

BMJ Open

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<http://bmjopen.bmj.com>).

If you have any questions on BMJ Open's open peer review process please email info.bmjopen@bmj.com

BMJ Open

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

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-050565
Article Type:	Original research
Date Submitted by the Author:	02-Mar-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 Setyaningsih, Hermawati; Universitas Gadjah Mada Fakultas Kedokteran Kesehatan Masyarakat dan Keperawatan Kok , Maarten ; Erasmus Universiteit Rotterdam; Vrije Universiteit Amsterdam Hoekstra, Trynke; VU University Amsterdam, Department of Health Sciences and the EMGO Institute for Health and Care Research Mukti, Ali; Universitas Gadjah Mada Fakultas Kedokteran Kesehatan Masyarakat dan Keperawatan, Public Health Pisani, Elizabeth ; Erasmus Universiteit Rotterdam; King's College London
Keywords:	HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, HEALTH ECONOMICS

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

1
2
3 1 **Is Indonesia achieving universal health coverage? Evidence from nationally**
4 2 **representative data relating insurance coverage; service access and use; and insurer and**
5 3 **household health spending.**
6 4

7 4
8 5 Agnes Bhakti Pratiwi^{1,2}, Hermawati Setiyaningsih¹, Maarten Olivier Kok^{3,4}, Trynke Hoekstra⁴,
9 6 Ali Ghufron Mukti¹, Elizabeth Pisani^{3,5}
10 7

11 8 ¹ Centre for Health Financing Policy and Health Insurance Management, and Department of Medical
12 9 Education and Bioethics, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada,
13 10 Yogyakarta, Indonesia

14 11 ² Section of Medical Ethics, Department of Ethics, Law and Humanities, University Amsterdam Medical
15 12 Center, University of Amsterdam, Amsterdam, The Netherlands

16 13 ³ Erasmus School for Health Policy and Management, Erasmus University Rotterdam, The Netherlands

17 14 ⁴ Department of Health Sciences and Amsterdam Public Health research institute, Vrije Universiteit,
18 15 Boelelaan 1085, 1081 HV Amsterdam, The Netherlands

19 16 ⁵ Faculty of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine,
20 17 London, UK
21 18
22 19

23 20 **Keywords:** Indonesia; Universal Health Coverage; UHC; health insurance; health equity; out
24 21 of pocket health payments
25 22

26 22
27 23 **Word count:** 4,463
28 24
29 25
30 26

31 27 **Corresponding author:**

32 28 Agnes Bhakti Pratiwi, MPH, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah
33 29 Mada, Jl. Farmako, Sekip Utara, Yogyakarta, Indonesia 55281
34 30 agnes.b.p@ugm.ac.id
35 31
36 32
37 33
38 34
39 35
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

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.

1
2
3 76
4 77 **INTRODUCTION**

5
6 78 In 2014, Indonesia, the world's fourth most populous nation, introduced a national health insurance
7
8 79 scheme, *Jaminan Kesehatan Nasional*, or JKN. Though the original target -- full coverage by 2019 --
9
10 80 was missed, achieving universal health coverage (UHC) remains a strong political priority for the current
11
12 81 government of Indonesia.¹⁻³ The scheme reports over 220 million participants (July 31st, 2020), 82% of
13
14 82 the national population of 268 million,⁴ making JKN one of the world's biggest single-payer health
15
16 83 insurance schemes.

17
18
19 84
20
21 85 Participation is compulsory, with premiums paid by employers. The state, which covers premiums for
22
23 86 its employees, the poor and the near-poor – pays 69% of all premiums.⁴ Non-poor Indonesians in
24
25 87 unsalaried jobs – some 30 million people – should pay their own premiums. In practice many do not.^{4,5}
26
27 88 For the first four years of the programme, monthly premiums started at IDR 25,500 (US\$ 1.80), rising
28
29 89 to IDR 80,000 (US\$ 5.52) for first class service.⁶

30
31 90
32
33 91 Over 2,300 hospitals, 1,700 of them private, accept JKN-funded patients.⁷ Broadly, JKN pays for
34
35 92 primary care (inpatient and outpatient) through capitation, while hospital care is reimbursed against
36
37 93 diagnostic codes.⁸⁻¹⁰ Many sophisticated and/or expensive treatments such as hip replacements and heart
38
39 94 septal surgery are covered at all premium levels.¹¹ The combination of low premium and generous
40
41 95 coverage has produced annual deficits since the programme's inception.^{12,13} The cumulative deficit was
42
43 96 51 trillion rupiah (3,7 billion US\$) at the end of 2019.¹⁴

44
45 97
46
47 98 In a bid to reduce the deficit, premiums were approximately doubled in January 2020, but the
48
49 99 Constitutional Court ruled that the increase in contributions violated the right to health, and it was
50
51 100 reversed, underlining the politically-charged landscape in which health reform takes place.^{6,15} In May
52
53 101 2020, the government again increased the premium.¹⁶

54
55
56
57 102

1
2
3 103 In accordance with the World Health Organization's vision for UHC,¹⁷ one of the goals of JKN was to
4
5 104 increase equitable access to health services without risk of impoverishment, across the nation. This is a
6
7 105 particular challenge given Indonesia's exceptional diversity. Over 60% of the population lives in Java,
8
9 106 just 6% of the land mass. There are a further 7,000 inhabited islands, with population density ranging
10
11 107 from 10/km² in Papua and North Kalimantan provinces to 1,400/km² in West Java.¹⁸ Income and health
12
13 108 needs are similarly diverse; for example 43% of children in East Nusa Tenggara are stunted, compared
14
15 109 9% in Jakarta province.¹⁹

16
17
18 110
19
20 111 The Government's most recent Health Sector Review, published five years into the JKN programme,
21
22 112 observed that the supply of health services remains a major constraint in many areas.²⁰ Studies in
23
24 113 Indonesia and other countries suggest that health care cumulates in areas with higher income and fewer
25
26 114 critical health needs.^{2,22-25} This study looks at the relationship between health need, service availability,
27
28 115 insurance status and financial protection across Indonesia.

29
30 116
31
32 117 Here, we merge four nationally representative data sources to undertake that analysis. If JKN enables
33
34 118 equitable health service access while protecting against impoverishment, we would expect areas with
35
36 119 highest health needs to have highest levels of service use and high insurance claims, with limited
37
38 120 variation in out-of-pocket spending nationwide. However, given the supply constraints reported in
39
40 121 the national health review,²⁰ we hypothesise that we will find a more complex relationship, as
41
42 122 illustrated in Figure 1.

43
44 123
45
46
47
48 124 At the aggregate level, we expect areas with more services to report higher claims. At the individual
49
50 125 level, we expect that insured service users would spend less out-of-pocket compared with uninsured
51
52 126 service users.

127 **METHODS**

128 **Data**

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

- 130 1. a national socio-economic survey or *Survey Sosial Ekonomi Nasional* (SUSENAS) 2018, a
131 cross-sectional household survey, statistically representative of all districts in Indonesia:
132 1,131,825 individual records;
- 133 2. a national census of villages or *Survei Potensi Desa* (PoDes) 2018, a census of all villages in
134 Indonesia: 83,931 village records;
- 135 3. a Population Health Development index or *Indeks Pembangunan Kesehatan Masyarakat*
136 (IPKM) 2018, a compound indicator of health status calculated at the district level, based on
137 data collected in the national health survey (RisKesDas), statistically representative of all
138 districts in Indonesia: 514 district records;
- 139 4. national insurance records from the Social Security Agency for health or *Badan Penyelenggara*
140 *Jaminan Sosial Kesehatan* (BPJS) end 2017, reported at the district level: 514 district records.

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

143 Further information about these sources, and the data derived from each, is given in Supplementary file

- 144 1. Supplementary file 2 shows the steps followed to merge these different data sets for analysis. All
145 supplementary material, as well as data management and merge codes for reuse, are provided at
146 <https://doi.org/10.7910/DVN/2Q37XL>.

148 **Measures**

149 **Health need**

150 We derived a proxy for health need from the Ministry of Health's 2018 public health index. The index
151 (0-1) includes reproductive, maternal and child and environmental health elements, disease prevalence,
152 and service access. Higher values indicate better community health. We recalculated the index excluding
153 service access, and inverted it ($100 - (100 * \text{public health index})$) to indicate district health need.

154

155 Insurance status

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

160

161 Out-of-Pocket payments

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

168

169 Health service access

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

174

175 **Region**

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

180 **Statistical Analysis**

1
2
3 181 We used STATA/MP 16.1 for Mac to perform data management, analysis, and maps configuration. In
4
5 182 collapsing data from the individual-level dataset (SUSENAS), we used individual sample weights. For
6
7 183 spending variables we calculated median values by district/province/region. For binary variables, we
8
9 184 calculated the percentage by district/province/region. No weights were used in collapsing the village
10
11 185 level data, since PoDes is a census. When collapsing BPJS data and for population totals, we summed
12
13 186 district totals to derive province and regional totals.
14

15
16 187
17
18 188 We performed descriptive and bivariate analysis of categorical variables, looking first at individual areas
19
20 189 of interest (health need, insurance status, service use, insurance claims and out-of-pocket spending). We
21
22 190 then proceeded through the associations in the logical framework illustrated in Figure 1, building up a
23
24 191 regression model using all salient variables and investigating factors associated first with use of services,
25
26 192 then with out-of-pocket spending on health (individual level), and with per capita insurance claims
27
28 193 (district level). Analysis files are provided at <https://doi.org/10.7910/DVN/2Q37XL>.
29

30 194

31 32 195 **Ethics**

33
34 196 The study involved no primary data collection; ethical review was not necessary. Study funders had no
35
36 197 role in the design of the study, nor in analysis or interpretation of the data. The corresponding author
37
38 198 had full access to all the data in the study and takes final responsibility for the decision to submit for
39
40 199 publication.
41

42
43 200

44 45 201 **Patient and public involvement**

46
47 202 No members of the public or patients were involved in this study.
48

49
50 203

51 52 204 **RESULTS**

53
54 205 Indonesia's regional diversity in terms of population, health indicators, service use and insurance
55
56 206 coverage is illustrated in **Table 1**. The far eastern region (covering the provinces of East Nusa
57
58 207 Tenggara (NTT), Maluku, North Maluku, West Papua and Papua) stands apart from the others in
59
60

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

211 **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

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

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

218 **Health status**

219 The index of health need (excluding measures of access) ranges from 23.4 in Gianyar, Bali, to 63.5 in
 220 Paniai, Papua. Papua is home to 15 of the 20 districts with poorest health status (See Supplementary file
 221 7b. and Supplementary Table A). Yet Papuans are less than half as likely to report recent symptoms of
 222 illness compared with people in Java and Bali; there is a weak inverse relationship between the Ministry
 223 of Health's index of health need and self-reported recent illness (Supplementary file 4).

225 **Insurance coverage**

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

1
2
3 230 which are reported in Table 2. Supplementary file 7c shows the diversity at the district level. By most
4
5 231 generous cover; 4.4% of Indonesians report more than one source of health insurance. People in poorer
6
7 232 households (by non-health consumption) are most likely to say that they are uninsured compared to
8
9 233 richest household (42.4% and 26.9% respectively). Poorest household quintiles are also most likely to
10
11 234 report subsidised insurance compared to richest household (51.8% and 25.8% respectively). Over a
12
13 235 quarter of those in the richest quintile report subsidised insurance (Supplementary file 3).
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

236 **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
13 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
14 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
16 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
17 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
20 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

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

238 JKN = *Jaminan Kesehatan Nasional* – National Health Insurance

239 For Claim : Currency conversion average rate for 2017 (US\$1=IDR 13,384)

240 For OOP (Out-of-pocket) : Currency conversion average rate for March 2018 (US\$1=IDR 13,760).

241 * Of households accessing any inpatient care in preceding 12 months

242

243

244

245

246

247 Access to health services and service use

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

254 **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

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

257 Insurance claims and out-of-pocket spending

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

263
 264 On the aggregate level, out-of-pocket spending on health was highest in areas where insurance claims
 265 were also high (Supplementary file 5). Median household expenditure on health (excluding insurance
 266 premia and transport) was 180% higher in Java and Bali than in the eastern provinces. Total out-of-
 267 pocket health spending was higher among the insured than the uninsured (Table 2). Some uninsured
 268 people reported paying nothing for inpatient care, which in some districts is free to all district residents
 269 at public facilities. However, the insured were nearly twice as likely to receive free inpatient care; bills
 270 for those that did pay were on average 20% lower than those faced by the uninsured.

1
2
3 271
4
5 272 Figure 2 shows the numbers receiving inpatient care, and per capita spending per inpatient, by insurance
6
7 273 status and wealth (non-health consumption level). Wealthier households are more likely to access
8
9 274 inpatient services than poorer households; the difference is most marked among the insured.
10
11 275 Proportionately, the rich are less likely to pay nothing for those services, but also less likely to pay high
12
13 276 amounts relative to other household consumption. In absolute terms, insured people from wealthy
14
15 277 households are the largest consumers of free inpatient care in Indonesia.

16 278
17
18 279 Supplementary file 6. summarises the data given in **Tables 1-3**. The radar graph illustrates inequalities
19
20 280 between the different regions using all indicators. The prosperous region Java/Bali with lowest health
21
22 281 needs, moderate insurance coverage, and best access to healthcare services, has the highest out-of-
23
24 282 pocket, insurance claims, and service use. In contrast, the poorer provinces of Eastern Indonesia (NTT,
25
26 283 Maluku, Papuas) have the highest health needs and insurance coverage, but lowest access to healthcare
27
28 284 services, subsequently lowest service use, out-of-pocket spending, and insurance claims.

29
30
31
32
33 285

34 286 **Regression model**

35
36 287 Our regression model followed the pathway indicated in Figure 1 for dependent variables including
37
38 288 service use, out-of-pocket spending and aggregate insurance claims, looking separately at inpatient and
39
40 289 outpatient services.

41
42
43
44 290

45
46 291 Compared to the districts with the highest health status, districts with lower health status generally have
47
48 292 lower odds of using inpatient service, lower spending on in- and outpatient services, and lower insurance
49
50 293 claims. Results for using outpatient service are less pronounced.

51
52 294

53
54 295 Being insured is associated with higher out-of-pocket spending on health services. Use of inpatient
55
56 296 services, household and insurer spending on both inpatient and outpatient services are highest in districts
57
58 297 with higher health status, controlling for both insurance status and access to services (**Table 4**). Having
59
60

298 health insurance is associated with 135% higher odds of using inpatient services compared with the
 299 uninsured after controlling for district health status and access to services, while among those reporting
 300 symptoms in the last month, the odds of using outpatient services increase by a quarter.
 301

	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 status	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 status	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

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

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

315
316 **Table 5.** shows the same model, with the addition of socio-economic status measured by non-health
317 consumption. Household wealth does not greatly influence use or spending outcomes for outpatient
318 care. While insurance remains associated with higher service use, its independent association with
319 higher out-of-pocket spending disappears for inpatient care. Spending rises sharply with wealth, for both
320 inpatient and outpatient services. Poor access to inpatient services continues to predict low service use
321 and spending below the threshold at which $\geq 80\%$ of villages have easy access.

322

	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

327 **DISCUSSION**

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

333
334 Health insurance is designed to provide protection against impoverishing spending.¹⁷ We hypothesized
335 that this protection may be eroded by uneven distribution of services across Indonesia's geographically
336 and economically diverse regions. However, we expected those with access to both services and
337 insurance to report low out-of-pocket spending.

338
339 Our findings confirm empirically the assertion in the national health review,²⁰ that limited service
340 provision constrains the utility of national health insurance for citizens in parts of the country,
341 particularly in poorer Eastern regions where health needs are greatest. While self-reported possession
342 of health insurance was associated with increased use of services, multivariable analyses suggest that in
343 districts where fewer than 80% of villages have easy access to services, limited access is associated with
344 lower service use, lower insurer spending and lower out-of-pocket spending on health, especially for
345 inpatient services. The findings are in line with earlier work showing that JKN claims per capita for
346 non-communicable diseases are consistently higher in Jakarta province (the national capital) than in
347 largely rural East Nusa Tenggara,²¹⁻²³ a difference attributed to differences in supply.²¹

348
349 As expected, we found considerable variation in access to health services across Indonesia, with services
350 most restricted in Eastern Indonesia and Kalimantan, as well as in the small islands of the extreme West.
351 While these areas are relatively sparsely populated,¹⁸ their inhabitants suffer the worst health (very
352 probably in part because of poor access to services). In Java and Bali, more than 90% of villages have
353 easy access to a hospital; in contrast, in Papua and Maluku the figure is below 30%. There may also be
354 a discrepancy in the quality of services provided. For example, Sidik et al. reported that paediatric care

1
2
3 355 in hospitals in eastern Indonesia perform worse than in wealthier regions, in each of the aspects assessed
4
5 356 including neonatal care, case management, facilities, emergency care, and access to hospital.²⁴ The
6
7 357 radical decentralisation undertaken by Indonesia since 2001 aimed to empower district governments in
8
9 358 these more remote areas to apportion funding (including for health) in ways that better meet local
10
11 359 needs,²⁵ thus reducing inequity. Pre-JKN academic estimates of the cost of meeting basic health needs
12
13 360 show significant variation by area (ranging from US\$ 15 in Yogyakarta to US\$ 48 in rural North
14
15 361 Maluku).²⁶ JKN, however, reverts to a largely centralised "one-size-fits-all" reimbursement model.¹

16
17 362
18
19
20 363 Unsurprisingly, we found that at the aggregate level, per capita insurer spending was significantly lower
21
22 364 in areas with poorest access to services. In the multivariable model insurer spending per registered JKN
23
24 365 participant was also highest in areas with good socio-economic status, highest out-of-pocket spending
25
26 366 and lowest health need, confirming the findings from Indonesia and other low and middle income
27
28 367 countries.^{22,27,28} This suggests cross-subsidisation of more developed areas by the poorest parts of the
29
30 368 country, which, unless addressed, is likely to further entrench health inequities.

31
32 369
33
34
35 370 While health insurance aims to reduce out-of-pocket spending on health, analyses of earlier insurance
36
37 371 schemes in Indonesia found that the insured spent more out-of-pocket than the uninsured, particularly
38
39 372 in urban areas.²⁸⁻³⁰ We expected that the more comprehensive JKN scheme would erode this anomaly.
40
41 373 Across the population as a whole it did not; controlling for access to health services and district health
42
43 374 index, the insured spent 9% more on inpatient services and 15% more on outpatient services than the
44
45 375 uninsured. It is likely that newly-insured patients may be emboldened to seek services which are not
46
47 376 fully covered, sometimes because health care providers seek profit by promoting "off-plan" services.³¹
48
49 377 This "gateway effect" has been seen in other countries embarking on scale-up of insurance, including
50
51 378 China, Ghana, Kenya and Zambia.³²⁻³⁵ In addition, patients may prefer to pay out-of-pocket for
52
53 379 outpatient services, in particular, since they are relatively affordable, perceived as higher quality, and
54
55 380 less burdensome in terms of queuing and paperwork.³⁴⁻³⁷

56
57
58 381
59
60

1
2
3 382 The aggregate increase in spending by insurance status disappears after controlling for household wealth
4
5 383 (measured by non-health consumption). This represents an improvement compared with findings of
6
7 384 studies conducted in the first years of the scheme,³⁸ suggesting the poorest households are protected
8
9 385 against additional spending when accessing inpatient services (where available). It may also signal a
10
11 386 difference in the variety or quality of services offered to poorer users of health insurance.
12

13
14 387

15 388 If we remove need and access from the equation and restrict the analysis to only insured patients who
16
17 389 have used inpatient services (Figure 2), we find that the poorest families are least likely to use services.
18
19 390 While more than half of the poorest who do get treated pay nothing, 13% use up more than 10% of their
20
21 391 monthly non-health budget on inpatient care. By some definitions, this is considered catastrophic;^{39,40} it
22
23 392 compares with generally low out-of-pocket spending on health in Indonesia compared with other Asian
24
25 393 countries, at below 2% of total household spending.⁴¹
26
27

28 394

29
30 395 While overall coverage of JKN was high, there were anomalies in the self-reported data. Self-reported
31
32 396 insurance coverage falls with socio-economic status (from 76% in the highest quintile to 59% in the
33
34 397 lowest), though the government covers premiums for the poor and near-poor, and the insurer reports
35
36 398 higher coverage in poorer areas. This suggests some people are unaware that they are registered, or do
37
38 399 not fully understand the utility of their health insurance card. Conversely, 26% of respondents in the
39
40 400 richest quintile reported state-subsidised insurance, suggesting that subsidised premiums could be better
41
42 401 targeted.
43

44 402

45 403 **Implication for research and practice**

46
47
48 404 Indonesia has made great strides in setting up a public insurance system, and it is effectively protecting
49
50 405 many poor families from excessive spending on inpatient care. However, its benefits are limited for the
51
52 406 millions of Indonesians – especially those living in areas with greatest health needs – who are unable to
53
54 407 benefit from their health insurance because they have extremely limited access to formal health services.
55
56

57 408
58
59
60

1
2
3 409 As Turkey – another large, middle-income country aspiring to provide UHC – has found, more equitable
4
5 410 access to quality health services is a prerequisite for the increased national equity of welfare the
6
7 411 Indonesian government seeks.^{42–44} But success in providing wider access to necessary services will be a
8
9 412 double-edged sword: fulfilling unmet demand will increase claims on a system that is already deeply in
10
11 413 deficit. While the social security agency which administers JKN might thus be reluctant to support
12
13 414 expanding services in under-served areas, the supply side is under the control of directly elected district
14
15 415 governments. They are more likely to see investment in health service supply as a viable option to
16
17 416 generate political popularity and opportunities for patronage.¹
18
19

20 417
21
22 418 To avoid crippling JKN with additional debt if service access and thus claims increase, the government
23
24 419 may need to: reduce per capita spending in more populous areas; continue on a course adopted in late
25
26 420 2019,⁴⁵ increasing revenue through higher premiums for those who can pay them; and/or prioritise
27
28 421 coverage to meet the most urgent needs first. All three options are politically unpalatable. The steep rise
29
30 422 in out-of-pocket spending by wealth quintile reported here suggests, however, that wealthier families
31
32 423 may be both able and willing to absorb higher contributions, allowing funds to be redirected to
33
34 424 incentivising supply in peripheral areas, and protecting those most in need.
35
36

37 425
38
39 426 A greater focus on equity in both supply and health financing would help Indonesia achieve the true
40
41 427 aims of Universal Health Coverage: to ensure that all citizens have fair access to basic health services
42
43 428 without being pushed into poverty.
44

45 429

47 430 **Figure 1: Expected relationship of insurance claims and out-of-pocket spending with health need,**
48 431 **insurance status, and service availability**

49 432
50 433 **Figure 2: Numbers reporting inpatient service use, by insurance status, non-health consumption quintile,**
51 434 **and percentage of household consumption spent on inpatient services**
52 435

53 436

54 437

56 437 **Contributors**

57

58

59

60

1
2
3 438 ABP, EP, AGM conceptualised the study. EP and HS performed the data cleaning and management.
4
5 439 ABP, EP, HS, TH performed the data analysis. EP and HS designed the figures. AGM and MOK
6
7 440 supervised the project. ABP and EP contributed equally to drafting the manuscript, with input of all
8
9 441 authors. All authors have approved the final manuscript.
10

11 442

14 443 **Funding**

16 444 Netherlands Universities Foundation for International Cooperation (NUFFIC). Grant number
17
18 445 NICHE/ IDN/ 226: CF 9900.
19

20 446

23 447 **Data sharing statement**

25 448 The data management and analysis files in Stata format (.do files) are available in the senior
26
27 449 author's research repository at <https://doi.org/10.7910/DVN/2Q37XL>. While the paper reports
28
29 450 data at the regional level, in the repository we provide data for each of Indonesia's 514
30
31 451 districts in Supplementary tables, as well as in more easily downloadable Excel format. These
32
33 452 are made available by the authors under a CC0 licence, though in view of the work that goes
34
35 453 in to this type of data integration, we would appreciate full citation by anyone re-using these
36
37 454 resources.
38
39
40
41

42 455

44 456 **Declaration of interest**

46 457 We declare no conflict of interest.
47

48 458

51 459 **Acknowledgements**

53 460 This study was funded by Netherlands Universities Foundation for International Cooperation
54
55 461 (NUFFIC). ABP received scholarship from Indonesia Endowment Fund for Education (LPDP).
56

57 462

58 463

464 **References**

1. Pisani E, Olivier Kok M, Nugroho K. Indonesia's road to universal health coverage: a political journey. *Health Policy Plan* 2017;32(2):267–76.
2. Agustina R, Dartanto T, Sitompul R, et al. Universal health coverage in Indonesia: concept, progress, and challenges. *Lancet* 2019;393(10166):75-102.
3. Mboi N. Indonesia: On the way to universal health care. *Health Syst Reform* 2015;1(2):91–7.
4. Social Security Agency for Health. JKN program participants, 2020. Available: <https://bpjs-kesehatan.go.id/bpjs/> [Accessed 29 Jan 2020]
5. Dartanto T, Halimatussadiyah A, Rezki JF, et al. Why do informal sector workers not pay the premium regularly? Evidence from the National Health Insurance System in Indonesia. *Appl Health Econ Health Policy* 2020 Feb; 18(1):81-96.
6. Government Republic of Indonesia. Presidential decree Republic of Indonesia number 82 year 2018, 2018. Available: <https://bpjs-kesehatan.go.id/bpjs/dmdocuments/2b85f7e015e747f9cd29ef384b4cb316.pdf> [Accessed 29 Jan 2020]
7. Ministry of Health Republic of Indonesia. Data and information: Indonesia health profile 2017, 2018.
8. Asyary A. Indonesian primary care through universal health coverage systems: A feeling in bones. *Public Health Indonesia* 2018;4(3):138–45.
9. World Health Organization. Primary health care on the road to universal health coverage: 2019 global monitoring report; Conference edition, 2019.
10. Minister of Health Republic of Indonesia. Minister of Health regulation number 52 year 2016 about healthcare services standard tarif in JKN, 2016. Available: http://hukor.kemkes.go.id/uploads/produk_hukum/PMK_No_52_Tahun_2016_Tentang_Standar_Tarif_Pelayanan_Kesehatan_Dalam_Penyelenggaraan_JKN_.pdf [Accessed 5 Sep 2020].
11. Ministry of Health Republic of Indonesia. Minister of Health regulation number 76 year 2016 about guideline INA-CBG in JKN, 2016.
12. Social Security Agency for Health. Executive summary of the 2016 social security program for health, management report and financial report, 2016. Available: <https://www.bpjs-kesehatan.go.id/bpjs/dmdocuments/b39df9ae7a30a5c7d4bd0f54d763b447.pdf> [Accessed 5 sep 2020].
13. Social Security Agency for Health. Executive summary of the 2019 program and finance BPJS 2019, 2019.
14. Social Security Agency for Health. 2019 program management report and 2019 program financial report. Available: <https://bpjs-kesehatan.go.id/bpjs/arsip/detail/1514> [Accessed 13 Nov 2020].
15. Supreme Court Republic of Indonesia. Decision number 7/HUM/2020, 2020.
16. President Republic of Indonesia. President regulation number 64 year 2020, 2020.
17. World Health Organization. Tracking universal health coverage: first global monitoring report. Geneva: World Health Organization 2015.
18. Central Bureau of Statistics Indonesia. Statistik Indonesia 2020, 2020.
19. Ministry of Health Republic of Indonesia. Public health development index. Jakarta, Indonesia: Ministry of Health, Publishing Body of Health Research and Development, Ministry of Health 2019.
20. Gani A, Budiharsana M. The consolidated report on Indonesia health sector review 2018. Jakarta: Republic of Indonesia, BAPPENAS 2019. Available: <https://www.unicef.org/indonesia/reports/consolidated-report-indonesia-health-sector-review-2018> [Accessed 31 Aug 2020].
21. Mulyanto J, Kunst AE, Kringos DS. Geographical inequalities in healthcare utilisation and the contribution of compositional factors: A multilevel analysis of 497 districts in Indonesia. *Health Place* 2019;60:102236.
22. Wati H, Thabrany H. Catastrophic claim comparison among JKN member in DKI Jakarta Province and East Nusa Tenggara in 2014. *Jurnal Ekonomi Kesehatan Indonesia* 2017;1(2). Available: <http://journal.fkm.ui.ac.id/jurnal-eki/article/view/1771> [Accessed 31 Aug 2020].

- 1
2
3 518 23. Mulyanto J. In the pursuit of universal access: inequalities in healthcare utilisation in Indonesia
4 519 [dissertation]. Amsterdam University Medical Centre, University of Amsterdam 2020.
5 520 24. Sidik NA, Lazuardi L, Agung FH, et al. Assessment of the quality of hospital care for children in
6 521 Indonesia. *Trop Med Int Health* 2013;18(4):407–15.
7 522 25. Maharani A, Tampubolon G. Has decentralisation affected child immunisation status in
8 523 Indonesia? *Glob Health Action* 2014;7(1):24913.
9 524 26. Ensor T, Firdaus H, Dunlop D, et al. Budgeting based on need: a model to determine sub-
10 525 national allocation of resources for health services in Indonesia. *Cost Eff Resour Alloc*
11 526 2012;10(1):11.
12 527 27. Van Doorslaer E, O'Donnell O, Rannan-Eliya RP, et al. Paying out-of-pocket for health care in
13 528 Asia: Catastrophic and poverty impact. Erasmus University, Rotterdam and IPS, Colombo 2005.
14 529 28. Sparrow R, Suryahadi A, Widyanti W. Social health insurance for the poor: Targeting and
15 530 impact of Indonesia's Askeskin programme. *Soc Sci Med* 2013;96:264–71.
16 531 29. Aji B, De Allegri M, Souares A, et al. The impact of health insurance programs on out-of-pocket
17 532 expenditures in Indonesia: An increase or a decrease?. *Int J Environ Res Public Health*
18 533 2013;10(7):2995–3013.
19 534 30. Aizawa T. The impact of health insurance on out-of-pocket expenditure on delivery in Indonesia.
20 535 *Health Care Women Int* 2019;40(12):1374–95.
21 536 31. Hasnida A, Kok M, Pisani E. Challenges in Maintaining Medicine Quality While Aiming for
22 537 Universal Health Coverage: A Qualitative Analysis from Indonesia. *BMJ Glob Health* [in Press]
23 538 2020.
24 539 32. Wagstaff A, Lindelow M. Can insurance increase financial risk? The curious case of health
25 540 insurance in China. *J Health Econ* 2008;27(4):990-1005.
26 541 33. Aryeetey GC, Westeneng J, Spaan E, et al. Can health insurance protect against out-of-pocket
27 542 and catastrophic expenditures and also support poverty reduction? Evidence from Ghana's
28 543 National Health Insurance Scheme. *Int J Equity Health* 2016;15(1):116.
29 544 34. Ekman B. Catastrophic health payments and health insurance: Some counterintuitive evidence
30 545 from one low-income country. *Health Policy* 2007;3(2–3):304–13.
31 546 35. Salari P, Di Giorgio L, Ilinca S, et al. The catastrophic and impoverishing effects of out-of-
32 547 pocket healthcare payments in Kenya, 2018. *BMJ Glob Health* 2019;4(6).
33 548 36. Selvaraj S, Farooqui HH, Karan A. Quantifying the financial burden of households' out-of-
34 549 pocket payments on medicines in India: a repeated cross-sectional analysis of National Sample
35 550 Survey data, 1994-2014. *BMJ Open*. 2018;8:e018020.
36 551 37. Tangcharoensathien V, Patcharanarumol W, Ir P, et al. Health-financing reforms in southeast
37 552 Asia: challenges in achieving universal coverage. *Lancet*. 2011;377(9768):863–73.
38 553 38. Mahendradhata Y, Laksono Trisnantoro, Listyadewi S, et al. The Republic of Indonesia health
39 554 system review, 2017.
40 555 39. Wagstaff A, Doorslaer E van. Catastrophe and impoverishment in paying for health care: with
41 556 applications to Vietnam 1993-1998. *Health Econ* 2003;12(11):921–33.
42 557 40. Wagstaff A, Flores G, Hsu J, et al. Progress on catastrophic health spending in 133 countries: a
43 558 retrospective observational study. *Lancet Glob Health* 2018;6(2):e169–79.
44 559 41. Van Doorslaer E, O'Donnell O, Rannan-Eliya RP, et al. Effect of payments for health care on
45 560 poverty estimates in 11 countries in Asia: an analysis of household survey data. *Lancet*
46 561 2006;368(9544):1357–1364.
47 562 42. President's Staff Office. Two Years of Real Work Jokowi-JK, 2016. Available:
48 563 <https://web.kominfo.go.id/sites/default/files/KSP%20%20Tahun%20Jokowi%20JK.pdf>
49 564 [Accessed 5 Sep 2020].
50 565 43. UNDP Indonesia. Converging development agendas: 'Nawa Cita', 'RPJMN', and SDGs, 2015.
51 566 44. Atun R, Aydin S, Chakraborty S, et al. Universal health coverage in Turkey: enhancement of
52 567 equity. *Lancet* 2013;382(9886):65–99.
53 568 45. President Republic of Indonesia. President regulation number 75 Year 2019, 2019. Available:
54 569 <https://www.bpjs-kesehatan.go.id/bpjs/dmdocuments/d24f3714c050f7cab8f817c5f8717c84>
55 570 [Accessed 5 Sep 2020].
56 571 46. Tirgil A, Dickens WT, Atun R. Effects of expanding a non-contributory health insurance scheme
57 572 on out-of-pocket healthcare spending by the poor in Turkey. *BMJ Glob Health* 2019;4:e001540

Healthcare needs

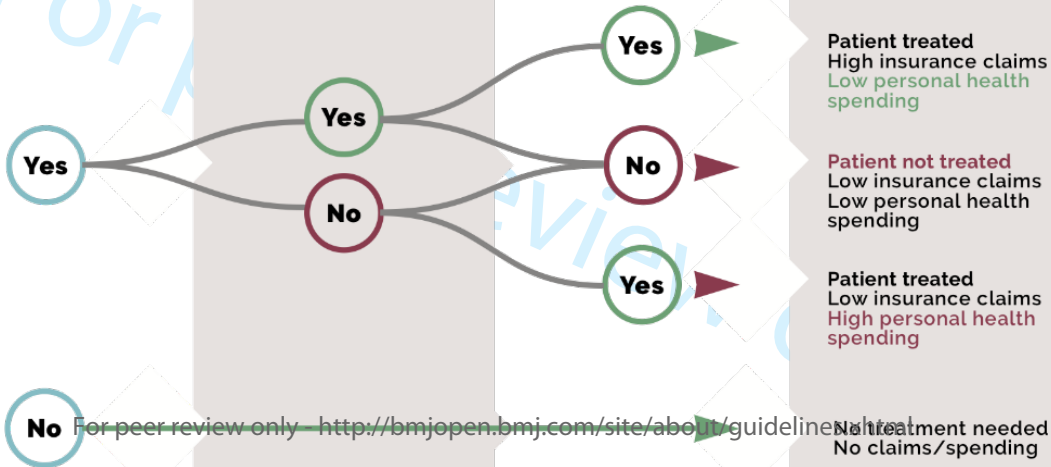
Person has health insurance

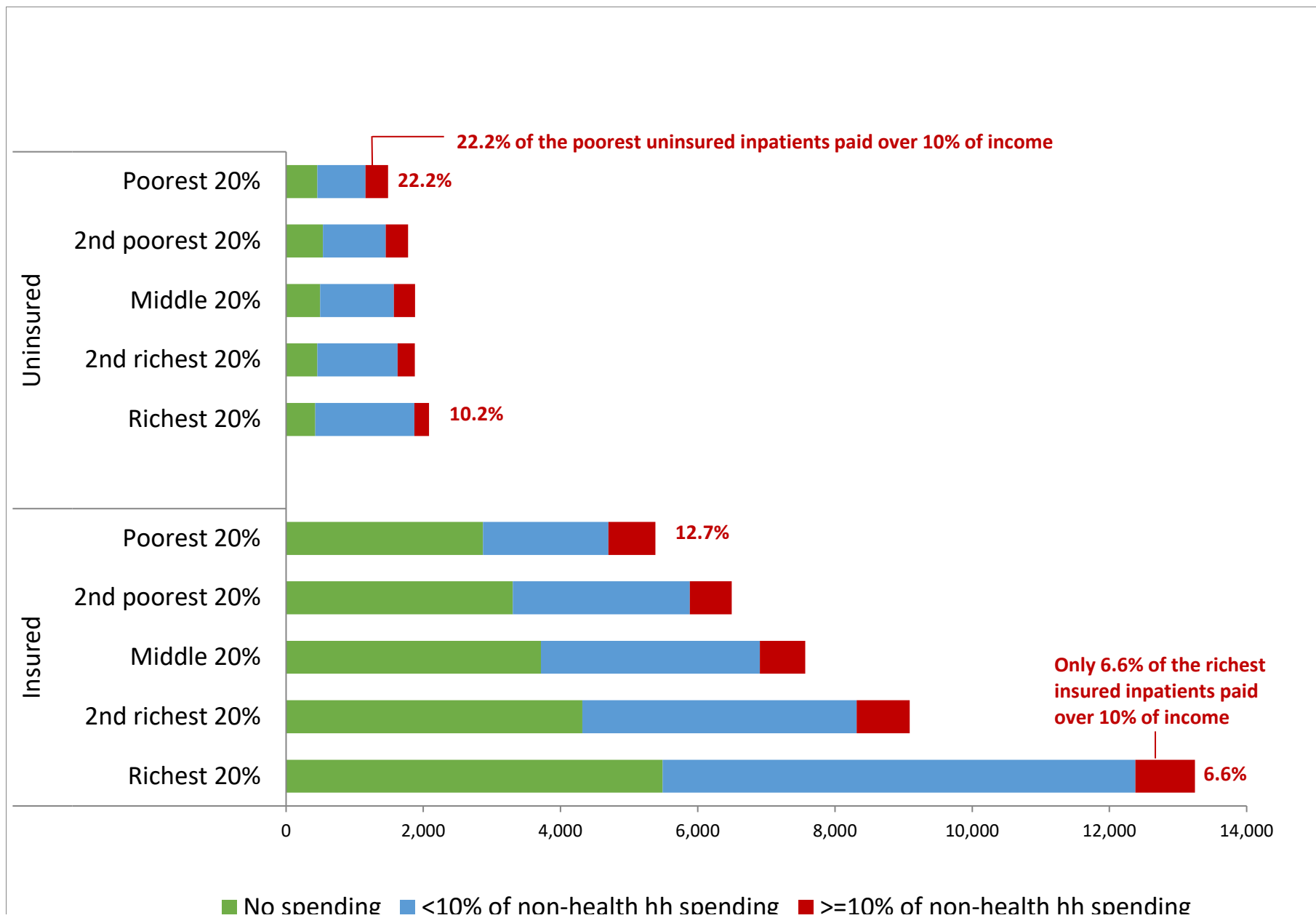
BMJ Open

Health services locally available

Health/spending outcomes

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16





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.

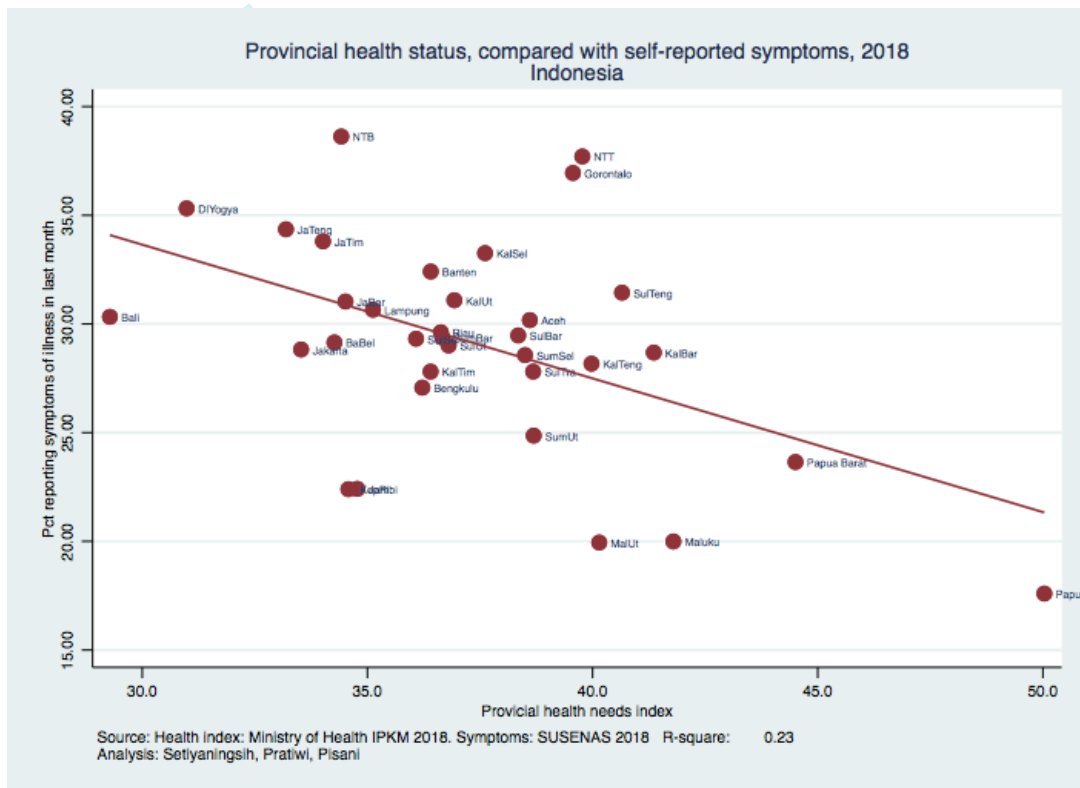
Consumption is calculated at the household level. As a proxy for wealth, we sum all non-health-related consumption, and divide it by the number of individuals in the household. This table shows health insurance status by quintiles of wealth.

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 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.

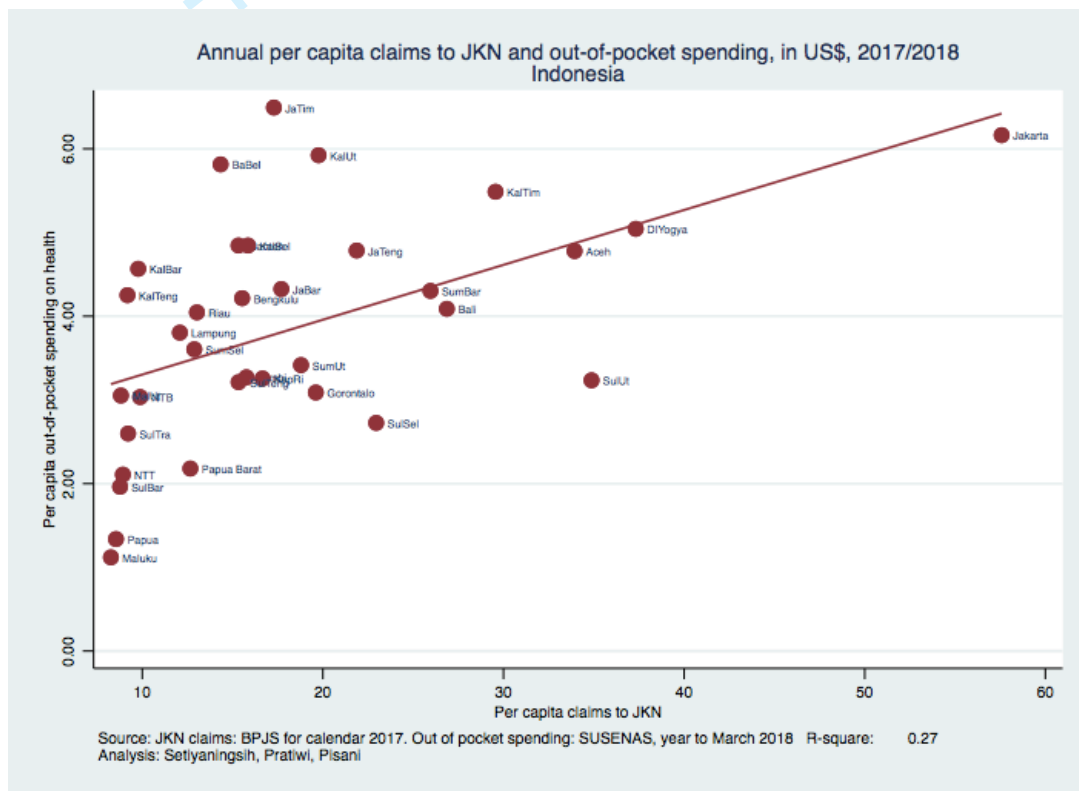


Supplementary material to Pratiwi et al.

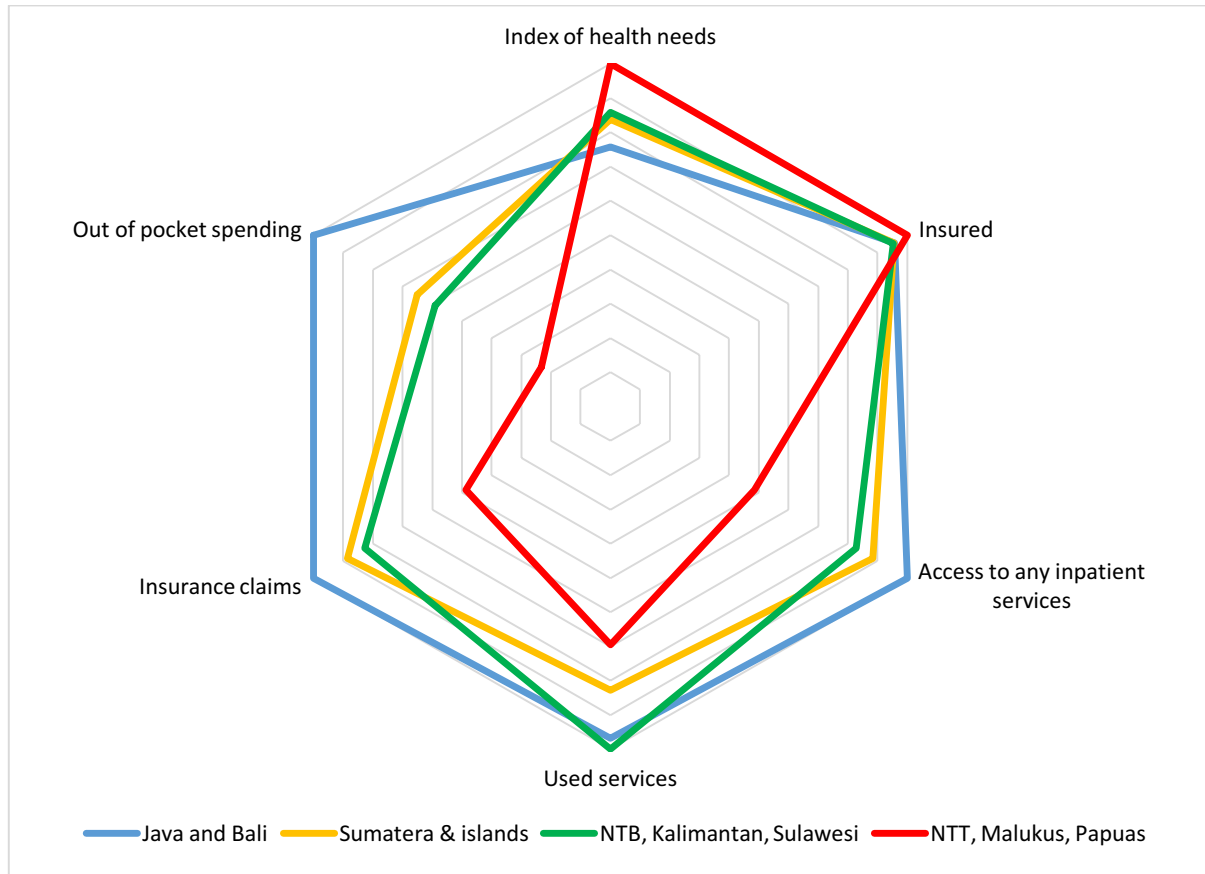
Supplementary file 5: Insurance claims vs OOP health spending

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

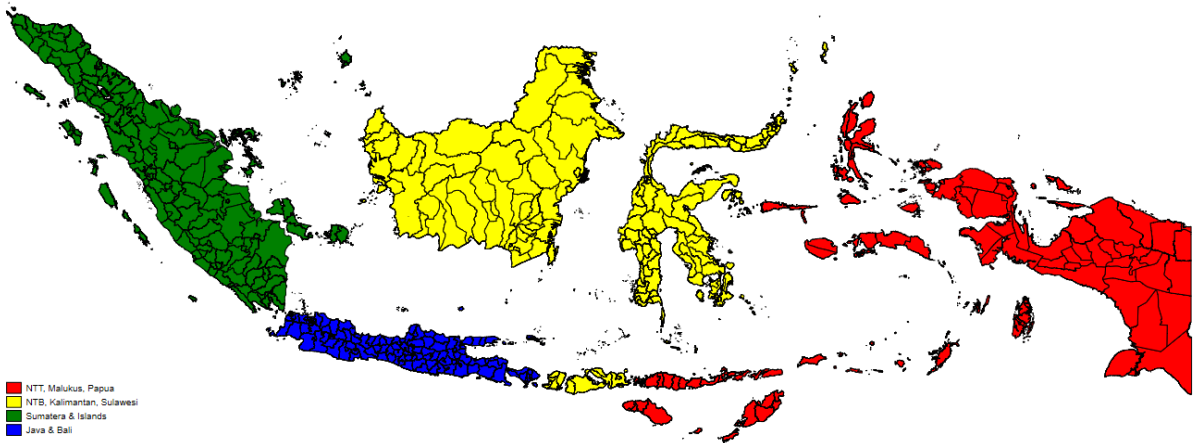
This graph compares the median out of pocket spending on health per capita reported for the year to March 2018 (SUSENAS data) with the per capita public insurance claims for each Indonesian province for calendar 2017. Per capita insurance claims are calculated by summing up all inpatient and outpatient 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.



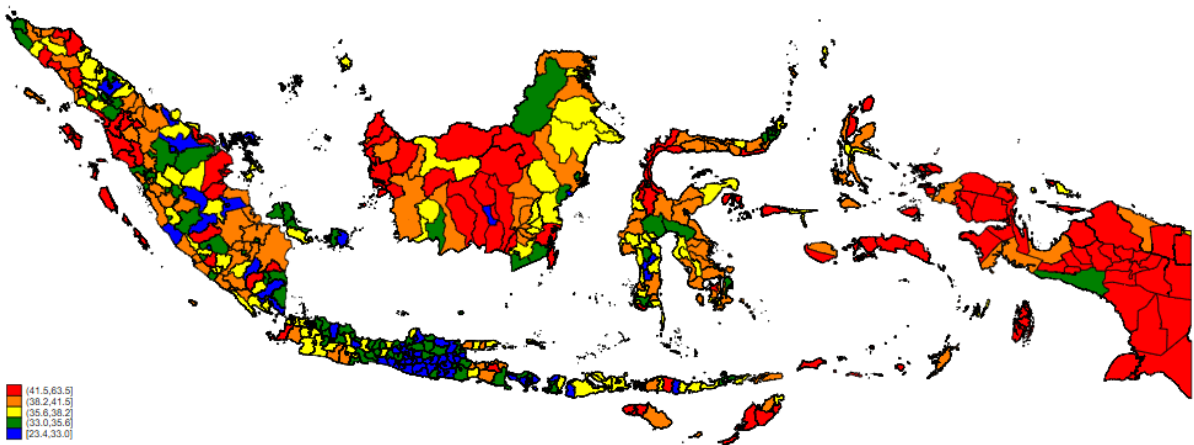
Supplementary file 6: Relative value of key indicators relating to inpatient services, by Indonesian region, 2018



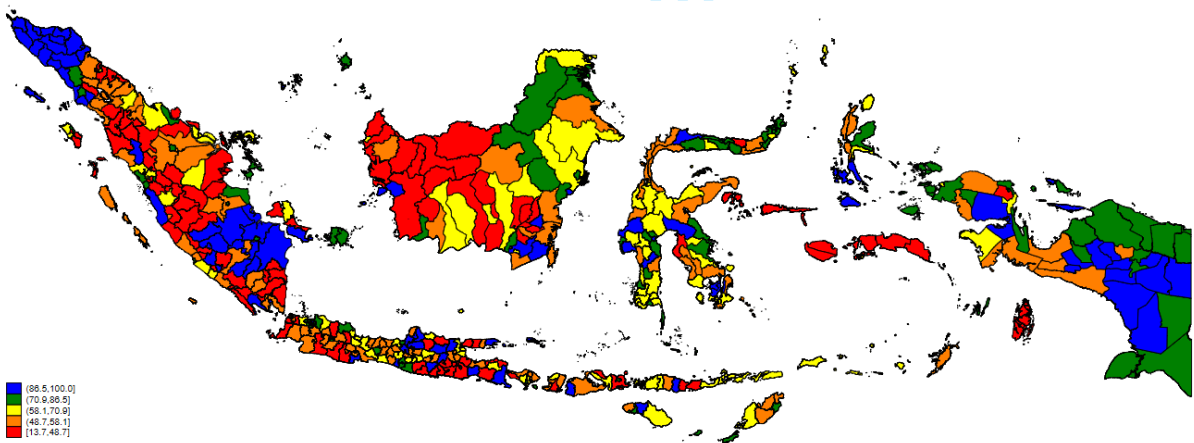
Used services: % of individuals using inpatient services in the last year. Access to any inpatient services: % of villages with easy access to hospital or primary care with inpatient services. Insured: % of individuals reporting any current health insurance. Out of pocket spending: Median value of (household 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.



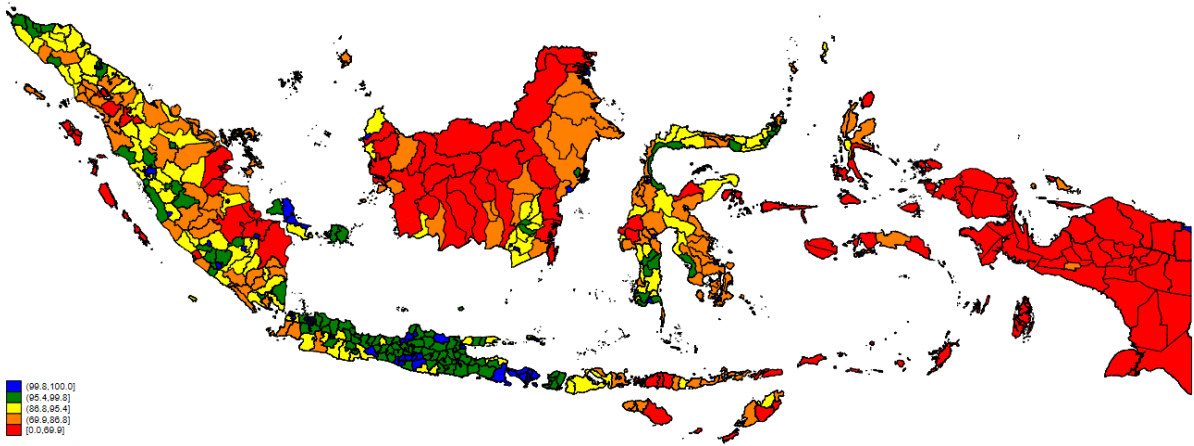
7a: Regional groupings



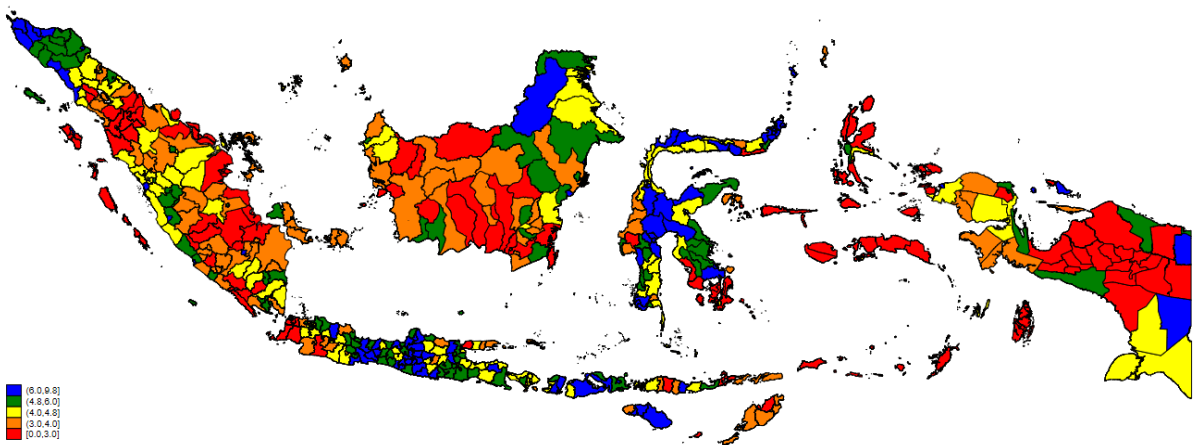
7b: Index of health need, Riskesdas, 2018. Red and orange areas have higher health needs



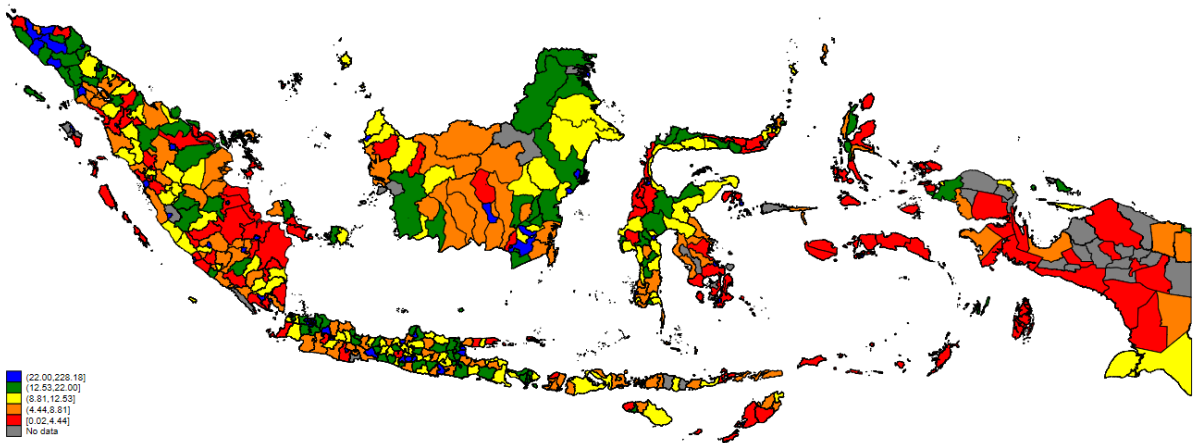
7c: Self-reported insurance status, Susenas, 2018. Red and orange areas have lower self-reported insurance status



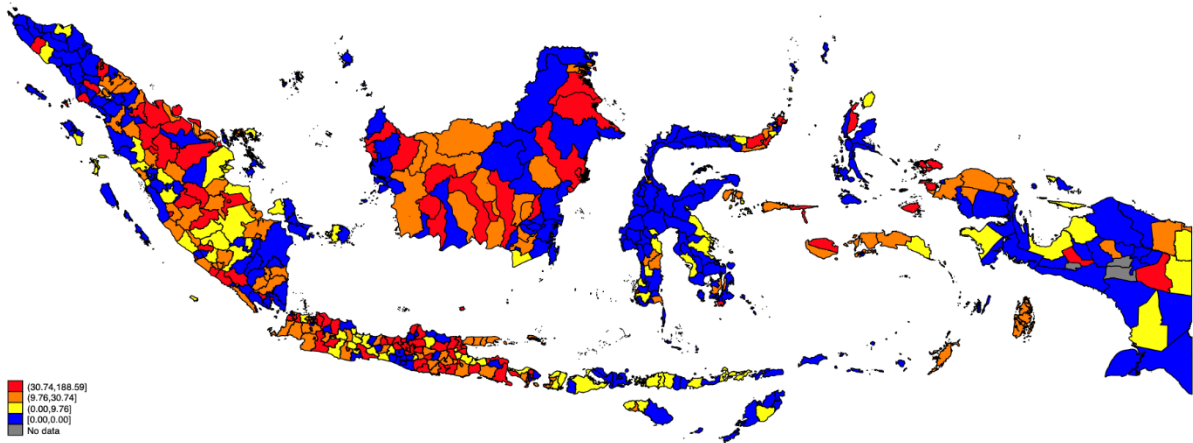
7d: Percentage of villages with easy access to inpatient services, PoDes, 2018. Red and orange areas have more difficult access



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:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-050565.R1
Article Type:	Original research
Date Submitted by the Author:	21-Jun-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 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

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

1
2
3 1 **Is Indonesia achieving universal health coverage? Secondary analysis of national data on**
4 2 **insurance coverage, health spending and service availability**

5 3
6 4 Agnes Bhakti Pratiwi^{1,2}, Hermawati Setyaningsih¹, Maarten Olivier Kok^{3,4}, Trynke Hoekstra⁴,
7 5 Ali Ghufron Mukti¹, Elizabeth Pisani^{3,5}
8 6

9 7 ¹ Centre for Health Financing Policy and Health Insurance Management; and Department of Medical
10 8 Education and Bioethics, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada,
11 9 Yogyakarta, Indonesia

12 10 ² Section of Medical Ethics, Department of Ethics, Law and Humanities, University Amsterdam Medical
13 11 Center, University of Amsterdam, Amsterdam, The Netherlands

14 12 ³ Erasmus School for Health Policy and Management, Erasmus University Rotterdam, The Netherlands

15 13 ⁴ Department of Health Sciences and Amsterdam Public Health research institute, Vrije Universiteit,
16 14 Amsterdam, The Netherlands

17 15 ⁵ Faculty of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine,
18 16 London, UK
19 17
20 18

21 19 **Keywords:** Indonesia; Universal Health Coverage; UHC; health insurance; health equity; out
22 20 of pocket health payments
23 21

24 22 **Word count:** 4,503
25 23
26 24
27 25

28 26 **Corresponding author:**

29 27 Agnes Bhakti Pratiwi, MPH, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah
30 28 Mada, Jl. Farmako, Sekip Utara, Yogyakarta, Indonesia 55281
31 29 agnes.b.p@ugm.ac.id
32 30
33 31
34 32
35 33
36 34
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

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.

73 INTRODUCTION

74 In 2014, Indonesia, the world's fourth most populous nation, introduced a national health insurance
75 scheme, *Jaminan Kesehatan Nasional*, or JKN. Politicians set an ambitious target: to sign up all
76 Indonesians, and thereby achieve Universal Health Coverage (UHC) by 2019.¹⁻³ Although the target
77 was missed, great strides have been made towards it, at least in terms of participant registration. The
78 scheme reports over 220 million participants (July 31st, 2020), 82% of the national population of 268
79 million,⁴ making JKN one of the world's biggest single-payer health insurance schemes. In accordance
80 with the World Health Organization's vision for UHC,⁵ one of the goals of JKN was to increase equitable
81 access to health services without risk of impoverishment, across the nation. However, the limited
82 availability of health services means that registration of participants may not translate into effective
83 'coverage'.

84
85 Participation is compulsory, with premiums paid by employers. The state, which covers premiums for
86 its employees, the poor and the near-poor – pays 69% of all premiums.⁴ Non-poor Indonesians in
87 unsalaried jobs – some 30 million people – should pay their own premiums. In practice many do not.^{4,6,7}
88 For the first four years of the programme, monthly premiums started at IDR 25,500 (US\$ 1.80), rising
89 to IDR 80,000 (US\$ 5.52) for first class service.⁸

90
91 Over 2,300 hospitals, 1,700 of them private, accept JKN-funded patients.⁹ Broadly, JKN pays for
92 primary care (inpatient and outpatient) through capitation, while hospital care is reimbursed against
93 diagnostic codes.¹⁰⁻¹² Many sophisticated and/or expensive treatments such as hip replacements and
94 heart septal surgery are covered at all premium levels.¹³ The combination of low premium and generous
95 coverage has produced annual deficits since the programme's inception.^{14,15} The cumulative deficit was
96 51 trillion rupiah (3,7 billion US\$) at the end of 2019.¹⁵

97
98 In a bid to reduce the deficit, premiums were approximately doubled in January 2020, but the
99 Constitutional Court ruled that the increase in contributions violated the right to health, and it was

1
2
3 100 reversed, underlining the politically-charged landscape in which health reform takes place.^{8,16} In May
4
5 101 2020, the government again increased the premium.¹⁷ By September 2020, the insurer's Director General
6
7
8 102 told the press 1.5 million people had opted to lower their premium class.^{18,19}
9

10
11 103
12
13 104 Achieving affordable access to quality health services nationwide is a particular challenge given
14
15 105 Indonesia's exceptional diversity. Over 60% of the population lives in Java, just 6% of the land mass.
16
17 106 There are a further 7,000 inhabited islands, with population density ranging from 10/km² in Papua and
18
19 107 North Kalimantan provinces to 1,400/km² in West Java.²⁰ Income and health needs are similarly diverse;
20
21 108 for example, 43% of children in East Nusa Tenggara are stunted, compared 9% in Jakarta province.²¹
22
23

24 109
25
26 110 The Government's most recent Health Sector Review, published five years into the JKN programme,
27
28 111 observed that the supply of health services remains a major constraint in many areas.²² Studies in
29
30 112 Indonesia and other countries suggest that health care cumulates in areas with higher income and fewer
31
32 113 critical health needs.^{2,23,24} This study looks at the relationship between health need, service availability,
33
34 114 insurance status and financial protection across Indonesia.
35

36 115
37
38 116 We merge four nationally representative data sources to undertake that analysis. If JKN enables
39
40 117 equitable health service access while protecting against impoverishment, we would expect areas with
41
42 118 highest health needs to have highest levels of service use and high insurance claims, with limited
43
44 119 variation in out-of-pocket spending nationwide. However, given the supply constraints reported in
45
46 120 the national health review,²² we hypothesised that we would find a more complex relationship, as
47
48 121 illustrated in Figure 1. At the aggregate level, we expect areas with more services to report higher
49
50 122 claims. At the individual level, we expect that insured service users would spend less out-of-pocket
51
52 123 compared with uninsured service users.
53
54
55
56
57
58
59
60

124 **METHODS**

125 **Data**

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

- 127 1. a national socio-economic survey or *Survey Sosial Ekonomi Nasional* (SUSENAS) 2018, a
128 cross-sectional household survey, statistically representative of all districts in Indonesia:
129 1,131,825 individual records;
- 130 2. a national census of villages or *Survei Potensi Desa* (PoDes) 2018, a census of all villages in
131 Indonesia: 83,931 village records;
- 132 3. a Population Health Development index or *Indeks Pembangunan Kesehatan Masyarakat*
133 (IPKM) 2018, a compound indicator of health status calculated at the district level, based on
134 data collected in the national health survey (RisKesDas), statistically representative of all
135 districts in Indonesia: 514 district records;
- 136 4. national insurance records from the Social Security Agency for health or *Badan Penyelenggara*
137 *Jaminan Sosial Kesehatan* (BPJS) end 2017, reported at the district level: 514 district records.

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

140 Further information about these sources, and the data derived from each, is given in Supplementary file

- 141 1. Supplementary file 2 shows the steps followed to merge these different data sets for analysis. All
142 supplementary material, as well as data management and merge codes for reuse, are provided at
143 <https://doi.org/10.7910/DVN/2Q37XL>.

145 **Measures**

146 Health need

147 We derived a proxy for health need from the Ministry of Health's 2018 public health index. The index
148 (0-1) includes reproductive, maternal and child and environmental health elements, disease prevalence,
149 and service access. Higher values indicate better community health. We recalculated the index excluding
150 service access, and inverted it ($100 - (100 * \text{public health index})$) to indicate district health need.

1
2
3 151
4
5 152 Insurance status
6
7 153 In SUSENAS 2018, individuals self-report health insurance by type: JKN (subsidised or non-subsidised),
8
9 154 district public health insurance scheme, private insurance, or supplementary work place insurance. In
10
11 155 the analysis reported here, we classified people as insured if they reported at least one form of health
12
13 156 insurance, and also calculated those reporting any public insurance (JKN or district health insurance).
14
15 157 We calculated insurer-reported coverage by dividing registered participants by district population.
16
17
18 158

19
20 159 Out-of-Pocket payments

21
22 160 In SUSENAS 2018 data we calculated out-of-pocket payments (OOP) for health by summing household
23
24 161 payments to formal health service providers and spending on medicines and medical supports e.g.
25
26 162 prostheses. Insurance premiums are excluded. We estimated per capita health spending by dividing all
27
28 163 household spending on health by number of household members. Per capita spending on inpatient care
29
30 164 was calculated by dividing inpatient spending over the previous 12 months by the number of household
31
32 165 members reporting inpatient care in the previous 12 months.
33
34

35 166

36
37 167 Health service access

38
39 168 We constructed a proxy for restricted physical access to health services at district level using village
40
41 169 census data. In PoDes, village heads are asked whether various health services were present in the
42
43 170 village, and if not, how easy each was to reach. We classified access to each as restricted if the nearest
44
45 171 facility was reported as 'hard' or 'very hard' to reach, and as easy if it was 'easy' or 'moderately easy' to
46
47 172 reach, or present in the village. For each district, we then calculated the percent of villages which have
48
49 173 no easy access to: 1) a hospital 2) any inpatient services 3) any one of: any inpatient services, primary
50
51 174 health centre, private clinic, private doctor, maternity waiting home, registered midwife, pharmacy. In
52
53 175 addition, we used SUSENAS data to capture actual realisation of access as self-reported utilisation in
54
55 176 inpatient care in the preceding 12 months and outpatient care in the preceding month.
56
57

58 177
59
60

178 **Region**

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

184 **Statistical Analysis**

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

191
192 We performed descriptive and bivariate analysis of categorical variables, looking first at individual areas
193 of interest (health need, insurance status, service use, insurance claims and out-of-pocket spending). We
194 then proceeded through the associations in the logical framework illustrated in Figure 1, building up a
195 regression model using all salient variables and investigating factors associated first with use of services,
196 then with out-of-pocket spending on health (individual level), and with per capita insurance claims
197 (district level). Analysis files are provided at <https://doi.org/10.7910/DVN/2Q37XL>.

199 **Ethics**

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

205 **Patient and public involvement**

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

207

208 RESULTS

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

215 **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

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

218 While the following section reports data at the regional level, tables giving the same data at a district

219 level are provided in the Supplementary Tables, which can all be found at:

220 <https://doi.org/10.7910/DVN/2Q37XL>. We also provide the data underlying the district-level tables in

221 Excel format, which may be imported into statistical software for re-use.

222

223 Health status

224 The index of health need (excluding measures of access) ranges from 23.4 in Gianyar, Bali, to 63.5 in

225 Paniai, Papua. Papua is home to 15 of the 20 districts with poorest health status (See Supplementary file

226 3b. and Supplementary Table A). Yet Papuans are less than half as likely to report recent symptoms of

1
2
3 227 illness compared with people in Java and Bali; there is a weak inverse relationship between the Ministry
4
5 228 of Health's index of health need and self-reported recent illness (Supplementary file 4).
6

7 229

8
9
10 230 **Insurance coverage**

11
12 231 We have two sources of data on insurance coverage: individual reports and number of members reported
13
14 232 by the insurer. The discrepancies between these will be reported in detail elsewhere. Overall, the insurer
15
16 233 reported coverage of 71.1%, compared with 60.6% JKN membership reported by the population. Since
17
18 234 people's perception of their own insurance cover is more likely to influence health seeking behaviour,
19
20 235 we here restrict our analysis to self-reported insurance status, which are reported in Table 2.
21
22 236 Supplementary file 3c shows the diversity at the district level, by most generous cover (4.4% of
23
24 237 Indonesians report more than one source of health insurance). People in poorer households (by non-
25
26 238 health consumption) are most likely to say that they are uninsured compared to richest household (42.4%
27
28 239 and 26.9% respectively). However, poorest household quintiles are also most likely to report state-
29
30 240 subsidised insurance: 51.8%, compared to 25.8% in the richest households (Supplementary file 5).
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

241 **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

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

243 JKN = *Jaminan Kesehatan Nasional* – National Health Insurance

244 For Claim : Currency conversion average rate for 2017 (US\$1=IDR 13,384)

245 For OOP (Out-of-pocket) : Currency conversion average rate for March 2018 (US\$1=IDR 13,760).

246 * Of households accessing any inpatient care in preceding 12 months

247

248

249

250

251

252 Availability of health services and service use

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

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

260 **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

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

263 Insurance claims and out-of-pocket spending

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

269
 270 On the aggregate level, out-of-pocket spending on health was highest in areas where insurance claims
 271 were also high (Supplementary file 6). Median household expenditure on health (excluding insurance
 272 premiums and transport) was 180% higher in Java and Bali than in the eastern provinces. Total out-of-
 273 pocket health spending was higher among the insured than the uninsured (Table 2). Some uninsured
 274 people reported paying nothing for their inpatient care, which in some districts is free to all district

1
2
3 275 residents at public facilities. However, the insured were nearly twice as likely to receive free inpatient
4
5 276 care; bills for those who did pay were on average 20% lower than those faced by the uninsured.

6
7 277
8
9 278 Figure 2 shows the numbers receiving inpatient care, and per capita spending per inpatient, by insurance
10
11 279 status and wealth (non-health consumption level). Wealthier households are more likely to access
12
13 280 inpatient services than poorer households; the difference is most marked among the insured.
14
15 281 Proportionately, the rich are less likely to pay nothing for those services, but also less likely to pay high
16
17 282 amounts relative to other household consumption. In absolute terms, insured people from wealthy
18
19 283 households are the largest consumers of free inpatient care in Indonesia.

20
21
22 284
23
24 285 Supplementary file 7. summarises the data given in Tables 1-3. The radar graph illustrates inequalities
25
26 286 between the different regions using all indicators. The prosperous region Java/Bali with lowest health
27
28 287 needs, moderate insurance coverage, and best access to healthcare services, consumes most healthcare,
29
30 288 and has the highest out-of-pocket spending and insurance claims per capita. In contrast, the poorer
31
32 289 provinces of Eastern Indonesia (NTT, Maluku, Papua) have the highest health needs and insurance
33
34 290 coverage, but lowest access to healthcare services, and thus the lowest service use, out-of-pocket
35
36 291 spending, and insurance claims.

37
38
39 292

40 41 293 **Regression model**

42
43 294 Our regression model followed the pathway indicated in Figure 1 for dependent variables including
44
45 295 service use, out-of-pocket spending and aggregate insurance claims, looking separately at inpatient and
46
47 296 outpatient services.

48
49
50 297
51
52 298 Compared to the districts with the highest health status, districts with lower health status generally have
53
54 299 lower odds of using inpatient service, lower spending on in- and outpatient services, and lower insurance
55
56 300 claims. Results for using outpatient service are less pronounced.

57
58 301
59
60

1
2
3 302 Being insured is associated with higher out-of-pocket spending on health services. Use of inpatient
4
5 303 services, household and insurer spending on both inpatient and outpatient services are highest in districts
6
7 304 with higher health status, controlling for both insurance status and access to services (Table 4). Having
8
9 305 health insurance is associated with 135% higher odds of using inpatient services compared with the
10
11 306 uninsured after controlling for district health status and access to services, while among those reporting
12
13 307 symptoms in the last month, the odds of using outpatient services increase by a quarter.
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

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

1
2
3 312 Restricted geographical access to inpatient services is independently associated with lower
4
5 313 hospitalisation in districts where more than 20% of villages report restricted access to such services;
6
7 314 there is a linear reduction in spending by households and insurers with increasingly constrained access.
8
9 315 In districts with poorest access, the odds of using inpatient services are around 40% lower than in the
10
11 316 best served districts; out-of-pocket spending and insurer spending on inpatient care per registered
12
13 317 participant are 46% and 71% lower respectively. Monthly spending on outpatient care among those
14
15 318 reporting symptoms shows a similar pattern, but dollar amounts are small.
16
17
18 319

19
20 320 Table 5 shows the same model, with the addition of socio-economic status measured by non-health
21
22 321 consumption. Household wealth does not greatly influence use or spending outcomes for outpatient
23
24 322 care. While insurance remains associated with higher service use, its independent association with
25
26 323 higher out-of-pocket spending disappears for inpatient care. Spending rises sharply with wealth, for both
27
28 324 inpatient and outpatient services. Restricted geographic access to inpatient services continues to predict
29
30 325 low service use and spending in districts where over 20% of villages report restricted access.
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

326
327**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

328

*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

329 **DISCUSSION**

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

350

351 Our findings confirm empirically the assertion in the national health review²⁰ that limited service
352 provision constrains the utility of national health insurance for citizens in parts of the country,
353 particularly in poorer Eastern regions where health needs are greatest. While self-reported possession
354 of health insurance was generally associated with increased use of services, multivariable analyses
355 suggest that in districts where over 20% of villages have restricted access to services, this constrained

1
2
3 356 service availability is associated with lower service use, lower insurer spending and lower out-of-pocket
4
5 357 spending on health, especially for inpatient services. In short, more money is spent (by both the insurer
6
7 358 and patients) in places where there are more health services to spend it on. These are also the areas with
8
9 359 the lowest health needs, probably in part because of the access to services. Studies in other low and
10
11 360 middle income countries report similar findings.²⁶⁻²⁹ Our study is also in line with earlier work in
12
13 361 Indonesia, showing that JKN claims per capita for non-communicable diseases are consistently higher
14
15 362 in Jakarta province (the national capital) than in largely rural East Nusa Tenggara,^{30,31} a difference
16
17 363 attributed to differences in supply.³⁰

19
20 364

21
22 365 The radical decentralisation undertaken by Indonesia since 2001 aimed to empower district governments
23
24 366 in these more remote areas to apportion funding (including for health) in ways that better meet local
25
26 367 needs,³² thus reducing inequity. Pre-JKN academic estimates of the cost of meeting basic health needs
27
28 368 show significant variation by area (ranging from US\$ 15 in Yogyakarta to US\$ 48 in rural North
29
30 369 Maluku).³³ JKN, however, reverts to a largely centralised "one-size-fits-all" reimbursement model.¹ In
31
32 370 Eastern Indonesia restricted service availability appears to restrict spending, leading to low
33
34 371 reimbursement and leaving the premia paid on behalf of the poorest citizens in those areas available to
35
36 372 subsidise health care for citizens in richer areas, where health services are more plentiful.

37
38
39 373

40
41 374 Having said that, it appears that for many poorer families who can access services and who are insured,
42
43 375 JKN provides effective protection against impoverishing spending. Hospitalisation was far more
44
45 376 common among the insured than the uninsured at all income levels, suggesting that insurance removed
46
47 377 a significant barrier to use of inpatient services. Despite this, out-of-pocket spending remained higher
48
49 378 among the insured, as was the case in pre-JKN days.^{27,34,35} Controlling for access to health services and
50
51 379 district health index, the insured spent 9% more on inpatient services and 15% more on outpatient
52
53 380 services than the uninsured. It is likely that newly-insured patients may be emboldened to seek services
54
55 381 which are not fully covered, sometimes because health care providers seek profit by promoting "off-
56
57 382 plan" services, including those not covered by the scheme, including branded medicines, laboratory tests,
58
59 383 and consultation with specialist doctors without referral.³⁶⁻³⁸ This "gateway effect" has been seen in

1
2
3 384 other countries embarking on scale-up of insurance, including China, Ghana, Kenya, and India.^{28,39–41}
4
5 385 In addition, patients may prefer to pay out-of-pocket for outpatient services, in particular, since they are
6
7 386 relatively affordable, perceived as higher quality, and less burdensome in terms of queuing and
8
9 387 paperwork.^{41–44}
10
11 388
12
13 389 Findings from other low and middle income countries about the financial protection provided by
14
15 390 national health insurance schemes are mixed.^{36,44} Using spending of 10% of a household's monthly per
16
17 391 capita non-health budget on inpatient care as a measure of the "catastrophic" spending health insurance
18
19 392 is designed to avoid, Indonesia appears to be performing relatively well, at least for those who use
20
21 393 services. (Like insurance registration, low out of pocket spending is not a measure of financial protection
22
23 394 in areas where there are no services to spend money on). Looking just at those who reported using
24
25 395 inpatient services, 87 percent of insured inpatients in the poorest income quintile spent less than 10% of
26
27 396 their non-health budget on hospitalisation, and for over half, the care was completely free. This
28
29 397 compares with the national health insurance in Zimbabwe, also around 87% in the poorest quintile
30
31 398 protected from catastrophic health expenditure.⁴⁵
32
33
34
35
36

37 400 **Implication for research and practice**

38
39 401 Indonesia has made great strides since 2014 in setting up a public health insurance system. By 2018 it
40
41 402 was effectively protecting many poor families from excessive spending on inpatient care. However, its
42
43 403 benefits remained limited for the millions of Indonesians – especially those living in areas with greatest
44
45 404 health needs – who were unable to benefit from their health insurance because they have extremely
46
47 405 limited access to formal health services.
48
49

50 406
51
52 407 A greater focus on equity in both supply and health financing would help Indonesia achieve the true
53
54 408 aims of universal health coverage: to ensure that all citizens have fair access to basic health services
55
56 409 without being pushed into poverty. This would require greater investments in health overall. Compared
57
58 410 with other countries in the region Indonesia's public investment in health is relatively low, at 2.9% of
59
60

1
2
3 411 GDP compared with 3.8% in Thailand and an average of 5% in East Asia and Pacific (not including
4
5 412 high income countries).⁴⁶ If the government had the fiscal space to investment the regional average, a
6
7 413 shift to financing public health provision out of general taxation (as suggested by Yates⁴⁷ and Fenny et
8
9 414 al.⁴⁸) might be feasible. However, given Indonesia's inefficient tax system and low tax yield, more
10
11 415 sustainable solutions might include hypothecated taxes on luxury goods, or reverting to an earlier system
12
13 416 which made greater use of local government subsidies in wealthier areas.^{49,50} Our study, which shows a
14
15 417 substantial increase in out of pocket spending by wealth, suggest that progressive contributions based
16
17 418 on income, suggested by Reeves et al.,⁵⁰ may also be a viable approach. Finally, the politically
18
19 419 unpalatable option of prioritising reimbursement to meet the most urgent needs of the poorest citizens
20
21
22 420 could be considered.
23

24 421
25
26 422 Health equity can not be achieved only by finding a sustainable financing model to pay for service
27
28 423 provision. Indonesia also needs to invest substantially in improving the supply of services in many areas
29
30 424 of the country. The directly elected district governments responsible for service provision could be
31
32 425 incentivised to invest more in this area, since it may be a viable way of generating political popularity,
33
34 426 while providing opportunities for local patronage.¹ But success in providing wider access to necessary
35
36 427 services will be a double-edged sword: fulfilling unmet demand will increase claims on JKN, which is
37
38 428 already deeply in deficit.
39

40
41 429

42 43 430 **Limitations**

44
45
46 431 Detailed analysis of merged data collected by Indonesian government agencies could help further inform
47
48 432 decision-making. Our study is limited by lack of granular information on health needs and outcomes. In
49
50 433 addition, the statistics agency was unwilling to release geographic identifiers at levels lower than district
51
52 434 for the household survey data, so we were unable to link service access measures at the village or sub-
53
54 435 district level. Our dataset nonetheless allows for the most granular analysis to date across a wide range
55
56 436 of health service use and spending-related measures in one of the world's most diverse nations. It suffers
57
58 437 from the common constraint of using secondary, quantitative data -- the inability to explain outliers, or
59
60

1
2
3 438 to pinpoint the political, economic and social factors that explain why more has not yet been done to
4
5 439 address inequity within JKN.
6

7 440

8
9 441 Future research

10
11 442 Our analysis was cross-sectional, so does not reflect the dynamism of the situation. However, two of the
12
13 443 datasets -- SUSENAS and JKN claims data -- are available annually, so many elements of this analysis
14
15 444 could be repeated in an investigation of trends over time. We believe this might provide insights into
16
17 445 which elements of inequity are temporal and which are structural. The data could also be used in studies
18
19 446 exploring in greater detail the differences in service use between public and private providers,
20
21 447 particularly in relation to insurance status and out-of-pocket spending.
22
23

24 448 **Figure 1: Expected relationship of insurance claims and out-of-pocket spending with health need,**
25 449 **insurance status, and service availability**

26 450
27 451 **Figure 2: Numbers reporting inpatient service use, by insurance status, non-health consumption quintile,**
28 452 **and percentage of household consumption spent on inpatient services**
29 453

30 454

31 455 **Contributors**

32
33
34
35 456 ABP, EP, MOK, and AGM conceptualised the study. EP and HS performed the data cleaning and
36
37 457 management. ABP, EP, HS, TH performed the data analysis. EP and HS designed the figures. AGM
38
39 458 and MOK supervised the project. ABP, EP, HS, MOK, TH contributed to drafting the manuscript, with
40
41 459 input of AGM. All authors have approved the final manuscript.
42
43

44 460

45 461 **Funding**

46
47
48 462 Netherlands Universities Foundation for International Cooperation (NUFFIC). Grant number
49
50 463 NICHE/ IDN/ 226: CF 9900.
51
52

53 464

54 465 **Data sharing statement**

1
2
3 466 The data management and analysis files in Stata format (.do files) are available in the senior
4
5 467 author's research repository at <https://doi.org/10.7910/DVN/2Q37XL>. While the paper reports
6
7 468 data at the regional level, in the repository we provide data for each of Indonesia's 514 districts
8
9
10 469 in Supplementary tables, as well as in more easily downloadable Excel format. These are made
11
12 470 available by the authors under a CC0 licence, though in view of the work that goes in to this
13
14 471 type of data integration, we would appreciate full citation by anyone re-using these resources.
15
16

17 472

19 473 **Declaration of interest**

21 474 We declare no conflict of interest.
22

23 475

26 476 **Acknowledgements**

28 477 This study was funded by Netherlands Universities Foundation for International Cooperation
29
30 478 (NUFFIC). ABP received scholarship from Indonesia Endowment Fund for Education (LPDP). We
31
32 479 thank D.L. Dick Willems and R.S. Padmawati for valuable input and support.
33
34

35 480

37 481 **References**

- 39 482 1. Pisani E, Olivier Kok M, Nugroho K. Indonesia's road to universal health coverage: a political
40 483 journey. *Health Policy Plan* 2017;32(2):267–76.
41 484 2. Agustina R, Dartanto T, Sitompul R, et al. Universal health coverage in Indonesia: concept,
42 485 progress, and challenges. *Lancet* 2019;393(10166):75-102.
43 486 3. Mboi N. Indonesia: On the way to universal health care. *Health Syst Reform* 2015;1(2):91–7.
44 487 4. Social Security Agency for Health. JKN program participants, 2020. Available: [https://bpjs-](https://bpjs-kesehatan.go.id/bpjs/)
45 488 [kesehatan.go.id/bpjs/](https://bpjs-kesehatan.go.id/bpjs/) [Accessed 29 Jan 2020]
46 489 5. World Health Organization. Tracking universal health coverage: first global monitoring report.
47 490 Geneva: World Health Organization; 2015.
48 491 6. Dartanto T, Halimatussadiyah A, Rezki JF, et al. Why do informal sector workers not pay the
49 492 premium regularly? Evidence from the National Health Insurance System in Indonesia. *Appl*
50 493 *Health Econ Health Policy* 2020 Feb; 18(1):81-96.
51 494 7. Muttaqien M, Setiyaningsih H, Aristianti V, et al. Why did informal sector workers stop paying
52 495 for health insurance in Indonesia? Exploring enrollees' ability and willingness to pay. *PloS one*
53 496 2021;4;16(6):e0252708.
54 497 8. Government Republic of Indonesia. Presidential decree Republic of Indonesia number 82 year
55 498 2018, 2018. Available: [https://bpjs-](https://bpjs-kesehatan.go.id/bpjs/dmdocuments/2b85f7e015e747f9cd29ef384b4cb316.pdf)
56 499 [kesehatan.go.id/bpjs/dmdocuments/2b85f7e015e747f9cd29ef384b4cb316.pdf](https://bpjs-kesehatan.go.id/bpjs/dmdocuments/2b85f7e015e747f9cd29ef384b4cb316.pdf) [Accessed 29 Jan
57 500 2020]
58
59
60

- 1
2
3 501 9. Ministry of Health Republic of Indonesia. Data and information: Indonesia health profile 2017,
4 502 2018.
- 5 503 10. Asyary A. Indonesian primary care through universal health coverage systems: A feeling in
6 504 bones. *Public Health Indonesia* 2018;4(3):138–45.
- 7 505 11. World Health Organization. Primary health care on the road to universal health coverage: 2019
8 506 global monitoring report; Conference edition, 2019.
- 9 507 12. Minister of Health Republic of Indonesia. Minister of Health regulation number 52 year 2016
10 508 about healthcare services standard tarif in JKN, 2016. Available:
11 509 [http://hukor.kemkes.go.id/uploads/produk_hukum/PMK_No._52_Tahun_2016_Tentang_Standar](http://hukor.kemkes.go.id/uploads/produk_hukum/PMK_No._52_Tahun_2016_Tentang_Standar_Tarif_Pelayanan_Kesehatan_Dalam_Penyelenggaraan_JKN_.pdf)
12 510 [Tarif Pelayanan Kesehatan Dalam Penyelenggaraan JKN .pdf](http://hukor.kemkes.go.id/uploads/produk_hukum/PMK_No._52_Tahun_2016_Tentang_Standar_Tarif_Pelayanan_Kesehatan_Dalam_Penyelenggaraan_JKN_.pdf) [Accessed 5 Sep 2020].
- 13 511 13. Ministry of Health Republic of Indonesia. Minister of Health regulation number 76 year 2016
14 512 about guideline INA-CBG in JKN, 2016.
- 15 513 14. Social Security Agency for Health. Executive summary of the 2016 social security program for
16 514 health, management report and financial report, 2016. Available: [https://www.bpjs-](https://www.bpjs-kesehatan.go.id/bpjs/dmdocuments/b39df9ae7a30a5c7d4bd0f54d763b447.pdf)
17 515 [kesehatan.go.id/bpjs/dmdocuments/b39df9ae7a30a5c7d4bd0f54d763b447.pdf](https://www.bpjs-kesehatan.go.id/bpjs/dmdocuments/b39df9ae7a30a5c7d4bd0f54d763b447.pdf) [Accessed 5 sep
18 516 2020].
- 19 517 15. Social Security Agency for Health. 2019 program management report and 2019 program
20 518 financial report. Available: <https://bpjs-kesehatan.go.id/bpjs/arsip/detail/1514> [Accessed 13 Nov
21 519 2020].
- 22 520 16. Supreme Court Republic of Indonesia. Decision number 7/HUM/2020, 2020.
- 23 521 17. President Republic of Indonesia. President regulation number 64 year 2020, 2020.
- 24 522 18. Liputan6.com. 2021. Class III BPJS Health contribution increases, YLKI predicts there will be
25 523 increasing arrears. Available: [https://www.liputan6.com/bisnis/read/4446947/iuran-bpjs-](https://www.liputan6.com/bisnis/read/4446947/iuran-bpjs-kesehatan-kelas-iii-naik-ylki-prediksi-akan-ada-pembengkakan-tunggakan)
26 524 [kesehatan-kelas-iii-naik-ylki-prediksi-akan-ada-pembengkakan-tunggakan](https://www.liputan6.com/bisnis/read/4446947/iuran-bpjs-kesehatan-kelas-iii-naik-ylki-prediksi-akan-ada-pembengkakan-tunggakan) [Accessed 5 Jun 21]
27 525 2020].
- 28 525 19. Putri CA. BPJS contribution increase, 1.57 million participants drop class, 2020. Available:
29 526 [https://www.cnbcindonesia.com/news/20200917194312-4-187637/iuran-bpjs-kesehatan-naik-](https://www.cnbcindonesia.com/news/20200917194312-4-187637/iuran-bpjs-kesehatan-naik-157-juta-peserta-turun-kelas)
30 527 [157-juta-peserta-turun-kelas](https://www.cnbcindonesia.com/news/20200917194312-4-187637/iuran-bpjs-kesehatan-naik-157-juta-peserta-turun-kelas) [Accessed 5 Jun 21]
31 528 2020].
- 32 528 20. Central Bureau of Statistics Indonesia. Statistik Indonesia 2020, 2020.
- 33 529 21. Ministry of Health Republic of Indonesia. Public health development index. Jakarta, Indonesia:
34 530 Ministry of Health, Publishing Body of Health Research and Development, Ministry of Health
35 531 2019.
- 36 532 22. Gani A, Budiharsana M. The consolidated report on Indonesia health sector review 2018.
37 533 Jakarta: Republic of Indonesia, BAPPENAS 2019. Available:
38 534 [https://www.unicef.org/indonesia/reports/consolidated-report-indonesia-health-sector-review-](https://www.unicef.org/indonesia/reports/consolidated-report-indonesia-health-sector-review-2018)
39 535 [2018](https://www.unicef.org/indonesia/reports/consolidated-report-indonesia-health-sector-review-2018) [Accessed 31 Aug 2020].
- 40 536 23. Mulyanto J, Kringos DS, Kunst AE. The evolution of income-related inequalities in healthcare
41 537 utilisation in Indonesia, 1993–2014. *PLoS One* 2019;14(6):e0218519.
- 42 538 24. Nandi S, Schneider H, Garg S. Assessing geographical inequity in availability of hospital
43 539 services under the state-funded universal health insurance scheme in Chhattisgarh state, India,
44 540 using a composite vulnerability index. *Glob Health Action* 2018;11(1):1541220.
- 45 541 25. Jansen JD. Political symbolism as policy craft: explaining non-reform in South African
46 542 education after apartheid. *J Educ Policy* 2002;17(2):199–215.
- 47 543 26. Van Doorslaer E, O'Donnell O, Rannan-Eliya RP, et al. Effect of payments for health care on
48 544 poverty estimates in 11 countries in Asia: an analysis of household survey data. *Lancet*
49 545 2006;368(9544):1357–1364.
- 50 546 27. Sparrow R, Suryahadi A, Widyanti W. Social health insurance for the poor: Targeting and
51 547 impact of Indonesia's Askeskin programme. *Soc Sci Med* 2013;96:264–71.
- 52 548 28. Garg S, Beberta KK, Tripathi N. Performance of India's national publicly funded health
53 549 insurance scheme, Pradhan Mantri Jan Arogya Yojana (PMJAY), in improving access and
54 550 financial protection for hospital care: findings from household surveys in Chhattisgarh state.
55 551 *BMC Public Health* 2020;20(1):949.
- 56 552 29. Lozano R, Fullman N, Mumford JE, Knight M, Barthelemy CM, Abbafati C, et al.
57 553 Measuring universal health coverage based on an index of effective coverage of health
58
59
60

- 1
2
3 554 services in 204 countries and territories, 1990–2019: a systematic analysis for the Global
4 555 Burden of Disease Study 2019. *Lancet* 2020;S0140673620307509.
- 5 556 30. Mulyanto J, Kunst AE, Kringos DS. Geographical inequalities in healthcare utilisation and the
6 557 contribution of compositional factors: A multilevel analysis of 497 districts in Indonesia. *Health*
7 558 *Place* 2019;60:102236.
- 8 559 31. Wati H, Thabrany H. Catastrophic claim comparison among JKN member in DKI Jakarta
9 560 Province and East Nusa Tenggara in 2014. *Jurnal Ekonomi Kesehatan Indonesia* 2017;1(2).
10 561 Available: <http://journal.fkm.ui.ac.id/jurnal-eki/article/view/1771> [Accessed 31 Aug 2020].
- 11 562 32. Maharani A, Tampubolon G. Has decentralisation affected child immunisation status in
12 563 Indonesia? *Glob Health Action* 2014;7(1):24913.
- 13 564 33. Ensor T, Firdaus H, Dunlop D, et al. Budgeting based on need: a model to determine sub-
14 565 national allocation of resources for health services in Indonesia. *Cost Eff Resour Alloc*
15 566 2012;10(1):11.
- 16 567 34. Aji B, De Allegri M, Souares A, et al. The impact of health insurance programs on out-of-pocket
17 568 expenditures in Indonesia: An increase or a decrease? *Int J Environ Res Public Health*
18 569 2013;10(7):2995–3013.
- 19 570 35. Aizawa T. The impact of health insurance on out-of-pocket expenditure on delivery in Indonesia.
20 571 *Health Care Women Int* 2019;40(12):1374–95.
- 21 572 36. Bredenkamp C, Buisman LR. Financial protection from health spending in the Philippines:
22 573 policies and progress. *Health Policy Plan*. 2016 Sep;31(7):919–27.
- 23 574 37. Sum G, Hone T, Atun R, Millett C, Suhrcke M, Mahal A, et al. Multimorbidity and out-of-
24 575 pocket expenditure on medicines: a systematic review. *BMJ Glob Health* 2018;3(1):e000505.
- 25 576 38. Hasnida A, Kok MO, Pisani E. Challenges in maintaining medicine quality while aiming for
26 577 universal health coverage: a qualitative analysis from Indonesia. *BMJ Glob Health* 2021;6(Suppl
27 578 3):e003663.
- 28 579 39. Wagstaff A, Lindelow M. Can insurance increase financial risk? The curious case of health
29 580 insurance in China. *J Health Econ* 2008;27(4):990-1005.
- 30 581 40. Aryeetey GC, Westeneng J, Spaan E, et al. Can health insurance protect against out-of-pocket
31 582 and catastrophic expenditures and also support poverty reduction? Evidence from Ghana's
32 583 National Health Insurance Scheme. *Int J Equity Health* 2016;15(1):116.
- 33 584 41. Ekman B. Catastrophic health payments and health insurance: Some counterintuitive evidence
34 585 from one low-income country. *Health Policy* 2007;3(2–3):304–13.
- 35 586 42. Salari P, Di Giorgio L, Ilinca S, et al. The catastrophic and impoverishing effects of out-of-
36 587 pocket healthcare payments in Kenya, 2018. *BMJ Glob Health* 2019;4(6).
- 37 588 43. Selvaraj S, Farooqui HH, Karan A. Quantifying the financial burden of households' out-of-
38 589 pocket payments on medicines in India: a repeated cross-sectional analysis of National Sample
39 590 Survey data, 1994-2014. *BMJ Open* 2018;8:e018020.
- 40 591 44. Tangcharoensathien V, Patcharanarumol W, Ir P, et al. Health-financing reforms in southeast
41 592 Asia: challenges in achieving universal coverage. *Lancet*. 2011;377(9768):863–73.
- 42 593 45. Zeng W, Lannes L, Mutasa R. Utilization of Health Care and Burden of Out-of-Pocket
43 594 Health Expenditure in Zimbabwe: Results from a National Household Survey. *Health*
44 595 *Syst Reform* 2018;2;4(4):300–12.
- 45 596 46. Current health expenditure (% of GDP) - East Asia & Pacific (excluding high income) |
46 597 Data [Internet]. Available:
47 598 <https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS?locations=4E> [Accessed 8
48 599 Jun 2021].
- 49 600 47. Yates R. Universal health coverage: progressive taxes are key. *Lancet*
50 601 2015;386(9990):227–9.
- 51 602 48. Fenny AP, Yates R, Thompson R. Strategies for financing social health insurance
52 603 schemes for providing universal health care: a comparative analysis of five countries.
53 604 *Glob Health Action* 2021;14(1):1868054.
- 54 605 49. Awosusi A, Folaranmi T, Yates R. Nigeria's new government and public financing for
55 606 universal health coverage. *Lancet Glob Health* 2015;3(9):e514–5.

- 1
2
3 607 50. Reeves A, Gourtsoyannis Y, Basu S, McCoy D, McKee M, Stuckler D. Financing
4 608 universal health coverage—effects of alternative tax structures on public health systems:
5 609 cross-national modelling in 89 low-income and middle-income countries. *Lancet*
6 610 2015;386(9990):274–80.
7 611
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

Healthcare needs

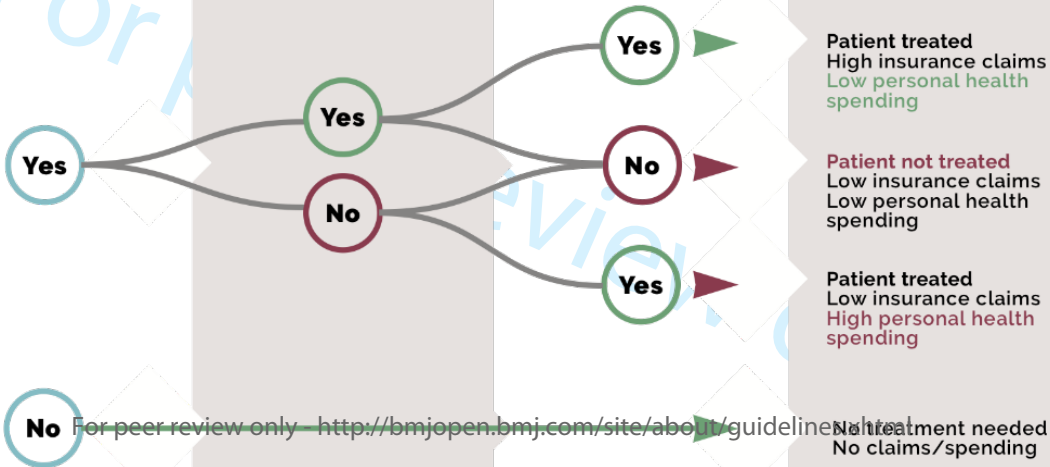
Person has health insurance

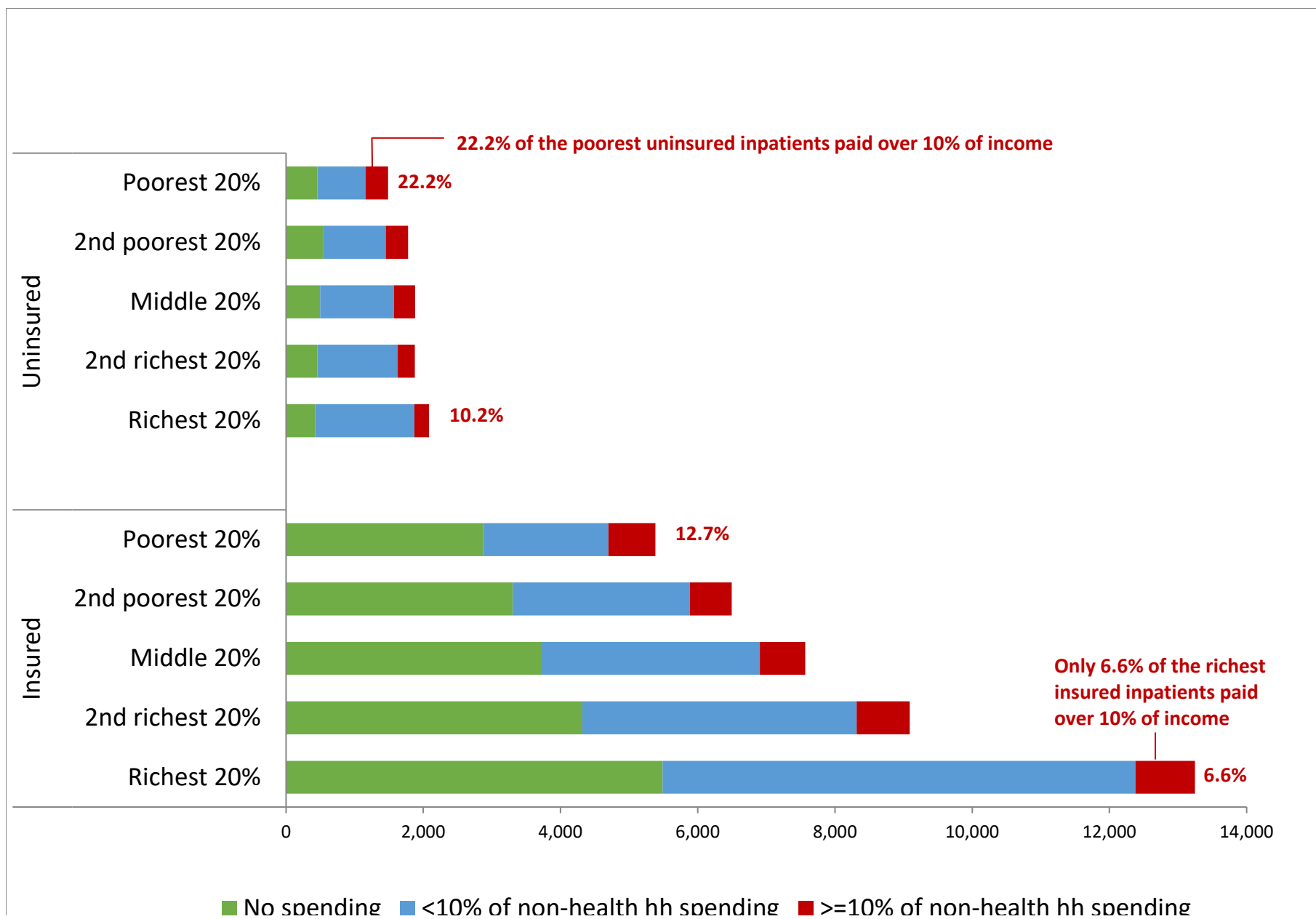
BMJ Open

Health services locally available

Health/spending outcomes

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16





Supplementary file 1: Data included in the merged datasets

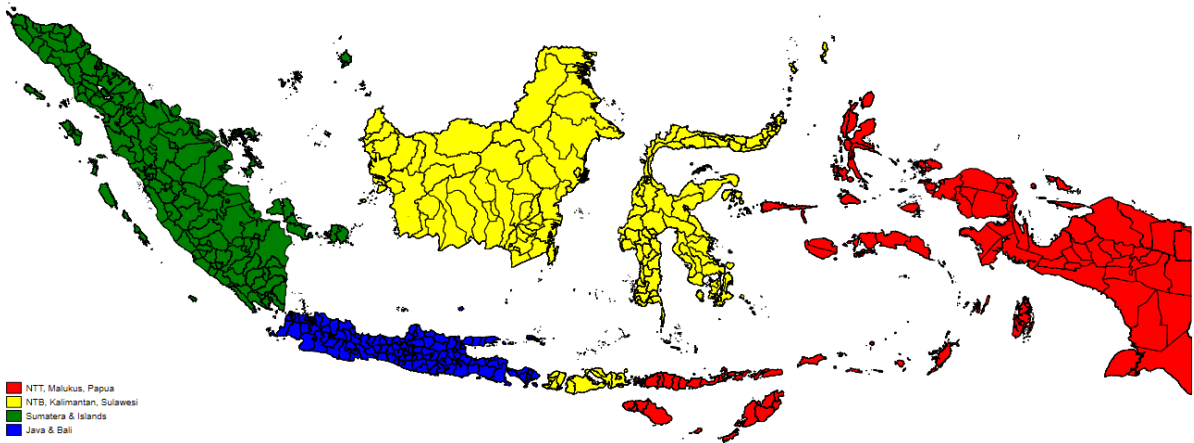
Data set acronym	Source	Years	Level of record	Representative level	Number of records	Key information
SUSENAS	BPS	2018	Individual	District	1,131,825	Insurance status, service use, spending on health
PoDes	BPS	2018	Village	Village (census)	83,931	Service availability
IPKM	MoH/ RisKesDas	2018	District	District	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.

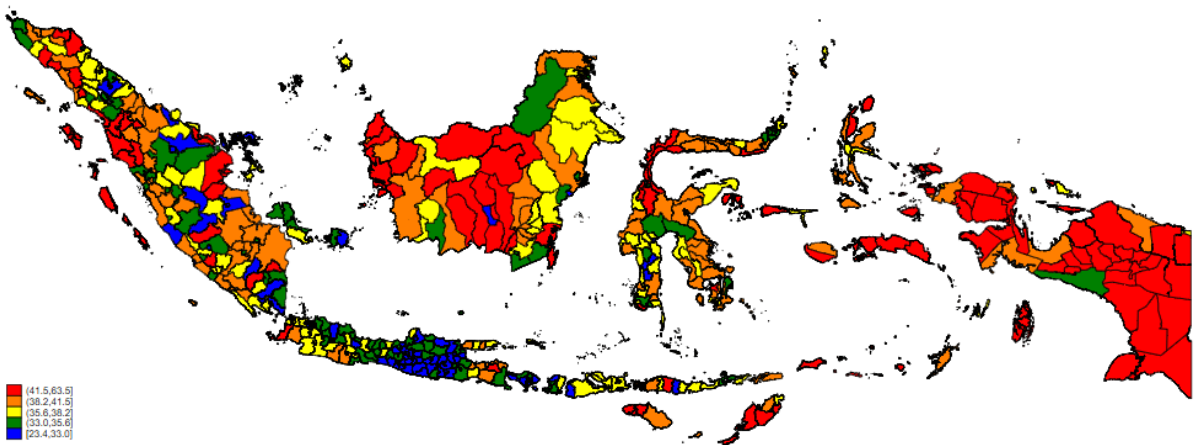
Supplementary file 2: Steps taken to integrate data from different sources

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

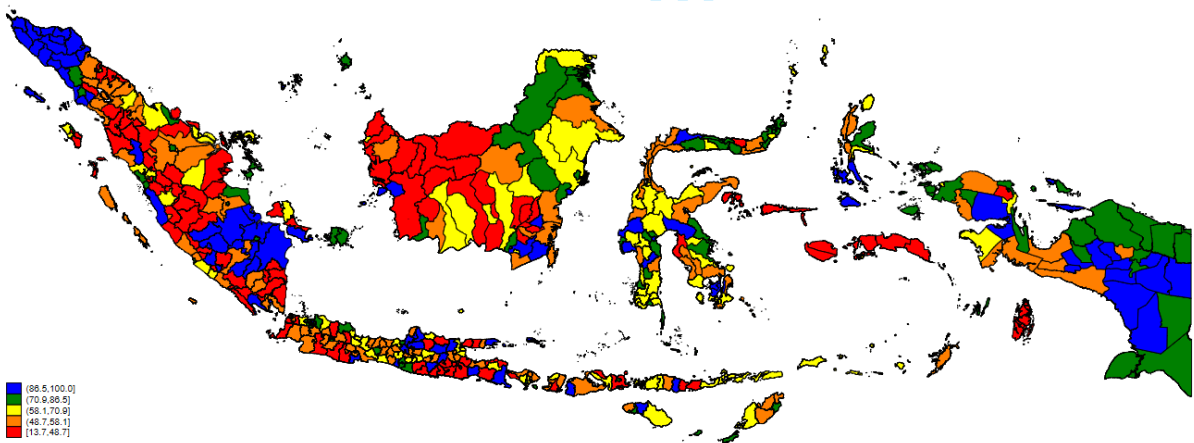
SUSENAS=National Social and Economic Survey. PoDes=Village Potential Survey. IPKM=Population Health Development Index. BPJS=Social Security Agency for Health.



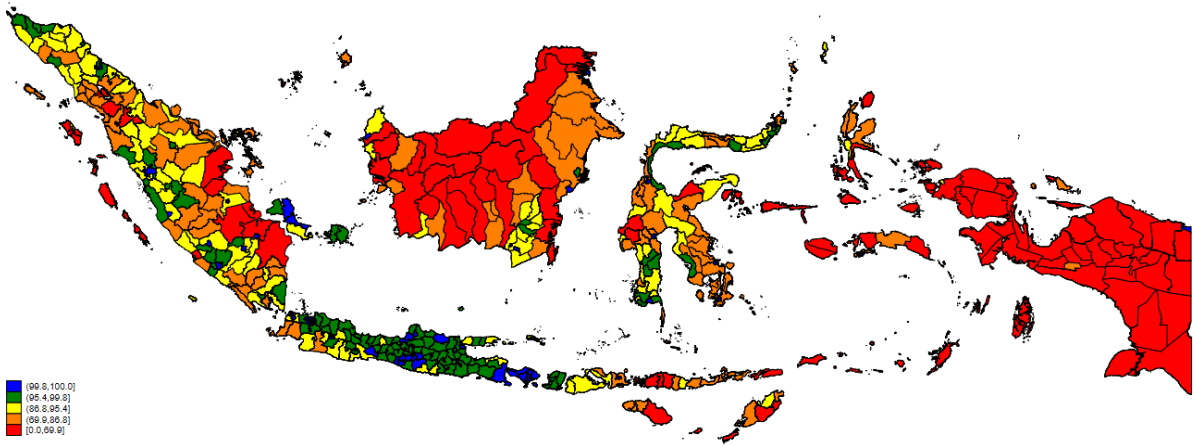
3a: Regional groupings



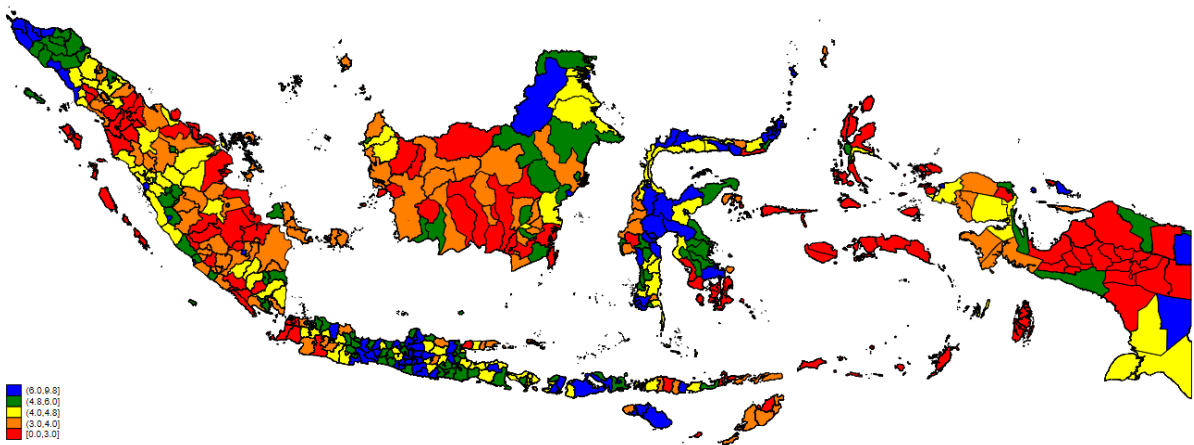
3b: Index of health need, Riskesdas, 2018. Red and orange areas have higher health needs



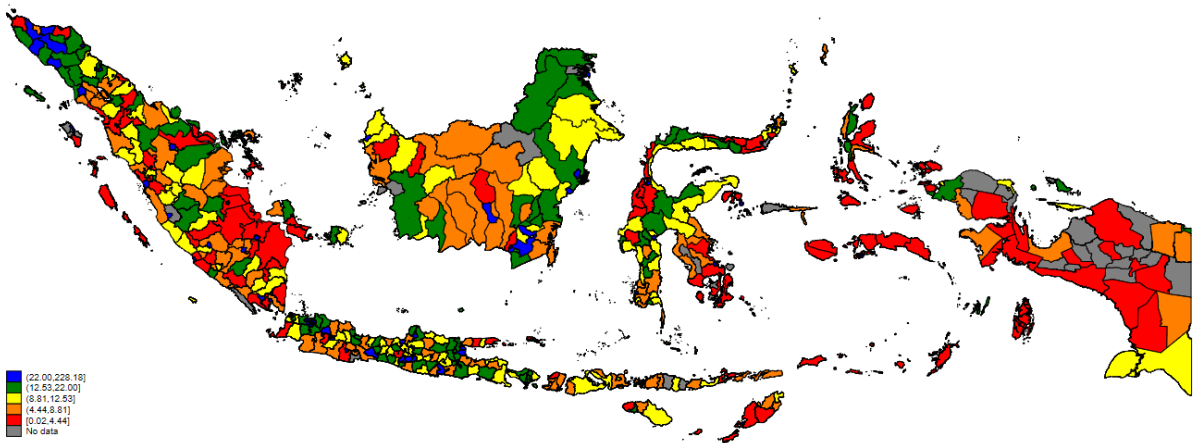
3c: Self-reported insurance status, Susenas, 2018. Red and orange areas have lower self-reported insurance status



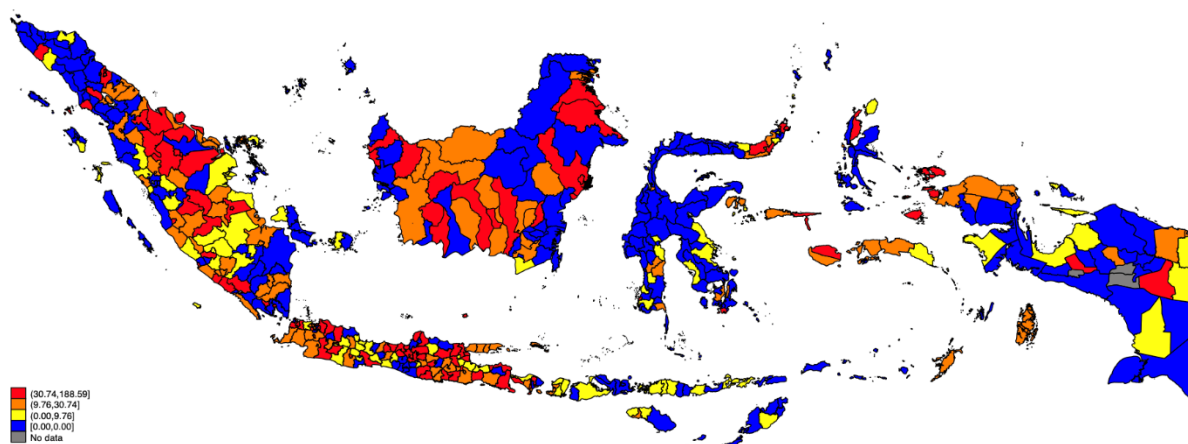
3d: Percentage of villages with easy access to inpatient services, PoDes, 2018. Red and orange areas have more difficult access



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.

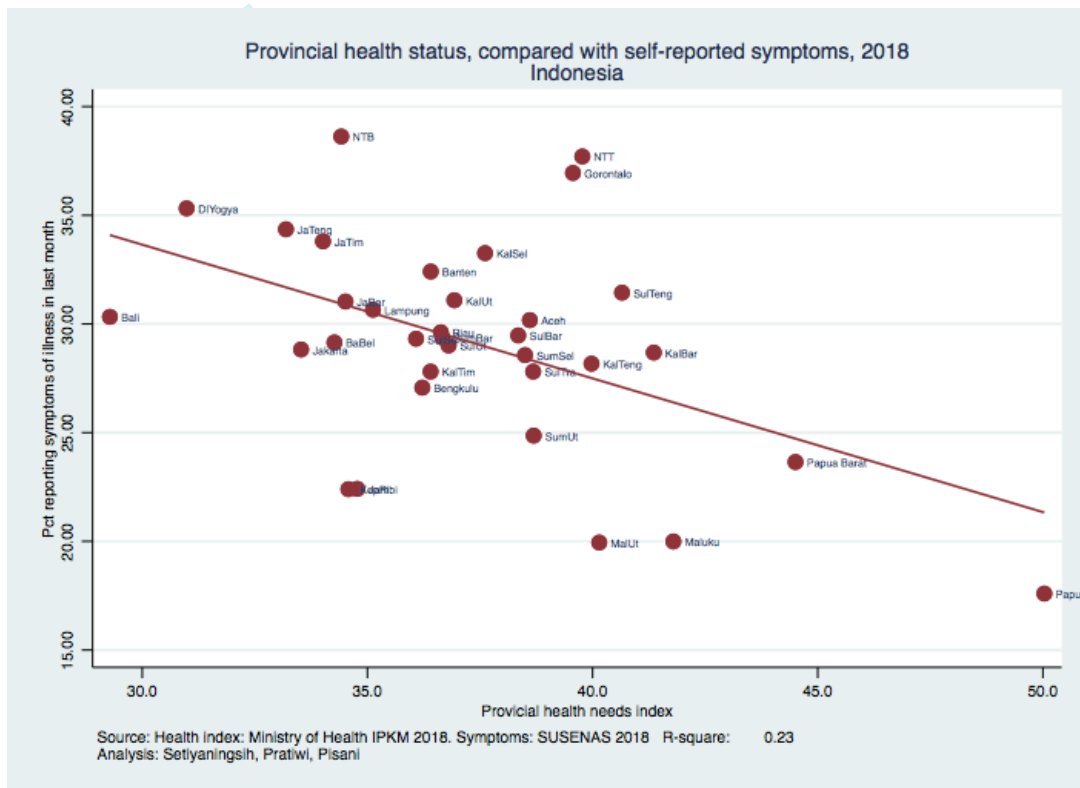


3g: Of those households with inpatients in last 12 months, average household spending on inpatient care, per patient. Susenas 2018. In both the first and second quintiles, spending was zero; these districts are all shown in blue. Red and orange districts have higher household spending on inpatient care.

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 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 material to Pratiwi et al.

Supplementary file 5: percent insurance ownership, self-reported

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.

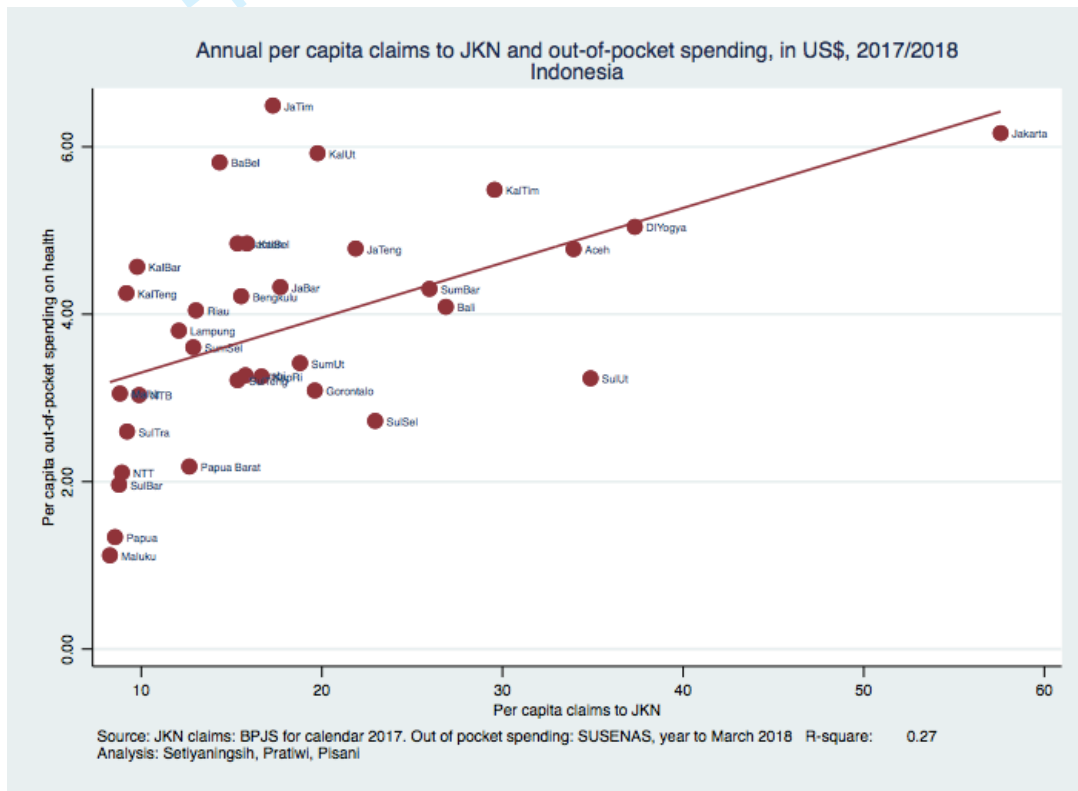
Consumption is calculated at the household level. As a proxy for wealth, we sum all non-health-related consumption, and divide it by the number of individuals in the household. This table shows health insurance status by quintiles of wealth.

Source: SUSENAS 2018

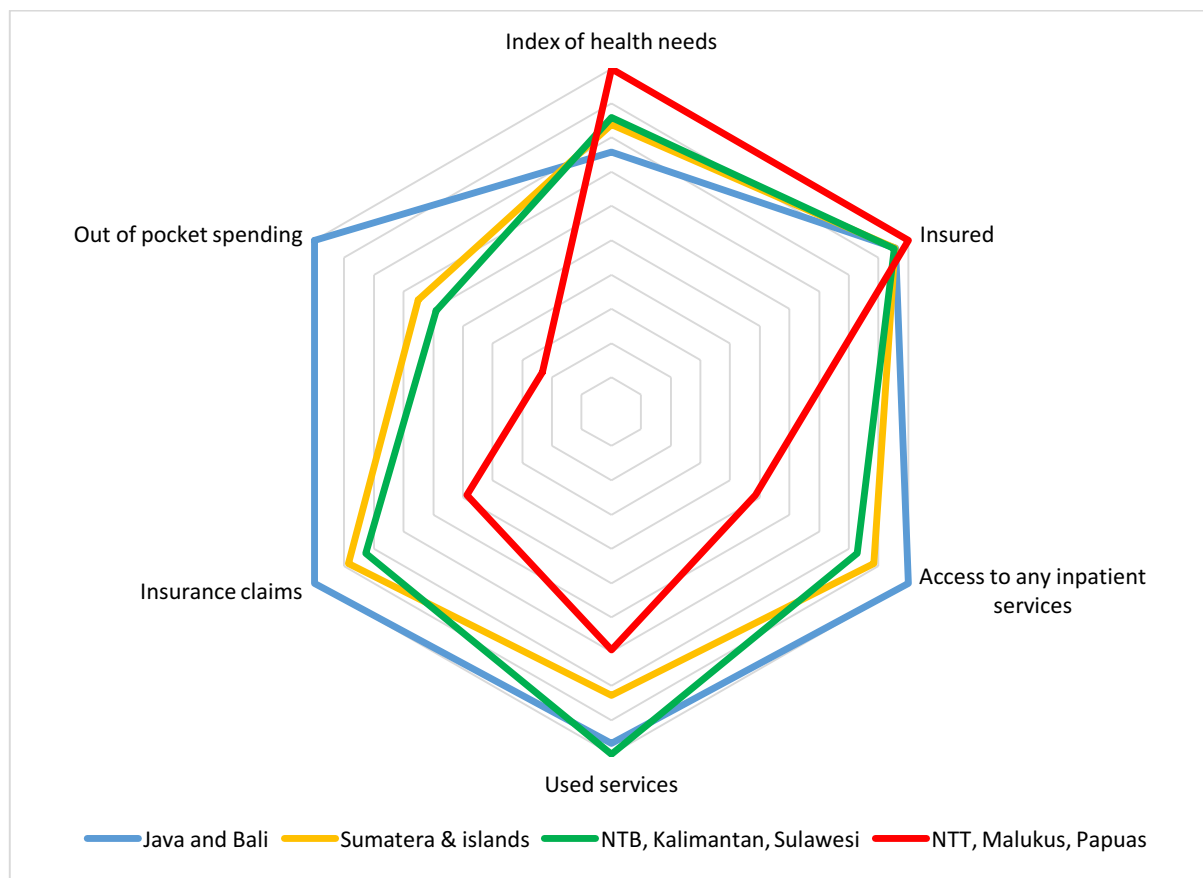
	Uninsured	Subsidised JKN	Independent JKN	Private insurance
Lowest 20%	42.43	51.76	5.26	0.54
Q2	41.21	48.34	9.01	1.43
Middle 20%	38.97	44.68	13.56	2.79
Q4	35.00	39.35	21.15	4.51
Highest 20%	26.85	25.77	36.77	10.61
All, National	35.9	40.35	19.15	4.6

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	
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	
Introduction			
Background/Rationale	2	Explain the scientific background and rationale for the investigation being reported	
Objectives	3	State specific objectives, including any prespecified hypotheses	
Methods			
Study Design	4	Present key elements of study design early in the paper	
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —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 <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	

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	
Bias	9	Describe any efforts to address potential sources of bias	
Study Size	10	Explain how the study size was arrived at	
Quantitative Variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	
Statistical Methods	12	(a) Describe all statistical methods, including those used to control for confounding	
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	
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	
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive Data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome Data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	

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	
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other Analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key Results	18	Summarise key results with reference to study objectives	
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	
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	
Generalisability	21	Discuss the generalisability (external validity) of the study results	
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	

*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.

BMJ Open

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

Journal:	<i>BMJ Open</i>
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

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

1
2
3 1 **Is Indonesia achieving universal health coverage? Secondary analysis of national data on**
4 2 **insurance coverage, health spending and service availability**

5 3
6 4 Agnes Bhakti Pratiwi^{1,2}, Hermawati Setyaningsih¹, Maarten Olivier Kok^{3,4}, Trynke Hoekstra⁴,
7 5 Ali Ghufroon Mukti¹, Elizabeth Pisani^{3,5}
8 6

9 7 ¹ Centre for Health Financing Policy and Health Insurance Management; and Department of Medical
10 8 Education and Bioethics, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada,
11 9 Yogyakarta, Indonesia

12 10 ² Section of Medical Ethics, Department of Ethics, Law and Humanities, University Amsterdam Medical
13 11 Center, University of Amsterdam, Amsterdam, The Netherlands

14 12 ³ Erasmus School for Health Policy and Management, Erasmus University Rotterdam, The Netherlands

15 13 ⁴ Department of Health Sciences and Amsterdam Public Health research institute, Vrije Universiteit,
16 14 Amsterdam, The Netherlands

17 15 ⁵ Faculty of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine,
18 16 London, UK
19 17
20 18

21 19 **Keywords:** Indonesia; Universal Health Coverage; UHC; health insurance; health equity; out
22 20 of pocket health payments
23 21

24 22 **Word count:** 4,279
25 23
26 24
27 25

28 26 **Corresponding author:**

29 27 Agnes Bhakti Pratiwi, MPH, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah
30 28 Mada, Jl. Farmako, Sekip Utara, Yogyakarta, Indonesia 55281
31 29 agnes.b.p@ugm.ac.id
32 30
33 31
34 32
35 33
36 34
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

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.

72 INTRODUCTION

73 In 2014, Indonesia, the world's fourth most populous nation, introduced a national health insurance
74 scheme, *Jaminan Kesehatan Nasional*, or JKN. Politicians set an ambitious target: to sign up all
75 Indonesians, and thereby achieve Universal Health Coverage (UHC) by 2019.¹⁻³ Although the target
76 was missed, great strides have been made towards it, at least in terms of participant registration. The
77 scheme reports over 220 million participants (July 31st, 2020), 82% of the national population of 268
78 million,⁴ making JKN one of the world's biggest single-payer health insurance schemes. In accordance
79 with the World Health Organization's vision for UHC,⁵ one of the goals of JKN was to increase equitable
80 access to health services without risk of impoverishment, across the nation. However, the limited
81 availability of health services means that registration of participants may not translate into effective
82 'coverage'.

83
84 Participation is compulsory, with premiums paid by employers. The state, which covers premiums for
85 its employees, the poor and the near-poor – pays 69% of all premiums.⁴ Non-poor Indonesians in
86 unsalaried jobs – some 30 million people – should pay their own premiums. In practice many do not.^{4,6,7}
87 For the first four years of the programme, monthly premiums started at IDR 25,500 (US\$ 1.80), rising
88 to IDR 80,000 (US\$ 5.52) for first class service.⁸

89
90 Over 2,300 hospitals, 1,700 of them private, accept JKN-funded patients.⁹ Broadly, JKN pays for
91 primary care (inpatient and outpatient) through capitation, while hospital care is reimbursed against
92 diagnostic codes.¹⁰⁻¹² Many sophisticated and/or expensive treatments such as hip replacements and
93 heart septal surgery are covered at all premium levels.¹³ The combination of low premium and generous
94 coverage has produced annual deficits since the programme's inception.^{14,15} The cumulative deficit was
95 51 trillion rupiah (3,7 billion US\$) at the end of 2019.¹⁵

96
97 In a bid to reduce the deficit, premiums were approximately doubled in January 2020, but the
98 Constitutional Court ruled that the increase in contributions violated the right to health, and it was

1
2
3 99 reversed, underlining the politically-charged landscape in which health reform takes place.^{8,16} In May
4
5 100 2020, the government again increased the premium.¹⁷ By September 2020, the insurer's Director General
6
7
8 101 told the press 1.5 million people had opted to lower their premium class.^{18,19}
9

10
11 102
12
13 103 Achieving affordable access to quality health services nationwide is a particular challenge given
14
15 104 Indonesia's exceptional diversity. Over 60% of the population lives in Java, just 6% of the land mass.
16
17 105 There are a further 7,000 inhabited islands, with population density ranging from 10/km² in Papua and
18
19 106 North Kalimantan provinces to 1,400/km² in West Java.²⁰ Income and health needs are similarly diverse;
20
21 107 for example, 43% of children in East Nusa Tenggara are stunted, compared 9% in Jakarta province.²¹
22
23

24 108
25
26 109 The Government's most recent Health Sector Review, published five years into the JKN programme,
27
28 110 observed that the supply of health services remains a major constraint in many areas.²² Studies in
29
30 111 Indonesia and other countries suggest that health care cumulates in areas with higher income and fewer
31
32 112 critical health needs.^{2,23,24} This study looks at the relationship between health need, service availability,
33
34 113 insurance status and financial protection across Indonesia.
35

36 114
37
38 115 We merge four nationally representative data sources to undertake that analysis. If JKN enables
39
40 116 equitable health service access while protecting against impoverishment, we would expect areas with
41
42 117 highest health needs to have highest levels of service use and high insurance claims, with limited
43
44 118 variation in out-of-pocket spending nationwide. However, given the supply constraints reported in
45
46 119 the national health review,²² we hypothesised that we would find a more complex relationship, as
47
48 120 illustrated in Figure 1. At the aggregate level, we expect areas with more services to report higher
49
50 121 claims. At the individual level, we expect that insured service users would spend less out-of-pocket
51
52 122 compared with uninsured service users.
53
54
55
56
57
58
59
60

123 **METHODS**

124 **Data**

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

- 126 1. a national socio-economic survey or *Survey Sosial Ekonomi Nasional* (SUSENAS) 2018, a
127 cross-sectional household survey, statistically representative of all districts in Indonesia:
128 1,131,825 individual records;
- 129 2. a national census of villages or *Survei Potensi Desa* (PoDes) 2018, a census of all villages in
130 Indonesia: 83,931 village records;
- 131 3. a Population Health Development index or *Indeks Pembangunan Kesehatan Masyarakat*
132 (IPKM) 2018, a compound indicator of health status calculated at the district level, based on
133 data collected in the national health survey (RisKesDas), statistically representative of all
134 districts in Indonesia: 514 district records;
- 135 4. national insurance records from the Social Security Agency for health or *Badan Penyelenggara*
136 *Jaminan Sosial Kesehatan* (BPJS) end 2017, reported at the district level: 514 district records.

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

139 Further information about these sources, and the data derived from each, is given in Supplementary file

- 140 1. Supplementary file 2 shows the steps followed to merge these different data sets for analysis. All
141 supplementary material, as well as data management and merge codes for reuse, are provided at
142 <https://doi.org/10.7910/DVN/2Q37XL>.

144 **Measures**

145 Health need

146 We derived a proxy for health need from the Ministry of Health's 2018 public health index. The index
147 (0-1) includes reproductive, maternal and child and environmental health elements, disease prevalence,
148 and service access. Higher values indicate better community health. We recalculated the index excluding
149 service access, and inverted it ($100 - (100 * \text{public health index})$) to indicate district health need.

150

151 Insurance status

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

157

158 Out-of-Pocket payments

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

165

166 Health service access

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

176

177 **Region**

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

183 **Statistical Analysis**

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

190
191 We performed descriptive and bivariate analysis of categorical variables, looking first at individual areas
192 of interest (health need, insurance status, service use, insurance claims and out-of-pocket spending). We
193 then proceeded through the associations in the logical framework illustrated in Figure 1, building up a
194 regression model using all salient variables and investigating factors associated first with use of services,
195 then with out-of-pocket spending on health (individual level), and with per capita insurance claims
196 (district level). Analysis files are provided at <https://doi.org/10.7910/DVN/2Q37XL>.

198 **Ethics**

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

204 **Patient and public involvement**

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

206

207 RESULTS

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

214 **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

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

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

221

222 Health status

223 The index of health need (excluding measures of access) ranges from 23.4 in Gianyar, Bali, to 63.5 in
 224 Paniai, Papua. Papua is home to 15 of the 20 districts with poorest health status (See Supplementary file
 225 3b). Yet Papuans are less than half as likely to report recent symptoms of illness compared with people

1
2
3 226 in Java and Bali; there is a weak inverse relationship between the Ministry of Health's index of health
4
5 227 need and self-reported recent illness (Supplementary file 4).

6
7 228

8
9
10 229 **Insurance coverage**

11
12 230 We have two sources of data on insurance coverage: individual reports and number of members reported
13
14 231 by the insurer. The discrepancies between these will be reported in detail elsewhere. Overall, the insurer
15
16 232 reported coverage of 71.1%, compared with 60.6% JKN membership reported by the population. Since
17
18 233 people's perception of their own insurance cover is more likely to influence health seeking behaviour,
19
20 234 we here restrict our analysis to self-reported insurance status, which are reported in Table 2.
21
22 235 Supplementary file 3c shows the diversity at the district level, by most generous cover (4.4% of
23
24 236 Indonesians report more than one source of health insurance). People in poorer households (by non-
25
26 237 health consumption) are most likely to say that they are uninsured compared to richest household (42.4%
27
28 238 and 26.9% respectively). However, poorest household quintiles are also most likely to report state-
29
30 239 subsidised insurance: 51.8%, compared to 25.8% in the richest households (Supplementary file 5).
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

240 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

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

246
 247
 248
 249
 250

251 Availability of health services and service use

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

257 **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

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

260 Insurance claims and out-of-pocket spending

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

265
 266 On the aggregate level, out-of-pocket spending on health was highest in areas where insurance claims
 267 were also high (Supplementary file 6). Median household expenditure on health (excluding insurance
 268 premiums and transport) was 180% higher in Java and Bali than in the eastern provinces. Total out-of-
 269 pocket health spending was higher among the insured than the uninsured (Table 2). Some uninsured
 270 people reported paying nothing for their inpatient care, which in some districts is free to all district
 271 residents at public facilities. However, the insured were nearly twice as likely to receive free inpatient
 272 care; bills for those who did pay were on average 20% lower than those faced by the uninsured.

273

1
2
3 274 Figure 2 and Supplementary file 3g shows the numbers receiving inpatient care, and per capita spending
4
5 275 per inpatient, by insurance status and wealth (non-health consumption level). Wealthier households are
6
7 276 more likely to access inpatient services than poorer households; the difference is most marked among
8
9 277 the insured. Proportionately, the rich are less likely to pay nothing for those services, but also less likely
10
11 278 to pay high amounts relative to other household consumption. In absolute terms, insured people from
12
13 279 wealthy households are the largest consumers of free inpatient care in Indonesia.

14
15
16 280

17
18 281 Supplementary file 7. summarises the data given in Tables 1-3. The radar graph illustrates inequalities
19
20 282 between the different regions using all indicators. The prosperous region Java/Bali with lowest health
21
22 283 needs, moderate insurance coverage, and best access to healthcare services, consumes most healthcare,
23
24 284 and has the highest out-of-pocket spending and insurance claims per capita. In contrast, the poorer
25
26 285 provinces of Eastern Indonesia (NTT, Maluku, Papua) have the highest health needs and insurance
27
28 286 coverage, but lowest access to healthcare services, and thus the lowest service use, out-of-pocket
29
30 287 spending, and insurance claims.

31
32
33 288

34 35 289 **Regression model**

36
37 290 Our regression model followed the pathway indicated in Figure 1 for dependent variables including
38
39 291 service use, out-of-pocket spending and aggregate insurance claims, looking separately at inpatient and
40
41 292 outpatient services.

42
43
44 293

45
46 294 Compared to the districts with the highest health status, districts with lower health status generally have
47
48 295 lower odds of using inpatient service, lower spending on in- and outpatient services, and lower insurance
49
50 296 claims. Results for using outpatient service are less pronounced.

51
52 297

53
54 298 Being insured is associated with higher out-of-pocket spending on health services. Use of inpatient
55
56 299 services, household and insurer spending on both inpatient and outpatient services are highest in districts
57
58 300 with higher health status, controlling for both insurance status and access to services (Table 4). Having

1
2
3 301 health insurance is associated with 135% higher odds of using inpatient services compared with the
4
5 302 uninsured after controlling for district health status and access to services, while among those reporting
6
7 303 symptoms in the last month, the odds of using outpatient services increase by a quarter.
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

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

1
2
3 308 Restricted geographical access to inpatient services is independently associated with lower
4
5 309 hospitalisation in districts where more than 20% of villages report restricted access to such services;
6
7 310 there is a linear reduction in spending by households and insurers with increasingly constrained access.
8
9 311 In districts with poorest access, the odds of using inpatient services are around 40% lower than in the
10
11 312 best served districts; out-of-pocket spending and insurer spending on inpatient care per registered
12
13 313 participant are 46% and 71% lower respectively. Monthly spending on outpatient care among those
14
15 314 reporting symptoms shows a similar pattern, but dollar amounts are small.
16
17
18 315

19
20 316 Table 5 shows the same model, with the addition of socio-economic status measured by non-health
21
22 317 consumption. Household wealth does not greatly influence use or spending outcomes for outpatient
23
24 318 care. While insurance remains associated with higher service use, its independent association with
25
26 319 higher out-of-pocket spending disappears for inpatient care. Spending rises sharply with wealth, for both
27
28 320 inpatient and outpatient services. Restricted geographic access to inpatient services continues to predict
29
30 321 low service use and spending in districts where over 20% of villages report restricted access.
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

322
323**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

324

*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 review²⁰ 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

1
2
3 352 service availability is associated with lower service use, lower insurer spending and lower out-of-pocket
4
5 353 spending on health, especially for inpatient services. In short, more money is spent (by both the insurer
6
7 354 and patients) in places where there are more health services to spend it on. These are also the areas with
8
9 355 the lowest health needs, probably in part because of the access to services. Studies in other low and
10
11 356 middle income countries report similar findings.²⁶⁻²⁹ Our study is also in line with earlier work in
12
13 357 Indonesia, showing that JKN claims per capita for non-communicable diseases are consistently higher
14
15 358 in Jakarta province (the national capital) than in largely rural East Nusa Tenggara,^{30,31} a difference
16
17 359 attributed to differences in supply.³⁰

18
19 360
20
21
22 361 The radical decentralisation undertaken by Indonesia since 2001 aimed to empower district governments
23
24 362 in these more remote areas to apportion funding (including for health) in ways that better meet local
25
26 363 needs,³² thus reducing inequity. Pre-JKN academic estimates of the cost of meeting basic health needs
27
28 364 show significant variation by area (ranging from US\$ 15 in Yogyakarta to US\$ 48 in rural North
29
30 365 Maluku).³³ JKN, however, reverts to a largely centralised "one-size-fits-all" reimbursement model.¹ In
31
32 366 Eastern Indonesia restricted service availability appears to restrict spending, leading to low
33
34 367 reimbursement and leaving the premia paid on behalf of the poorest citizens in those areas available to
35
36 368 subsidise health care for citizens in richer areas, where health services are more plentiful.

37
38 369
39
40
41 370 Having said that, it appears that for many poorer families who can access services and who are insured,
42
43 371 JKN provides effective protection against impoverishing spending. Hospitalisation was far more
44
45 372 common among the insured than the uninsured at all income levels, suggesting that insurance removed
46
47 373 a significant barrier to use of inpatient services. Despite this, out-of-pocket spending remained higher
48
49 374 among the insured, as was the case in pre-JKN days.^{27,34,35} Controlling for access to health services and
50
51 375 district health index, the insured spent 9% more on inpatient services and 15% more on outpatient
52
53 376 services than the uninsured. It is likely that newly-insured patients may be emboldened to seek services
54
55 377 which are not fully covered, sometimes because health care providers seek profit by promoting "off-
56
57 378 plan" services, including those not covered by the scheme, including branded medicines, laboratory tests,
58
59 379 and consultation with specialist doctors without referral.³⁶⁻³⁸ This "gateway effect" has been seen in

1
2
3 380 other countries embarking on scale-up of insurance, including China, Ghana, Kenya, and India.^{28,39–41}
4
5 381 In addition, patients may prefer to pay out-of-pocket for outpatient services, in particular, since they are
6
7 382 relatively affordable, perceived as higher quality, and less burdensome in terms of queuing and
8
9 383 paperwork.^{41–44}
10
11 384
12
13 385 Findings from other low and middle income countries about the financial protection provided by
14
15 386 national health insurance schemes are mixed.^{36,44} Using spending of 10% of a household's monthly per
16
17 387 capita non-health budget on inpatient care as a measure of the "catastrophic" spending health insurance
18
19 388 is designed to avoid, Indonesia appears to be performing relatively well, at least for those who use
20
21 389 services. (Like insurance registration, low out of pocket spending is not a measure of financial protection
22
23 390 in areas where there are no services to spend money on). Looking just at those who reported using
24
25 391 inpatient services, 87 percent of insured inpatients in the poorest income quintile spent less than 10% of
26
27 392 their non-health budget on hospitalisation, and for over half, the care was completely free. This
28
29 393 compares with the national health insurance in Zimbabwe, also around 87% in the poorest quintile
30
31 394 protected from catastrophic health expenditure.⁴⁵
32
33
34
35

36 37 396 **Implication for research and practice**

38
39 397 Indonesia has made great strides since 2014 in setting up a public health insurance system. By 2018 it
40
41 398 was effectively protecting many poor families from excessive spending on inpatient care. However, its
42
43 399 benefits remained limited for the millions of Indonesians – especially those living in areas with greatest
44
45 400 health needs – who were unable to benefit from their health insurance because they have extremely
46
47 401 limited access to formal health services.
48
49

50 402
51
52 403 A greater focus on equity in both supply and health financing would help Indonesia achieve the true
53
54 404 aims of universal health coverage: to ensure that all citizens have fair access to basic health services
55
56 405 without being pushed into poverty. This would require greater investments in health overall. Compared
57
58 406 with other countries in the region Indonesia's public investment in health is relatively low, at 2.9% of
59
60

1
2
3 407 GDP compared with 3.8% in Thailand and an average of 5% in East Asia and Pacific (not including
4
5 408 high income countries).⁴⁶ If the government had the fiscal space to investment the regional average, a
6
7 409 shift to financing public health provision out of general taxation (as suggested by Yates⁴⁷ and Fenny et
8
9 410 al.⁴⁸) might be feasible. However, given Indonesia's inefficient tax system and low tax yield, more
10
11 411 sustainable solutions might include hypothecated taxes on luxury goods, or reverting to an earlier system
12
13 412 which made greater use of local government subsidies in wealthier areas.^{49,50} Our study, which shows a
14
15 413 substantial increase in out of pocket spending by wealth, suggest that progressive contributions based
16
17 414 on income, suggested by Reeves et al.,⁵⁰ may also be a viable approach. Finally, the politically
18
19 415 unpalatable option of prioritising reimbursement to meet the most urgent needs of the poorest citizens
20
21 416 could be considered.
22
23

24 417

25
26 418 Health equity can not be achieved only by finding a sustainable financing model to pay for service
27
28 419 provision. Indonesia also needs to invest substantially in improving the supply of services in many areas
29
30 420 of the country. The directly elected district governments responsible for service provision could be
31
32 421 incentivised to invest more in this area, since it may be a viable way of generating political popularity,
33
34 422 while providing opportunities for local patronage.¹ But success in providing wider access to necessary
35
36 423 services will be a double-edged sword: fulfilling unmet demand will increase claims on JKN, which is
37
38 424 already deeply in deficit.
39
40

41 425

42 426 **Limitations**

43
44
45 427 Detailed analysis of merged data collected by Indonesian government agencies could help further inform
46
47 428 decision-making. Our study is limited by lack of granular information on health needs and outcomes. In
48
49 429 addition, the statistics agency was unwilling to release geographic identifiers at levels lower than district
50
51 430 for the household survey data, so we were unable to link service access measures at the village or sub-
52
53 431 district level. Our dataset nonetheless allows for the most granular analysis to date across a wide range
54
55 432 of health service use and spending-related measures in one of the world's most diverse nations. It suffers
56
57 433 from the common constraint of using secondary, quantitative data -- the inability to explain outliers, or
58
59
60

1
2
3 434 to pinpoint the political, economic and social factors that explain why more has not yet been done to
4
5 435 address inequity within JKN.

6
7 436

8
9 437 Future research

10
11 438 Our analysis was cross-sectional, so does not reflect the dynamism of the situation. However, two of the
12
13 439 datasets -- SUSENAS and JKN claims data -- are available annually, so many elements of this analysis
14
15 440 could be repeated in an investigation of trends over time. We believe this might provide insights into
16
17 441 which elements of inequity are temporal and which are structural. The data could also be used in studies
18
19 442 exploring in greater detail the differences in service use between public and private providers,
20
21 443 particularly in relation to insurance status and out-of-pocket spending.
22
23

24 444

25 26 445 **CONCLUSION**

27
28 446 Successful progress of JKN is shown by the number of insured people. However, healthcare access is
29
30 447 deterred due to supply-side constraints. Insured individuals have higher OOP than uninsured. However,
31
32 448 among individuals using inpatient care, the insured incur lower OOP. The priority concern of the
33
34 449 government to bring UHC forward should focus on policies and efforts on providing equitable access
35
36 450 to those districts without access.
37
38

39 451

40
41 452 **Figure 1: Expected relationship of insurance claims and out-of-pocket spending with health need,**
42 453 **insurance status, and service availability**

43 454
44 455 **Figure 2: Numbers reporting inpatient service use, by insurance status, non-health consumption quintile,**
45 456 **and percentage of household consumption spent on inpatient services**
46 457

47 48 49 458 **Contributors**

50
51 459 ABP, EP, MOK, and AGM conceptualised the study. EP and HS performed the data cleaning and
52
53 460 management. ABP, EP, HS, TH performed the data analysis. EP and HS designed the figures. AGM
54
55 461 and MOK supervised the project. ABP, EP, HS, MOK, TH contributed to drafting the manuscript, with
56
57 462 input of AGM. All authors have approved the final manuscript.
58

59 463
60

464 **Funding**

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

469 **Data sharing statement**

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

477 **Declaration of interest**

478 We declare no conflict of interest.

480 **Acknowledgements**

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

485 **References**

- 486 1. Pisani E, Olivier Kok M, Nugroho K. Indonesia's road to universal health coverage: a political
487 journey. *Health Policy Plan* 2017;32(2):267–76.
- 488 2. Agustina R, Dartanto T, Sitompul R, et al. Universal health coverage in Indonesia: concept,
489 progress, and challenges. *Lancet* 2019;393(10166):75-102.
- 490 3. Mboi N. Indonesia: On the way to universal health care. *Health Syst Reform* 2015;1(2):91–7.
- 491 4. Social Security Agency for Health. JKN program participants, 2020. Available: [https://bpjs-](https://bpjs-kesehatan.go.id/bpjs/)
492 [kesehatan.go.id/bpjs/](https://bpjs-kesehatan.go.id/bpjs/) [Accessed 29 Jan 2020]

- 1
- 2
- 3 493 5. World Health Organization. Tracking universal health coverage: first global monitoring report.
- 4 494 Geneva: World Health Organization; 2015.
- 5 495 6. Dartanto T, Halimatussadiyah A, Rezki JF, et al. Why do informal sector workers not pay the
- 6 496 premium regularly? Evidence from the National Health Insurance System in Indonesia. *Appl*
- 7 497 *Health Econ Health Policy* 2020 Feb; 18(1):81-96.
- 8 498 7. Muttaqien M, Setiyaningsih H, Aristianti V, et al. Why did informal sector workers stop paying
- 9 499 for health insurance in Indonesia? Exploring enrollees' ability and willingness to pay. *PloS one*
- 10 500 2021;4;16(6):e0252708.
- 11 501 8. Government Republic of Indonesia. Presidential decree Republic of Indonesia number 82 year
- 12 502 2018, 2018. Available: [https://bpjs-](https://bpjs-kesehatan.go.id/bpjs/dmdocuments/2b85f7e015e747f9cd29ef384b4cb316.pdf)
- 13 503 [kesehatan.go.id/bpjs/dmdocuments/2b85f7e015e747f9cd29ef384b4cb316.pdf](https://bpjs-kesehatan.go.id/bpjs/dmdocuments/2b85f7e015e747f9cd29ef384b4cb316.pdf) [Accessed 29 Jan
- 14 504 2020]
- 15 505 9. Ministry of Health Republic of Indonesia. Data and information: Indonesia health profile 2017,
- 16 506 2018.
- 17 507 10. Asyary A. Indonesian primary care through universal health coverage systems: A feeling in
- 18 508 bones. *Public Health Indonesia* 2018;4(3):138–45.
- 19 509 11. World Health Organization. Primary health care on the road to universal health coverage: 2019
- 20 510 global monitoring report; Conference edition, 2019.
- 21 511 12. Minister of Health Republic of Indonesia. Minister of Health regulation number 52 year 2016
- 22 512 about healthcare services standard tarif in JKN, 2016. Available:
- 23 513 [http://hukor.kemkes.go.id/uploads/produk_hukum/PMK_No_52_Tahun_2016_Tentang_Standar](http://hukor.kemkes.go.id/uploads/produk_hukum/PMK_No_52_Tahun_2016_Tentang_Standar_Tarif_Pelayanan_Kesehatan_Dalam_Penyelenggaraan_JKN_.pdf)
- 24 514 [Tarif Pelayanan Kesehatan Dalam Penyelenggaraan JKN .pdf](http://hukor.kemkes.go.id/uploads/produk_hukum/PMK_No_52_Tahun_2016_Tentang_Standar_Tarif_Pelayanan_Kesehatan_Dalam_Penyelenggaraan_JKN_.pdf) [Accessed 5 Sep 2020].
- 25 515 13. Ministry of Health Republic of Indonesia. Minister of Health regulation number 76 year 2016
- 26 516 about guideline INA-CBG in JKN, 2016.
- 27 517 14. Social Security Agency for Health. Executive summary of the 2016 social security program for
- 28 518 health, management report and financial report, 2016. Available: [https://www.bpjs-](https://www.bpjs-kesehatan.go.id/bpjs/dmdocuments/b39df9ae7a30a5c7d4bd0f54d763b447.pdf)
- 29 519 [kesehatan.go.id/bpjs/dmdocuments/b39df9ae7a30a5c7d4bd0f54d763b447.pdf](https://www.bpjs-kesehatan.go.id/bpjs/dmdocuments/b39df9ae7a30a5c7d4bd0f54d763b447.pdf) [Accessed 5 sep
- 30 520 2020].
- 31 521 15. Social Security Agency for Health. 2019 program management report and 2019 program
- 32 522 financial report. Available: <https://bpjs-kesehatan.go.id/bpjs/arsip/detail/1514> [Accessed 13 Nov
- 33 523 2020].
- 34 524 16. Supreme Court Republic of Indonesia. Decision number 7/HUM/2020, 2020.
- 35 525 17. President Republic of Indonesia. President regulation number 64 year 2020, 2020.
- 36 526 18. Liputan6.com. 2021. Class III BPJS Health contribution increases, YLKI predicts there will be
- 37 527 increasing arrears. Available: [https://www.liputan6.com/bisnis/read/4446947/iuran-bpjs-](https://www.liputan6.com/bisnis/read/4446947/iuran-bpjs-kesehatan-kelas-iii-naik-ylki-prediksi-akan-ada-pembengkakan-tunggakan)
- 38 528 [kesehatan-kelas-iii-naik-ylki-prediksi-akan-ada-pembengkakan-tunggakan](https://www.liputan6.com/bisnis/read/4446947/iuran-bpjs-kesehatan-kelas-iii-naik-ylki-prediksi-akan-ada-pembengkakan-tunggakan) [Accessed 5 Jun 21]
- 39 529 19. Putri CA. BPJS contribution increase, 1.57 million participants drop class, 2020. Available:
- 40 530 [https://www.cnbcindonesia.com/news/20200917194312-4-187637/iuran-bpjs-kesehatan-naik-](https://www.cnbcindonesia.com/news/20200917194312-4-187637/iuran-bpjs-kesehatan-naik-157-juta-peserta-turun-kelas)
- 41 531 [157-juta-peserta-turun-kelas](https://www.cnbcindonesia.com/news/20200917194312-4-187637/iuran-bpjs-kesehatan-naik-157-juta-peserta-turun-kelas) [Accessed 5 Jun 21]
- 42 532 20. Central Bureau of Statistics Indonesia. Statistik Indonesia 2020, 2020.
- 43 533 21. Ministry of Health Republic of Indonesia. Public health development index. Jakarta, Indonesia:
- 44 534 Ministry of Health, Publishing Body of Health Research and Development, Ministry of Health
- 45 535 2019.
- 46 536 22. Gani A, Budiharsana M. The consolidated report on Indonesia health sector review 2018.
- 47 537 Jakarta: Republic of Indonesia, BAPPENAS 2019. Available:
- 48 538 [https://www.unicef.org/indonesia/reports/consolidated-report-indonesia-health-sector-review-](https://www.unicef.org/indonesia/reports/consolidated-report-indonesia-health-sector-review-2018)
- 49 539 [2018](https://www.unicef.org/indonesia/reports/consolidated-report-indonesia-health-sector-review-2018) [Accessed 31 Aug 2020].
- 50 540 23. Mulyanto J, Kringos DS, Kunst AE. The evolution of income-related inequalities in healthcare
- 51 541 utilisation in Indonesia, 1993–2014. *PLoS One* 2019;14(6):e0218519.
- 52 542 24. Nandi S, Schneider H, Garg S. Assessing geographical inequity in availability of hospital
- 53 543 services under the state-funded universal health insurance scheme in Chhattisgarh state, India,
- 54 544 using a composite vulnerability index. *Glob Health Action* 2018;11(1):1541220.
- 55 545 25. Jansen JD. Political symbolism as policy craft: explaining non-reform in South African
- 56 546 education after apartheid. *J Educ Policy* 2002;17(2):199–215.

- 1
2
3 547 26. Van Doorslaer E, O'Donnell O, Rannan-Eliya RP, et al. Effect of payments for health care on
4 548 poverty estimates in 11 countries in Asia: an analysis of household survey data. *Lancet*
5 549 2006;368(9544):1357–1364.
- 6 550 27. Sparrow R, Suryahadi A, Widyanti W. Social health insurance for the poor: Targeting and
7 551 impact of Indonesia's Askeskin programme. *Soc Sci Med* 2013;96:264–71.
- 8 552 28. Garg S, Bebartha KK, Tripathi N. Performance of India's national publicly funded health
9 553 insurance scheme, Pradhan Mantri Jan Arogya Yojana (PMJAY), in improving access and
10 554 financial protection for hospital care: findings from household surveys in Chhattisgarh state.
11 555 *BMC Public Health* 2020;20(1):949.
- 12 556 29. Lozano R, Fullman N, Mumford JE, Knight M, Barthelemy CM, Abbafati C, et al.
13 557 Measuring universal health coverage based on an index of effective coverage of health
14 558 services in 204 countries and territories, 1990–2019: a systematic analysis for the Global
15 559 Burden of Disease Study 2019. *Lancet* 2020;S0140673620307509.
- 16 560 30. Mulyanto J, Kunst AE, Kringos DS. Geographical inequalities in healthcare utilisation and the
17 561 contribution of compositional factors: A multilevel analysis of 497 districts in Indonesia. *Health*
18 562 *Place* 2019;60:102236.
- 19 563 31. Wati H, Thabrany H. Catastrophic claim comparison among JKN member in DKI Jakarta
20 564 Province and East Nusa Tenggara in 2014. *Jurnal Ekonomi Kesehatan Indonesia* 2017;1(2).
21 565 Available: <http://journal.fkm.ui.ac.id/jurnal-eki/article/view/1771> [Accessed 31 Aug 2020].
- 22 566 32. Maharani A, Tampubolon G. Has decentralisation affected child immunisation status in
23 567 Indonesia? *Glob Health Action* 2014;7(1):24913.
- 24 568 33. Ensor T, Firdaus H, Dunlop D, et al. Budgeting based on need: a model to determine sub-
25 569 national allocation of resources for health services in Indonesia. *Cost Eff Resour Alloc*
26 570 2012;10(1):11.
- 27 571 34. Aji B, De Allegri M, Souares A, et al. The impact of health insurance programs on out-of-pocket
28 572 expenditures in Indonesia: An increase or a decrease? *Int J Environ Res Public Health*
29 573 2013;10(7):2995–3013.
- 30 574 35. Aizawa T. The impact of health insurance on out-of-pocket expenditure on delivery in Indonesia.
31 575 *Health Care Women Int* 2019;40(12):1374–95.
- 32 576 36. Bredenkamp C, Buisman LR. Financial protection from health spending in the Philippines:
33 577 policies and progress. *Health Policy Plan*. 2016 Sep;31(7):919–27.
- 34 578 37. Sum G, Hone T, Atun R, Millett C, Suhrcke M, Mahal A, et al. Multimorbidity and out-of-
35 579 pocket expenditure on medicines: a systematic review. *BMJ Glob Health* 2018;3(1):e000505.
- 36 580 38. Hasnida A, Kok MO, Pisani E. Challenges in maintaining medicine quality while aiming for
37 581 universal health coverage: a qualitative analysis from Indonesia. *BMJ Glob Health* 2021;6(Suppl
38 582 3):e003663.
- 39 583 39. Wagstaff A, Lindelow M. Can insurance increase financial risk? The curious case of health
40 584 insurance in China. *J Health Econ* 2008;27(4):990-1005.
- 41 585 40. Aryeetey GC, Westeneng J, Spaan E, et al. Can health insurance protect against out-of-pocket
42 586 and catastrophic expenditures and also support poverty reduction? Evidence from Ghana's
43 587 National Health Insurance Scheme. *Int J Equity Health* 2016;15(1):116.
- 44 588 41. Ekman B. Catastrophic health payments and health insurance: Some counterintuitive evidence
45 589 from one low-income country. *Health Policy* 2007;3(2–3):304–13.
- 46 590 42. Salari P, Di Giorgio L, Ilinca S, et al. The catastrophic and impoverishing effects of out-of-
47 591 pocket healthcare payments in Kenya, 2018. *BMJ Glob Health* 2019;4(6).
- 48 592 43. Selvaraj S, Farooqui HH, Karan A. Quantifying the financial burden of households' out-of-
49 593 pocket payments on medicines in India: a repeated cross-sectional analysis of National Sample
50 594 Survey data, 1994-2014. *BMJ Open* 2018;8:e018020.
- 51 595 44. Tangcharoensathien V, Patcharanarumol W, Ir P, et al. Health-financing reforms in southeast
52 596 Asia: challenges in achieving universal coverage. *Lancet*. 2011;377(9768):863–73.
- 53 597 45. Zeng W, Lannes L, Mutasa R. Utilization of Health Care and Burden of Out-of-Pocket
54 598 Health Expenditure in Zimbabwe: Results from a National Household Survey. *Health*
55 599 *Syst Reform* 2018;2;4(4):300–12.
- 56
57
58
59
60

- 1
2
3 600 46. Current health expenditure (% of GDP) - East Asia & Pacific (excluding high income) |
4 601 Data [Internet]. Available:
5 602 <https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS?locations=4E> [Accessed 8
6 603 Jun 2021].
7
8 604 47. Yates R. Universal health coverage: progressive taxes are key. *Lancet*
9 605 2015;386(9990):227–9.
10 606 48. Fenny AP, Yates R, Thompson R. Strategies for financing social health insurance
11 607 schemes for providing universal health care: a comparative analysis of five countries.
12 608 *Glob Health Action* 2021;14(1):1868054.
13 609 49. Awosusi A, Folaranmi T, Yates R. Nigeria’s new government and public financing for
14 610 universal health coverage. *Lancet Glob Health* 2015;3(9):e514–5.
15 611 50. Reeves A, Gourtsoyannis Y, Basu S, McCoy D, McKee M, Stuckler D. Financing
16 612 universal health coverage—effects of alternative tax structures on public health systems:
17 613 cross-national modelling in 89 low-income and middle-income countries. *Lancet*
18 614 2015;386(9990):274–80.
19 615
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Healthcare needs

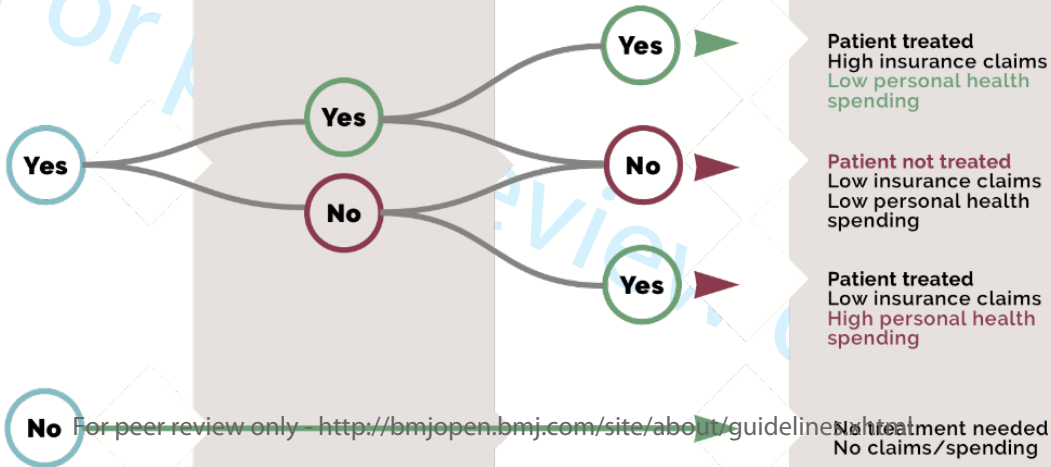
Person has health insurance

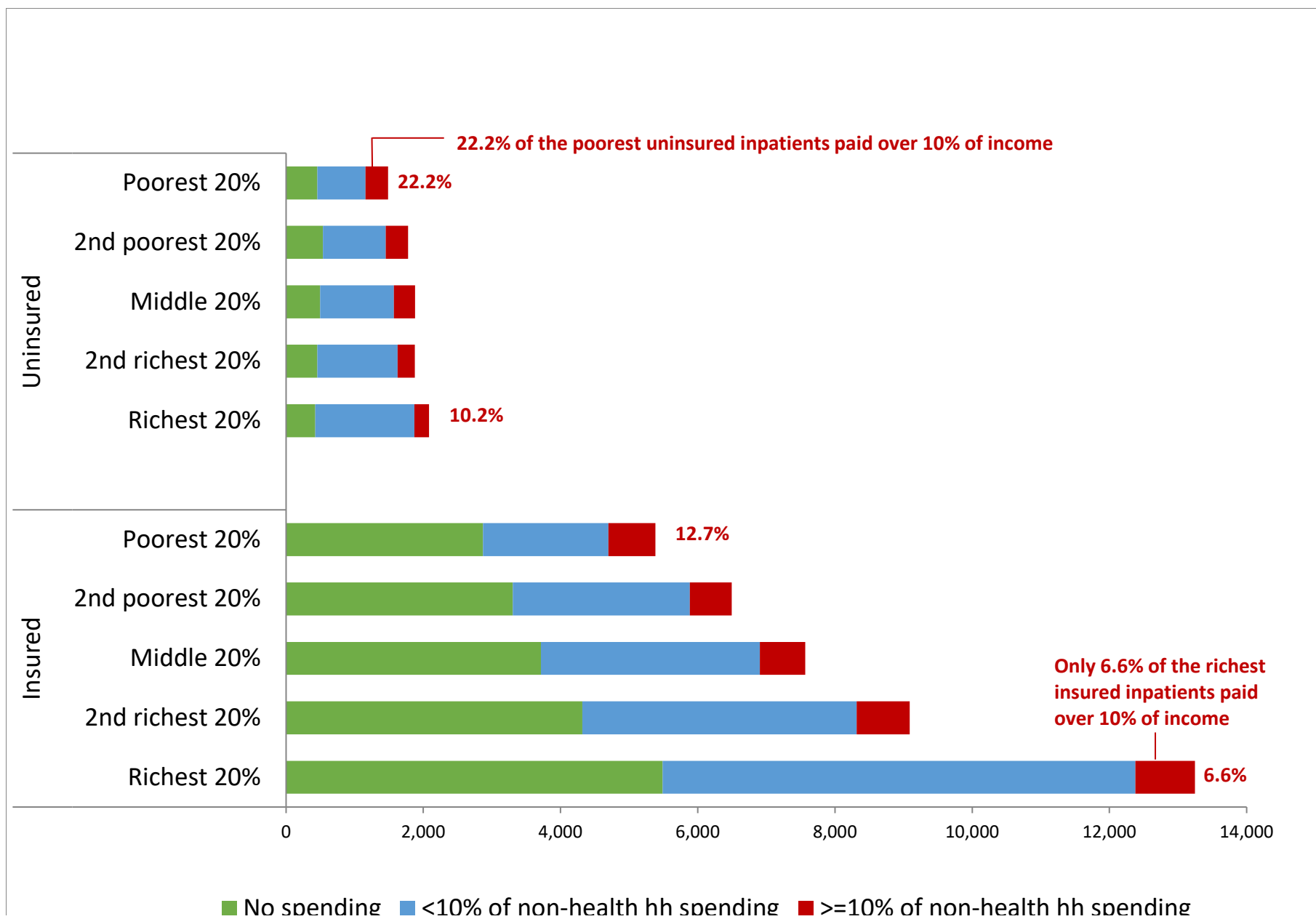
BMJ Open

Health services locally available

Health/spending outcomes

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16





Supplementary file 1: Data included in the merged datasets

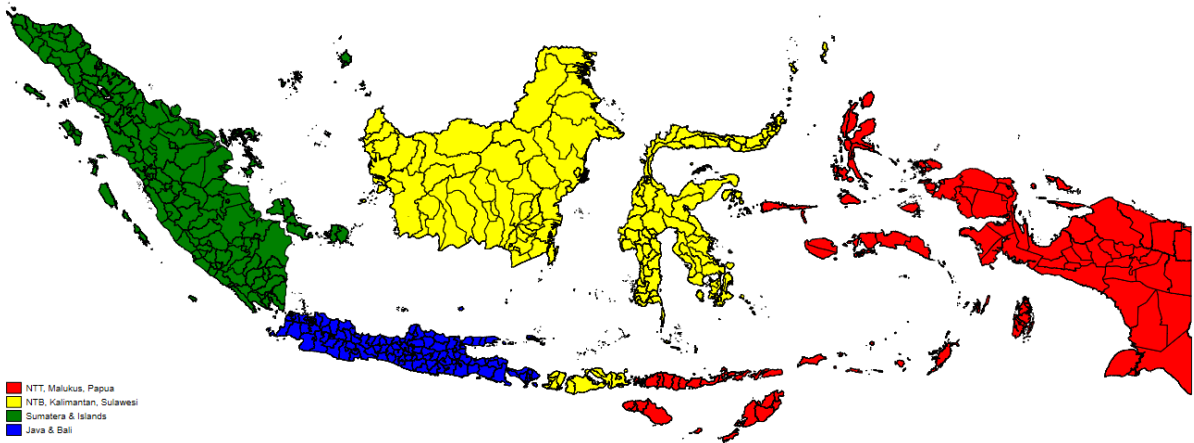
Data set acronym	Source	Years	Level of record	Representative level	Number of records	Key information
SUSENAS	BPS	2018	Individual	District	1,131,825	Insurance status, service use, spending on health
PoDes	BPS	2018	Village	Village (census)	83,931	Service availability
IPKM	MoH/ RisKesDas	2018	District	District	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.

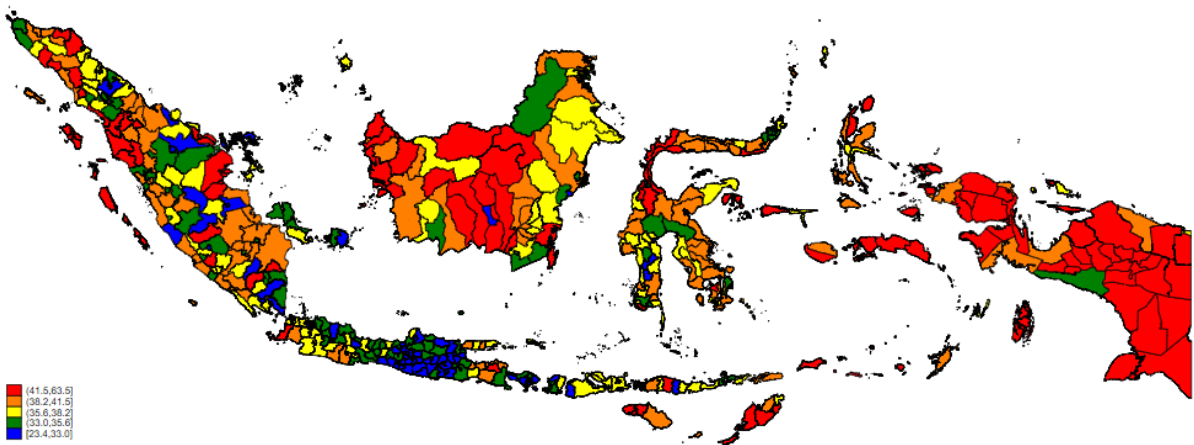
Supplementary file 2: Steps taken to integrate data from different sources

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

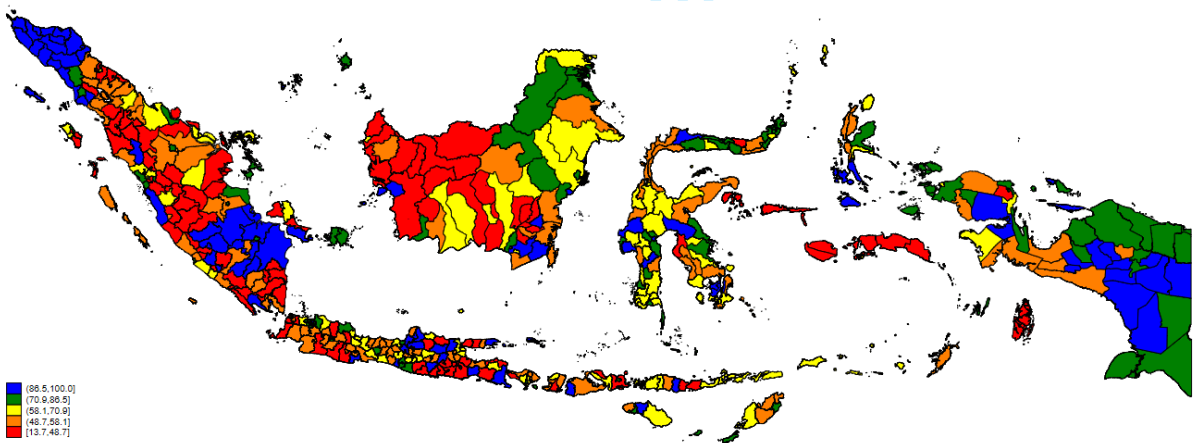
SUSENAS=National Social and Economic Survey. PoDes=Village Potential Survey. IPKM=Population Health Development Index. BPJS=Social Security Agency for Health.



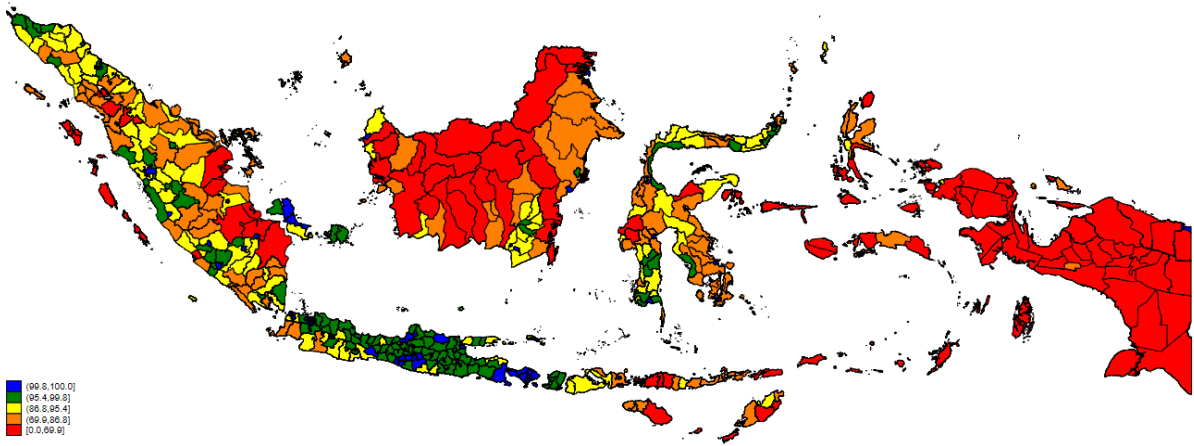
3a: Regional groupings



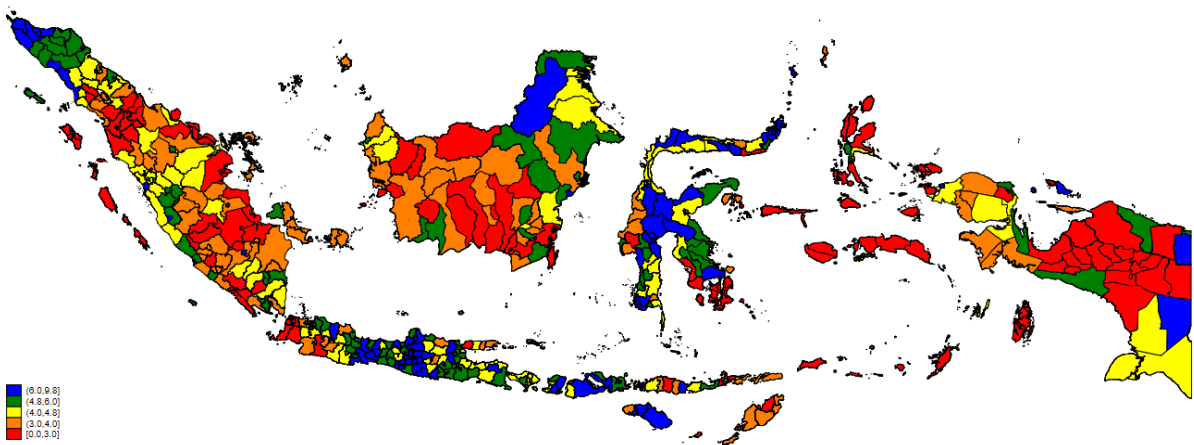
3b: Index of health need, Riskesdas, 2018. Red and orange areas have higher health needs



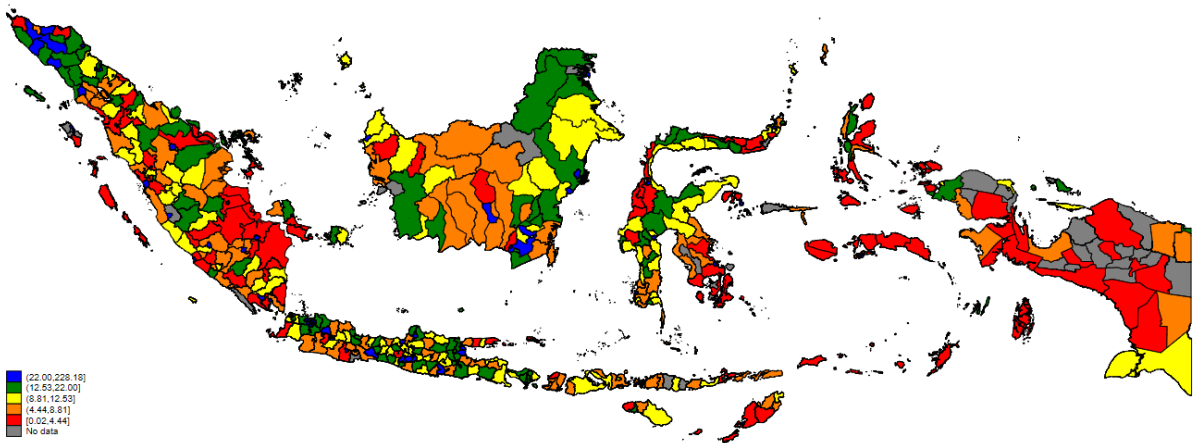
3c: Self-reported insurance status, Susenas, 2018. Red and orange areas have lower self-reported insurance status



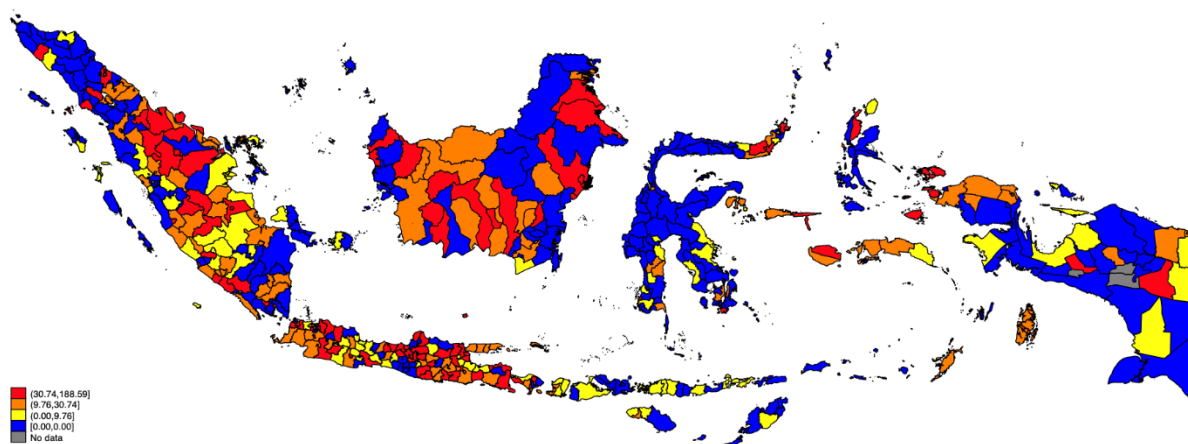
3d: Percentage of villages with easy access to inpatient services, PoDes, 2018. Red and orange areas have more difficult access



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.

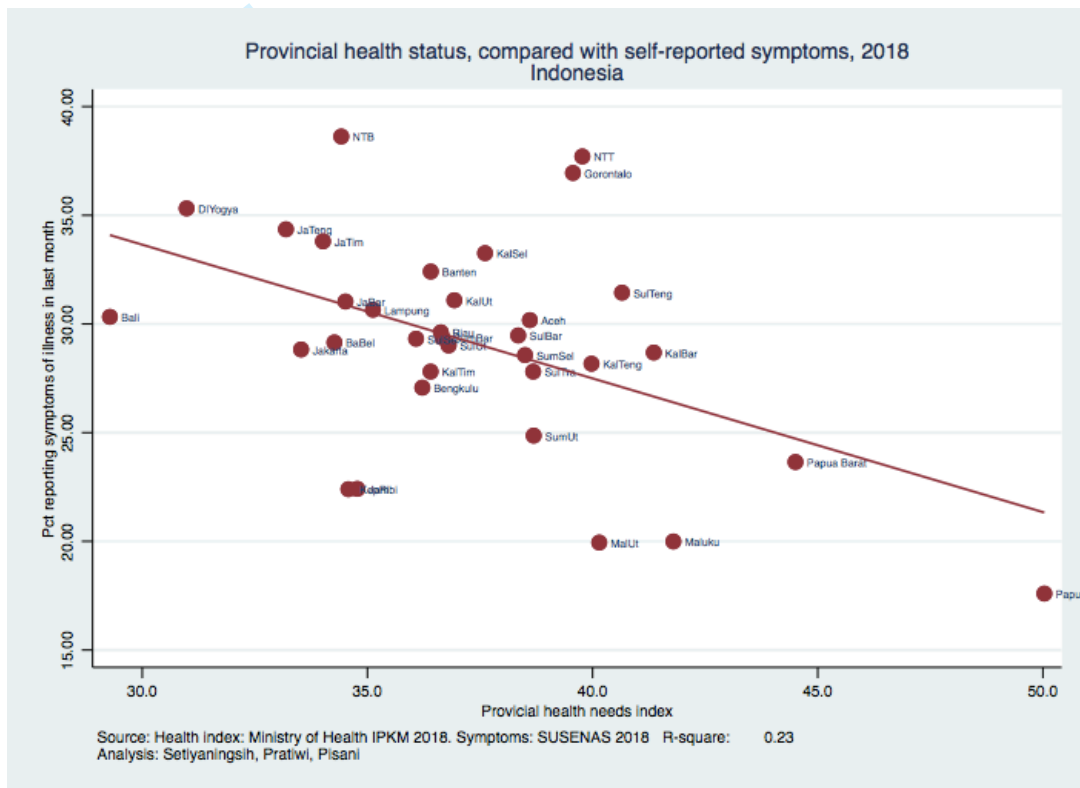


3g: Of those households with inpatients in last 12 months, average household spending on inpatient care, per patient. Susenas 2018. In both the first and second quintiles, spending was zero; these districts are all shown in blue. Red and orange districts have higher household spending on inpatient care.

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 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 material to Pratiwi et al.

Supplementary file 5: percent insurance ownership, self-reported

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.

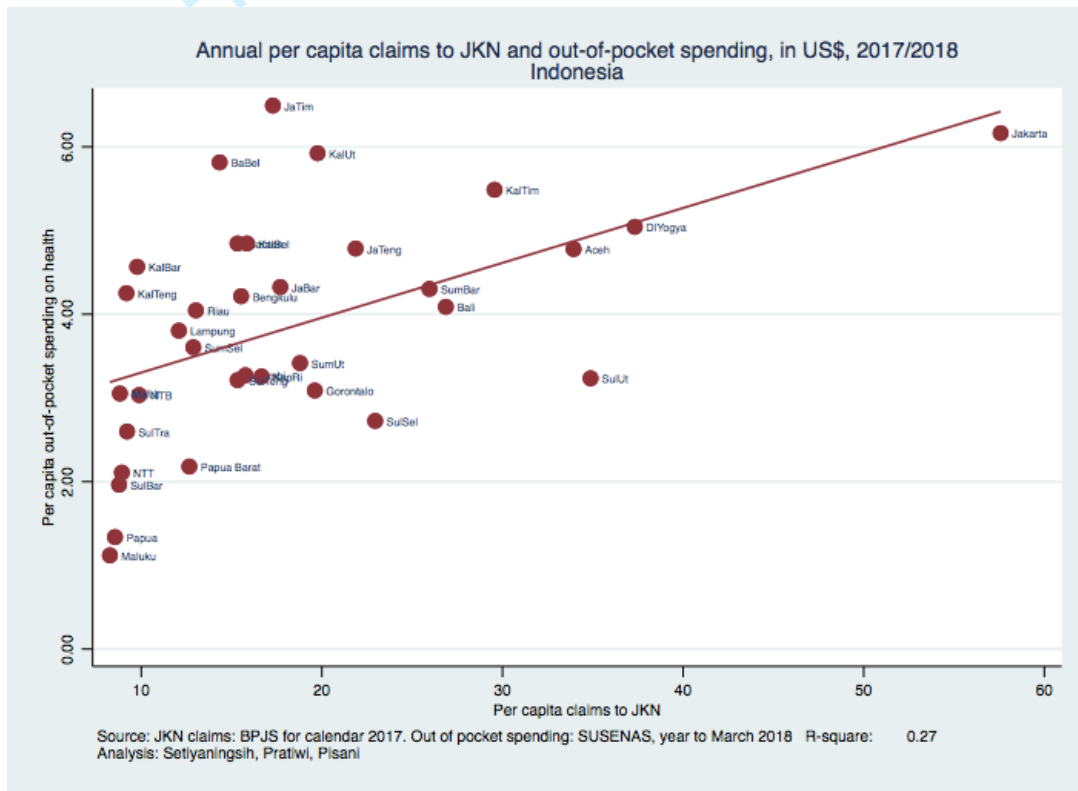
Consumption is calculated at the household level. As a proxy for wealth, we sum all non-health-related consumption, and divide it by the number of individuals in the household. This table shows health insurance status by quintiles of wealth.

Source: SUSENAS 2018

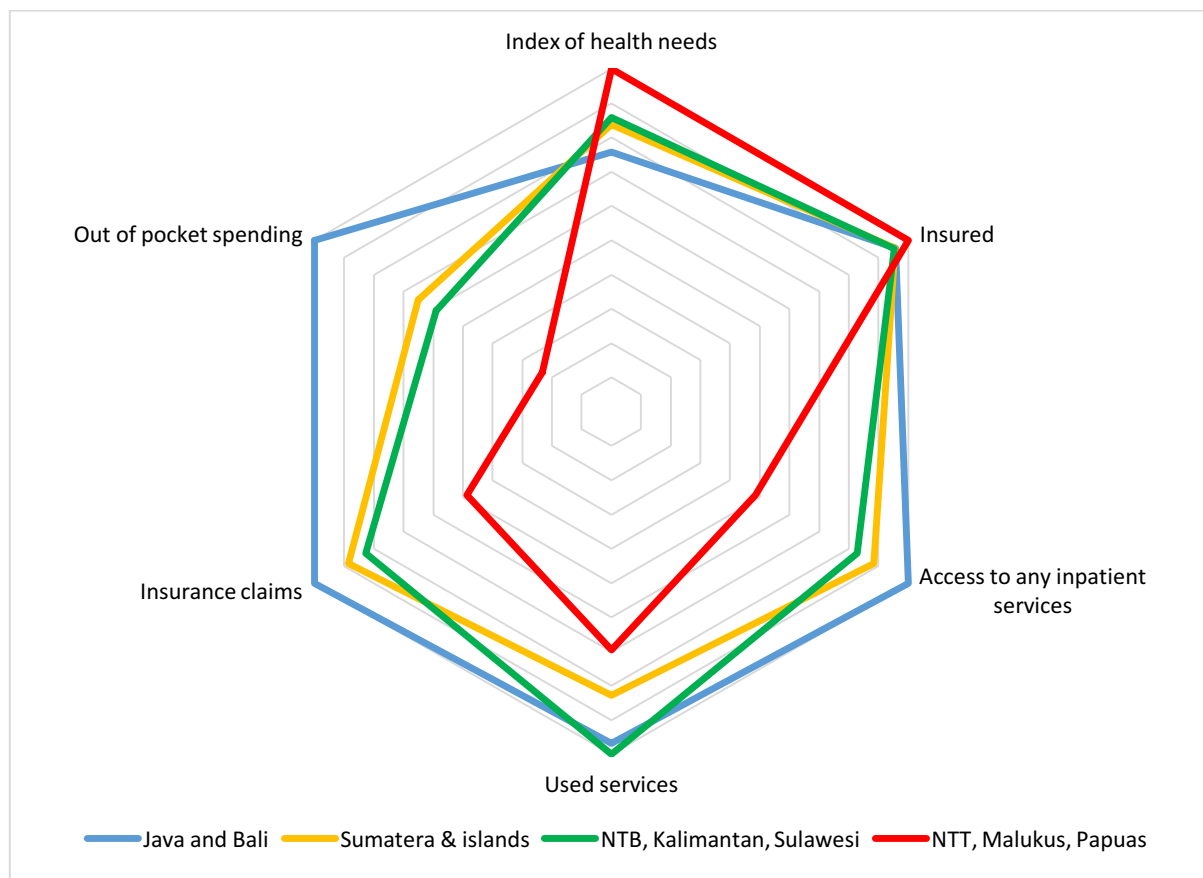
	Uninsured	Subsidised JKN	Independent JKN	Private insurance
Lowest 20%	42.43	51.76	5.26	0.54
Q2	41.21	48.34	9.01	1.43
Middle 20%	38.97	44.68	13.56	2.79
Q4	35.00	39.35	21.15	4.51
Highest 20%	26.85	25.77	36.77	10.61
All, National	35.9	40.35	19.15	4.6

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	
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	
Introduction			
Background/Rationale	2	Explain the scientific background and rationale for the investigation being reported	
Objectives	3	State specific objectives, including any prespecified hypotheses	
Methods			
Study Design	4	Present key elements of study design early in the paper	
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —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 <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	

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	
Bias	9	Describe any efforts to address potential sources of bias	
Study Size	10	Explain how the study size was arrived at	
Quantitative Variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	
Statistical Methods	12	(a) Describe all statistical methods, including those used to control for confounding	
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	
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	
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive Data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome Data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	

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	
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other Analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key Results	18	Summarise key results with reference to study objectives	
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	
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	
Generalisability	21	Discuss the generalisability (external validity) of the study results	
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	

*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.