BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2021-050565
Article Type:	Original research
Date Submitted by the Author:	02-Mar-2021
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Keywords:	HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, HEALTH ECONOMICS

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Is Indonesia achieving universal health coverage? Evidence from nationally representative data relating insurance coverage; service access and use; and insurer and household health spending.

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Keywords: Indonesia; Universal Health Coverage; UHC; health insurance; health equity; out of pocket health payments

Word count: 4,463

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ABSTRACT

Objectives To analyse the relationship between health need, insurance coverage, access to services, service use, insurance claims and out-of-pocket spending across Indonesia.

Design This study used four different national data sets, namely national socio-economic survey 2018, national census of villages 2018, population health development index 2018, and national insurance records end 2017.

Setting Individual and district level data across the country's 514 districts, representative for Indonesia population.

Participants This study consists of 1,131,825 individual records on the national socio-economic survey and 83,931 village records on the village census.

Primary and secondary outcome measures Primary outcome measures were health need, insurance status, out-of-pocket payments, health service access and use. Secondary outcomes were insurance claims.

Results There is an inverse relationship between health need and all measures of health access and spending, other than insurance coverage. Self-reported possession of health insurance is associated with increased use of services, but also increased out-of-pocket spending, except for the poorest families. Multivariate analysis suggests that limited access to services is the factor most strongly associated with lower service use, lower insurer spending and lower out-of-pocket spending on health, especially for inpatient services. Because access constraints and insurance coverage are both highest in Eastern Indonesia, the region effectively subsidises insurance in wealthier regions.

Conclusions The Indonesian public insurance system protects many poor inpatients from excessive spending. However, others can't benefit because few services are available. To achieve health equity, the Indonesian government needs to address supply side constraints and reduce structural underfunding.

Article summary

Strengths and limitations of this study

- Given Indonesia's extreme geographic, economic and social diversity, our study brings together four large, nationally representative data sets, representative at the level of the country's 514 districts.
- Our analysis pays particular attention to geographical differences in insurance coverage, service availability and health spending; detailed analysis of merged data collected by Indonesian government agencies could help further inform decision-making.
- Some of our findings provide solid quantitative evidence that confirms previous smaller-scale studies, in particular those pointing to the importance of constrained supply in undermining the effectiveness of insurance as a guarantor of access to affordable health care.
- Our study is limited by lack of granular information on health needs and outcomes.
- In addition, the statistics agency was unwilling to release geographic identifiers at levels lower than district for the household survey data, so we were unable to link service access measures at the village or sub-district level.

INTRODUCTION

In 2014, Indonesia, the world's fourth most populous nation, introduced a national health insurance scheme, *Jaminan Kesehatan Nasional*, or JKN. Though the original target -- full coverage by 2019 -- was missed, achieving universal health coverage (UHC) remains a strong political priority for the current government of Indonesia.[1–3] The scheme reports over 220 million participants (July 31st, 2020), 82% of the national population of 268 million,[4] making JKN one of the world's biggest single-payer health insurance schemes.

Participation is compulsory, with premiums paid by employers. The state, which covers premiums for its employees, the poor and the near-poor – pays 69% of all premiums.[4] Non-poor Indonesians in unsalaried jobs – some 30 million people – should pay their own premiums. In practice many do not.[4,5] For the first four years of the programme, monthly premiums started at IDR 25,500 (US$ 1.80), rising to IDR 80,000 (US$ 5.52) for first class service.[6]

Over 2,300 hospitals, 1,700 of them private, accept JKN-funded patients.[7] Broadly, JKN pays for primary care (inpatient and outpatient) through capitation, while hospital care is reimbursed against diagnostic codes.[8–10] Many sophisticated and/or expensive treatments such as hip replacements and heart septal surgery are covered at all premium levels.[11] The combination of low premium and generous coverage has produced annual deficits since the programme's inception.[12,13] The cumulative deficit was 51 trillion rupiah (3,7 billion US$) at the end of 2019.[14]

In a bid to reduce the deficit, premiums were approximately doubled in January 2020, but the Constitutional Court ruled that the increase in contributions violated the right to health, and it was reversed, underlining the politically-charged landscape in which health reform takes place.[6,15] In May 2020, the government again increased the premium.[16]

In accordance with the World Health Organization's vision for UHC,[17] one of the goals of JKN was to increase equitable access to health services without risk of impoverishment, across the nation. This is a particular challenge given Indonesia's exceptional diversity. Over 60% of the population lives in Java, just 6% of the land mass. There are a further 7,000 inhabited islands, with population density ranging from 10/km^2 in Papua and North Kalimantan provinces to 1,400/km^2 in West Java.[18] Income and health needs are similarly diverse; for example 43% of children in East Nusa Tenggara are stunted, compared 9% in Jakarta province.[19]

The Government's most recent Health Sector Review, published five years into the JKN programme, observed that the supply of health services remains a major constraint in many areas.[20] Studies in Indonesia and other countries suggest that health care cumulates in areas with higher income and fewer critical health needs.[2,22–25] This study looks at the relationship between health need, service availability, insurance status and financial protection across Indonesia.

Here, we merge four nationally representative data sources to undertake that analysis. If JKN enables equitable health service access while protecting against impoverishment, we would expect areas with highest health needs to have highest levels of service use and high insurance claims, with limited variation in out-of-pocket spending nationwide. However, given the supply constraints reported in the national health review,[20] we hypothesise that we will find a more complex relationship, as illustrated in Figure 1.

At the aggregate level, we expect areas with more services to report higher claims. At the individual level, we expect that insured service users would spend less out-of-pocket compared with uninsured service users.

METHODS

Data

We used four different datasets, all refering to year-end 2017 or mid 2018. They are:

1. a national socio-economic survey or *Survey Sosial Ekonomi Nasional* (SUSENAS) 2018, a cross-sectional household survey, statistically representative of all districts in Indonesia: 1,131,825 individual records;
2. a national census of villages or *Survei Potensi Desa* (PoDes) 2018, a census of all villages in Indonesia: 83,931 village records;
3. a Population Health Development index or *Indeks Pembangunan Kesehatan Masyarakat* (IPKM) 2018, a compound indicator of health status calculated at the district level, based on data collected in the national health survey (RisKesDas), statistically representative of all districts in Indonesia: 514 district records;
4. national insurance records from the Social Security Agency for health or *Badan Penyelenggara Jaminan Sosial Kesehatan* (BPJS) end 2017, reported at the district level: 514 district records.

In addition, GIS data from StatisticsIndonesia, with 2017 administrative boundaries, were used to generate district and province maps.

Further information about these sources, and the data derived from each, is given in Supplementary file 1. Supplementary file 2 shows the steps followed to merge these different data sets for analysis. All supplementary material, as well as data management and merge codes for reuse, are provided at https://doi.org/10.7910/DVN/2Q37XL.

Measures

Health need

We derived a proxy for health need from the Ministry of Health's 2018 public health index. The index (0-1) includes reproductive, maternal and child and environmental health elements, disease prevalence, and service access. Higher values indicate better community health. We recalculated the index excluding service access, and inverted it (100 – (100*public health index) to indicate district health need.

Insurance status

In SUSENAS 2018, individuals self-report health insurance by type: JKN (subsidised or non-subsidised), district public health insurance scheme, private insurance, or supplementary work place insurance. In the analysis reported here, we classified people as insured if they reported at least one form of health insurance, and also calculated those reporting any public insurance (JKN or district health insurance).

Out-of-Pocket payments

In SUSENAS 2018 data we calculated out-of-pocket payments (OOP) for health by summing household payments to formal health service providers and spending on medicines and medical supports e.g. prostheses. Insurance premiums are excluded. We estimated per capita health spending by dividing all household spending on health by number of household members. Per capita spending on inpatient care was calculated by dividing inpatient spending over the previous 12 months by the number of household members reporting inpatient care in the previous 12 months.

Health service access

We constructed a proxy for constrained access to health services at district level using village census data. For each district, we calculated the percent of villages which have no easy access to: 1) a hospital 2) any inpatient services 3) any one of: any inpatient services, primary health centre, private clinic, private doctor, maternity waiting home, registered midwife, pharmacy.

Region

We grouped provinces into four regions which also share broad economic characteristics, as shown in Table 1 and Supplementary file 7a (see Results, below). From west to east the regions are Sumatera and western islands; Java and Bali; West Nusa Tenggara (NTB), Kalimantan, Sulawesi; and East Nusa Tenggara (NTT), Malukus, Papuas.

Statistical Analysis

We used STATA/MP 16.1 for Mac to perform data management, analysis, and maps configuration. In collapsing data from the individual-level dataset (SUSENAS), we used individual sample weights. For spending variables we calculated median values by district/province/region. For binary variables, we calculated the percentage by district/province/region. No weights were used in collapsing the village level data, since PoDes is a census. When collapsing BPJS data and for population totals, we summed district totals to derive province and regional totals.

We performed descriptive and bivariate analysis of categorical variables, looking first at individual areas of interest (health need, insurance status, service use, insurance claims and out-of-pocket spending). We then proceeded through the associations in the logical framework illustrated in Figure 1, building up a regression model using all salient variables and investigating factors associated first with use of services, then with out-of-pocket spending on health (individual level), and with per capita insurance claims (district level). Analysis files are provided at https://doi.org/10.7910/DVN/2Q37XL.

Ethics

The study involved no primary data collection; ethical review was not necessary. Study funders had no role in the design of the study, nor in analysis or interpretation of the data. The corresponding author had full access to all the data in the study and takes final responsibility for the decision to submit for publication.

Patient and public involvement

No members of the public or patients were involved in this study.

RESULTS

Indonesia's regional diversity in terms of population, health indicators, service use and insurance coverage is illustrated in Table 1. The far eastern region (covering the provinces of East Nusa Tenggara (NTT), Maluku, North Maluku, West Papua and Papua) stands apart from the others in

having the smallest population and the lowest expenditure (including health expenditure) while scoring highest on health needs. The Java/Bali region, in contrast, is most populous, richest, scores lowest on health needs, but has the highest out-of-pocket spending on health.

Table 1 : Demographic and health-related characteristics, by Indonesian region, 2018

Region	Java and Bali	Sumatera & islands	NTB, Kalimantan, Sulawesi	NTT, Maluku, Papua	National
Population	153,549,597	57,559,884	40,537,682	12,583,596	264,230,759
Median per capita monthly expenditure (US$)	61.2	61	60.2	50.1	60.6
Index of health need	33.6	37.1	38.0	44.3	37.7
Illness in last 30 days	32.5	27.7	30.9	27.2	31
Outpatient treatment in last 30 days	16.4	13.1	13.4	13.3	15.1
% of those ill seeking treatment	50.4	47.2	43.4	48.8	48.7
Inpatient treatment, last 12 months	4.9	4.2	5.0	3.5	4.7
JKN coverage, insurer reports	71.97	66.95	72.61	86.97	71.1
JKN coverage, population reports	59.8	61.0	61.3	66.3	60.6
Any health insurance, population reports	64.0	63.9	63.7	66.9	64.1
Median per capita OOP spending on health, last 12 months (US$)	20.4	16.6	15.4	8.9	18

OOP=Out of pocket. JKN=Jaminan Kesehatan Nasional – National Health Insurance. NTB=Nusa Tenggara Barat – West Nusa Tenggara. NTT=Nusa Tenggara Timur – East Nusa Tenggara

While the following section reports data at the regional level, tables giving the same data at a district level are provided in the Supplementary Tables, which can all be found at**:** **https://doi.org/10.7910/DVN/2Q37XL.** We also provide the data underlying the district-level tables in Excel format, which may be imported into statistical software for re-use.

Health status

The index of health need (excluding measures of access) ranges from 23.4 in Gianyar, Bali, to 63.5 in Paniai, Papua. Papua is home to 15 of the 20 districts with poorest health status (See Supplementary file 7b. and Supplementary Table A). Yet Papuans are less than half as likely to report recent symptoms of illness compared with people in Java and Bali; there is a weak inverse relationship between the Ministry of Health's index of health need and self-reported recent illness (Supplementary file 4).

Insurance coverage

We have two sources of data on insurance coverage: individual reports and number of members reported by the insurer. The discrepancies between these will be reported in detail elsewhere. In most areas, the insurer reports higher coverage. Since people's perception of their own insurance cover is more likely to influence health seeking behaviour, we here restrict our analysis to self-reported insurance status,

which are reported in Table 2. Supplementary file 7c shows the diversity at the district level. By most generous cover; 4.4% of Indonesians report more than one source of health insurance. People in poorer households (by non-health consumption) are most likely to say that they are uninsured compared to richest household (42.4% and 26.9% respectively). Poorest household quintiles are also most likely to report subsidised insurance compared to richest household (51.8% and 25.8% respectively). Over a quarter of those in the richest quintile report subsidised insurance (Supplementary file 3).

Table 2 : Insurance Coverage, Claim and Out of Pocket, 2018

	Insurance Coverage				Claims, in US$						Out of Pocket Spending, in US$					
					Average payment per claim		Total payments per registered participant		Average number of claims per 1,000 registered participants		Median annual OOP health spending, per capita		Of households using inpatient care, % reporting no OOP spending on inpatient services		OOP spending on inpatient care per inpatient, among those reporting OOP for inpatient care	
	Uninsured	Subsidised JKN	Independent JKN	Private insurance	Inpatient	Outpatient	Inpatient	Outpatient	Inpatient	Outpatient	Uninsured	Insured	Uninsured	Insured	Uninsured	Insured
Java and Bali	35.97	38.77	19.67	5.6	386.23	22.53	20.58	10.39	53	461	4.24	5.72	24.9	44.0	130.81	109.01
Sumatera & islands	36.1	42.25	17.95	3.7	319.00	20.80	19.68	7.59	62	365	3.36	4.19	32.3	49.5	112.65	80.08
NTB, Kalimantan, Sulawesi	36.26	39.49	21.01	3.24	323.23	22.36	18.08	6.33	56	283	3.20	3.86	25.0	53.9	53.56	58.43
NTT, Maluku, Papua	33.07	53.71	12.29	0.93	270.40	18.82	8.43	2.16	31	115	1.74	1.89	20.3	54.2	46.15	25.44
National	35.90	40.35	19.15	4.6	324.71	21.13	16.69	6.62	50.52	305.92	3.65	4.78	26.0	47.1	109.54	87.21

NTB=Nusa Tenggara Barat – West Nusa Tenggara. NTT=Nusa Tenggara Timur – East Nusa Tenggara
JKN = *Jaminan Kesehatan Nasional* – National Health Insurance
For Claim : Currency conversion average rate for 2017 (US$1=IDR 13,384)
For OOP (Out-of-pocket) : Currency conversion average rate for March 2018 (US$1=IDR 13,760).
* Of households accessing any inpatient care in preceding 12 months

Access to health services and service use

Access to health services and service use varies widely across the country. In five percent of Indonesia's districts, no village has easy access to a hospital, while in 17% of districts all villages have easy access. In household surveys, 4.7% of Indonesians reported using inpatient services in the previous year. At the provincial level, a low of 2.6% of Papuan residents (in the far East) reported using inpatient services, rising to 6.7% in Aceh, in the far West (Table 3, Supplementary file 7d and 7e, and Supplementary Table C).

Table 3 : Access to health services and inpatient service use, by region, 2018

Region	% of villages with easy access to:			No easy access to any formal health services at all	% of population accessing inpatient services in last 12 months
	A hospital	Inpatient services at primary health centre only	Outpatient primary health centre		
Java and Bali	93.1	4.2	91.5	0.5	4.9
Sumatera & islands	71.0	15.0	81.9	6.3	4.2
NTB, Kalimantan, Sulawesi	59.3	21.1	70.4	13.6	5.0
NTT, Maluku, Papua	27.1	20.2	43.5	40.6	3.5
National	68.2	13.9	76.2	11.6	4.7

NTB=Nusa Tenggara Barat – West Nusa Tenggara. NTT=Nusa Tenggara Timur – East Nusa Tenggara

Insurance claims and out-of-pocket spending

As Table 2, Supplementary file 7f and Supplementary Table D show, insurance payments were higher in Java and Bali than in Eastern Indonesia, both on a per-claim and per-participant basis (using the insurer's count of registered participants). In all regions, total claims were between 4.2 and 5.3 times higher in districts classified as cities (*kota,* n=98) compared with largely rural districts (*kabupaten,* n=416).

On the aggregate level, out-of-pocket spending on health was highest in areas where insurance claims were also high (Supplementary file 5). Median household expenditure on health (excluding insurance premia and transport) was 180% higher in Java and Bali than in the eastern provinces. Total out-of-pocket health spending was higher among the insured than the uninsured (Table 2). Some uninsured people reported paying nothing for inpatient care, which in some districts is free to all district residents at public facilities. However, the insured were nearly twice as likely to receive free inpatient care; bills for those that did pay were on average 20% lower than those faced by the uninsured.

Figure 2 shows the numbers receiving inpatient care, and per capita spending per inpatient, by insurance status and wealth (non-health consumption level). Wealthier households are more likely to access inpatient services that poorer households; the difference is most marked among the insured. Proportionately, the rich are less likely to pay nothing for those services, but also less likely to pay high amounts relative to other household consumption. In absolute terms, insured people from wealthy households are the largest consumers of free inpatient care in Indonesia.

Supplementary file 6. summarises the data given in Tables 1-3. The radar graph illustrates inequalities between the different regions using all indicators. The prosperous region Java/Bali with lowest health needs, moderate insurance coverage, and best access to healthcare services, has the highest out-of-pocket, insurance claims, and service use. In contrast, the poorer provinces of Eastern Indonesia (NTT, Malukus, Papuas) have the highest health needs and insurance coverage, but lowest access to healthcare services, subsequently lowest service use, out-of-pocket spending, and insurance claims.

Regression model

Our regression model followed the pathway indicated in Figure 1 for dependent variables including service use, out-of-pocket spending and aggregate insurance claims, looking separately at inpatient and outpatient services.

Compared to the districts with the highest health status, districts with lower health status generally have lower odds of using inpatient service, lower spending on in- and outpatient services, and lower insurance claims. Results for using outpatient service are less pronounced.

Being insured is associated with higher out-of-pocket spending on health services. Use of inpatient services, household and insurer spending on both inpatient and outpatient services are highest in districts with higher health status, controlling for both insurance status and access to services (Table 4). Having

health insurance is associated with 135% higher odds of using inpatient services compared with the uninsured after controlling for district health status and access to services, while among those reporting symptoms in the last month, the odds of using outpatient services increase by a quarter.

	Inpatient Services Only						Outpatient Services					
	Used inpatient services last year		Annual US$ per capita spent on inpatient services		US$ public insurance inpatient claims per insured person (district aggregate)**		Used outpatient services last month, of those reporting symptoms		Monthly US$ per capita spent on outpatient services		Monthly US$ public insurance outpatient claims per insured person (district aggregate)	
	Odds Ratio	p value	Coefficient	p value	Coefficient	p value	Odds Ratio	p value	Coefficient	p value	Coefficient	p value
Constant (Average for reference category)	0.027	<0.0001	34.10	<0.0001	43.36	<0.0001	0.890	<0.0001	0.52	<0.0001	1.39	<0.0001
District health index, in quartiles												
Highest health status	Reference		Reference		Reference				Reference		Reference	
2nd best health	1.017	0.312	-4.44	<0.0001	-4.96	0.043	0.999	0.932	-0.08	<0.0001	-0.37	<0.0001
Middle health status	0.929	0.001	-6.86	<0.0001	-6.19	0.024	1.036	0.031	-0.08	<0.0001	-0.55	<0.0001
2nd worst health	0.893	<0.0001	-12.88	<0.0001	-5.12	0.075	0.960	0.014	-0.15	<0.0001	-0.52	<0.0001
Lowest health status	0.796	<0.0001	-12.87	<0.0001	-7.89	0.015	0.851	<0.0001	-0.16	<0.0001	-0.57	<0.0001
Individual is insured												
No	Reference		Reference						Reference			
Yes	2.348	<0.0001	3.14	<0.0001	n/a		1.252	<0.0001	0.08	<0.0001	n/a	<0.0001
Percentage of villages in district with no easy access to health services*												
All villages have access	Reference		Reference		Reference				Reference		Reference	
up to 5% without access	1.145	<0.0001	-4.81	<0.0001	-24.98	<0.0001	0.882	<0.0001	-0.12	<0.0001	-0.65	<0.0001
>5 to 20% without access	1.008	0.710	-9.65	<0.0001	-27.32	<0.0001	0.839	<0.0001	-0.14	<0.0001	-0.69	<0.0001
>20 to 50% without access	0.872	<0.0001	-12.54	<0.0001	-30.12	<0.0001	0.793	<0.0001	-0.15	<0.0001	-0.69	<0.0001
>50% have no access	0.605	<0.0001	-15.52	<0.0001	-30.92	<0.0001	0.948	0.219	-0.31	<0.0001	-0.73	0.003

*For inpatient analyses, this is restricted to hospitals or health centres with inpatient access only, for outpatient it includes access to any formal health service

** 34/514 districts, including many of the most remote, did not report claims data and are excluded from this model

Table 4 : Use of health services, out-of-pocket spending and aggregate insurance claims – regression model including district health needs index and access to services, and personal insurance status

Constrained access to inpatient services is independently associated with lower use below a threshold at which more than 80% of villages lack easy access; there is a linear reduction in spending by households and insurers with increasingly constrained access. In districts with poorest access, the odds of using inpatient services are around 40% lower than in the best served areas; out-of-pocket spending and insurer spending on inpatient care per registered participant are some 46% and 71% lower

respectively. Monthly spending on outpatient care among those reporting symptoms shows a similar pattern, but dollar amounts are small.

Table 5. shows the same model, with the addition of socio-economic status measured by non-health consumption. Household wealth does not greatly influence use or spending outcomes for outpatient care. While insurance remains associated with higher service use, its independent association with higher out-of-pocket spending disappears for inpatient care. Spending rises sharply with wealth, for both inpatient and outpatient services. Poor access to inpatient services continues to predict low service use and spending below the threshold at which ≥ 80% of villages have easy access.

	Inpatient Services				Outpatient Services			
	Used inpatient services last year		Annual US$ per capita OOP, inpatient services		Used outpatient services last month, of those reporting symptoms		Monthly US$ per capita OOP, outpatient services	
	Odds Ratio	p value	Coefficient	p value	Odds Ratio	p value	Coefficient	p value
Constant (Average for reference category)	0.252	<0.0001	11.03	<0.0001	0.878	<0.0001	0.30	<0.0001
District health index, in quartiles								
Highest health status	Reference		Reference		Reference		Reference	
2nd best health	1.018	0.292	-4.37	<0.0001	1.000	0.983	-0.06	<0.0001
Middle health status	0.929	0.001	-6.94	<0.0001	1.038	0.021	-0.05	0.007
2nd worst health	0.900	<0.0001	-10.96	<0.0001	0.962	0.023	-0.11	<0.0001
Lowest health status	0.806	<0.0001	-9.89	<0.0001	0.854	<0.0001	-0.10	<0.0001
Individual is insured								
No	Reference		Reference		Reference		Reference	
Yes	2.320	<0.0001	-0.06	0.925	1.249	<0.0001	0.04	<0.0001
% of villages in district with no easy access to health services*								
All villages have access	Reference		Reference				Reference	
up to 5% without access	1.181	<0.0001	4.04	<0.0001	0.885	<0.0001	-0.06	<0.0001
>5 to 20% without access	1.039	0.064	-1.11	0.223	0.840	<0.0001	-0.12	<0.0001
>20 to 50% without access	0.894	<0.0001	-5.80	<0.0001	0.793	<0.0001	-0.15	<0.0001
>50% have no access	0.616	<0.0001	-10.22	<0.0001	0.945	0.192	-0.30	<0.0001
Non-health household spending, in quintiles								
Lowest consumption (poorest)	Reference		Reference		Reference		Reference	
2nd lowest consumption	0.955	0.043	4.37	<0.0001	1.007	0.673	0.03	<0.0001
Middle quintile	1.006	0.798	9.56	<0.0001	1.009	0.557	0.11	<0.0001
2nd highest consumption	1.044	0.051	18.04	<0.0001	1.002	0.885	0.18	<0.0001
Highest consumption (richest)	1.142	<0.0001	45.71	<0.0001	1.041	0.009	0.54	<0.0001

*For inpatient analyses, this is restricted to hospitals or health centres with inpatient access only, for outpatient it includes access to any formal health service

Table 5 : Use of health services and out-of-pocket spending – regression model including district health needs index and access to services, personal insurance status and household wealth

DISCUSSION

Our study for the first time integrated data from several large-scale representative surveys, censuses and administrative records collected by national authorities to investigate the progress of Indonesia's ambitious plans to achieve UHC through a mandatory national health insurance scheme, JKN. The integrated data from 2018 allowed us to look at the relationship between health needs, insurance status, health service use and spending at the level of Indonesia's 514 district in JKN's fourth year.

Health insurance is designed to provide protection against impoverishing spending.[17] We hypothesized that this protection may be eroded by uneven distribution of services across Indonesia's geographically and economically diverse regions. However, we expected those with access to both services and insurance to report low out-of-pocket spending.

Our findings confirm empirically the assertion in the national health review,[20] that limited service provision constrains the utility of national health insurance for citizens in parts of the country, particularly in poorer Eastern regions where health needs are greatest. While self-reported possession of health insurance was associated with increased use of services, multivariable analyses suggest that in districts where fewer than 80% of villages have easy access to services, limited access is associated with lower service use, lower insurer spending and lower out-of-pocket spending on health, especially for inpatient services. The findings are in line with earlier work showing that JKN claims per capita for non-communicable diseases are consistently higher in Jakarta province (the national capital) than in largely rural East Nusa Tenggara,[21–23] a difference attributed to differences in supply.[21]

As expected, we found considerable variation in access to health services across Indonesia, with services most restricted in Eastern Indonesia and Kalimantan, as well as in the small islands of the extreme West. While these areas are relatively sparsely populated,[18] their inhabitants suffer the worst health (very probably in part because of poor access to services). In Java and Bali, more than 90% of villages have easy access to a hospital; in contrast, in Papua and Maluku the figure is below 30%. There may also be a discrepancy in the quality of services provided. For example, Sidik et al. reported that paediatric care

in hospitals in eastern Indonesia perform worse than in wealthier regions, in each of the aspects assessed including neonatal care, case management, facilities, emergency care, and access to hospital.[24] The radical decentralisation undertaken by Indonesia since 2001 aimed to empower district governments in these more remote areas to apportion funding (including for health) in ways that better meet local needs,[25] thus reducing inequity. Pre-JKN academic estimates of the cost of meeting basic health needs show significant variation by area (ranging from US$ 15 in Yogyakarta to US$ 48 in rural North Maluku).[26] JKN, however, reverts to a largely centralised "one-size-fits-all" reimbursement model.[1]

Unsurprisingly, we found that at the aggregate level, per capita insurer spending was significantly lower in areas with poorest access to services. In the multivariable model insurer spending per registered JKN participant was also highest in areas with good socio-economic status, highest out-of-pocket spending and lowest health need, confirming the findings from Indonesia and other low and middle income countries.[22,27,28] This suggests cross-subsidisation of more developed areas by the poorest parts of the country, which, unless addressed, is likely to further entrench health inequities.

While health insurance aims to reduce out-of-pocket spending on health, analyses of earlier insurance schemes in Indonesia found that the insured spent more out-of-pocket than the uninsured, particularly in urban areas.[28–30] We expected that the more comprehensive JKN scheme would erode this anomaly. Across the population as a whole it did not; controlling for access to health services and district health index, the insured spent 9% more on inpatient services and 15% more on outpatient services than the uninsured. It is likely that newly-insured patients may be emboldened to seek services which are not fully covered, sometimes because health care providers seek profit by promoting "off-plan" services.[31] This "gateway effect" has been seen in other countries embarking on scale-up of insurance, including China, Ghana, Kenya and Zambia.[32-35] In addition, patients may prefer to pay out-of-pocket for outpatient services, in particular, since they are relatively affordable, perceived as higher quality, and less burdensome in terms of queuing and paperwork.[34–37]

The aggregate increase in spending by insurance status disappears after controlling for household wealth (measured by non-health consumption). This represents an improvement compared with findings of studies conducted in the first years of the scheme,[38] suggesting the poorest households are protected against additional spending when accessing inpatient services (where available). It may also signal a difference in the variety or quality of services offered to poorer users of health insurance.

If we remove need and access from the equation and restrict the analysis to only insured patients who have used inpatient services (Figure 2), we find that the poorest families are least likely to use services. While more than half of the poorest who do get treated pay nothing, 13% use up more than 10% of their monthly non-health budget on inpatient care. By some definitions, this is considered catastrophic;[39,40] it compares with generally low out-of-pocket spending on health in Indonesia compared with other Asian countries, at below 2% of total household spending.[41]

While overall coverage of JKN was high, there were anomalies in the self-reported data. Self-reported insurance coverage falls with socio-economic status (from 76% in the highest quintile to 59% in the lowest), though the government covers premiums for the poor and near-poor, and the insurer reports higher coverage in poorer areas. This suggests some people are unaware that they are registered, or do not fully understand the utility of their health insurance card. Conversely, 26% of respondents in the richest quintile reported state-subsidised insurance, suggesting that subsidised premiums could be better targeted.

Implication for research and practice

Indonesia has made great strides in setting up a public insurance system, and it is effectively protecting many poor families from excessive spending on inpatient care. However, its benefits are limited for the millions of Indonesians – especially those living in areas with greatest health needs – who are unable to benefit from their health insurance because they have extremely limited access to formal health services.

As Turkey – another large, middle-income country aspiring to provide UHC – has found, more equitable access to quality health services is a prerequisite for the increased national equity of welfare the Indonesian government seeks.[42–44] But success in providing wider access to necessary services will be a double-edged sword: fulfilling unmet demand will increase claims on a system that is already deeply in deficit. While the social security agency which administers JKN might thus be reluctant to support expanding services in under-served areas, the supply side is under the control of directly elected district governments. They are more likely to see investment in health service supply as a viable option to generate political popularity and opportunities for patronage.[1]

To avoid crippling JKN with additional debt if service access and thus claims increase, the government may need to: reduce per capita spending in more populous areas; continue on a course adopted in late 2019,[45] increasing revenue through higher premiums for those who can pay them; and/or prioritise coverage to meet the most urgent needs first. All three options are politically unpalatable. The steep rise in out-of-pocket spending by wealth quintile reported here suggests, however, that wealthier families may be both able and willing to absorb higher contributions, allowing funds to be redirected to incentivising supply in peripheral areas, and protecting those most in need.

A greater focus on equity in both supply and health financing would help Indonesia achieve the true aims of Universal Health Coverage: to ensure that all citizens have fair access to basic health services without being pushed into poverty.

Figure 1: Expected relationship of insurance claims and out-of-pocket spending with health need, insurance status, and service availability

Figure 2: Numbers reporting inpatient service use, by insurance status, non-health consumption quintile, and percentage of household consumption spent on inpatient services

Contributors

ABP, EP, AGM conceptualised the study. EP and HS performed the data cleaning and management. ABP, EP, HS, TH performed the data analysis. EP and HS designed the figures. AGM and MOK supervised the project. ABP and EP contributed equally to drafting the manuscript, with input of all authors. All authors have approved the final manuscript.

Funding

Netherlands Universities Foundation for International Cooperation (NUFFIC). Grant number NICHE/ IDN/ 226: CF 9900.

Data sharing statement

The data management and analysis files in Stata format (.do files) are available in the senior author's research repository at https://doi.org/10.7910/DVN/2Q37XL. While the paper reports data at the regional level, in the repository we provide data for each of Indonesia's 514 districts in Supplementary tables, as well as in more easily downloadable Excel format. These are made available by the authors under a CC0 licence, though in view of the work that goes in to this type of data integration, we would appreciate full citation by anyone re-using these resources.

Declaration of interest

We declare no conflict of interest.

Acknowledgements

This study was funded by Netherlands Universities Foundation for International Cooperation (NUFFIC). ABP received scholarship from Indonesia Endowment Fund for Education (LPDP).

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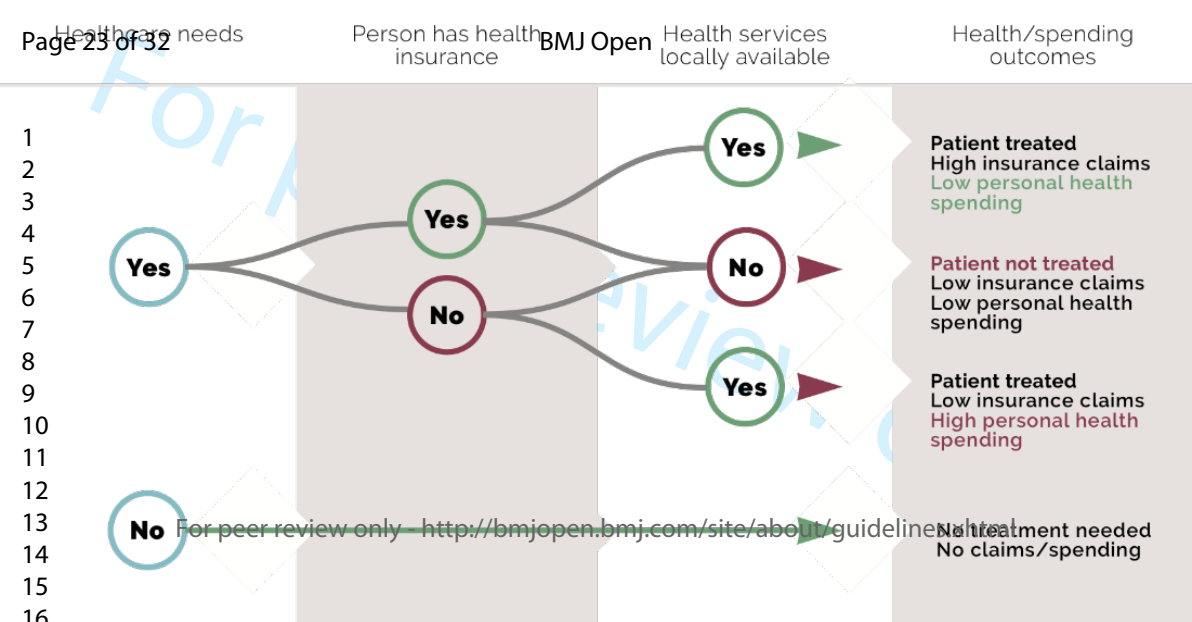
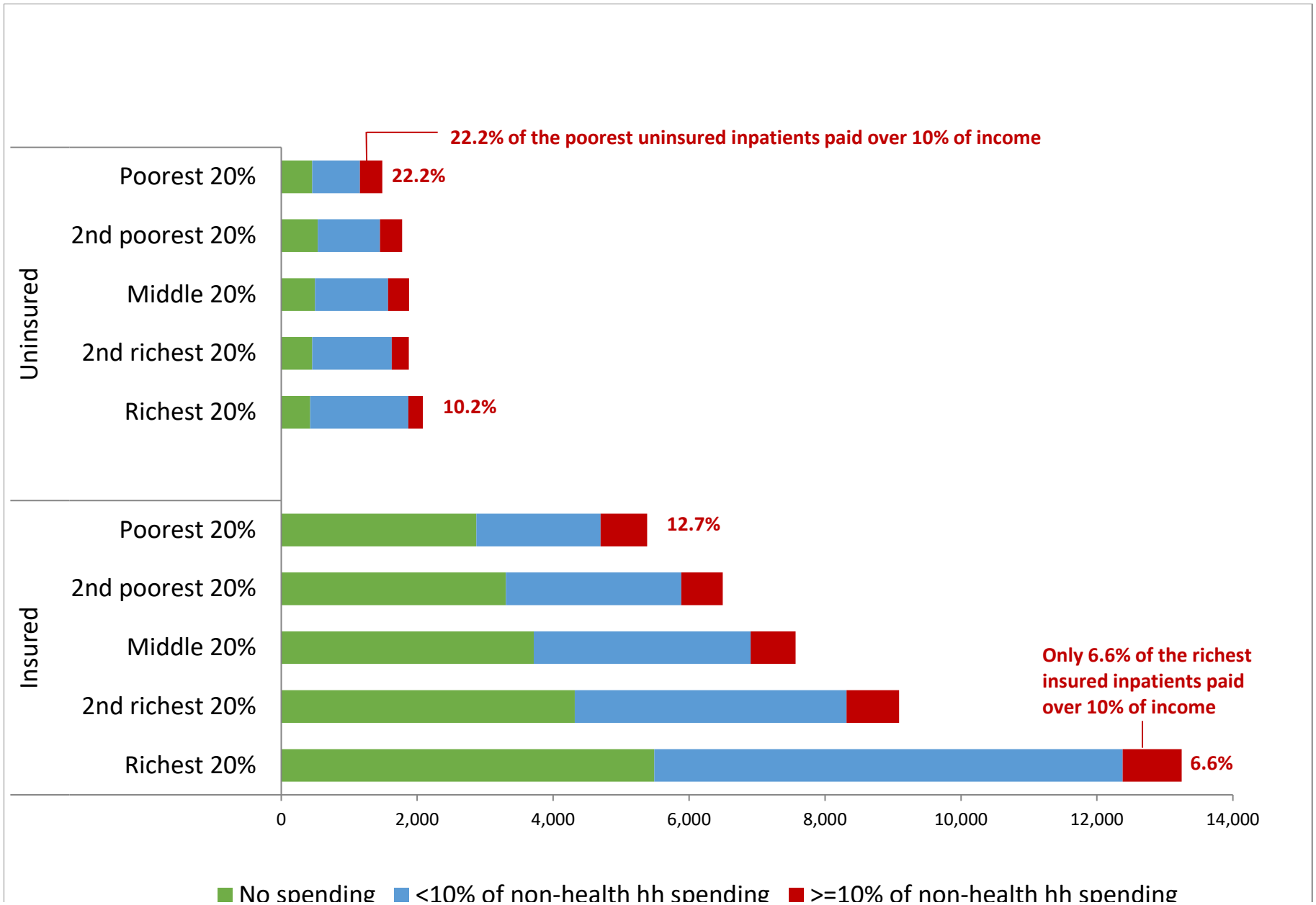



22.2% of the poorest uninsured inpatients paid over 10% of income
Uninsured
Poorest 20%
22.2%
2nd poorest 20%
Middle 20%
2nd richest 20%
Richest 20%
10.2%
Insured
Poorest 20%
12.7%
2nd poorest 20%
Middle 20%
2nd richest 20%
Richest 20%
Only 6.6% of the richest insured inpatients paid over 10% of income
6.6%
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
No spending
<10% of non-health hh spending
>=10% of non-health hh spending

Supplementary material to Pratiwi et al.

Supplementary file 1: Information about the sources

Supplementary file 1: Data included in the merged datasets

Data set acronym	Source	Years	Level of record	Representative level	Number of records	Key information
SUSENAS	BPS	2018	Individual	District	1,131,825	Insurance status, service use, spending on health
PoDes	BPS	2018	Village	Village (census)	83,931	Service availability
IPKM	MoH/ RisKesDas	2018	District	District	514	Health status
BPJS	BPJS	End 2017	District	District	514	Insurance premiums, insurance claims
GIS data	BPS	2017	District	District, Province	514	Administrative boundaries

SUSENAS=*Survey Sosial Ekonomi Nasional*, or National Social and Economic Survey. An annual cross-sectional household survey, statistically representative of all districts in Indonesia. PodDes=*Survei Potensi Desa*, or Village Potential Survey: a periodic census of all villages in Indonesia. IPKM=*Indeks Pembangunan Kesehatan Masyarakat* or Population Health Development Index: Compound indicator of health status calculated at the district level, based on measures and responses collected at household level. MoH=Ministry of Health. RisKesDas=*Riset Kesehatan Dasar*, or Basic Health Research: a five-yearly household survey, statistically representative of all districts in Indonesia. BPJS=*Badan Penyelenggara Jaminan Sosial Kesehatan*, or Social Security Agency for Health. BPJS claims data reported by districts are collated at the national level. BPS=*Badan Pusat Statistik* or National Statistics Agency, also called Statistics Indonesia.

Supplementary file 2: Steps taken to integrate data from different sources

Data types processed	Operation	Output
All	Within each data type, generate variables needed for analysis, and standardise variables needed for merge.	Coded dataset for each data type
SUSENAS	Using weighted data, 1) collapse continuous variables to district/province/regional levels 2) collapse categorical variables. Merge 1) & 2)	3 SUSENAS datasets: district, region, province
PoDes	Collapse to district, provincial and regional levels as above	3 PoDes datasets: district, region, province
IPKM, BPJS	Collapse to provincial and regional levels	3 IPKM and 3 BPJS datasets: district, region, province
All collapsed	Merge all same-level datasets on geographic identifier	Full datasets for district, province and region
Full district and province datasets	Merge in shape files for mapping on geographic identifier	Full 2018 (BPJS 2017) datasets for district and province, with mapping data
SUSENAS	Merge district-level indicators from other datasets back into individual records	Full individual level dataset

SUSENAS=National Social and Economic Survey. PoDes=Village Potential Survey. IPKM=Population Health Development Index. BPJS=Social Security Agency for Health.

Supplementary file 3: Indonesian districts, self-reported insurance coverage by quintile of household non-health consumption, 2018

Each individual in the household is asked whether they have insurance, and which type of insurance they have. Individuals can report more than one type of coverage; here we show only the most generous source of coverage.

Consumption is calculated at the household level. As a proxy for wealth, we sum all non-health-related consumption, and divide it by the number of individuals in the household. This table shows health insurance status by quintiles of wealth.

Source: SUSENAS 2018

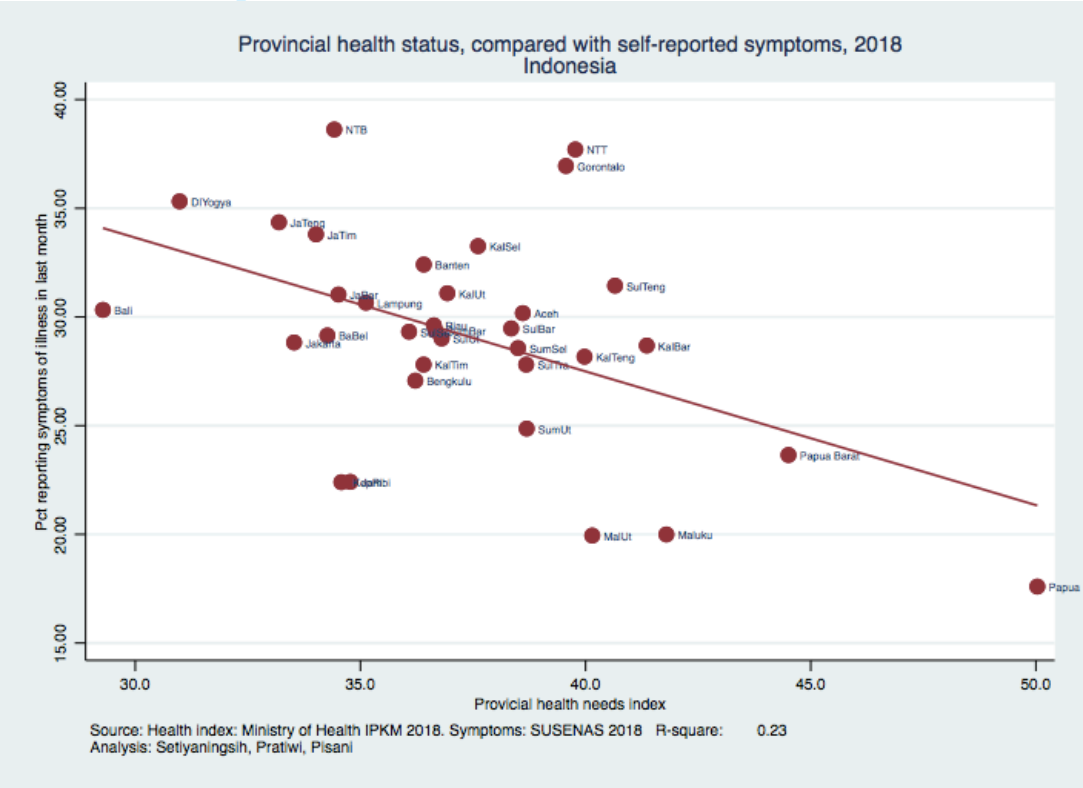
	Uninsured	Subsidised JKN	Independent JKN	Private insurance
Lowest 20%	42.43	51.76	5.26	0.54
Q2	41.21	48.34	9.01	1.43
Middle 20%	38.97	44.68	13.56	2.79
Q4	35.00	39.35	21.15	4.51
Highest 20%	26.85	25.77	36.77	10.61
All, National	35.9	40.35	19.15	4.6

Supplementary material to Pratiwi et al.

Supplementary file 4: Provincial health need vs symptoms

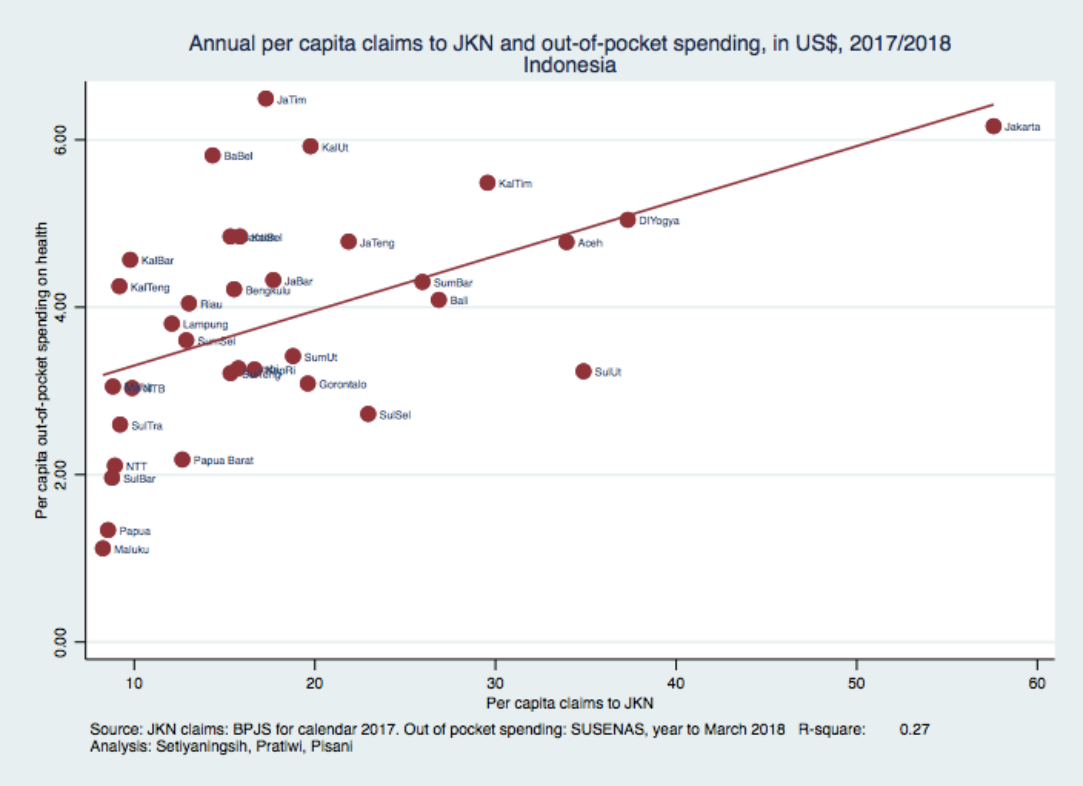
Supplementary file 4: Health needs index compared with self-reported symptoms, Indonesian provinces, 2018

This graph compares the provincial index of health need (RisKesDas excluding service access) with the prevalence of self-reported symptoms in the previous month from SUSENAS household-level data at the provincial level. Provinces with the best health status score lower on the health needs index.

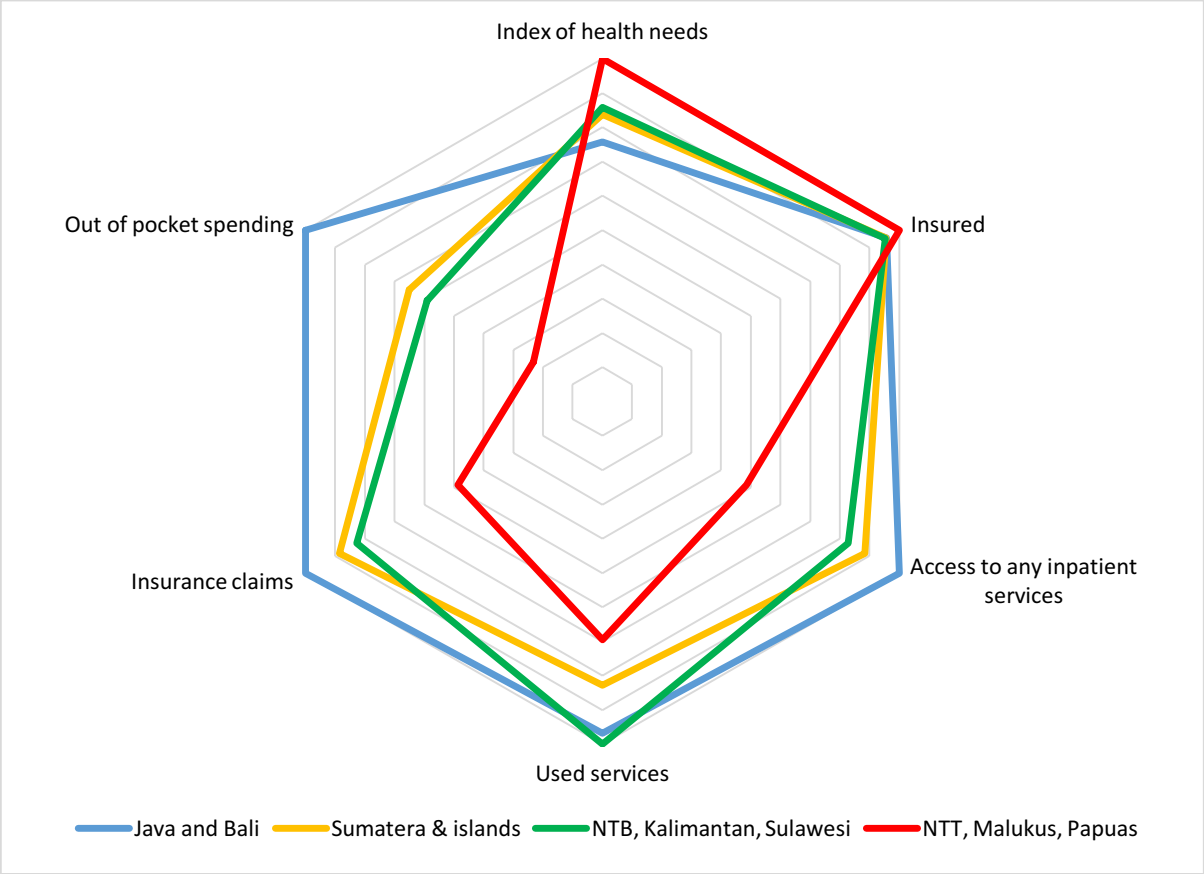


Supplementary file 5: Out of pocket spending on health compared with insurance claims per capita, Indonesian provinces, 2018

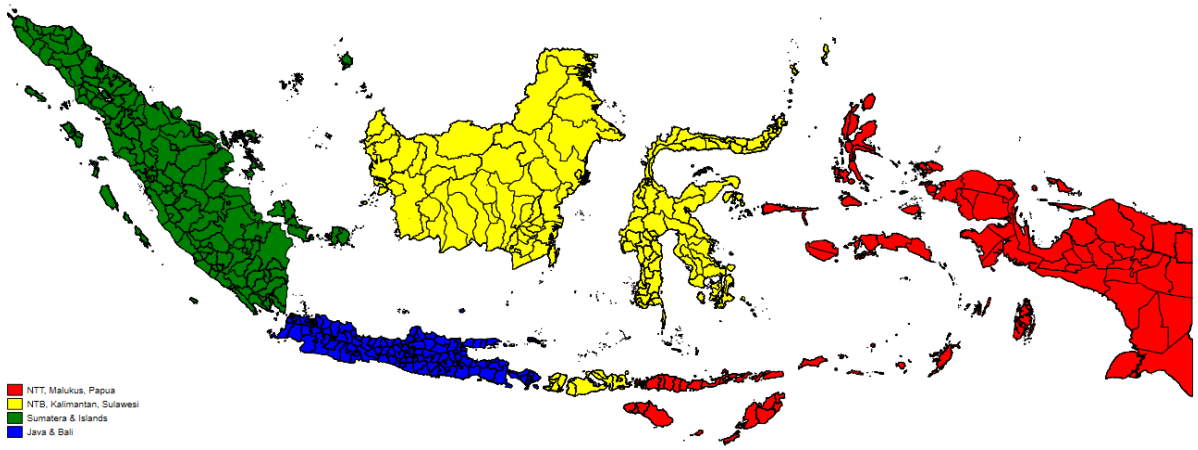
This graph compares the median out of pocket spending on health per capita reported for the year to March 2018 (SUSENAS data) with the per capita public insurance claims for each Indonesian province for calendar 2017. Per capita insurance claims are calculated by summing up all inpatient and outpatient claims to the insurer, and dividing by the provincial population (BPJS). Rupiah totals are converted to US Dollars at the average Bank Indonesia rate for 2017 (US$1 = IDR 13,384) for BPJS data, and the average rate for March 2018 (US$1= IDR 13,760) for SUSENAS data.



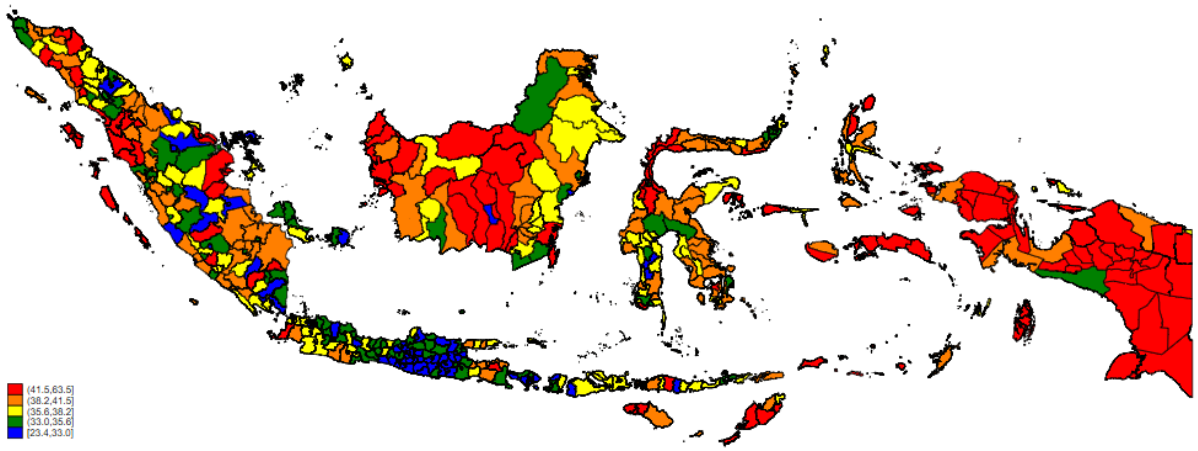
Supplementary file 6: Relative value of key indicators relating to inpatient services, by Indonesian region, 2018



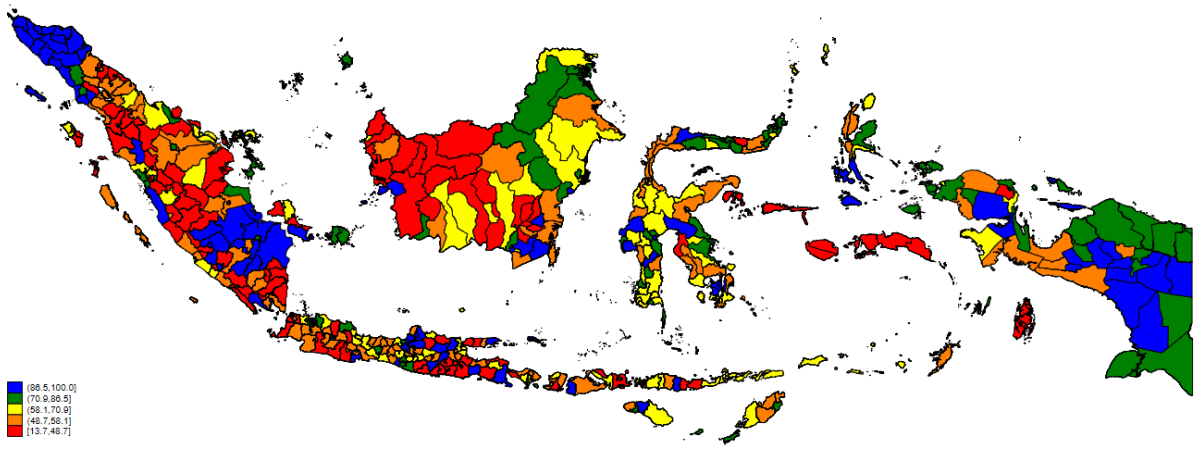
Used services: % of individuals using inpatient services in the last year. Access to any inpatient services: % of villages with easy access to hospital or primary care with inpatient services. Insured: % of individuals reporting any current health insurance Out of pocket spending: Median value of (household spending on inpatient services in the last year, divided by the number of household members reporting inpatient care in the last year). Insurance claims: Total claims to public insurer for inpatient and outpatient care, divided by total registered participants.



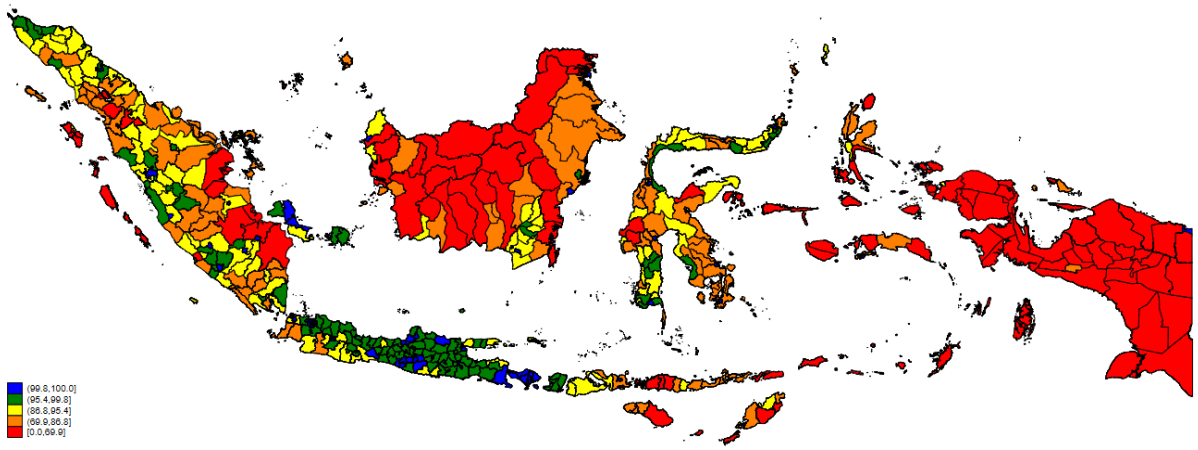
7a: Regional groupings



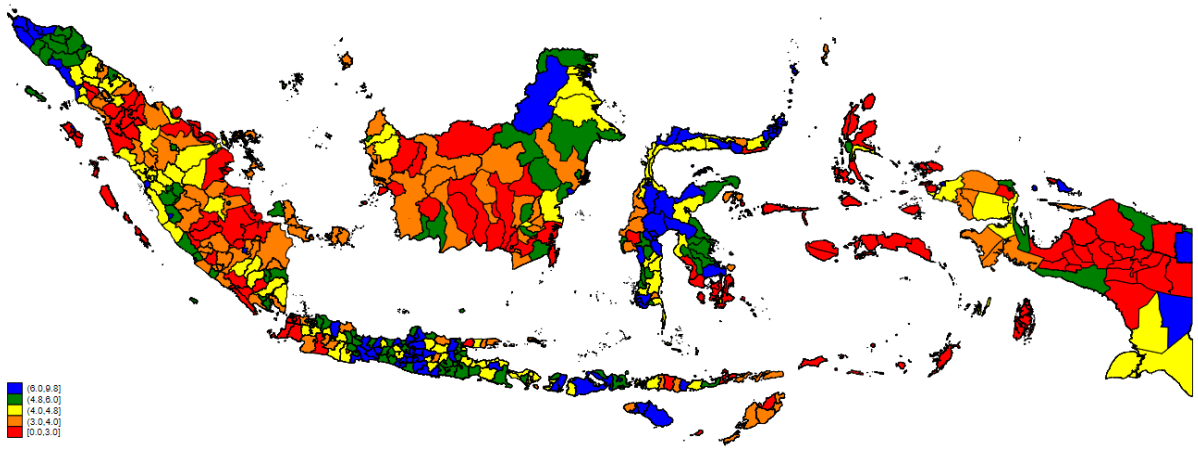
7b: Index of health need, Riskesdas, 2018. Red and orange areas have higher health needs



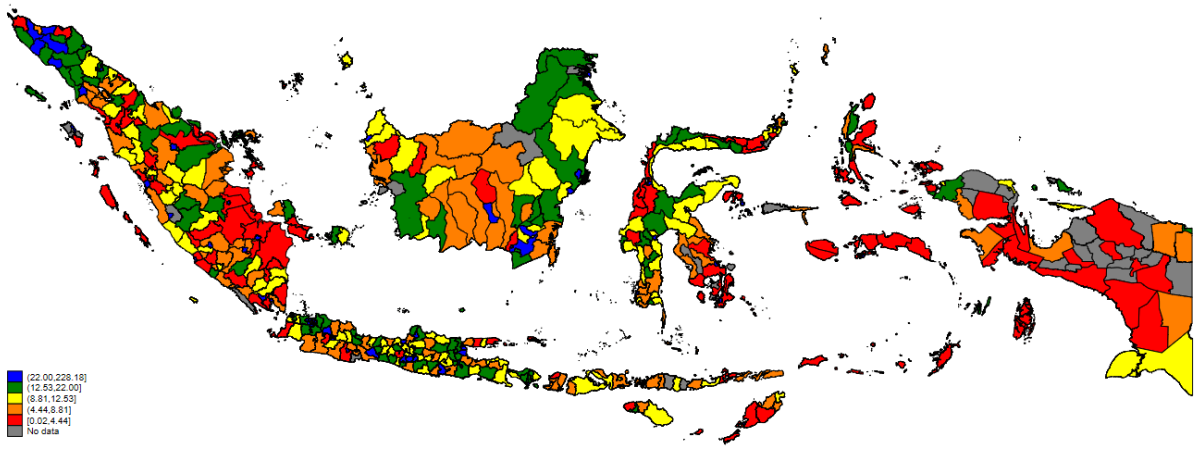
7c: Self-reported insurance status, Susenas, 2018. Red and orange areas have lower self-reported insurance status



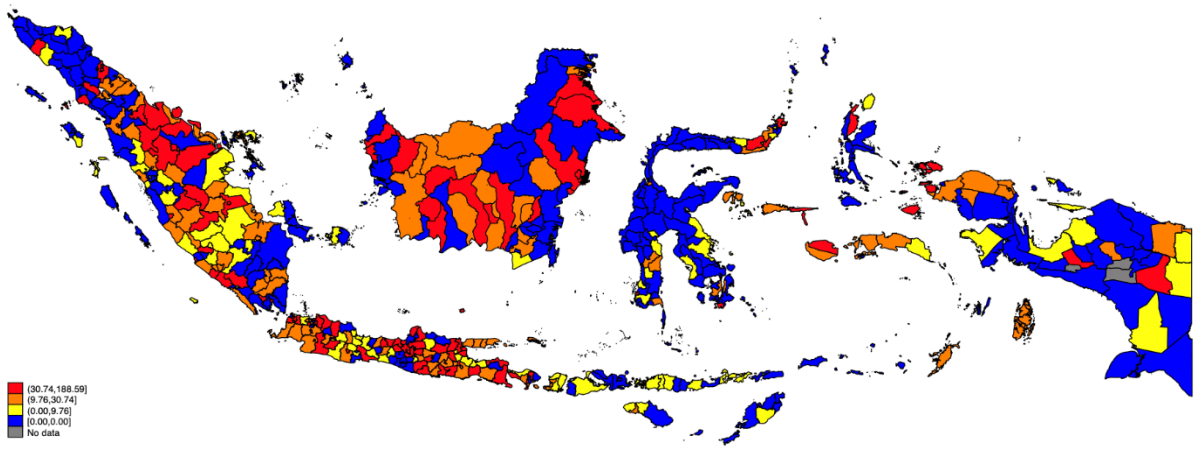
7d: Percentage of villages with easy access to inpatient services, PoDes, 2018. Red and orange areas have more difficult access



7e: Percentage of population reporting use of inpatient services in last 12 months. Susenas, 2018. Red and orange areas report less use of inpatient services



7f: Average annual claim to public insurer for inpatient services, per registered JKN- insured person, in US$. Year to December 2017: Red and orange areas have the lowest claims.



D7: Of those households with inpatients in last 12 months, average household spending on inpatient care, per patient. Susenas 2018. In both the first and second quintiles, spending was zero; these districts are all shown in blue. Red and orange districts have higher household spending on inpatient care.

Supplementary file 7: Key indicators, shown at the district level. Maps D2-D7 shows data by quintiles; the legends give range of the indicator value for each quintile. Figure D1 provides a graphic illustration of the four regional groupings for which data are shown in Tables 1-3, and in Figure C.

BMJ Open

Is Indonesia achieving universal health coverage? Secondary analysis of national data on insurance coverage, health spending and service availability

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2021-050565.R1
Article Type:	Original research
Date Submitted by the Author:	21-Jun-2021
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Primary Subject Heading:	Health policy
Secondary Subject Heading:	Public health
Keywords:	HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, HEALTH ECONOMICS

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Is Indonesia achieving universal health coverage? Secondary analysis of national data on insurance coverage, health spending and service availability

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Keywords: Indonesia; Universal Health Coverage; UHC; health insurance; health equity; out of pocket health payments

Word count: 4,503

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ABSTRACT

Objectives To analyse the relationship between health need, insurance coverage, health service availability, service use, insurance claims and out-of-pocket spending on health across Indonesia.

Design Secondary analysis of nationally representative quantitative data. We merged four national data sets: the national socio-economic survey 2018, national census of villages 2018, population health development index 2018, and national insurance records to end 2017. Descriptive analysis and linear regression was performed.

Setting Indonesia, in the context of one of the world's largest single-payer national health insurance schemes. Data are individual and district level; all are representative for each of the country's 514 districts.

Participants Anonymised secondary data from 1,131,825 individual records in the national socio-economic survey and 83,931 village records in the village census. Aggregate data for 220 million insured citizens.

Primary outcome measures Health service use and out-of-pocket payments, by health need, insurance status and service availability. Secondary outcome: insurance claims.

Results Self-reported national health insurance registration (60.6%) is about 10% lower compared to the insurer's report (71.1%). Insurance coverage is highest in poorer areas, where service provision, and thus service use and health spending, are lowest. Inpatient use is higher among the insured than the uninsured (OR 2.35, controlling for health need and access), and poorer patients are most likely to report free inpatient care (53% in wealth quintile 1 vs 41% in Q5). Insured patients spend more on hospitalisation than the uninsured (OR 3.14), but the difference disappears when controlled for wealth. Lack of services is a major constraint on service use, insurance claims and out-of-pocket spending.

Conclusions The Indonesian public insurance system protects many inpatients from excessive spending. However, others, especially in Eastern Indonesia can't benefit because few services are available. To achieve health equity, the Indonesian government needs to address supply side constraints and reduce structural underfunding.

Article summary

Strengths and limitations of this study

- Our study brings together four large, data sets, representative at the level of each of the country's 514 districts, allowing for exploration of diversity, and for triangulation between data sources.
- Our analysis pays particular attention to geographical differences in insurance coverage, service availability and health spending in one of the world's largest single payer health insurance systems.
- Our study is limited by lack of granular information on health needs and outcomes.
- We were unable to link service access measures at the village or sub-district level because geographic identifiers were not made available.

INTRODUCTION

In 2014, Indonesia, the world's fourth most populous nation, introduced a national health insurance scheme, *Jaminan Kesehatan Nasional*, or JKN. Politicians set an ambitious target: to sign up all Indonesians, and thereby achieve Universal Health Coverage (UHC) by 2019.[1–3] Although the target was missed, great strides have been made towards it, at least in terms of participant registration. The scheme reports over 220 million participants (July 31st, 2020), 82% of the national population of 268 million,[4] making JKN one of the world's biggest single-payer health insurance schemes. In accordance with the World Health Organization's vision for UHC,[5] one of the goals of JKN was to increase equitable access to health services without risk of impoverishment, across the nation. However, the limited availability of health services means that registration of participants may not translate into effective 'coverage'.

Participation is compulsory, with premiums paid by employers. The state, which covers premiums for its employees, the poor and the near-poor – pays 69% of all premiums.[4] Non-poor Indonesians in unsalaried jobs – some 30 million people – should pay their own premiums. In practice many do not.[4,6,7] For the first four years of the programme, monthly premiums started at IDR 25,500 (US$ 1.80), rising to IDR 80,000 (US$ 5.52) for first class service.[8]

Over 2,300 hospitals, 1,700 of them private, accept JKN-funded patients.[9] Broadly, JKN pays for primary care (inpatient and outpatient) through capitation, while hospital care is reimbursed against diagnostic codes.[10–12] Many sophisticated and/or expensive treatments such as hip replacements and heart septal surgery are covered at all premium levels.[13] The combination of low premium and generous coverage has produced annual deficits since the programme's inception.[14,15] The cumulative deficit was 51 trillion rupiah (3,7 billion US$) at the end of 2019.[15]

In a bid to reduce the deficit, premiums were approximately doubled in January 2020, but the Constitutional Court ruled that the increase in contributions violated the right to health, and it was

reversed, underlining the politically-charged landscape in which health reform takes place.[8,16] In May 2020, the government again increased the premium.[17] By September 2020, the insurer's Director General told the press 1.5 million people had opted to lower their premium class.[18,19]

Achieving affordable access to quality health services nationwide is a particular challenge given Indonesia's exceptional diversity. Over 60% of the population lives in Java, just 6% of the land mass. There are a further 7,000 inhabited islands, with population density ranging from 10/km^2 in Papua and North Kalimantan provinces to 1,400/km^2 in West Java.[20] Income and health needs are similarly diverse; for example, 43% of children in East Nusa Tenggara are stunted, compared 9% in Jakarta province.[21]

The Government's most recent Health Sector Review, published five years into the JKN programme, observed that the supply of health services remains a major constraint in many areas.[22] Studies in Indonesia and other countries suggest that health care cumulates in areas with higher income and fewer critical health needs.[2,23,24] This study looks at the relationship between health need, service availability, insurance status and financial protection across Indonesia.

We merge four nationally representative data sources to undertake that analysis. If JKN enables equitable health service access while protecting against impoverishment, we would expect areas with highest health needs to have highest levels of service use and high insurance claims, with limited variation in out-of-pocket spending nationwide. However, given the supply constraints reported in the national health review,[22] we hypothesised that we would find a more complex relationship, as illustrated in Figure 1. At the aggregate level, we expect areas with more services to report higher claims. At the individual level, we expect that insured service users would spend less out-of-pocket compared with uninsured service users.

METHODS

Data

We used four different datasets, all referring to year-end 2017 or mid 2018. They are:

1. a national socio-economic survey or *Survey Sosial Ekonomi Nasional* (SUSENAS) 2018, a cross-sectional household survey, statistically representative of all districts in Indonesia: 1,131,825 individual records;
2. a national census of villages or *Survei Potensi Desa* (PoDes) 2018, a census of all villages in Indonesia: 83,931 village records;
3. a Population Health Development index or *Indeks Pembangunan Kesehatan Masyarakat* (IPKM) 2018, a compound indicator of health status calculated at the district level, based on data collected in the national health survey (RisKesDas), statistically representative of all districts in Indonesia: 514 district records;
4. national insurance records from the Social Security Agency for health or *Badan Penyelenggara Jaminan Sosial Kesehatan* (BPJS) end 2017, reported at the district level: 514 district records.

In addition, GIS data from StatisticsIndonesia, with 2017 administrative boundaries, were used to generate district and province maps.

Further information about these sources, and the data derived from each, is given in Supplementary file 1. Supplementary file 2 shows the steps followed to merge these different data sets for analysis. All supplementary material, as well as data management and merge codes for reuse, are provided at https://doi.org/10.7910/DVN/2Q37XL.

Measures

Health need

We derived a proxy for health need from the Ministry of Health's 2018 public health index. The index (0-1) includes reproductive, maternal and child and environmental health elements, disease prevalence, and service access. Higher values indicate better community health. We recalculated the index excluding service access, and inverted it (100 – (100*public health index) to indicate district health need.

Insurance status

In SUSENAS 2018, individuals self-report health insurance by type: JKN (subsidised or non-subsidised), district public health insurance scheme, private insurance, or supplementary work place insurance. In the analysis reported here, we classified people as insured if they reported at least one form of health insurance, and also calculated those reporting any public insurance (JKN or district health insurance). We calculated insurer-reported coverage by dividing registered participants by district population.

Out-of-Pocket payments

In SUSENAS 2018 data we calculated out-of-pocket payments (OOP) for health by summing household payments to formal health service providers and spending on medicines and medical supports e.g. prostheses. Insurance premiums are excluded. We estimated per capita health spending by dividing all household spending on health by number of household members. Per capita spending on inpatient care was calculated by dividing inpatient spending over the previous 12 months by the number of household members reporting inpatient care in the previous 12 months.

Health service access

We constructed a proxy for restricted physical access to health services at district level using village census data. In PoDes, village heads are asked whether various health services were present in the village, and if not, how easy each was to reach. We classified access to each as restricted if the nearest facility was reported as 'hard' or 'very hard' to reach, and as easy if it was 'easy' or 'moderately easy' to reach, or present in the village. For each district, we then calculated the percent of villages which have no easy access to: 1) a hospital 2) any inpatient services 3) any one of: any inpatient services, primary health centre, private clinic, private doctor, maternity waiting home, registered midwife, pharmacy. In addition, we used SUSENAS data to capture actual realisation of access as self-reported utilisation in inpatient care in the preceding 12 months and outpatient care in the preceding month.

Region

We grouped provinces into four regions which also share broad economic characteristics, as shown in Table 1 and mapped in Supplementary file 3a (see Results, below). From west to east the regions are Sumatera and western islands; Java and Bali; West Nusa Tenggara (NTB), Kalimantan, Sulawesi; and East Nusa Tenggara (NTT), Malukus, Papuas.

Statistical Analysis

We used STATA/MP 16.1 for Mac to perform data management, analysis, and maps configuration. In collapsing data from the individual-level dataset (SUSENAS), we used individual sample weights. For spending variables, we calculated median values by district/province/region. For binary variables, we calculated the percentage by district/province/region. No weights were used in collapsing the village level data, since PoDes is a census. When collapsing BPJS data and for population totals, we summed district totals to derive province and regional totals.

We performed descriptive and bivariate analysis of categorical variables, looking first at individual areas of interest (health need, insurance status, service use, insurance claims and out-of-pocket spending). We then proceeded through the associations in the logical framework illustrated in Figure 1, building up a regression model using all salient variables and investigating factors associated first with use of services, then with out-of-pocket spending on health (individual level), and with per capita insurance claims (district level). Analysis files are provided at https://doi.org/10.7910/DVN/2Q37XL.

Ethics

The study involved no primary data collection. We obtained permission to use the data for research from national agencies: StatisticsIndonesia (SUSENAS and PoDes) and from the Health Social Security Agency (JKN data). All data were anonymised before being provided to us. Study funders had no role in the design of the study, nor in analysis or interpretation of the data.

Patient and public involvement

No members of the public or patients were involved in this study.

RESULTS

Indonesia's regional diversity in terms of population, health indicators, service use and insurance coverage is illustrated in Table 1. The far eastern region (covering the provinces of East Nusa Tenggara (NTT), Maluku, North Maluku, West Papua and Papua) stands apart from the others in having the smallest population and the lowest expenditure (including health expenditure) while scoring highest on health needs. The Java/Bali region, in contrast, is most populous, richest, scores lowest on health needs, but has the highest out-of-pocket spending on health.

Table 1 : Demographic and health-related characteristics, by Indonesian region, 2018

Region	Java and Bali	Sumatera & islands	NTB, Kalimantan, Sulawesi	NTT, Maluku, Papua	National
Population	153,549,597	57,559,884	40,537,682	12,583,596	264,230,759
Median per capita monthly expenditure (US$)	61.2	61	60.2	50.1	60.6
Index of health need	33.6	37.1	38.0	44.3	37.7
Illness in last 30 days	32.5	27.7	30.9	27.2	31
Outpatient treatment in last 30 days	16.4	13.1	13.4	13.3	15.1
% of those ill seeking treatment	50.4	47.2	43.4	48.8	48.7
Inpatient treatment, last 12 months	4.9	4.2	5.0	3.5	4.7
JKN coverage, insurer reports	71.97	66.95	72.61	86.97	71.1
JKN coverage, population reports	59.8	61.0	61.3	66.3	60.6
Any health insurance, population reports	64.0	63.9	63.7	66.9	64.1
Median per capita OOP spending on health, last 12 months (US$)	20.4	16.6	15.4	8.9	18

OOP=Out of pocket. JKN=Jaminan Kesehatan Nasional – National Health Insurance. NTB=Nusa Tenggara Barat – West Nusa Tenggara. NTT=Nusa Tenggara Timur – East Nusa Tenggara

While the following section reports data at the regional level, tables giving the same data at a district level are provided in the Supplementary Tables, which can all be found at**:** **https://doi.org/10.7910/DVN/2Q37XL.** We also provide the data underlying the district-level tables in Excel format, which may be imported into statistical software for re-use.

Health status

The index of health need (excluding measures of access) ranges from 23.4 in Gianyar, Bali, to 63.5 in Paniai, Papua. Papua is home to 15 of the 20 districts with poorest health status (See Supplementary file 3b. and Supplementary Table A). Yet Papuans are less than half as likely to report recent symptoms of

illness compared with people in Java and Bali; there is a weak inverse relationship between the Ministry of Health's index of health need and self-reported recent illness (Supplementary file 4).

Insurance coverage

We have two sources of data on insurance coverage: individual reports and number of members reported by the insurer. The discrepancies between these will be reported in detail elsewhere. Overall, the insurer reported coverage of 71.1%, compared with 60.6% JKN membership reported by the population. Since people's perception of their own insurance cover is more likely to influence health seeking behaviour, we here restrict our analysis to self-reported insurance status, which are reported in Table 2. Supplementary file 3c shows the diversity at the district level, by most generous cover (4.4% of Indonesians report more than one source of health insurance). People in poorer households (by non-health consumption) are most likely to say that they are uninsured compared to richest household (42.4% and 26.9% respectively). However, poorest household quintiles are also most likely to report state-subsidised insurance: 51.8%, compared to 25.8% in the richest households (Supplementary file 5).

Table 2 : Insurance Coverage, Claim and Out of Pocket, 2018

	Insurance Coverage				Claims, in US$						Out of Pocket Spending, in US$					
					Average payment per claim		Total payments per registered participant		Average number of claims per 1,000 registered participants		Median annual OOP health spending, per capita		Of households using inpatient care, % reporting no OOP spending on inpatient services		OOP spending on inpatient care per inpatient, among those reporting OOP for inpatient care	
	Uninsured	Subsidised JKN	Independent JKN	Private insurance	Inpatient	Outpatient	Inpatient	Outpatient	Inpatient	Outpatient	Uninsured	Insured	Uninsured	Insured	Uninsured	Insured
Java and Bali	35.97	38.77	19.67	5.6	386.23	22.53	20.58	10.39	53	461	4.24	5.72	24.9	44.0	130.81	109.01
Sumatera & islands	36.1	42.25	17.95	3.7	319.00	20.80	19.68	7.59	62	365	3.36	4.19	32.3	49.5	112.65	80.08
NTB, Kalimantan, Sulawesi	36.26	39.49	21.01	3.24	323.23	22.36	18.08	6.33	56	283	3.20	3.86	25.0	53.9	53.56	58.43
NTT, Maluku, Papua	33.07	53.71	12.29	0.93	270.40	18.82	8.43	2.16	31	115	1.74	1.89	20.3	54.2	46.15	25.44
National	35.90	40.35	19.15	4.6	324.71	21.13	16.69	6.62	50.52	305.92	3.65	4.78	26.0	47.1	109.54	87.21

NTB=Nusa Tenggara Barat – West Nusa Tenggara. NTT=Nusa Tenggara Timur – East Nusa Tenggara
JKN = *Jaminan Kesehatan Nasional* – National Health Insurance
For Claim : Currency conversion average rate for 2017 (US$1=IDR 13,384)
For OOP (Out-of-pocket) : Currency conversion average rate for March 2018 (US$1=IDR 13,760).
* Of households accessing any inpatient care in preceding 12 months

Availability of health services and service use

Availability of health services and service use varies widely across the country. In five percent of Indonesia's districts, no village has easy access to a hospital, while in 17% of districts all villages have easy access.

In household surveys, 4.7% of Indonesians reported using inpatient services in the previous year. At the provincial level, a low of 2.6% of Papuan residents (in the far East) reported using inpatient services, rising to 6.7% in Aceh, in the far West (Table 3, Supplementary file 3d and 3e, and Supplementary Table C).

Table 3 : Availability of health services and inpatient service use, by region, 2018

Region	% of villages with easy access to:			No easy access to any formal health services at all	% of population accessing inpatient services in last 12 months
	A hospital	Inpatient services at primary health centre only	Outpatient primary health centre		
Java and Bali	93.1	4.2	91.5	0.5	4.9
Sumatera & islands	71.0	15.0	81.9	6.3	4.2
NTB, Kalimantan, Sulawesi	59.3	21.1	70.4	13.6	5.0
NTT, Maluku, Papua	27.1	20.2	43.5	40.6	3.5
National	68.2	13.9	76.2	11.6	4.7

NTB=Nusa Tenggara Barat – West Nusa Tenggara. NTT=Nusa Tenggara Timur – East Nusa Tenggara

Insurance claims and out-of-pocket spending

As Table 2, Supplementary file 3f and Supplementary Table D show, insurance payments were higher in Java and Bali than in Eastern Indonesia, both on a per-claim and per-participant basis (using the insurer's count of registered participants). In all regions, total claims were between 4.2 and 5.3 times higher in districts classified as cities (*kota,* n=98) compared with largely rural districts (*kabupaten,* n=416).

On the aggregate level, out-of-pocket spending on health was highest in areas where insurance claims were also high (Supplementary file 6). Median household expenditure on health (excluding insurance premiums and transport) was 180% higher in Java and Bali than in the eastern provinces. Total out-of-pocket health spending was higher among the insured than the uninsured (Table 2). Some uninsured people reported paying nothing for their inpatient care, which in some districts is free to all district

residents at public facilities. However, the insured were nearly twice as likely to receive free inpatient care; bills for those who did pay were on average 20% lower than those faced by the uninsured.

Figure 2 shows the numbers receiving inpatient care, and per capita spending per inpatient, by insurance status and wealth (non-health consumption level). Wealthier households are more likely to access inpatient services than poorer households; the difference is most marked among the insured. Proportionately, the rich are less likely to pay nothing for those services, but also less likely to pay high amounts relative to other household consumption. In absolute terms, insured people from wealthy households are the largest consumers of free inpatient care in Indonesia.

Supplementary file 7. summarises the data given in Tables 1-3. The radar graph illustrates inequalities between the different regions using all indicators. The prosperous region Java/Bali with lowest health needs, moderate insurance coverage, and best access to healthcare services, consumes most healthcare, and has the highest out-of-pocket spending and insurance claims per capita. In contrast, the poorer provinces of Eastern Indonesia (NTT, Malukus, Papuas) have the highest health needs and insurance coverage, but lowest access to healthcare services, and thus the lowest service use, out-of-pocket spending, and insurance claims.

Regression model

Our regression model followed the pathway indicated in Figure 1 for dependent variables including service use, out-of-pocket spending and aggregate insurance claims, looking separately at inpatient and outpatient services.

Compared to the districts with the highest health status, districts with lower health status generally have lower odds of using inpatient service, lower spending on in- and outpatient services, and lower insurance claims. Results for using outpatient service are less pronounced.

Being insured is associated with higher out-of-pocket spending on health services. Use of inpatient services, household and insurer spending on both inpatient and outpatient services are highest in districts with higher health status, controlling for both insurance status and access to services (Table 4). Having health insurance is associated with 135% higher odds of using inpatient services compared with the uninsured after controlling for district health status and access to services, while among those reporting symptoms in the last month, the odds of using outpatient services increase by a quarter.

Table 4 : Use of health services, out-of-pocket spending and aggregate insurance claims – regression model including district health needs index and access to services, and personal insurance status

	Inpatient Services Only						Outpatient Services					
	Used inpatient services last year		Annual US$ per capita spent on inpatient services		US$ public insurance inpatient claims per insured person (district aggregate)**		Used outpatient services last month, of those reporting symptoms		Monthly US$ per capita spent on outpatient services		Monthly US$ public insurance outpatient claims per insured person (district aggregate)	
	Odds Ratio	p value	Coefficient	p value	Coefficient	p value	Odds Ratio	p value	Coefficient	p value	Coefficient	p value
Constant (Average for reference category)	0.027	<0.0001	34.10	<0.0001	43.36	<0.0001	0.890	<0.0001	0.52	<0.0001	1.39	<0.0001
District health index, in quartiles												
Highest health status	Reference		Reference		Reference				Reference		Reference	
2nd best health	1.017	0.312	-4.44	<0.0001	-4.96	0.043	0.999	0.932	-0.08	<0.0001	-0.37	<0.0001
Middle health status	0.929	0.001	-6.86	<0.0001	-6.19	0.024	1.036	0.031	-0.08	<0.0001	-0.55	<0.0001
2nd worst health	0.893	<0.0001	-12.88	<0.0001	-5.12	0.075	0.960	0.014	-0.15	<0.0001	-0.52	<0.0001
Lowest health status	0.796	<0.0001	-12.87	<0.0001	-7.89	0.015	0.851	<0.0001	-0.16	<0.0001	-0.57	<0.0001
Individual is insured												
No	Reference		Reference						Reference			
Yes	2.348	<0.0001	3.14	<0.0001	n/a		1.252	<0.0001	0.08	<0.0001	n/a	<0.0001
Percentage of villages in district with no easy access to health services*												
All villages have access	Reference		Reference		Reference				Reference		Reference	
up to 5% without access	1.145	<0.0001	-4.81	<0.0001	-24.98	<0.0001	0.882	<0.0001	-0.12	<0.0001	-0.65	<0.0001
>5 to 20% without access	1.008	0.710	-9.65	<0.0001	-27.32	<0.0001	0.839	<0.0001	-0.14	<0.0001	-0.69	<0.0001
>20 to 50% without access	0.872	<0.0001	-12.54	<0.0001	-30.12	<0.0001	0.793	<0.0001	-0.15	<0.0001	-0.69	<0.0001
>50% have no access	0.605	<0.0001	-15.52	<0.0001	-30.92	<0.0001	0.948	0.219	-0.31	<0.0001	-0.73	0.003

*For inpatient analyses, this is restricted to hospitals or health centres with inpatient access only, for outpatient it includes access to any formal health service

** 34/514 districts, including many of the most remote, did not report claims data and are excluded from this model

Restricted geographical access to inpatient services is independently associated with lower hospitalisation in districts where more than 20% of villages report restricted access to such services; there is a linear reduction in spending by households and insurers with increasingly constrained access. In districts with poorest access, the odds of using inpatient services are around 40% lower than in the best served districts; out-of-pocket spending and insurer spending on inpatient care per registered participant are 46% and 71% lower respectively. Monthly spending on outpatient care among those reporting symptoms shows a similar pattern, but dollar amounts are small.

Table 5 shows the same model, with the addition of socio-economic status measured by non-health consumption. Household wealth does not greatly influence use or spending outcomes for outpatient care. While insurance remains associated with higher service use, its independent association with higher out-of-pocket spending disappears for inpatient care. Spending rises sharply with wealth, for both inpatient and outpatient services. Restricted geographic access to inpatient services continues to predict low service use and spending in districts where over 20% of villages report restricted access.

Table 5 : Use of health services and out-of-pocket spending – regression model including district health needs index and access to services, personal insurance status and household wealth

	Inpatient Services				Outpatient Services			
	Used inpatient services last year		Annual US$ per capita OOP, inpatient services		Used outpatient services last month, of those reporting symptoms		Monthly US$ per capita OOP, outpatient services	
	Odds Ratio	p value	Coefficient	p value	Odds Ratio	p value	Coefficient	p value
Constant (Average for reference category)	0.252	<0.0001	11.03	<0.0001	0.878	<0.0001	0.30	<0.0001
District health index, in quartiles								
Highest health status	Reference		Reference		Reference		Reference	
2nd best health	1.018	0.292	-4.37	<0.0001	1.000	0.983	-0.06	<0.0001
Middle health status	0.929	0.001	-6.94	<0.0001	1.038	0.021	-0.05	0.007
2nd worst health	0.900	<0.0001	-10.96	<0.0001	0.962	0.023	-0.11	<0.0001
Lowest health status	0.806	<0.0001	-9.89	<0.0001	0.854	<0.0001	-0.10	<0.0001
Individual is insured								
No	Reference		Reference		Reference		Reference	
Yes	2.320	<0.0001	-0.06	0.925	1.249	<0.0001	0.04	<0.0001
% of villages in district with no easy access to health services*								
All villages have access	Reference		Reference				Reference	
up to 5% without access	1.181	<0.0001	4.04	<0.0001	0.885	<0.0001	-0.06	<0.0001
>5 to 20% without access	1.039	0.064	-1.11	0.223	0.840	<0.0001	-0.12	<0.0001
>20 to 50% without access	0.894	<0.0001	-5.80	<0.0001	0.793	<0.0001	-0.15	<0.0001
>50% have no access	0.616	<0.0001	-10.22	<0.0001	0.945	0.192	-0.30	<0.0001
Non-health household spending, in quintiles								
Lowest consumption (poorest)	Reference		Reference		Reference		Reference	
2nd lowest consumption	0.955	0.043	4.37	<0.0001	1.007	0.673	0.03	<0.0001
Middle quintile	1.006	0.798	9.56	<0.0001	1.009	0.557	0.11	<0.0001
2nd highest consumption	1.044	0.051	18.04	<0.0001	1.002	0.885	0.18	<0.0001
Highest consumption (richest)	1.142	<0.0001	45.71	<0.0001	1.041	0.009	0.54	<0.0001

*For inpatient analyses, this is restricted to hospitals or health centres with inpatient access only, for outpatient it includes access to any formal health service

DISCUSSION

Our study for the first time integrated data from several large-scale representative surveys, censuses and administrative records collected by national authorities to investigate Indonesia's progress towards UHC through a mandatory national health insurance scheme, JKN. The integrated data from 2018 allowed us to look at the relationship between health needs, insurance status, health service use and insurer and patient spending at the level of Indonesia's 514 district in JKN's fourth year. While the insurer reported that 71% of the population were JKN members, only 61% of citizens in a nationally representative household survey reported being insured by JKN. Surprisingly, 26% of respondents in the richest quintile reported state-subsidised insurance, suggesting that subsidised premiums could be better targeted. Further, self-reported insurance coverage falls with socio-economic status (from 76% in the highest wealth quintile to 62% in the lowest). Many of the 38% of the people in poorest households who report being uninsured likely qualify for subsidised insurance. Possibly, the government is paying premiums for some poorer people without their knowledge. Additionally, people may report being uninsured simply because insurance is not of any use to them, because there are no health services within easy reach. Even in the self-reported data, however, JKN coverage is highest in the NTT, Maluku, Papua region, where it correlates inversely with physical access to services. In this eastern part, only 27% of villages have easy access to a hospital in contrast with 93% in Java and Bali. These findings mirror those of Nandi et al (2018), who reported that poorer areas of India have higher insurance enrolment compared with wealthier areas, but on the contrary lower availability of hospitals.[24] These data call into question the use of participant registration as a measure of UHC, and raise the possibility that equating registration with coverage is more useful for political optics than for effective programme evaluation.[25]

Our findings confirm empirically the assertion in the national health review[20] that limited service provision constrains the utility of national health insurance for citizens in parts of the country, particularly in poorer Eastern regions where health needs are greatest. While self-reported possession of health insurance was generally associated with increased use of services, multivariable analyses suggest that in districts where over 20% of villages have restricted access to services, this constrained

service availability is associated with lower service use, lower insurer spending and lower out-of-pocket spending on health, especially for inpatient services. In short, more money is spent (by both the insurer and patients) in places where there are more health services to spend it on. These are also the areas with the lowest health needs, probably in part because of the access to services. Studies in other low and middle income countries report similar findings.[26–29] Our study is also in line with earlier work in Indonesia, showing that JKN claims per capita for non-communicable diseases are consistently higher in Jakarta province (the national capital) than in largely rural East Nusa Tenggara,[30,31] a difference attributed to differences in supply.[30]

The radical decentralisation undertaken by Indonesia since 2001 aimed to empower district governments in these more remote areas to apportion funding (including for health) in ways that better meet local needs,[32] thus reducing inequity. Pre-JKN academic estimates of the cost of meeting basic health needs show significant variation by area (ranging from US$ 15 in Yogyakarta to US$ 48 in rural North Maluku).[33] JKN, however, reverts to a largely centralised "one-size-fits-all" reimbursement model.[1] In Eastern Indonesia restricted service availability appears to restrict spending, leading to low reimbursement and leaving the premia paid on behalf of the poorest citizens in those areas available to subsidise health care for citizens in richer areas, where health services are more plentiful.

Having said that, it appears that for many poorer families who can access services and who are insured, JKN provides effective protection against impoverishing spending. Hospitalisation was far more common among the insured than the uninsured at all income levels, suggesting that insurance removed a significant barrier to use of inpatient services. Despite this, out-of-pocket spending remained higher among the insured, as was the case in pre-JKN days.[27,34,35] Controlling for access to health services and district health index, the insured spent 9% more on inpatient services and 15% more on outpatient services than the uninsured. It is likely that newly-insured patients may be emboldened to seek services which are not fully covered, sometimes because health care providers seek profit by promoting "off-plan" services, including those not covered by the scheme, including branded medicines, laboratory tests, and consultation with specialist doctors without referral.[36–38] This "gateway effect" has been seen in

other countries embarking on scale-up of insurance, including China, Ghana, Kenya, and India.[28,39–41] In addition, patients may prefer to pay out-of-pocket for outpatient services, in particular, since they are relatively affordable, perceived as higher quality, and less burdensome in terms of queuing and paperwork.[41–44]

Findings from other low and middle income countries about the financial protection provided by national health insurance schemes are mixed.[36,44] Using spending of 10% of a household's monthly per capita non-health budget on inpatient care as a measure of the "catastrophic" spending health insurance is designed to avoid, Indonesia appears to be performing relatively well, at least for those who use services. (Like insurance registration, low out of pocket spending is not a measure of financial protection in areas where there are no services to spend money on). Looking just at those who reported using inpatient services, 87 percent of insured inpatients in the poorest income quintile spent less than 10% of their non-health budget on hospitalisation, and for over half, the care was completely free. This compares with the national health insurance in Zimbabwe, also around 87% in the poorest quintile protected from catastrophic health expenditure.[45]

Implication for research and practice

Indonesia has made great strides since 2014 in setting up a public health insurance system. By 2018 it was effectively protecting many poor families from excessive spending on inpatient care. However, its benefits remained limited for the millions of Indonesians – especially those living in areas with greatest health needs – who were unable to benefit from their health insurance because they have extremely limited access to formal health services.

A greater focus on equity in both supply and health financing would help Indonesia achieve the true aims of universal health coverage: to ensure that all citizens have fair access to basic health services without being pushed into poverty. This would require greater investments in health overall. Compared with other countries in the region Indonesia's public investment in health is relatively low, at 2.9% of

GDP compared with 3.8% in Thailand and an average of 5% in East Asia and Pacific (not including high income countries).[46] If the government had the fiscal space to investment the regional average, a shift to financing public health provision out of general taxation (as suggested by Yates[47] and Fenny et al.[48]) might be feasible. However, given Indonesia's inefficient tax system and low tax yield, more sustainable solutions might include hypothecated taxes on luxury goods, or reverting to an earlier system which made greater use of local government subsidies in wealthier areas.[49,50] Our study, which shows a substantial increase in out of pocket spending by wealth, suggest that progressive contributions based on income, suggested by Reeves et al.,[50] may also be a viable approach. Finally, the politically unpalatable option of prioritising reimbursement to meet the most urgent needs of the poorest citizens could be considered.

Health equity can not be achieved only by finding a sustainable financing model to pay for service provision. Indonesia also needs to invest substantially in improving the supply of services in many areas of the country. The directly elected district governments responsible for service provision could be incentivised to invest more in this area, since it may be a viable way of generating political popularity, while providing opportunities for local patronage.[1] But success in providing wider access to necessary services will be a double-edged sword: fulfilling unmet demand will increase claims on JKN, which is already deeply in deficit.

Limitations

Detailed analysis of merged data collected by Indonesian government agencies could help further inform decision-making. Our study is limited by lack of granular information on health needs and outcomes. In addition, the statistics agency was unwilling to release geographic identifiers at levels lower than district for the household survey data, so we were unable to link service access measures at the village or sub-district level. Our dataset nonetheless allows for the most granular analysis to date across a wide range of health service use and spending-related measures in one of the world's most diverse nations. It suffers from the common constraint of using secondary, quantitative data -- the inability to explain outliers, or

to pinpoint the political, economic and social factors that explain why more has not yet been done to address inequity within JKN.

Future research

Our analysis was cross-sectional, so does not reflect the dynamism of the situation. However, two of the datasets -- SUSENAS and JKN claims data -- are available annually, so many elements of this analysis could be repeated in an investigation of trends over time. We believe this might provide insights into which elements of inequity are temporal and which are structural. The data could also be used in studies exploring in greater detail the differences in service use between public and private providers, particularly in relation to insurance status and out-of-pocket spending.

Figure 1: Expected relationship of insurance claims and out-of-pocket spending with health need, insurance status, and service availability

Figure 2: Numbers reporting inpatient service use, by insurance status, non-health consumption quintile, and percentage of household consumption spent on inpatient services

Contributors

ABP, EP, MOK, and AGM conceptualised the study. EP and HS performed the data cleaning and management. ABP, EP, HS, TH performed the data analysis. EP and HS designed the figures. AGM and MOK supervised the project. ABP, EP, HS, MOK, TH contributed to drafting the manuscript, with input of AGM. All authors have approved the final manuscript.

Funding

Netherlands Universities Foundation for International Cooperation (NUFFIC). Grant number NICHE/ IDN/ 226: CF 9900.

Data sharing statement

The data management and analysis files in Stata format (.do files) are available in the senior author's research repository at https://doi.org/10.7910/DVN/2Q37XL. While the paper reports data at the regional level, in the repository we provide data for each of Indonesia's 514 districts in Supplementary tables, as well as in more easily downloadable Excel format. These are made available by the authors under a CC0 licence, though in view of the work that goes in to this type of data integration, we would appreciate full citation by anyone re-using these resources.

Declaration of interest

We declare no conflict of interest.

Acknowledgements

This study was funded by Netherlands Universities Foundation for International Cooperation (NUFFIC). ABP received scholarship from Indonesia Endowment Fund for Education (LPDP). We thank D.L. Dick Willems and R.S. Padmawati for valuable input and support.

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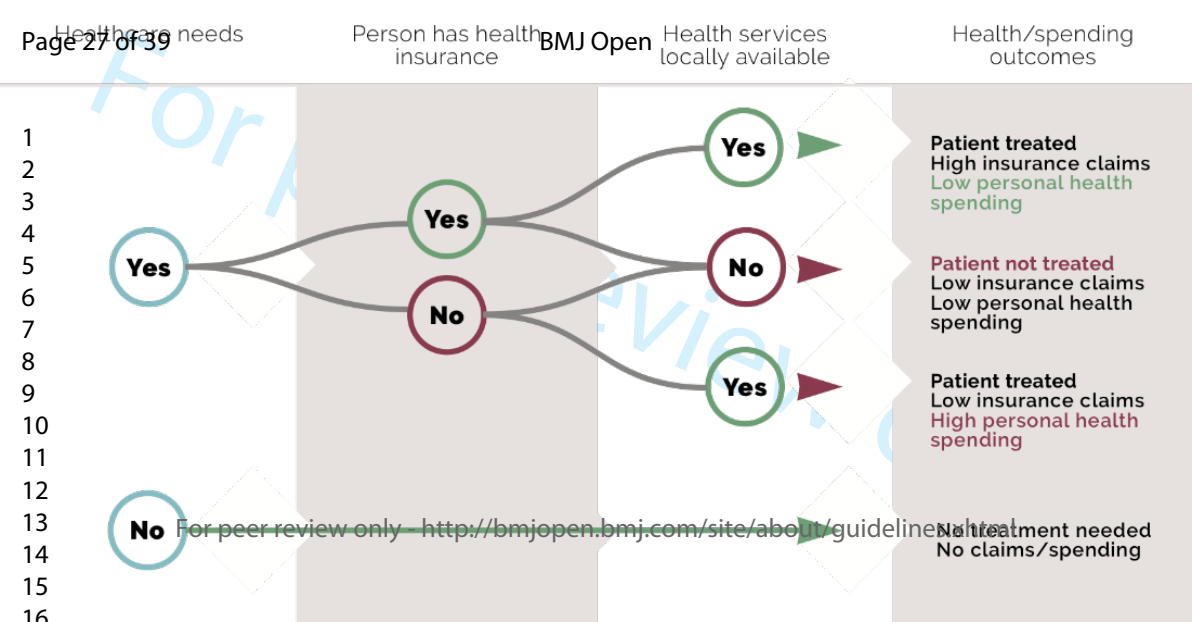
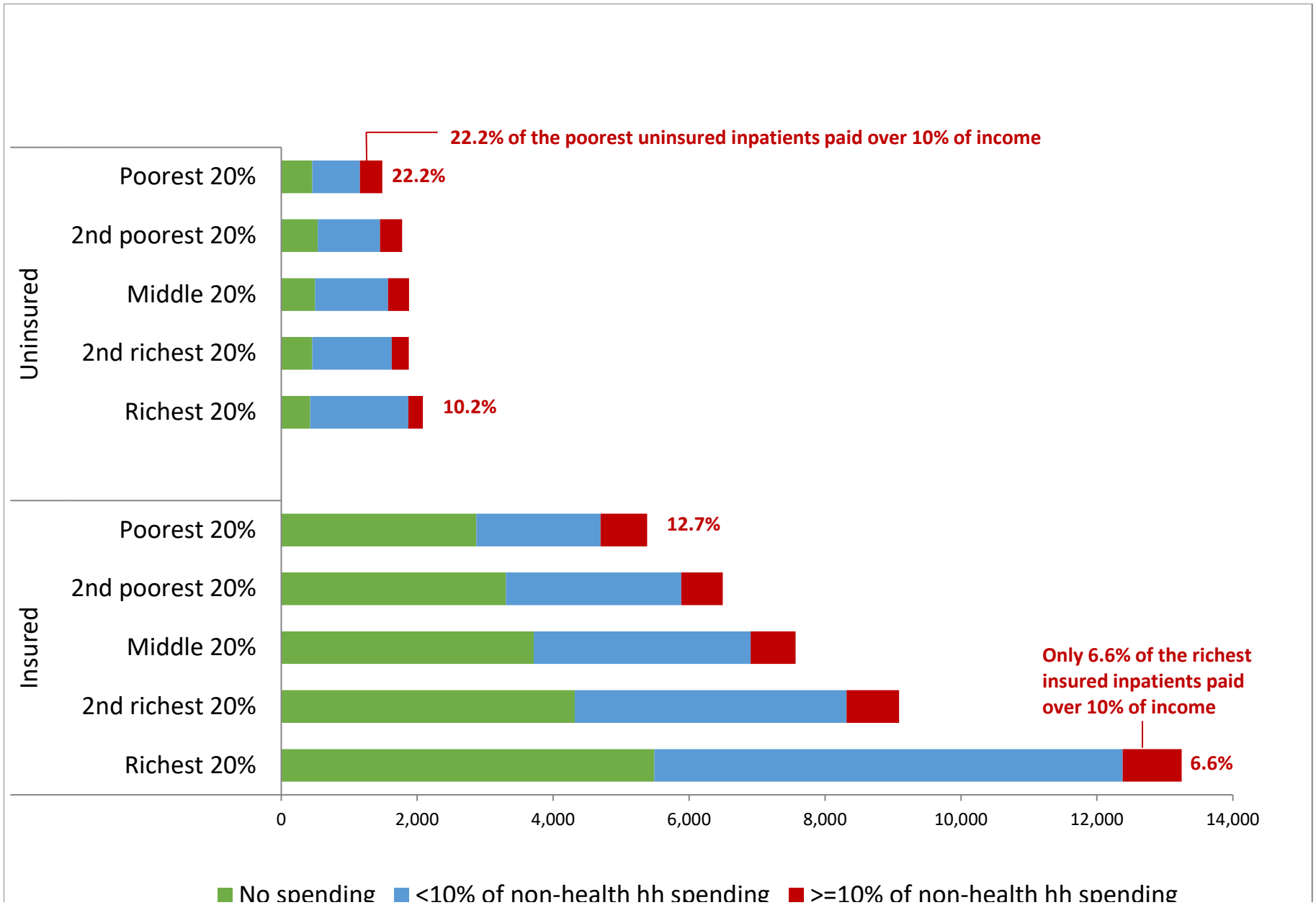



22.2% of the poorest uninsured inpatients paid over 10% of income
Uninsured
Poorest 20%
22.2%
2nd poorest 20%
Middle 20%
2nd richest 20%
Richest 20%
10.2%
Insured
Poorest 20%
12.7%
2nd poorest 20%
Middle 20%
Only 6.6% of the richest insured inpatients paid over 10% of income
2nd richest 20%
Richest 20%
6.6%
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
No spending
<10% of non-health hh spending
>=10% of non-health hh spending

Supplementary material to Pratiwi et al.

Supplementary file 1: Information about the sources

Supplementary file 1: Data included in the merged datasets

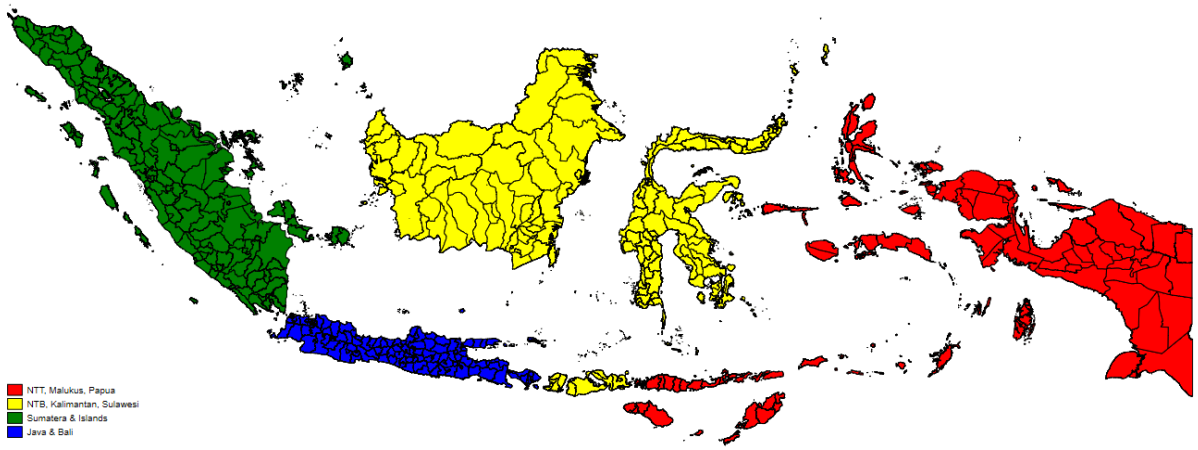
Data set acronym	Source	Years	Level of record	Representative level	Number of records	Key information
SUSENAS	BPS	2018	Individual	District	1,131,825	Insurance status, service use, spending on health
PoDes	BPS	2018	Village	Village (census)	83,931	Service availability
IPKM	MoH/ RisKesDas	2018	District	District	514	Health status
BPJS	BPJS	End 2017	District	District	514	Insurance premiums, insurance claims
GIS data	BPS	2017	District	District, Province	514	Administrative boundaries

SUSENAS=*Survey Sosial Ekonomi Nasional*, or National Social and Economic Survey. An annual cross-sectional household survey, statistically representative of all districts in Indonesia. PodDes=*Survei Potensi Desa*, or Village Potential Survey: a periodic census of all villages in Indonesia. IPKM=*Indeks Pembangunan Kesehatan Masyarakat* or Population Health Development Index: Compound indicator of health status calculated at the district level, based on measures and responses collected at household level. MoH=Ministry of Health. RisKesDas=*Riset Kesehatan Dasar*, or Basic Health Research: a five-yearly household survey, statistically representative of all districts in Indonesia. BPJS=*Badan Penyelenggara Jaminan Sosial Kesehatan*, or Social Security Agency for Health. BPJS claims data reported by districts are collated at the national level. BPS=*Badan Pusat Statistik* or National Statistics Agency, also called Statistics Indonesia.

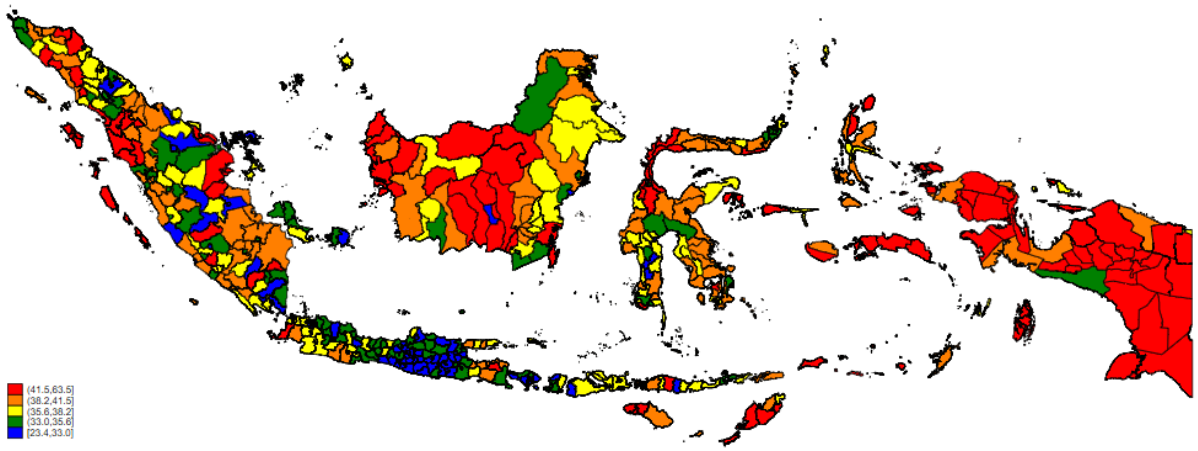
Supplementary file 2: Steps taken to integrate data from different sources

Data types processed	Operation	Output
All	Within each data type, generate variables needed for analysis, and standardise variables needed for merge.	Coded dataset for each data type
SUSENAS	Using weighted data, 1) collapse continuous variables to district/province/regional levels 2) collapse categorical variables. Merge 1) & 2)	3 SUSENAS datasets: district, region, province
PoDes	Collapse to district, provincial and regional levels as above	3 PoDes datasets: district, region, province
IPKM, BPJS	Collapse to provincial and regional levels	3 IPKM and 3 BPJS datasets: district, region, province
All collapsed	Merge all same-level datasets on geographic identifier	Full datasets for district, province and region
Full district and province datasets	Merge in shape files for mapping on geographic identifier	Full 2018 (BPJS 2017) datasets for district and province, with mapping data
SUSENAS	Merge district-level indicators from other datasets back into individual records	Full individual level dataset

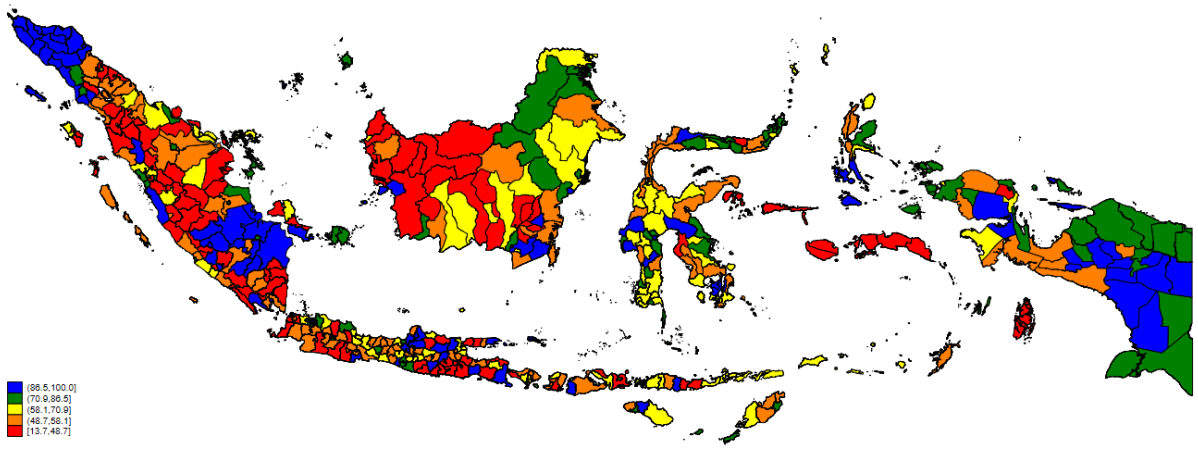
SUSENAS=National Social and Economic Survey. PoDes=Village Potential Survey. IPKM=Population Health Development Index. BPJS=Social Security Agency for Health.



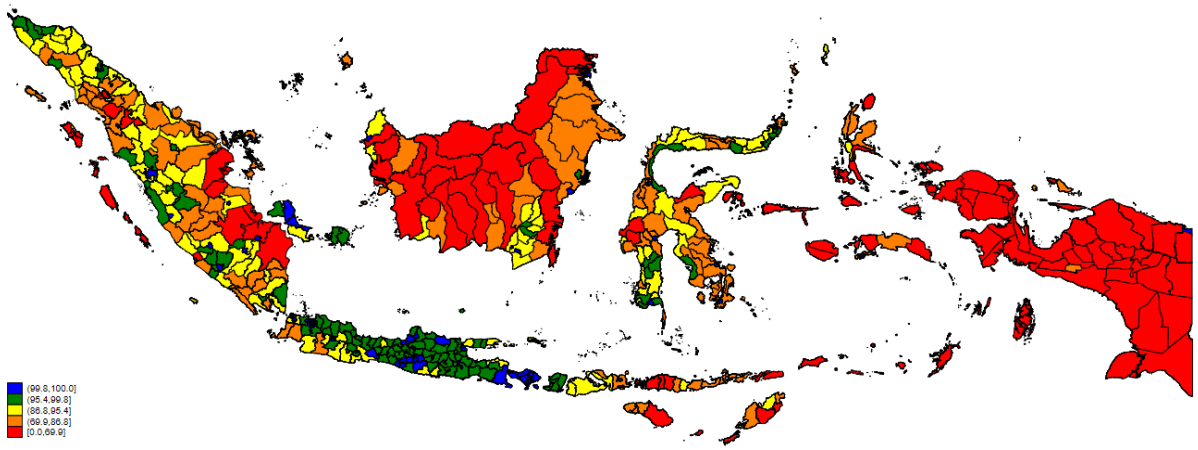
3a: Regional groupings



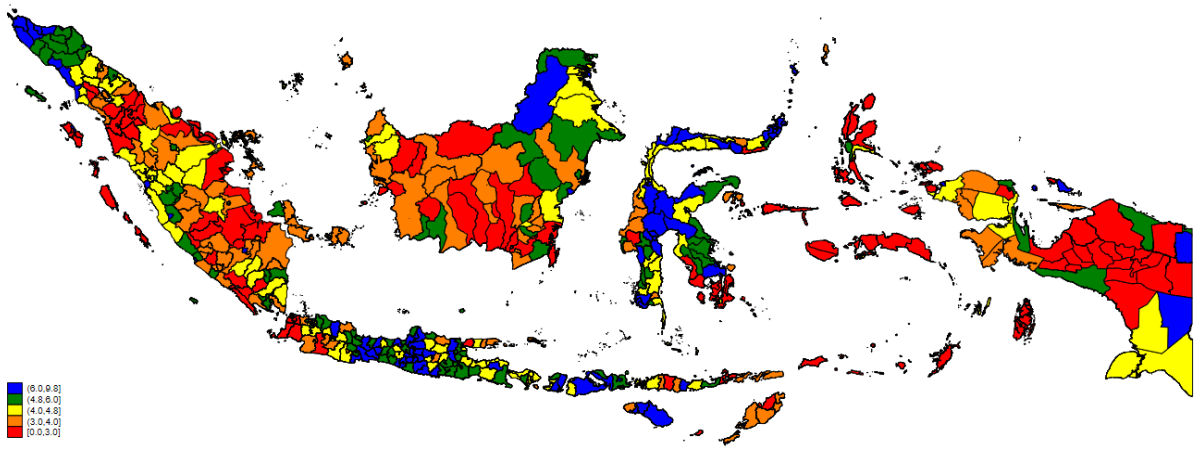
3b: Index of health need, Riskesdas, 2018. Red and orange areas have higher health needs



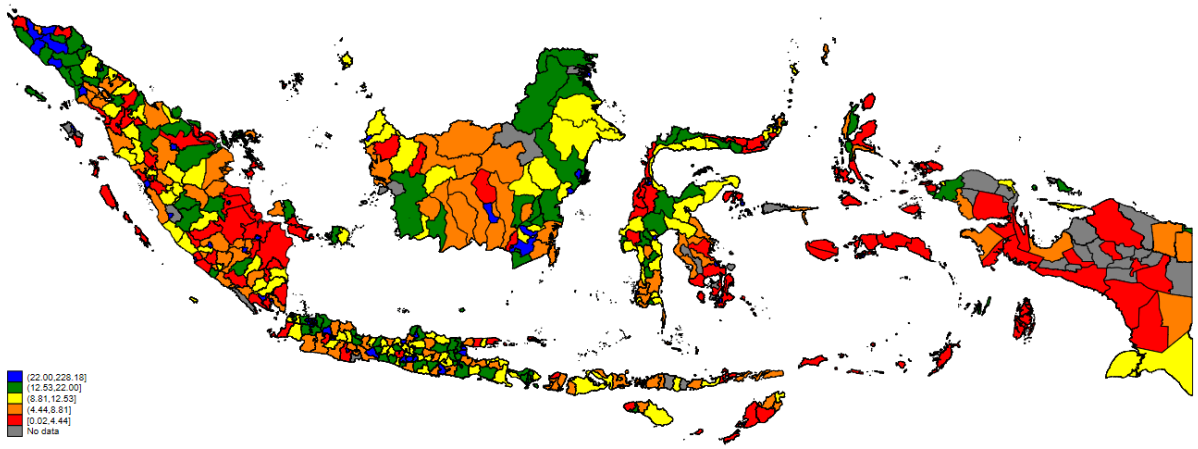
3c: Self-reported insurance status, Susenas, 2018. Red and orange areas have lower self-reported insurance status



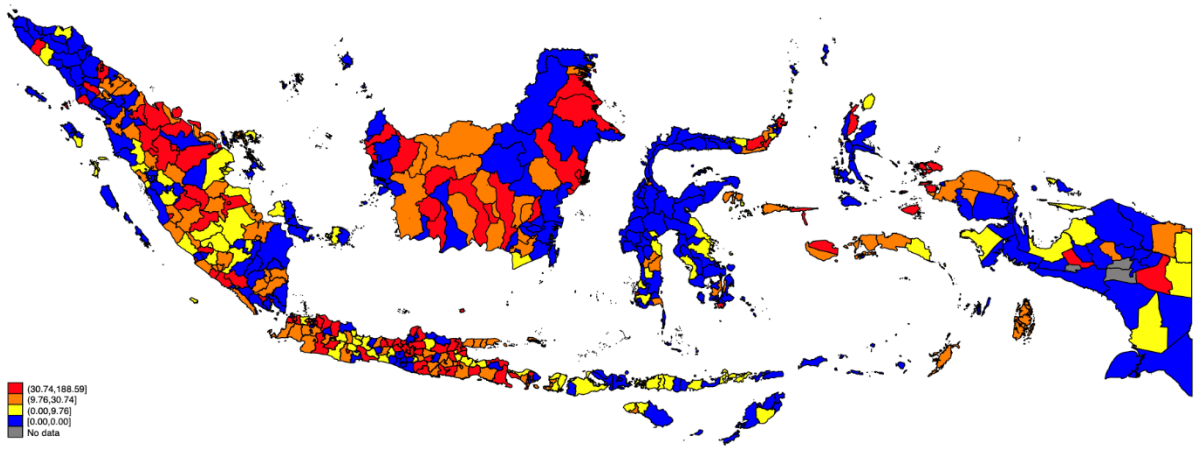
3d: Percentage of villages with easy access to inpatient services, PoDes, 2018. Red and orange areas have more difficult access



3e: Percentage of population reporting use of inpatient services in last 12 months. Susenas, 2018. Red and orange areas report less use of inpatient services



3f: Average annual claim to public insurer for inpatient services, per registered JKN- insured person, in US$. Year to December 2017: Red and orange areas have the lowest claims.



3g: Of those households with inpatients in last 12 months, average household spending on inpatient care, per patient. Susenas 2018. In both the first and second quintiles, spending was zero; these districts are all shown in blue. Red and orange districts have higher household spending on inpatient care.

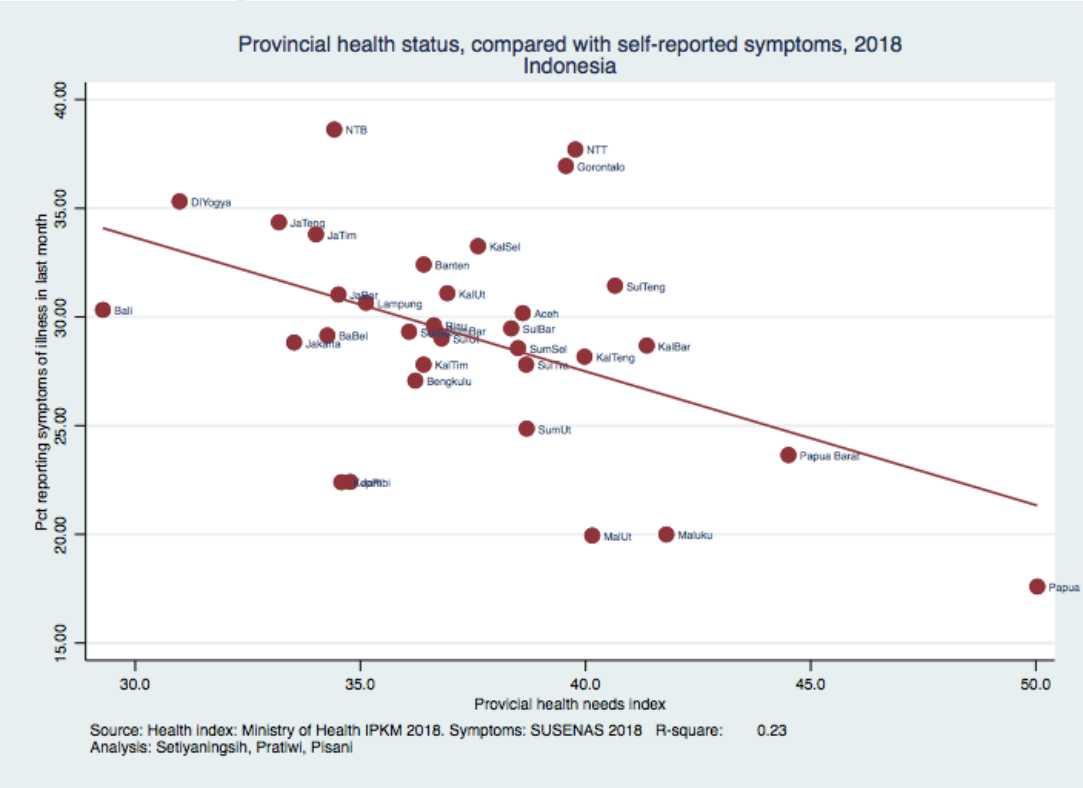
Figure 3: Key indicators, shown at the district level. Maps 3b-3g shows data by quintiles; the legends gives range of the indicator value for each quintile. Figure 3a provides a graphic illustration of the four regional groupings for which data are shown in Tables 1-3, and in Supplementary file 7.

Supplementary material to Pratiwi et al.

Supplementary file 4: Provincial health need vs symptoms

Supplementary file 4: Health needs index compared with self-reported symptoms, Indonesian provinces, 2018

This graph compares the provincial index of health need (RisKesDas excluding service access) with the prevalence of self-reported symptoms in the previous month from SUSENAS household-level data at the provincial level. Provinces with the best health status score lower on the health needs index.



Supplementary file 5: Indonesian districts, self-reported insurance coverage by quintile of household non-health consumption, 2018

Each individual in the household is asked whether they have insurance, and which type of insurance they have. Individuals can report more than one type of coverage; here we show only the most generous source of coverage.

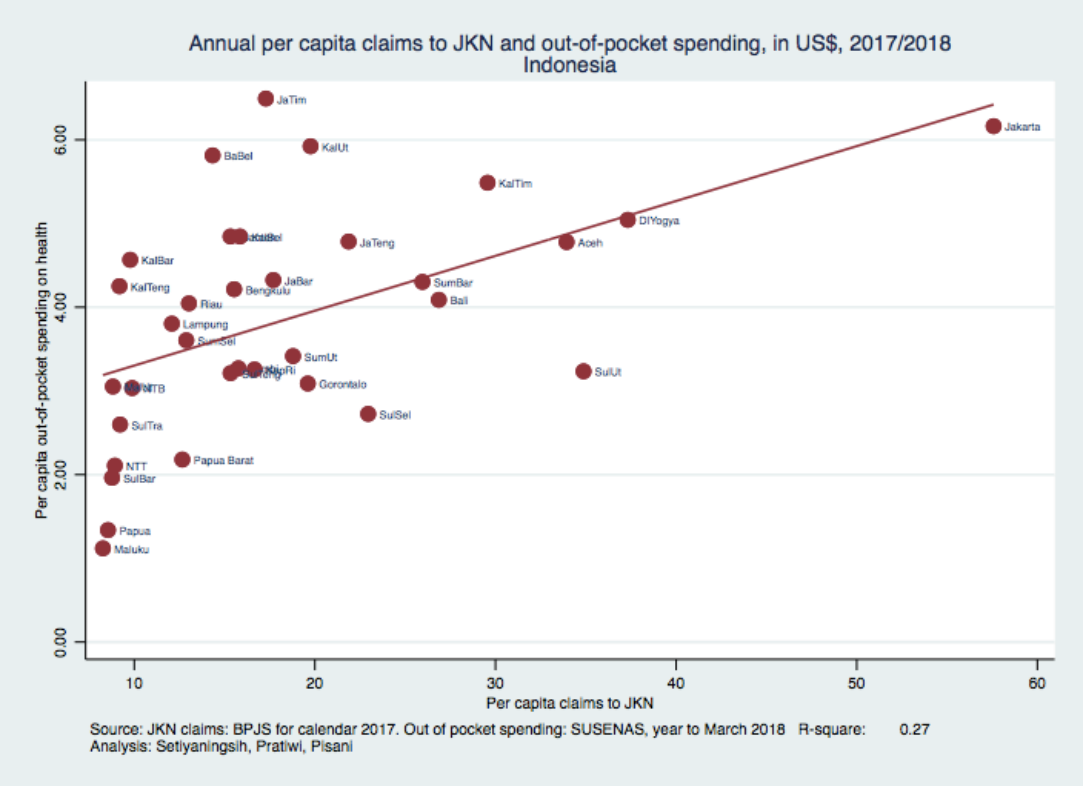
Consumption is calculated at the household level. As a proxy for wealth, we sum all non-health-related consumption, and divide it by the number of individuals in the household. This table shows health insurance status by quintiles of wealth.

Source: SUSENAS 2018

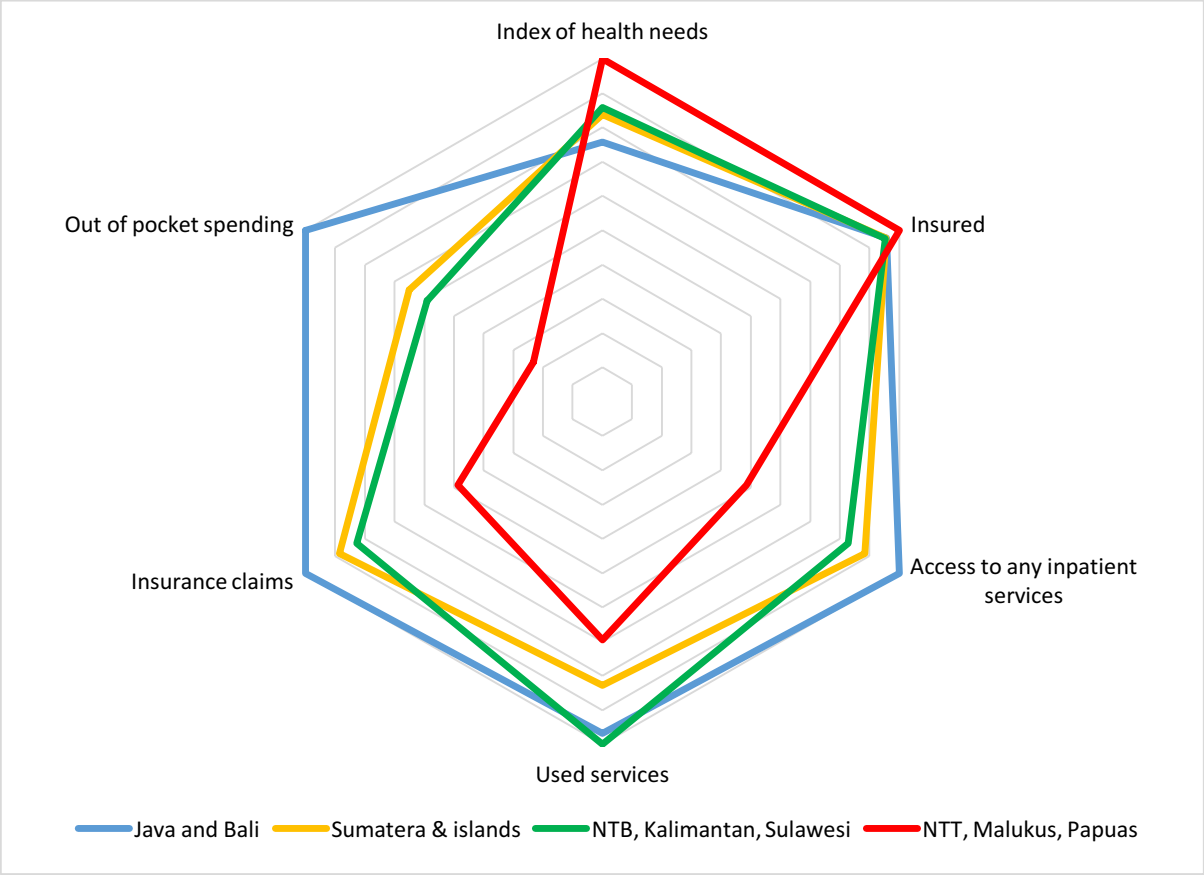
	Uninsured	Subsidised JKN	Independent JKN	Private insurance
Lowest 20%	42.43	51.76	5.26	0.54
Q2	41.21	48.34	9.01	1.43
Middle 20%	38.97	44.68	13.56	2.79
Q4	35.00	39.35	21.15	4.51
Highest 20%	26.85	25.77	36.77	10.61
All, National	35.9	40.35	19.15	4.6

Supplementary file 6: Out of pocket spending on health compared with insurance claims per capita, Indonesian provinces, 2018

This graph compares the median out of pocket spending on health per capita reported for the year to March 2018 (SUSENAS data) with the per capita public insurance claims for each Indonesian province for calendar 2017. Per capita insurance claims are calculated by summing up all inpatient and outpatient claims to the insurer, and dividing by the provincial population (BPJS). Rupiah totals are converted to US Dollars at the average Bank Indonesia rate for 2017 (US$1 = IDR 13,384) for BPJS data, and the average rate for March 2018 (US$1= IDR 13,760) for SUSENAS data.



Supplementary file 7 : Relative value of key indicators relating to inpatient services, by Indonesian region, 2018



Used services: % of individuals using inpatient services in the last year. Access to any inpatient services: % of villages with easy access to hospital or primary care with inpatient services. Insured: % of individuals reporting any current health insurance Out of pocket spending: Median value of (household spending on inpatient services in the last year, divided by the number of household members reporting inpatient care in the last year). Insurance claims: Total claims to public insurer for inpatient and outpatient care, divided by total registered participants.

STROBE (Strengthening The Reporting of OBservational Studies in Epidemiology) Checklist

A checklist of items that should be included in reports of observational studies. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Section and Item	Item No.	Recommendation	Reported on Page No.
Title and Abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1, 2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/Rationale	2	Explain the scientific background and rationale for the investigation being reported	3,4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study Design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	NA NA 5
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	NA NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5,6,7

Section and Item	Item No.	Recommendation	Reported on Page No.
Data Sources/ Measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5, 6, 7
Bias	9	Describe any efforts to address potential sources of bias	6
Study Size	10	Explain how the study size was arrived at	5
Quantitative Variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical Methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	7
		(*c*) Explain how missing data were addressed	5
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	NA NA 5
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive Data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	NA
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	NA
Outcome Data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	NA
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	NA
		Cross-sectional study—Report numbers of outcome events or summary measures	8-14

Section and Item	Item No.	Recommendation	Reported on Page No.
Main Results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-16
		(*b*) Report category boundaries when continuous variables were categorized	8-16
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other Analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key Results	18	Summarise key results with reference to study objectives	17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	20
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20
Generalisability	21	Discuss the generalisability (external validity) of the study results	20
Other Information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	7, 21

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

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BMJ Open

Is Indonesia achieving universal health coverage? Secondary analysis of national data on insurance coverage, health spending and service availability

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2021-050565.R2
Article Type:	Original research
Date Submitted by the Author:	04-Aug-2021
Complete List of Authors:	Pratiwi, Agnes; Universitas Gadjah Mada, Department of Medical Education and Bioethics; University of Amsterdam, Department of Ethics, Law, and Humanities, Amsterdam UMC Setiyaningsih, Hermawati; Universitas Gadjah Mada Fakultas Kedokteran Kesehatan Masyarakat dan Keperawatan, Centre for Health Financing Policy and Health Insurance Management Kok , Maarten ; Erasmus University Rotterdam, Erasmus School for Health Policy and Management; Vrije Universiteit Amsterdam, Department of Health Sciences and Amsterdam Public Health research institute Hoekstra, Trynke; Vrije Universiteit Amsterdam, Department of Health Sciences and Amsterdam Public Health research institute Mukti, Ali; Universitas Gadjah Mada Fakultas Kedokteran Kesehatan Masyarakat dan Keperawatan, Public Health Pisani, Elizabeth ; Erasmus University Rotterdam, Erasmus School for Health Policy and Management; London School of Hygiene & Tropical Medicine, Faculty of Epidemiology and Population Health
Primary Subject Heading:	Health policy
Secondary Subject Heading:	Public health
Keywords:	HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, HEALTH ECONOMICS

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Is Indonesia achieving universal health coverage? Secondary analysis of national data on insurance coverage, health spending and service availability

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Keywords: Indonesia; Universal Health Coverage; UHC; health insurance; health equity; out of pocket health payments

Word count: 4,279

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ABSTRACT

Objectives To analyse the relationship between health need, insurance coverage, health service availability, service use, insurance claims and out-of-pocket spending on health across Indonesia.

Design Secondary analysis of nationally representative quantitative data. We merged four national data sets: the national socio-economic survey 2018, national census of villages 2018, population health development index 2018, and national insurance records to end 2017. Descriptive analysis and linear regression was performed.

Setting Indonesia has one of the world's largest single-payer national health insurance schemes. Data are individual and district level; all are representative for each of the country's 514 districts.

Participants Anonymised secondary data from 1,131,825 individual records in the national socio-economic survey and 83,931 village records in the village census. Aggregate data for 220 million insured citizens.

Primary outcome measures Health service use and out-of-pocket payments, by health need, insurance status and service availability. Secondary outcome: insurance claims.

Results Self-reported national health insurance registration (60.6%) is about 10% lower compared to the insurer's report (71.1%). Insurance coverage is highest in poorer areas, where service provision, and thus service use and health spending, are lowest. Inpatient use is higher among the insured than the uninsured (OR 2.35 (95% CI 2.27-2.42)), controlling for health need and access), and poorer patients are most likely to report free inpatient care (53% in wealth quintile 1 vs 41% in Q5). Insured patients spend US$ 3.14 more on hospitalisation than the uninsured (95% CI 1.98-4.31), but the difference disappears when controlled for wealth. Lack of services is a major constraint on service use, insurance claims and out-of-pocket spending.

Conclusions The Indonesian public insurance system protects many inpatients, especially the poorest, from excessive spending. However, others, especially in Eastern Indonesia can't benefit because few services are available. To achieve health equity, the Indonesian government needs to address supply side constraints and reduce structural underfunding.

Article summary

Strengths and limitations of this study

- Our study brings together four large, data sets, representative at the level of each of the country's 514 districts, allowing for exploration of diversity, and for triangulation between data sources.
- Our analysis pays particular attention to geographical differences in insurance coverage, service availability and health spending in one of the world's largest single payer health insurance systems.
- Our study is limited by lack of granular information on health needs and outcomes.
- We were unable to link service access measures at the village or sub-district level because geographic identifiers were not made available.

INTRODUCTION

In 2014, Indonesia, the world's fourth most populous nation, introduced a national health insurance scheme, *Jaminan Kesehatan Nasional*, or JKN. Politicians set an ambitious target: to sign up all Indonesians, and thereby achieve Universal Health Coverage (UHC) by 2019.[1–3] Although the target was missed, great strides have been made towards it, at least in terms of participant registration. The scheme reports over 220 million participants (July 31st, 2020), 82% of the national population of 268 million,[4] making JKN one of the world's biggest single-payer health insurance schemes. In accordance with the World Health Organization's vision for UHC,[5] one of the goals of JKN was to increase equitable access to health services without risk of impoverishment, across the nation. However, the limited availability of health services means that registration of participants may not translate into effective 'coverage'.

Participation is compulsory, with premiums paid by employers. The state, which covers premiums for its employees, the poor and the near-poor – pays 69% of all premiums.[4] Non-poor Indonesians in unsalaried jobs – some 30 million people – should pay their own premiums. In practice many do not.[4,6,7] For the first four years of the programme, monthly premiums started at IDR 25,500 (US$ 1.80), rising to IDR 80,000 (US$ 5.52) for first class service.[8]

Over 2,300 hospitals, 1,700 of them private, accept JKN-funded patients.[9] Broadly, JKN pays for primary care (inpatient and outpatient) through capitation, while hospital care is reimbursed against diagnostic codes.[10–12] Many sophisticated and/or expensive treatments such as hip replacements and heart septal surgery are covered at all premium levels.[13] The combination of low premium and generous coverage has produced annual deficits since the programme's inception.[14,15] The cumulative deficit was 51 trillion rupiah (3,7 billion US$) at the end of 2019.[15]

In a bid to reduce the deficit, premiums were approximately doubled in January 2020, but the Constitutional Court ruled that the increase in contributions violated the right to health, and it was

reversed, underlining the politically-charged landscape in which health reform takes place.[8,16] In May 2020, the government again increased the premium.[17] By September 2020, the insurer's Director General told the press 1.5 million people had opted to lower their premium class.[18,19]

Achieving affordable access to quality health services nationwide is a particular challenge given Indonesia's exceptional diversity. Over 60% of the population lives in Java, just 6% of the land mass. There are a further 7,000 inhabited islands, with population density ranging from 10/km^2 in Papua and North Kalimantan provinces to 1,400/km^2 in West Java.[20] Income and health needs are similarly diverse; for example, 43% of children in East Nusa Tenggara are stunted, compared 9% in Jakarta province.[21]

The Government's most recent Health Sector Review, published five years into the JKN programme, observed that the supply of health services remains a major constraint in many areas.[22] Studies in Indonesia and other countries suggest that health care cumulates in areas with higher income and fewer critical health needs.[2,23,24] This study looks at the relationship between health need, service availability, insurance status and financial protection across Indonesia.

We merge four nationally representative data sources to undertake that analysis. If JKN enables equitable health service access while protecting against impoverishment, we would expect areas with highest health needs to have highest levels of service use and high insurance claims, with limited variation in out-of-pocket spending nationwide. However, given the supply constraints reported in the national health review,[22] we hypothesised that we would find a more complex relationship, as illustrated in Figure 1. At the aggregate level, we expect areas with more services to report higher claims. At the individual level, we expect that insured service users would spend less out-of-pocket compared with uninsured service users.

METHODS

Data

We used four different datasets, all referring to year-end 2017 or mid 2018. They are:

1. a national socio-economic survey or *Survey Sosial Ekonomi Nasional* (SUSENAS) 2018, a cross-sectional household survey, statistically representative of all districts in Indonesia: 1,131,825 individual records;
2. a national census of villages or *Survei Potensi Desa* (PoDes) 2018, a census of all villages in Indonesia: 83,931 village records;
3. a Population Health Development index or *Indeks Pembangunan Kesehatan Masyarakat* (IPKM) 2018, a compound indicator of health status calculated at the district level, based on data collected in the national health survey (RisKesDas), statistically representative of all districts in Indonesia: 514 district records;
4. national insurance records from the Social Security Agency for health or *Badan Penyelenggara Jaminan Sosial Kesehatan* (BPJS) end 2017, reported at the district level: 514 district records.

In addition, GIS data from StatisticsIndonesia, with 2017 administrative boundaries, were used to generate district and province maps.

Further information about these sources, and the data derived from each, is given in Supplementary file 1. Supplementary file 2 shows the steps followed to merge these different data sets for analysis. All supplementary material, as well as data management and merge codes for reuse, are provided at https://doi.org/10.7910/DVN/2Q37XL.

Measures

Health need

We derived a proxy for health need from the Ministry of Health's 2018 public health index. The index (0-1) includes reproductive, maternal and child and environmental health elements, disease prevalence, and service access. Higher values indicate better community health. We recalculated the index excluding service access, and inverted it (100 – (100*public health index) to indicate district health need.

Insurance status

In SUSENAS 2018, individuals self-report health insurance by type: JKN (subsidised or non-subsidised), district public health insurance scheme, private insurance, or supplementary work place insurance. In the analysis reported here, we classified people as insured if they reported at least one form of health insurance, and also calculated those reporting any public insurance (JKN or district health insurance). We calculated insurer-reported coverage by dividing registered participants by district population.

Out-of-Pocket payments

In SUSENAS 2018 data we calculated out-of-pocket payments (OOP) for health by summing household payments to formal health service providers and spending on medicines and medical supports e.g. prostheses. Insurance premiums are excluded. We estimated per capita health spending by dividing all household spending on health by number of household members. Per capita spending on inpatient care was calculated by dividing inpatient spending over the previous 12 months by the number of household members reporting inpatient care in the previous 12 months.

Health service access

We constructed a proxy for restricted physical access to health services at district level using village census data. In PoDes, village heads are asked whether various health services were present in the village, and if not, how easy each was to reach. We classified access to each as restricted if the nearest facility was reported as 'hard' or 'very hard' to reach, and as easy if it was 'easy' or 'moderately easy' to reach, or present in the village. For each district, we then calculated the percent of villages which have no easy access to: 1) a hospital 2) any inpatient services 3) any one of: any inpatient services, primary health centre, private clinic, private doctor, maternity waiting home, registered midwife, pharmacy. In addition, we used SUSENAS data to capture actual realisation of access as self-reported utilisation in inpatient care in the preceding 12 months and outpatient care in the preceding month.

Region

We grouped provinces into four regions which also share broad economic characteristics, as shown in Table 1 and mapped in Supplementary file 3a (see Results, below). From west to east the regions are Sumatera and western islands; Java and Bali; West Nusa Tenggara (NTB), Kalimantan, Sulawesi; and East Nusa Tenggara (NTT), Malukus, Papuas.

Statistical Analysis

We used STATA/MP 16.1 for Mac to perform data management, analysis, and maps configuration. In collapsing data from the individual-level dataset (SUSENAS), we used individual sample weights. For spending variables, we calculated median values by district/province/region. For binary variables, we calculated the percentage by district/province/region. No weights were used in collapsing the village level data, since PoDes is a census. When collapsing BPJS data and for population totals, we summed district totals to derive province and regional totals.

We performed descriptive and bivariate analysis of categorical variables, looking first at individual areas of interest (health need, insurance status, service use, insurance claims and out-of-pocket spending). We then proceeded through the associations in the logical framework illustrated in Figure 1, building up a regression model using all salient variables and investigating factors associated first with use of services, then with out-of-pocket spending on health (individual level), and with per capita insurance claims (district level). Analysis files are provided at https://doi.org/10.7910/DVN/2Q37XL.

Ethics

The study involved no primary data collection. We obtained permission to use the data for research from national agencies: StatisticsIndonesia (SUSENAS and PoDes) and from the Health Social Security Agency (JKN data). All data were anonymised before being provided to us. Study funders had no role in the design of the study, nor in analysis or interpretation of the data.

Patient and public involvement

No members of the public or patients were involved in this study.

RESULTS

Indonesia's regional diversity in terms of population, health indicators, service use and insurance coverage is illustrated in Table 1. The far eastern region (covering the provinces of East Nusa Tenggara (NTT), Maluku, North Maluku, West Papua and Papua) stands apart from the others in having the smallest population and the lowest expenditure (including health expenditure) while scoring highest on health needs. The Java/Bali region, in contrast, is most populous, richest, scores lowest on health needs, but has the highest out-of-pocket spending on health.

Table 1 : Demographic and health-related characteristics, by Indonesian region, 2018

Region	Java and Bali	Sumatera & islands	NTB, Kalimantan, Sulawesi	NTT, Maluku, Papua	National
Population	153,549,597	57,559,884	40,537,682	12,583,596	264,230,759
Median per capita monthly expenditure (US$)	61.2	61	60.2	50.1	60.6
Index of health need	33.6	37.1	38.0	44.3	37.7
Illness in last 30 days	32.5	27.7	30.9	27.2	31
Outpatient treatment in last 30 days	16.4	13.1	13.4	13.3	15.1
% of those ill seeking treatment	50.4	47.2	43.4	48.8	48.7
Inpatient treatment, last 12 months	4.9	4.2	5.0	3.5	4.7
JKN coverage, insurer reports	71.97	66.95	72.61	86.97	71.1
JKN coverage, population reports	59.8	61.0	61.3	66.3	60.6
Any health insurance, population reports	64.0	63.9	63.7	66.9	64.1
Median per capita OOP spending on health, last 12 months (US$)	20.4	16.6	15.4	8.9	18

OOP=Out of pocket. JKN=Jaminan Kesehatan Nasional – National Health Insurance. NTB=Nusa Tenggara Barat – West Nusa Tenggara. NTT=Nusa Tenggara Timur – East Nusa Tenggara

While the following section reports data at the regional level, tables giving the same data at a district level are provided separately, which can all be found at**:** **https://doi.org/10.7910/DVN/2Q37XL.** We also provide the data underlying the district-level tables in Excel format, which may be imported into statistical software for re-use.

Health status

The index of health need (excluding measures of access) ranges from 23.4 in Gianyar, Bali, to 63.5 in Paniai, Papua. Papua is home to 15 of the 20 districts with poorest health status (See Supplementary file 3b). Yet Papuans are less than half as likely to report recent symptoms of illness compared with people

in Java and Bali; there is a weak inverse relationship between the Ministry of Health's index of health need and self-reported recent illness (Supplementary file 4).

Insurance coverage

We have two sources of data on insurance coverage: individual reports and number of members reported by the insurer. The discrepancies between these will be reported in detail elsewhere. Overall, the insurer reported coverage of 71.1%, compared with 60.6% JKN membership reported by the population. Since people's perception of their own insurance cover is more likely to influence health seeking behaviour, we here restrict our analysis to self-reported insurance status, which are reported in Table 2. Supplementary file 3c shows the diversity at the district level, by most generous cover (4.4% of Indonesians report more than one source of health insurance). People in poorer households (by non-health consumption) are most likely to say that they are uninsured compared to richest household (42.4% and 26.9% respectively). However, poorest household quintiles are also most likely to report state-subsidised insurance: 51.8%, compared to 25.8% in the richest households (Supplementary file 5).

Table 2 : Insurance Coverage, Claim and Out of Pocket, 2018

	Insurance Coverage				Claims, in US$						Out of Pocket Spending, in US$					
					Average payment per claim		Total payments per registered participant		Average number of claims per 1,000 registered participants		Median annual OOP health spending, per capita		Of households using inpatient care, % reporting no OOP spending on inpatient services		OOP spending on inpatient care per inpatient, among those reporting OOP for inpatient care	
	Uninsured	Subsidised JKN	Independent JKN	Private insurance	Inpatient	Outpatient	Inpatient	Outpatient	Inpatient	Outpatient	Uninsured	Insured	Uninsured	Insured	Uninsured	Insured
Java and Bali	35.97	38.77	19.67	5.6	386.23	22.53	20.58	10.39	53	461	4.24	5.72	24.9	44.0	130.81	109.01
Sumatera & islands	36.1	42.25	17.95	3.7	319.00	20.80	19.68	7.59	62	365	3.36	4.19	32.3	49.5	112.65	80.08
NTB, Kalimantan, Sulawesi	36.26	39.49	21.01	3.24	323.23	22.36	18.08	6.33	56	283	3.20	3.86	25.0	53.9	53.56	58.43
NTT, Maluku, Papua	33.07	53.71	12.29	0.93	270.40	18.82	8.43	2.16	31	115	1.74	1.89	20.3	54.2	46.15	25.44
National	35.90	40.35	19.15	4.6	324.71	21.13	16.69	6.62	50.52	305.92	3.65	4.78	26.0	47.1	109.54	87.21

NTB=Nusa Tenggara Barat – West Nusa Tenggara. NTT=Nusa Tenggara Timur – East Nusa Tenggara
JKN = *Jaminan Kesehatan Nasional* – National Health Insurance
For Claim : Currency conversion average rate for 2017 (US$1=IDR 13,384)
For OOP (Out-of-pocket) : Currency conversion average rate for March 2018 (US$1=IDR 13,760).
* Of households accessing any inpatient care in preceding 12 months

Availability of health services and service use

Availability of health services and service use varies widely across the country. In five percent of Indonesia's districts, no village has easy access to a hospital, while in 17% of districts all villages have easy access. In household surveys, 4.7% of Indonesians reported using inpatient services in the previous year. At the provincial level, a low of 2.6% of Papuan residents (in the far East) reported using inpatient services, rising to 6.7% in Aceh, in the far West (Table 3, Supplementary file 3d and 3e).

Table 3 : Availability of health services and inpatient service use, by region, 2018

Region	% of villages with easy access to:			No easy access to any formal health services at all	% of population accessing inpatient services in last 12 months
	A hospital	Inpatient services at primary health centre only	Outpatient primary health centre		
Java and Bali	93.1	4.2	91.5	0.5	4.9
Sumatera & islands	71.0	15.0	81.9	6.3	4.2
NTB, Kalimantan, Sulawesi	59.3	21.1	70.4	13.6	5.0
NTT, Maluku, Papua	27.1	20.2	43.5	40.6	3.5
National	68.2	13.9	76.2	11.6	4.7

NTB=Nusa Tenggara Barat – West Nusa Tenggara. NTT=Nusa Tenggara Timur – East Nusa Tenggara

Insurance claims and out-of-pocket spending

As Table 2 and Supplementary file 3f show, insurance payments were higher in Java and Bali than in Eastern Indonesia, both on a per-claim and per-participant basis (using the insurer's count of registered participants). In all regions, total claims were between 4.2 and 5.3 times higher in districts classified as cities (*kota,* n=98) compared with largely rural districts (*kabupaten,* n=416).

On the aggregate level, out-of-pocket spending on health was highest in areas where insurance claims were also high (Supplementary file 6). Median household expenditure on health (excluding insurance premiums and transport) was 180% higher in Java and Bali than in the eastern provinces. Total out-of-pocket health spending was higher among the insured than the uninsured (Table 2). Some uninsured people reported paying nothing for their inpatient care, which in some districts is free to all district residents at public facilities. However, the insured were nearly twice as likely to receive free inpatient care; bills for those who did pay were on average 20% lower than those faced by the uninsured.

Figure 2 and Supplementary file 3g shows the numbers receiving inpatient care, and per capita spending per inpatient, by insurance status and wealth (non-health consumption level). Wealthier households are more likely to access inpatient services than poorer households; the difference is most marked among the insured. Proportionately, the rich are less likely to pay nothing for those services, but also less likely to pay high amounts relative to other household consumption. In absolute terms, insured people from wealthy households are the largest consumers of free inpatient care in Indonesia.

Supplementary file 7. summarises the data given in Tables 1-3. The radar graph illustrates inequalities between the different regions using all indicators. The prosperous region Java/Bali with lowest health needs, moderate insurance coverage, and best access to healthcare services, consumes most healthcare, and has the highest out-of-pocket spending and insurance claims per capita. In contrast, the poorer provinces of Eastern Indonesia (NTT, Malukus, Papuas) have the highest health needs and insurance coverage, but lowest access to healthcare services, and thus the lowest service use, out-of-pocket spending, and insurance claims.

Regression model

Our regression model followed the pathway indicated in Figure 1 for dependent variables including service use, out-of-pocket spending and aggregate insurance claims, looking separately at inpatient and outpatient services.

Compared to the districts with the highest health status, districts with lower health status generally have lower odds of using inpatient service, lower spending on in- and outpatient services, and lower insurance claims. Results for using outpatient service are less pronounced.

Being insured is associated with higher out-of-pocket spending on health services. Use of inpatient services, household and insurer spending on both inpatient and outpatient services are highest in districts with higher health status, controlling for both insurance status and access to services (Table 4). Having

health insurance is associated with 135% higher odds of using inpatient services compared with the uninsured after controlling for district health status and access to services, while among those reporting symptoms in the last month, the odds of using outpatient services increase by a quarter.

Table 4 : Use of health services, out-of-pocket spending and aggregate insurance claims – regression model including district health needs index and access to services, and personal insurance status

	Inpatient Services Only						Outpatient Services					
	Used inpatient services last year		Annual US$ per capita spent on inpatient services		US$ public insurance inpatient claims per insured person (district aggregate)**		Used outpatient services last month, of those reporting symptoms		Monthly US$ per capita spent on outpatient services		Monthly US$ public insurance outpatient claims per insured person (district aggregate)	
	Odds Ratio	95% CI	Coefficient	95% CI	Coefficient	95% CI	Odds Ratio	95% CI	Coefficient	95% CI	Coefficient	95% CI
Constant (Average for reference category)	0.027	0.026-0.028	34.10	32.46-35.75	43.36	39.49-47.23	0.890	0.87-0.91	0.52	0.49-0.55	1.39	1.26-1.53
District health index, in quartiles												
Highest health status	Reference		Reference		Reference				Reference		Reference	
2nd best health	1.017	0.98-1.05	-4.44	-6.04-(-2.83)	-4.96	-9.78-(-0.15)	0.999	0.97-1.02	-0.08	-0.11-(-0.05)	-0.37	-0.55-(-0.19)
Middle health status	0.929	0.89-0.97	-6.86	-8.95-(-4.77)	-6.19	-11.55-(-0.83)	1.036	1.003-1.069	-0.08	-0.12-(-0.05)	-0.55	-0.74-(-0.35)
2nd worst health	0.893	0.85-0.93	-12.88	-14.53-(-11.22)	-5.12	-10.76-(-0.52)	0.960	0.93-0.99	-0.15	-0.18-(-0.12)	-0.52	-0.73-(-0.31)
Lowest health status	0.796	0.75-0.84	-12.87	-14.93-(-10.82)	-7.89	-14.27-(-1.51)	0.851	0.82-0.88	-0.16	-0.19-(-0.13)	-0.57	-0.81-(-0.33)
Individual is insured												
No	Reference		Reference						Reference			
Yes	2.348	2.27-2.42	3.14	1.98-4.31	n/a	n/a	1.252	1.23-1.28	0.08	0.06-0.09	n/a	n/a
Percentage of villages in district with no easy access to health services*												
All villages have access	Reference		Reference		Reference				Reference		Reference	
up to 5% without access	1.145	1.11-1.18	-4.81	-6.45-(-3.17)	-24.98	-29.82-(-20.14)	0.882	0.86-0.90	-0.12	-0.14-(-0.09)	-0.65	-0.82-(-0.49)
>5 to 20% without access	1.008	0.97-1.05	-9.65	-11.45-(-7.84)	-27.32	-32.45-(-22.19)	0.839	0.81-0.86	-0.14	-0.17-(-0.11)	-0.69	-0.88-(-0.51)
>20 to 50% without access	0.872	0.83-0.92	-12.54	-14.41-(-10.66)	-30.12	-36.18-(-24.06)	0.793	0.76-0.82	-0.15	-0.18-(-0.13)	-0.69	-0.92-(-0.47)
>50% have no access	0.605	0.56-0.65	-15.52	-17.65-(-13.37)	-30.92	-38.99-(-22.83)	0.948	0.87-1.03	-0.31	-0.33-(-0.28)	-0.73	-1.20-(-0.25)

*For inpatient analyses, this is restricted to hospitals or health centres with inpatient access only, for outpatient it includes access to any formal health service

** 34/514 districts, including many of the most remote, did not report claims data and are excluded from this model

Restricted geographical access to inpatient services is independently associated with lower hospitalisation in districts where more than 20% of villages report restricted access to such services; there is a linear reduction in spending by households and insurers with increasingly constrained access. In districts with poorest access, the odds of using inpatient services are around 40% lower than in the best served districts; out-of-pocket spending and insurer spending on inpatient care per registered participant are 46% and 71% lower respectively. Monthly spending on outpatient care among those reporting symptoms shows a similar pattern, but dollar amounts are small.

Table 5 shows the same model, with the addition of socio-economic status measured by non-health consumption. Household wealth does not greatly influence use or spending outcomes for outpatient care. While insurance remains associated with higher service use, its independent association with higher out-of-pocket spending disappears for inpatient care. Spending rises sharply with wealth, for both inpatient and outpatient services. Restricted geographic access to inpatient services continues to predict low service use and spending in districts where over 20% of villages report restricted access.

Table 5 : Use of health services and out-of-pocket spending – regression model including district health needs index and access to services, personal insurance status and household wealth

	Inpatient Services				Outpatient Services			
	Used inpatient services last year		Annual US$ per capita OOP, inpatient services		Used outpatient services last month, of those reporting symptoms		Monthly US$ per capita OOP, outpatient services	
	Odds Ratio	95% CI	Coefficient	95% CI	Odds Ratio	95% CI	Coefficient	95% CI
Constant (Average for reference category)	0.252	0.02-0.03	11.03	9.30-12.75	0.878	0.85-0.91	0.30	0.26-0.32
District health index, in quartiles								
Highest health status	Reference		Reference		Reference		Reference	
2nd best health	1.018	0.98-1.05	-4.37	-5.97-(-2.77)	1.000	0.97-1.03	-0.06	-0.09-(-0.03)
Middle health status	0.929	0.89-0.97	-6.94	-9.02-(-4.85)	1.038	1.01-1.07	-0.05	-0.08-(-0.01)
2nd worst health	0.900	0.86-0.94	-10.96	-12.60-(-9.31)	0.962	0.93-0.99	-0.11	-0.14-(-0.08)
Lowest health status	0.806	0.76-0.85	-9.89	-11.95-(-7.82)	0.854	0.82-0.88	-0.10	-0.13-(-0.07)
Individual is insured								
No	Reference		Reference		Reference		Reference	
Yes	2.320	2.25-2.39	-0.06	-1.22- 1.11	1.249	1.22-1.27	0.04	0.02-0.05
% of villages in district with no easy access to health services*								
All villages have access	Reference		Reference				Reference	
up to 5% without access	1.181	1.14-1.22	4.04	2.34-5.74	0.885	0.86-0.91	-0.06	-0.08-(-0.04)
>5 to 20% without access	1.039	0.99-1.08	-1.11	-2.89- 0.67	0.840	0.81-0.86	-0.12	-0.15-(-0.09)
>20 to 50% without access	0.894	0.85-0.94	-5.80	-7.63-(-3.97)	0.793	0.76-0.82	-0.15	-0.17-(-0.12)
>50% have no access	0.616	0.57-0.66	-10.22	-12.30-(-8.13)	0.945	0.87-1.03	-0.30	-0.32-(-0.27)
Non-health household spending, in quintiles								
Lowest consumption (poorest)	Reference		Reference		Reference		Reference	
2nd lowest consumption	0.955	0.91-0.99	4.37	3.51-5.23	1.007	0.97-1.04	0.03	0.02-0.05
Middle quintile	1.006	0.96-1.05	9.56	8.72-10.39	1.009	0.98-1.04	0.11	0.09-0.13
2nd highest consumption	1.044	0.99-1.09	18.04	16.80-19.23	1.002	0.97-1.03	0.18	0.16-0.20
Highest consumption (richest)	1.142	1.09-1.19	45.71	43.69-47.72	1.041	1.01-1.07	0.54	0.50-0.58

*For inpatient analyses, this is restricted to hospitals or health centres with inpatient access only, for outpatient it includes access to any formal health service

DISCUSSION

Our study for the first time integrated data from several large-scale representative surveys, censuses and administrative records collected by national authorities to investigate Indonesia's progress towards UHC through a mandatory national health insurance scheme, JKN. The integrated data from 2018 allowed us to look at the relationship between health needs, insurance status, health service use and insurer and patient spending at the level of Indonesia's 514 district in JKN's fourth year. While the insurer reported that 71% of the population were JKN members, only 61% of citizens in a nationally representative household survey reported being insured by JKN. Surprisingly, 26% of respondents in the richest quintile reported state-subsidised insurance, suggesting that subsidised premiums could be better targeted. Further, self-reported insurance coverage falls with socio-economic status (from 76% in the highest wealth quintile to 62% in the lowest). Many of the 38% of the people in poorest households who report being uninsured likely qualify for subsidised insurance. Possibly, the government is paying premiums for some poorer people without their knowledge. Additionally, people may report being uninsured simply because insurance is not of any use to them, because there are no health services within easy reach. Even in the self-reported data, however, JKN coverage is highest in the NTT, Maluku, Papua region, where it correlates inversely with physical access to services. In this eastern part, only 27% of villages have easy access to a hospital in contrast with 93% in Java and Bali. These findings mirror those of Nandi et al (2018), who reported that poorer areas of India have higher insurance enrolment compared with wealthier areas, but on the contrary lower availability of hospitals.[24] These data call into question the use of participant registration as a measure of UHC, and raise the possibility that equating registration with coverage is more useful for political optics than for effective programme evaluation.[25]

Our findings confirm empirically the assertion in the national health review[20] that limited service provision constrains the utility of national health insurance for citizens in parts of the country, particularly in poorer Eastern regions where health needs are greatest. While self-reported possession of health insurance was generally associated with increased use of services, multivariable analyses suggest that in districts where over 20% of villages have restricted access to services, this constrained

service availability is associated with lower service use, lower insurer spending and lower out-of-pocket spending on health, especially for inpatient services. In short, more money is spent (by both the insurer and patients) in places where there are more health services to spend it on. These are also the areas with the lowest health needs, probably in part because of the access to services. Studies in other low and middle income countries report similar findings.[26–29] Our study is also in line with earlier work in Indonesia, showing that JKN claims per capita for non-communicable diseases are consistently higher in Jakarta province (the national capital) than in largely rural East Nusa Tenggara,[30,31] a difference attributed to differences in supply.[30]

The radical decentralisation undertaken by Indonesia since 2001 aimed to empower district governments in these more remote areas to apportion funding (including for health) in ways that better meet local needs,[32] thus reducing inequity. Pre-JKN academic estimates of the cost of meeting basic health needs show significant variation by area (ranging from US$ 15 in Yogyakarta to US$ 48 in rural North Maluku).[33] JKN, however, reverts to a largely centralised "one-size-fits-all" reimbursement model.[1] In Eastern Indonesia restricted service availability appears to restrict spending, leading to low reimbursement and leaving the premia paid on behalf of the poorest citizens in those areas available to subsidise health care for citizens in richer areas, where health services are more plentiful.

Having said that, it appears that for many poorer families who can access services and who are insured, JKN provides effective protection against impoverishing spending. Hospitalisation was far more common among the insured than the uninsured at all income levels, suggesting that insurance removed a significant barrier to use of inpatient services. Despite this, out-of-pocket spending remained higher among the insured, as was the case in pre-JKN days.[27,34,35] Controlling for access to health services and district health index, the insured spent 9% more on inpatient services and 15% more on outpatient services than the uninsured. It is likely that newly-insured patients may be emboldened to seek services which are not fully covered, sometimes because health care providers seek profit by promoting "off-plan" services, including those not covered by the scheme, including branded medicines, laboratory tests, and consultation with specialist doctors without referral.[36–38] This "gateway effect" has been seen in

other countries embarking on scale-up of insurance, including China, Ghana, Kenya, and India.[28,39–41] In addition, patients may prefer to pay out-of-pocket for outpatient services, in particular, since they are relatively affordable, perceived as higher quality, and less burdensome in terms of queuing and paperwork.[41–44]

Findings from other low and middle income countries about the financial protection provided by national health insurance schemes are mixed.[36,44] Using spending of 10% of a household's monthly per capita non-health budget on inpatient care as a measure of the "catastrophic" spending health insurance is designed to avoid, Indonesia appears to be performing relatively well, at least for those who use services. (Like insurance registration, low out of pocket spending is not a measure of financial protection in areas where there are no services to spend money on). Looking just at those who reported using inpatient services, 87 percent of insured inpatients in the poorest income quintile spent less than 10% of their non-health budget on hospitalisation, and for over half, the care was completely free. This compares with the national health insurance in Zimbabwe, also around 87% in the poorest quintile protected from catastrophic health expenditure.[45]

Implication for research and practice

Indonesia has made great strides since 2014 in setting up a public health insurance system. By 2018 it was effectively protecting many poor families from excessive spending on inpatient care. However, its benefits remained limited for the millions of Indonesians – especially those living in areas with greatest health needs – who were unable to benefit from their health insurance because they have extremely limited access to formal health services.

A greater focus on equity in both supply and health financing would help Indonesia achieve the true aims of universal health coverage: to ensure that all citizens have fair access to basic health services without being pushed into poverty. This would require greater investments in health overall. Compared with other countries in the region Indonesia's public investment in health is relatively low, at 2.9% of

GDP compared with 3.8% in Thailand and an average of 5% in East Asia and Pacific (not including high income countries).[46] If the government had the fiscal space to investment the regional average, a shift to financing public health provision out of general taxation (as suggested by Yates[47] and Fenny et al.[48]) might be feasible. However, given Indonesia's inefficient tax system and low tax yield, more sustainable solutions might include hypothecated taxes on luxury goods, or reverting to an earlier system which made greater use of local government subsidies in wealthier areas.[49,50] Our study, which shows a substantial increase in out of pocket spending by wealth, suggest that progressive contributions based on income, suggested by Reeves et al.,[50] may also be a viable approach. Finally, the politically unpalatable option of prioritising reimbursement to meet the most urgent needs of the poorest citizens could be considered.

Health equity can not be achieved only by finding a sustainable financing model to pay for service provision. Indonesia also needs to invest substantially in improving the supply of services in many areas of the country. The directly elected district governments responsible for service provision could be incentivised to invest more in this area, since it may be a viable way of generating political popularity, while providing opportunities for local patronage.[1] But success in providing wider access to necessary services will be a double-edged sword: fulfilling unmet demand will increase claims on JKN, which is already deeply in deficit.

Limitations

Detailed analysis of merged data collected by Indonesian government agencies could help further inform decision-making. Our study is limited by lack of granular information on health needs and outcomes. In addition, the statistics agency was unwilling to release geographic identifiers at levels lower than district for the household survey data, so we were unable to link service access measures at the village or sub-district level. Our dataset nonetheless allows for the most granular analysis to date across a wide range of health service use and spending-related measures in one of the world's most diverse nations. It suffers from the common constraint of using secondary, quantitative data -- the inability to explain outliers, or

to pinpoint the political, economic and social factors that explain why more has not yet been done to address inequity within JKN.

Future research

Our analysis was cross-sectional, so does not reflect the dynamism of the situation. However, two of the datasets -- SUSENAS and JKN claims data -- are available annually, so many elements of this analysis could be repeated in an investigation of trends over time. We believe this might provide insights into which elements of inequity are temporal and which are structural. The data could also be used in studies exploring in greater detail the differences in service use between public and private providers, particularly in relation to insurance status and out-of-pocket spending.

CONCLUSION

Successful progress of JKN is shown by the number of insured people. However, healthcare access is deterred due to supply-side constraints. Insured individuals have higher OOP than uninsured. However, among individuals using inpatient care, the insured incur lower OOP. The priority concern of the government to bring UHC forward should focus on policies and efforts on providing equitable access to those districts without access.

Figure 1: Expected relationship of insurance claims and out-of-pocket spending with health need, insurance status, and service availability

Figure 2: Numbers reporting inpatient service use, by insurance status, non-health consumption quintile, and percentage of household consumption spent on inpatient services

Contributors

ABP, EP, MOK, and AGM conceptualised the study. EP and HS performed the data cleaning and management. ABP, EP, HS, TH performed the data analysis. EP and HS designed the figures. AGM and MOK supervised the project. ABP, EP, HS, MOK, TH contributed to drafting the manuscript, with input of AGM. All authors have approved the final manuscript.

Funding

Netherlands Universities Foundation for International Cooperation (NUFFIC). Grant number NICHE/ IDN/ 226: CF 9900. ABP received funding from Indonesia Endowment Fund for Education (LPDP) number 201909222915503.

Data sharing statement

The data management and analysis files in Stata format (.do files) are available in the senior author's research repository at https://doi.org/10.7910/DVN/2Q37XL. While the paper reports data at the regional level, in the repository we provide data for each of Indonesia's 514 districts in Supplementary tables, as well as in more easily downloadable Excel format. These are made available by the authors under a CC0 licence, though in view of the work that goes in to this type of data integration, we would appreciate full citation by anyone re-using these resources.

Declaration of interest

We declare no conflict of interest.

Acknowledgements

This study was funded by Netherlands Universities Foundation for International Cooperation (NUFFIC). ABP received funding from Indonesia Endowment Fund for Education (LPDP). We thank D.L. Dick Willems and R.S. Padmawati for valuable input and support.

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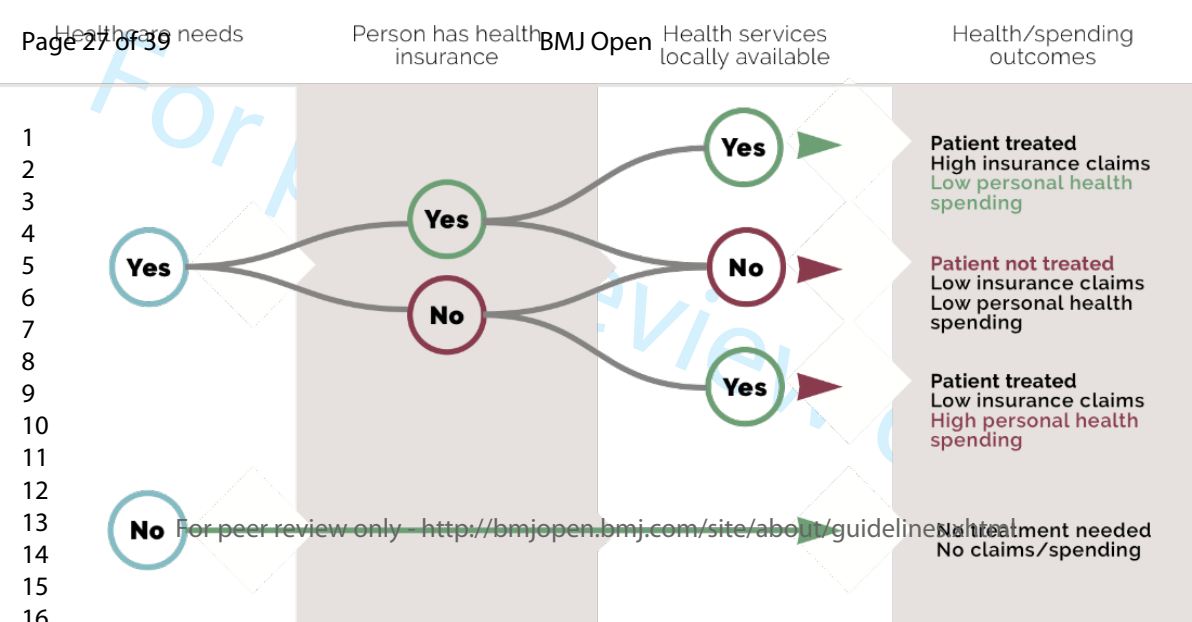
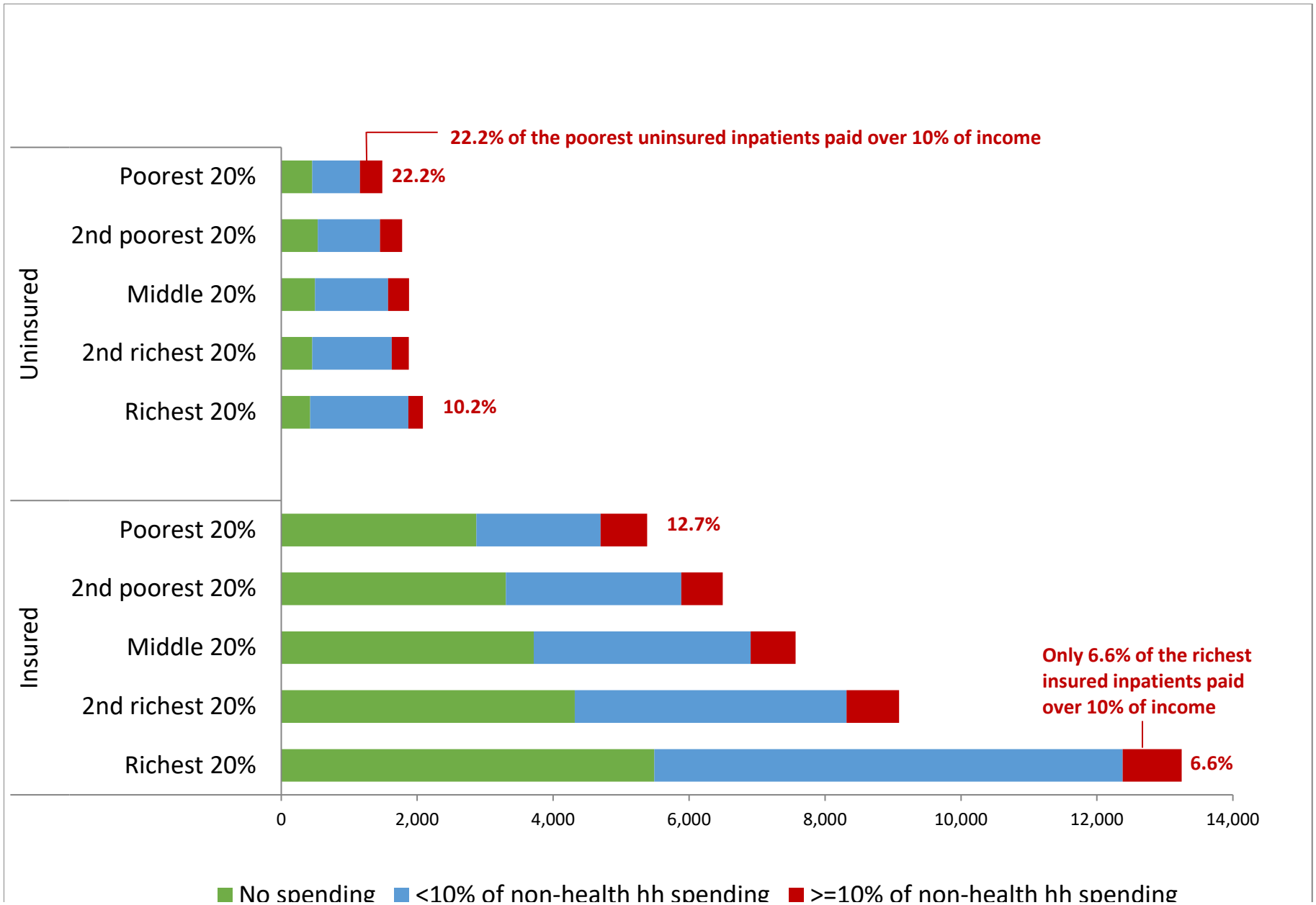



22.2% of the poorest uninsured inpatients paid over 10% of income
Uninsured
Poorest 20%
22.2%
2nd poorest 20%
Middle 20%
2nd richest 20%
Richest 20%
10.2%
Insured
Poorest 20%
12.7%
2nd poorest 20%
Middle 20%
Only 6.6% of the richest insured inpatients paid over 10% of income
2nd richest 20%
Richest 20%
6.6%
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
No spending
<10% of non-health hh spending
>=10% of non-health hh spending

Supplementary material to Pratiwi et al.

Supplementary file 1: Information about the sources

Supplementary file 1: Data included in the merged datasets

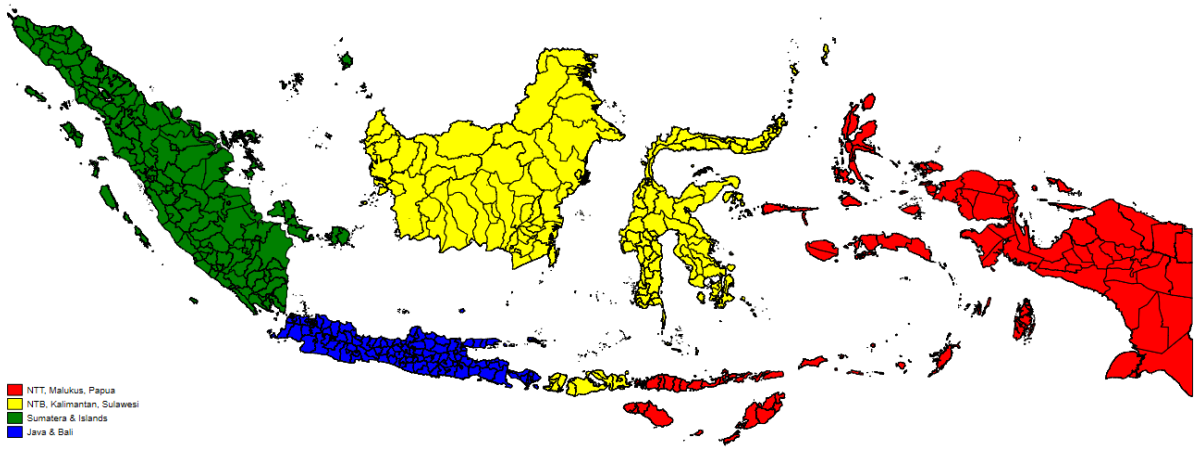
Data set acronym	Source	Years	Level of record	Representative level	Number of records	Key information
SUSENAS	BPS	2018	Individual	District	1,131,825	Insurance status, service use, spending on health
PoDes	BPS	2018	Village	Village (census)	83,931	Service availability
IPKM	MoH/ RisKesDas	2018	District	District	514	Health status
BPJS	BPJS	End 2017	District	District	514	Insurance premiums, insurance claims
GIS data	BPS	2017	District	District, Province	514	Administrative boundaries

SUSENAS=*Survey Sosial Ekonomi Nasional*, or National Social and Economic Survey. An annual cross-sectional household survey, statistically representative of all districts in Indonesia. PodDes=*Survei Potensi Desa*, or Village Potential Survey: a periodic census of all villages in Indonesia. IPKM=*Indeks Pembangunan Kesehatan Masyarakat* or Population Health Development Index: Compound indicator of health status calculated at the district level, based on measures and responses collected at household level. MoH=Ministry of Health. RisKesDas=*Riset Kesehatan Dasar*, or Basic Health Research: a five-yearly household survey, statistically representative of all districts in Indonesia. BPJS=*Badan Penyelenggara Jaminan Sosial Kesehatan*, or Social Security Agency for Health. BPJS claims data reported by districts are collated at the national level. BPS=*Badan Pusat Statistik* or National Statistics Agency, also called Statistics Indonesia.

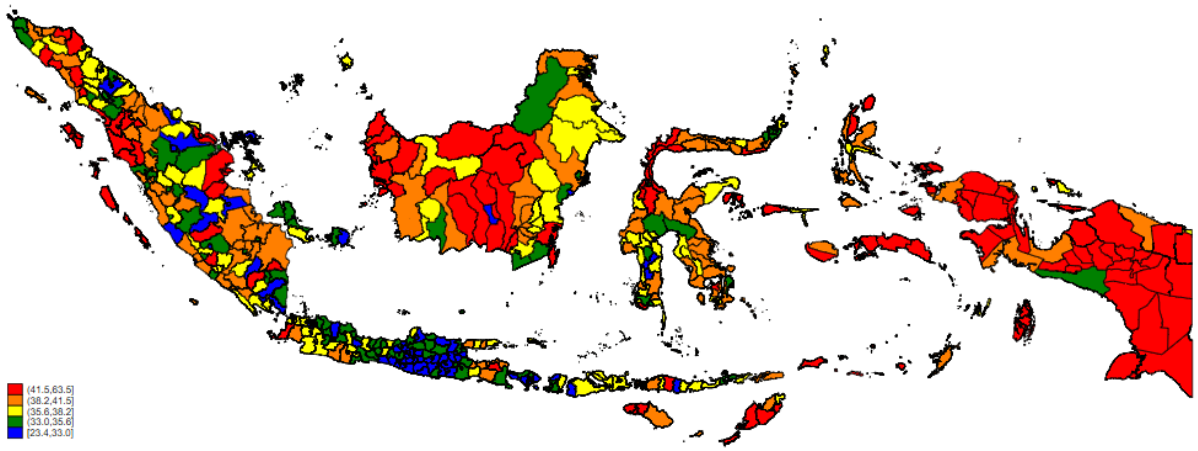
Supplementary file 2: Steps taken to integrate data from different sources

Data types processed	Operation	Output
All	Within each data type, generate variables needed for analysis, and standardise variables needed for merge.	Coded dataset for each data type
SUSENAS	Using weighted data, 1) collapse continuous variables to district/province/regional levels 2) collapse categorical variables. Merge 1) & 2)	3 SUSENAS datasets: district, region, province
PoDes	Collapse to district, provincial and regional levels as above	3 PoDes datasets: district, region, province
IPKM, BPJS	Collapse to provincial and regional levels	3 IPKM and 3 BPJS datasets: district, region, province
All collapsed	Merge all same-level datasets on geographic identifier	Full datasets for district, province and region
Full district and province datasets	Merge in shape files for mapping on geographic identifier	Full 2018 (BPJS 2017) datasets for district and province, with mapping data
SUSENAS	Merge district-level indicators from other datasets back into individual records	Full individual level dataset

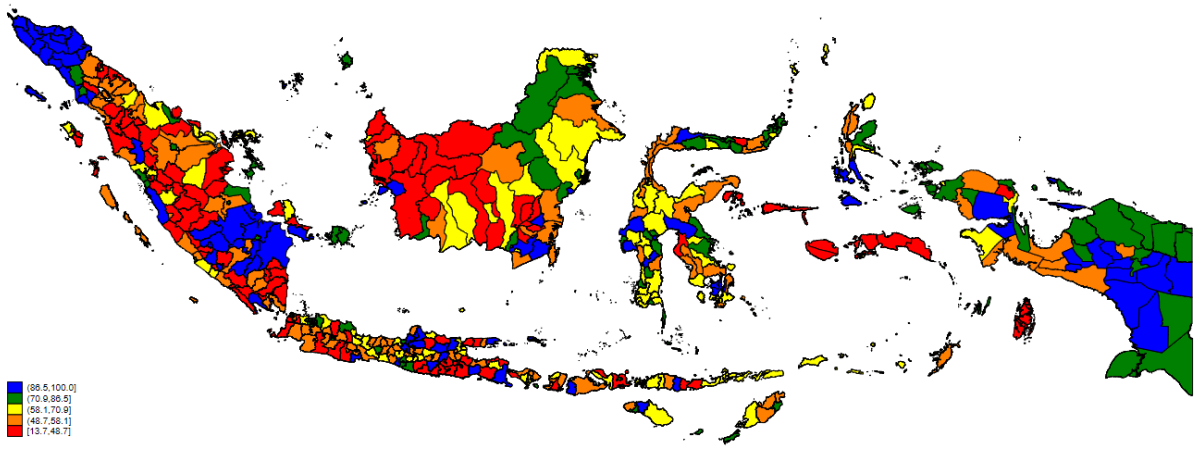
SUSENAS=National Social and Economic Survey. PoDes=Village Potential Survey. IPKM=Population Health Development Index. BPJS=Social Security Agency for Health.



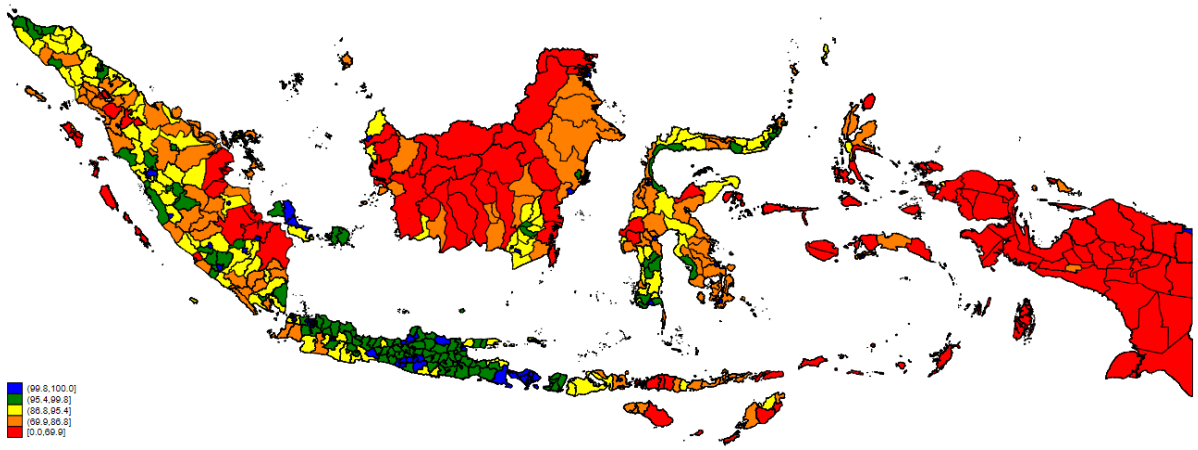
3a: Regional groupings



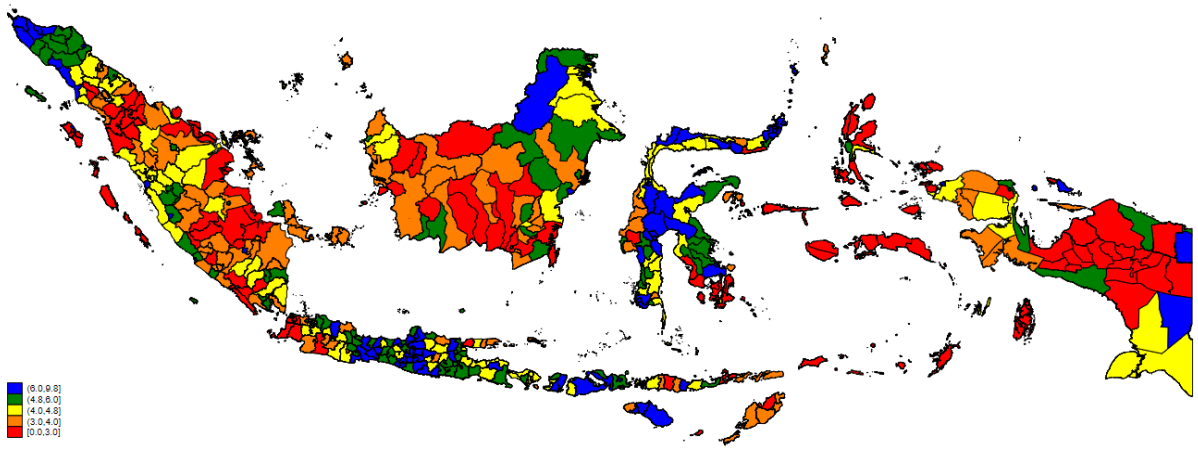
3b: Index of health need, Riskesdas, 2018. Red and orange areas have higher health needs



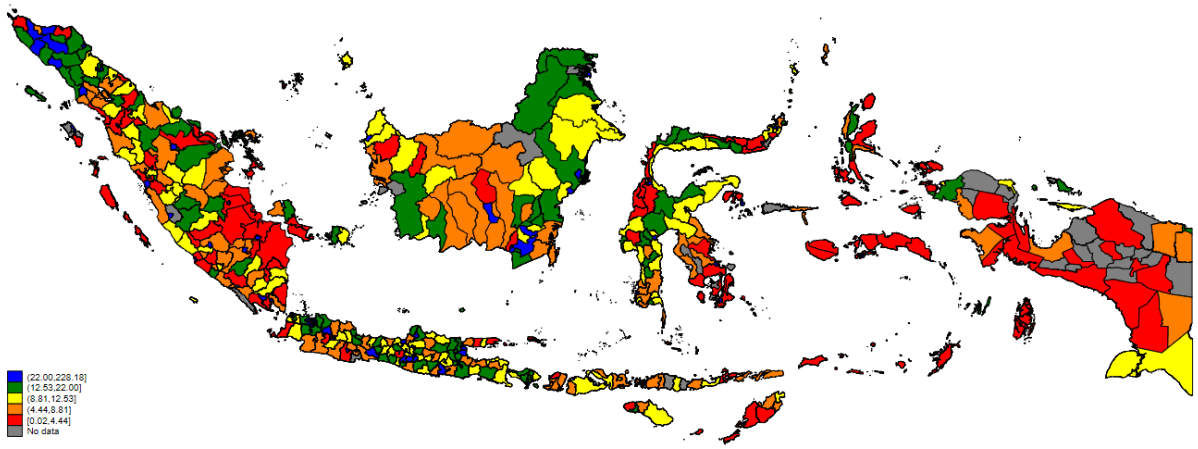
3c: Self-reported insurance status, Susenas, 2018. Red and orange areas have lower self-reported insurance status



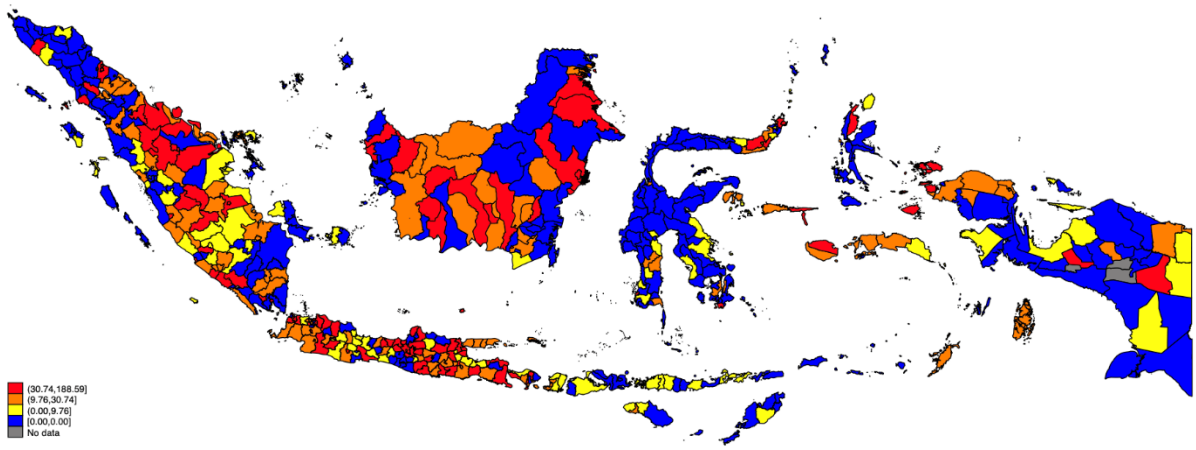
3d: Percentage of villages with easy access to inpatient services, PoDes, 2018. Red and orange areas have more difficult access



3e: Percentage of population reporting use of inpatient services in last 12 months. Susenas, 2018. Red and orange areas report less use of inpatient services



3f: Average annual claim to public insurer for inpatient services, per registered JKN- insured person, in US$. Year to December 2017: Red and orange areas have the lowest claims.



3g: Of those households with inpatients in last 12 months, average household spending on inpatient care, per patient. Susenas 2018. In both the first and second quintiles, spending was zero; these districts are all shown in blue. Red and orange districts have higher household spending on inpatient care.

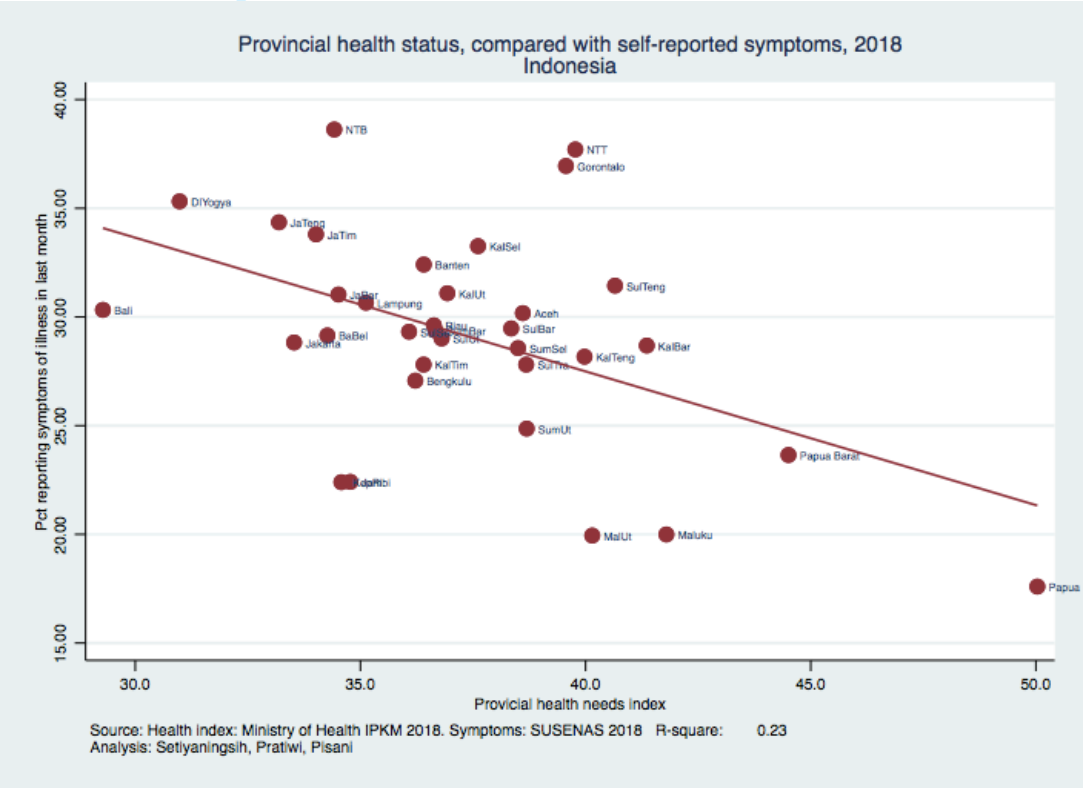
Figure 3: Key indicators, shown at the district level. Maps 3b-3g shows data by quintiles; the legends gives range of the indicator value for each quintile. Figure 3a provides a graphic illustration of the four regional groupings for which data are shown in Tables 1-3, and in Supplementary file 7.

Supplementary material to Pratiwi et al.

Supplementary file 4: Provincial health need vs symptoms

Supplementary file 4: Health needs index compared with self-reported symptoms, Indonesian provinces, 2018

This graph compares the provincial index of health need (RisKesDas excluding service access) with the prevalence of self-reported symptoms in the previous month from SUSENAS household-level data at the provincial level. Provinces with the best health status score lower on the health needs index.



Supplementary file 5: Indonesian districts, self-reported insurance coverage by quintile of household non-health consumption, 2018

Each individual in the household is asked whether they have insurance, and which type of insurance they have. Individuals can report more than one type of coverage; here we show only the most generous source of coverage.

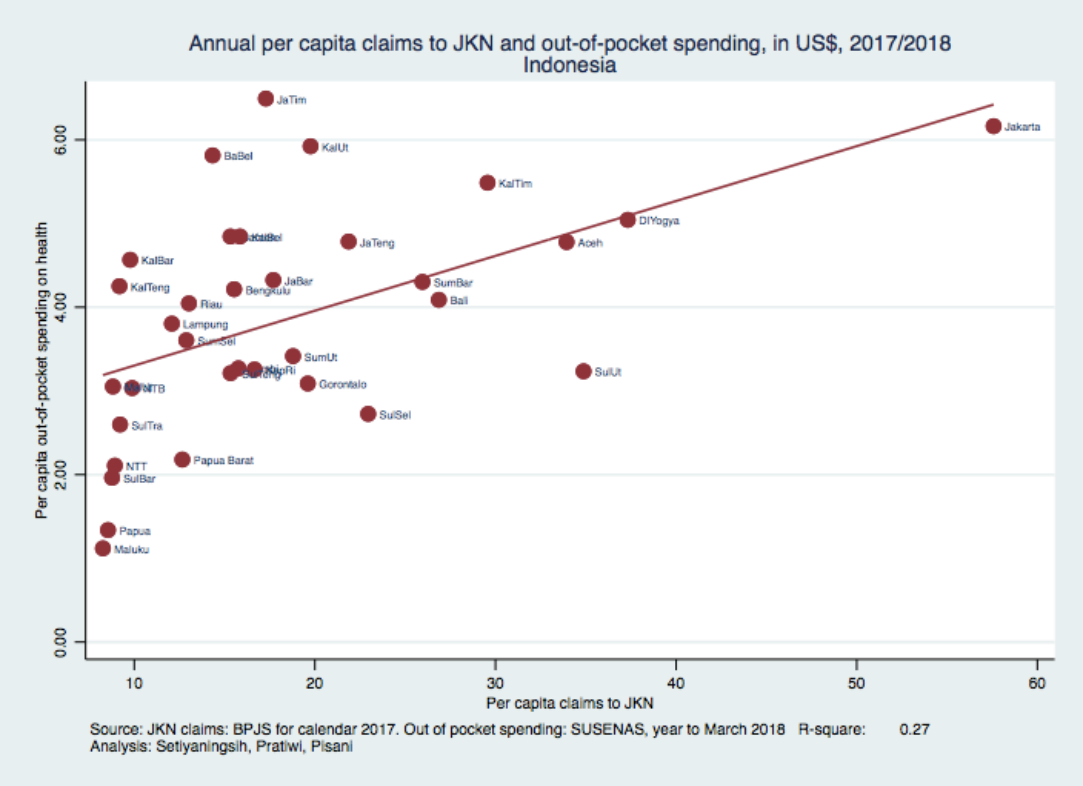
Consumption is calculated at the household level. As a proxy for wealth, we sum all non-health-related consumption, and divide it by the number of individuals in the household. This table shows health insurance status by quintiles of wealth.

Source: SUSENAS 2018

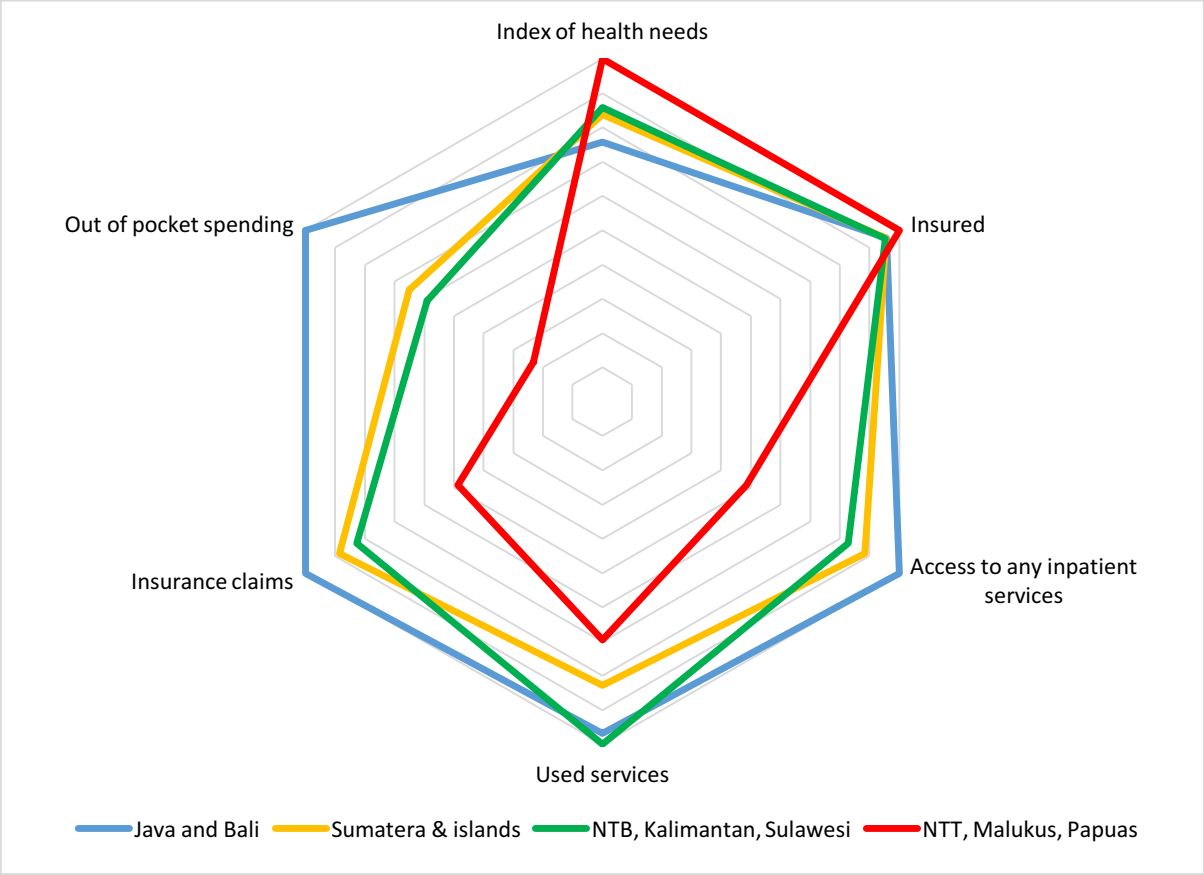
	Uninsured	Subsidised JKN	Independent JKN	Private insurance
Lowest 20%	42.43	51.76	5.26	0.54
Q2	41.21	48.34	9.01	1.43
Middle 20%	38.97	44.68	13.56	2.79
Q4	35.00	39.35	21.15	4.51
Highest 20%	26.85	25.77	36.77	10.61
All, National	35.9	40.35	19.15	4.6

Supplementary file 6: Out of pocket spending on health compared with insurance claims per capita, Indonesian provinces, 2018

This graph compares the median out of pocket spending on health per capita reported for the year to March 2018 (SUSENAS data) with the per capita public insurance claims for each Indonesian province for calendar 2017. Per capita insurance claims are calculated by summing up all inpatient and outpatient claims to the insurer, and dividing by the provincial population (BPJS). Rupiah totals are converted to US Dollars at the average Bank Indonesia rate for 2017 (US$1 = IDR 13,384) for BPJS data, and the average rate for March 2018 (US$1= IDR 13,760) for SUSENAS data.



Supplementary file 7 : Relative value of key indicators relating to inpatient services, by Indonesian region, 2018



Used services: % of individuals using inpatient services in the last year. Access to any inpatient services: % of villages with easy access to hospital or primary care with inpatient services. Insured: % of individuals reporting any current health insurance Out of pocket spending: Median value of (household spending on inpatient services in the last year, divided by the number of household members reporting inpatient care in the last year). Insurance claims: Total claims to public insurer for inpatient and outpatient care, divided by total registered participants.

STROBE (Strengthening The Reporting of OBservational Studies in Epidemiology) Checklist

A checklist of items that should be included in reports of observational studies. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Section and Item	Item No.	Recommendation	Reported on Page No.
Title and Abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1, 2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/Rationale	2	Explain the scientific background and rationale for the investigation being reported	3,4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study Design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	NA NA 5
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	NA NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5,6,7

Section and Item	Item No.	Recommendation	Reported on Page No.
Data Sources/ Measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5, 6, 7
Bias	9	Describe any efforts to address potential sources of bias	6
Study Size	10	Explain how the study size was arrived at	5
Quantitative Variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical Methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	7
		(*c*) Explain how missing data were addressed	5
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	NA NA 5
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive Data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	NA
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	NA
Outcome Data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	NA
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	NA
		Cross-sectional study—Report numbers of outcome events or summary measures	8-14

Section and Item	Item No.	Recommendation	Reported on Page No.
Main Results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-16
		(*b*) Report category boundaries when continuous variables were categorized	8-16
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other Analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key Results	18	Summarise key results with reference to study objectives	17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	20
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20
Generalisability	21	Discuss the generalisability (external validity) of the study results	20
Other Information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	7, 21

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.