

## Pandemic inequity in a megacity: a multilevel analysis of individual, community and health care vulnerability risks for COVID-19 mortality in Jakarta, Indonesia

### Supplementary data

**Table S1: Age-specific mortality with confidence limits in COVID-19 cases in Jakarta, Indonesia, March 2, 2020 to August 31, 2021**

Age group (years)	N total	N deceased	% deceased	95% CI
0-4	21,793	47	0.22	0.16-0.29
5-9	23,070	16	0.07	0.04-0.11
10-19	66,514	72	0.11	0.09-0.14
20-29	149,267	311	0.21	0.19-0.23
30-39	146,900	692	0.47	0.44-0.51
40-49	121,454	1,455	1.20	1.14-1.26
50-59	98,934	3,115	3.15	3.04-3.26
60-69	52,776	2,827	5.36	5.17-5.55
70-79	24,261	2,261	9.13	8.78-9.50

**Table S2: Sensitivity analysis of individual and community-level risk factors associated with COVID-19 mortality in Jakarta, Indonesia, March 2, 2020 to August 31, 2021**

	Adjusted OR (95% CI)	p value
<b>Individual factors</b>		
Age group, years		
0-4	0.71 (0.44-1.14)	0.154
5-9	0.30 (0.15-0.59)	<0.0001
10-19	0.50 (0.36-0.71)	<0.0001
20-29	1 (ref)	..
30-39	1.97 (1.64-2.36)	<0.0001
40-49	4.41 (3.73-5.22)	<0.0001
50-59	11.75 (10.03-13.76)	<0.0001
60-69	17.22 (14.65-20.25)	<0.0001
≥70	30.53 (25.91-35.99)	<0.0001
Sex		
Female	1 (ref)	..
Male	1.29 (1.24-1.34)	<0.0001
Comorbidities		
No	1 (ref)	..
Yes	4.25 (3.81-4.75)	<0.0001
Period of time		
First wave	0.87 (0.69-1.09)	0.215
Second wave	1 (ref)	..
<b>Community (sub-district)-level factors</b>		
Population density		
Lowest	1 (ref)	..
Q2	1.18 (1.03-1.35)	0.017
Q3	1.22 (1.06-1.40)	0.005
Highest	1.32 (1.14-1.54)	<0.0001
Poverty level		
Lowest	1 (ref)	..
Q2	1.39 (1.15-1.67)	0.001
Q3	1.33 (1.16-1.52)	<0.0001
Highest	1.16 (0.97-1.40)	0.109
Vaccine coverage		
Lowest	1.23 (1.13-1.35)	<0.0001

Q2	1.18 (1.09-1.28)	<0.0001
Q3	1.03 (0.90-1.18)	0.059
Highest	1 (ref)	..

Table S2 presents the final multi-level multivariable logistic regression with multiple imputations for missing comorbidities. Sub-district was treated as the random effect variable. First wave: March 2020 to April 2021, Second wave: May 2021 to August 2021. Numeric values were categorised into quartiles (Q), i.e., below 25<sup>th</sup> percentile (Lowest), 25<sup>th</sup>–50<sup>th</sup> percentile (Q2), 50<sup>th</sup>–75<sup>th</sup> percentile (Q3) and above 75<sup>th</sup> percentile (Highest) for each sub-district level variable.

**Table S3: Multivariable analysis of effect of age on mortality associated with COVID-19 mortality in Jakarta, Indonesia, March 2, 2020 to August 31, 2021**

	First wave		Second wave	
	Adjusted OR (95% CI)	p value	Adjusted OR (95% CI)	p value
Age group, years				
<b>0-4</b>	<b>1.56 (1.04-2.35)</b>	<b>0.033</b>	<b>0.72 (0.45-1.16)</b>	<b>0.183</b>
5-9	0.41 (0.19-0.88)	0.022	0.31 (0.16-0.61)	0.001
10-19	0.53 (0.35-0.80)	0.003	0.52 (0.37-0.72)	<0.0001
20-29	1 (ref)	..	1 (ref)	..
30-39	2.48 (2.03-3.04)	<0.0001	1.97 (1.64-2.36)	<0.0001
40-49	6.87 (5.70-8.29)	<0.0001	4.50 (3.80-5.32)	<0.0001
50-59	17.72 (14.80-21.22)	<0.0001	12.33 (10.52-14.44)	<0.0001
60-69	32.81 (27.39-39.29)	<0.0001	18.37 (15.64-21.58)	<0.0001
≥70	58.99 (49.11-70.86)	<0.0001	33.45 (28.41-39.38)	<0.0001

Table S3 presents the time-specific effect of age on mortality, after controlling for sex, comorbidities, population density, poverty, and vaccine coverage, and correlation at sub-district level (random effect variable). OR=odds ratio. First wave=March 2020 to April 2021. Second wave=May 2021 to August 2021.

**Table S4: Effect of poverty level on COVID-19 mortality based on population density**

	Adjusted OR (95% CI)	p value
Lowest density		
Lowest poverty	1 (ref)	..
Q2	1.43 (1.17-1.75)	<0.0001
Q3	1.35 (1.34-0.77)	<0.0001
Highest poverty	1.18 (0.97-1.43)	0.093
Q2		
Lowest poverty	1.20 (1.04-1.39)	0.012
Q2	1.12 (0.94-1.34)	0.192
Q3	1.34 (1.16-1.55)	<0.0001
<b>Highest poverty</b>	<b>1.25 (1.08-1.45)</b>	<b>0.003</b>
Q3		
Lowest poverty	1.23 (1.06-1.42)	0.006
Q2	1.37 (1.18-1.58)	<0.0001
Q3	NA	NA
<b>Highest poverty</b>	<b>1.23 (1.05-1.45)</b>	<b>0.011</b>
Highest density		
Lowest poverty	1.34 (1.14-1.58)	<0.0001
Q2	1.42 (1.15-1.75)	0.001
Q3	1.24 (1.06-1.45)	0.008
<b>Highest poverty</b>	<b>1.27 (1.10-1.47)</b>	<b>0.001</b>

Table S4 presents the effect of poverty on mortality based on population density, after controlling for sex, comorbidities, time period, vaccine coverage, and correlation at sub-

district level (random effect variable). OR=odds ratio. First wave=March 2020 to April 2021. Second wave=May 2021 to August 2021. First wave: March 2020 to April 2021, Second wave: May 2021 to August 2021.

**Table S5: Association between population density with poverty, prevalence of hypertension, diabetes, and tuberculosis**

	Population density				p value
	Lowest	Q2	Q3	Highest	
Poverty					
Lowest	35.18%	28.24%	27.84%	22.53%	<0.0001
Q2	11.05%	13.14%	49.16%	11.14%	
Q3	44.38%	28.27%	0.00%	31.02%	
Highest	9.38%	30.34%	23.00%	<b>35.32%</b>	
Hypertension prevalence					
Lowest	27.48%	27.57%	25.19%	17.21%	<0.0001
Q2	27.30%	34.71%	29.29%	22.90%	
Q3	10.88%	22.63%	18.42%	30.62%	
Highest	34.34%	15.09%	27.10%	<b>29.27%</b>	
Diabetes prevalence					
Lowest	14.23%	39.26%	34.31%	10.24%	<0.0001
Q2	34.75%	32.97%	0.00%	26.33%	
Q3	31.75%	5.38%	29.75%	38.09%	
Highest	19.27%	22.39%	35.94%	<b>25.33%</b>	
Tb prevalence					
Lowest	60.29%	0.00%	19.56%	20.15%	<0.0001
Q2	31.09%	27.13%	21.23%	20.54%	
Q3	5.77%	28.43%	40.62%	25.19%	
Highest	9.12%	50.77%	12.65%	<b>27.45%</b>	

Table S5: Association between population density and other covariates. Numeric values were categorised into quartiles (Q), i.e., below 25<sup>th</sup> percentile (Lowest), 25<sup>th</sup>–50<sup>th</sup> percentile (Q2), 50<sup>th</sup>–75<sup>th</sup> percentile (Q3) and above 75<sup>th</sup> percentile (Highest) for each sub-district level variable.

**Table S6: Association between poverty with prevalence of hypertension, diabetes, and tuberculosis**

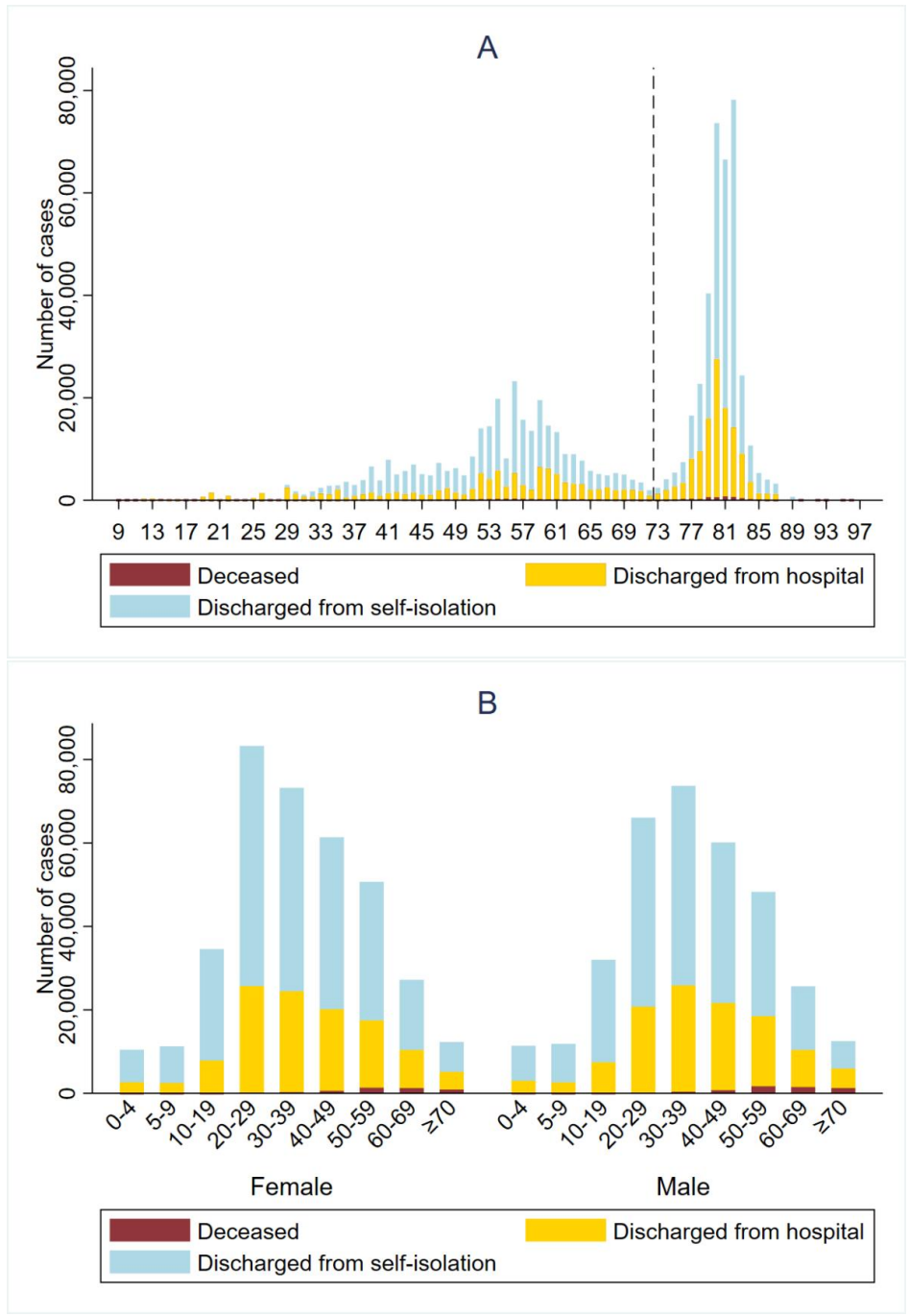
	Poverty				p value
	Lowest	Q2	Q3	Highest	
Hypertension prevalence					
Lowest	16.94%	46.95%	27.97%	10.15%	<0.0001
Q2	29.16%	41.99%	12.34%	33.75%	
Q3	42.88%	0.00%	25.97%	8.09%	
Highest	11.03%	11.06%	33.71%	<b>48.01%</b>	
Diabetes prevalence					
Lowest	13.43%	54.05%	27.97%	13.43%	<0.0001
Q2	28.46%	27.44%	20.38%	14.55%	
Q3	40.26%	0.00%	17.94%	37.25%	
Highest	17.85%	18.50%	33.71%	<b>34.77%</b>	
Tb prevalence					
Lowest	37.44%	0.00%	45.83%	15.67%	<0.0001
Q2	38.55%	11.32%	19.29%	33.83%	
Q3	11.03%	53.05%	7.68%	30.56%	
Highest	12.99%	35.63%	27.21%	<b>19.94%</b>	

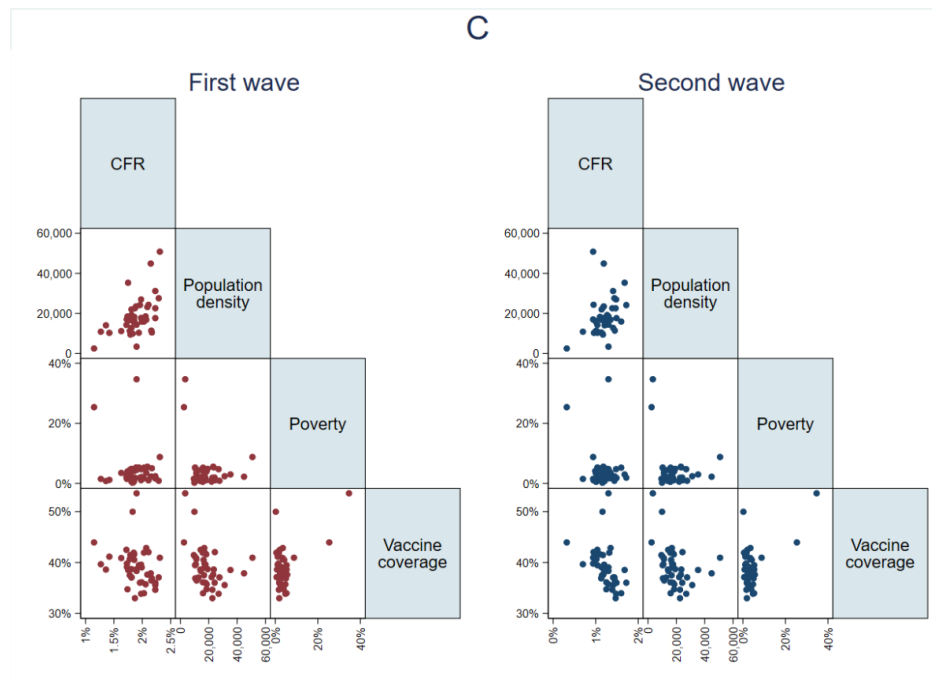
Table S6: Association between poverty and other covariates. Numeric values were categorised into quartiles (Q), i.e., below 25<sup>th</sup> percentile (Lowest), 25<sup>th</sup>–50<sup>th</sup> percentile (Q2), 50<sup>th</sup>–75<sup>th</sup> percentile (Q3) and above 75<sup>th</sup> percentile (Highest) for each sub-district level variable.

**Table S7. Socio-demographics, health care capacity, and health related characteristics in 44 sub-districts in Jakarta, Indonesia**

Sub-district	Population Density (per Km <sup>2</sup> )	Poverty (%)	Doctor per 10,000 population	Nurse per 10,000 population	COVID-19 vaccine coverage (%)	Universal child immunization (%)	Prevalence of hypertension (%)	Prevalence of diabetes (%)	Prevalence of Tuberculosis (%)	All-cause mortality <5 years (%0)
Cakung	12772	2.20	2.57	2.91	37.06	100,0%	6,17109	0,78947	0,115	1.92
Cempaka Putih	18255	1.10	32.29	110.38	41.62	99,9%	5,510682	3,95818	0,661	0.84
Cengkareng	22577	1.67	4.04	11.07	34.65	97,0%	7,205347	1,231485	0,337	4.97
Cilandak	11255	3.46	12.53	87.63	40.66	97,7%	13,59891	4,732758	0,921	1.05
Cilincing	11420	2.32	4.23	10.15	36.48	97,7%	9,209451	2,664586	0,238	5.57
Cipayung	10843	1.5	5.09	11.18	39.66	98,1%	8,663206	1,586175	0,228	3.08
Ciracas	17746	1.11	5.08	8.76	39.58	100,0%	15,1519	2,845558	0,322	3.38
Duren Sawit	17649	1.83	6.00	14.75	36.02	97,3%	8,679389	3,815861	0,348	1.81
Gambir	10353	5.32	35.76	168.87	39.47	95,9%	6,789173	2,711851	1,12	2.36
Grogol Petamburan	24321	1.04	9.88	21.32	42.05	96,6%	10,83572	3,102093	0,317	2.86
Jagakarsa	17075	2.87	5.01	8.94	39.12	96,3%	4,584679	1,075965	0,137	2.06
Jatinegara	26977	4.76	4.84	20.70	33.86	100,0%	7,635612	3,243347	0,437	5.69
Johar Baru	50829	8.80	6.47	7.89	40.95	100,0%	23,46242	3,029096	0,298	3.08
Kali Deres	15848	2.09	5.07	11.21	36.12	98,5%	5,697283	1,06661	0,248	2.76
Kebayoran Baru	11168	3.51	28.76	78.17	40.89	96,0%	32,62043	3,266271	0,498	2.11
Kebayoran Lama	18520	4.78	7.81	25.58	35.73	95,8%	17,88785	3,179411	0,263	1.25
Kebon Jeruk	21982	0.61	7.53	19.56	37.13	98,0%	12,33676	2,272229	0,272	2.54
Kelapa Gading	9887	0.24	11.23	35.70	49.97	95,3%	6,392551	1,672805	0,204	1.84
Kemayoran	35303	2.99	19.69	45.17	38.54	98,3%	15,07767	3,368653	0,247	4.40
Kembangan	14093	0.81	9.75	29.74	38.61	98,4%	12,00573	1,553009	0,16	6.35
Kepulauan Seribu Selatan	3401	34.67	19.28	31.81	53.60	100,0%	14,19069	9,360841	0,299	1.72
Kepulauan Seribu Utara	2495	25.39	16.32	39.73	43.95	99,2%	13,27327	2,028944	0,277	2.62
Koja	24157	1.94	8.65	41.99	36.03	95,1%	5,592655	1,958228	0,543	5.31
Kramat Jati	22563	1.89	9.30	81.84	32.99	98,3%	5,281363	0,564158	0,84	2.35

Makasar	9443	1.53	7.99	33.18	41.46	97,1%	13,74364	1,933827	0,45	3.64
Mampang Prapatan	19182	4.88	7.81	10.44	38.70	95,2%	21,02849	4,280326	0,232	1.81
Matraman	31173	2.41	6.24	16.76	35.58	96,5%	9,637406	2,524881	0,279	4.28
Menteng	10483	5.05	21.33	91.44	36.90	98,1%	14,01172	2,544663	0,634	2.22
Pademangan	16979	1.49	5.59	6.83	39.79	97,3%	5,517487	1,074496	0,289	3.05
Palmerah	27578	0.90	18.20	118.96	37.09	96,2%	8,364958	1,272729	0,94	4.07
Pancoran	18431	3.98	9.80	29.51	34.74	100,0%	13,18797	3,037165	0,305	2.65
Pasar Minggu	14372	4.50	8.33	31.89	38.33	96,7%	7,873365	1,297698	0,468	2.58
Pasar Rebo	17289	1.70	13.20	68.05	41.93	97,4%	4,184727	0,805819	0,567	1.81
Penjaringan	10307	1.18	8.98	27.57	41.15	95,5%	7,092672	2,233571	0,136	3.08
Pesanggrahan	16675	4.50	7.35	22.54	37.51	96,4%	7,229962	1,595965	0,203	1.52
Pulo Gadung	17092	2.13	7.91	44.74	39.04	95,5%	7,293491	1,806214	0,881	3.96
Sawah Besar	16827	3.55	14.57	42.64	42.85	100,0%	14,50251	3,301464	0,651	2.31
Senen	23159	5.60	74.83	416.08	37.63	96,2%	6,658772	1,935464	2,396	1.06
Setia Budi	16325	4.18	21.71	83.93	40.52	100,0%	14,75228	5,44102	0,433	4.97
Taman Sari	14248	2.11	11.06	11.33	42.49	98,3%	8,161193	2,033044	0,336	2.11
Tambora	44875	2.23	5.90	3.18	37.87	96,2%	8,731285	1,650683	0,17	3.53
Tanah Abang	15938	5.27	24.29	77.92	33.97	98,1%	16,92944	2,504942	0,529	1.87
Tanjung Priok	15726	0.54	7.47	22.78	41.93	93,7%	10,97636	3,364723	0,316	2.19
Tebet	23500	5.32	9.57	15.92	38.63	97,4%	33,04226	2,086671	0,302	3.27





**Figure S1. Outcomes over time (A), over age and by gender (B), and correlation between case fatality rate (CFR) with sub-district population density, poverty, and COVID-19 vaccine coverage by epidemic wave (C).**

Dashed black line represents the cut-off between the first and the second wave.