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DETERMINANTS OF COVID-19 FATALITY RATES IN INDONESIA: A CONFIGURATIONAL ANALYSIS OF GOVERNMENT POLICIES AND SOCIETAL CONDITIONS

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Abstract. This paper systematically identifies the determinants of COVID-19 death rates at the initial stages of the outbreak in Indonesia by considering configurations of government conditions (responsiveness, ability to control case rate, and capacity to cure infected people) and societal conditions (vulnerability and compliance). Configurational analysis using crisp-set QCA was employed to analyze these sets of conditions and outcomes in 34 provinces throughout Indonesia. The results show that the high ability of local government to control the spread of the disease is a necessary and sufficient condition for a low death rate.

However, the opposite condition (the low ability of government) is only necessary but not sufficient for a high fatality rate. To create sufficient conditions for a high death rate, the low ability of local governments to restrain the spread of the virus requires other specific conditions, particularly a low level of community obedience to the restriction policy. The present study highlights that the institutionalization of a new normal life during the pandemic through regulative, normative and cultural-cognitive mechanisms is of paramount importance.

Keywords: COVID-19 pandemic, death rate, public policy characteristics, societal factors, configurational analysis, Indonesia.

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Introduction

The coronavirus disease (COVID-19) has spread rapidly throughout the world, and has disrupted most countries’ social, economic and political orders (Anttiroiko, 2021). In the face of the pandemic, governments experience contradicting challenges, such as tensions between human safety and economic security. While movement restrictions, mass gathering bans, area lockdowns, school closures, isolation and work-from-home regulations are required to prevent the spread of the disease, the negative economic consequences are of great concern. However, the idea of the trade-off between health and economy is not fully supported by empirical evidence.

Hasell (2020) shows that countries with the highest COVID-19 death rate in August 2020 (> 600/million), such as Peru, Spain and the UK, suffered the worst economic downturn (negative GDP growth of > 20% in Q2/2020). In the same period, countries with a low death rate (<50/million) such as Taiwan, South Korea, Lithuania, Indonesia and Norway succeeded in preventing a deeper economic decline (negative GDP growth of 1–5%). In contrast, countries with a similar decline in GDP (minus 8–10%), for instance, the USA, Sweden, Denmark, the Netherlands and Japan, had very different mortality rates: the USA and Sweden (> 550/million), the Netherlands (364/million), Denmark (107.73/million) and Japan (10.16/million).

There is no doubt that policy measures play an essential role in reducing infection and fatality rates (Capano et al., 2020; Asmorowati, Schubert and Ningrum, 2021). In this vein, prior works highlight the government’s ability to control the spread of the disease (Mei, 2020; Walensky and del Rio, 2020; Hsiang et al., 2020), in responding to the crisis quickly (Kim, 2020; Migone, 2020), and in curing infected people (Khan et al., 2020). However, the critical role of societal factors cannot be ignored, such as social vulnerability (Daoust, 2020; Karaye and Horney, 2020) and community compliance with health policies (Murphy et al., 2020; Van Rooij et al., 2020). Because they are interconnected and equally important (Bloukh et al., 2020; Capano et al., 2020), such conditions should be considered as configurations rather than single causal factors. Therefore, configurational analysis is needed to identify combinations of necessary and sufficient conditions for either success or failure in dealing with the pandemic.

To date, very little configurational analysis of the recent crisis has been carried out. Primc and Slabe-Erker (2020) have only identified combinations of conditions related to governmental policies, which led to either a high or low COVID-19 death rate. Despite considering a societal factor (population vulnerability), Ito and Pongeluppe (2020) examined the combinations of contextual factors that (only) led to a negative outcome, i.e low spread of COVID-19. No previous study has examined the role of combinative conditions in determining two different COVID-19 outcomes (positive and negative, respectively).

Using crisp-set qualitative comparative analysis (cs-QCA), this present work makes contributions by systematically identifying necessary and sufficient conditions, related to both government and society, for the high or low COVID-19 death rate. This study is guided by the research question: How do public policy characteristics and societal factors in combination enable either a low or high COVID-19 death rate at the initial stages of the outbreak in Indonesia?

Indonesian provincial cases were purposively selected for analysis to enrich theoretical contributions based on Asian narratives, as COVID-19 studies using QCA were mostly conducted in western countries, e.g., international comparison of European countries (Primc and Slabe-Erker, 2020) and comparison between parts of a country in South America (Ito and Pongeluppe, 2020). More importantly, as a country with a relatively low death rate and a modest economic impact, Indonesia provides relevant local cases to study configurational conditions for the COVID-19 death rate during the critical initial stage, i.e., six months after the country's first case was announced. The configurations are beneficial points of consideration in developing a more sensitive crisis management model.

In the next section, we sketch out the theoretical backdrop underpinning the study. Then we move on to the description of the method, followed by the presentation of the findings highlighting the necessary and sufficient conditions for either a low or high COVID-19 death rate. Finally, we discuss the theoretical implications of our analysis and provide some suggestions for future research.

The theoretical background of COVID-19 fatalities and their potential causal conditions

COVID-19 deaths are the key indicator to assess the pandemic fatality. When the WHO first declared it a pandemic on January 30, 2020, the death toll was 171. On December 31, 2020, the number had reached 1.8 million. However, the WHO estimates that the actual death toll is at least 3 million or 66% higher than officially reported (WHO, 2020). Many countries still lack accurate data on deaths. Comparisons are often difficult because countries use different methods to report COVID-19 mortality. Furthermore, the use of indicators varies, for example, fatality rate, crude death rate, deaths per capita, excess mortality or others, and the most appropriate indicator is still debated (Heuveline and Tzen, 2021).

Mortality indicators are critical, but the causes of high fatality rates are even more important to study. This section provides a brief overview of five conditions that can determine COVID-19 death rate: societal conditions (community vulnerability and obedience to restriction measures) and government conditions (the government's ability to control the spread of COVID-19, the responsiveness and capacity of health facilities and medical personnel).

Vulnerability

Bloukh et al. (2020) reveal that, during SARS-CoV, MERS-CoV, and COVID-19 outbreaks, high mortality rates were observed among elderly patients whose immune systems have been compromised by their illnesses, such as diabetes, hypertension, and cardiovascular disease. People who are over 60 years old, suffering from chronic diseases, or having both conditions, are more susceptible to infection with COVID-19 (Wyper et al., 2020). This condition is in accordance with Venton and Hansford's Crunch Model (2006), highlighting that a disaster can occur when a hazard meets a vulnerable situation. Thus, areas with a more vulnerable population tend to face a greater threat of a disaster than other regions.

Obedience

The community's compliance with health protocols and restrictive policies, such as working from home, minimizing mobility, and not visiting public areas such as shopping centers, is critical to reducing disease transmission (Bloukh et al., 2020). Citizens' compliance with government policies can result from either rational or normative reasons (Foorthuis and Bos, 2011). Rational reasons reflect individual considerations to comply with regulations influenced by cost-benefit calculations and the use of rewards and punishments. In contrast, normative reasons indicate people's considerations to obey rules or norms because they are seen as legitimate and appropriate, not because of fear of punishment (Scott, 2014). Several studies show that adherence to social distancing rules depends on socioeconomic reasons, such as whether citizens have access to flexible work arrangements, and behavioral factors such as beliefs about virus transmission (Akesson et al., 2020). In addition, studies indicate that civic and citizenship values determine the degree of compliance with such public health containment measures (Barrios et al., 2021; Durante, Guiso and Gulino, 2021).

Control

The government's ability to control the spread of COVID-19 is required to reduce the death rate. The most commonly performed measures include restrictions on mobility and activities in public places and the enforcement of health protocols (Migone, 2020). However, the implementation of these measures varies greatly. Lockdowns can take many forms, ranging from very loose to very strict. Some countries, such as China, South Korea, France, and the UK, imposed more strict lockdowns, such as border closures, international and local flight bans, public event cancellation, and the closure of schools and businesses in all regions (Primc and Slabe-Erker, 2020; Atalan, 2020; Kim, 2020).

However, less strict forms of quarantine were observed in many other countries. One example is Indonesia, which preferred a looser and partial restriction (called *Pembatasan Sosial Berskala Besar* or "PSBB") in several regions rather than a strict lockdown in all localities. This policy was taken to avoid the negative consequences of a total lockdown, which would have a significant impact on workers in the informal sector (Andriani, 2020; Olivia, Gibson and Nasrudin, 2020). In short, the primary consideration of such a restriction policy is to balance between public health and economic safety. Supervision of the implementation of health protocols also varies from country to country and from region to region within a country, which can lead to different outcomes.

Responsiveness

The government's rapid response to the pandemic can curb the spread of COVID-19 and reduce the death rate (Primc and Slabe-Erker, 2020; Kim, 2020). Migone (2020) states that Australia, Japan, and South Korea have succeeded in reducing the low COVID-19 infection rate because they responded quickly to the pandemic. In South Korea, collaborative and fast responses led by the government were the key, particularly in conducting extensive tracing and testing and facilitating early quarantine after the spike in new cases of infection (Kim, 2020). Based on their research in China, Wang et al. (2020) prove that the government's effective emergency response played an essential role in flattening the epidemic curve and slowing the onset of peak periods. As a result, the emergency measures effectively prevented a spike in the number of infected patients that exceeded the capacity of the medical system

Treatment

The capacity of health facilities and medical personnel to cure infected patients is the other critical requirement to reduce the fatality rate. In their study on healthcare capacity, Khan et al. (2020) found that greater health care capacity is associated with a lower number of COVID-19 fatalities. An essential finding of this study is that countries with strong health care capacities have lower death rates. Souris and Gonzalez (2020) state that during the first critical phase of COVID-19 in France, there was a significant spike in daily deaths in metropolitan areas due to the overload of healthcare facilities caused by significantly increased hospitalization rates. In contrast, limited access to healthcare facilities for French people living in rural areas was the cause of high fatality rates in areas with low population density. Similarly, Bravata et al. (2021) found that COVID-19 patients treated in the Intesive Care Unit (ICU) during increased ICU demand had a higher risk of death than patients treated in the ICU during decreased ICU demand. Besides increasing the number of COVID-19 tests, Upadhyay and Shukla (2021) also highlight the importance of augmenting health care spending and improving overall health care capacity to reduce the COVID-19 death rates.

Research Method

Data and measurements

The research is a multiple case study of all 34 Indonesian provinces intended to identify the patterns of relations between COVID-19 death rate and their causal conditions. The conditions observed in this comparative study include two societal conditions (community vulnerability and compliance with mobility restrictions) and three government conditions (responsiveness, ability to control case rate, and capacity to cure the infected people). The following are descriptions of data used in assessing the outcome and each studied condition.

The outcome

The outcome assessed in this QCA is the COVID-19 death rate for each province, labeled *Death* (coded as “D”). The number of Covid-19 deaths was chosen because the variation in population and number of infected people between provinces in Indonesia are very large, while just one death indicates a condition requiring greater attention. The cut-off value for this outcome was determined by the median of death rates in 34 provinces in Indonesia on August 2, 2020, as compiled by the COVID-19 National Task Force. A province is considered to have a high death rate if its value is 33.5 or above (coded as “D_0”). Meanwhile, a province with a lower value is classified as the opposite (coded as “D_1”).

The conditions

The first examined condition is community vulnerability (coded as “V”), which is observed from the composite variable based on the percentage of the population aged over 60 and the morbidity rate[1] with a weighted value of 60:40. The higher the number, the more susceptible the population is to diseases, including being infected with COVID-19. The data were obtained from Statistics Indonesia or *Badan Pusat Statistik* (BPS, 2019). The vulnerability level of a province’s population is considered high (coded as “V_1”) when the value is above the national average (>10.5 percent). In contrast, a province with a lower value is categorized as low vulnerability (coded as “V_0”).

Community compliance is the second condition of interest and is labeled *obedience* (coded as “O”). This condition represents the extent to which the population in each province complied with the call to reduce activities outside the home. The condition was observed based on data, processed using the Google mobility index, indicating the difference between the decrease in the percentage of people working in the office and those visiting shopping venues (traditional markets, shopping malls, supermarkets) during the first week of the implementation of the restriction policy (*PSBB*) in the Indonesian capital (April 10–17, 2020). This period was chosen because at that time the Central Government warned all Indonesians (not only in the capital city) to reduce their activities outside the home. The warning also included continuing the work from home and distance learning, which had started on March 16, 2020. A large gap (>30%) indicates that people in a province tend not to comply with the call, i.e., the number of people working in offices had decreased significantly, but those visiting shopping venues had not decreased much. Provinces with values above 30 are considered to have a low level of obedience (coded as “O_0”). Meanwhile, provinces with a lower value are classified as having a high degree of obedience (coded as “O_1”).

The third condition assessed is government responsiveness (coded as “R”), that is, the speed with which the local government reacts to the event of a deteriorating situation at the beginning of the COVID-19 pandemic. It must be noted that not all provinces have adopted the restriction policy (called PSBB). Considering

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[1] The morbidity rate is the percentage of the population experiencing health problems caused by illness or accidents, interfering with their daily activities.

the economic consequences of the restrictions, the central government did not want all provinces to implement the restriction policy. The provinces that wanted to adopt the policy were required to submit a proposal to the central government. The central government would then review the proposal and decide whether or not to allow a province to apply the restrictions in full or in part. Therefore, for provinces that have implemented PSBB, the responsiveness is assessed by considering the speed at which PSBB was fully or partially implemented, measured in the number of days before implementation of the PSBB. After obtaining permission from the central government, the provincial and district governments needed to prepare technical arrangements, disseminate them to the public, and officially implement the restriction policy. A local government is regarded as slow to respond (coded as “R_0”) if the restriction policy was not officially implemented until more than ten days after a positive case spike in the province. Provinces that take less than ten days to implement PSBB, or that introduce adopting PSBB before the first spike, are considered fast responders (coded as “R_1”). The number of days is counted from the time the proposal is sent to the central government until the restriction policy is officially implemented. For provinces where several districts started implementing PSBB at different times, an average value is used. The data were collected from the National Agency for Disaster Management or BNPB, i.e., the list of provinces and districts that implement PSBB, and various news media, i.e., the dates of the proposal submission, approval, and PSBB implementation in each province or district.

For provinces that have not implemented a PSBB, the responsiveness is based on their ability to control the case fatality rate (CFR) in the first three months of the pandemic in the country. Local governments are considered highly responsive (“R_1”) if the CFR in their area was less than 5% of the total infected people by the end of May 2020. Provinces with a higher CFR are classified as low responsive (“R_0”). The CFR of COVID-19, i.e., the ratio between the number of confirmed deaths from the disease and the number of confirmed cases in a specific time and place, was used as a proxy for local government responsiveness, as the data can indicate how quickly a local government has taken the necessary actions to prevent or reduce the risk in the area. The data were obtained from the official website of the COVID-19 National Task Force (https://covid19.go.id/).

The fourth condition is labeled *control* (coded as “C”) and represents the local government’s ability to control the spread of the disease, which was observed by the percentage of positive cases in the regions compared to the total positive COVID-19 cases in the country. The data were compiled from the official website of the COVID-19 National Task Force (https://covid19.go.id/). The cutoff point is established at the median, which is defined as 1 percent. As a result, provinces that have a proportion of 1 percent or higher are categorized as low (and marked as “C_0”), whereas those with a proportion below 1 percent are categorized as high (and marked as “C_1”).

The last condition is the ability of healthcare facilities and medical personnel in the regions to cure COVID-19 patients, labeled as *treatment* (coded as “T”), which was identified by calculating the number of infected people who recovered (recovery rate) in the regions on August 2, 2020.

Table 1

The outcome variables and their antecedents by provinces

Provinces	Σ Death	Vulnerability	Obedience	Responsiveness	Control	Treatment
East Java (JI)	1719	14.63	39.5	PSBB: 41.5 days	19.3	71.3
Jakarta (JK)	860	9.70	39.87	PSBB: 16 days	18.90	63.2
Central Java (JT)	655	14.07	40.37	PSBB: 30 days	8.3	63.6
South Sulawesi (SN)	321	11.40	34	PSBB: 30 days	8.3	69
West Java (JB)	210	12.01	40.25	PSBB: 30 days	5.7	58.5
South Kalimantan (KS)	295	10.18	32	PSBB: 21 days	5.3	59.9
North Sumatra (SU)	201	9.94	34.12	Death in May: 10.45%	3.5	42.4
Bali (BA)	48	13.72	21.87	Death in May: 0.85%	3	86.7
South Sumatra (SS)	163	10.00	34.75	PSBB: 38.5 days	2.9	62.3
Papua (PA)	33	5.58	20.5	Death in May: 0.9%	2.70	57.3
North Sulawesi (SA)	133	13.21	34.12	Death in May: 10.98%	2.3	55
West Nusa Tenggara (NB)	116	13.64	30.62	Death in May: 1.58%	1.8	62
Banten (BT)	90	11.28	43.88	PSBB: 23 days	1.6	70.8
Central Kalimantan (KT)	91	8.89	30.62	PSBB: 21 days	1.5	70.6
North Maluku (MU)	49	8.23	38.5	Death in May: 6.54%	1.4	51
East Kalimantan (KI)	36	8.35	34	Death in May: 1.02%	1.4	62.5
Gorontalo (GO)	35	13.59	41.5	PSBB: before the first spike	1.2	71.1

Provinces	Σ Death	Vulnerability	Obedience	Responsiveness	Control	Treatment
Maluku (MA)	23	9.13	38.37	Death in May: 3.59%	1	59.5
West Sumatra (SB)	34	11.77	33.62	PSBB: 17 days	0.9	70.6
South East Sulawesi (SG)	13	10.24	29	Death in May: 1.64%	0.7	67.9
Yogyakarta (YO)	21	15.86	28.87	Death in May: 3.62%	0.7	66.1
Aceh (AC)	15	11.25	29.75	Death in May: 5%	0.4	15.7
Riau (RI)	12	8.40	27.87	PSBB: before the first spike	0.4	52.2
Riau Islands (KR)	18	6.74	39.75	Death in May: 7.89%	0.4	60.3
West Papua (PB)	6	7.27	34	Death in May: 0.6%	0.4	65.6
North Kalimantan (KU)	2	8.90	31	PSBB: 12 days	0.3	90.5
West Kalimantan (KB)	4	9.79	28.62	Death in May: 1.08%	0.3	92.7
Bangka Belitung (BB)	2	9.88	35.75	Death in May: 4.35%	0.2	94
Bengkulu (BE)	19	10.20	36.5	Death in May: 3.3%	0.2	58.7
Central Sulawesi (ST)	7	11.73	31.87	PSBB: 11 days	0.2	90.3
Jambi (JA)	4	8.70	33.25	Death in May: 0	0.2	56.2
Lampung (LA)	13	11.83	40	Death in May: 8.27%	0.2	73.6
West Sulawesi (SR)	4	10.62	28.62	Death in May: 2.17%	0.2	62.5
East Nusa Tenggara (NT)	1	13.93	37.37	Death in May: 1.09%	0.1	85.5

Sources: the authors' compilation.

The recovery rate was used as a proxy for the ability of health treatment particularly provided to the infected people in a specific time and place. Although the recovery of patients with COVID-19 can be caused by their own ability to recover, the medical treatment they receive during hospitalization determines the recovery speed. The data were gathered from the official website of the COVID-19 National Task Force (https://covid19.go.id/). The cut-off for this condition was determined by the mean national recovery rate (>65.86%). Provinces with 65.86% or above are categorized as high (coded as "T_1") and below as low ("T_0"). As shown in the table, there were different conditions in the provinces in terms of mortality and recovery rates, where high mortality rates were not always followed by low recovery rates. This indicates that the two were not always interdependent and therefore QCA was required to recognize the patterns of differences and similarities in the cases studied across the provinces and considered them in identifying necessary and sufficient conditions for high or low death rates.

Analysis strategy

We used the qualitative comparative methodology (QCA) to identify conditions or combinations of conditions that are necessary or sufficient for the outcomes, as high or low death rates. Developed by Charles Ragin in the 1970s, QCA can be used to understand situations and contexts in a systematic and transparent way (Greckhamer et al., 2018). QCA was initially developed as a middle ground between qualitative (case-oriented) and quantitative (variable-oriented) approaches, providing researchers with a novel set of tools to identify complex causal relations through systematic comparisons and configurational analysis (Fiss, Marx and Cambre´, 2013; Thomann, van Engen and Tummers, 2018; Fischer, 2015). Particularly, we utilized crisp-set QCA (csQCA), following the methodology of Rihoux and Mour (2009), and conducted our analysis using the Tosmana v1.5.2 software, developed by Cronqvist (2016). The use of QCA varies widely, encompassing activities like developing typologies, pinpointing subset relations, testing existing theories, and inductively generating new hypotheses, as described by Thomann and Maggetti (2020).

The present study is not aimed to test hypotheses, but rather to find partial relationships between the conditions and outcomes studied, which can be considered hypotheses generated by the approach. The analysis is performed in four steps, which are briefly described below.

Step 1: Data preparation

To conduct csQCA, the conditions and outcomes of each case must first be converted into dichotomous data. For example, high and low death rates were determined by using the median as a cut-off value, i.e. the death rate in a province is classified as high if its share of the total national mortality rate is > 33.5. Based on this cut-off value, there are 16 provinces with high death rates, while 18 others are classified in the low death rate category. We also determined a cut-off point for each condition to classify the provincial cases into ones with a high or low level of each condition. The binary data were entered into the Tosmana worksheet. Data processing was then performed using the Tosmana program to produce a truth table (i.e., a table listing all logically possible configurations of binary causal conditions, along with the empirical outcome associated with each configuration) and Boolean expressions indicating configurations of conditions that result in either a high or low death rate.

Step 2: Necessity analysis

Following the csQCA protocol, necessity and sufficiency analyses were carried out based on a truth table presenting certain combinations of conditions related to a given outcome (Rihoux and Mour, 2009). As recommended by Ragin (2006), we performed a necessity analysis before conducting sufficiency analyses.

A necessity test is used to identify single conditions that are considered necessary or required for an outcome. A condition (X_1) is necessary for an outcome (Y_1) if the occurrence of Y_1 is not possible without the presence of X_1, but X_1 alone is not necessarily sufficient to produce Y_1. A condition is necessary if it is present in most cases or if the consistency value is above 0.9 and the coverage value is above 0.5 (Ragin, 2006; Schneider and Wagemann, 2012; Thomann, van Engen and Tummers, 2018).

The consistency value ranges from 0 to 1 and expresses the proportion of cases with a specific condition in all cases with a particular outcome. With the same range of values, the coverage value shows the number of cases with a particular condition and a particular outcome compared to cases with the same condition and a different outcome.

Step 3: Sufficiency analysis

One of the features of QCA is causal asymmetry, i.e., that the opposite conditions cannot be automatically assumed to affect the opposite outcome. Therefore, separate sufficiency analyses were then conducted to identify a set of conditions leading to high or low death rates, respectively. The Tosmana program produces several tracks indicating set-relationships between particular conditions or combinations of conditions and outcomes. It is important to note that the analyses included the empirical cases and the logical remainders, as suggested by Rihoux and Mour (2009). The exclusion of the logical remainders or potential cases only results in descriptive formulas (i.e., complex formulas expressing set relations between conditions and outcomes of the empirical cases). To obtain shorter or simpler *Boolean* expressions, the software must be allowed to take potential cases into account. Rihoux and Mour (2009, p. 60) explain that ‘the simpler a *Boolean* expression, the larger the number of configurations it covers. … [The software] selects some logical remainders useful to achieve shorter formulas, adds them to the set of observed cases, and makes ‘simplifying assumptions’ regarding these logical remainders.’ As a result, this mechanism produces simpler formulas expressing set-relationships between conditions and outcomes.

A set-relationship suggests that a condition or a configuration of conditions is sufficient for a particular outcome. A condition (e.g., X_1) is sufficient for an outcome (e.g., Y_1) if Y_1 always occurs when X_1 is present. However, other conditions (e.g., X_2) or combinations of conditions (e.g., X_2*X_3) can also lead to Y_1. A reasonably well-established consistency benchmark for sufficiency analysis is at least 0.80 (Greckhamer et al., 2018).

Step 4: Evaluation of results

The evaluation serves to assess the consistency of the set-theoretical relationships with the underlying data. We performed consistency and coverage measurements as fitting parameters (Ragin, 2006). Consistency measures the degree to which a relation between a causal condition (or combination of conditions) and a particular outcome is met within a given data set. In sufficiency relations, the consistency parameter indicates the proportion of cases with a particular condition (e.g., X_1) or configuration of conditions (e.g., X_1*X_2) that have a result (e.g., Y_1) relative to all cases with X_1 (or X_1*X_2). The higher the consistency value of X_1 (or X_1*X_2), the closer X_1 (or X_1*X_2) is to being a consistently sufficient condition (or combination of conditions) for Y_1. If the consistency value is 1, then X_1 (or X_1*X_2) can be interpreted as absolutely sufficient for Y_1.

The coverage values empirically indicate the relevance of the relationship between a condition (or combination of conditions) and an outcome (Ragin, 2006). We created two coverage measures, for both high and low death rates. First, raw coverage of each trace, that is, the number of cases with a particular condition (or configuration of conditions) that also have a specific outcome (including cases covered by multiple configurations). Second, the unique coverage of each track, that is the proportion of cases with a particular outcome exclusively covered by a given track (no other tracks cover those cases) (Andrews, Beynon and McDermott, 2016).

We also measured the consistency and coverage of the solution or combination of the tracks for each outcome, i.e., high and low death rates. While solution consistency indicates the combined consistency of the causal conditions or combinations of conditions, solution coverage expresses the proportion of cases covered by all the tracks (Andrews, Beynon and McDermott, 2016). A high consistency score (>0.75; see Ragin, 2006) indicates that a causal condition or combination of conditions is necessary for a particular outcome to occur. If consistency or coverage values for the solution are low (<0.75), this indicates a poorly specified set.

The csQCA and its Findings

The csQCA resulted in a set of data presenting the configurations of societal and government conditions and death rates in each province (as presented in the truth table), which became the basis for further analysis. The number of logically possible configurations in the truth table is automatically determined by the formula ‘2^k’, where *k* is the number of conditions (Grofman and Schneider, 2009). In this study, *k* represents the number of societal and government conditions assessed. Thus, the truth table here consists of 2^5, or 32, logically possible configurations, i.e., including the 19 configurations identified from the observed cases (Table 2). Out of 19 logically possible combinations identified from the observed cases, eight are associated with high death rates (rows 1–8) and 11 others with linked to low death rates (rows 9–19). The truth table shows that not all logically possible combinations are empirically observed, termed “the logical remainders” (Rihoux and Mour, 2009), i.e., the 13 configurations listed in rows 20–32.

Table 2

Truth Table

Row	Conditions					Outcome		Cases
	Vulnerability (V)	Obedience (O)	Responsiveness (R)	Control (C)	Treatment (T)	Death (D)	n	
1	0	0	0	0	0	0	5	JK, KS, SU, SS, MU
2	0	0	0	0	1	0	1	KT
3	0	0	1	0	0	0	1	KI
4	1	0	0	0	0	0	3	JT, JB, SA
5	1	0	0	0	1	0	3	JI, SN, BT
6	1	0	1	0	0	0	1	NB
7	1	0	1	0	1	0	1	GO
8	1	1	1	0	1	0	1	BA
9	0	0	0	1	0	1	1	KR
10	0	0	0	1	1	1	1	KU
11	0	0	1	1	0	1	3	MA, BE, JA
12	0	0	1	1	1	1	2	PB, BB
13	0	1	1	0	0	1	1	PA
14	0	1	1	1	0	1	1	RI
15	0	1	1	1	1	1	2	SG, KB
16	1	0	0	1	1	1	3	SB, ST, LA
17	1	0	1	1	1	1	1	NT
18	1	1	1	1	0	1	2	AC, SR
19	1	1	1	1	1	1	1	YO
20	0	0	1	0	1	*r*	0	–
21	0	1	0	0	0	*r*	0	–
22	0	1	0	0	1	*r*	0	–
23	0	1	1	0	1	*r*	0	–
24	0	1	0	1	0	*r*	0	–
25	0	1	0	1	1	*r*	0	–
26	1	0	0	1	0	*r*	0	–
27	1	0	1	1	0	*r*	0	–
28	1	1	0	0	0	*r*	0	–
29	1	1	0	0	1	*r*	0	–

Row	Conditions					Outcome		Cases
	Vulnerability (V)	Obedience (O)	Responsiveness (R)	Control (C)	Treatment (T)	Death (D)	n	
30	1	1	0	1	0	*r*	0	–
31	1	1	0	1	1	*r*	0	–
32	1	1	1	0	0	*r*	0	–

Notes:

V_1	The level of vulnerability was higher than the national average (>10.50%)
V_0	The level of vulnerability was lower than the national average (<10.50%)
O_1	The level of community compliance with the mobility restriction policy was relatively high (the difference in reduction in the number of people going to the office and visiting shopping venues <30%)
O_0	The level of compliance with the mobility restriction policy was relatively low (the difference in the reduction in the number of people going to the office and visiting shopping venues> 30%)
R_1	Local government responsiveness was high (the adoption of the PSBB/social restriction policy started in less than ten days as the number of cases increased, or the death rate in the first three months <5%)
R_0	Local government responsiveness was low (the adoption of the PSBB/social restriction policy started in more than ten days as the number of cases increased, or the death rate in the first three months >5%)
C_1	The ability of local government to control the spread of COVID-19 was high (total positive cases <1%)
C_0	The ability of local government to control the spread of COVID-19 was low (total positive cases > 1%)
T_1	The ability of healthcare facilities and medical personnel to cure infected patients was high (the number of recovered patients >65,86%)
T_0	The ability of healthcare facilities and medical personnel to cure infected patients was low (the number of recovered patients <65,86%)
D_1	Low death rate (<33,5)
D_0	High death rate (>33,5)
r	The logical remainders or non-observed cases

Sources: developed further by the authors based on the result of the Tosmana software.

Necessity analysis

This first step of the analysis is particularly aimed to identify the existence of necessary conditions. The analysis of necessity reveals that the government's high ability to control the spread of COVID-19 (symbolized as C_1) is individually necessary for a low death rate, while its opposite condition (i.e., the low ability of government, coded as C_0) and the low compliance with the call to reduce activities outside the home (coded as O_0) are separately necessary for a high death rate (Table 3). However, as shown in Table 3, the coverage value of C_0 is much higher than that of O_0, which means that the occurrence of a high death rate is (almost) not possible if the local government is unable to control the spread of COVID-19. The opposite condition is required for high death rates.

In addition, the results of the necessity test also indicate important conditions (those with a high consistency value but under 0.9), i.e., a high responsiveness (R_1) that is important for a low death rate, and the opposite condition (R_0) for a high death rate. A sufficiency test is needed to know whether the necessary conditions are also sufficient to enable the outcomes.

Table 3

The measure of consistency

Conditions	Consistency for high death rate	Consistency for low death rate
V_1	9/16=0.56	7/18=0.38
O_1	1/16=0.06	7/18=0.38
R_1	4/16=0.25	13/18=0.72
C_1	0/16=0	**17/18=0.94** (coverage: 1)
T_1	6/16=0.37	10/18=0.55
V_0	7/16=0.43	11/18=0.61
O_0	**15/16=0.93** (coverage: 0.57)	11/18=0.61
R_0	12/16=0.75	5/18=0.27
C_0	**16/16=1** (coverage: 0.94)	1/18=0.05
T_0	10/16=0.62	8/18=0.44

Note: The letter codes followed by a '1' indicate the high level of the condition; codes with '0' indicate the low level of the condition.

Sources: the authors' analysis.

What combination of conditions is sufficient for a high death rate?

The csQCA generated three paths indicating the condition or configuration of conditions associated with a high death rate (Table 4). The analysis clearly shows that all three configurations include the low ability of the local government to control the spread of COVID-19 (C_0). It indicates that the low ability of the local government to control the spread of COVID-19 (C_0) is necessary but insufficient to lead to a high death rate. This condition requires other conditions to cause high mortality.

Track 1 exhibits that the combination of the high level of community vulnerability and the low ability of local government to control the spread of COVID-19 (V_1*C_0) led to a high death rate. Nine provinces with such a configuration were found. Track 2 includes provinces that have a combination of a low level of community compliance with mobility restrictions and the low ability of the local government to control the spread of COVID-19 (O_0*C_0).

This configuration was confirmed in 15 provinces. Track 3 covers only six provinces, where the combination of the low ability of the local government to control the spread of the virus and the high capacity of healthcare facilities and medical personnel in curing infected patients was found (C_0*T_1).

Table 4

Configurations of conditions for high death rate

	Track 1	Track 2	Track 3
Condition or configuration of conditions identified through Tosmana	V_1*C_0	O_0*C_0	C_0*T_1
Code of cases explained	Nine provinces: JI, SN, BT, JT, JB, SA, BA, NB, and GO.	15 provinces: JI, SN, BT, JK, KS, SU, SS, MU, JT, JB, SA, NB, KT, KI, and GO.	Six provinces: JI, SN, BT, BA, KT, and GO.
Code of cases explained uniquely (by each track)	–	Six provinces: JK, KS, SU, SS, MU, and KI	–
Consistency	9/9=1	15/15=1	6/6=1
Raw coverage	9/16=0.56	15/16=0.93	6/16=0.37
Unique coverage	0	6/16 = 0.37	0
Solution consistency	1.00		
Solution coverage	16/16=1.00		

Sources: the authors' analysis.

The consistency and coverage values of the solution are both high (>0.75), indicating that the solution (consisting of the three paths) is a fitting model. Furthermore, each track also has a perfect consistency value, meaning that each of these three configurations was sufficient for a high death rate. However, as shown in Table 4, the second track (O_0*C_0) covered many more empirical cases, i.e., 15 provinces (the raw coverage: 0.93). The second track includes eight (of nine) provinces covered by the first path's formula and five (of six) representative provinces of the third track. This indicates that the low level of both society's obedience to mobility restriction policy and the ability of local government to control the spread of the disease is a sufficient configuration of conditions for a high death rate supported by most empirical cases. Provinces that had a combination of these two conditions tended to have high mortality rate.

A high mortality rate due to COVID-19 can be avoided if efforts are focused on the necessary condition, that is, effective and consistent efforts to suppress the increase in new positive cases. As found, people's reluctance to reduce their mobility is the most empirically confirmed pair of the necessary conditions that consistently enable a high mortality rate. A low capacity of healthcare facilities and medical personnel or a high level of community vulnerability can also lead to high mortality rates. However, the relatively high capacity of medical staff to treat and cure COVID-19 patients will be meaningless when local governments fail to control the spread of COVID-19 (as reflected in Track 3). The configuration identified as Track 3 serves as a cautionary note to regional authorities who might perceive their COVID-19 response as successful, based on high recovery rates despite a significant number of cases. It underscores the futility of having an adept medical workforce if local governments do not effectively curb the virus's transmission.

Evaluating the effectiveness of COVID-19 response efforts requires careful consideration of death rates, which are influenced by the ability to manage the rise in new infections within the area. Hospitals tend to collapse when the increase in the number of infected patients gets out of control and exceeds the capacity of healthcare facilities. This condition makes it impossible to treat patients properly, which can potentially increase the number of deaths.

The local government's inability to control the spread of COVID-19 could also result in high death cases when community vulnerability in the area is relatively high. The national COVID-19 task force's website shows that death cases are dominated by elderly patients and those with chronic diseases. This fact confirms the study's finding regarding one of the configurations of minimal conditions required for a high mortality rate (Track 1).

What combination of conditions is sufficient for a low death rate?

A separate sufficiency analysis was conducted to identify a condition or configuration of conditions that enable low death rates (Table 5). The Tosmana program reveals three tracks. The first track covers most of the low-death rate cases (17 provinces), while the other two were only found in four provinces. The cases under Track 1 all show a high ability of local government to restrain the spread of the virus (C_1). Papua was the only low-death rate and a low ability of the local government to control the spread of COVID-19. Of the 17 provinces, only a few provinces adopted PSBB (a large-scale social restriction), i.e., West Sumatra, Riau, North Kalimantan, and Central Sulawesi. Some other provinces, such as Yogyakarta and Aceh, preferred to establish a conventional emergency response status arranged by the local government and encourage 'local lockdowns' at the community level (i.e., village or *gampong*). In these two provinces, restriction, tracing, isolation, and social assistance were carried out by the local governments with great support from communities that already have social capital and local wisdom, i.e., the tradition of *gotong royong* (cooperation among citizens) (Lestari and Astuti, 2020; Utomo, 2020).

The second configuration comprises the combination of a low level of community vulnerability and a high level of community obedience to the mobility restriction policy (V_0*O_1). This combination applies to Papua, South East Sulawesi, West Kalimantan, and Riau. Similar to the second combination, the third one combines a high level of community obedience to the mobility restriction policy with a low level of healthcare facilities and the ability of medical personnel to cure infected patients (O_1*T_0). This combination applies to Papua, Aceh, West Sulawesi, and Riau.

As shown in Table 5, the second and third configurations include high community compliance with the mobility restriction policy. Except for Papua, the provinces with these last two configurations have the same condition: the relatively high ability of the local government to control the virus spread. Dominated by mountains and wilderness, Papua is a province with the largest area and low population density but a strong tradition of living in groups. Given these characteristics, it is understandable that the local government had difficulties controlling the spread of the virus.

Table 5

Configurations for low death rate

	Track 1	**Track 2**	**Track 3**
Condition or configuration of conditions identified through Tosmana	C_1	$V_0{*}O_1$	$O_1{*}T_0$
Cases explained	17 provinces: MA, BE, JA, SB, ST, LA, SG, KB, YO, AC, SR, RI, KR, PB, BB, KU, and NT.	4 Provinces: PA, SG, KB, and RI.	4 Provinces: PA, AC, SR, and RI.
Cases explained uniquely	12 provinces: MA, BE, JA, SB, ST, LA, YO, KR, PB, BB, KU, and NT.	–	–
Consistency	17/17=1.00	4/4=1.00	4/4=1.00
Raw coverage	17/18=0.94	4/18=0.22	4/18=0.22
Unique coverage	12/18=0.66	0/18=0	0/18=0
Solution consistency	1.00		
Solution coverage	18/18=1.00		

Sources: the authors' analysis.

Table 5 shows that both solution consistency and coverage are perfect, i.e., 1.00, meaning the sets containing three tracks ($C_1+V_0{*}O_1+O_1{*}T_0$àD_1) are absolutely consistent and consistently supported by the empirical cases. The consistency value for each track indicates that each recipe was sufficient condition(s) for a low death rate. Similar to the sets produced by Tosmana for the high death rate, one track covers much more empirical cases, including those represented by two other tracks. With high values of the raw and unique coverage, the first track includes the following condition: the high ability of the local governmentto prevent the spread of COVID-19. This dominant track is characterized by the local government's effective ability to halt the spread of COVID-19, leading to the conclusion that the initial path (C_1) serves as both a necessary and sufficient factor for reducing death rates, backed by a substantial amount of empirical data. The key factor is not the quickness of the response but the effectiveness and consistency of measures to curb the rise of new cases. As found, the response speed was neither a necessary condition nor a part of sufficient combinations of conditions for a low death rate.

The other two tracks are configurations, that both involve high community compliance with restrictive policies. These configurations confirm that the condition is necessary for a low death rate. Track 3 highlights the importance of community compliance, which is particularly needed when the capacity of hospitals and medical personnel in the regions is insufficient to cure COVID-19 patients. If public compliance with the restriction policy is high, the spread of COVID-19 can be controlled so that the existing healthcare facilities and personnel can handle a small number of infected patients. The configuration of Track 2 describes the other situation: obedience to restriction policies is not enough; a low fatality rate can only be achieved when community vulnerability is also low.

Discussion and conclusion

Greckhamer et al. (2018, p. 492) suggest that 'configurational theorizing should be the foundation of any QCA analysis to avoid the mechanistic deployment of its technique.' We agree with that and, for the same reasons, it is important to add that QCA users need to demonstrate both theoretical contributions and practical implications that highlight configurational theories based on their QCA. Therefore, this section recalls what we have learned from the QCA and its findings to specify the theoretical contributions and practical implications of the study.

This research study made theoretical contributions by assessing the role of mixed conditions, i.e., government-societal sides and the outcome-action levels. Government conditions studied include responsiveness, the ability to control the spread of the disease, and the capacity to cure infected people, while the societal conditions observed include community vulnerability and compliance. In the face of a pandemic crisis, both government and societal conditions must be considered together. QCA is an appropriate approach to assess such causal configurations. Regarding varied levels of conditions, this work studied a combination of outcome-level (when assessing the government ability to control the virus transmission, the capacity of healthcare facilities and personnel to cure infected people, community vulnerability, and public compliance with mobility restriction policy) and action-level (when observing government responsiveness). The use of outcome-level indicators allows the examination of results (rather than efforts), which is more relevant and convincing when examining the effectiveness of public policies or services. However, further in-depth studies are then required in particular cases to find out what efforts have been made.

The first essential finding shows conjunctural or configurational causation (for further explanation, see Fiss, Marx and Cambre´, 2013; Thomann, van Engen and Tummers, 2018): the condition or configuration of conditions that lead to either high or low COVID-19 death rate. Many studies have shown that speed of response is key to the success of some countries in dealing with pandemics (Kim, 2020), but the present research reveals that consistent efforts are more effective to avoid high mortality rates. The necessity analysis confirms the individual factors that determine the COVID-19 death rate as found in previous studies: the government's ability to control the spread of the disease (Migone, 2020) and the community obedience to public health policies (Bloukh et al., 2020). However, the present study clearly shows that each of these individual conditions is not automatically sufficient to enable a high or low death rate. A high government's ability to prevent the increased number of infected people was found to be a single condition necessary and sufficient for a low fatality. Despite their lower coverage values (indicating a more limited empirical support), two alternative paths consistently lead to a low COVID-19 death rate: high community obedience combined with either a low vulnerability or a low capacity of medical facilities and personnel.

Three alternative configurations of conditions are also mentioned as causes of a high death rate. Although a low ability of the government to control the increase in positive cases is necessary for a high COVID-19 death rate, this condition alone is insufficient to enable a negative outcome and must be combined with either high community vulnerability or low community obedience. In addition, the low ability of the government to control the spread of the disease remains a critical part of the cause of high mortality, despite the high capacity of medical facilities and personnel in a region. The necessity analysis also reveals that response speed is neither necessary nor sufficient for a high or low death rate. The findings mostly show the ways in which certain conditions interact to produce an outcome (either a high or a low death rate), rather than how a single variable affects a dependent variable. This has important practical implications, as efforts to achieve a low COVID-19 death rate should not focus on the necessary factors as single conditions, but rather as configurations.

The second point that is essential to emphasize is equifinality (for further explanation, see: Marx, Cambre´ and Rihoux, 2013; Thomann, van Engen and Tummers, 2018), i.e., different configurations can enable a specific fatality rate (either high or low). By performing the sufficiency analysis, we can identify the causal pathways reflecting the set-relations between the condition, or combination of conditions, and the COVID-19 death rates in Indonesia.

As mentioned, there are three possible alternative tracks for a high mortality rate. In some regions, a high fatality rate can be caused by one configuration, while in other regions it can be enabled by an alternative configuration. Similarly, three alternative configurations potentially lead to a low mortality rate. Despite the difference in coverage values, each alternative path is sufficient to enable either a high or a low mortality rate. A region can have two sufficient configurations that lead to a particular outcome. Equifinality has practical implications: by managing the sufficient condition and configurations of conditions, there are opportunities to avoid high death rates or maintain a low death rate.

The last important finding is asymmetric causality (for further explanation, see: Fiss, Marx and Cambre´, 2013), i.e., that the conditions explaining the occurrence of an outcome are irreversible and do not have the same and opposite effects to enable a contrary outcome. This asymmetrical connection is different from traditional correlational approaches that commonly assume symmetrical relations–that each independent variable's influence is equal to the opposite effect of the contrary one. As can be concluded from this study, a high government's ability to control the spread of the virus is necessary and sufficient for the low fatality rate. However, the opposite condition is only the necessary but not sufficient to cause a high death rate. The condition can only lead to high fatality rates when combined with other particular conditions. A low level of community compliance with restrictive policies is the most likely pair (compared to two other alternatives). Therefore, it is necessary to pay extra attention to those sets in dealing with the COVID-19 pandemic.

Changes in conditions, especially the necessary and sufficient ones, have implications for changes in mortality rates. In Indonesia, provinces like Yogyakarta, Aceh, Lampung, NTB, and Riau, which had low mortality rates during the initial COVID-19 wave, experienced a shift to high mortality in the second wave (July-August 2021). This shift was due to changes in local conditions that became both necessary and sufficient for an increase in the death rate. The first four provinces mentioned were categorized as provinces with a high level of vulnerability due to the number of elderly and sick populations. A drastic increase in COVID-19 deaths in those provinces during the second wave was inevitable because the ability of local government to control the spread of the disease had declined (https://covid19.go.id/).

This condition combined with the decreasing level of citizen compliance with health protocols, as this study found based on the first wave cases, has become an alternative track to a high death rate in these provinces, including Riau. This does not indicate a weakness in the QCA results, but confirms the theories (that emerged from the analysis) in predicting set relations, including the occurrence of changes in outcomes due to changes in condition configuration.

By considering the most critical sets, we highlight two practical implications for Indonesia and other countries to deal with the long COVID-19 pandemic or similar disasters in the future. First, governments must develop sound public healthcare policies to control the spread of the disease. To be effective, a sound policy should be clear, consistently targeted through adaptive efforts in implementation, and continuously evaluated to make adjustments to the policy based on current evidence. Furthermore, such restriction measures and public health policies must influence people's perceptions and shape their behaviors to learn, adapt, and survive in the crisis triggered by the pandemic. To suppress the increase in new positive cases, the government needs to institutionalize 'new living traditions' through regulatory, structural, and coercive mechanisms. To achieve community compliance, it is not enough to simply enact regulations; it must be complemented by a system of rewards and punishments. Sound policies can be an effective instrument for such institutional measures.

Second, when such sound policies are absent, the level of obedience of the community is the key to a high or low fatality rate, which can be avoided if the community had a high level of awareness and willingness to limit mobility, minimize activities in public places, and apply health protocols in a disciplined manner. Although their existence is very crucial, the lack of a sound policy will not lead to a high mortality rate if their essential role in shaping positive behaviors of the community to coexist with the pandemic can be handled by other institutional actors, such as higher education institutions, faith-based organizations or community organizers.

The "normal" perceptions, habits, routines and behaviors to live in a pandemic world can be institutionalized not only through regulatory mechanisms (e.g., rules or laws), but also through normative and cultural-cognitive mechanisms, such as collective actions and positive framings (Scott, 2014). Through formal and informal education, both government and non-governmental actors should consistently promote healthy and productive ways of living during the pandemic. Such collective actions can instill cognitive awareness so that the wider community can culturally accept and practice the new habits.

However, the research has its limitations. First, given the policies adopted, the QCA results can only generally apply to Indonesian regions or countries that follow a similar approach, balancing public health and economic safety. In the case of Indonesia, such an approach is manifested in the role of the central government, which allows or prohibits local governments to carry out tighter restrictions. Second, observation conducted by this research study focuses on the provincial level and therefore tends to ignore variations in each district of the provinces. Therefore, future studies could be conducted at the district level representing urban and rural areas in each province. Alternatively, further studies could add a condition reflecting a regional characteristic such as population density. Third, the study was conducted in the early phase of the pandemic when vaccines were still unavailable.

As there is a high degree of variations between the regions, it would be useful to include vaccination coverage as an additional condition in the configurational analysis conducted in relation to the subsequent waves unfolding throughout the course of the pandemic.

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