidy

The uncertainty of health costs can increase the financial risk of those households with low income and low health status. Conversely, rich and healthy households experience minimum exposure to such risk. Without government intervention, it is difficult to spread the risk among the whole population regardless of economic and health status. Governments in many countries have thus developed a risk-pooling mechanism through the implementation of social health insurance, made mandatory for the entire population to avoid adverse selection. Insurance premiums or contributions are subsidised partially or entirely by the government, making social health insurance a form of demand-side subsidy.

Indonesia plans to introduce universal health insurance coverage to its population gradually up until 2019, and as such is among a small number of countries worldwide (Malaysia, Thailand, Philippines and the United Kingdom, among others) with an expressed commitment to provide universal health coverage. The scheme began in 2004 with the establishment of a new scheme for the poor, *Asuransi Kesehatan Masyarakat Miskin* ('Health Insurance for Poor Population') or *Askeskin*. It was managed by the Ministry of Health, and from inception it covered the healthcare costs of more than 76 million poor people. Another scheme, known as *Askes*, had been established in 1968 for civil servants. This covers around 6%

of the entire population. Since *Askeskin* is a scheme specifically for the poor, the contribution is subsidised entirely by the government. Askes contribution however is paid from two separate sources: the employee and the employer (the government). Premium rate is set at 4%, with 2% being taken from employees' basic salary and family allowance, and the other 2% paid (subsidised) by the government.

Another major health insurance scheme operating in Indonesia is *Jamsostek* which covers approximately 2% of the population, particularly formal private sector workers. However, since this scheme is run by a state-owned company and contributions are paid entirely by its beneficiaries, *Jamsostek* is not considered to be a form of demand-side subsidy. There are also a number of private insurance and other schemes which cover a further 3% of the population (see Table 2.2 for more details).

Table 2.2: Health insurance coverage in Indonesia (%), 2006-2008

Scheme	2006	2007	2008
Askes	5.87	6.68	6.46
Jamsostek	1.91	1.84	2.18
Private insurance	0.81	0.72	0.76
Company reimbursement	1.59	1.49	1.19
Askeskin	16.52	16.59	15.49
Health fund	0.57	0.31	0.51
Other insurance	1.03	1.63	3.09
Total insured	28.30	29.26	29.68
Total uninsured	71.70	70.74	70.32

Source: Susenas 2006-2008

In the context of Asia, health insurance participation is low in Indonesia, which is even the case when compared specifically to South East Asia countries (Tangcharoensathien et al., 2011): out of seven countries in South East Asia, Indonesia ranked fifth in 2009 (Table 2.3).

Reports regarding the percentage of insured population in Indonesia vary.

Table 2.3: 2009 health insurance coverage: country comparison (%)

Country	Percentage
Malaysia	100
Thailand	98
Philippines	76
Vietnam	55
Indonesia	48
Cambodia	24
Laos	8

Source: Tangcharoensathien et al., 2011

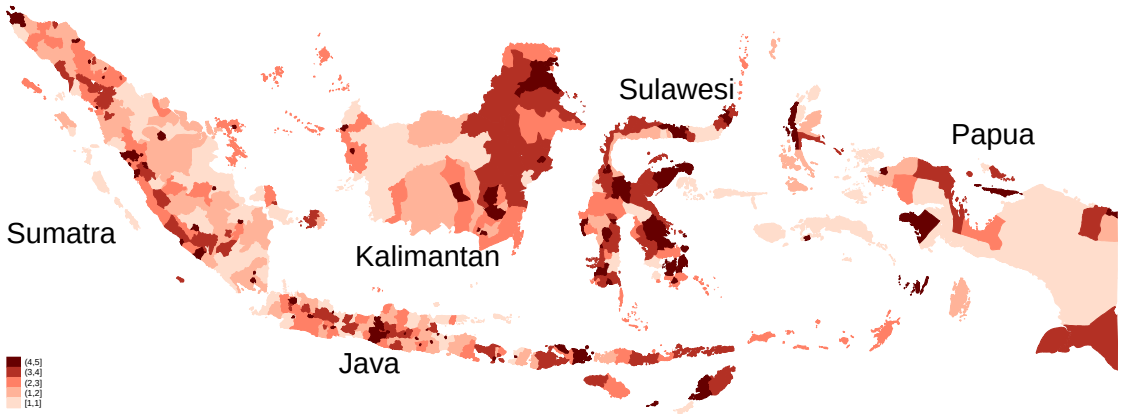
The 2008 socioeconomic survey (*Susenas*) data reported 29% of the population to be insured. Studies by Tangcharoensathien et al. (2011) and Rokx et al. (2009) however both suggest 48%. This may be explained by the different base calculation used by each publication. The 2008 *Susenas* uses a sample of 200,000 households, or around 1.1 million individuals; Tangcharoensathien et al. refer to data from World Health Statistics 2010 and Rokx et al. use World Bank calculations and data from other studies. Whichever dataset is referred to however, Indonesia's health insurance coverage is still low compared to other nations in South East Asia (Tangcharoensathien et al., 2011).

Askes is a mandatory health insurance programme for active and retired civil servants, retired military personnel, retired police officers, war veterans, intern doctors and midwives, and their dependents. The total number of *Askes* beneficiaries in 2008 was roughly 16 million. Benefits of the scheme include outpatient, inpatient and maternity care, prevention and health promotion, at health centres and selected hospitals. Since 2003, *Askes* programme has covered expenditure for high-cost diagnoses, including cardiovascular disease, cancer, renal failure, and thalassaemia (Rokx et al., 2009).

The distribution of *Askes* membership across districts as percentage of district population is shown in quantiles in Figure 2.1 (q1: 0%, q2: 4.2%, q3: 6.4%, q4:

10%, q5: 34%). *Askes* beneficiaries are equally distributed in Java, but not across the other islands of Indonesia. For example, there is a higher concentration in the westof Sumatra than in the east, and in the east of Kalimantan compared to the west. On Sulawesi, *Askes* dominates almost the entire island except for the central region, whereas on Papua *Askes* beneficiaries beneficiaries are mostly located in the north and south of the island.

Figure 2.1: 2008 distribution of *Askes* beneficiaries across districts



Source: Susenas 2008

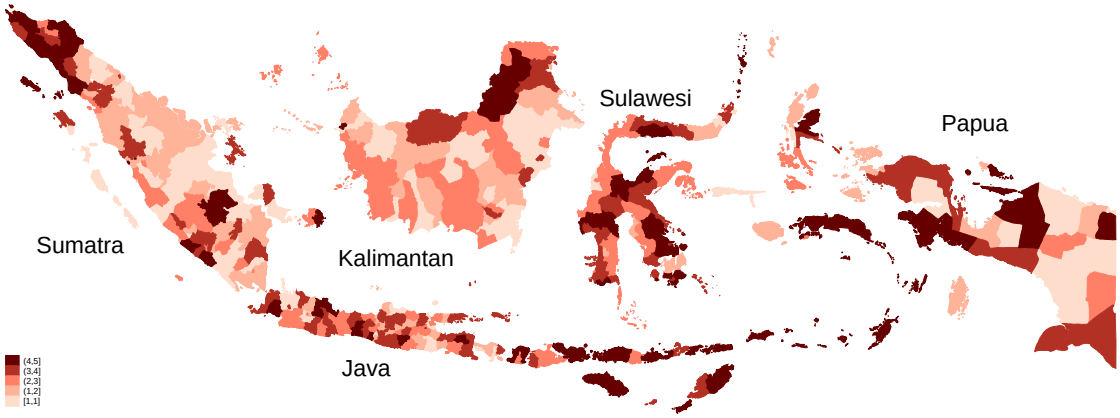
Askeskin is a social health insurance programme targeting 76.4 million poor and near-poor. Insurance risks were pooled at district level, with a monthly premium of IDR5,000 (GBP0.30), fully subsidised by the government. The benefit includes outpatient care, third tier inpatient care, and an obstetric service package. A problem arose with beneficiary targeting when eligible individuals declined coverage (Arifianto et al., 2005) due to having to pay the cost of the photograph which appeared on their *Askeskin* cards. Some households prefer partial coverage by registering those household members with a potentially high demand for healthcare. *Askeskin* has become a scheme with predominantly poor-health beneficiaries. Sparrow et al. (2010) suggest that *Askeskin* successfully targets individuals who would otherwise incur relatively high self-payment charges for healthcare.

Unlike the distribution of *Askes*, *Askeskin* beneficiaries are concentrated in the western and central regions of Java. they are more concentrated in the north and south; in Kalimantan they are mostly located in the north,with very few elsewhere on the island. In Sulawesi, the distribution of *Askeskin* beneficiaries is similar to those of *Askes*. Finally, the central region of Papua has many more *Askeskin* beneficiaries than the south. For more details, see Figure 2.2 (q1: 1%, q2: 11%, q3: 18%, q4: 28%, q5: 73%).

2.1.1 The association between demand-side subsidy and health spending

The level of financial protection provided by a health insurance scheme is measured by the amount of health expenditure an individual must pay on top of their insurance premiums; the specific features of health insurance may also affect the level of financial protection. Of these two social health insurance programmes,

Figure 2.2: 2008 distribution of *Askeskin* beneficiaries across districts



Source: Susenas 2008

Askes is allowed by law to charge cost-sharing (the difference between the actual health cost and the *Askes* tariff). *Askeskin*, on the other hand, is prohibited from doing so, since the programme is targeted at the poor. In reality however, there is evidence that *Askeskin* beneficiaries must pay for cost sharing (Sparrow et al., 2010). For example, although medicines are covered by the scheme, in some cases they are not available in pharmacies. Patients are thus obliged to purchase substitute medicine which is often more expensive (Rokx et al., 2009). The general features of the health insurance schemes in Indonesia are outlined in Table 2.4.

Table 2.4: Comparison of health insurance schemes in Indonesia

Characteristics	Askes	Jamsostek	Askeskin
Participation	Compulsory	Compulsory with opt-out option	Social insurance
Beneficiaries	Civil servant (including retirees)	Private formal sector workers	Identified poor and near poor
Provider	Public and private	Public and private	Public
Exclusion	Health conditions caused by natural disaster, self inflicted, and extreme sports	Health conditions caused by natural disaster, self inflicted, and extreme sports	None
Services uncovered	Cosmetic surgery, physical check-up, alternative medicine, dental prostheses, fertility treatment, nonbasic immunisation	General check up, cancer treatment, heart surgery, renal dialysis, lifelong treatment for congenital diseases, prostheses, nonbasic immunisation, transplantation, fertility treatment	Cosmetic surgery physical check-up, alternative medicine, dental prostheses, fertility treatment
Payment mechanism	Primary care: capitation; Secondary: fee schedule with limit	Primary care: capitation; Secondary: fee schedule and capitation	Primary care: capitation; Secondary: fee schedule with limit
Cost sharing	Primary: No; Secondary: Yes, if members want to upgrade class or use non-listed drug	None	None

Source: Rokx, et al. (2009) page 36

2.2 Supply-side subsidy

The performance of the health system in Indonesia is measured by its ability to achieve health policy goals, namely: 1) to increase health outcomes; 2) to improve health access, and 3) to provide financial protection against unpredictable health costs (Rokx et al., 2009). To achieve the third goal, Indonesia uses supply-side subsidies to reduce the price of health treatment at public hospitals and public health centres. Before decentralisation in 2001, health subsidies were paid directly from the central government budget; decentralisation moved the budget to district governments (Pradhan and Prescott, 2002).

2.2.1 The association between district health spending and household health spending

In general, the association between public health subsidies and a household's self-payment for healthcare is likely to be negative: the smaller the amount of public health subsidy, the more the households need to pay for their medical treatment (Pradhan and Prescott, 2002). However, the link between increases in public health spending and health outcomes is complicated for several reasons: 1) an increase in government health spending may result in a decrease in private health spending (see Table 2.5); 2) the increase in government spending does not necessarily increase its efficiency. For example, purchasing sophisticated medical equipment may be inefficient if funds for its maintenance are insufficient), and 3) even if public health spending is implemented efficiently, support will still be needed from other infrastructures in order to maximise its benefit. For example, if transportation costs or transportation facilities to health providers are lacking, or access to clean water and sanitation are difficult (World Bank, 2008), then

any benefits intended by an increase in public health spending are likely to be compromised.

Table 2.5: Indonesia expenditure on health, 2005-2010

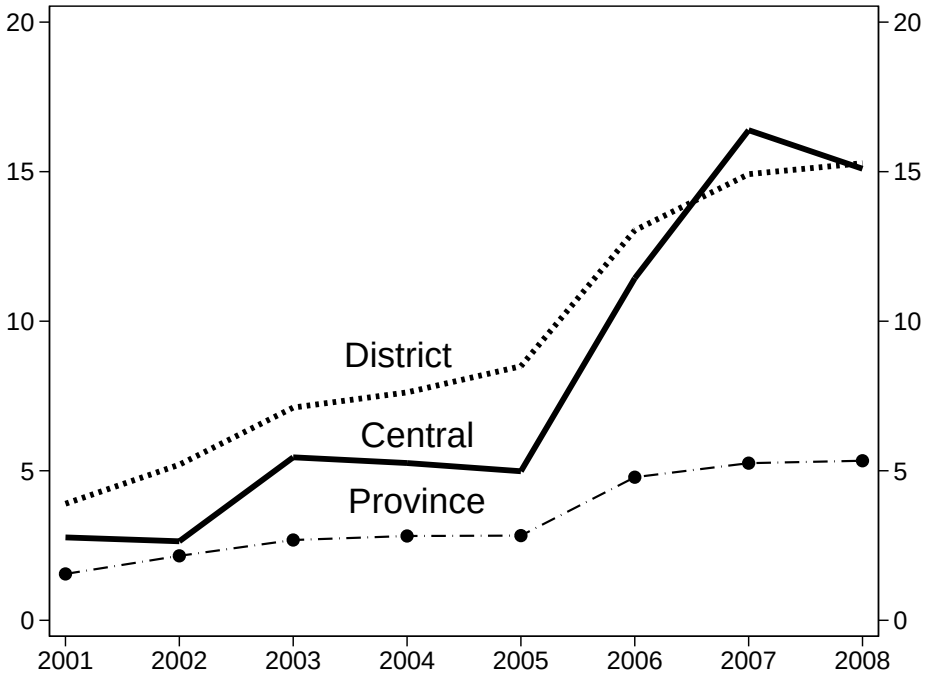
Indicator	2005	2006	2007	2008	2009	2010
Total expenditure on health as % of GDP	2.4	2.5	2.7	2.5	2.5	2.6
Government share (%)	38.1	41.4	45.8	46.5	46.1	49.1
Private share (%)	61.9	58.6	54.2	53.5	53.9	50.9

Source: WHO National Health Accounts Database

2.3 Public expenditure on health

Following decentralisation, public health spending at district level continued to rise, to the point which it was higher than both central and province level spending (an exception was 2007, when the central government was in its final year of implementing the *Askeskin* scheme). The programme adopted a fee-for-service payment system, where hospitals were reimbursed according to the treatments they performed. Hospitals were thus encouraged to provide an increased number of treatments since reimbursement would be made by *Askeskin*. As a result, there was a steep climb in central health spending from 2005 to 2007. In 2008, the programme changed its name to *Jamkesmas*, and more importantly changed to a prospective payment system, meaning that hospitals were reimbursed according to a set price per agreed diagnoses (Ministry of Health, 2008). As a result, central health spending started to decrease between 2007 and 2008. The trend of health spending by level of government (inflation adjusted) is presented in Figure 2.3.

Figure 2.3: Trends in health expenditure by level of government (in trillion IDR), 2001-2008



Source: World Bank, 2008

One of the purposes of decentralising the health budget is to allocate health subsidies according to each district's needs and socioeconomic conditions. A major consideration when allocating a decentralised health budget should thus be to provide financial protection for people seeking healthcare from public providers.

However, most district governments in Indonesia still lack adequate capacity in budget management. Rokx et al. (2009) found that 60% of the annual district health budget is spent in the final trimester of each year. Many programmes are thus implemented during a relatively short period, a move likely to reduce quality. However, despite weak management, only eight provinces reported absorption of less than 100% (see Table 2.6). Some provinces even exceeded 100%, made possible since budget from other posts are used to finance health programmes. While absorption at province level thus looks encouraging, there are however still large disparities between districts, marked by the high standard deviation rate. For example, the province of North Maluku was ranked second in terms of absorption rate, but was also ranked first in absorption disparity across districts. While averaging 118%, district budget absorptions ranged from 35% in the Tidore Islands to 215% in East Halmahera, a clear indication of the need to address the varying levels of efficiency of public health spending across districts.

District health spending per capita in Indonesia is shown in quantiles in Figure 2.4 (in million IDR; q1: 7.2, q2: 37, q3: 52, q4: 69, q5: 178). Districts of Java are among the highest spending in Indonesia; in the districts of Sulawesi and Maluku, however, the level of district health spending is among the lowest. Spending in districts in Kalimantan and Papua are evenly distributed.

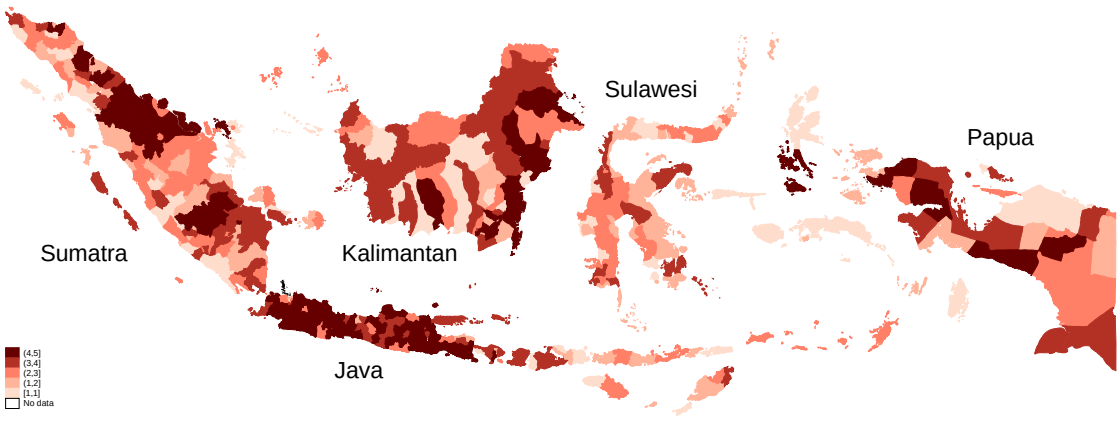
The amount of health spending in seven main islands amplifies health spending inequality in Indonesia. Java island spends 36% of the national health budget, despite constituting only 25% of the total districts. Districts in Java also spend

Table 2.6: 2008 top and bottom 5 in health budget absorption

Rank	Province	Districts	Absorption (%)	Std. dev. (%)
1	West Papua	7	122	36
2	North Maluku	4	118	74
3	Central Java	33	115	27
4	Bali	9	114	33
5	Banten	4	113	21
28	North Sulawesi	10	97	18
29	South Kalimantan	11	97	18
30	Bengkulu	7	94	13
31	Riau	6	94	22
32	Bangka Belitung	6	85	16

Source: Ministry of Finance

Figure 2.4: 2008 spatial distribution of health spending across districts in Indonesia



Source: Susenas 2008

higher than districts on other islands -an annual average of IDR81 billion - and also have the highest level of inequality, indicated by the high standard deviation (see Table 2.7).

Table 2.7: 2008 health spending in 7 major islands in Indonesia

		Spending (in billion IDR)		
Island	Districts	Total	Average	Std. dev.
Sumatra	136	7,208	53	31
Java	115	9,333	81	36
Bali and Nusa Tenggara	37	1,732	47	19
Kalimantan	53	2,972	56	28
Sulawesi	69	2,827	41	17
Maluku	16	611	38	17
Papua	29	1,596	55	21

Source: Ministry of Finance, 2008

The lack of district capacity in managing the health budget is more apparent if we consider the state financial audit report. An audit conducted by the Indonesian Financial Supervisor in 2012 shows that 27% of financial reports from the districts fall into the 'disclaimer' category, the worst category possible (Ministry of Finance, 2012). The highest share of the health budget is allocated to staff wages and incentives. About a quarter is allocated to medicines and vaccines, and only a relatively small amount (around 5%, see Table 2.8) to the operation of health centres. Even worse, a large sum of money stagnates in bank accounts, while service delivery suffers from lack of operational funds to provide essential public health services (World Bank, 2008).

A sample of 10 districts was selected to provide a detailed, representative account of how the health budget is spent. The largest share is allocated to routine or project administration (see Table 2.9). It appears that programmes covering preventative health activities, nutrition, and family and environmental health are not, according to budget allocation, considered public health priorities.

Table 2.8: District health fund allocation, 2005

Category/item	Avg % of budget
Medicine and vaccines	24.4
Medical instruments	7.2
Wages and incentives	54.6
Building - investment	10.4
Vehicles - transport	3.9
Health centre operational	4.9

Source: World Bank, 2008

However, interpreting health budget allocation should be done carefully, since some programmes are partially funded by other pots of money, in particular from over-funded posts (World Bank, 2008). For example, when spending on drugs and food is budgeted below the actual requirement, the government may use any monies left over for other programmes.

Table 2.9: Functional classification of health fund from 10 sample districts, 2002-2006

Programme	Total (%)
Routine/project administration	48.5
Drugs and food	12.8
Public health services	13.1
Vehicles	6.7
Communicable disease control	9.7
Health workforce	2.7
Family health	2.6
Health promotion	1.8
Nutrition	1.3
Environmental health	0.7

Source: World Bank, 2008

District health expenditure is also hindered by lack of authority in health procurement. Although districts can independently set health programmes and health fees, their role in health procurement is limited to providing suggestions, while most actual decisions are made by central government (Strauss et al., 2004). Health procurement potentially contributes to inefficiency by ignoring local needs.

For example, districts have in the past reported several months of medicine shortages as a result of procurement inefficiency (Rokx et al., 2009). Such shortages, especially of those medicines covered by health insurance, may result in a need for self-payment for alternative medicines, with the consequent increased risk of catastrophic health expenditure.

Finally, decentralised health spending may also be subject to endogeneity in budget allocation (Strauss et al., 2004). The public health budget is not ramdomly allocated, but depends on certain district characteristics (Pitt et al., 1993). For example, it can be allocated according to the availability of public health providers or number of staff, as part of the budget is allocated as subsidy for them. The association between household health expenditure and district health spending is thus clearly a complex one.

The allocation of central health spending is different. Data obtained from the Ministry of Finance shows that the majority is allocated to individual health services, which include demand-side subsidies such as health insurance for the poor (World Bank, 2008). The second highest spend is on the public health service, although this declined by half after 2011 (see Table 2.10).

Table 2.10: Functional health spending by central government 2007-2012 (in %)

Function	2007	2008	2009	2010	2011	2012
Drugs and health supplies	6	10	8	7	11	16
Individual health service	50	63	62	64	58	56
Public health services	21	12	17	17	9	7
Demography and family planning	3	3	4	4	17	17
Health research and development	1	1	1	1	2	2
Others	19	11	8	6	3	2

Source: Ministry of Finance, 2012

Despite the differences in health spending allocation between district and central government, both aim to protect Indonesians against the risk of catastrophic

health expenditure. By combining demand and supply-side subsidies into the analysis, I am able to draw conclusions on the effectiveness of each type of subsidy. This result is important because one of the biggest challenges faced by Indonesia is to optimise its limited health budget, especially in the forthcoming implementation of universal health insurance coverage planned for 2014.

2.4 Communicable diseases

Communicable diseases (such as HIV/AIDS, tuberculosis and malaria) create a substantial financial burden to those who contract them. They continue to be a major cause of morbidity and mortality in Indonesia: nearly 300 people die of tuberculosis daily, with over half a million new cases estimated to occur every day (World Health Organization, 2007). Malaria is a major concern in large parts of Indonesia, and large scale outbreaks of dengue hemorrhagic fever are reported every year. Although leprosy has been eliminated at national level, Indonesia ranked third in South East Asia in terms of global burden. Indonesia has also overtaken Vietnam in the number of deaths from avian influenza, with case fatality rates in 2006 nearing 75%. In short, the burden of communicable diseases is a major concern in Indonesia.

Although HIV/AIDS is present in almost every province in Indonesia, its prevalence is characterised by huge disparities across provinces. There were 177,926 reported cases in 2010, with the highest prevalence in West Java (16.8%), followed by East Java (15.3%) and Central Java (12.5%). Only 11.4% of Indonesians profess comprehensive knowledge of HIV/AIDS, including knowledge of prevention and transmission. This low level indicates the likelihood of this disease being an increasing burden in the future (Ministry of Health, 2010).

Malaria is acknowledged as a worldwide health problem, including in Indonesia. It commonly occurrs in remote areas and only in poor or developing countries, and was thus identified as one of the global commitment priorities of the *Millennium Development Goals* declared by 189 United Nations countries in 2000. According to national reports, the national prevalence of malaria is 23 per 1,000 population. In 2009 the lowest incidence was in Bali (3), and the highest in Papua (262) followed by West Papua (253), East Nusa Tenggara (118) and North Maluku (103) (Ministry of Health, 2010).

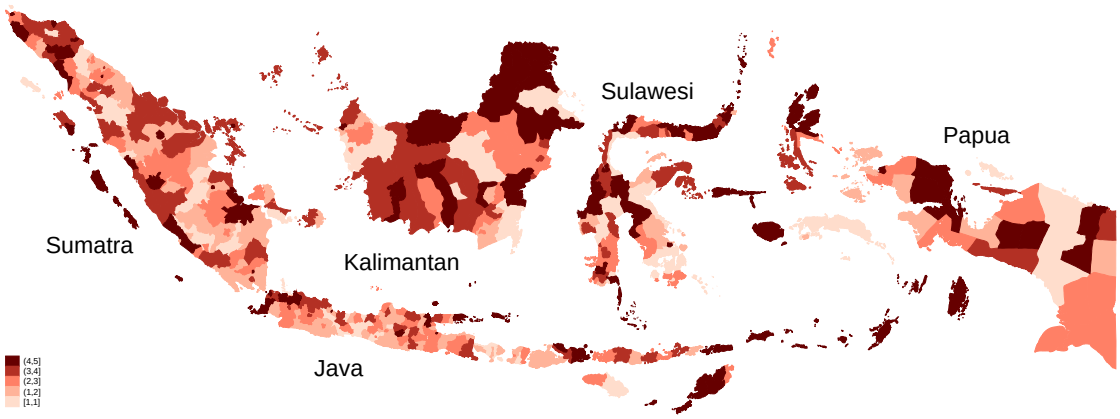
Tuberculosis is a chronic communicable disease and in 2009 Indonesia was categorised as the third highest tuberculosis burden country after India and China. The national prevalence figure is 725 per 100,000 population. Out of 33 provinces, the five worst affected provinces are Papua (1,441 per 100,000 populations), Banten (1,282), North Sulawesi (1,221), Gorontalo (1,200) and Jakarta (1,032) (Ministry of Health, 2010).

The distribution of communicable diseases in Indonesia is shown in Figure 2.5. They include diarrhoea, dengue, measles, upper respiratory infections, malaria, avian influenza, tuberculosis, and other diseases. The figure represents the percentage of villages in a district with at least one disease outbreak in the previous year and is divided into quantiles (q1: 1%, q2: 2.3%, q3: 12%, q4: 21%, q5: 26%).

2.5 Health care resources

Adequate availability of doctors, health centres, and hospitals is essential to provide appropriate health access to those who need it. Inequality in the distribution of health resources may affect individual health status. When health resources are unavailable locally, individuals may be forced to seek treatment in

Figure 2.5: 2008 spatial distribution of communicable disease across districts in Indonesia



Source: Susenas 2008

a different district, or even province, a constraint which may delay healthcare and result in further deterioration of their health status. In the long term it may increase the severity of illness and the cost of treatment. Health resources are unequally distributed across provinces in Indonesia. There are 32,492 registered general practitioners which make up the national ratio of 13.5 doctors per 100,000 population. Central Java has the highest ratio (91.9 per 100,000) and West Papua has the lowest (3.89). Similarly, inequality in the ratio of dentists is evident, with East Java leading (27.5), and Gorontalo (0.75) coming last. Jakarta leads in the ratio of nurses (430.7 per 100,000 population), while Gorontalo (28.5) remains last. This compares with a ratio of 982 nurse per 100,000 of the population in the United States and 1013 per 100,000 in the United Kingdom. Finally, inequality in the distribution of specialists is evident, with 62% of Indonesia's specialists concentrated in Java (Ministry of Health, 2011). The distribution of health resources in Indonesia is further outlined in Table 2.11.

Table 2.11: 2011 health resources ratio per 100,000 population

Province	Nurse	GP	Dentist	Specialist
Aceh	165	25	5	7
North Sumatra	273	60	18	28
West Sumatra	145	22	8	10
Riau	95	20	7	5
Jambi	72	14	4	4
South Sumatra	95	17	3	4
Bengkulu	76	8	2	3
Lampung	118	19	5	6
Bangka Belitung	38	5	1	0
Riau Islands	87	10	3	2
Jakarta	431	55	23	93
West Java	307	63	24	32
Central Java	511	92	25	55
Yogyakarta	113	27	10	19
East Java	416	62	28	14
Banten	185	15	5	16
Bali	105	21	6	19
West Nusa Tenggara	97	13	3	3
East Nusa Tenggara	91	13	3	1
West Kalimantan	239	12	3	4
Central Kalimantan	82	10	2	2
South Kalimantan	121	12	4	9
East Kalimantan	97	19	7	4
North Sulawesi	101	20	1	10
Central Sulawesi	120	9	2	1
South Sulawesi	177	25	11	11
South East Sulawesi	69	9	2	1
Gorontalo	28	5	1	1
West Sulawesi	41	5	2	0
Maluku	111	7	2	1
North Maluku	78	5	1	0
West Papua	41	4	1	1
Papua	121	14	2	2

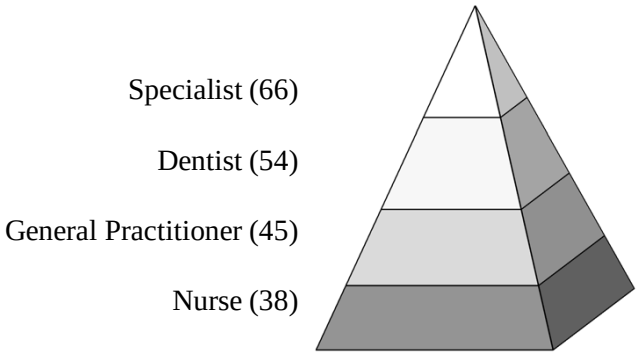
Source: Ministry of Health, 2011

I use the Gini index as an aggregate measure of health resource inequality. The Gini index takes a value between 0 and 1, with higher values indicating higher level of inequality (Munga and Maestad, 2009). For discrete distribution where the observations have been ranked, the Gini index can be calculated as

$$G = \frac{\sum_{i=1}^{n}(2i - n - 1)X_i}{n^2\mu}$$

where G is the Gini index, n is the number of observations, X_i is the number of health workers in the i_{th} province and μ is the mean number of health workers. The association between health worker's skill and their distribution forms a pattern where the higher the skills, the more unequal their distributions. Using this index, I am able to summarise the distribution into a single pyramid chart (see Figure 2.6). The height of the pyramid represents the higher skill specification while the area of each level of the pyramid represents the Gini index.

Figure 2.6: 2011 inequality in health resources (in % of Gini index)



Source: Author's calculations from 2011 Indonesia's Health Profile provided by the Ministry of Health

2.6 Pollution and natural disaster

Environment and health have a strong association in Indonesia. Air pollution from fossil fuels in cities and major forest fires throughout Indonesia negatively impact public health. Moreover, indoor air pollution from use of biomass fuel in poorly ventilated houses, an unreliable supply of clean water, and inadequate sanitation have led to dangerous levels of household pollution in some areas. In addition, urbanisation, industrialisation, and motorisation increase air pollution and have resulted in increased health problems and loss of productivity (World Bank, 2003).

Water pollution is also a problem, particularly in urban cities like Jakarta where the lack of adequate sewerage system has caused human waste to contaminate rivers. As a result, waterborne diarrheal disease is a constant problem (Kido et al., 2009). Similarly in Kalimantan, although the water quality was found to be higher than the WHO bacterial guidelines, local residents continued to mix boiled and unboiled water for consumption, exposing them to the risk of disease (Kido et al., 2009).

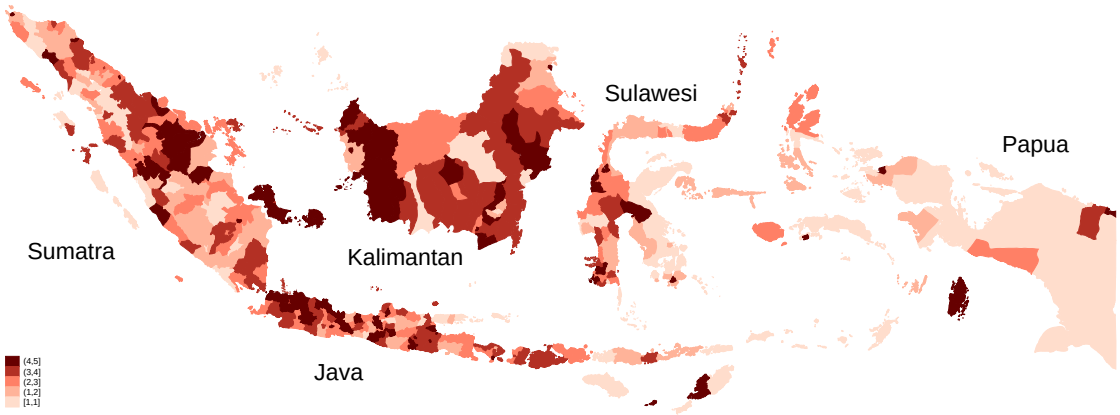
Soil pollution is largely caused by lack of waste management, particularly industrial and agricultural waste. The contamination of the soil and the subsequent reduction in its fertility results in lowered plant production and thus the production of unhealthy food. It has potential longterm adverse effects on human health (World Bank, 2003).

In major cities, noise pollution caused by traffic has turned many local residents into 'noise victims', a problem made worse by the lack of sound insulation in most buildings in Indonesia. High noise levels may cause hearing loss, sleep disturbance, a rise in blood pressure and increase in stress, which may in turn increase the risk of cardiovascular disease. In addition, noise pollution may neg-

atively impact mental health and lead to psychiatric disorders (Stansfeld and Matheson, 2003).

The spatial distribution of pollution in Indonesia is described in Figure 2.7. Types of pollution include water, soil, air, and noise. The figure represents the percentage of villages within districts with at least one type of pollution and is presented in quantiles (q1: 0%, q2: 3%, q3: 6%, q4: 9%, q5: 27%).

Figure 2.7: 2008 spatial distribution of pollution across districts in Indonesia

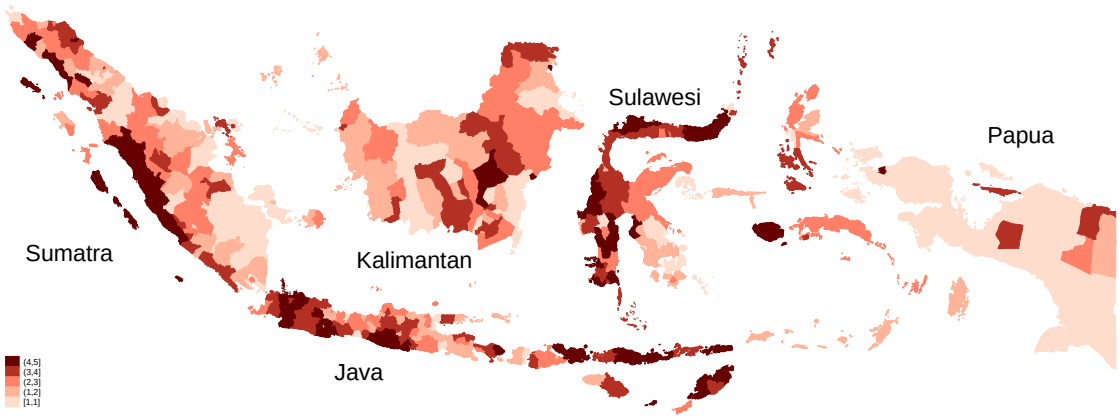


Source: Podes 2008

Indonesia is prone not only to natural disasters such as sea floor quakes, volcanic eruptions and earthquakes, but also to manmade disasters, which frequently result in numerous casualties. For example, the haze disaster in September-November 1997 caused 527 deaths in 8 provinces (Aditama, 2000). Until recently, the country's ability both to provide proper health treatment and to provide basic needs of refugees in the event of natural disaster was lacking. The Aceh tsunami in 2004 also ignited the need to improve emergency preparedness at both national and local level. In short, disaster management remains an area for improvement, which includes immediate response capability at district-, provincial- and central-level health facilities in the event of natural disasters (World Health Organization, 2007).

Figure 2.8 shows the spatial distribution of the incidence of natural disasters in Indonesia. It represents the percentage of villages within a district which has experienced at least one type of natural disaster. These include landslide, flood, earthquake, tsunami, tornado, storm, volcanic eruption, and forest fire. The figure is presented in quantiles (q1: 0%, q2: 3%, q3: 6%, q4: 9%, q5: 21%).

Figure 2.8: 2008 spatial distribution of natural disaster across districts in Indonesia



Source: Podes, 2008

Natural disasters in Indonesia are spread equally across its islands, and occur particularly in Sumatra and Java. These two islands , along with the northern part of Sulawesi, constitute part of 'the ring of fire', or areas which experience frequent earthquakes and vulcanic eruptions. Other types of natural disasters to which Indonesia is prone are shown in Table 2.12 (World Health Organization, 2008). Over the limited time period of four months in 2007, different natural disasters occurred on five major islands; the impact of such disasters on health status differs from one island to the next. Clearly, natural disaster is an important predictor in estimating the risk of catastrophic health expenditure.

Table 2.12: Natural disaster in Indonesia, January - April 2007

Date	Disaster	Region
08 Jan 07	Landslide	Padang Pariaman, West Sumatra
12 Jan 07	Floods and landslide	Sangihe, North Sulawesi
17 Jan 07	Tornado	South-East Sulawesi
21 Jan 07	Earthquake	North Sulawesi and North Maluku
02 Feb 07	Flood	Jakarta, Banten, West Java
19 Feb 07	Landslide	Magelang district, Central Java
20 Feb 07	Storm	Yogyakarta
03 Mar 07	Flood - landslide	Manggarai, East Nusa Tenggara
06 Mar 07	Earthquake	Batusangkar, West Sumatra
14 Mar 07	Flood	Cipinang, Jakarta
14 Mar 07	Flash flood	Belu, East Nusa Tenggara
15 Mar 07	Earthquake	Labuha, Maluku

Source: WHO South East Asia, 2008

Chapter 3

Data and method

This study brings household and district characteristics into the analysis. Household variables are taken from the 2008 socioeconomic survey (*Susenas*) and include household health expenditure and household demography. District variables come from various sources: district health characteristics are taken from the 2008 village survey (*Podes*), district Gross Domestic Products are from the Central Statistics Office and district health spending are from the Ministry of Finance. district GDP figures are from the Central Statistics Office, and district health spending data from the Ministry of Finance. Finally, the district Gini index is aggregated from *Susenas*. The construction of each variable is explained in greater detail in the following section.

3.1 Dependent variable

As mentioned in the previous section, this study follows Xu's definition of catastrophic health expenditure, namely when household health expenditure exceeds 40% of a household's capacity to pay (household expenditure after subtracting essential spending such as on food). The first step in the construction of the dependent variable is to divide each household's annual health expenditure by its

annual non-food expenditure to create a ratio between 0 and 1.

$$O_i = \frac{H_i}{y_i} - \tau$$

where H_i is the household's annual health expenditure, y_i is a measure of household resource (which in this study is the annual household non-food expenditure), and τ is the catastrophic analysis. A ratio close to 0 suggests that health expenditure is low compared to non-food spending. Second, following Xu's definition, I transform O_i into a binary variable E_i, with $E_i = 1$ if $O_i > 0$ (categorised as 'catastrophic') and otherwise 0 (Beauliere et al., 2010; Boyer et al., 2011; Galarraga et al., 2010; Gotsadze et al., 2009; Hajizadeh and Nghiem, 2011; Richardson et al., 2011; Lara and Gomez, 2011; Nguyen et al., 2011; Shi et al., 2011; Su et al., 2006; Yardim et al., 2010).

3.2 District independent variables

Data is taken from the 2008 *Podes* where village characteristics are collected and aggregated to form district characteristics. The respondent of this survey is the chief of village who provides information on village characteristics. The chief must recall whether disease outbreak, environmental pollution, and natural disaster occurred in the past year (the recall period for natural disaster is 3 years). For healthcare-related questions, the chief was asked about the number of healthcare providers in the village.

Using the chief as the sole respondent of *Podes* may result in bias, as the y may have only incomplete knowledge of their village healthcare characteristics. For example, the chief of small villages may know the number of doctors practicing in the villages, but in bigger villages they may encounter difficulties, particularly

in villages where major hospitals are located. In such cases, there is actually only a slight possibility that the chief will know the exact number of doctors practising on his territory. Despite this potential bias, I still use *Podes* data, as district-level data is not available from any other source. Most government publications, particularly those provided by the Ministry of Health, are available at province-level, while district-level publications are mostly incomplete. Some adjustments are made to reduce bias, which will be explained in more detail below. In short, my justification for using *Podes* is to deal with the lack of data availability. District gross domestic product (GDP) per capita and district health spending per capita are available from the Central Statistical Office and Ministry of Finance. The following section explains the construction of each variable in more detail.

1. *The percentage of villages with disease outbreak.* The village chief was asked whether disease outbreak occurred in the past year (binary responses 'Yes' or 'No'). There are 8 types of diseases listed in the survey: measles, diarrhea, malaria, dengue, upper respiratory infection, tuberculosis, avian inuenza, and other disease. The statistic obtained was then aggregated to form a percentage of villages within the district with disease outbreak. For example, if a district has 100 villages and an outbreak of measles occurred in 50 of those, then the percentage obtained is 50%. The average taken from all types of diseases forms this variable. There are no publications about Indonesia regarding the association between disease outbreak and the risk of catastrophic health expenditure. This study might be the first to analyse such association.

2. *The percentage of villages with incidence of natural disaster in the past 3 years.* The chief was asked whether earthquake, flood, volcanic eruption, and

tsunami had occurred in the past 3 years. The construction of this variable is similar to the process involved in calculating the percentage of villages with disease outbreak, in that villages which have experienced any of these types of natural disaster are coded '1'. The total number of villages that experienced natural disaster is divided by the total number of villages within a district. No studies have analysed the association between the occurrence of natural disaster and the risk of catastrophic health expenditure, although the association between natural disaster and general health (Frankenberg et al., 2005; Kunii et al., 2002; Watson et al., 2007; Phifer et al., 1988) and mental health (Madakasira and O'Brien, 1987; Murphy, 1987; Kokai et al., 2004; McFarlane and Papay, 1992) are well-documented.

3. *The percentage of villages with pollution.* The chief was asked whether air, water, soil, and noise pollution occurred in the last 1 year. The villages with at least 1 type of pollution are coded '1'. The variable is constructed by dividing the total of polluted villages by the total number of villages within a district. Previous studies have documented the association of air, soil (World Bank, 2003), water (Kido et al., 2009), and noise (Stansfeld and Matheson, 2003) with general health. However, studies relating pollution with the risk of catastrophic health expenditure are not available.

4. *The percentage of villages with health resources.* The 2008 *Podes* data pertaining to health resources describes the availability of hospitals, doctors, and health centres within the village. Code '1' is given to villages where health resources is available. To form this variable, the total number of villages with at least one type of health resource is divided by the total number of villages in the district. It forms a proxy ofhealthcare access, an alternative

being 'distance from healthcare provider' (Ekman, 2007; Shi et al., 2011); unfortunately such information is not provided by *Podes*.

5. *District GDP per capita*. The construction of this variable is straightforward: calculate the ratio between district GDP and district population. Both statistics are available from the Central Statistics Office. GDP per capita is a basic economic indicator relative to the population and reflects the general well-being of the population. Growth in per capita GDP indicates growth in individual income, but it is not an indication for income distribution (OECD, 2011). No studies have yet examined the association between per capita GDP and the risk of catastrophic health expenditure in Indonesia, despite the strong association between the two (van Doorslaer et al., 2007). However, the inequality of GDP per capita across districts in Indonesia has been documented (Akita, 2003; Resosudarmo and Vidyattama, 2006), making it possible to examine whether GDP per capita is a predictor for the risk of catastrophic health expenditure.

6. *District-level Gini index*. This statistic describes income inequalities in each district. A previous study included district Gini index as a predictor for catastrophic health expenditure (Saksena et al., 2010). The index is calculated using household expenditure data provided by *Susenas*, and follows Milanovic (1997):

$$G = \frac{1}{\sqrt{3}} \frac{\sigma_y}{\overline{y}} \rho(y, r_y)$$

where G is Gini index, σ_y is the standard deviation of household expenditure, $\overline{y}$ is the average household expenditure, and $\rho(y, r_y)$ is the correlation between expenditure and its rank. To anticipate differences in price level

across districts in Indonesia, the household expenditure data is adjusted with the district consumer price index.

7. *District health spending.* This variable is readily available from the Ministry of Finance. To resemble the normal distribution, I transform district health spending using logarithmic transformation. This variable represents the supply-side subsidy to healthcare which was decentralised to district government in 2001.

3.3 Household independent variables

Individual and household data are taken from the 2008 *Susenas*. The population of this study comprises households that have experienced illness in the previous year, ignoring those which are healthy. The reason for this selection is related to the aim of our study, namely to test the impact of health policy on a household's financial status during illness. After selection, there are 189,163 eligible households. This selected population is different to the one used by Xu et al. (2003), who examine those whose health spending is greater than zero and ignore those who spend nothing on healthcare. One of the weaknesses of this Xu's selection is that it ignores those households which spend nothing on healthcare because they have financial protection provided by health insurance or for other reasons. This situation is relevant to Indonesia, where some households expend nothing on healthcare because they receive free healthcare.

I found evidence that some households in Indonesia are covered by more than one health insurance scheme (see Table 3.1). For example, the head of household may be covered by *Askes* (health insurance for civil servants), while another household member is covered by *Askeskin* (health insurance for the poor). When

this individual data is summarised in the form of household data, a decision must be made as to whether the household is covered by *Askes* or *Askeskin*. In this situation, self-payment is assumed to come from health insurance that implements cost-sharing, namely, *Askes*. Where a household is covered by both *Askes* and *Askeskin*, household health expenditure may be caused by enrolment in *Askes*. Where a household is covered by *Askes* plus other forms of insurance, self-payment may come from being beneficiaries of the other insurance scheme (the government provides additional funds to cover chronic and high cost diseases through the *Askes* programme). In any event, multiple health insurance ownership cases are few in number.

Table 3.1: Health insurance membership

Ownership	Frequency	Percentage
0	119,982	63.43
1	66,246	35.02
2	2,890	1.53
3	45	0.02
Total	189,163	100.00

Source: Susenas, 2008

Household independent variables are as follow:

1. *Household size*. The OECD household equivalency scale assigns weight to each household member since adults consume more than children. Household heads are assigned a value of 1 regardless of their sex. Household members older than 17 years old are assigned 0.7, while those younger than 17 are weighted by the value 0.5 (OECD, 1982). For example, a household size of 4 which consists of husband and wife (both older than 17) and 2 children (both younger than 17) are considered to have an equivalent household size of 2.7 (1 + 0.7 + 0.5 + 0.5). Another approach to adjusting household size is introduced by the National Research Council, where the adult

equivalency follows this formula:

$$AE = (A + \alpha K)^{\theta}$$

A is the number of adults in the household, K is the number of children, α is between 0 and 1 (the relative cost of a child compared to an adult), and θ represents the extent of economies of scale. Setting the values of α and θ should include taking into consideration the level of economic development of the country, since raising children in an industrialised country is likely to cost more than in poorer countries (i.e. food , clothes, entertainment). Therefore, θ may be similar in western and poor countries. Since poor households spend most of their budget on food, the economies of scale may be limited, thus θ is likely to be close to 1. In richer households, θ may be as low as 0.75 (Deaton, A. and Zaidi, S., 2001).

Alternatively, the OECD equivalency scale is more appropriate when examining *Susenas* data since it provides information regarding each household member's position and age. The calculation process is simple and straightforward. The National Research Council formula requires assumptions for two statistics which are prone to bias. This study thus uses the OECD household equivalency scale to adjust for household size.

2. *Percentage of household member over 65 years of age.* Code 1 is assigned to household members older than 65 years old, and 0 to all others. By aggregating individual data into household data, we can calculate the number of household members older than 65 years. Finally, I divide the number of household members aged 65 or more by the household size. Some studies use dummy variables to identify the presence of elderly members in the

household (Bowser and Mahal, 2011; Galarraga et al., 2010; Knaul et al., 2006; Saksena et al., 2010; Xu et al., 2006; Yardim et al., 2010). However, I argue that using a percentage is more accurate since it accomodates the increasing risk of having more than one elderly member at home.

3. *Total health complaints reported by household members.* Questions about individual health status include whether individuals experienced any health complaints in the past month. Since this study concentrates exclusively of ill households, the answer to this question will be 'Yes'. This is a multiple answer comprising 8 symptoms: 1) fever; 2) cough; 3) running nose; 4) asthma; 5) diarrhoea; 6) headache; 7) toothache and 8) other symptoms. I summarise individual data in the form of household data to calculate total health complaints per household. I use health complaints as a proxy for disease prevalence, since most studies use other variables, such as number of household members with chronic disease (Wagstaff and Lindelow, 2008; Trujillo et al., 2005; Shi et al., 2011; Salti et al., 2010; Nguyen et al., 2011).

4. *Total household disruptive-days due to health complaints.* This information indicates whether a health complaint disrupts the individual's daily activities (e.g. work and school) and is used as proxy for health status.

5. *Dummy variable for self-treatment (reference: no treatment).* A number of other studies find that self-treatment increases the likelihood of self-payment since it can prolong and worsen illness and increase the severity of illness, and can thus eventually increase the risk of catastrophic health expenditure (van Doorslaer et al., 2007; Castillo-Riquelme et al., 2008). However, self-treatment can also reduce health expenditure as it is generally less expensive than formal healthcare (Somkotra and Lagrada, 2008; Limwattananon et al.,

2007; Gotsadze et al., 2009). Poor households might also opt to self-treat because of their concerns regarding high healthcare costs (Castillo-Riquelme et al., 2008).

6. *Dummy variable for outpatient and inpatient care in different types of hospitals (reference: public hospitals. Susenas* asks respondents whether they received outpatient care during the past 1 month and inpatient care during the past 1 year. Responses refer to the following options of outpatient and inpatient care: 1) public hospital; 2) private hospital; 3) doctor/clinic; 4) health centre; 5) health staff; 6) traditional medication; 7 midwife and 8) other settings. The reason for creating dummy variables for public and private hospitals is that some studies found that the risk of catastrophic health expenditure increases when individuals received treatment at private hospitals (Hajizadeh and Nghiem, 2011; Limwattananon et al., 2007; Salti et al., 2010). Similarly, in Indonesia, receiving health treatment in a public hospital compared to private hospital may reduce self-payment because of government subsidy (Pradhan and Prescott, 2002).

7. *Total outpatient visits per household.* The number of outpatient visits indicates the intensity of hospital services. Its association with the risk of catastrophic health expenditure has been documented in previous studies (Bowser and Mahal, 2011; Galarraga et al., 2010; Kim and Yang, 2011; Lara and Gomez, 2011; Limwattananon et al., 2007; Lu et al., 2012; Pradhan and Prescott, 2002; Saksena et al., 2010; Shahrawat and Rao, 2012; Shi et al., 2011; Tangcharoensathien et al., 2011; Trujillo et al., 2005; Wagstaff and Lindelow, 2008). The question regarding the number of outpatient visits is divided into eight health facilities: 1)public hospital; 2) private hospital;

3) doctor/clinic; 4) health centre; 5) health staff;6) traditional medication; 7) midwife and 8) other settings. The recall period for this question is 1 month.

8. *Total days of inpatient care.* Total days of inpatient care (or length of stay) also contribute to the picture of the intensity of hospital service. *Susenas* accomodates inpatient care in several settings: 1) public hospital; 2) private hospital; 3) health centre; 4) health staff; 5) traditional medication and 6) other settings. The recall period for this question is 1 year. Other studies use a dummy variable for inpatient care (reference: no care) to analyse the association between healthcare utilisation and the risk of catastrophic health expenditure (Berki, 1986; Xu et al., 2006). I use total days of inpatient care (or 'length of stay'), which is a count variable and better describes the intensity of healthcare where a longer length of stay is positively associated with the risk of catastrophic health expenditure (Hajizadeh and Nghiem, 2011).

9. *Dummy variable for type of health insurance (reference: no insurance).* There are seven types of schemes referred to by the *Susenas* questionnaire. I created four dummy variables to separate two schemes categorised as demand-side subsidies (*Askes* and *Askeskin*). A further dummy variable is the combination of various types of health insurance, with 'uninsured' as the reference group. The 'combination of various types of health insurance' category consists of various schemes with differing features: (1) *Jamsostek* (which covers formal private workers and is run by a state-owned company); (2) private health insurance (whose diverse features are offered to both individuals or groups); (3) company reimbursement (which can provide employ-

ees with up to 100% health cost reimbursement); (4) health funds offered by the Ministry of Health (which is allocated to community-based health insurance), and (5) other health insurance. Future studies could provide a more detailed analysis by examining these types of insurance separately.

10. *Dummy variable for household head's education level (reference: no education).* Four dummy variables were generated, categorising the level of education as either primary, secondary, tertiary, or uneducated. Primary education is grade 1 to 6, secondary education is grade 7 to 12, and tertiary education is university degree from diploma to postgraduate. Those without education are the reference group. This question reflects the completion of each level. For example, if the household head's education ends at seventh grade, s/he has not completed secondary education and thus falls into the category of 'primary education'. This is used to define level of education in several studies (Yardim et al., 2010; Trujillo et al., 2005; Shi et al., 2011; Saksena et al., 2010; Pal, 2012; Nguyen et al., 2011; Lu et al., 2012; Knaul et al., 2006; Kim and Yang, 2011; Beauliere et al., 2010). Some studies use 'years of education' to represent education level (Hajizadeh and Nghiem, 2011; Galarraga et al., 2010) or a dummy variable to indicate whether head of household has completed several years of education (Xu et al., 2006; Flores et al., 2008; Boyer et al., 2011; Bowser and Mahal, 2011). However, I prefer to use education level completed since it better represents advancement in knowledge compared to other variables. For example, a person with six years of education does not necessary have twice as much education as someone with three.

11. *Dummy variable for household head's employment status (reference: unem-*

ployed). Susenas asked household members older than 10 years of age about their activity in the past week. Possible answers include: 1) work; 2) school; 3) stay at home, and 4) other activities. By associating this question with the respondent's position in the household, we can identify the head of household's employment status. I generate a dummy variable to represent two categories: employed and unemployed (Yardim et al., 2010). Categorising employment status into the formal and informal sectors (Beauliere et al., 2010; Tangcharoensathien et al., 2011) or employed and self-employed (Ekman, 2007; Hajizadeh and Nghiem, 2011; Lara and Gomez, 2011; Onoka et al., 2011; Richardson et al., 2011; Trujillo et al., 2005) may be preferable in health expenditure studies; however, such categories are not available through *Susenas*.

In addition, there is no clear definition of 'head of household' in the *Susenas* survey. There are nine codes for household members who are defined in terms of their relation to the head of the household: 1) the head of household him/herself; 2) spouse; 3) child; 4) child-in-law; 5) grandchild; 6) parents/in-laws; 7) other families; 8) housemaid and 9) others. In general, the husband is the head of household, but *Susenas* also accomodates women in this position. Many studies identify the sex or age of household head (Barros et al., 2011; Bowser and Mahal, 2011; Flores et al., 2008; Galarraga et al., 2010; Hajizadeh and Nghiem, 2011; Knaul et al., 2006; Lara and Gomez, 2011; Lu et al., 2012; Nguyen et al., 2011; Onoka et al., 2011; Pal, 2012). In general, female heads of households have a higher probability of suffering from catastrophic health expenditure compared to males (Pal, 2012). However, it is unclear whether the difference in risk of catastrophic health expenditure is caused by differences in sex or differences in education (women in general

have lower levels of education than men). Future studies in Indonesia should thus consider the sex of household head.

12. *Dummy variable for house ownership (reference: full ownership).* Home ownership status includes: 1) full ownership; 2) rented; 3) rent-free; 4) official (owned by company/government); 5) owned by parents/other relatives, and 6) others. A study of healthcare costs suggests that the sale of assets is one of the strategies employed to cope with such costs (Flores et al., 2008). Since one's house is likely to be one's most valuable asset, it is relevant to analyse whether households with full ownership of their house are more protected than other types of house owners.

13. *Dummy variable for rural/urban area.* This variable is straighforward: code 1 represents a household located in rural area and 0 a household in urban area. This is used by many studies as a predictor of catastrophic health expenditure (Ekman, 2007; Galarraga et al., 2010; Hajizadeh and Nghiem, 2011; Knaul et al., 2006; Lu et al., 2012; Richardson et al., 2011; Saksena et al., 2010; Trujillo et al., 2005; Yardim et al., 2010). However, the association between living in rural area and the risk of catastrophic health expenditure is puzzling. People in rural areas may decide to forego treatment, thus avoiding exposure to catastrophic health expenditure (Trujillo et al., 2005; Rokx et al., 2009). The price of medicine in rural areas is however higher, meaning that self-payments is more likely to increase the risk of catastrophic health expenditure (Richardson et al., 2011). In Indonesia, health centres are mostly located in rural areas (Sparrow et al., 2010). However, rural households have to rely on advanced health facilities in urban areas to treat chronic or severe diseases (Rokx et al., 2009). The

association between living in a rural area and the risk of catastrophic health expenditure may thus depend on the severity of illness and the decision to forego treatment, to use a local health centre, or to travel to health facilities in urban areas . The disaggregation of these factors would be a useful addition to further research.

14. *Household per capita expenditure.* I use household per capita expenditure since it is a proxy for a household's economic class (Yardim et al., 2010; Xu et al., 2006; Shahrawat and Rao, 2012; Pradhan and Prescott, 2002; Pal, 2012; Flores et al., 2008; Bowser and Mahal, 2011). Per capita household expenditure reflects a household's economic status more accurately than total household expenditure. Two families with different household sizes may experience identical total expenditure but differing per capita expenditure: the family with more members will have lower per capita expenditure. It is unlikely that these families will belong to the same economic class: the family with more members is more likely to come from a lower economic class. *Susenas* provides detailed data on household expenditure. It is divided into two categories : 1) food, beverage, and tobacco; and 2) non-food. Weekly food consumption consists of: 1) grains; 2) other carbohydrates; 3) fisheries; 4) meat; 5) eggs and milk; 6) vegetables; 7) nuts; 8) fruits; 9) oils and fats; 10) beverages; 11) spices; 12) instant food; 13) processed food and beverages, and 14) tobacco. Monthly and annual non-food consumption includes: 1) housing; 2) goods and services; 3) clothing; 4) furnitures and other accessories; 5) tax and insurance; and 6) celebration/traditional ceremony. *Susenas* also covers large and non-routine spending such as purchasing a car or home. All such expenditure is incuded in annual expenditure and adjusted for spatial inflation to form a continuous variable (Xu et al., 2006).

In other studies, household per capita expenditure is expressed in quintiles (Bowser and Mahal, 2011; Boyer et al., 2011; Lu et al., 2012; Saksena et al., 2010), and this provides a different interpretation.

3.4 Analytic strategy

Considering household i living at district j the model is:

$$log(\frac{\lambda_{ij}}{1-\lambda_{ij}}) = \beta_0 + \beta_i x_i + \beta_j x_j + u_j$$

where λ_{ij} is the probability of a household incurring catastrophic health expenditure (y = 1), x_i are household characteristics, x_j are district-level characteristics and u_j is the district effect or level 2 residual or random effect which follows normal distribution with zero means:

$$u_j \sim N(0, \sigma_u^2)$$

β_0 is interpreted as the *log-odds* of y = 1 when household, district-level characteristics, and district effect are equal to 0. The exponential value of β_0 represents the *odds* of y = 1 for x = 0 and u = 0. β_i and β_j are the effect of a 1-unit change in explanatory variables on the log-odds that y = 1 when u = 0. Multilevel logistic regressions are estimated using Stata MP version 12.

This study ignores endogeneity in health insurance caused by potential self-selection to enter the scheme. In general, participation in a health insurance scheme is non-random: individuals with a higher probability of using healthcare will enter the scheme while healthy individuals opt out. Insurance and error term are thus likely to be correlated and to overestimate the coefficient of health

insurance. In short, self-selection of health insurance may result in a positive association between insurance and catastrophic health expenditure.

On the other hand, a favourable selection may underestimate the coefficient of health insurance. A negative association between health insurance and catastrophic health expenditure may reflect that the insurance scheme contains members with a low probability of healthcare self-payment (Wagstaff and Lindelow, 2008). Either way, endogeneity causes a bias estimation of the association between health insurance and catastrophic health expenditure (Galarraga et al., 2010; Trujillo et al., 2005). Such bias occurred when comparing health expenditures among health insurance participants and non-participants, as each group manifests unobserved characteristics which may impact their health expenditure. Health expenditure may thus not only be associated with health insurance, but also with some unobserved characteristics. Endogeneity can be reduced by using experimental data, where random assignment to each health insurance scheme can be designed and controlled. However, in reality it is almost impossible to perform such an experiment.

Chapter 4

Results

The descriptive statistics highlighted three main outputs: (1) the ratio of health expenditure and non-food spending; (2) the amount of per capita self-payment, and (3) the incidence of catastrophic health expenditure. The distribution of self-paid health expenditure is presented across districts and across demographies. Results from multilevel logistic regression estimation is presented, followed by sensitivity analyses which test the robustness of the effect of demand and supply-side subsidies across different sub-populations and different catastrophic thresholds.

4.1 Descriptive statistics

The descriptive statistics of the variables are shown in Table 4.1. On average, households suffered nearly seven interrupted days due to illness per month, and the average household size is 4.19. The average expenditure per capita per year is IDR7.3 million (GBP491). Nearly 80% of households in this survey are homeowners, while the rest are tenants. The level of self treatment is 98% which means that almost every household has at some point decided to treat their illness itself. Four per cent of households experienced outpatient care in public hospitals and

only 2% in private hospitals. More than 50% of households visited health facilities other than a hospital for outpatient care. The incidence of inpatient care is slightly higher, with nearly 6% of households being treated at public hospitals and 3.6% at private hospitals.

Table 4.1: Descriptive statistics

Variable	Mean	Stdev
Household level variables		
Elderly	6.3%	18.9%
Sick days	6.9	10.2
Rural	64.7%	47.8%
HH size	4.2	1.8
Yearly expenditure/capita (in thousand)	7,366	6,129
House owner	79.8%	40.1%
Self treatment	98.4%	12.6%
Health care utilisation		
Outpatient at public hospital	4.2%	20.2%
Outpatient at private hospital	2.3%	14.9%
Outpatient other facilities	51.5%	49.9%
Inpatient at public hospital	5.8%	23.4%
Inpatient at private hospital	3.6%	18.6%
Inpatient at other facilities	2.8%	16.6%
Health care intensity		
Outpatient visits last month	1.4	2.3
Length of inpatient (days)	0.8	4.3
Health insurance coverage		
Askes	8.1%	27.3%
Insurance for the poor	20.6%	40.4%
Other insurance	9.5%	29.3%
Uninsured	63.4%	48.2%
Household head's education		
Primary	32.7%	46.9%
Secondary	21.1%	40.8%
Tertiary	4.2%	19.9%
Household head's occupation		
Employed	52.8%	49.9%
District-level variables		
Number of households (in thousands)	132	151
Polluted villages	7.6%	5.9%
Villages with natural disaster	7.1%	4.7%
Endemic villages	11.9%	7.7%
Villages with health resources	16.1%	15.8%
GDP per capita (in thousand USD)	1.73	3.81
District health spending (in thousand)	228	245
Gini index	0.3	0.4

In Table 4.2, the descriptive statistics are divided according to type of care (outpatient and inpatient). The majority of households that received outpatient or inpatient care have attempted to self-treat their illness prior to visiting a health-care provider, which is consistent with previous findings (World Bank, 2008; Heywood and Harahap, 2009; Rokx et al., 2009). Outpatient care is conducted mostly in facilities other than a hospital, presumably in health centres since they have been the main primary healthcare provider in Indonesia since 1970 (Rokx et al., 2009).

Table 4.2: Descriptive statistics by type of care

Variable	Outpatient		Inpatient	
	Mean	Stdev	Mean	Stdev
Elderly	6.4%	18.7%	5.7%	16.6%
Sick days	8.9	11.2	9.3	12.7
Rural	63.2%	48.2%	51.6%	50%
HH size	4.3	1.8	4.6	1.9
Exp/capita (in thousand IDR)	7,556	6,044	9,410	8,447
House ownership	79.8%	40.2%	76.7%	42.3%
Self-treatment	100%	0%	86.1%	34.6%
Health care utilisation				
Public hospital	7.7%	26.7%	50.2%	50%
Private hospital	4.2%	20.0%	31.2%	46.3%
Other facilities	93.8%	24.1%	24.4%	43.0%
Health care intensity				
Outpatient visits/Inpatient LOS	2.6	2.6	7.0	10.8
Health insurance coverage				
Askes	9.1%	28.7%	15.1%	35.8%
Insurance for the poor	22.2%	41.6%	25.0%	43.2%
Other insurance	10.6%	30.8%	15.3%	36.0%
Uninsured	60.1%	49.0%	48.0%	50.0%
Household head's education				
Primary	34.0%	47.3%	28.3%	45.1%
Secondary	22.8%	42.0%	25.1%	43.4%
Tertiary	4.3%	20.3%	6.9%	25.4%
No education	38.8%	48.7%	39.6%	48.9%
Household head's occupation				
Employed	54.4%	49.8%	48.6%	50%

In terms of district variables, on average 7.6% of total villages within a district are affected by either air, water, soil or sound pollution. Similarly, 7% of total villages within a district experienced at least one natural disaster in the past three years. Sixteen per cent of villages have health resources (either hospitals, doctors or health centres). The average district per capita GDP per year is IDR17.3 million (around GBP1,150), and district per capita health spending per year is IDR 228,000 (around GBP15).

4.2 Distribution of self-paid health expenditure

Figure 4.1 shows the kernel distributions of the underlying variable that form the binary 'catastrophic health expenditure' variable: 1) the annual household health spending (left) and 2) the ratio between a household's annual health and annual non-food spending (right). The lefthand figure shows that despite experiencing illness, there are 2,156 households with 0 health expenditure, accounting for 1.1% of the population. Most observations lie near the mean annual health expenditure of IDR624,820, while others are distributed over a long tail of high health expenditure values. The standard deviation of annual health expenditure is IDR3.3 million, the median is IDR180,000 and the highest value reached is IDR74 million. The relatively large differences between mean and median show the heavily skewed nature of annual health expenditure. The righthand figure shows that the majority of observations lie below the mean ratio of 6.6%. The density of the ratio resembles that of a log normal. The standard deviation is 9.2%, the median is 3.2% and the maximum value is 98.7%.

Figure 4.1: Kernel distributions: health expenditure and ratio of health expenditure

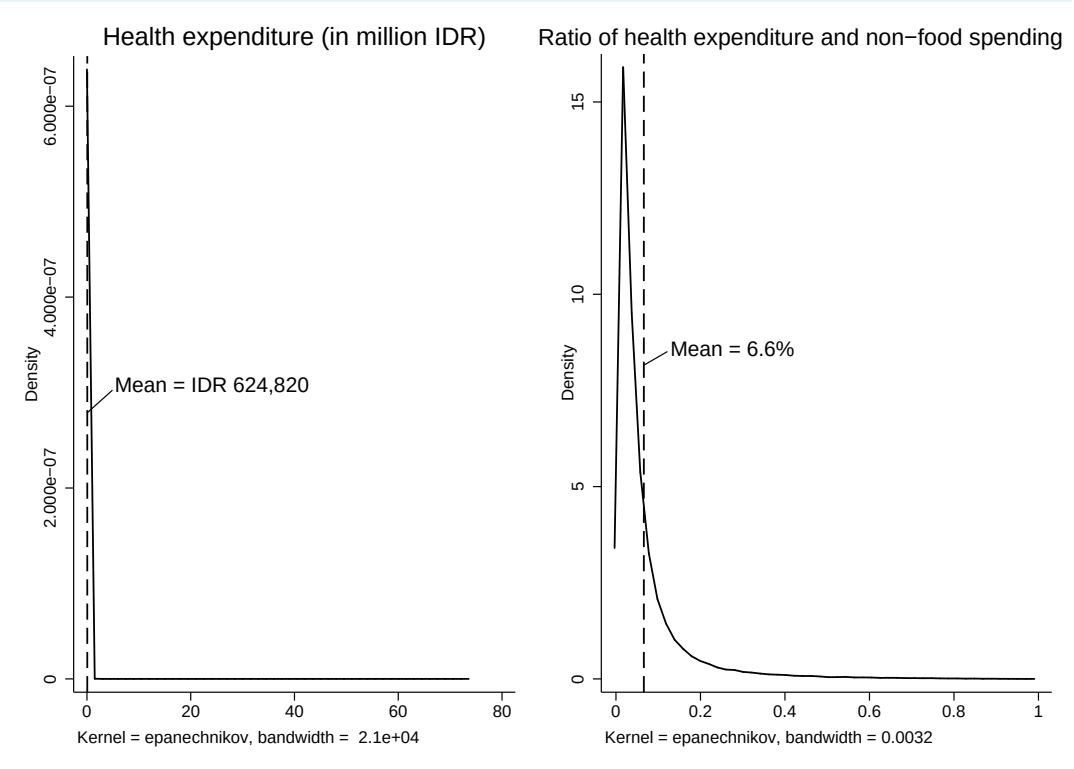
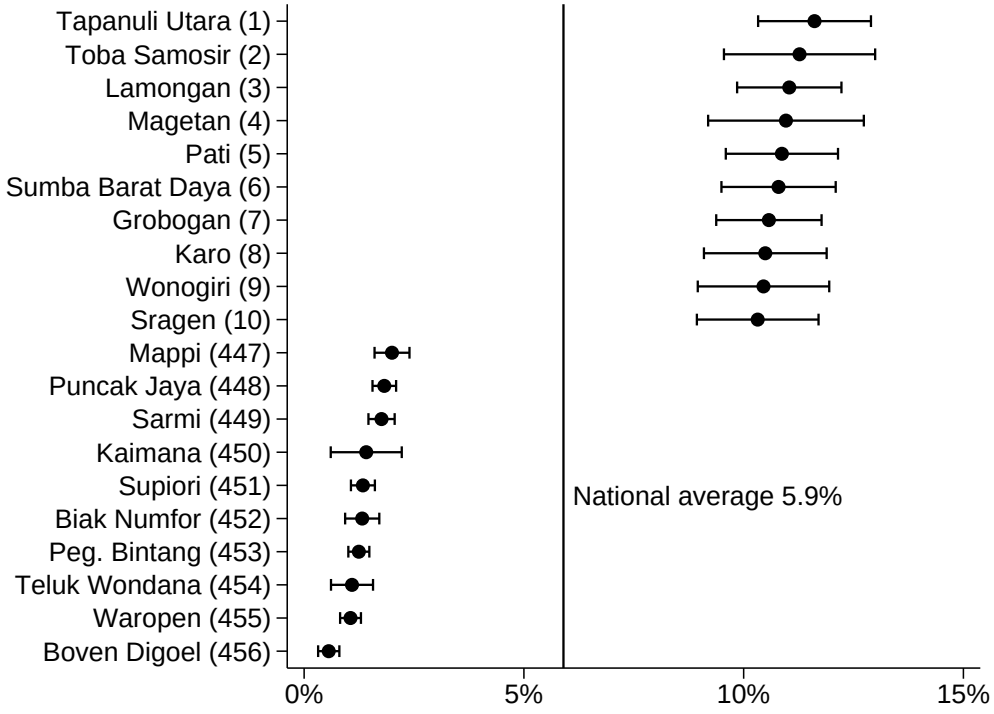


Figure 4.2 describes the top and bottom 10 districts in terms of self-payment share relative to household non-food spending. The vertical dashed line represents the national average share of self-payment (5.9%). The black circle represents the average self-paid health expenditure in each district, while the horizontal line covers the 95% confidence interval which describes the level of variation within district. For example, Magetan (ranked fourth) has a higher variation compared to Lamongan (ranked third), which suggests that some households in Magetan experience higher self-payment than those at Lamongan, despite the former being ranked lower than the latter. The district with the highest share of self-payment is Tapanuli Utara (North Sumatra province) with 11.6%, followed by Toba Samosir (North Sumatra) and Lamongan (East Java) with 11.3% and 11% respectively. Although two of the top three districts are located in Sumatra, overall six out of 10 districts are located in Java.

Figure 4.2 also describes the bottom 10 districts. Again, there are large disparities within some districts. For example, Kaimana (ranked 450th) has a larger variation than Boven Digoel (ranked 456). Boven Digoel is the lowest with less than 1%, followed by Waropen and Teluk Wondama with 1.06% and 1.09% respectively. The three lowest districts are in Papua and West Papua provinces. Overall, the majority of districts with the lowest self-payment share are located in the eastern part of Indonesia.

Figure 4.2 shows the ratio or percentage of household annual health expenditure relative to non-food spending. It does not show the amount of health expenditure that an average household has to pay in a certain district. There is a difference between these two measurements. For the poor household, relatively low health expenditure can result in high ratio because their capacity to pay is low. On the other hand, the rich household (with possibly a relatively high health

Figure 4.2: Districts with highest and lowest ratio of self-payment in Indonesia, 2008 (mean and 95% confidence interval)



expenditure) may result in a low ratio for the opposite reason. It is necessary therefore to compare health expenditure in terms of ratio and nominal to provide a more accurate analysis.

This more apparent in Table 4.3. This describes the top and bottom 10 districts in terms of nominal self-payment. None of the districts in the top 10 self-payment amounts are in the top 10 self-payment ratio list. Major cities dominate the top self-payment amount list, with five out of 10 top health spending districts located near the capital (Jakarta). Others are mostly provincial capitals. The highest level of variability occurs in Belitung (ranked fifth) where the nominal health expenditure ranges from IDR800,000 (around GBP53) to IDR3 million (around GBP200).

Table 4.3: Top and bottom 10 of annual per capita self-payment (in thousand IDR), 2008

Rank	District	Average	Std deviation
1	Jakarta Selatan	3,052	778
2	Depok	2,250	305
3	Bekasi	2,172	234
4	Jakarta Timur	1,986	197
5	Belitung	1,926	1,159
6	Probolinggo	1,906	452
7	Banda Aceh	1,886	323
8	Jakarta Pusat	1,822	207
9	Surabaya	1,777	301
10	Bontang	1,770	235
447	Rote Ndao	105	17
448	Biak Numfor	104	19
449	Kep. Mentawai	99	10
450	Jayawijaya	98	9
451	Timor Tengah Selatan	79	23
452	Puncak Jaya	72	7
453	Peg. Bintang	70	12
454	Mappi	49	6
455	Boven Digoel	47	21
456	Tolikara	33	2

The discrepancy between self-payment ratio and self-payment nominal suggests the lack of association between these categories. A high self-payment ratio may be contributed to by low capacity-to-pay instead of high payment. Using the same argument, a low self-payment ratio may be contributed to by a low self-payment nominal instead of high capacity-to-pay. However, it is unknown whether the low self-payment nominal is due to effective financial protection or lack of healthcare access.

4.3 Catastrophic health expenditure and self-payment across demography

Table 4.4 shows the distribution of catastrophic headcount and average self-payment across demographic groups. Among health insurance beneficiaries, *Askes* average self-payment is three times higher than *Askeskin*, but the catastrophic headcount is relatively similar. The average self-payment of those with tertiary education is also three times higher compared to primary education, but the catastrophic headcount is actually lower. A higher education level of the household head is known to protect households from catastrophic health expenditure (Beauliere et al., 2010; Bowser and Mahal, 2011; Boyer et al., 2011; Hajizadeh and Nghiem, 2011; Kim and Yang, 2011). Educated heads of households are more likely to access specialised and sub-specialised treatment without being exposed to catastrophic health expenditure, probably because they are financially secure, employed, and have health insurance (Hajizadeh and Nghiem, 2011). However, bivariate analysis on the impact of education on catastrophic health expenditure may not provide sufficient explanation for this, since other related variables are excluded. In general, the negative association between catastrophic headcount

and the amount of self-payment suggests that some groups have better access to high-quality healthcare but at the same time are able to avoid catastrophic health expenditure.

Table 4.4: Distribution of catastrophic incidence across demographic groups

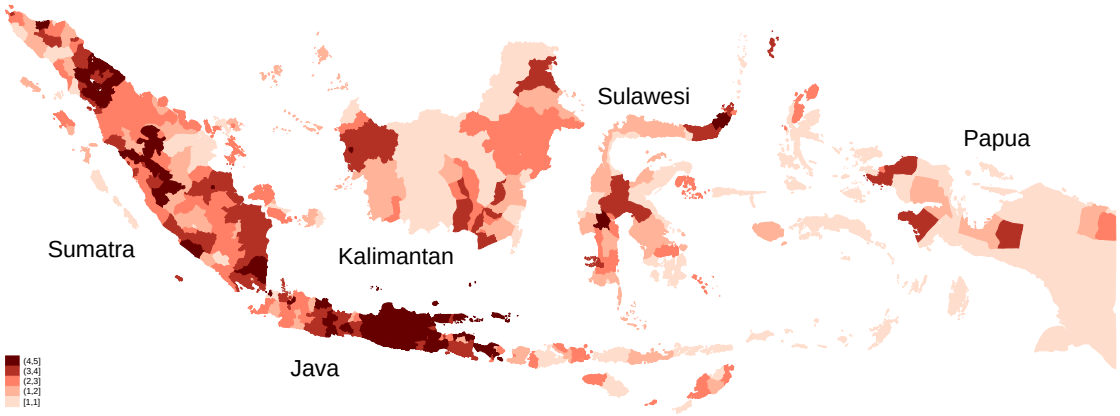
Demographic	Catastrophic (%)	Self-payment (thousand IDR)
Health insurance		
No insurance *(n = 111,826)*	2.6	775
Askes *(n = 15,279)*	2.1	1,253
Insurance for the poor *(n = 38,971)*	2.0	411
Other insurance *(n = 17,911)*	2.2	1,182
Head of household's education		
No education *(n = 63,017)*	2.4	816
Primary *(n = 61,930)*	1.9	470
Secondary *(n = 39,859)*	1.8	781
Tertiary *(n = 7,869)*	1.7	1,539
Rural *(n = 122,460)*	1.7	435
Urban *(n = 66,703)*	1.8	974
Household expenditure quintile		
Q1 *(n = 37,833)*	0.8	169
Q2 *(n = 37,833)*	1.5	294
Q3 *(n = 37,833)*	1.6	400
Q4 *(n = 37,833)*	1.9	602
Q5 *(n = 37,833)*	2.8	1,660
Head of household employment		
Employed *(n = 99,925)*	1.4	547
Unemployed *(n = 89,238)*	2.1	712
District health spending		
Q1 *(n = 37,939)*	1.2	594
Q2 *(n = 37,959)*	1.3	601
Q3 *(n = 37,696)*	1.6	595
Q4 *(n = 37,908)*	2.4	620
Q5 *(n = 37,457)*	2.3	712

Interestingly, catastrophic headcount and self-payment increase along with district health spending. This result indicates that district health spending fails to decrease the risk of catastrophic health expenditure. However, multivariate analysis may provide a better understanding.

4.4 Spatial distribution of catastrophic headcounts

Figure 4.3 illustrates the spatial distribution of catastrophic headcounts across districts in Indonesia in quantiles (q1: 0%, q2 0.6%, q3: 1.3%, q4: 2.4%, q5: 6.1%). Catastrophic health expenditure occurs mostly in Java, particularly in the central and eastern regions. There are 38 districts with zero headcount, 19 of which are located in Papua. As discussed earlier, the non-existence of households with catastrophic health expenditure in the eastern part of Indonesia is likely to be due to low levels of health expenditure. The non-existence of catastrophic households is thus not always a good sign. For Papua, it is also distinguished by low health status and low health spending, which might relate to the lack of health access and financial protection of the population.

Figure 4.3: 2008 spatial distribution of district catastrophic head counts



From nine provinces in Sumatra, districts with high catastrophic headcount are concentrated in the northern and central regions. In Kalimantan, districts in the western, eastern and southern areas have a higher incidence of catastrophic headcount compared to those in the central areas. In addition, districts in the northern and central parts of Sulawesi have a higher incidence compared to districts in other parts of the island. A more detailed description of district catastrophic head counts is provided in Table 4.5.

Table 4.5: 2008 top and bottom 10 catastrophic head counts (%)

Rank	District	Headcount	Std error
1	Magetan	7.8	2.8
2	Toba Samosir	7.6	2.8
3	Karanganyar	6.7	2.3
4	Tapanuli Utara	6.5	2.3
5	Surakarta	6.1	2.2
6	Sragen	6.1	2.2
7	Wonogiri	5.5	2.3
8	Klaten	5.4	2.0
9	Dairi	5.4	2.3
10	Grobogan	5.3	1.8
447	Puncak Jaya	0.0	-
448	Boven Digoel	0.0	-
449	Mappi	0.0	-
450	Asmat	0.0	-
451	Yahukimo	0.0	-
452	Peg. Bintang	0.0	-
453	Tolikara	0.0	-
454	Sarmi	0.0	-
455	Waropen	0.0	-
456	Supiori	0.0	-

Until this point, the analysis indicates that inequality occurs across districts. Both the catastrophic headcount and average self-payment for healthcare vary across districts. I would now like to move on to multilevel regression, which is a more appropriate analysis to incorporate household and district characteristics

into the risk of catastrophic health expenditure.

4.5 Multilevel logistic regression

Table 4.6 shows the result of multilevel logistic regression. The analyses use three different catastrophic thresholds: 35%, 40% and 45%. The estimates are presented in odds ratios. A ratio below 1 lowers the probability of catastrophic health expenditure; a ratio greater than 1 increases it.

Across three thresholds, almost all household characteristics significantly impact the odds of catastrophic health expenditure. Households with a 1% increase in the proportion of household members older than 65 years old have a 85% to 95% greater chance of experiencing catastrophic expenditure, with the odds increasing by 3% for each additional sick day. The odds are also 40% higher for people living in rural rather than urban areas. In addition, an increase in 1 unit of per capita log household expenditure (172% increase in nominal expenditure) will double the probability of catastrophic expenditure. Unexpectedly, a protective effect against the risk of catastrophic expenditure is shown from the size of the household, where an increase in 1 member reduces the odds of catastrophic expenditure by about 17% to 18%. Finally, the odds of catastrophic expenditure decreases to half for households that self-treat their illness, compared to those that seek treatment.

Healthcare at public hospitals proved to be more protective compared to that provided by private hospitals. For outpatient care, those who treat their illness at a private hospital have a 30% to 40% more chance of experiencing catastrophic expenditure than those who use public hospital. An additional visit to outpatient care will also increase the odds of catastrophic expenditure by 5% to 7%.

Table 4.6: Multilevel logistic regression of catastrophic health expenditure at various thresholds (odds ratio)

	Catastrophic thresholds		
	35%	40%	45%
Household level variables			
Elderly	1.86‡	1.82‡	1.96‡
Sick days	1.03‡	1.03‡	1.03‡
Rural (0 = urban)	1.32‡	1.41‡	1.51‡
Household size	0.82‡	0.83‡	0.83‡
Expenditure per capita (log)	2.03‡	2.34‡	2.70‡
House owner (0 = house renter)	0.86‡	0.95	0.95
Self treatment (0 = other treatment)	0.44‡	0.42‡	0.44‡
Health care utilisation (0 = public hospital)			
Outpatient private hospital	1.31‡	1.34‡	1.41‡
Outpatient other facilities	1.00	0.97	0.94
Inpatient at private hospital	6.53‡	6.39‡	6.62‡
Inpatient at other facilities	1.13	1.08	1.04
Health care intensity			
Outpatient visits	1.06‡	1.06‡	1.05‡
Length of inpatient (days)	1.11‡	1.09‡	1.08‡
Health insurance (0 = no insurance)			
Askes	0.69‡	0.66‡	0.62‡
Insurance for the poor	1.44‡	1.42‡	1.49‡
Other insurance	0.84‡	0.82‡	0.78‡
Household head's education (0 = no education)			
Primary	1.65‡	1.61‡	1.71‡
Secondary	1.36‡	1.40‡	1.50‡
Tertiary	0.98	0.86	0.81
Household head's employment (0 = unemployed)			
Employed	0.54‡	0.54‡	0.50‡
District-level variables			
Pollution	1.78	1.78	1.31
Natural disaster	0.99	1.28	1.93
Endemic area	0.09‡	0.10‡	0.08‡
Health care resources	1.59	1.58	1.31
GDP per capita (log)	0.79‡	0.74‡	0.75†
District health spending (log)	1.49‡	1.52‡	1.69‡
Gini index	1.15	2.26	6.48
Intercept	$1.4e^{-09}$‡	$1.2e^{-10}$‡	$4.4e^{-13}$‡
σ_u (std. deviation of random intercept)	0.70	0.74	0.75
ρ (intraclass correlation)	0.13	0.14	0.15

‡ : significant at $\alpha = 1\%$
† : significant at $\alpha = 5\%$
n = 189,163 households

Moreover, inpatient care in private hospitals increases the probability of catastrophic expenditure fivefold, between 547% to 556%. An additional day of inpatient care increases the possibility of catastrophic expenditure by 8% to 11%.

Somewhat unexpectedly, not all health insurance schemes succeed in providing financial protection for their beneficiaries. Out of three health insurance schemes, only *Askes* and 'other insurance' (an aggregate of both private and public health insurance schemes) have protective effects. Compared to households without health insurance coverage, *Askes* beneficiaries have a 30% to 38% less chance of suffering from catastrophic health expenditure compared to those without health insurance. *Askeskin* beneficiaries, however, are less protected against the risk of catastrophic health exenditure. In fact, being an Askeskin beneficiary increases the risk by 44% to 50% compared to those without insurance.

The association between head of household's education level and the risk of catastrophic health expenditure varies. Those who receive primary education (elementary school) are 64% to 70% more likely to experience catastrophic health expenditure compared to those without education. Households where the head are educated up to secondary level (junior and senior high school) are also more likely to experience catastrophic health expenditure. However, the odds fall slightly to around 43%. Households with heads educated up to tertiary level (diploma to doctoral degree) are insignificant in terms of the risk of experiencing catastrophic health expenditure compared to those with no education. Furthermore, households with heads who are employed have a decreased risk of catastrophic health expenditure by 46% to 50% compared to those whose heads are unemployed.

Out of seven district-level variables, three are significant across all thresholds. First, the percentage of villages with disease outbreak, unexpectedly have 90% less chance of experiencing catastrophic health expenditure. This result is contrary to

our expectation, since districts with a high percentage of disease outbreak should be more prone to catastrophic expenditure. Second, an increase in 1 unit of GDP per capita (that is, an increase of 172% of nominal GDP per capita) will increase protection by 21% to 25%. Third, an increase in 1 unit of district health spending will also increase the chance of catastrophic health expenditure by 49% to 69%.

The contradictive effect of district health expenditure is expected. As mentioned earlier in this study, district health expenditure still faces a problem with the absorptive capacity of staff (Rokx et al., 2009), transparency (Ministry of Finance, 2012), authority (Strauss et al., 2004) and endogeneity (Pitt et al., 1993). Further improvements are required in order to increase the effectiveness and efficiency of decentralised health budget.

4.6 Sensitivity analyses

Sensitivity analyses are performed to test whether the associations of health insurance and district health spending are similar in different sub-populations. For this, the population is separated by healthcare utilisation (outpatient and inpatient) and by area (rural and urban). The outpatient sub-population consists of 89,827 households from 455 districts, with an average of 197 households nested in each district. For this sub-population, the variable 'self treatment' is omitted from the analysis. The structure of the questionnaire automatically associates the questions about self-treatment and outpatient care. The first sequence of the questionnaire asked respondents whether they self-treat their illnesses. If they do not, the second sequence asked whether they visit health facilities for outpatient care. These sequences mean that outpatient respondents constitute those who do not self-treat their illnesses. The 'self treatment' variable is thus omitted be-

cause it does not provide a proper comparison between those who self-treat and those who do not. The inpatient sub-population has 8,060 households from 448 districts; each district nests an average of 18 households.

Table 3.7 shows the sensitivity analysis for two different sub-samples: inpatient and outpatient. Interestingly, the only health insurance having a protective effect on both sub-populations is *Askes*. Other health insurance schemes lose their significance, including *Askeskin*. This result suggests that in terms of risk of catastrophic health expenditure there is no significant difference between *Askeskin* beneficiaries and those without health insurance in terms of risk of catastrophic health expenditure. There is a possibility that financial burden for *Askeskin* beneficiaries originates from a source other than inpatient and outpatient care, such as medicine (Saksena et al., 2010; Barros et al., 2011; Bowser and Mahal, 2011; Knaul et al., 2006; Lara and Gomez, 2011). As mentioned above, while medicines are covered by both *Askes* and *Askeskin*, they are often in short supply (Rokx et al., 2009), and as a result people need to self-pay for them, increasing the risk of catastrophic health expenditure (Rokx et al., 2009).

The effect of district health spending remains consistent with the full model. Similarly, the effect of hospital settings remains the same, where treatment in private hospitals increases the risk of catastrophic expenditure.

Table 4.7: Sensitivity analysis between inpatient and outpatient sub-population

	Sub population	
	Inpatient	Outpatient
Household level variables		
Elderly	2.09‡	2.14‡
Sick days	1.02‡	1.03‡
Rural (0 = urban)	1.81‡	1.42†
Household size	0.80‡	0.72‡
Expenditure per capita (log)	1.48‡	2.57‡
House owner (0 = house renter)	1.05	1.13
Self treatment (0 = other treatment)	1.02	omitted
Health care utilisation (0 = public hospital)		
Outpatient private hospital	omitted	1.67‡
Outpatient other facilities	omitted	0.33‡
Inpatient at private hospital	1.61‡	omitted
Inpatient at other facilities	0.25‡	omitted
Health care intensity		
Outpatient visits	omitted	1.09‡
Length of inpatient	1.06‡	omitted
Health insurance (0 = no insurance)		
Askes	0.42‡	0.66†
Insurance for the poor	1.06	1.08
Other insurance	0.67	0.82
Household head's education (0 = no education)		
Primary	1.44‡	1.32‡
Secondary	1.25	1.24
Tertiary	0.94	0.66
Household head's employment (0 = unemployed)		
Employed	0.76†	0.46‡
District-level variables		
Pollution	0.53	2.17
Natural disaster	0.40	0.83
Endemic area	0.26	0.32
Health care resources	1.29	0.62
GDP per capita (log)	0.78‡	0.74‡
District health spending	1.48‡	1.49‡
Gini index	2.90	0.21
Intercept	$6.4e^{-07}$‡	$1.0e^{-10}$‡
σ_u (std. deviation of random intercept)	0.71	0.59
ρ (intraclass correlation)	0.13	0.10

‡ : significant at $\alpha = 1\%$
† : significant at $\alpha = 5\%$
n1 = 8,060 households (inpatient) n2 = 89,827 households (outpatient)

Moreover, Table 4.8 describes the sensitivity analysis for rural and urban sub-population. The rural sub-population consists of 122,460 households nested in 424 districts. The urban sub-population comprises 66,499 households in 423 districts. For households living in urban areas, outpatient care in private and public hospitals have no significant differences in terms of the incidence of catastrophic health expenditure. The performance of each health insurance scheme is consistent at both sub-populations, except for 'other health insurance' where it is insignificant compared to 'no insurance' in rural areas. District health spending remains statistically significant at both sub-populations.

Table 4.8: Sensitivity analysis between rural and urban sub-population

	Sub-population	
	Rural	Urban
Household level variables		
Elderly	1.79‡	2.06‡
Sick days	1.03‡	1.03‡
Rural (0 = urban)	omitted	omitted
Household size	0.82‡	0.84‡
Expenditure per capita (log)	2.52‡	2.13‡
House owner (0 = house renter)	1.03	0.91
Self treatment (0 = other treatment)	0.31‡	0.56‡
Health care utilisation (0 = public hospital)		
Outpatient private hospital	1.54‡	1.14
Outpatient other facilities	1.00	0.94
Inpatient at private hospital	6.51‡	6.61‡
Inpatient at other facilities	1.03	0.99
Health care intensity		
Outpatient visits	1.07‡	1.04‡
Length of inpatient	1.11‡	1.08‡
Health insurance (0 = no insurance)		
Askes	0.60‡	0.72‡
Insurance for the poor	1.33‡	1.61‡
Other insurance	1.01	0.76‡
Household head's education (0 = no education)		
Primary	1.48‡	1.89‡
Secondary	1.28‡	1.52‡
Tertiary	0.95	0.85
Household head's employment (0 = unemployed)		
Employed	0.51‡	0.60‡
District-level variables		
Pollution	1.14	1.34
Natural disaster	0.87	0.97
Endemic area	0.07‡	0.24†
Health care resources	2.16	1.81
GDP per capita (log)	0.75‡	0.69‡
District health spending	1.57‡	1.70‡
Gini index	3.01	1.38
Intercept	$2.4e^{-11}$‡	$1.0e^{-10}$‡
σ_u (std. deviation of random intercept)	0.77	0.68
ρ (intraclass correlation)	0.15	0.12

‡ : significant at $\alpha = 1\%$
† : significant at $\alpha = 5\%$
n1 = 122,460 households (rural) n2 = 66,499 households (urban)

Chapter 5

Discussion

This section highlights the inconsistent association between health insurance and the risk of catastrophic health expenditure, an association which is likely to be caused by differences in health insurance features. The impact of district health spending differsfrom the hypothesis, while contextual characteristics have varying impact.

5.1 Does demand-side subsidy provide financial protection?

The analysis suggests that *Askes* and 'other health insurance' have a protective effect, but *Askeskin* does not. In fact, the latter increases the risk of catastrophic health expenditure. This finding is consistent with the findings in China (Wagstaff and Lindelow, 2008), Zambia (Ekman, 2007), India (Shahrawat and Rao, 2012), Moldova (Richardson et al., 2011), and Brazil (Barros et al., 2011).

Why does *Askeskin* increase financial risk? *Askeskin* should provide complete coverage, similar to *Seguro Popular* in Brazil. However, illegal cost sharing still exist especially for purchasing medicine uncovered by the scheme (Sparrow et al., 2010). Medicine is also the main source of self-payment in India (Shahrawat and

Rao, 2012). This finding also suggests that *Askeskin* is no longer a free-of-charge scheme as advertised. Instead, it implements cost sharing illegally to the poorest population in Indonesia, increasing the exposure to beneficiaries to the risk of catastrophic health expenditure.

Furthermore, *Askeskin* also faces problem in targeting (Sparrow et al., 2010). This is consistent with the findings in India (Shahrawat and Rao, 2012) and Colombia (Trujillo et al., 2005). The main reasons for this are corruption and limited local capacity. As a result, *Askeskin* beneficiaries have lower health status compared to those covered by other insurance schemes, indicated by their average number of sick days (Grossman, 1972): the typical *Askeskin* beneficiary takes an average of 8.8 sickdays per month, compared to 5.9 taken by those under *Askes*. *Askeskin* beneficiaries also have fewer financial resources, as indicated by their low expenditure per person (see Table5.1). The combination of low health status and low health resources further exposes *Askeskin* beneficiaries to catastrophic health expenditure.

The *Askeskin* scheme also uses a fee-for-service payment system, meaning that health treatments are paid separately. This system is similar to those implemented under private insurance in Brazil (Barros et al., 2011). , and can result in healthcare providers becoming eager to provide unnecessary health treatments in order to maximise their profits. This supply-induced demand is common under a fee-for-service system (Barros et al., 2011). *Askeskin* beneficiaries may thus be required to pay additional fees, which again increases their odds of catastrophic health expenditure.

Askes on the other hand, has certain exemptions and cost sharings features similar to health insurance in Moldova (Richardson et al., 2011) and Zambia (Ekman, 2007). However, there is one distinctive feature of *Askes* that provides

Table 5.1: Socioeconomic and health status across health insurance

Indicator	*Askeskin*	*Askes*
Per person expenditure (yearly)		
Average	IDR 5,317,530	IDR 12,264,128
Standard deviation	IDR 2,993,285	IDR 8,639,890
Sick days		
Average	8.78	5.86
Standard deviation	11.64	9.77
Average proportion of health spending		
Average	6.8%	6.1%
Standard deviation	9.6%	9.9%

full coverage for high-cost diseases such as heart disease, cancer, renal failure and thalassemia. This feature may be this scheme's source of financial protection. Furthermore, *Askes* beneficiaries are relatively healthier and better-off than those covered by *Askeskin*. They thus have lower healthcare utilisation and the self-payment charges do not represent a significant proportion of their household resources.

5.2 Does supply-side subsidy protect households against the risk of catastrophic health expenditure?

The result suggests that the more a district spends on health, the more residents are exposed to catastrophic expenditure. This finding relates to the explanation above, namely that district health spending in Indonesia is not necessarily linked with efforts to protect the population against the risk of catastrophic expenditure (World Bank, 2008). A district might invest in high-technology equipment which may prompt health providers to use it and charge an additional fee to patients.

For example, when a public hospital purchases obstetric ultrasonography equipment, the rate of ultrasonography procedure may increase due to the hospital's interest in maximising their profits from its use. At the same time, patients are encouraged by their gynaecologists to use it. This supplier-induced demand mechanism explains why district health spending may increase the risk of household's health expenditure.

Another possible explanation is the lack of absorptive capacity of district government (Rokx et al., 2009). Lack of absorptive capacity refers to the inability to fit the health budget with the objective of providing protection from financial catastrophe. In addition, most of the district budget is allocated to expenses unrelated to healthcare, such as staff wages and incentives. Health spending in central government is different, as most of the budget is allocated to health-related activities, such as the financing of individual health services.

The need to allocate health budget appropriately is also suggested by Pradhan andPrescott (2002) who analyse Indonesia's public health spending prior to decentralisation. They suggest that supply-side subsidy can further reduce the risk of catastrophic expenditure if more of it is spend more on inpatient care. They find that the current subsidy focuses on outpatient care, when the real source of financial risk is actually inpatient care (Pradhan and Prescott, 2002). It is therefore important for local authorities to be informed about the source of financial risk in healthcare, in order to achieve the objective of providing financial protection to the population.

To summarise, the reason for the ineffectiveness of district health spending in Indonesia is its lack of focus on providing the population with financial protection. Local authorities may not have the ability to determine the source of catastrophic health expenditure. These findings are the highlights of our analysis,

and support the general argument of decentralisation, namely that adequate institutional capacity is an essential prerequisite to effective decentralisation (Boyer et al., 2011).

5.3 Do contextual health characteristics have an impact on catastrophic spending?

Our analysis suggests that the impact of contextual characteristics is not significant. The coefficients of district pollution are insignificant. Unfortunately, there are no prior studies that analyse the association of pollution with catastrophic health expenditure. Nevertheless, it is proven that pollution, particularly air pollution, affects population health (Frankenberg et al., 2005). It is likely that people living in polluted areas have adjusted their health thresholds and become unaware of the pollution, to the point which they consider health treatment unnecessary.

The percentage of villages experiencing natural disaster is also insignificant. Again, there are no prior studies that relate the occurence of natural disaster and catastrophic health expenditure. However, there are several potential explanations. First, because the sources of data for household level and district level characteristics differ, there is a chance that the households are not located in the village or sub-district where the natural disaster takes place. Second, the variable of 'natural disaster' might be too broad since it aggregates different types of disaster. It is known that specific disasters (flood, for example) are associated with increased mortality and morbidity (Ahern et al., 2005). Morbidity during disaster is also associated with population displacement (Watson et al., 2007). Therefore, 'natural disaster' should be more specifically defined in order to examine its true impact on catastrophic health expenditure.

Finally, the percentage of health resources in villages is insignificant. This finding is consistent with the study in China, where health resources in villages may only provide limited and simple health treatments due to their poor human capacity (Shi et al., 2011). Such treatments are low in price and do not pose risks of catastrophic health expenditure. Another potential explanantion is that households may decide to use health resources other than those available in the village, a decision which may be due to the lack of health resources (either expertise or equipment) in the village in which they live. Furthermore, several health insurance schemes (*Askes*, *Askeskin* and *Jamsostek*) allow referrals to receive treatment from higher-level health providers, meaning that there is a possibility that households living in one district receive treatment in another district or province.

5.4 Other variables

The analysis result also shows that healthcare obtained at a private hospital is financially less protective compared to healthcare from a public hospital. This finding is consistent with findings of a study from Thailand, where households using inpatient care in private hospitals are more likely to face catastrophic expenditures and impoverishment from self-payment (Limwattananon et al., 2007). More importantly, it emphasises the importance of public subsidy being paid through public health providers. With the subsidy, public providers are able to set health tariffs lower than private providers (Pradhan and Prescott, 2002).

There is a puzzling result from the multilevel logistic regression estimation. Household size positively decreases the risk of catastrophic health expenditure. This result contradicts my expectation, which was that the association between household size and risk of financial catastrophe would be positive. This result also

contradicts findings in Burkina Faso (Su et al., 2006). One possible explanation for this is that many Indonesians live with their parents after reaching adulthood; some even stay in their parent's house after gaining employment or starting a family. Extended family may also live inthe same house and are also likely to be employed. Table 5.2 provides an insight into the distribution of household members and their employment status. In total, 58% of household members are employed. Fifty eight per cent of spouses are also employed, and 36% of children and 71% of children-in-law. Their presence in the household thus serves as additional financial protection against the risk of financial catastrophe.

Table 5.2: Percentage of employed household members, 2008

Household member	%
Head	87
Spouse	55
Children	36
Children-in-law	71
Grandchildren	22
Parents/parents in-law	26
Other family members	50
Housemaid	100
Others	63
Total	**58**

Source: Susenas 2008

Chapter 6

Conclusion

This study links catastrophic health expenditure with household and district-level characteristics. More precisely, it examines whether health policies (in the form of providing health insurance and decentralising public health spending) protect households against the risk of catastrophic health expenditure. Three types of health insurance are analysed: *Askes*, *Askeskin* and 'other' health insurance, which is an aggregate of public and private health insurance. Future studies might benefit from separating public and private health insurance, enabling them to provide a clearer and more comprehensive policy suggestion to the government.

The main result suggests that only *Askes* and 'other insurance' provide financial protection to their beneficiaries. *Askeskin* beneficiaries are exposed to increased risk of catastrophe. However, the lack of randomisation in health insurance allocation cannot surmount the endogeneity problem commonly found in observation studies. Future studies should thus apply appropriate analysis to solve such problems. For example, studies in China (Wagstaff and Lindelow, 2008) and Mexico (Galarraga et al., 2010) have addressed this issue by implementing instrumental variables and produced an unbiased estimation of the impact of health

insurance.

Additionally, district health spending significantly increases the risk of catastrophic health expenditure. There is a possibility that district government spends the budget ineficiently, mainly due to lack of absorptive capacity. It is essential to increase the capacity of district government to make sure that the health budget is used to achieve the objective of health policy: providing financial protection against high and prolonged expenditure on health care.

This study is particularly relevant since Indonesia is on the verge of implementing universal health insurance coverage in 2014. The government needs to make sure that the health insurance scheme 1) solves the problem of adverse selection; 2) covers highcost diseases, and 3) minimises cost-sharing to avoid any significant financial burden, particularly for poor households. Adverse selection is likely to be solved since the entire population will enrol in the scheme (unlike the current health insurance schemes which are segmented based on occupation, economic class and health status). High-cost diseases are likely to be covered, since the forthcoming scheme will implement a case-based groups (CBG) payment system, where payment to health providers is based on diagnoses. Cost-sharing must be carefully calculated; future studies could calculate the cost-sharing threshold above which the scheme will create financial burden and below which it will cause excessive healthcare demand. Problems in drug availability should also be addressed. Although medicine costs are covered by the scheme, this will be useless if shortages in supply continue to occur. As many studies suggest, medicine is often the main source of catastrophic health expenditure, especially for the poor . Therefore, government's intentions to provide healthcare to the population, especially to the most needful in society, should be available to all without fear of catastrophic risk.

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Appendix A

Codebook and syntax

A.1 Codebook of variables used for the study

```
-------------------------------------------------------------------------------
Prov                                                                 Province
-------------------------------------------------------------------------------

                  type:  numeric (byte)

                 range:  [11,94]                      units:  1
          unique values:  33                     missing .:  0/189163

                  mean:   41.7383
             std. dev:   23.4731

            percentiles:        10%       25%       50%       75%       90%
                                 13        18        35        63        74

-------------------------------------------------------------------------------
Dist                                                                 District
-------------------------------------------------------------------------------

                  type:  numeric (byte)

                 range:  [1,79]                       units:  1
          unique values:  38                     missing .:  0/189163

                  mean:    22.079
             std. dev:   27.2829
```

```
           percentiles:        10%       25%       50%       75%       90%
                                 2         4         8        24        73

-------------------------------------------------------------------------------
Subdist                                                          Subdistrict
-------------------------------------------------------------------------------

                  type:  numeric (int)

                 range:  [10,740]                    units:  1
         unique values:  127                     missing .:  0/189163

                  mean:   63.9309
             std. dev:   60.3098

           percentiles:        10%       25%       50%       75%       90%
                                10        22        50        81       140

-------------------------------------------------------------------------------
Vill                                                                  Village
-------------------------------------------------------------------------------

                  type:  numeric (int)

                 range:  [1,913]                     units:  1
         unique values:  100                     missing .:  0/189163

                  mean:   8.92303
             std. dev:   20.0351

           percentiles:        10%       25%       50%       75%       90%
                                 2         3         6        11        17

-------------------------------------------------------------------------------
Sample_Code                                                Sample identifier
-------------------------------------------------------------------------------

                  type:  numeric (int)

                 range:  [10001,29988]               units:  1
         unique values:  5468                    missing .:  0/189163

                  mean:   19907.3
```

```
              std. dev:   4758.56

           percentiles:        10%       25%       50%       75%       90%
                             10754     20008     20338     25006     25281
```

HH_Code — Household identifier

```
                  type:  numeric (byte)

                 range:  [1,16]                       units:  1
          unique values:  16                      missing .:  0/189163

                  mean:   8.46051
              std. dev:   4.61444

           percentiles:        10%       25%       50%       75%       90%
                                 2         4         8        12        15
```

Elderly — Proportion of household member over 65

```
                  type:  numeric (double)

                 range:  [0,1]                        units:  1.000e-09
          unique values:  31                      missing .:  0/189163

                  mean:   .063363
              std. dev:   .189449

           percentiles:        10%       25%       50%       75%       90%
                                 0         0         0         0       .25
```

Self_Treat — Dummy for self-treatment (0 = no treatment)

```
                  type:  numeric (double)

                 range:  [0,1]                        units:  1
          unique values:  2                       missing .:  0/189163
```

```
            tabulation:  Freq.  Value
                          3035  0
                        1.9e+05 1

-------------------------------------------------------------------------------
Out_Pub_Hosp                               Outpatient care in public hospital
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,1]                        units:  1
         unique values:  2                    missing .:  0/189163

            tabulation:  Freq.  Value
                        1.8e+05 0
                          8028  1

-------------------------------------------------------------------------------
Out_Priv_Hosp                              Outpatient care in private hospital
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,1]                        units:  1
         unique values:  2                    missing .:  0/189163

            tabulation:  Freq.  Value
                        1.8e+05 0
                          4343  1

-------------------------------------------------------------------------------
Out_Others                                 Outpatient care in other facilities
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,1]                        units:  1
         unique values:  2                    missing .:  0/189163

            tabulation:  Freq.  Value
                         91844  0
                         97319  1
```

```
-------------------------------------------------------------------------------
Out_Freq                                        Frequency of outpatient visit
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,65]                       units:  1
         unique values:  49                       missing .:  0/189163

                  mean:   1.43318
             std. dev:   2.30081

           percentiles:        10%       25%       50%       75%       90%
                                 0         0         1         2         4

-------------------------------------------------------------------------------
Inp_Pub_Hosp                                  Inpatient care in public hospital
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,1]                        units:  1
         unique values:  2                        missing .:  0/189163

            tabulation:  Freq.  Value
                        1.8e+05 0
                         10978  1

-------------------------------------------------------------------------------
Inp_Priv_Hosp                                Inpatient care in private hospital
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,1]                        units:  1
         unique values:  2                        missing .:  0/189163

            tabulation:  Freq.  Value
                        1.8e+05 0
                          6819  1

-------------------------------------------------------------------------------
```

```
Inp_Others                                  Inpatient care in other facilities
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,1]                        units:  1
         unique values:  2                    missing .:  0/189163

            tabulation:  Freq.  Value
                        1.8e+05 0
                          5331  1

-------------------------------------------------------------------------------
Inp_LOS                                              Length of inpatient care
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,360]                      units:  1
         unique values:  101                  missing .:  0/189163

                  mean:   .810481
             std. dev:   4.31384

           percentiles:        10%       25%       50%       75%       90%
                                 0         0         0         0         2

-------------------------------------------------------------------------------
Askes                                      Health insurance for civil servants
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,1]                        units:  1
         unique values:  2                    missing .:  0/189163

            tabulation:  Freq.  Value
                        1.7e+05 0
                         15279  1

-------------------------------------------------------------------------------
Ins_Poor                                        Health insurance for the poor
-------------------------------------------------------------------------------
```

```
                type:  numeric (double)

               range:  [0,1]                        units:  1
        unique values:  2                       missing .:  0/189163

          tabulation:  Freq.  Value
                      1.5e+05 0
                       38971  1

-------------------------------------------------------------------------------
Other_Ins                                          Other health insurance
-------------------------------------------------------------------------------

                type:  numeric (double)

               range:  [0,1]                        units:  1
        unique values:  2                       missing .:  0/189163

          tabulation:  Freq.  Value
                      1.7e+05 0
                       17911  1

-------------------------------------------------------------------------------
HH_Head_Occup         Dummy if household head is employed (0 = unemployed)
-------------------------------------------------------------------------------

                type:  numeric (double)

               range:  [0,1]                        units:  1
        unique values:  2                       missing .:  0/189163

          tabulation:  Freq.  Value
                       89238  0
                       99925  1

-------------------------------------------------------------------------------
Primary   Dummy if household head had primary education (0 = no education)
-------------------------------------------------------------------------------

                type:  numeric (double)

               range:  [0,1]                        units:  1
```

```
         unique values:  2                       missing .:  0/189163

            tabulation:  Freq.  Value
                        1.3e+05 0
                         61930  1
```

SecondarDummy if household head had secondary education (0 = no education)

```
                 type:  numeric (double)

                range:  [0,1]                        units:  1
         unique values:  2                       missing .:  0/189163

            tabulation:  Freq.  Value
                        1.5e+05 0
                         39859  1
```

Tertiary Dummy if household head had tertiary education (0 = no education)

```
                 type:  numeric (double)

                range:  [0,1]                        units:  1
         unique values:  2                       missing .:  0/189163

            tabulation:  Freq.  Value
                        1.8e+05 0
                          7869  1
```

Sick_days Number of interrupted days due to illness

```
                 type:  numeric (double)

                range:  [0,210]                      units:  1
         unique values:  121                     missing .:  0/189163

                 mean:   6.94526
            std. dev:   10.2267
```

```
          percentiles:        10%       25%       50%       75%       90%
                               0         0         3         9        20

-------------------------------------------------------------------------------
Rural                          Dummy for living in rural area (0 = urban)
-------------------------------------------------------------------------------

                 type:  numeric (float)

                range:  [0,1]                        units:  1
        unique values:  2                    missing .:  0/189163

           tabulation:  Freq.  Value
                        66703  0
                       1.2e+05 1

-------------------------------------------------------------------------------
HH_Size                                                      Household size
-------------------------------------------------------------------------------

                 type:  numeric (float)

                range:  [1,20]                       units:  1
        unique values:  20                   missing .:  0/189163

                 mean:   4.18816
            std. dev:   1.79684

          percentiles:        10%       25%       50%       75%       90%
                               2         3         4         5         6

-------------------------------------------------------------------------------
HH_Equivalent                          Household member weighting from OECD
-------------------------------------------------------------------------------

                 type:  numeric (float)

                range:  [1,12.9]                     units:  1.000e-07
        unique values:  95                   missing .:  0/189163

                 mean:   2.93643
            std. dev:   1.07801
```

```
      percentiles:        10%       25%       50%       75%       90%
                          1.7       2.2       2.7       3.6       4.3

-------------------------------------------------------------------------------
Health_OOP                  Household yearly out-of-pocket health spending
-------------------------------------------------------------------------------

                 type:  numeric (long)

                range:  [0,7.357e+08]                units:  1
        unique values:  33580                    missing .:  0/189163

                 mean:    624820
            std. dev:   3.3e+06

      percentiles:        10%       25%       50%       75%       90%
                        30380     77200    180000    429500   1.1e+06

-------------------------------------------------------------------------------
Nonfood                                  Household yearly non-food spending
-------------------------------------------------------------------------------

                 type:  numeric (long)

                range:  [158000,1.019e+09]           units:  1
        unique values:  122995                   missing .:  0/189163

                 mean:   9.5e+06
            std. dev:   1.5e+07

      percentiles:        10%       25%       50%       75%       90%
                        2.1e+06   3.3e+06   5.9e+06   1.1e+07   1.9e+07

-------------------------------------------------------------------------------
Year_Spend                                Household yearly total spending
-------------------------------------------------------------------------------

                 type:  numeric (float)

                range:  [599771.44,1.109e+09]        units:  .01
        unique values:  182903                   missing .:  0/189163
```

```
                  mean:   2.1e+07
             std. dev:   2.0e+07

          percentiles:        10%       25%       50%       75%       90%
                           7.2e+06   1.1e+07   1.7e+07   2.6e+07   3.8e+07
```

Health_Share1 Share of health spending relative to total spending

---

```
                  type:  numeric (float)

                 range:  [0,.95495832]                units:  1.000e-15
         unique values:  186595                   missing .:  0/189163

                  mean:   .025597
             std. dev:   .051353

          percentiles:        10%       25%       50%       75%       90%
                           .002154   .005182   .011266   .023889   .053754
```

Health_Share2 Share of health spending relative to non-food spending

---

```
                  type:  numeric (float)

                 range:  [0,.98709452]                units:  1.000e-15
         unique values:  185857                   missing .:  0/189163

                  mean:   .061634
             std. dev:   .091644

          percentiles:        10%       25%       50%       75%       90%
                           .005723   .014032      .032    .06852   .142114
```

Catastrophe5 Catastrophic health expenditure of 5% from total spending

---

```
                  type:  numeric (float)

                 range:  [0,1]                        units:  1
```

```
         unique values:  2                        missing .:  0/189163

            tabulation:  Freq.  Value
                        1.7e+05 0
                         20565  1

-------------------------------------------------------------------------------
Catastrophe10   Catastrophic health expenditure of 10% from total spending
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [0,1]                        units:  1
         unique values:  2                        missing .:  0/189163

            tabulation:  Freq.  Value
                        1.8e+05 0
                          8921  1

-------------------------------------------------------------------------------
Catastrophe15   Catastrophic health expenditure of 15% from total spending
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [0,1]                        units:  1
         unique values:  2                        missing .:  0/189163

            tabulation:  Freq.  Value
                        1.8e+05 0
                          5098  1

-------------------------------------------------------------------------------
Catastrophe35 Catastrophic health expenditure (35% from non-food spending)
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [0,1]                        units:  1
         unique values:  2                        missing .:  0/189163

            tabulation:  Freq.  Value
                        1.8e+05 0
```

```
                        4367  1

-------------------------------------------------------------------------------
Catastrophe40 Catastrophic health expenditure (40% from non-food spending)
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [0,1]                        units:  1
          unique values:  2                       missing .:  0/189163

             tabulation:  Freq.  Value
                         1.9e+05 0
                           3269  1

-------------------------------------------------------------------------------
Catastrophe45 Catastrophic health expenditure (45% from non-food spending)
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [0,1]                        units:  1
          unique values:  2                       missing .:  0/189163

             tabulation:  Freq.  Value
                         1.9e+05 0
                           2454  1

-------------------------------------------------------------------------------
id_district                                                 Name of district
-------------------------------------------------------------------------------

                  type:  string (str30)

          unique values:  456                     missing "":  0/189163

               examples:  "Kab. Empat Lawang"
                          "Kab. Lingga"
                          "Kab. Rembang"
                          "Kota Banjarmasin"

                warning:  variable has embedded blanks
```

```
-------------------------------------------------------------------------------
Proliferation       Dummy for proliferated district (0 = not proliferated)
-------------------------------------------------------------------------------

                  type:  numeric (byte)

                 range:  [1,1]                        units:  1
          unique values:  1                    missing .:  136235/189163

             tabulation:  Freq.  Value
                           52928  1
                          1.4e+05 .

-------------------------------------------------------------------------------
gdp2008                                    Per capita district GDP year 2008
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [.81772002,544.50188]        units:  1.000e-09
          unique values:  456                    missing .:  0/189163

                  mean:   17.6842
             std. dev:   35.8125

            percentiles:        10%       25%       50%       75%       90%
                             4.42486   6.61287   9.69089   15.4373    29.734

-------------------------------------------------------------------------------
Health_Budget                                          District health budget
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [0,206741.97]                units:  .0001
          unique values:  423                    missing .:  12973/189163

                  mean:   47648.6
             std. dev:   29427.1

            percentiles:        10%       25%       50%       75%       90%
                              21301     28329   40319.3   58747.6   75662.6
```

```
-------------------------------------------------------------------------------
Health_Spending                                    District health spending
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [.0129894,2.1456415]         units:  1.000e-10
          unique values:  455                      missing .:  204/189163

                  mean:   .186066
             std. dev:   .174635

            percentiles:        10%       25%       50%       75%       90%
                             .054054   .078094   .151158   .239226    .33038

-------------------------------------------------------------------------------
District_Code                                        District identifier
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [1101,9471]                  units:  1
          unique values:  456                      missing .:  0/189163

                  mean:   4195.91
             std. dev:   2344.16

            percentiles:        10%       25%       50%       75%       90%
                               1302      1807      3509      6305      7402

-------------------------------------------------------------------------------
GI                                                    District Gini index
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [.17869414,.50738007]        units:  1.000e-08
          unique values:  456                      missing .:  0/189163

                  mean:   .320441
             std. dev:    .03975

            percentiles:        10%       25%       50%       75%       90%
```

```
                          .271713   .295119    .31969   .344893   .367893

-------------------------------------------------------------------------------
GI_adjusted     District Gini index after adjusted by consumer price index
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [.17869416,.50738007]        units:  1.000e-08
         unique values:  456                       missing .:  0/189163

                  mean:   .320441
             std. dev:    .03975

           percentiles:        10%       25%       50%       75%       90%
                          .271713   .295119    .31969   .344893   .367893

-------------------------------------------------------------------------------
Housing                                          House ownership (0 = rent)
-------------------------------------------------------------------------------

                  type:  numeric (byte)

                 range:  [0,1]                        units:  1
         unique values:  2                         missing .:  0/189163

            tabulation:  Freq.  Value
                         38134  0
                        1.5e+05 1

-------------------------------------------------------------------------------
Capita                                     Household per capita expenditure
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [12.187442,19.493494]        units:  1.000e-07
         unique values:  179464                    missing .:  0/189163

                  mean:   15.6236
             std. dev:   .587247

           percentiles:        10%       25%       50%       75%       90%
```

```
                          14.8763    15.255   15.6041   15.9795    16.353

-------------------------------------------------------------------------------
HH                                        Number of households in district
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [3058,1080435]               units:  1
          unique values:  455                    missing .:  0/189163

                  mean:    160797
             std. dev:    175547

           percentiles:        10%       25%       50%       75%       90%
                             29156     44796     84000    229563    403139

-------------------------------------------------------------------------------
Water_Poll                       Percentage of villages with water pollution
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,.94957983]                units:  1.000e-11
          unique values:  380                    missing .:  0/189163

                  mean:   .122758
             std. dev:   .109416

           percentiles:        10%       25%       50%       75%       90%
                            .020408   .050847    .09465   .161458       .25

-------------------------------------------------------------------------------
Soil_Poll                         Percentage of villages with soil pollution
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,.23188406]                units:  1.000e-11
          unique values:  228                    missing .:  0/189163

                  mean:   .017112
             std. dev:   .031198
```

```
           percentiles:        10%       25%       50%       75%       90%
                                 0         0   .006061   .022989   .041667

-------------------------------------------------------------------------------
Air_Poll                         Percentage of villages with air pollution
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,1]                        units:  1.000e-11
          unique values:  340                    missing .:  0/189163

                  mean:   .098377
             std. dev:   .104488

           percentiles:        10%       25%       50%       75%       90%
                            .002646   .028986   .071429   .134021   .215297

-------------------------------------------------------------------------------
Sound_Poll                      Percentage of villages with sound pollution
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,.83193277]                units:  1.000e-11
          unique values:  339                    missing .:  0/189163

                  mean:   .065335
             std. dev:    .07424

           percentiles:        10%       25%       50%       75%       90%
                                 0   .017021   .043321   .086957   .160714

-------------------------------------------------------------------------------
Landslide                    Percentage of villages with landslide disaster
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,.6375]                    units:  1.000e-11
          unique values:  340                    missing .:  0/189163
```

```
                  mean:   .103406
             std. dev:   .132467

          percentiles:        10%       25%       50%       75%       90%
                                0   .009615    .05098    .14486   .294798
```

Flood — Percentage of villages with flood disaster

```
                  type:  numeric (double)

                 range:  [0,.93548387]                units:  1.000e-11
          unique values:  397                      missing .:  0/189163

                  mean:   .225816
             std. dev:   .185974

          percentiles:        10%       25%       50%       75%       90%
                           .032051   .076923   .170833   .340426    .51497
```

Earthquake — Percentage of villages with earthquake disaster

```
                  type:  numeric (double)

                 range:  [0,1]                        units:  1.000e-11
          unique values:  174                      missing .:  0/189163

                  mean:     .0825
             std. dev:   .219378

          percentiles:        10%       25%       50%       75%       90%
                                0         0         0   .029412   .258278
```

Tsunami — Percentage of villages with tsunami disaster

```
                  type:  numeric (double)

                 range:  [0,.07746479]                units:  1.000e-10
```

```
         unique values:  9                        missing .:  0/189163

            tabulation:  Freq.  Value
                        1.9e+05 0
                           232  .0023753
                           361  .00383142
                           545  .00471698
                           469  .00625
                           163  .00892857
                           578  .02564103
                           652  .04899135
                           500  .07746479
```

Tidal_Wave Percentage of villages with tidal wave disaster

```
                  type:  numeric (double)

                 range:  [0,.66666667]                units:  1.000e-11
         unique values:  213                      missing .:  0/189163

                  mean:   .028997
             std. dev:   .052788

           percentiles:        10%       25%       50%       75%       90%
                                 0         0   .005076   .037037   .088123
```

Tornado Percentage of villages with tornado disaster

```
                  type:  numeric (double)

                 range:  [0,.81818182]                units:  1.000e-11
         unique values:  349                      missing .:  0/189163

                  mean:   .106098
             std. dev:   .123028

           percentiles:        10%       25%       50%       75%       90%
                                 0   .026316   .066148   .146341   .263598
```

```
-------------------------------------------------------------------------------
Eruption           Percentage of villages with vulcanic eruption disaster
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,.36842105]                units:  1.000e-11
          unique values:  25                       missing .:  0/189163

                  mean:   .002592
             std. dev:    .019656

            percentiles:        10%       25%       50%       75%       90%
                                  0         0         0         0         0

-------------------------------------------------------------------------------
Forest_Fire               Percentage of villages with forest fire disaster
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,.22340426]                units:  1.000e-11
          unique values:  211                      missing .:  0/189163

                  mean:   .015124
             std. dev:    .031014

            percentiles:        10%       25%       50%       75%       90%
                                  0         0    .00369   .014388    .04375

-------------------------------------------------------------------------------
Hospital                          Percentage of villages with hospital(s)
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,.4516129]                 units:  1.000e-11
          unique values:  327                      missing .:  0/189163

                  mean:   .046125
             std. dev:    .07831

            percentiles:        10%       25%       50%       75%       90%
```

```
                          .003906   .007353   .014286   .039773   .151515

-------------------------------------------------------------------------------
Health_Centre                 Percentage of villages with health centre(s)
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [.01747573,1]                units:  1.000e-11
          unique values:  390                     missing .:  0/189163

                  mean:   .171466
             std. dev:   .160947

            percentiles:        10%       25%       50%       75%       90%
                           .071429    .09205   .120773   .185714   .293333

-------------------------------------------------------------------------------
Doctor                       Percentage of villages with doctor practice(s)
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,1]                        units:  1.000e-10
          unique values:  407                     missing .:  0/189163

                  mean:   .265285
             std. dev:   .266392

            percentiles:        10%       25%       50%       75%       90%
                           .034375   .076923   .158416   .347222       .75

-------------------------------------------------------------------------------
Diarrhea                     Percentage of villages with diarrhea outbreak
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,1]                        units:  1.000e-10
          unique values:  386                     missing .:  0/189163

                  mean:   .192395
             std. dev:   .136117
```

```
           percentiles:        10%       25%       50%       75%       90%
                            .043478   .094972   .166667   .270833   .375479

-------------------------------------------------------------------------------
Dengue                         Percentage of villages with dengue outbreak
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,.95384615]                units:  1.000e-11
          unique values:  387                     missing .:  0/189163

                  mean:   .184999
             std. dev:   .203278

           percentiles:        10%       25%       50%       75%       90%
                            .010417   .033898   .107477   .272727   .490196

-------------------------------------------------------------------------------
Measles                       Percentage of villages with measles outbreak
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,.41860465]                units:  1.000e-11
          unique values:  335                     missing .:  0/189163

                  mean:     .0656
             std. dev:    .07054

           percentiles:        10%       25%       50%       75%       90%
                                 0   .014925   .044118    .09375   .162679

-------------------------------------------------------------------------------
Respiratory_Infection    % of villages with respiratory infection outbreak
-------------------------------------------------------------------------------

                  type:  numeric (double)

                 range:  [0,.95454545]                units:  1.000e-10
          unique values:  362                     missing .:  0/189163
```

```
                  mean:   .115461
             std. dev:   .104887

         percentiles:        10%       25%       50%       75%       90%
                          .007634   .040323   .090395   .170404   .249042
```

Malaria Percentage of villages with malaria outbreak

```
                  type:  numeric (double)

                 range:  [0,.95454545]                units:  1.000e-11
          unique values:  373                     missing .:  0/189163

                  mean:   .147566
             std. dev:   .181228

         percentiles:        10%       25%       50%       75%       90%
                            0   .014925   .066802   .231481   .433962
```

Avian_Influenza Percentage of villages with avian influenza outbreak

---

```
                  type:  numeric (double)

                 range:  [0,.06153846]                units:  1.000e-11
          unique values:  117                     missing .:  0/189163

                  mean:   .003292
             std. dev:   .008347

         percentiles:        10%       25%       50%       75%       90%
                            0         0         0    .00303   .009967
```

TBC Percentage of villages with TBC outbreak

```
                  type:  numeric (double)

                 range:  [0,.65116279]                units:  1.000e-11
```

```
         unique values:  375                      missing .:  0/189163

                  mean:   .127192
             std. dev:   .106231

           percentiles:        10%       25%       50%       75%       90%
                           .007246   .047619   .112583   .173611   .272727
```

Population — District population

```
                  type:  numeric (double)

                 range:  [13561,4219324]              units:  1
         unique values:  456                      missing .:  0/189163

                  mean:    611208
             std. dev:    650006

           percentiles:        10%       25%       50%       75%       90%
                            116091    177185    339522    854757   1.5e+06
```

Villages — Number of villages in district

```
                  type:  numeric (float)

                 range:  [6,852]                      units:  1
         unique values:  256                      missing .:  0/189163

                  mean:   170.843
             std. dev:   123.783

           percentiles:        10%       25%       50%       75%       90%
                                38        69       148       247       335
```

Pollution — Percentage of polluted villages

```
                  type:  numeric (float)
```

```
                range:  [0,.49159664]               units:  1.000e-10
        unique values:  416                      missing .:  0/189163

                 mean:   .075896
            std. dev:   .059537

          percentiles:        10%       25%       50%       75%       90%
                           .01721   .033195   .063953   .101351   .148256
```

Disaster — Percentage of villages experiencing disaster

```
                 type:  numeric (float)

                range:  [0,.28947368]               units:  1.000e-11
        unique values:  427                      missing .:  0/189163

                 mean:   .070629
            std. dev:   .046896

          percentiles:        10%       25%       50%       75%       90%
                          .019943   .034128   .062225   .093458   .140306
```

Health_Resource — Percentage of health resources in district

```
                 type:  numeric (float)

                range:  [.00582524,.80645162]       units:  1.000e-10
        unique values:  433                      missing .:  0/189163

                 mean:   .160959
            std. dev:   .157886

          percentiles:        10%       25%       50%       75%       90%
                          .041995   .063492   .099291    .19209   .383333
```

Endemic — Percentage of endemic villages

```
                  type:  numeric (float)

                 range:  [0,.55194807]                units:  1.000e-10
         unique values:  431                       missing .:  0/189163

                  mean:   .119501
             std. dev:   .076817

           percentiles:        10%       25%       50%       75%       90%
                            .032715   .063312   .107937   .163265   .209877
```

Capita2 — Log expenditure per capita

```
                  type:  numeric (float)

                 range:  [196308.33,2.924e+08]        units:  .01
         unique values:  179464                    missing .:  0/189163

                  mean:   7.4e+06
             std. dev:   6.1e+06

           percentiles:        10%       25%       50%       75%       90%
                            2.9e+06   4.2e+06   6.0e+06   8.7e+06   1.3e+07
```

Quintile — 5 quantiles of Capita2

```
                  type:  numeric (byte)

                 range:  [1,5]                        units:  1
         unique values:  5                         missing .:  0/189163

            tabulation:  Freq.  Value
                         37833  1
                         37833  2
                         37832  3
                         37833  4
                         37832  5
```

```
-------------------------------------------------------------------------------
public                    Log of district health spending in million IDR
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [3421548.3,2.441e+08]        units:  .1
         unique values:  455                      missing .:  204/189163

                  mean:   6.1e+07
             std. dev:   3.5e+07

           percentiles:        10%       25%       50%       75%       90%
                            2.9e+07   3.9e+07   5.3e+07   7.4e+07   1.0e+08

-------------------------------------------------------------------------------
gdp                                                 Log of GDP per capita
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [2.2653291,8.214e+37]        units:  1.000e-07
         unique values:  446                      missing .:  4670/189163

                  mean:   4.3e+35
             std. dev:   5.9e+36

           percentiles:        10%       25%       50%       75%       90%
                            79.8721   649.044   15313.5   1.9e+06   6.7e+11
```

A.2 Stata syntax

```
clear all
set mem 700m

global dir "E:"

use $dir200808_modul43.dta, clear
keep b1r1 b1r2 b1r3 b1r4 b1r5 b1r7 b1r8 b2r1 b43r18_b b43r23k4 b43r25k3
rename b1r1 Prov
rename b1r2 Dist
rename b1r3 Subdist
rename b1r4 Vill
rename b1r5 Rural
rename b1r7 Sample_Code
rename b1r8 HH_Code
rename b2r1 HH_Size
rename b43r18_b Health_OOP
rename b43r23k4 Nonfood
rename b43r25k3 Month_Spend
label var Prov "Province"
label var Dist "District"
label var Subdist "Subdistrict"
label var Vill "Village"
label var Rural "Dummy for Rural (0 = Urban)"
label var Sample_Code "Sample code"
label var HH_Code "Household code"
label var HH_Size "Household size"
label var Health_OOP "Out-of-pocket health spending"
label var Nonfood "Non-food spending"
label var Month_Spend "Monthly household spending"
destring, replace force
gen Year_Spend = Month_Spend * 12
drop Month_Spend
gen Health_Share1 = Health_OOP/Year_Spend
gen Health_Share2 = Health_OOP/Nonfood
replace Rural = 0 if Rural == 1
replace Rural = 1 if Rural == 2

*** INCIDENCE OF CATASTROPHIC AT VARIOUS THRESHOLDS (TOTAL SPENDING ///
*** AS DENOMINATOR)
forvalues i = 5 10 to 15
gen Catastrophe`i' = (Health_Share1 > (`i'/100))
```

```
*** INCIDENCE OF CATASTROPHIC AT VARIOUS THRESHOLDS (NON-FOOD ///
*** SPENDING AS DENOMINATOR)
forvalues i = 35 40 to 45
gen Catastrophe‘i’ = (Health_Share2 > (‘i’/100))


save "C:_HH.dta", replace
clear

*** ================================================================--
*** ================================================================

*** HOUSING STATUS
use $dir200808rt.dta, clear
keep b1r1 b1r2 b1r3 b1r4 b1r5 b1r7 b1r8 b6r1
rename b1r1 Prov
rename b1r2 Dist
rename b1r3 Subdist
rename b1r4 Vill
rename b1r5 Rural
rename b1r7 Sample_Code
rename b1r8 HH_Code
rename b6r1 Housing
label var Housing "House ownership (0 = rent)"
replace Housing = 0 if Housing != 1
save "C:_Housing.dta", replace
clear

* INDIVIDUAL LEVEL COVARIATES
use $dir200808ind.dta, clear
keep b1r1 b1r2 b1r3 b1r4 b1r5 b1r7 b1r8 nart umur b5r3 b5r4a b5r6a ///
b5r6b b5r6c b5r6d b5r6e b5r6f b5r6g b5r6h b5r8a b5r8b b5r8c b5r8d ///
b5r8e b5r8f b5r9a b5r9b b5r9c b5r9d b5r9e b5r9f b5r9g b5r15 b5r20a1
rename b1r1 Prov
rename b1r2 Dist
rename b1r3 Subdist
rename b1r4 Vill
rename b1r5 Rural
rename b1r7 Sample_Code
rename b1r8 HH_Code
rename nart HH_Member_Code
```

```
rename umur Age
rename b5r3 Sick_days
rename b5r4a Self_Treat
rename b5r6a Out_Pub_Hosp
rename b5r6b Out_Priv_Hosp
rename b5r6c Out_Clinic
rename b5r6d Out_Health_Centre
rename b5r6e Out_Health_Officer
rename b5r6f Out_Traditional
rename b5r6g Out_Midwife
rename b5r6h Out_Others
rename b5r8a Inp_Pub_Hosp
rename b5r8b Inp_Priv_Hosp
rename b5r8c Inp_Health_Centre
rename b5r8d Inp_Health_Officer
rename b5r8e Inp_Traditional
rename b5r8f Inp_Others
rename b5r9a Askes
rename b5r9b Jamsostek
rename b5r9c Priv_Ins
rename b5r9d Reimburse
rename b5r9e Ins_Poor
rename b5r9f Health_Fund
rename b5r9g Other_Ins
rename b5r15 Education
rename b5r20a1 Work

*** HOUSEHOLD SIZE
by Prov Dist Subdist Vill Sample_Code HH_Code, sort: gen HH_Size = _N

*** CODE FOR HOUSEHOLD MEMBER ABOVE 65
gen Elderly = 1 if Age > 65
replace Elderly = 0 if Elderly == .

*** OECD HOUSEHOLD EQUIVALENCY SCALE (TO CALCULATE PER CAPITA ///
*** YEARLY EXPENDITURE)
gen Adult = 1 if Age >= 17
replace Adult = 0 if Adult ==.

*** APPLYING WEIGHT TO EACH HOUSEHOLD MEMBER
gen HH_Equiv = 1 if Adult == 1 & HH_Member_Code == 1
replace HH_Equiv = 1 if Adult == 0 & HH_Member_Code == 1
replace HH_Equiv = 0.7 if Adult == 1 & HH_Member_Code != 1
```

```
replace HH_Equiv = 0.5 if Adult == 0 & HH_Member_Code != 1
by Prov Dist Subdist Vill Sample_Code HH_Code, sort: egen ///
HH_Equivalent = total(HH_Equiv)

*** DUMMY VARIABLE FOR HEALTH INSURANCE
replace Askes = 0 if Askes == 2
replace Jamsostek = 0 if Jamsostek == 2
replace Priv_Ins = 0 if Priv_Ins == 2
replace Reimburse = 0 if Reimburse == 2
replace Ins_Poor = 0 if Ins_Poor == 2
replace Health_Fund = 0 if Health_Fund == 2
replace Other_Ins = 0 if Other_Ins == 2
replace Other_Ins = Jamsostek + Reimburse + Health_Fund + ///
Priv_Ins + Health_Fund + Other_Ins
drop Jamsostek Reimburse Health_Fund Priv_Ins Health_Fund

*** DUMMY VARIABLE FOR EDUCATION LEVEL OF HOUSEHOLD HEAD (0 = NO ///
*** EDUCATION)
gen HH_Head_Edu = Education if HH_Member_Code == 1
replace HH_Head_Edu = 0 if HH_Head_Edu == .
gen Primary = 1 if HH_Head_Edu == 1 | HH_Head_Edu == 2
replace Primary = 0 if Primary == .
gen Secondary = 1 if HH_Head_Edu >= 3 & HH_Head_Edu <= 8
replace Secondary = 0 if Secondary == .
gen Tertiary = 1 if HH_Head_Edu >= 9
replace Tertiary = 0 if Tertiary == .

*** OCCUPATION OF HOUSEHOLD HEAD
gen HH_Head_Occup = Work if HH_Member_Code == 1
replace HH_Head_Occup = 0 if HH_Head_Occup == . | HH_Head_Occup == 2

*** RURAL VS URBAN
replace Rural = 0 if Rural == 1
replace Rural = 1 if Rural == 2

*** GENERATE NEW VARIABLE FOR OUTPATIENT CARE OTHER THAN PUBLIC & ///
*** PRIVATE HOSPITAL CARE
replace Out_Others = Out_Clinic + Out_Health_Centre + ///
Out_Health_Officer + Out_Traditional + Out_Midwife + Out_Others
drop Out_Clinic Out_Health_Centre Out_Health_Officer ///
Out_Traditional Out_Midwife

*** GENERATE NEW VARIABLE TO MEASURE FREQUENCY OF OUTPATIENT CARE
```

```
gen Out_Freq = Out_Pub_Hosp + Out_Priv_Hosp + Out_Others

*** GENERATE NEW VARIABLE FOR INPATIENT CARE OTHER THAN PUBLIC & ///
*** PRIVATE HOSPITAL CARE
replace Inp_Others = Inp_Health_Centre + Inp_Health_Officer + ///
Inp_Traditional + Inp_Others
drop Inp_Health_Centre Inp_Health_Officer Inp_Traditional

*** GENERATE NEW VARIABLE TO MEASURE LENGTH OF STAY AT INPATIENT CARE
gen Inp_LOS = Inp_Pub_Hosp + Inp_Priv_Hosp + Inp_Others

*** DROP OBSERVATIONS WITHOUT HEALTH CARE UTILITIES
egen Utiliy = rowtotal(Self_Treat Out_Pub_Hosp Out_Priv_Hosp ///
Out_Others Inp_Pub_Hosp Inp_Priv_Hosp Inp_Others)
drop if Utiliy == 0

*** AGGREGATE FROM INDIVIDUAL LEVEL TO HOUSEHOLD LEVEL
collapse (sum) Elderly Self_Treat Out_Pub_Hosp Out_Priv_Hosp ///
Out_Others Out_Freq Inp_Pub_Hosp Inp_Priv_Hosp Inp_Others Inp_LOS ///
Askes Ins_Poor Other_Ins HH_Head_Occup Primary Secondary Tertiary ///
Sick_days (mean) Rural HH_Size HH_Equivalent, by (Prov Dist ///
Subdist Vill Sample_Code HH_Code)

save "C:_Ind_2.dta", replace

*** ================================================================
*** ================================================================

*** COMBINE DATASETS
joinby Prov Dist Subdist Vill Rural Sample_Code HH_Code using ///
"C:_HH.dta"
save "C:_HH_Ind_2.dta", replace
clear

*** COMBINE DISTRICT DATASETS
use "C:20082009.dta", clear
mmerge id_district using "C:200808.dta", ukeep (gdp2008)
mmerge id_district using "C:20082007.dta", ukeep (angkes)
mmerge id_district using "C:2008 Budget 2008.dta", ///
ukeep (hspe)
gen District_Code = (100*prop) + kabkota
joinby District_Code using "C:20082008_District.dta"
drop _merge provinsi propkabkota
```

```
rename prop Prov
rename kabkota Dist
rename pemekaran Proliferation
rename angkes Health_Budget
rename hspe Health_Spending
save "C:_District.dta", replace
clear

use "C:_HH_Ind_2.dta", clear
joinby Prov Dist using "C:_District.dta"
joinby Prov Dist Subdist Vill Sample_Code HH_Code using ///
"C:_Housing.dta"

*** PER CAPITA SPENDING
gen Capita = Year_Spend/HH_Equivalent

*** PERCENTAGE OF ELDERLY IN HOUSEHOLD
replace Elderly = Elderly/HH_Size

*** DUMMY VARIABLE FOR SELF TREATMENT
replace Self_Treat = 1 if Self_Treat > 1

*** DUMMY VARIABLE FOR OUTPATIENT CARE (0 = OUTPATIENT IN PUBLIC ///
*** HOSPITAL)
replace Out_Pub_Hosp = 1 if Out_Pub_Hosp > 1
replace Out_Priv_Hosp = 1 if Out_Priv_Hosp > 1
replace Out_Others = 1 if Out_Others > 1

*** PRIORITISE PRIVATE HOSPITAL CARE IN CASE OF MULTIPLE OUTPATIENT ///
*** CARE (PRIVATE > OTHERS > PUBLIC)
gen Out_Other = Out_Others
replace Out_Other = 0 if Out_Priv_Hosp == 1 & Out_Others == 1

*** DUMMY VARIABLE FOR INPATIENT CARE (0 = INPATIENT IN PUBLIC HOSPITAL)
replace Inp_Pub_Hosp = 1 if Inp_Pub_Hosp > 1
replace Inp_Priv_Hosp = 1 if Inp_Priv_Hosp > 1
replace Inp_Others = 1 if Inp_Others > 1

*** PRIORITISE PRIVATE HOSPITAL IN CASE OF MULTIPLE INPATIENT CARE ///
*** RESPONSES
gen Inp_Other = Inp_Others
replace Inp_Other = 0 if Inp_Priv_Hosp == 1 & Inp_Others == 1
```

```
*** DUMMY VARIABLE FOR HEALTH INSURANCE (0 = ASKES)
replace Ins_Poor = 1 if Ins_Poor > 1
replace Other_Ins = 1 if Other_Ins > 1

*** PRIORITISE INSURANCE FOR THE POOR IN CASE OF MULTIPLE INSURANCE ///
*** OWNERSHIP
gen Other_Insurance = Other_Ins
replace Other_Insurance = 0 if Ins_Poor == 1 & Other_Ins == 1

save "C: 2008.dta", replace
clear

*** ================================================================-
*** ================================================================-

*** COMBINING WITH PODES DATASET
use "E:20082008.dta", clear
keep prop kab r401a r401b r401c r510a_2 r510b_2 r510c_2 r510d_2 ///
r513a_2 r513b_2 r513d_2 r513e_2 r513f_2 r513g_2 r513h_2 r513i_2 ///
r604a_2 r604d_2 r604f_2 r607a_2 r607b_2 r607c_2 r607d_2 r607e_2 ///
r607f_2 r607g_2
rename prop Prov
rename kab Dist
rename r401a Male
rename r401b Female
rename r401c HH
rename r510a_2 Water_Poll
rename r510b_2 Soil_Poll
rename r510c_2 Air_Poll
rename r510d_2 Sound_Poll
rename r513a_2 Landslide
rename r513b_2 Flood
rename r513d_2 Earthquake
rename r513e_2 Tsunami
rename r513f_2 Tidal_Wave
rename r513g_2 Tornado
rename r513h_2 Eruption
rename r513i_2 Forest_Fire
rename r604a_2 Hospital
rename r604d_2 Health_Centre
rename r604f_2 Doctor
rename r607a_2 Diarrhea
rename r607b_2 Dengue
```

```
rename r607c_2 Measles
rename r607d_2 Respiratory_Infection
rename r607e_2 Malaria
rename r607f_2 Avian_Influenza
rename r607g_2 TBC

gen Population = Male + Female
replace Water_Poll = 0 if Water_Poll == 2
replace Soil_Poll = 0 if Soil_Poll == 2
replace Air_Poll = 0 if Air_Poll == 2
replace Sound_Poll = 0 if Sound_Poll == 2
replace Landslide = 0 if Landslide == 2
replace Flood = 0 if Flood == 2
replace Earthquake = 0 if Earthquake == 2
replace Tsunami = 0 if Tsunami == 2
replace Tidal_Wave = 0 if Tidal_Wave == 2
replace Tornado = 0 if Tornado == 2
replace Eruption = 0 if Eruption == 2
replace Forest_Fire = 0 if Forest_Fire == 2
replace Hospital = 0 if Hospital == 2
replace Health_Centre = 0 if Health_Centre == 2
replace Doctor = 0 if Doctor == 2
replace Diarrhea = 0 if Diarrhea == 2
replace Dengue = 0 if Dengue == 2
replace Measles = 0 if Measles == 2
replace Respiratory_Infection = 0 if Respiratory_Infection == 2
replace Malaria = 0 if Malaria == 2
replace Avian_Influenza = 0 if Avian_Influenza == 2
replace TBC = 0 if TBC == 2
drop Male Female
by Prov Dist, sort: gen Villages = _N
collapse (sum) HH Water_Poll Soil_Poll Air_Poll Sound_Poll ///
Landslide Flood Earthquake Tsunami Tidal_Wave Tornado Eruption ///
Forest_Fire Hospital Health_Centre Doctor Diarrhea Dengue ///
Measles Respiratory_Infection Malaria Avian_Influenza TBC ///
Population
(mean) Villages, by(Prov Dist)
replace
replace Water_Poll = Water_Poll/Villages
replace Soil_Poll = Soil_Poll/Villages
replace Air_Poll = Air_Poll/Villages
replace Sound_Poll = Sound_Poll/Villages
replace Landslide = Landslide/Villages
```

```
replace Flood = Flood/Villages
replace Earthquake = Earthquake/Villages
replace Tsunami = Tsunami/Villages
replace Tidal_Wave = Tidal_Wave/Villages
replace Tornado = Tornado/Villages
replace Eruption = Eruption/Villages
replace Forest_Fire = Forest_Fire/Villages
replace Hospital = Hospital/Villages
replace Health_Centre = Health_Centre/Villages
replace Doctor = Doctor/Villages
replace Diarrhea = Diarrhea/Villages
replace Dengue = Dengue/Villages
replace Measles = Measles/Villages
replace Respiratory_Infection = Respiratory_Infection/Villages
replace Malaria = Malaria/Villages
replace Avian_Influenza = Avian_Influenza/Villages
replace TBC = TBC/Villages

save "C: 2008.dta", replace
clear

*** COMBINE CATASTROPHIC AND PODES DATASET

use "C: 2008.dta", clear
joinby Prov Dist using "C: 2008.dta"
replace gdp2008 = gdp2008/Population
replace Health_Spending = Health_Spending/Population
label var Prov "Province"
label var Dist "District"
label var Subdist "Subdistrict"
label var Vill "Village"
label var Sample_Code "Sample identifier"
label var HH_Code "Household identifier"
label var Elderly "Proportion of household member over 65"
label var Self_Treat "Dummy for self-treatment (0 = no treatment)"
label var Out_Pub_Hosp "Outpatient care in public hospital"
label var Out_Priv_Hosp "Outpatient care in private hospital"
label var Out_Others "Outpatient care in other facilities"
label var Out_Freq "Frequency of outpatient visit"
label var Inp_Pub_Hosp "Inpatient care in public hospital"
label var Inp_Priv_Hosp "Inpatient care in private hospital"
label var Inp_Others "Inpatient care in other facilities"
label var Inp_LOS "Length of inpatient care"
```

```
label var Askes "Health insurance for civil servants"
label var Ins_Poor "Health insurance for the poor"
label var Other_Ins "Other health insurance"
label var HH_Head_Occup "Dummy if household head is employed ///
(0 = unemployed)"
label var Primary "Dummy if household head had primary education ///
(0 = no education)"
label var Secondary "Dummy if household head had secondary ///
education (0 = no education)"
label var Tertiary "Dummy if household head had tertiary education ///
(0 = no education)"
label var Sick_days "Number of interrupted days due to illness"
label var Rural "Dummy for living in rural area (0 = urban)"
label var HH_Size "Household size"
label var HH_Equivalent "Household member weighting from OECD"
label var Health_OOP "Household yearly out-of-pocket health spending"
label var Nonfood "Household yearly non-food spending"
label var Year_Spend "Household yearly total spending"
label var Health_Share1 "Share of health spending relative to ///
total spending"
label var Health_Share2 "Share of health spending relative to ///
non-food spending"
label var Catastrophe5 "Catastrophic health expenditure of 5% ///
from total spending"
label var Catastrophe10 "Catastrophic health expenditure of 10% ///
from total spending"
label var Catastrophe15 "Catastrophic health expenditure of 15% ///
from total spending"
label var Catastrophe35 "Catastrophic health expenditure of 35% ///
from total non-food spending"
label var Catastrophe40 "Catastrophic health expenditure of 40% ///
from total non-food spending"
label var Catastrophe45 "Catastrophic health expenditure of 45% ///
from total non-food spending"
label var id_district "Name of district"
label var Proliferation "Dummy for proliferated district (0 = not ///
proliferated)"
label var gdp2008 "Per capita district GDP year 2008"
label var Health_Budget "District health budget"
label var Health_Spending "District health spending"
label var District_Code "District identifier"
label var GI "District Gini index"
label var GI_adjusted "District Gini index after adjusted by ///
```

```
consumer price index"
label var Capita "Household per capita expenditure"
drop Out_Other Inp_Other Other_Insurance
label var HH "Number of households in district"
label var Water_Poll "Percentage of villages with water pollution"
label var Soil_Poll "Percentage of villages with soil pollution"
label var Air_Poll "Percentage of villages with air pollution"
label var Sound_Poll "Percentage of villages with sound pollution"
label var Landslide "Percentage of villages with landslide disaster"
label var Flood "Percentage of villages with flood disaster"
label var Earthquake "Percentage of villages with earthquake disaster"
label var Tsunami "Percentage of villages with tsunami disaster"
label var Tidal_Wave "Percentage of villages with tidal wave disaster"
label var Tornado "Percentage of villages with tornado disaster"
label var Eruption "Percentage of villages with vulcanic eruption ///
disaster"
label var Forest_Fire "Percentage of villages with forest fire disaster"
label var Hospital "Percentage of villages with hospital(s)"
label var Health_Centre "Percentage of villages with health centre(s)"
label var Doctor "Percentage of villages with doctor practice(s)"
label var Diarrhea "Percentage of villages with diarrhea outbreak"
label var Dengue "Percentage of villages with dengue outbreak"
label var Measles "Percentage of villages with measles outbreak"
label var Respiratory_Infection "Percentage of villages with upper ///
respiratory infection outbreak"
label var Malaria "Percentage of villages with malaria outbreak"
label var Avian_Influenza "Percentage of villages with avian ///
influenza outbreak"
label var TBC "Percentage of villages with TBC outbreak"
label var Population "District population"
label var Villages "Number of villages in district"

replace Askes = 1 if Askes > 1
replace Capita = log(Capita)
egen Pollution = rowmean(Water_Poll Soil_Poll Air_Poll Sound_Poll)
egen Disaster = rowmean(Landslide Flood Earthquake Tsunami ///
Tidal_Wave Tornado Eruption Forest_Fire)
egen Health_Resource = rowmean(Hospital Health_Centre Doctor)
egen Endemic = rowmean(Diarrhea Dengue Measles ///
Respiratory_Infection Malaria Avian_Influenza TBC)

save "C:_Jaya2008.dta", replace
```

```
log using C:_Jaya_ratio, text replace
use "C:_Jaya2008.dta" , clear

*** MULTILEVEL LOGISTIC MODEL
xtset District_Code

*** INCIDENCE OF CATASTROPHIC AT VARIOUS THRESHOLDS - TOTAL SPENDING ///
*** AS DENOMINATOR
xtlogit Catastrophe5 Elderly Self_Treat Out_Priv_Hosp Out_Others ///
Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes Ins_Poor Other_Ins ///
HH_Head_Occup Primary Secondary Tertiary Sick_days Rural HH_Size ///
Capita Housing Pollution Disaster Health_Resource Endemic gdp2008 ///
Health_Spending GI_adjusted, i(District_Code)

xtlogit Catastrophe10 Elderly Self_Treat Out_Priv_Hosp Out_Others ///
Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes Ins_Poor Other_Ins ///
HH_Head_Occup Primary Secondary Tertiary Sick_days Rural HH_Size ///
Capita Housing Pollution Disaster Health_Resource Endemic gdp2008 ///
Health_Spending GI_adjusted, i(District_Code)

xtlogit Catastrophe15 Elderly Self_Treat Out_Priv_Hosp Out_Others ///
Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes Ins_Poor Other_Ins ///
HH_Head_Occup Primary Secondary Tertiary Sick_days Rural HH_Size ///
Capita Housing Pollution Disaster Health_Resource Endemic gdp2008 ///
Health_Spending GI_adjusted, i(District_Code)

xtlogit Catastrophe35 Elderly Self_Treat Out_Priv_Hosp Out_Others ///
Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes Ins_Poor Other_Ins ///
HH_Head_Occup Primary Secondary Tertiary Sick_days Rural HH_Size ///
Capita Housing Pollution Disaster Health_Resource Endemic gdp2008 ///
Health_Spending GI_adjusted, i(District_Code) or

xtlogit Catastrophe40 Elderly Self_Treat Out_Priv_Hosp Out_Others ///
Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes Ins_Poor Other_Ins ///
HH_Head_Occup Primary Secondary Tertiary Sick_days Rural HH_Size ///
Capita Housing Pollution Disaster Health_Resource Endemic gdp2008 ///
Health_Spending GI_adjusted, i(District_Code) or

xtlogit Catastrophe45 Elderly Self_Treat Out_Priv_Hosp Out_Others ///
Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes Ins_Poor Other_Ins ///
HH_Head_Occup Primary Secondary Tertiary Sick_days Rural HH_Size ///
Capita Housing Pollution Disaster Health_Resource Endemic gdp2008 ///
Health_Spending GI_adjusted, i(District_Code) or
```

```
log close

*** SENSITIVITY ANALYSIS BY COMPARING THE RESULTS AFTER SEPARATING ///
*** THE POPULATION
*** SETTING OUTPATIENT POPULATION
use "C:_Jaya2008.dta", clear
drop if Out_Freq == 0
drop if Inp_LOS > 0
save "C:_Jaya2008.dta", replace
log using C:_Jaya_outpatient, ///
text replace

*** MULTILEVEL LOGISTIC MODEL
xtset District_Code

*** IMPACT OF HEALTH INSURANCE TOWARDS CATASTROPHIC - DISTRICT ///
*** HEALTH SPENDING OMMITED
xtlogit Catastrophe40 Elderly Self_Treat Out_Priv_Hosp Out_Others ///
Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes Ins_Poor Other_Ins ///
HH_Head_Occup Primary Secondary Tertiary Sick_days Rural HH_Size ///
Capita Housing Pollution Disaster Health_Resource Endemic gdp ///
public GI_adjusted, i(District_Code) or

log close

*** SETTING INPATIENT POPULATION
use "C:_Jaya2008.dta", clear
drop if Inp_LOS == 0
drop if Out_Freq > 0
save "C:_Jaya2008.dta", replace
log using C:_Jaya_inpatient, ///
text replace

*** MULTILEVEL LOGISTIC MODEL
xtset District_Code

*** IMPACT OF HEALTH INSURANCE TOWARDS CATASTROPHIC - DISTRICT ///
*** HEALTH SPENDING OMMITED
xtlogit Catastrophe40 Elderly Self_Treat Out_Priv_Hosp Out_Others ///
Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes Ins_Poor Other_Ins ///
HH_Head_Occup Primary Secondary Tertiary Sick_days Rural HH_Size ///
Capita Housing Pollution Disaster Health_Resource Endemic gdp ///
```

```
public GI_adjusted, i(District_Code) or

log close

*** SETTING RURAL POPULATION
use "C:_Jaya2008.dta", clear
drop if Rural == 0
save "C:_Jaya2008.dta", replace
log using C:_Jaya_rural, ///
text replace

*** MULTILEVEL LOGISTIC MODEL
xtset District_Code

*** IMPACT OF HEALTH INSURANCE TOWARDS CATASTROPHIC - DISTRICT ///
*** HEALTH SPENDING OMMITED
xtlogit Catastrophe40 Elderly Self_Treat Out_Priv_Hosp ///
Out_Others Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes ///
Ins_Poor Other_Ins HH_Head_Occup Primary Secondary Tertiary ///
Sick_days Rural HH_Size Capita Housing Pollution Disaster ///
Health_Resource Endemic gdp public GI_adjusted, i(District_Code) or

log close

*** SETTING URBAN POPULATION
use "C:_Jaya2008.dta", clear
drop if Rural == 1
save "C:_Jaya2008.dta", replace
log using C:_Jaya_urban, ///
text replace

*** MULTILEVEL LOGISTIC MODEL
xtset District_Code

*** IMPACT OF HEALTH INSURANCE TOWARDS CATASTROPHIC - ///
*** DISTRICT HEALTH SPENDING OMMITED
xtlogit Catastrophe40 Elderly Self_Treat Out_Priv_Hosp ///
Out_Others Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes ///
Ins_Poor Other_Ins HH_Head_Occup Primary Secondary Tertiary ///
Sick_days Rural HH_Size Capita Housing Pollution Disaster ///
Health_Resource Endemic gdp public GI_adjusted, i(District_Code) or

log close
```

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*** MULTILEVEL LOGISTIC MODEL
xtset District_Code

log using C:_Jaya, text replace

*** INCIDENCE OF CATASTROPHIC - DISTRICT TOTAL HEALTH SPENDING

xtlogit Catastrophe35 Elderly Self_Treat Out_Priv_Hosp ///
Out_Others Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes ///
Ins_Poor Other_Ins HH_Head_Occup Primary Secondary Tertiary ///
Sick_days Rural HH_Size Capita Housing Pollution Disaster ///
Health_Resource Endemic gdp public GI_adjusted, i(District_Code) or

xtlogit Catastrophe40 Elderly Self_Treat Out_Priv_Hosp ///
Out_Others Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes ///
Ins_Poor Other_Ins HH_Head_Occup Primary Secondary Tertiary ///
Sick_days Rural HH_Size Capita Housing Pollution Disaster ///
Health_Resource Endemic gdp public GI_adjusted, i(District_Code) or

xtlogit Catastrophe45 Elderly Self_Treat Out_Priv_Hosp ///
Out_Others Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes ///
Ins_Poor Other_Ins HH_Head_Occup Primary Secondary Tertiary ///
Sick_days Rural HH_Size Capita Housing Pollution Disaster ///
Health_Resource Endemic gdp public GI_adjusted, i(District_Code) or

log close

*** SENSITIVITY ANALYSIS: MULTILEVEL MIXED EFFECT LOGISTIC, ///
*** AND GLLAMM
xtset District_Code

log using C:_Jaya, text replace

xtmelogit Catastrophe40 Elderly Self_Treat Out_Priv_Hosp Out_Others ///
Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes Ins_Poor Other_Ins ///
HH_Head_Occup Primary Secondary Tertiary Sick_days Rural HH_Size ///
Capita Housing Pollution Disaster Health_Resource Endemic gdp ///
public GI_adjusted || District_Code:, intpoints(30) or

gllamm Catastrophe40 Elderly Self_Treat Out_Priv_Hosp Out_Others ///
Out_Freq Inp_Priv_Hosp Inp_Others Inp_LOS Askes Ins_Poor Other_Ins ///
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HH_Head_Occup Primary Secondary Tertiary Sick_days Rural HH_Size ///
Capita Housing Pollution Disaster Health_Resource Endemic gdp ///
public GI_adjusted, i(District_Code) link(logit) family(binom) ///
nip(30) adapt or

log close

exit
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