Lee Kuan Yew School of Public Policy

Asia Competitiveness Institute

ACI Research Paper #17-2021

A Contextual Analysis using COVID-19 Resilience Index: Which Indonesian Provinces are More Resilient and Why?

Wen Chong CHEAH

Doris Wan Yin LIEW

Xuyao ZHANG

August 2021

Please cite this article as:

Cheah, Wen Chong, Doris Wan Yin Liew and Xuyao Zhang, "A Contextual Analysis using COVID-19 Resilience Index: Which Indonesian Provinces are More Resilient and Why?", Research Paper #17-2021, *Asia Competitiveness Institute Research Paper Series (August 2021).*

A Contextual Analysis using COVID-19 Resilience Index: Which Indonesian Provinces are More Resilient and Why?*

Wen Chong Cheah Doris Wan Yin Liew Xuyao Zhang

August 13, 2021

Abstract

Indonesia is currently weathering the third wave of the COVID-19 pandemic. Since early June 2021, COVID-19 cases in the country continue trending upwards. The ongoing wave is one of the worst COVID-19 outbreaks that the world has seen thus far - the healthcare system is crumbling, and the country is running low on oxygen and medical supplies. The current situation is expected to deteriorate further as the emerging COVID-19 B.1.617.2 (Delta) variant spreads across the archipelago. That said, the situation is not uniform in every part of the country where certain sub-national economies showed higher resilience to the third wave of the pandemic. Using the methodology from Bloomberg's Covid Resilience Ranking, this paper constructs a COVID-19 resilience index to show the sub-national heterogeneity and perform quadrant analysis to contrast the findings with ACI Competitiveness Index. We found that COVID-19 resilience is geographically clustered and there is a high correlation between COVID-19 resilience and ACI's Standard of Living, Education and Social Stability sub-environment.

1 Introduction

The surge of COVID-19 infections in Indonesia has made the country the new epicentre of Asia. In early July 2021, Indonesia saw its daily case record broken almost every other day. According to health experts (Barker, 2021), the situation is set to worsen as the highly contagious B.1.617.2 (Delta) variant rages across densely populated areas, including DKI Jakarta, and parts of Central and East Java.

The propagation of the Delta variant heightens the risks of the country being overwhelmed by the virus. Indonesia, being an archipelagic nation, kept the virus confined to the densely populated island of Java. As isolated clusters of the Delta variant have emerged in distant regions of Indonesia (Agustinus Costa, 2021), Indonesia's strength could manifest as its weakness, as supplies and medical personnel struggle to reach these remote areas. The third wave of the pandemic in Indonesia paints a bleak resemblance to the second wave of outbreaks in India in April 2021: Fully occupied hospital beds, scrambles for oxygen tanks, and record-high cases and death rates.

Indonesia was doing relatively well up until January 2021 (see Fig. 1). The country was put under the large-scale social distancing policy, known locally as Pembatas Sosial Berskala Besar (PSBB) from March 2020, while several provinces transitioned into "micro-scale" social restrictions as cases tapered off in late September 2020. The regional elections proceeded in December 2020 amidst rising cases. As cases continued to climb, Indonesia closed its international borders in early 2021 to prevent the importation of the more contagious strain from the United Kingdom and South Africa. Following another spike

*We thank Paul Cheung and Ammu George for their constructive comments.

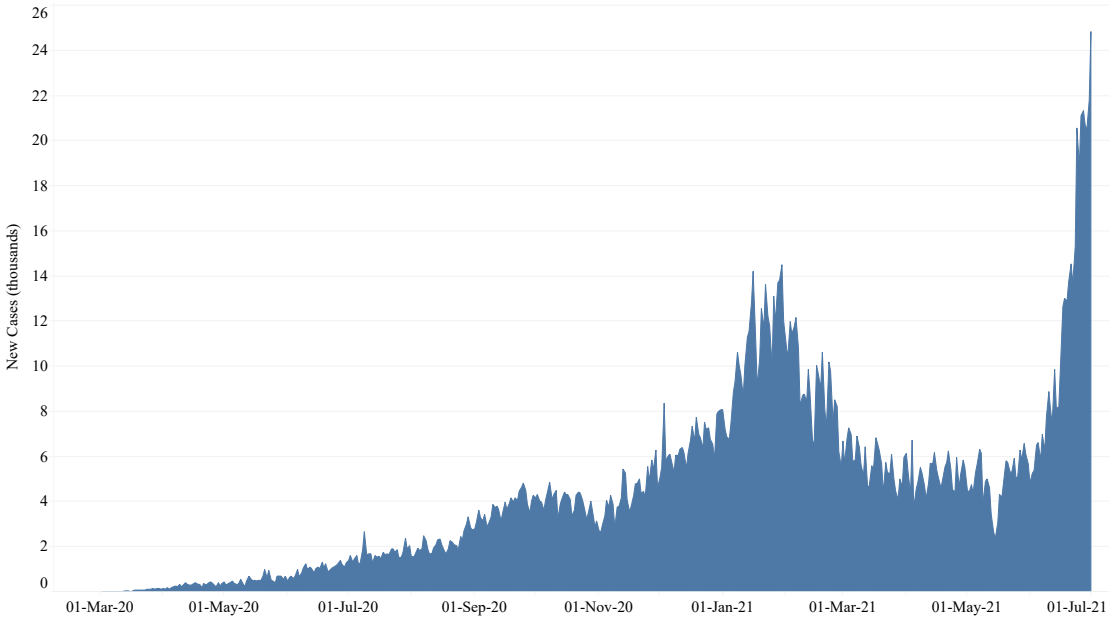

Figure 1: Daily New COVID-19 Cases in Indonesia
Source: Our World in Data[1]

in cases, the Enforcement of Restrictions on Public Activities or Pemberlakuan Pembatasan Kegiatan Masyarakat (PPKM) was enforced in Jakarta and several other provinces in Java and Bali. There was a brief respite in March 2021, but cases soon exploded in late May 2021. While the mudik (exodus) ban in 2020 was pivotal in preventing an outbreak last year, the corresponding ban in 2021 was largely ignored by residents which had fuelled the most recent wave (Syakriah et al., 2021a).

Although the national level indicators point to a low resilience to the third wave of COVID-19 infections, the picture is varied for different sub-national economies. For example, DKI Jakarta and West Java faced the heaviest brunt of the second and third waves with high infection rates and fatalities. Four provinces on Java island (Central Java, East Java, West Java, and DKI Jakarta) accounted for close to two-thirds of all cases, while the remaining one-third of COVID-19 cases were spread across the other 30 provinces (see Fig. 2). In light of this regional heterogeneity, this study constructs a COVID-19 resilience ranking for each Indonesian province using the Bloomberg COVID-19 resilience index methodology. The key question this paper attempts to unravel is the extent of heterogeneity of the pandemic's effects across Indonesia's provinces, and the reasons behind this dispersion.

Further analysis of the provincial data suggests that COVID-19 resilience follows a geographical pattern. Provinces located in greater proximity to the Java region were more likely to exhibit lower COVID-19 resilience. We also compare the COVID-19 resilience ranking with the competitiveness ranking of the provinces by the Asia Competitiveness Institute (ACI). Interestingly, we found the more competitive provinces to be less resilient to the third wave of the COVID-19 pandemic. We also found that existing healthcare infrastructure is an important determinant of COVID-19 resilience. Finally, in view of the country's vision to achieve mass inoculation, we examined the nation's vaccine distribution situation.

[1]For more information, refer to Roser et al. (2020)

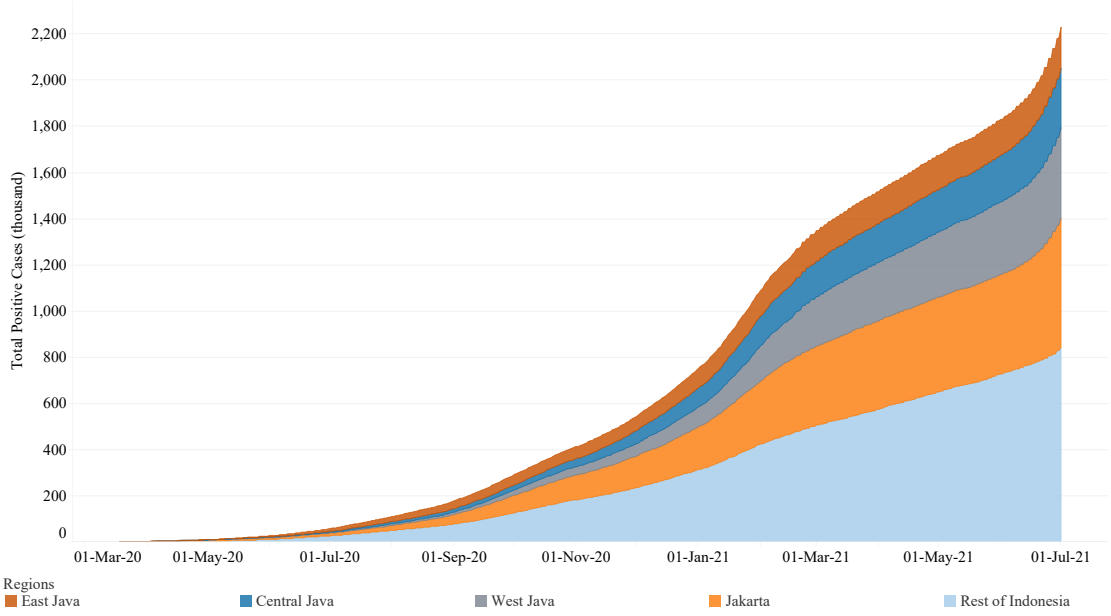

Figure 2: Cumulative COVID-19 Cases by Major Provinces in Indonesia
Source: Ministry of Health of Indonesia

The remainder of the paper is organised as follow: Section 2 discusses the methodology and the data used in constructing the COVID-19 resilience ranking, Section 3 analyses the COVID-19 situation based on our COVID-19 resilience indicators, Section 4 delves into the COVID-19 resilience ranking *vis-à-vis* the ACI competitiveness ranking of the Indonesian provinces, Section 5 discusses the issues pertaining to the vaccination drive, and finally, Section 6 concludes with policy recommendations.

2 Data and Methodology

Our methodology predominantly follows the framework from Bloomberg's COVID Resilience Rankings (Chang and Hong, 2021), which assesses the success of 53 of the largest economies around the world in handling the COVID-19 pandemic. However, our study differs from it with respect to two criteria: a) our focus is on assessing the province-level COVID-19 resilience for Indonesia, which encompasses all 34 provinces; and b) we use province-level specific indicators based on data availability.

We diverge from the Bloomberg index by substituting healthcare coverage with two indicators: adequacy of hospitals and population per medical personnel. As cases ravage across the country, these two indicators are essential to gauging resilience as they indicate critical bottlenecks in Indonesia's efforts to combat the pandemic. Towards the end of our study period, hospital beds in DKI Jakarta and West Java were fully occupied with several hospitals refusing entry (Nupus, 2021). Equally important is the number of medical personnel. Several emergency rooms in hospitals across Java have been forced to shut as medical personnel become infected, further straining the thin workforce (Cahya, 2021).

The time period taken into consideration is from 1^{st} June 2021 to 1^{st} July 2021, which covers the onset of the third COVID-19 wave in Indonesia. We use population data from 2020 to compute per capita indicators. We use the most up-to-date data where possible. The complete list of indicators used

is presented in Table 1, and the list of our province-level COVID-19 resilience rankings as well as the raw scores of the selected indicators are presented in Appendix A[2].

The 'max-min' methodology is used to score the 10 indicators on a scale of 0-100, with 0 indicating the worst performance and 100 the best (see Eq. (1)) Their final scores for each province are based on the average of the performance across all the indicators weighted equally. The max-min scaling method is defined as follow:

$$v_{ei} = \frac{x_{ei} - min(x_i)}{max(x_i) - min(x_i)} * 100 \tag{1}$$

where v_{ei} is the standardised score of province e for indicator i, x_{ei} is the raw score of province e for indicator i, and $\min(x_i)$ and $\max(x_i)$ refer to the minimum and maximum scores of indicator i respectively for all provinces.

Table 1: List of COVID-19 Resilience Ranking Indicators

Category	Indicators	Definition	Source
COVID	1 Month Cases per 100,000	Confirmed COVID-19 cases per 100000 people for June 2021	Ministry of Health, Indonesia
	1 Month Fatality Rate	COVID-19 deaths as a proportion of confirmed cases for June 2021	Ministry of Health, Indonesia
	Total Deaths per 1 Million	Total COVID-19 deaths per one million people from 18 Mar 2020 to 1 Jul 2021	Ministry of Health, Indonesia
	Positivity Rate	Positivity rate of tests of the week of 1 July 2021	Ministry of Health, Indonesia
Economy	Q1 Real GRDP	Year-on-year real regional domestic product growth rate for Jan - Mar 2021	Statistics Indonesia
	Mobility 30-day average	Movement of people to retail and workplaces compared to pre-COVID baseline	Google
	HDI	Province-level Human Development Index for 2020	Statistics Indonesia
Healthcare	Adequacy of Hospitals	Population (10,000 people) per public hospital	Statistics Indonesia
	Adequacy of Medical Personnel	Population (10,000 people) per medical personnel	Asia Competitiveness Institute
	Vaccination Rate	Proportion of fully vaccinated people as of 1 Jul 2021	Ministry of Health, Indonesia

3 Results

Fig. 3 displays the scores for the indicators directly related to the health impact of COVID-19, such as 1-month confirmed cases per 100,000, 1-month fatality rate, and total deaths per one million.

The population-adjusted COVID-19 cases in DKI Jakarta, Riau Islands, and DI Yogyakarta were amongst the highest in the country in June 2021 (Komite Penanganan Covid-19 dan Pemulihan Ekonomi Nasional, 2021), owing to their location centrality [3], high international and domestic connectivity, [4] and high population density - factors of which affect disease spread. DKI Jakarta recorded 1,140 cases per 100,000 people, which is close to three times higher than that of the next worst province - Riau Islands at 449 cases per 100,000 people. The rise in cases in Riau Islands during this period may also be attributed to returning Indonesian migrant workers from Singapore and Malaysia during the Eid Mubarak holiday (Syakriah et al., 2021b). Despite that, the fatality rate of these provinces remained relatively stable throughout 2021.

While the fatality rate of DKI Jakarta has decreased substantially in recent months [5], it still accounts for the highest proportion of total deaths in the country at 799.65 per 1 million people. The positive test rate[6] is the highest for Lampung at 49.70%, closely followed by Banten at 49.40%, and DKI Jakarta at 48.50%. These high rates could suggest under-testing, which we explore in later sections.

[2]We cross-reference our provincial data with Kawal Covid-19 (2021), an open-source database of reliable information pertaining to COVID-19 supported by the Indonesian Anti-Hoax Community (MAFINDO).

[3]These provinces are the economic powerhouses of Indonesia with a high concentration of industrial activities with high absorption of labours, which also consist of migrant workers from other provinces

[4]DKI Jakarta is the main gateway for international arrivals into Indonesia.

[5]Fatality rate for DKI Jakarta has stabilised below 2% since 20 Nov 2021

[6]The positive test rate is measured as the number of confirmed cases over the number of tests administered over one week

1-Mth Cases per 100K		1-Mth Fatality Rate		Total Deaths per 1M		Positivity Rate	
Province		Province		Province		Province	
Papua	100.0	West Sulawesi	100.0	Papua	100.0	North Sulawesi	100.0
North Sulawesi	99.4	North Maluku	92.1	West Kalimantan	99.8	West Nusa Tenggara	98.9
West Nusa Tenggara	99.3	West Papua	91.1	Jambi	96.6	North Kalimantan	96.1
South Sulawesi	98.9	DKI Jakarta	90.8	Maluku	96.4	Gorontalo	94.6
Central Sulawesi	98.7	Papua	90.4	North Sumatra	95.8	Central Sulawesi	88.0
North Sumatra	98.6	North Kalimantan	87.3	West Sulawesi	95.1	Bali	84.9
West Sulawesi	98.5	Central Kalimantan	87.0	East Nusa Tenggara	95.0	South Kalimantan	84.6
Gorontalo	98.4	West Java	80.9	Southeast Sulawesi	94.6	Papua	83.4
South Kalimantan	98.1	East Nusa Tenggara	79.9	West Nusa Tenggara	94.2	Bangka Belitung Islands	83.2
Southeast Sulawesi	98.0	Bengkulu	79.8	North Maluku	93.2	West Sulawesi	77.7
Lampung	97.6	Banten	79.3	South Sulawesi	92.1	West Sumatra	77.5
East Nusa Tenggara	97.0	South Sulawesi	79.0	Bengkulu	92.1	North Maluku	74.5
East Java	96.9	North Sulawesi	77.1	West Java	91.6	East Nusa Tenggara	73.8
Maluku	96.5	Bangka Belitung Islands	76.0	Banten	91.0	South Sulawesi	73.2
South Sumatra	96.4	Maluku	76.0	Lampung	90.0	North Sumatra	70.7
North Maluku	95.4	Bali	74.9	Central Sulawesi	88.6	Southeast Sulawesi	66.6
Banten	95.3	Riau Islands	74.9	Aceh	86.1	Riau	65.6
West Kalimantan	94.8	Southeast Sulawesi	73.8	Gorontalo	85.9	Maluku	65.5
Bali	94.5	East Kalimantan	72.9	West Papua	84.5	East Kalimantan	64.5
Aceh	94.1	Jambi	68.5	South Sumatra	83.6	West Papua	62.3
Jambi	93.0	DI Yogyakarta	68.1	Central Kalimantan	79.3	South Sumatra	61.8
Bengkulu	91.5	West Sumatra	65.6	North Sulawesi	78.3	Central Kalimantan	50.7
Central Kalimantan	90.0	Gorontalo	64.0	West Sumatra	77.8	West Kalimantan	44.9
West Sumatra	89.5	Central Java	63.2	Bangka Belitung Islands	76.4	Bengkulu	44.8
North Kalimantan	89.1	North Sumatra	55.8	South Kalimantan	71.7	Riau Islands	38.2
West Papua	88.9	Riau	55.0	Riau Islands	71.1	East Java	36.6
West Java	87.8	South Kalimantan	50.3	North Kalimantan	68.0	Aceh	32.0
Central Java	87.6	West Nusa Tenggara	36.4	Central Java	67.4	DI Yogyakarta	22.3
Riau	86.7	West Kalimantan	33.7	Riau	66.1	Jambi	17.7
East Kalimantan	86.7	Central Sulawesi	31.6	East Java	65.1	Central Java	12.3
Bangka Belitung Islands	82.6	South Sumatra	28.2	Bali	58.2	DKI Jakarta	7.9
DI Yogyakarta	61.5	Aceh	26.5	DI Yogyakarta	48.6	Banten	6.9
Riau Islands	61.3	Lampung	22.0	East Kalimantan	40.9	West Java	2.2
DKI Jakarta	0.0	East Java	0.0	DKI Jakarta	0.0	Lampung	0.0

Figure 3: COVID-19 Indicators at the Province Level

Source: Ministry of Health of Indonesia, Authors' calculation

Note: The colours refer to the rank attained by each province, with green representing the highest ranked and red the lowest. The numbers refer to the standardised score attained by each province for the indicator

Fig. 4 focuses on the scores pertaining to the gross regional domestic product growth rate for the first quarter of 2021, the human development index for 2020, and the movement of people to and fro retail and workplaces.

Papua achieved the highest year-on-year real GRDP growth rate in the first quarter of 2021, followed by North Maluku, owing to their substantial mining industries which weathered the COVID-19 pandemic (Supriyatna, 2021). Papua and North Maluku were the only provinces that recorded double-digit growth rates of 14.28% and 13.45% respectively. Incidentally, Papua and North Maluku performed relatively well in cases and deaths, which could be due to their remoteness from Java. On the other hand, tourism-oriented Bali recorded the poorest growth rate, at -9.85%. 24 out of 34 provinces saw their growth rates slipping below negative.

Fig. 5 highlights the scores related to healthcare infrastructure among provinces, namely adequacy of hospitals, adequacy of medical personnel, and vaccination rate.

DI Yogyakarta leads in hospital adequacy with each hospital catering to slightly less than half a million residents, followed by West Papua, North Sulawesi, and DKI Jakarta. The worst performers

GRDP

Province	
Papua	100.0
North Maluku	96.6
Central Sulawesi	66.8
DI Yogyakarta	66.3
North Sulawesi	48.6
West Papua	46.9
Bangka Belitung Islands	44.8
Riau	42.5
East Nusa Tenggara	41.3
Southeast Sulawesi	41.1
West Kalimantan	40.4
West Sumatra	40.2
South Sulawesi	40.0
Jambi	39.5
Banten	39.2
South Sumatra	39.1
East Java	39.0
West Java	37.4
Central Java	37.2
West Nusa Tenggara	36.1
Riau Islands	35.9
West Sulawesi	35.8
South Kalimantan	35.6
Bengkulu	34.3
DKI Jakarta	34.0
North Sumatra	33.2
Maluku	33.0
North Kalimantan	32.9
Aceh	32.7
Gorontalo	32.6
Lampung	32.1
East Kalimantan	28.6
Central Kalimantan	27.9
Bali	0.0

30-Day Mobility

Province	
Gorontalo	100.0
Central Sulawesi	86.0
Southeast Sulawesi	85.4
East Nusa Tenggara	71.9
West Sumatra	71.7
Bengkulu	69.6
West Sulawesi	68.9
North Sulawesi	65.9
South Kalimantan	61.1
West Nusa Tenggara	60.0
Jambi	58.5
Central Java	57.0
East Java	56.4
North Maluku	55.5
North Kalimantan	53.7
Central Kalimantan	53.4
South Sulawesi	53.1
Maluku	52.7
South Sumatra	51.8
Banten	51.0
Riau	50.5
Lampung	50.3
Aceh	49.1
East Kalimantan	48.8
West Java	45.2
Bangka Belitung Islands	44.4
North Sumatra	43.1
West Papua	37.9
DI Yogyakarta	36.1
West Kalimantan	28.8
Papua	26.7
Riau Islands	26.4
DKI Jakarta	8.4
Bali	0.0

HDI

Province	
DKI Jakarta	100.0
DI Yogyakarta	96.1
East Kalimantan	77.7
Riau Islands	74.5
Bali	74.1
North Sulawesi	61.4
Riau	60.4
Banten	59.1
West Sumatra	58.7
West Java	57.3
Aceh	56.8
South Sulawesi	56.5
Central Java	56.2
North Sumatra	55.7
East Java	55.4
Bangka Belitung Islands	54.3
Southeast Sulawesi	54.2
Bengkulu	53.9
Jambi	53.4
Central Kalimantan	52.2
South Kalimantan	51.5
North Kalimantan	50.1
South Sumatra	47.1
Lampung	45.5
Central Sulawesi	44.8
Maluku	44.5
Gorontalo	40.5
North Maluku	39.6
West Nusa Tenggara	38.4
West Kalimantan	35.5
West Sulawesi	27.9
East Nusa Tenggara	23.4
West Papua	22.9
Papua	0.0

Figure 4: Macroeconomic and Mobility Indicators at the Province Level

Source: Google, Ministry of Health of Indonesia, Authors' calculation

Note: The colours refer to the rank attained by each province, with green representing the highest ranked and red the lowest. The numbers refer to the standardised score attained by each province for the indicator

are West Nusa Tenggara, followed by West Java, where each hospital has to cater to almost 1.4 million residents. Meanwhile, DKI Jakarta takes the top spot for adequacy of medical personnel, followed by West Nusa Tenggara, DI Yogyakarta, and Bali. Despite DI Yogyakarta and DKI Jakarta being among the top performers for both adequacy of hospitals, hospitals in these provinces were reporting massive shortages of oxygen and beds (Arshad, 2021), highlighting the general inadequacy of the healthcare infrastructure in the country. The worst affected provinces put in greater effort in vaccinating their populations - DKI Jakarta, Bali, and DI Yogyakarta were the top provinces up to the week of 1 July 2021. Nevertheless, the vaccination rate of the front-runner of the nation, DKI Jakarta is at a meagre 18.28%, way below the President's target of 75% by August 2021 (Siregar, 2021).

Adequacy of Hospitals

Province	
DI Yogyakarta	100.0
West Papua	95.6
North Sulawesi	93.0
DKI Jakarta	90.7
Bangka Belitung Islands	87.7
North Maluku	86.8
Maluku	86.7
Southeast Sulawesi	82.4
Bali	81.1
East Kalimantan	79.3
North Sumatra	77.5
Riau Islands	77.0
North Kalimantan	75.2
West Sumatra	74.5
Papua	68.2
Aceh	67.1
South Sulawesi	64.5
Central Sulawesi	63.9
Bengkulu	61.6
Gorontalo	59.6
Jambi	54.1
South Kalimantan	51.4
Riau	50.6
West Kalimantan	43.5
South Sumatra	41.1
Central Kalimantan	40.3
East Java	38.6
East Nusa Tenggara	37.4
Lampung	33.3
Banten	32.0
West Sulawesi	28.1
Central Java	27.6
West Java	3.7
West Nusa Tenggara	0.0

Adequacy of Personnel

Province	
DKI Jakarta	100.0
West Nusa Tenggara	96.0
DI Yogyakarta	95.9
Bali	89.1
North Sulawesi	86.0
East Kalimantan	82.2
Bangka Belitung Islands	82.0
Jambi	81.0
North Kalimantan	80.2
Riau Islands	78.3
Gorontalo	78.2
East Java	77.7
Bengkulu	76.8
West Papua	76.6
Central Java	73.0
West Sumatra	72.2
Central Kalimantan	67.7
Aceh	66.8
Southeast Sulawesi	66.8
South Kalimantan	66.4
South Sulawesi	65.6
Riau	64.1
West Sulawesi	57.5
North Maluku	55.1
West Kalimantan	52.2
Central Sulawesi	49.4
Papua	48.7
Maluku	48.1
Banten	45.4
North Sumatra	43.3
South Sumatra	36.0
Lampung	27.8
West Java	8.0
East Nusa Tenggara	0.0

Vaccination Rate

Province	
DKI Jakarta	100.0
Bali	94.0
DI Yogyakarta	52.8
Riau Islands	22.9
East Kalimantan	22.7
Central Kalimantan	21.5
Riau	19.5
North Sulawesi	18.8
East Java	18.1
Gorontalo	17.6
Bangka Belitung Islands	17.4
South Sulawesi	16.4
Central Java	16.0
South Kalimantan	14.2
West Sulawesi	10.6
West Java	10.4
North Kalimantan	9.6
South Sumatra	9.6
Banten	9.4
West Papua	9.3
Jambi	9.2
North Sumatra	8.3
Southeast Sulawesi	7.6
West Nusa Tenggara	6.5
East Nusa Tenggara	5.9
Central Sulawesi	5.3
Maluku	5.0
Bengkulu	3.8
Papua	3.1
West Sumatra	2.8
West Kalimantan	2.5
Aceh	0.9
North Maluku	0.2
Lampung	0.0

Figure 5: Healthcare Infrastructure and Vaccination Rates at the Province Level
Source: Statistics Indonesia, Ministry of Health of Indonesia, Authors' calculation
Note: The colours refer to the rank attained by each province, with green representing the highest ranked and red the lowest. The numbers refer to the standardised score attained by each province for the indicator

Geographical clustering as a factor for COVID-19 resilience

Fig. 6 shows that the COVID-19 resilience can be better explained via geographical spread where most of the bottom-ranked provinces clustered around the international gateways. Regions further away from the international entry points (including most of the provinces in Sulawesi and Maluku-Papua, and most of the provinces in Kalimantan) exhibit middle to high resilience to the pandemic.

To explain why the pandemic is clustered in Java and Bali, we need to first look at their provincial profiles. These two regions were amongst the first few places in the country to be exposed to the virus - this includes the emergence of the Delta variant. Indonesia's largest and busiest airport, the Soekarno-Hatta International Airport in Jakarta, accounted for 75% of Indonesia's foreign arrivals in May 2021. Since April 2020, over 80% of all air traffic from foreign countries arrived via Jakarta (Badan Pusat Statistic, 2021). Additionally, transport infrastructure on Java island is relatively more developed than in other provinces, with 34% of total roads being on Java island and Bali (Tan et al., 2019), thus reflecting the high mobility of people within and between these provinces.

Once COVID-19 enters Indonesia, the spread of the virus is further propagated by the high urban

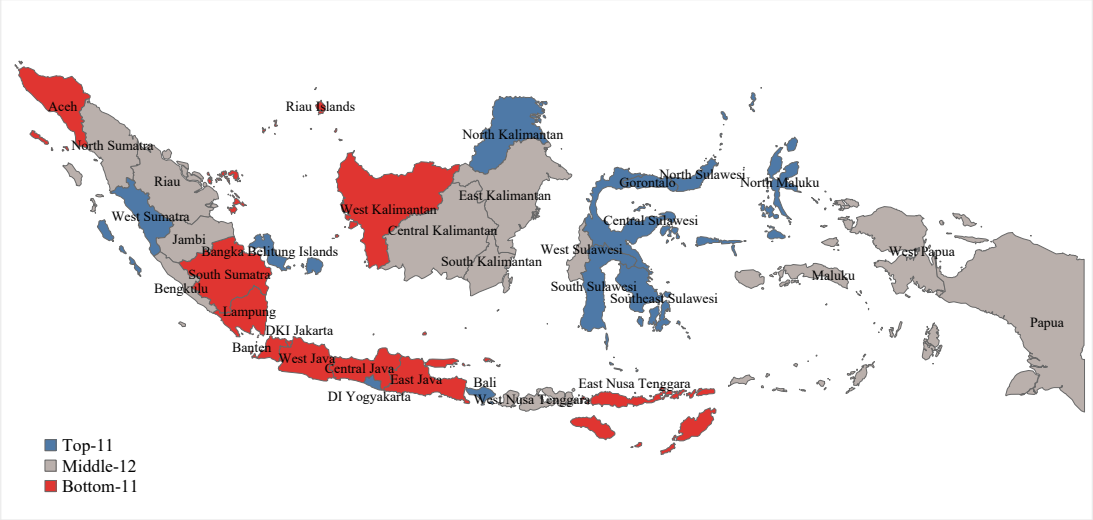

Figure 6: COVID-19 Resilience Map
Source: Statistics Indonesia, World Bank, Ministry of Health of Indonesia, Authors' calculation

density and economic inter-connectivity amongst provinces within these regions. This prompts a series of government measures to contain the virus within the epicentres. Amid the rising cases in the Java and Bali regions, the government implemented an emergency public activity restriction (PPKM Darurat) from 3 July 2021 as an effort to prevent transmission within and outside of Java and Bali (Office of Assistant to Deputy Cabinet Secretary for State Documents & Translation, 2021), especially in the weeks leading up to the Eid Mubarak holiday, one of the largest celebration in Indonesia and typically involved large movements of people across provinces. These containment efforts could explain why COVID-19 cases are largely confined within the epicentres. Besides Java and Bali, Riau Islands which borders Singapore and Malaysia have also seen an upsurge in cases due to the returning Indonesian migrant workers from these two countries during the Eid Mubarak period (Syakriah et al., 2021b).

The rankings for the remainder of the 11 bottom-ranked provinces were more influenced by the preparedness of their healthcare infrastructure rather than the COVID-19 spread. For instance, East Nusa Tenggara with relatively low cases and death rates suffered from insufficient medical personnel and hospital capacity. Similarly, Lampung (the least COVID-19 resilient province) is plagued by a serious deficiency in healthcare infrastructure - which directly or indirectly caused high fatality and positivity rates while its vaccination rate remains the lowest in the country.

4 Have the competitive provinces of Indonesia proven to be resilient to COVID-19?

At ACI, we publish the province-level competitiveness rankings and scores for Indonesia annually.[7] ACI classifies the provinces of Indonesia into Top, Middle and Bottom based on the competitiveness rankings. Similarly, for the COVID-19 Resilience rankings, the first 11 provinces constitute the Top group, the

[7]For more details about the methodology refer to Tan et al. (2019).

next 12 form the Middle group and the last 11 form the Bottom group (see Appendix A). In this section, we will analyse the overall competitiveness of Indonesian provinces against their respective COVID-19 Resilience, then we will zoom into our Standard of living, Education and Social Stability sub-environment.

4.1 Overall Competitiveness of Indonesian provinces against COVID-19 Resilience

In Fig. 7, the left axis represents the Top, Middle and Bottom groups for the competitiveness ranking and the right axis represents the same groups for the COVID-19 resilience rankings. The 'flows' indicate the change in a given province's competitiveness ranking *vis-à-vis* its COVID-19 resilience ranking.

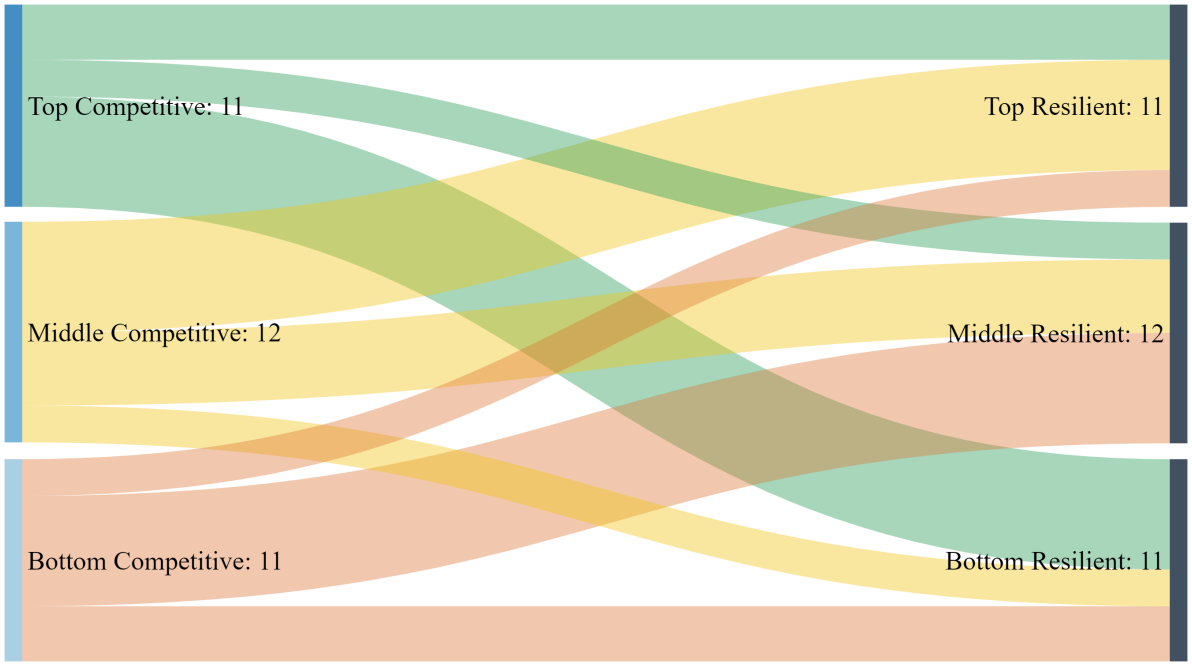

Figure 7: Competitiveness Vs. COVID-19 Resilience for Top, Middle and Bottom Provinces
Source: Authors' calculation

Only a small fraction of the Top competitive provinces prove to be among the Top COVID-19 resilient economies. A majority of the Top competitive economies are extremely vulnerable to the COVID-19 pandemic as indicated by the rank flow from the Top competitive to the Bottom resilience. For the Middle competitive economies, most of them moved into the Top COVID-19 resilience category, with a sizeable proportion remaining in the Middle resilience group. Another interesting trend can be seen in the case of the Bottom competitive economies, most of which move to the Middle resilience group, with a substantial number remaining in the Bottom resilience group.

To provide a more in-depth understanding of this anomalous finding whereby the majority of the Top competitive provinces are least resilient to the pandemic and vice-versa for the Bottom competitive economies, we performed a quadrant analysis, as illustrated in Fig. 8. The horizontal and vertical lines lay at the 17^{th} rank — the midpoints for the COVID-19 Resilience and the 2021 Competitiveness Rankings respectively. The points are also colour-coded to represent the region the particular province belongs to.

More competitive and more COVID-19 resilient: The bottom-left region of Fig. 8 showcases the provinces which are highly competitive and also resilient to the COVID-19 pandemic. Among the

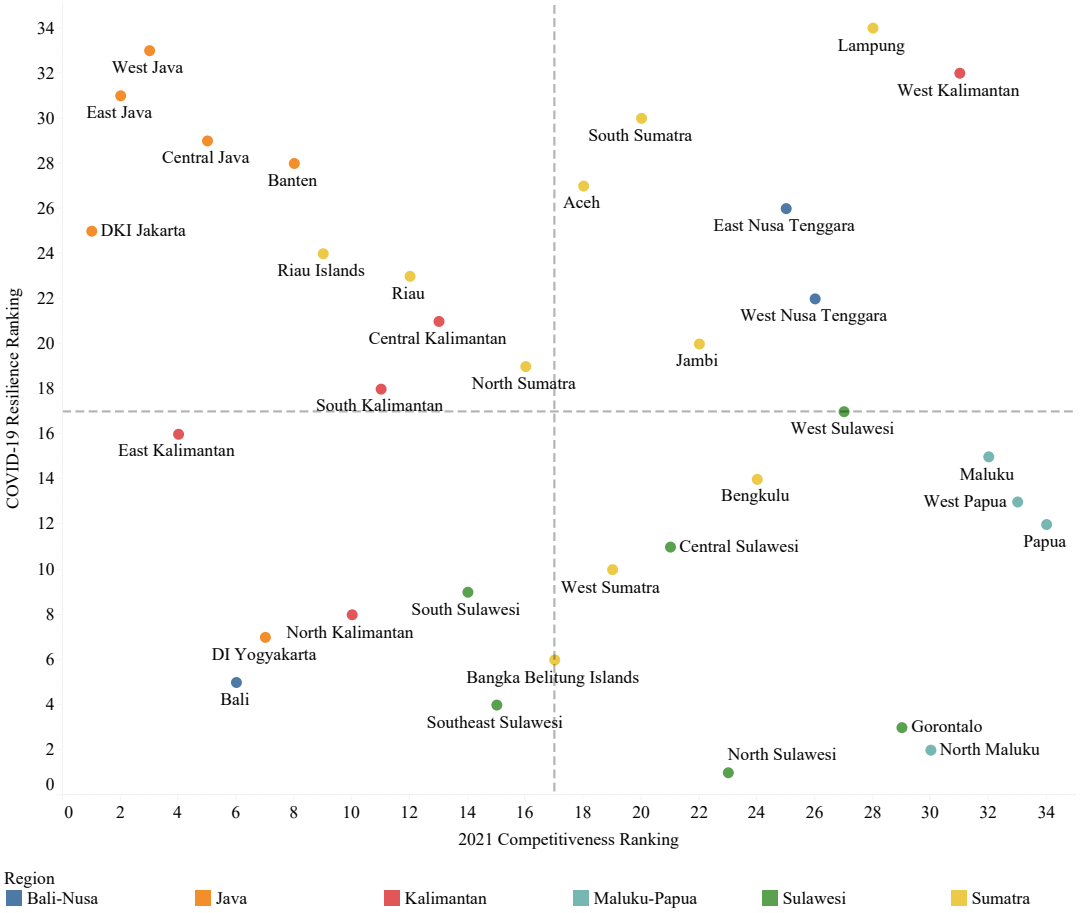

Figure 8: Competitiveness Vs. COVID-19 Resilience Rankings at the Province-Level
Source: Authors' calculation

provinces in this category are the Kalimantan provinces of East Kalimantan and North Kalimantan, the Sulawesi provinces of South Sulawesi and Southeast Sulawesi, the Javanese province of DI Yogyakarta, and Bali. The healthcare infrastructure in these provinces are largely better than that of the others: the adequacy of hospitals and the population of medical personnel of these provinces are above the national average, with Bali, DI Yogyakarta, East Kalimantan, and North Kalimantan occupying the top 25% percentile of all provinces. With the exception of DI Yogyakarta, tight containment measures in these provinces have kept cases per population at bay for the period of study.

Less competitive and more COVID-19 resilient: The bottom-right region, which consists of the least competitive but most resilient economies, is dominated by the provinces from the Eastern Indonesia region of Sulampua. The underdevelopment of these provinces and their sparse population, while considered economically backward during normal times, have contributed to its high COVID-19 resilience as these attributes slowed the spread of COVID-19. These provinces exhibit a common trend of low monthly COVID-19 cases, fatality rate, deaths and COVID-19 test positivity rate. Even though they are less competitive, these provinces exhibit a good level of healthcare adequacy that further contributes

to their high resilience scores.

More competitive and less COVID-19 resilient: The upper-left region of Fig. 8 features the economies which are highly competitive yet are also the most vulnerable to the pandemic. All of the provinces from the Java region, other than DI Yogyakarta, fall under this group. As the economic powerhouse of Indonesia, the region's economic vibrancy has for a long time encouraged the congregation of labours in its cities[8], which acts as an ideal breeding ground for the COVID-19 virus. DKI Jakarta registered the highest 1-month COVID-19 cases and 1-month total death rate per million population as the capital city struggled to keep the infection under control. Banten, DKI Jakarta and West Java also have one of the highest COVID-19 positivity rates in Indonesia. Four provinces from Sumatra and Kalimantan are also classified into this group, though COVID-19 performance is more varied across indicators. For instance, although COVID-19 cases and positivity rate are high in Riau Islands, the province's strengths in healthcare infrastructure (measured by the adequacy of hospitals and population per medical personnel) has kept fatality low and quickens its vaccination rate.

Less competitive and less COVID-19 resilient: Finally, the upper-right region illustrates economies that are both low in competitiveness and vulnerable to the pandemic. While the COVID-19 cases in these provinces are low compared to more economically advanced provinces, they are plagued with inadequate healthcare systems which led to high fatality rates and low vaccination rates. Take the case of Lampung, the least resilient province in Indonesia. While the province's COVID-19 cases are lower than average, the COVID-19 fatality rate is one of the highest and its vaccination rate is the lowest out of the 34 provinces. At the same time, its hospital and medical personnel are amongst the most inadequate in Indonesia.

4.2 COVID-19 Resilience Index and ACI's Standard of Living, Education and Social Stability Sub-environment

As there is no clear relationship between ACI's 2021 Overall Competitiveness Ranking and the COVID-19 Resiliency Ranking, in this section we attempt to further evaluate the sub-environment within the competitiveness index that could provide a more nuanced understanding of its relationship with the country's COVID-19 resilience. ACI's annual sub-national competitiveness analysis evaluates the competitiveness of 34 Indonesian provinces across four environments namely: (1) Macroeconomic Stability, (2) Government and Institutional Setting, (3) Financial, Businesses and Manpower Conditions and (4) Quality of Life and Infrastructure Development. The index found that the performance of the provinces varied across the environments, such that the most economically developed economies may excel in the first three environments but were found to be wanting in the Quality of Life and Infrastructure Development.

We are interested to understand if the pre-pandemic quality of life reflects the resilience or vulnerabilities of the provinces. To do this, we further dissect the correlations between provincial resilience and the three measures of competitiveness under the Quality of Life and Infrastructure Development environment: (1) Physical Infrastructure, (2) Technological Infrastructure and (3) Standard of Living, Education and Social Stability.

We found the relationship is particularly strong between the COVID-19 resilience raking and the Standard of Living, Education and Social Stability sub-environment. The relationship is positive and

[8] Over half of the country's labour force were congregated in the Java region (Indonesia's National Bureau of Statistics, 2019)

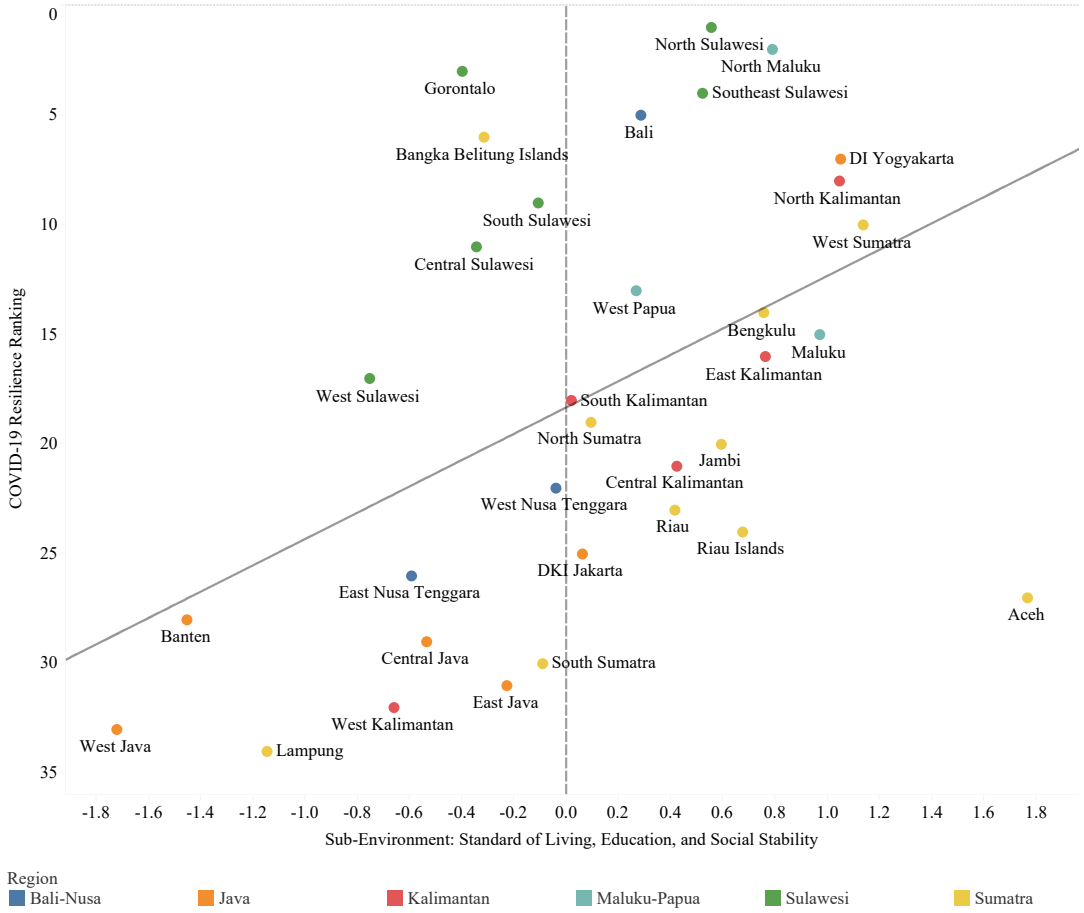

Figure 9: Standard of Living, Education and Social Stability Vs COVID-19 Resilience Rankings
Source: Authors' calculation

significantly correlated at the 1% level (see Fig. 9). Further analysis on the indicators showed that provinces with higher resilience rankings have a better life expectancy and healthcare infrastructure. This reiterates our earlier arguments that healthcare infrastructure affects COVID-19 indicators: Provinces with adequate healthcare tends to also have lower COVID-19 cases, deaths, fatality rate and positivity rate while at the same time performed relatively more vaccinations.

5 Vaccines as the panacea to Indonesia's COVID-19 Debacle?

As COVID-19 ravages through Indonesia, the vaccination drive remains one of the primary resolves to ending the pandemic. International Monetary Fund (2021) and Asian Development Bank (2021) reported that faster vaccine rollout could reduce COVID-19 infection rates and fatality rates and at the same time pave the way towards economic reopening. Tracking the vaccination rate, therefore, is key to understanding the road towards COVID-19 resilience. In line with this objection, President Joko Widodo, Indonesia's President, aimed to inoculate 7.5 million out of 10.5 million residents in DKI Jakarta by the end-August (Siregar, 2021), in the hope that it could put an end to COVID-19 in the disease

epicentre. While the pace of vaccinations have ramped up and experts believing DKI Jakarta can reach this goal, they caution that there may not be enough time for herd immunity to be achieved.

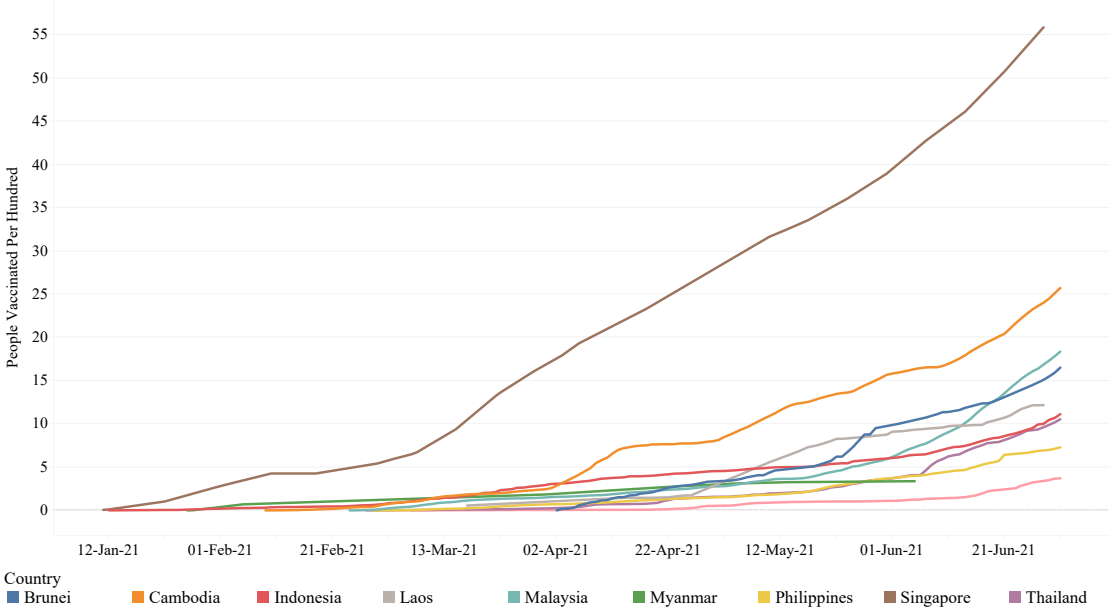

Figure 10: Vaccination Rate (First Dose) in ASEAN-10
Source: Our World in Data
Note: Data from 11 Jan 2021 - 1 Jul 2021. Data availability is subject to individual country's reporting schedules

Despite the high vaccination rate in the capital city and Indonesia being one of the earliest recipients of the Sinovac vaccine (Tassia Sipahutar and Arys Aditya, 2020), the countrywide vaccine roll-out has been relatively slow compared to its neighbours in Southeast Asia. The vaccination rate (first dose) in Indonesia, as of 1^{st} July, is behind Singapore, Cambodia, Malaysia, Brunei and Laos, and edging only slightly ahead of Thailand, Philippines and Vietnam (see Fig. 10). One of the potential reasons for the low vaccination rate is Indonesia's poor healthcare infrastructure. According to the World Health Organisation (WHO), Indonesia has one of the lowest numbers of medical personnel per population amongst ASEAN countries: Indonesia has 0.46 medical doctors per 1,000 population, compared to 2.29 in Singapore, 1.54 in Malaysia and 0.92 in Thailand (Vardell, 2020). At the provincial level, we also observed a variation in medical personnel adequacy, as presented and discussed in Section 2.

While vaccination rates are high in major cities like DKI Jakarta and Bali (see Fig. 5), in other parts of the country, the vaccination rates remain low due to the poor healthcare infrastructure present in the less-developed provinces. To further understand the relationship between healthcare infrastructure and vaccination rate, we compute the community vaccination rate[9] and pit it against the adequacy of medical personnel, a proxy for healthcare infrastructure. As the country has vaccinated all of its healthcare workers, we use the community vaccination rate to avoid spurious correlation.

The results are presented in Fig. 11. The left side chart shows that the community vaccination rate is significantly correlated with the sufficiency of medical personnel. Other than DKI Jakarta and Bali, DI Yogyakarta — with higher medical personnel adequacy at 1 medical worker per 793 population —

[9]Community vaccination rate is computed by first subtracting the total vaccination number with the number of healthcare personnel, and then by dividing the new vaccination figure with the total population of the province

has a relatively high vaccination rate of 10.3%. In contrast, East Nusa Tenggara that has 1 medical worker per 8,311 population has only inoculated 3.1% of its population. As the government prioritized vaccination in provinces with high infection rates such as DKI Jakarta, Bali and DI Yogyakarta, we are interested to find out if this relationship persists when we remove the three outliers. The findings are presented in the right-side chart of Fig. 11 which shows that the correlation between healthcare adequacy and vaccination rates remains high for the remaining 31 provinces. Our findings imply that the lack of medical personnel in the province could potentially serve as a bottleneck in the country's objective to full immunisation. Moving forward, the Indonesian authority is highly encouraged to address this adequacy gap in order to achieve its target of inoculating the majority of the Indonesian population. Special aid should be directed to places with poor healthcare infrastructure to achieve this target and ensure equal distribution of vaccines.

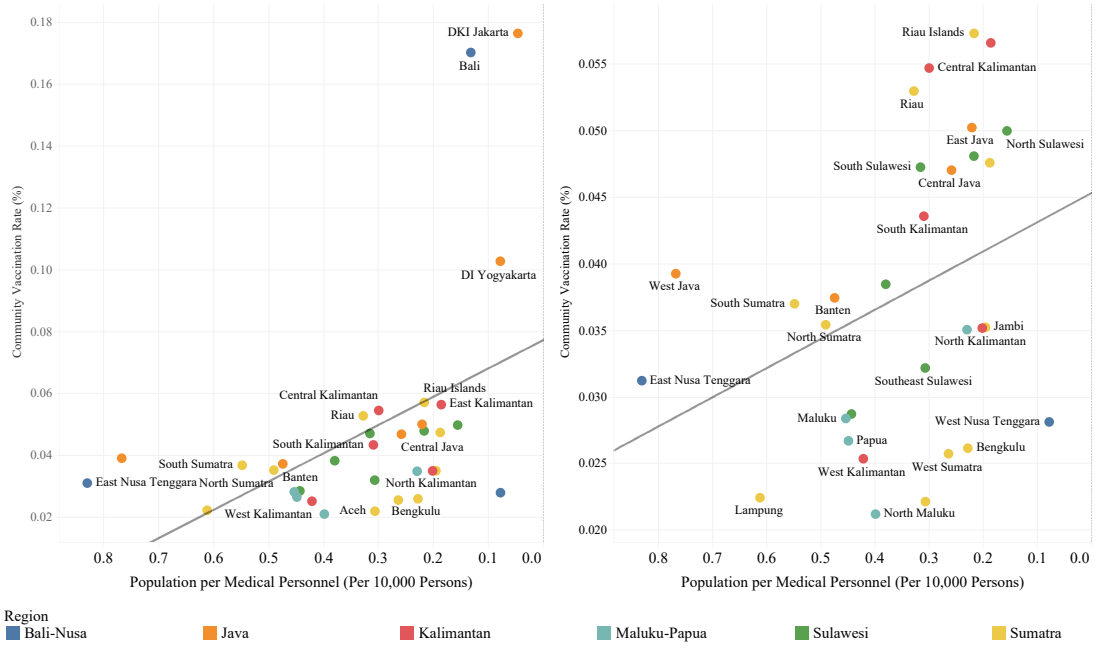

Figure 11: Community Vaccination Rate (%) against Population per Medical Personnel (per 10,000 Persons) for all Provinces (left) and for all Provinces except DKI Jakarta, Bali and DI Yogyakarta (right)

Source: Ministry of Health of Indonesia, World Bank Indo-Dapoer Database

Even with mass vaccinations, there were concerns raised regarding vaccine efficacy. This was brought to attention after hundreds of Sinovac-inoculated doctors had contracted Covid-19 in June 2021 (Widianto and Lamb, 2021). There are currently five vaccines approved in Indonesia - Moderna (mRNA-1273), Pfizer-BioNtech (BNT162b2), Oxford/AstraZeneca (AZD1222), Sinopharm (Beijing) (BBIBP-CorV) and Sinovac (CoronaVac). These vaccines have varying efficacy rates against the different COVID-19 variants. Against the Delta variant for instance, studies by Yadav et al. (2021); Edara et al. (2021) found reduced efficacy of the Pfizer-BioNtech and Moderna vaccines in preventing infections. However, it is important to note that while vaccines may not offer full protection against infections, they are highly effective in preventing severe, critical or fatal symptoms (World Health Organization, 2021). As the

discussion surrounding vaccines is rapidly evolving, healthcare authorities in the country should closely monitor vaccine research and development, and continue to revise and update the national vaccination programme to optimise vaccine effectiveness.

6 Policy Implications and Concluding Remarks

The spike in cases in June 2021 has been largely confined to DKI Jakarta, but numbers towards the end of June are pointing to an alarmingly rising number of cases in neighbouring provinces on Java island. Based on our analysis, highly competitive provinces are extremely vulnerable to the COVID-19 pandemic, as most of the top competitive provinces end up being in the least resilient category. All of the provinces from the Java region, other than DI Yogyakarta, form the bulk of provinces in the highly competitive but poorly resilient group. As the economic powerhouse of Indonesia, the region's economic vibrancy has for a long time encouraged the congregation of labours in its cities. Indonesia's ability to bounce back will be severely limited should these cities continue to remain vulnerable to sporadic spikes.

As Indonesia rises to become the epicentre of Asia with the more virulent Delta variant propagating across the archipelago, the government is bracing for what it calls the "worst-case scenario". The Indonesian Food and Drug Authority (BPOM) has granted emergency approval for the administration of the Pfizer-BioNTech vaccine ahead of the arrival of 50 million doses in August 2021, while the President announced a lockdown for the entire island of Java and Bali for the majority of July. However, there are concerns that these efforts came too little, too late. There is also a deluge of misinformation sweeping the nation, such as anti-vaccine messages which are often mixed with conspiracy theories (Sastramidjaja and Rosli, 2021), as well as the promotion of scientifically unproven immunity boosters and natural remedies (Menon, 2021).

The government's COVID-19 task force had attracted public ire for failing to prepare for the latest spike by being sluggish to discourage travel during Ramadan, as well as the inability to institute an effective test, trace, and isolate system. Since mid-2020, there were signs of severe under-testing and under-reporting across the archipelago (van Empel et al., 2020), even among prominent figures from the government such as DKI Jakarta Governor Anies Baswedan (Allard et al., 2020) and National Disaster Mitigation Agency (BNPB) spokesman Agus Wibowo (Sustrino, 2020). The data suggest that under-testing is still widespread and this limits the reliability of the case tally. The weekly COVID-19 positivity rate data displays a min-max testing rate of 11.21%-47.48% across provinces - far above the WHO benchmark rate of 5%, a general reference of testing sufficiency[10]. The WHO emphasised the importance of testings for situational assessment, disease tracing and initiating public health intervention (World Health Organization, 2020a). The low testing rate is a corollary of (1) lack of government support in COVID-19 testing even for suspected cases and close contacts of confirmed COVID-19 patients (Syakriah, 2020) and (2) the cost for a private PCR test - ranging from Rp 700,000 to over Rp 2.5 million (approximately US$50 to US$170) (Sutarsa et al., 2020) - is daunting for the majority of Indonesians who receive an average monthly income within the Rp 1-2 million band (Indonesia's National Bureau of Statistics, 2019). This raises the apprehension that the reality could be much grimmer than official accounts, even as the country registered record cases and deaths.

[10] Dr Tedros Adhanom, the Director of WHO, suggested that the high positivity rate implies that many community cases were not being picked up via health surveillance. This in turn results in an underestimation of COVID-19 cases (World Health Organization, 2020b)

References

Agustinus Costa (2021, July). Delta variant taking hold of indonesia's papua as hospitals near capacity.

Allard, T., K. Kapoor, and S. Widianto (2020, April). Exclusive: Jump in jakarta funerals raises fears of unreported coronavirus deaths.

Arshad, A. (2021, July). Indonesia sources oxygen supply, including from singapore, to battle covid-19 surge. *The Straits Times*.

Asian Development Bank (2021, April). Vaccine rollouts to spur north pacific economic recovery.

Badan Pusat Statistic (2021, April). Indonesia airports: Passenger traffic: International: Arrival.

Barker, A. (2021, June). Coronavirus is surging again in indonesia, and experts fear the worst is yet to come. *ABC*.

Cahya, G. H. (2021, July). Covid surge pushes indonesia's health system to the brink. *Guardian*.

Chang, R. and J. Hong (2021). Inside bloomberg's covid resilience ranking.

Edara, V.-V., L. Lai, M. Sahoo, K. Floyd, M. Sibai, D. Solis, M. W. Flowers, L. Hussaini, C. R. Ciric, S. Bechnack, et al. (2021). Infection and vaccine-induced neutralizing antibody responses to the sars-cov-2 b. 1.617. 1 variant. *bioRxiv*.

Indonesia's National Bureau of Statistics (2019, August). Labor force situation in indonesia august 2019.

International Monetary Fund (2021, April). World economic outlook: Managing divergent recoveries.

Kawal Covid-19 (2021, July). KawalCOVID19 untuk mengurai derasnya informasi seputar COVID-19.

Komite Penanganan Covid-19 dan Pemulihan Ekonomi Nasional (2021, July). Peta Sebaran COVID-19.

Menon, S. (2021, July). Covid: Ivermectin, milk among indonesia's unproven 'cures'. *BBC*.

Nupus, H. (2021, July). Feature: Hospitals overwhelmed in indonesia as covid-19 cases surge. *Xinhua*.

Office of Assistant to Deputy Cabinet Secretary for State Documents & Translation (2021, July). Gov't to impose emergency ppkm in java, bali on 3-20 july. *Cabinet Secretariat of the Republic of Indonesia*.

Roser, M., H. Ritchie, E. Ortiz-Ospina, and J. Hasell (2020). Coronavirus pandemic (covid-19). *Our world in data*.

Sastramidjaja, Y. and A. A. Rosli (2021, July). Tracking the swelling covid-19 vaccine chatter on tiktok in indonesia. *ISEAS*.

Siregar, K. (2021, July). Jokowi aims to vaccinate 7.5 million jakartans by end august, but experts say herd immunity is not a given. *CNA*.

Supriyatna, I. (2021, June). Hilirisasi nikel cegah kontraksi ekonomi di maluku utara.

Sustrino, B. (2020, April). Bnpb confirms covid-19 data discrepancy between central, regional govts.

Sutarsa, I. N., A. Prabandari, and F. Itriyati (2020, April). Poor and rich indonesians do not get equal access to covid-19 tests: this is why it's a problem.

Syakriah, A. (2020, December). Without govt support, covid-19 testing remains low in indonesia.

Syakriah, A., D. Suhendra, and V. F. Thomas (2021a, May). Covid-19 case spike looms as millions skirt 'mudik' ban. *Jakarta Post*.

Syakriah, A., D. Suhendra, and V. F. Thomas (2021b, May). Why indonesia's province nearest to singapore struggles with covid-19. *today online*.

Tan, K. G., D. W. Y. Liew, and C. Handoko (2019). *Annual Competitiveness Analysis and Impact Estimation of Welfare Spending on Fiscal Sustainability of Sub-national Economies of Indonesia*. International series of monographs on physics. Asia Competitiveness Institute.

Tassia Sipahutar and Arys Aditya (2020, December). Indonesia gets first batch of vaccine from china's sinovac.

van Empel, G., J. Mulyanto, and B. S. Wiratama (2020). Undertesting of covid-19 in indonesia: what has gone wrong? *Journal of Global Health 10*(2).

Vardell, E. (2020). Global health observatory data repository. *Medical reference services quarterly 39*(1), 67–74.

Widianto, S. and K. Lamb (2021, June). Hundreds of vaccinated indonesian health workers get covid-19, dozens in hospital. *Reuters*.

World Health Organization (2020a, March). Covid-19 - virtual press conference [press release].

World Health Organization (2020b, May). Public health criteria to adjust public health and social measures in the context of covid-19.

World Health Organization (2021, June). Covid-19 weekly epidemiological update.

Yadav, P., G. N. Sapkal, P. Abraham, R. Ella, G. Deshpande, D. Y. Patil, D. Nyayanit, N. Gupta, R. R. Sahay, A. M. Shete, et al. (2021). Neutralization of variant under investigation b. 1.617 with sera of bbv152 vaccinees. *bioRxiv*.

A Appendix

Table A.1: COVID-19 Resilience Ranking for the Sub-National Economies of Indonesia

Province	COVID-19 Resilience Ranking	COVID-19 Resilience Classification
North Sulawesi	1	
North Maluku	2	
Gorontalo	3	
Southeast Sulawesi	4	
Bali	5	
Bangka Belitung Islands	6	Top
DI Yogyakarta	7	
North Kalimantan	8	
South Sulawesi	9	
West Sumatra	10	
Central Sulawesi	11	
Papua	12	
West Papua	13	
Bengkulu	14	
Maluku	15	
East Kalimantan	16	
West Sulawesi	17	Middle
South Kalimantan	18	
North Sumatra	19	
Jambi	20	
Central Kalimantan	21	
West Nusa Tenggara	22	
Riau	23	
Riau Islands	24	
DKI Jakarta	25	
East Nusa Tenggara	26	
Aceh	27	
Banten	28	
Central Java	29	Bottom
South Sumatra	30	
East Java	31	
West Kalimantan	32	
West Java	33	
Lampung	34	

Table A.2: Raw Scores of Selected Indicators

Province	1-Mth Cases Per 100000	1-Mth Fatality Rate	Total Deaths Per 1 Million	Positivity Rate (%)	Vaccination Rate (%)
Aceh	79.60	5.07	153.75	35.89	2.50
Bali	75.07	2.04	363.41	16.67	17.32
Bangka Belitung Islands	209.73	1.97	226.70	17.29	5.12
Banten	65.76	1.76	117.27	44.99	3.85
Bengkulu	109.17	1.73	108.92	31.22	2.96
Central Java	152.33	2.77	294.34	43.03	4.91
Central Kalimantan	126.22	1.28	204.87	29.09	5.78
Central Sulawesi	27.50	4.75	135.31	15.58	3.20
DI Yogyakarta	446.72	2.47	435.03	39.38	10.76
DKI Jakarta	1140.22	1.04	799.65	44.62	18.28
East Java	47.77	6.73	311.44	34.21	5.23
East Kalimantan	163.09	2.17	493.10	24.1	5.97
East Nusa Tenggara	46.89	1.72	86.75	20.72	3.30
Gorontalo	31.41	2.72	155.33	13.17	5.16
Jambi	92.55	2.44	74.69	41.07	3.82
Lampung	39.79	5.36	124.67	47.48	2.36
Maluku	52.25	1.97	76.26	23.71	3.15
North Kalimantan	135.51	1.26	289.26	12.61	3.88
North Maluku	65.16	0.96	100.55	20.45	2.39
North Sulawesi	20.10	1.90	212.44	11.21	5.34
North Sumatra	29.44	3.24	80.68	21.85	3.67
Papua	13.13	1.06	49.49	17.23	2.85
Riau	162.87	3.28	303.72	23.69	5.46
Riau Islands	448.85	2.04	266.40	33.62	6.00
South Kalimantan	34.32	3.58	261.93	16.79	4.61
South Sulawesi	25.41	1.78	108.78	20.92	4.97
South Sumatra	53.26	4.97	172.78	25.07	3.88
Southeast Sulawesi	36.19	2.11	90.29	23.34	3.57
West Java	150.79	1.66	112.21	46.7	4.01
West Kalimantan	71.99	4.62	50.98	31.2	2.75
West Nusa Tenggara	20.70	4.45	93.04	11.61	3.40
West Papua	137.99	1.02	165.77	24.89	3.84
West Sulawesi	30.44	0.46	85.96	19.3	4.04
West Sumatra	131.76	2.62	215.74	19.38	2.80

Table A.3: Raw Scores of Selected Indicators (cont)

Province	2021 Q1 Real GRDP Growth (%)	HDI	Mobility 30-Day Average	Adequacy of Hospitals (10,000 persons)	Adequacy of Medical Personnel (10,000 persons)
Aceh	-1.95	71.99	-9.95	7.70	0.31
Bali	-9.85	75.5	-28.67	6.41	0.13
Bangka Belitung Islands	0.97	71.47	-11.75	5.80	0.19
Banten	-0.39	72.45	-9.22	10.96	0.48
Bengkulu	-1.58	71.4	-2.12	8.22	0.23
Central Java	-0.87	71.87	-6.92	11.37	0.26
Central Kalimantan	-3.12	71.05	-8.30	10.19	0.30
Central Sulawesi	6.26	69.55	4.13	8.01	0.44
DI Yogyakarta	6.14	79.97	-14.90	4.66	0.08
DKI Jakarta	-1.65	80.77	-25.47	5.53	0.05
East Java	-0.44	71.71	-7.15	10.35	0.22
East Kalimantan	-2.96	76.24	-10.05	6.58	0.19
East Nusa Tenggara	0.12	65.19	-1.25	10.46	0.83
Gorontalo	-1.98	68.68	9.47	8.40	0.22
Jambi	-0.33	71.29	-6.35	8.92	0.20
Lampung	-2.1	69.69	-9.48	10.84	0.61
Maluku	-1.88	69.49	-8.57	5.90	0.45
North Kalimantan	-1.91	70.63	-8.18	6.96	0.20
North Maluku	13.45	68.49	-7.50	5.88	0.40
North Sulawesi	1.87	72.93	-3.55	5.31	0.16
North Sumatra	-1.85	71.77	-12.23	6.75	0.49
Papua	14.28	60.44	-18.47	7.61	0.45
Riau	0.41	72.71	-9.40	9.24	0.33
Riau Islands	-1.19	75.59	-18.62	6.79	0.22
South Kalimantan	-1.25	70.91	-5.38	9.17	0.31
South Sulawesi	-0.21	71.93	-8.40	7.95	0.32
South Sumatra	-0.41	70.01	-8.92	10.12	0.55
Southeast Sulawesi	0.06	71.45	3.90	6.29	0.31
West Java	-0.83	72.09	-11.43	13.58	0.77
West Kalimantan	-0.1	67.66	-17.68	9.89	0.42
West Nusa Tenggara	-1.13	68.25	-5.78	13.93	0.08
West Papua	1.47	65.09	-14.20	5.07	0.23
West Sulawesi	-1.2	66.11	-2.40	11.33	0.38
West Sumatra	-0.16	72.38	-1.33	7.03	0.26