THE COVID-19 LOCKDOWN EFFECTS ON MENTAL WELL-BEING AND RELIGIOSITY: EVIDENCE FROM INDONESIA

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ABSTRACT

We investigate the effects of COVID-19 lockdowns on frequency of online search on mental well-being and religiosity-related terms in Indonesia using high-frequency data from Google Trends and Bank Indonesia Consumer Survey from January 1st, 2018, to February 28th, 2021. Monthly search terms and consumer survey data are merged at the provincial level, which results in a total of 131,300 individual observations. Using event analysis and instrumental variable approaches, our study suggests that lockdown policy is significantly associated with higher search intensity of mental well-being and religiosity-related terms compared to the pre-lockdown period. Our findings suggest that mentally disturbed people tend to lean on religion to cope with stressful events during a crisis. Our study has substantial policy implications on ensuring appropriate government interventions that minimize the detrimental effect of COVID-19 on mental well-being.

I. INTRODUCTION

The COVID-19 crisis caused by the SARS-CoV-2 virus was sudden and affected the world. In March 2020, WHO announced the pandemic and not long after, issued social distancing measures as well as enforced health protocols to slow down the increase in active cases. These protocols extend to social measures, including closing schools and offices, restricting large-size gatherings, instructing to shelter-in-place, imposing travel bans, and prohibiting minor commercial activity.[1] The repercussions of these measures greatly shock the economy and other parts of society (Brodeur, Gray, et al., 2021; Flor et al., 2022; Nicola et al., 2020).

Like many other countries, Indonesia is no exception. To keep the virus from spreading, the Indonesia Government announced the instructions for stay-at-home and social restrictions as of March 15th, 2020, then followed by large-scale social restrictions (*Pembatasan Sosial Berskala Besar*) at the provincial level. Thereby, economic activity is halted massively, and people are instructed not to go out unless the matter is urgent. Studies have suggested that COVID-19 has lowered household income and consumption (Ridhwan et al., 2023a), negatively affected the labor market (Ridhwan et al., 2023a, 2023b), and increased poverty (Suryahadi et al., 2021).

The consequences of the pandemic are not only limited to the economy but also the mental well-being of the people who must stay at home for an unknown period (Moreno et al., 2020). A previous study on the prevalence and burden estimates of mental disorders reports that there had been no global evidence of a burden decrease since 1990, and mental illness continues to be among the top ten primary sources of global burden (GBS 2019 Mental Disorders Collaborators, 2022). These raise questions on whether the pandemic worsens people's mental condition. In reciprocation, existing evidence reveals that the uncertainty and isolation following the pandemic heighten depressive symptoms, anxiety, post-traumatic stress disorder (PTSD), and other psychological stress in general populations, college students, and even health workers (Aymerich et al., 2022; Leung et al., 2022; Li et al., 2021; Xiong et al., 2020). The effects are also heterogeneous by subgroups, for example, age, gender, educational background, and region.

In addition, previous studies on the relationship between mental well-being and religious affiliation provide various results. Aksoy et al. (2021) find that Christians have higher mental well-being scores in comparison to Muslims, although it is probably due to the latter group being a minority, hence is prone to discrimination (Helbling, 2014; Jordanova et al., 2015; Wallace et al., 2016), and is likely suffering from socioeconomic disadvantages (Louise, 2016). Other researches are also adjacent to these findings (Ngamaba & Soni, 2018; Rözer & Kraaykamp, 2013). In other words, distinctive religious affiliations may result in different mental well-being states. This background supports the suspicion that the association between religious affiliation and mental well-being is context-dependent (Aksoy et al., 2021). Nevertheless, there is a lack of comprehensive studies that analyze the effects of COVID-19 on mental well-being and religiosity in Indonesia. It is then important to provide empirical evidence on the relationship

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1 See study by Cucinotta and Vanelli (2020) that has documented WHO responses to the COVID-19 pandemic.

between COVID-19, mental well-being, and religiosity in Indonesia, the world's largest Muslim country.[2] Therefore, this study offers a fascinating context, which makes this study a significant contributor to the literature.

This study fills the literature gap by conducting the event study and Two-Stage Least Squares (TSLS) analyses to examine the impact of the COVID-19 lockdown on mental well-being and religiosity in Indonesia. We use Google Search Volume Indexes (SVIs) as the measure of mental well-being and religiosity (Bentzen, 2021; Brodeur, Clark, et al., 2021; Karagöl & Törenli Kaya, 2022; Knipe et al., 2021; Lemoine et al., 2022; Shawcroft et al., 2022; Silverio-Murillo et al., 2021). We construct an event analysis following the study from Brodeur, Clark, et al. (2021) to analyze the dynamic impacts of the lockdown announcement on mental well-being and religiosity. The SVIs are then combined with Bank Indonesia Consumer Survey data to capture the financial situations of Indonesian households. We use the average active cases per month as an instrument of lockdowns, following the approach of Coibion et al. (2020). Since the lockdown implementations in Indonesia are varied across the province, these variations allow us to estimate the impact of lockdowns as the main independent variable on our outcome variables. The provincial lockdowns are employed in the baseline estimate, whereas lockdowns duration is used as an alternative independent variable in our robustness check for TSLS, following the approach of Ridhwan et al. (2023a).

This study contributes to the literature in several ways: first, this study provides an estimated association between COVID-19, mental well-being, and religiosity in the most Muslim-populated country. Second, the use of novel and high-frequency data from the Google SVIs to measure mental health and religiosity indicators. SVIs are known for their large-scale representation (Ginsberg et al., 2009) and can be used to study various events, policies, and economic indicators, especially when administrative or survey data are not timely available (Caperna et al., 2022). Third, this study provides heterogeneous impacts of lockdown by demographic groups (i.e., based on the share of the Muslim population and the Mosque proportion). Four, this study may help us understand whether religion plays a pivotal role in reducing the negative impact of lockdown policies on mental well-being. Additionally, this provides evidence that religious affiliation and mental well-being are context-dependent.

The rest of the paper is organized as follows. Section 2 discusses the literature review on mental health and religiosity measures using Google Trends and how COVID-19 affects mental health and religiosity. Section 3 covers the data and methodology used in this study. Section 4 discusses the results and findings. Lastly, Section 5 provides conclusion, policy implications, limitations of this study, and direction for future research.

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2 It is estimated that in 2021, there were 231 million Muslims in Indonesia. Followed by Pakistan with 212 million Muslims. See https://worldpopulationreview.com/country-rankings/muslim-population-by-country for further information.

II. LITERATURE REVIEW

To slow down the virus's spread, governments worldwide issued social distancing measures and lockdown strategies that confine individuals to stay at home. These strategies led to various effects following the public restriction during the COVID-19 pandemic, such as increased food prices and reduced dietary diversification (Matsungo & Chopera, 2020). A prior study also observes that the COVID-19 pandemic leads to lower household income and consumption in Indonesia (Ridhwan et al., 2023a). Moreover, several studies suggest that the pandemic also changes the emotional state and lifestyle of both parents and children (Fasano et al., 2021) and enhances the atmospheric environment (Kanniah et al., 2020).

When associated with mental well-being, existing literature suggests that the lockdown is a significant predictor. Brodeur, Clark, et al. (2021) estimate the effects of the COVID-19 pandemic through lockdown policies in searches of well-being related-terms in the US and Europe. Evidence on the incremental searches for *boredom*, *sadness*, *loneliness*, and *worry* signal the negative impacts of public restrictions on people's mental well-being from the first few weeks. Similarly, Lemoine et al. (2022) use public restrictions during the early pandemic period to compare search trends before and after the COVID-19 outbreak in England. An increase in search terms *insomnia* and *difficulty falling asleep* are found in this study. This finding highlights the potential source of mental disruption during lockdown policy which comes from sleep deprivation, and calls for immediate measures to tackle sleep disturbances among those affected (Freeman et al., 2017).

The effects of lockdown are also seen across population subgroups. Using lockdown restrictions in 16 European countries, García-Prado et al. (2022) determine whether lockdown restrictions affect the psychological condition of the older generations. They discover mental degradation among the samples, denoted by insomnia, anxiety, and depression. The effect is substantial on women and those within the age group of 50 and 65. Contrastingly, younger generations in the UK are shown to be significantly affected by the lockdown policy, as estimates display a substantial magnitude of increased anxiety and depressive symptoms (Fancourt et al., 2021).

There are two, if not more, mechanisms that may explain lockdowns are responsible for mental deterioration. First, policies that confine individuals and limit their mobility to conduct social interactions will increase health risks. Humans' well-being depends on social relationships (Steptoe et al., 2013); hence, restricting social activity leads to isolation and loneliness, which consequently hampers individuals' psychological departments. Second, previous literature shows that lockdown disrupts microeconomic conditions through the fall in household income (Ridhwan et al., 2023a). In their longitudinal study, Sareen et al. (2011) argue that reduced household income is linked to an increased incidence of mental illness, and having disadvantages in wealth is associated with mental disorders and attempts to suicide. Older women experience the most prominent outcome of this relationship, and the effect is heterogeneous across educational backgrounds (Golberstein, 2015). Therefore, a decline in household income likely contributes to psychological decay.

Under difficult situations, people tend to turn to religion for solace and explanation (Bentzen, 2021). Religion may favor mental health by reducing emotional stress caused by the outbreak, but religion can also interfere with religious communities owing to lockdown policies that prohibit mass religious gatherings. In social scientific studies, various studies provide several measures of religiosity, such as religious affiliation, religious belief, religious salience, frequency of religious service attendance, and frequency of prayer (Pearce et al., 2017). Previous studies suggest that SVIs of religious-related terms reflect religiosity measures (Yeung, 2019; Bentzen, 2021). Bentzen (2021) finds that Google searches for *prayer* in 107 countries increased significantly during the pandemic. Google searches for *prayer* become a sign that peoples' interest in prayer is increasing, with a considerable rise reported in the group with high religiosity and for all types of religion, except Buddhism. These findings suggest that global religiosity has grown as a corollary of the pandemic (Bentzen, 2021).

Furthermore, a prior study shows that religion has a beneficial influence on dealing with mental health during COVID-19 (Pirutinsky et al., 2020; Schwalm et al., 2022; Shadmi et al., 2020; Walsh, 2020). However, the effect of COVID-19 differs greatly depending on whether the population is a majority or minority religious group (Shadmi et al., 2020). In contrast, some research has led to findings that contradict the consensus results. According to Panico et al. (2022), the impacts of religiosity may shift when confronted with a crisis circumstance, such as the COVID-19 pandemic. Depending on people's beliefs, religion may have a beneficial or detrimental impact on their mental health (Baetz & Toews, 2009; James & Wells, 2003). Individuals with strong religiosity have more control and are better able to cope with stressful situations than those with weak religiosity (Wachholtz et al., 2007). To address these issues, this study attempts to provide evidence that mental well-being and religious affiliation are context-dependent by analyzing the consequences of the COVID-19 lockdown on mental well-being and religiosity in the context of a Muslim-majority country using Google SVIs.

III. METHODOLOGY
3.1. Data
We employ numerous data sources to examine the impact of COVID-19 lockdowns on mental well-being and religiosity-related search terms in Indonesia. We obtain SVIs from Google Trends specifically used to quantify the search popularity of mental well-being and religiosity-related terms. Second, we utilize monthly data from the Bank Indonesia Consumer Survey (BI-CS) to obtain the income and characteristics of households. Finally, we gather Indonesian COVID-19 data, which we subsequently use as an instrument for lockdown in our study. All these data are collected from January 1st, 2018, to February 28th, 2021. Monthly Google Trends data, BI-CS data, and Indonesian COVID-19 data are merged at the provincial level, which results in a total of 131,300 individual observations.

3.1.1. Google Trends

Google Trends provides data regarding its users' search requests in the Google search engine. The data are in the form of SVIs by a query over a specified period in a given geographical area.[3] The daily search results are normalized based on the time and location and then scaled on a range of 0 to 100, known as SVI, where 0 represents the fewest and 100 represents the most searches for the query on that given time and location. Google Trends provides the SVIs of search terms or topic queries. The search term query contains the exact search words entered by users into the Google search engine, whereas the topic query contains several search terms that might be ascribed to a specific semantic domain.

Google Trends data have numerous advantages over survey data, including they capture the behaviors of all Google Search users, do not suffer from interviewer biases, and are less susceptible to small-sample bias (Brodeur, Clark, et al., 2021). As a result, Google Trends data have been used extensively in various recent studies. For instance, SVIs are used to evaluate the impact of lockdowns on well-being (Brodeur, Clark, et al., 2021), examine the level of economic anxiety (Fetzer et al., 2021), and the employment expectations during the pandemic (Simionescu & Raišienė, 2021). Another study uses topics and search term queries to construct a search-based unemployment index (Caperna et al., 2022). Lastly, Google searches for *prayer* are used to reflect the peoples' interest in prayer during COVID-19 (Bentzen, 2021).

For our study, we examine the impact of lockdowns on mental well-being and religiosity in the context of Indonesia. We decide to use search terms because they represent associated mental well-being and religiosity-related terms in their native languages. We select five mental well-being related search-terms based on the following literature: "*insomnia*" [insomnia], "*putus asa*" [hopelessness], "*cemas*" [anxiety], "*mudah marah*" [irritability], and "*panik*" [panic], (Brodeur, Clark, et al., 2021; Karagöl & Törenli Kaya, 2022; Knipe et al., 2021; Lemoine et al., 2022; Shawcroft et al., 2022; Silverio-Murillo et al., 2021). For religiosity, we use a measure using the keyword of *"beribadah"* [prayer] (Bentzen, 2021). We gather SVIs data from 12 provinces in Indonesia (i.e., DKI Jakarta, West Java, Central Java, East Java, Banten, North Sumatera, South Sumatera, West Sumatera, West Kalimantan, East Kalimantan, South Kalimantan, and South Sulawesi) based on internet users' proportion and the total population, where these 12 provinces' total population in 2020 is around 74% of the total population in Indonesia.[4]

The Google Trends data were retrieved on September 27th, 2022, with the data period of January 1st, 2019, to August 31st, 2020, and January 1st, 2018, to February 28th, 2021. The first data period is used to assess whether the lockdown announcement in Indonesia led to changes in mental well-being and religiosity using event study analysis. The second data period is used to analyze the association between COVID-19 through lockdown implementation on mental well-being and religiosity using TSLS. All search terms are retrieved as individual searches.

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3 Further details, see: https://trends.google.com/trends/

4 Data from Statistics Indonesia *(Badan Pusat Statistik,* BPS) (2020). https://www.bps.go.id/indicator/12/1886/1/jumlah-penduduk-hasil-proyeksi-menurut-provinsi-dan-jenis-kelamin.html; and https://www.bps.go.id/indicator/27/1225/1/proporsi-individu-yang-menggunakan-internet-menurut-provinsi.html (accessed: August 8th, 2022).

Since daily SVIs can be obtained only for periods less than nine months and up to thirty-six hours preceding the search request, we gathered daily data separately between January 1st to August 31st, 2019, and January 1st to August 31st, 2020. We chose this period to evaluate changes in search popularity during the lockdown announcement at the beginning of the COVID-19 pandemic. The psychological impact of the lockdown may have evolved as soon as the instruction was made public. As the daily data in 2019 and 2020 are collected from different retrieval, the resulting SVIs in these two periods are not comparable. Thus, following the study of Brodeur, Clark, et al. (2021), we rescale the daily data for each period by the search interest weights calculated using weekly data obtained over the entire period from January 1st, 2019, to August 31st, 2020.

We gather the daily SVI on day t in province p from January 1st to August 31st, 2019 ($D_{p,t,2019}$) and January 1st to August 31st, 2020 ($D_{p,t,2020}$), then aggregate them to calculate the weekly average SVI over each period (i.e., $\overline{D_{p,t,2019}}$ and $\overline{D_{p,t,2020}}$). By using the weekly data over the entire period from January 1st, 2019, to August 31st, 2020 ($\overline{D_{p,t,2019-2020}}$) the weekly search interest weights can be written as follows:

$$w_{p,2019} = \frac{\overline{D_{p,t,2019-2020}}}{\overline{D_{p,t,2019}}} \quad and \quad w_{p,2020} = \frac{\overline{D_{p,t,2019-2020}}}{\overline{D_{p,t,2020}}} \tag{1}$$

where $w_{p,2019}$ is search interest weights in province p for the 2019 period, $w_{p,2020}$ is search interest weights in province p for the 2020 period, $\overline{D_{p,t,2019}}$ is the weekly average SVI in province p for the 2019 period, $\overline{D_{p,t,2020}}$ is the weekly average SVI in province p for the 2020 period, and $\overline{D_{p,t,2019-2020}}$ is weekly data from January 1st, 2019, to August 31st, 2020.

By using these search interest weights, we rescale the daily data for each separate period, then combine and normalize it in a range of 0 to 100. Hence, the rescaled data can be written as follows:

$$\begin{aligned} D_{p,t,2019-2020} &= D_{p,t,2019} \times w_{p,2019} \quad in\ 2019 \\ D_{p,t,2019-2020} &= D_{p,t,2020} \times w_{p,2020} \quad in\ 2020 \\ D_{p,t,2019-2020*} &= \frac{D_{p,t,2019-2020}}{max\ (D_{p,t,2019-2020})} \times 100 \end{aligned} \tag{2}$$

where $D_{p,t,2019-2020*}$ is the daily rescaled data for the 2019 and 2020 periods in province p.

3.1.2. Bank Indonesia Consumer Survey (BI-CS)

BI-CS is a monthly survey conducted by Bank Indonesia since 1999 to capture consumer confidence, expectations, and financial situations.[5] The survey employs a stratified random sampling method and is conducted in the capital and major

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5 Bank Indonesia is the central bank of the Republic of Indonesia. The sample in BI-CS data is different in each survey. Therefore, we only have cross-sectional variation from the dataset.

cities throughout 18 provinces in Indonesia. These provinces include DKI Jakarta, West Java, East Java, Banten, Bangka Belitung, North Sumatera, South Sumatera, West Sumatera, Lampung, East Kalimantan, South Kalimantan, West Kalimantan, South Sulawesi, North Sulawesi, Bali, Maluku, and West Nusa Tenggara. In 2020, these 18 provinces' overall population accounted for about 83% of Indonesia's total population.[6]

For this study, we merge the monthly BI-CS data with monthly SVIs data at the province level from January 1st, 2018, to February 28th, 2021. The survey data variables which are used as control variables include the change of income compared to six months ago (i.e., discrete sequences ranging from -2 (representing a significant decrease) to +2 (representing a significant increase), and 0 representing the absence of changes) and the respondents' characteristics (i.e., sex, age, education attainment, job category, and work sector).

3.1.3. Indonesian COVID-19 and Lockdown Data

The Indonesian COVID-19 data utilized in this study are from the Indonesian National Board for Disaster Management (*Badan Nasional Penanggulangan Bencana*, BNPB), which contains daily active, death, and recovered COVID-19 cases throughout Indonesian provinces.[7] Data on average active cases per month are considered an instrument of COVID-19 lockdowns in our study, following the approach of Coibion et al. (2020). Moreover, Ridhwan et al. (2023a) validate using active cases as an instrument for COVID-19 lockdowns in the Indonesian context.

To mitigate the spread of Coronavirus, the President of Indonesia delivered a press statement regarding the handling of COVID-19 on March 15th, 2020. He requested the Indonesian people to work, study, worship at home, and practice social distancing.[8] This President's instruction is followed by Indonesian lockdowns permitted at the provincial level, known as *Pembatasan Sosial Skala Besar* (PSBB) or Large-Scale Social Restriction. However, some provinces have never implemented PSBB, such as West Kalimantan and East Kalimantan. Throughout the time, some provinces transitioned from PSBB to more lenient lockdowns, called PSBB *Transisi*. In early 2021, many provinces introduced PSBB at the district level, called *Pemberlakuan Pembatasan Kegiatan Masyarakat* (PPKM).

We compile lockdown statistics by summarizing online news about lockdowns for each province because there is no official data on lockdown history in Indonesia, and local regulations surrounding province lockdowns are publicly

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6 Data from Statistics Indonesia *(Badan Pusat Statistik,* BPS) (2020). https://www.bps.go.id/indicator/12/1886/1/jumlah-penduduk-hasil-proyeksi-menurut-provinsi-dan-jenis-kelamin.html (Accessed: August 8th, 2022).

7 The information can be accessed from https://bnpb-inacovid19.hub.arcgis.com/search?collection=Dataset

8 The Jakarta Post reports that President Joko Widodo is calling on all Indonesians to just stay home and practice social distancing. https://www.thejakartapost.com/news/2020/03/16/stay-home-president-says.html (Accessed: August 1st, 2022)

unavailable.[9] This data collection generates two variables: a provincial lockdown dummy that indicates if a province is under lockdown and the number of days a province is under lockdown in a particular month. The provincial lockdowns dummy is employed in the baseline estimate, whereas lockdowns duration is used as an alternative independent variable in our robustness check. The lockdown implementations are varied across the province. Hence, these variations allow us to estimate the impact of lockdowns on our outcome variables.

3.2. Identification Strategy
3.2.1. Event Analysis
We construct an event analysis to analyze the dynamic impacts of the lockdown announcement (Brodeur, Clark, et al., 2021; Silverio-Murillo et al., 2021). The event study model can be written as follows:

$$Y_{p,t} = \sum_{m=-3}^{m=5} \alpha E_{m,t} \times Year_t + \sum_{m=-3}^{m=5} \beta E_{m,t} + \gamma X_{p,t-1} + \theta_p + \mu_t + \epsilon_{p,t} \tag{3}$$

where $E_{m,t}$ is a dummy variable for three months before the event of lockdown announcement and five months after the event of lockdown announcement in province p; $Year_t$ is the year of lockdown announcement; $X_{p,t-1}$ is the control for the lagged daily COVID-19 death in province p; θ_p is the province fixed effects; and μ_t is the time-fixed effects (i.e., year and month). The two months before the stay-at-home and lockdown announcement in Indonesia (both in 2019 and 2020) are used as the reference period when WHO declared a Public Health Emergency of International Concern (PHEIC).[10]

3.2.2. Two-Stage Least Squares (TSLS) Regression
In TSLS regression, we define lockdown as the lockdown implementation in the given province. To quantify the impact of lockdowns on outcomes, we must address numerous identification problems, such as lockdown implementations by the local government may be endogenous to local characteristics (e.g., awareness, health facilities), and there may also be concerns about the effectiveness of lockdown policies in their implementation (Ridhwan et al., 2023a). Although the use of Google Trends data presents several advantages, these data also suffer from drawbacks, such as we cannot assess the heterogeneous impacts of lockdown by demographic groups (Brodeur, Clark, et al., 2021) and only present an aggregate depiction of microdata behavior that is influenced by the country's internet penetration rate (Simionescu & Raišienė, 2021). Thus, we select the provinces based

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9 This was done by searching PSBB news for each province per month from March 2020 to February 2021, for example, "PSBB Jawa Timur Juni 2020". We also corroborate our search with the information retrieved from https://indonesien.ahk.de/en/infocenter/news/news-details/covid-19-developments-in-indonesia that compiles all the information about COVID-19 development in Indonesia.

10 WHO declaring COVID-19 as a Public Health Emergency of International Concern (PHEIC) on January 30th, 2020. https://www.who.int/emergencies/diseases/novel-coronavirus-2019.

on the proportion of internet users and the total population of those provinces and conduct a merging between monthly SVIs data with monthly BI-CS data at the province level.

Furthermore, there may be a selection issue on how lockdowns are proxied in our study; lockdowns may affect people's behavior without changing their mental health and religiosity, and other factors that might influence their Google search activity (e.g., access, preferences, habits). As a result, our findings should be interpreted as the impact of lockdowns on Google users' mental health rather than the effect on those with pre-pandemic mental health problems. Hence, estimating the influence of COVID-19 on our outcome variables using lockdowns may suffer from measurement error.

To mitigate these identification concerns, we employ a TSLS regression method with the following specifications:

$$Lockdown_{i,p,t} = \alpha' + \beta' ActiveCase_{i,p,t} + X'_{i,p,t} + \theta'_p + \mu'_t + \epsilon'_{i,p,t}$$
$$Y''_{i,p,t} = \alpha'' + \beta'' \widehat{Lockdown}_{i,p,t} + X''_{i,p,t} + \theta''_p + \mu''_t + \epsilon''_{i,p,t}$$

(4)

Where *i* is the index of households; *p* is province; *t* is the month; *Y* is the outcome variable (i.e., SVI related to mental well-being and religiosity); $Lockdown_{ipt}$ is a dummy variable that takes the value of 1 if a province *p*, where household *i* resides, is in a lockdown at time *t*, and 0 if otherwise; $ActiveCase_{ipt}$ is the active COVID-19 cases in province *p* at time *t*, which is used as the instrumental variable in this study, following the approach conducted by Coibion et al. (2020). The number of active cases has been used as the main indication by health officials in various countries to decide on the lockdown policy (Coibion et al., 2020). Thus, the lockdown implementations of each province are instrumented by active cases of the given province. The vector *X* includes a range of household characteristics (i.e., change of income, sex, age, education attainment, job category, and work sector); θ_p is the province fixed effects; and μ_t is the time effects. As lockdown policies are varied at the province level, we cluster the standard errors at this level.

In our robustness analysis, we use the length of the lockdown in days as an alternative independent variable. Finally, we analyze the possible heterogeneous impact of lockdowns across the Muslim population's share and Mosque proportion (the number of Mosques over the Muslim population in the particular province)[11]. Since the provinces included in this study are Muslim majority, we use the average Muslim population's share of 77% as the cutoff for evaluating the heterogeneity across the different populations of the religious groups (i.e., the majority group population's share below 77% and majority group population's share above 77%). The lower share of the Muslim population also refers to the higher share of the non-Muslim population, the minority religious group in our context. For the Mosque proportion, we use the median of the national Mosque proportion as the cutoff value for grouping (i.e., lower Mosque proportion—below the median, and higher Mosque proportion—above the median).

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11 The information can be accessed from https://data.kemenag.go.id/statistik/agama/umat/agama and https://data.kemenag.go.id/statistik/agama/masjid/tipologi (Accessed: August 1st, 2022)

IV. RESULTS AND ANALYSIS

4.1. Descriptive Statistics

Table A.1 in the Appendix shows the summary statistics of the variables used in this study. Panel A shows the key statistics for our main independent variables. The mean of the dummy lockdown variable is 0.14, meaning that 14% of the data sample carried out lockdowns. With a relatively high standard deviation, the implementation of lockdowns is varied by time and province. Furthermore, the average length of lockdown is 3.15 days. This variable also has a high standard deviation, suggesting a high variation of lockdown days across provinces. Daily active cases are 1,311.04 on average, with a standard deviation of 4,311.87. Since the standard deviation of daily active cases is relatively high, the variations of daily cases are also high, and hence showing the relevance of the instrument used in this study.

Panel B shows the key statistics of our dependent variables. The average search volume index for *insomnia* is 37.65, with a standard deviation of 15.91. Furthermore, the mean for *hopelessness* is 26.21, with a standard deviation of 16.12. Search intensity for *anxiety* is 29.80 on average, with a standard deviation of 18.50. *Irritability* has the lowest average search volume index among all dependent variables, which is 12.42, with 10.48 standard deviations. Lastly, the search intensity for *panic* is 15.23 on average, with a standard deviation of 11.91. From this panel, *insomnia* has the highest average. It indicates that people searched for the word *insomnia* the most during the pandemic, followed by the keywords *anxiety* and *hopelessness*.

Panel C displays the summary statistics of the control variables. The mean for change in income is -0.02, meaning that there is a decrease in income experienced by the households. Approximately 48% of this sample is male, while the rest 52% is female. On average, the sample's age is 35.95 years old. Moreover, the summary statistics reported that 66% of this sample are high school graduates, while 32% are diploma/bachelor graduates. Only 2% of this sample get their Master's or Doctoral's degree. Lastly, the sample is dominated by 64% of informal workers. There is only 34% of formal workers in this sample.

4.2. Event Analysis

We conduct an event analysis to document how the search volume index is affected by the lockdown policy in Indonesia. The first president's announcement about the stay-at-home and lockdown instructions will be the main determinant of the search volume index. Figure 1 shows the search intensity of keywords related to mental well-being and religiosity before and after the COVID-19 pandemic. The results show that *insomnia, panic,* and *prayer* experience an immediate jolt, unlike *hopelessness* and *anxiety*, which take some time before their search intensity increase. Meanwhile, *irritability* does not show much change.

Well-being: insomnia

Well-being: hopelessness
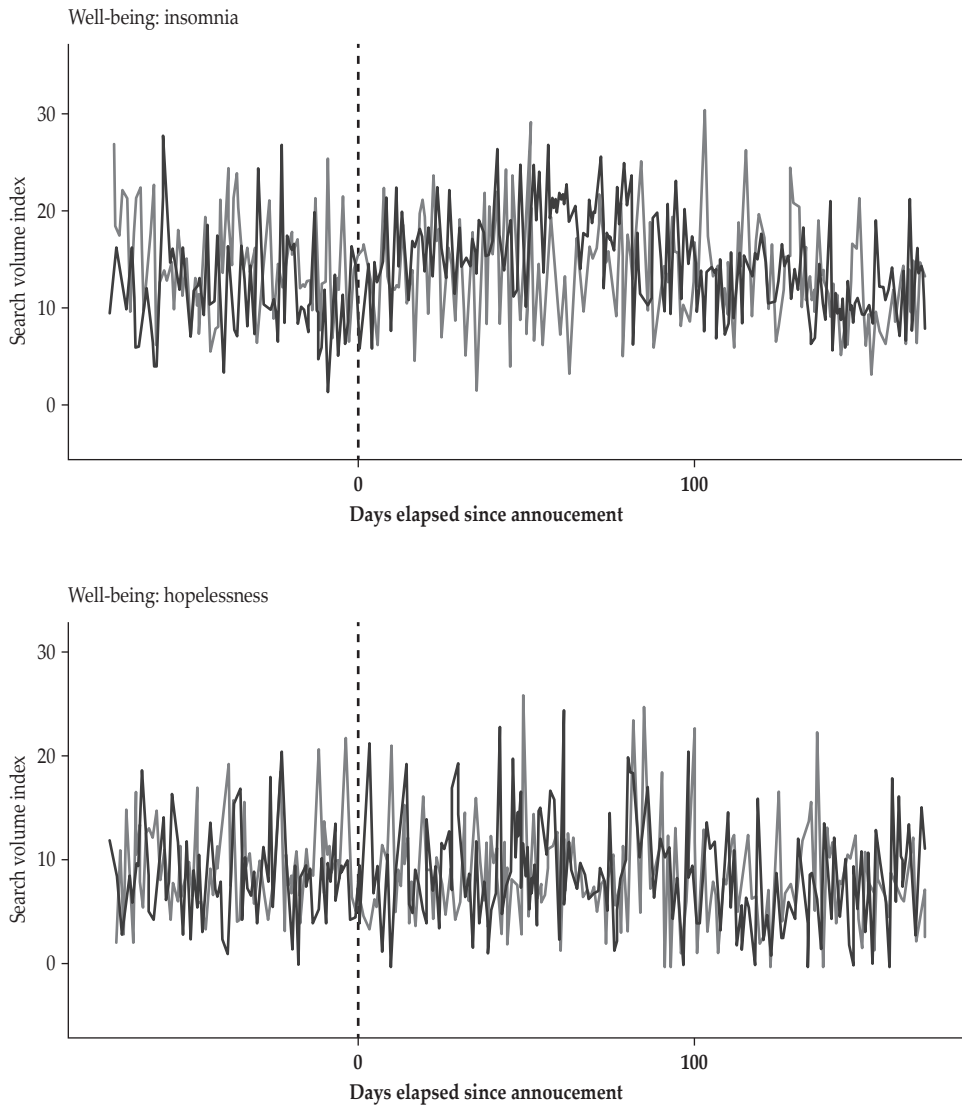
Note: Blue line is data in the 2020 period, and the grey line is data in the 2019 period as the counterfactual.

Figure 1.
Comparison of Search Terms Associated with Mental Well-being and Religiosity
Before and After the COVID-19 Pandemic

Well-being: anxiety

Well-being: irritability

Figure 1.
Comparison of Search Terms Associated with Mental Well-being and Religiosity
Before and After the COVID-19 Pandemic (Continued)

Well-being: panic

Religiosity: prayer
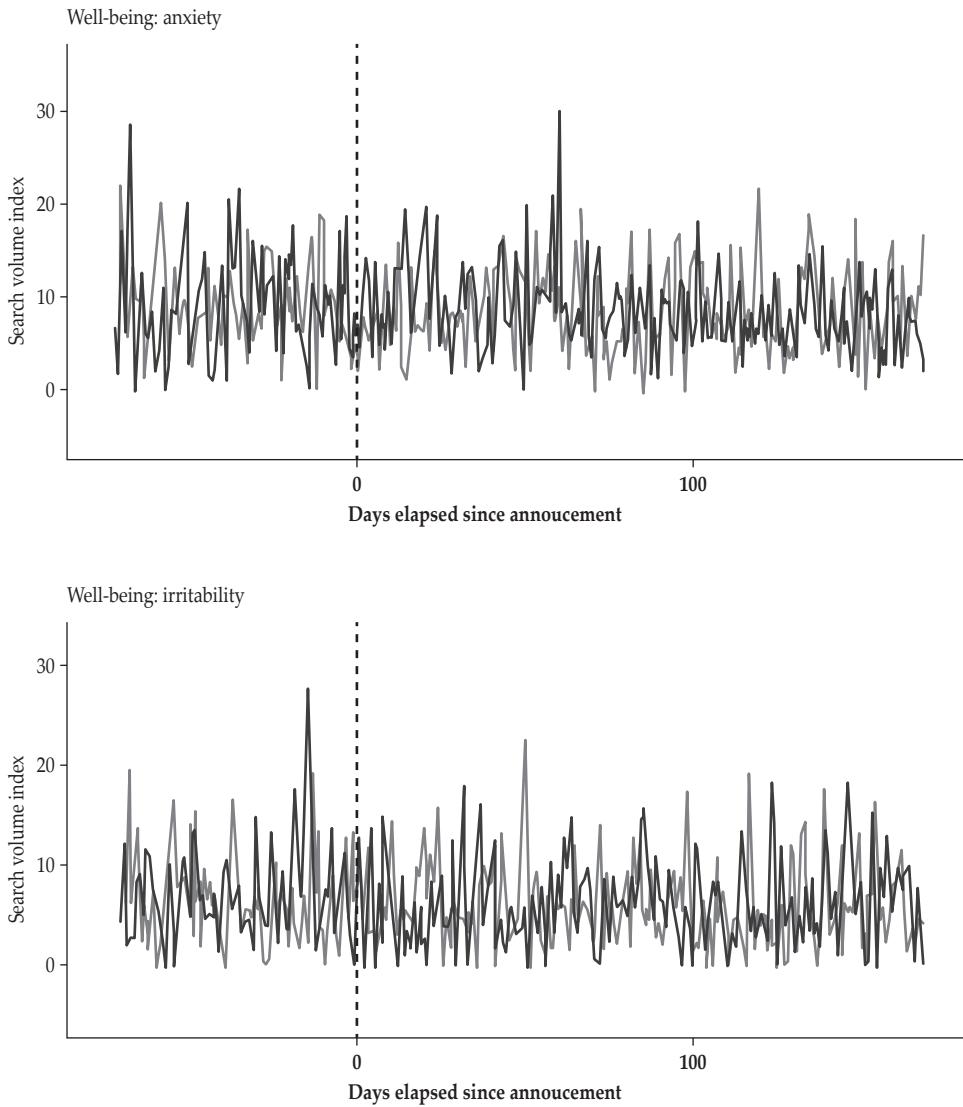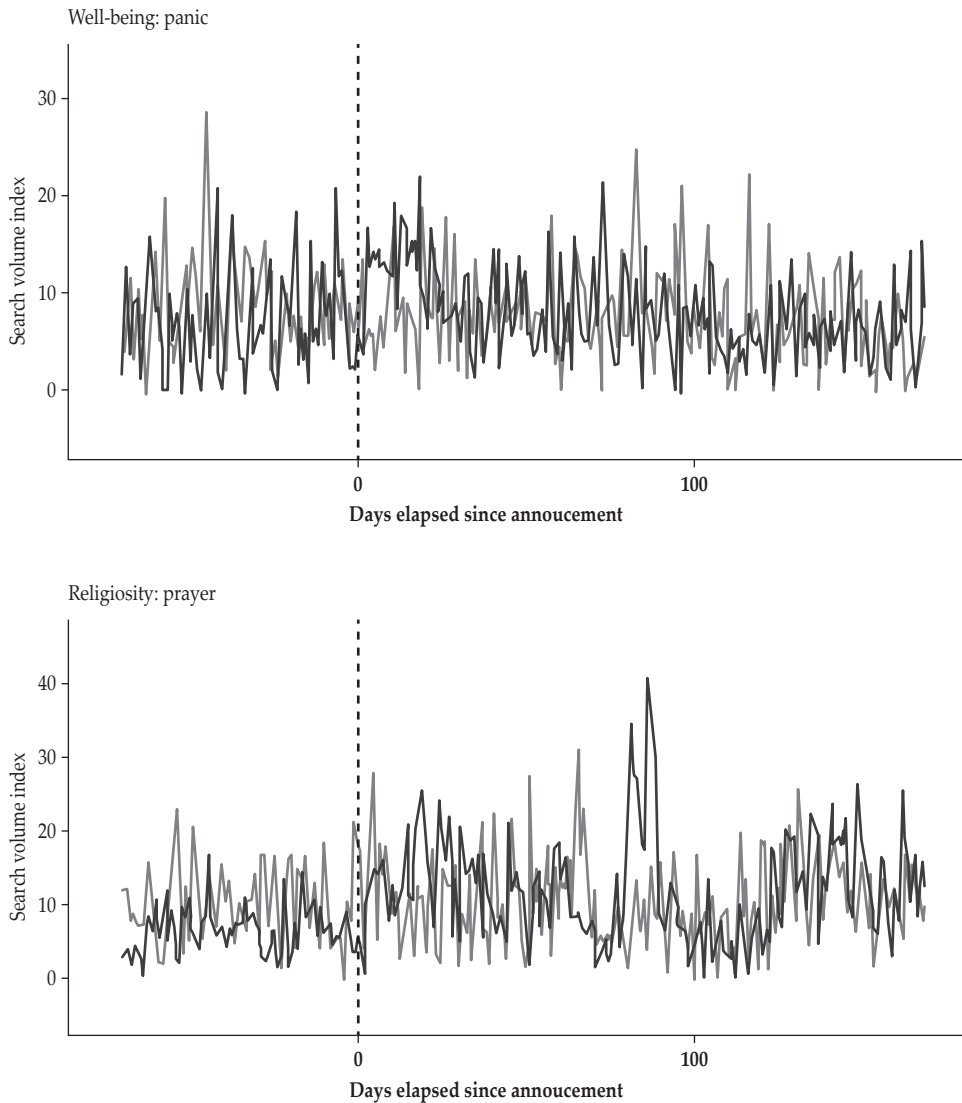
Figure 1.
Comparison of Search Terms Associated with Mental Well-being and Religiosity
Before and After the COVID-19 Pandemic (Continued)

Figure 2 shows the dynamic changes of the COVID-19 lockdown impact on well-being and religiosity. The existence of COVID-19 may have distorted people's mental well-being even before the lockdown order is announced. It can be seen by the increase of point index in all mental well-being keywords, particularly *insomnia* and *panic,* which show a significant increase after WHO declared a Public Health Emergency of International Concern (PHEIC) on January 30th, 2020. After the lockdown order is announced, some keyword search indexes, e.g., *insomnia*, *hopelessness*, and *prayer*, keep heightening. A prior study also note that mental well-

being might have been distorted before the stay-at-home order, and the lockdown policy exacerbated those conditions (Brodeur, Clark, et al., 2021). The finding of this study shows that the detrimental impacts are most apparent in the keyword *sadness* in western European and US samples. While in Indonesia, *insomnia* and *hopelessness* have the most recognizable increases.
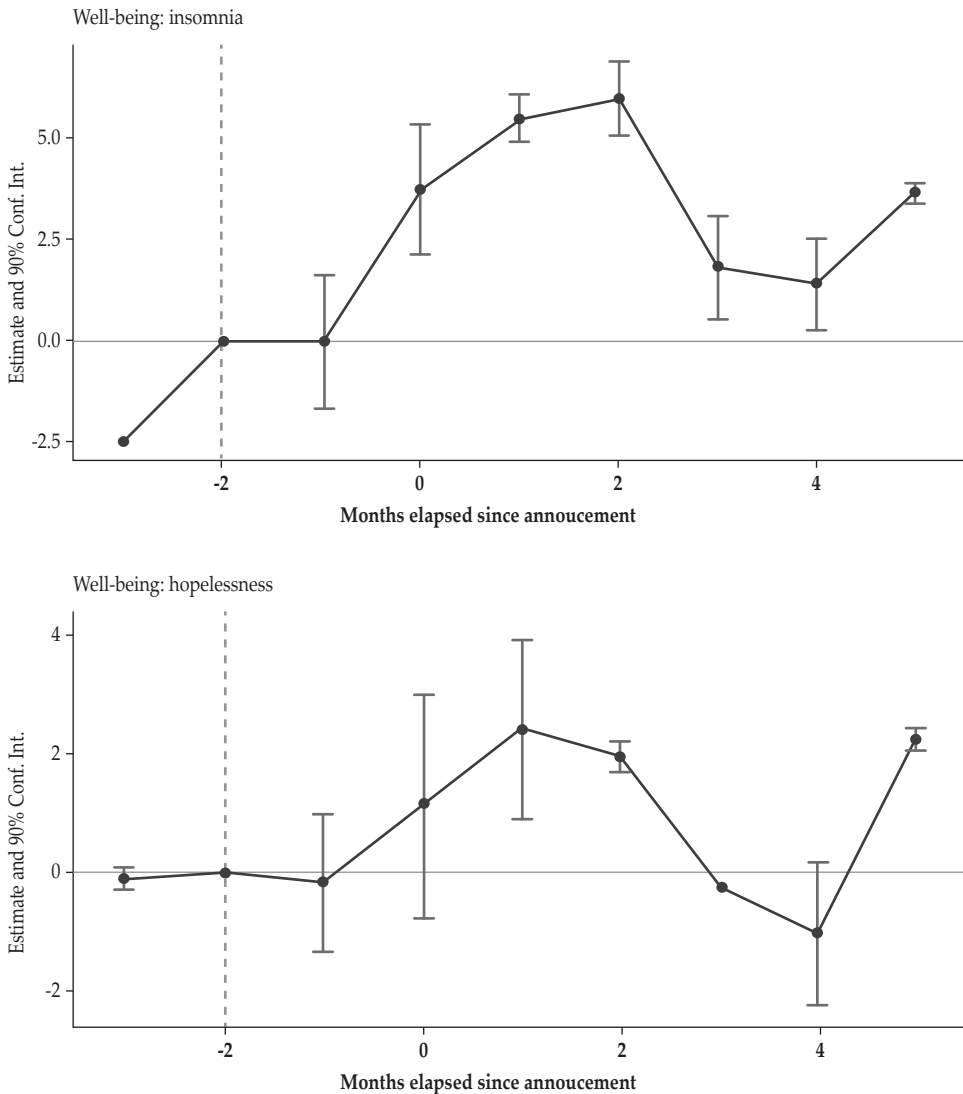
Note: Duration of the effects of the stay-at-home and lockdown announcement on keywords related to mental well-being and religiosity. The vertical axis shows event-study estimates using the 2019 period as the counterfactual. The two months before the stay-at-home and lockdown announcement (in 2019 or 2020) is the reference period when WHO declared a Public Health Emergency of International Concern (PHEIC). The models include dummies from three months before to five months after the stay-at-home and lockdown announcement. Controls: year and month fixed effects as well as the one-day lagged number of new deaths from COVID-19.

Figure 2.
People's Adaptation to the Stay-at-home and Lockdown Announcement
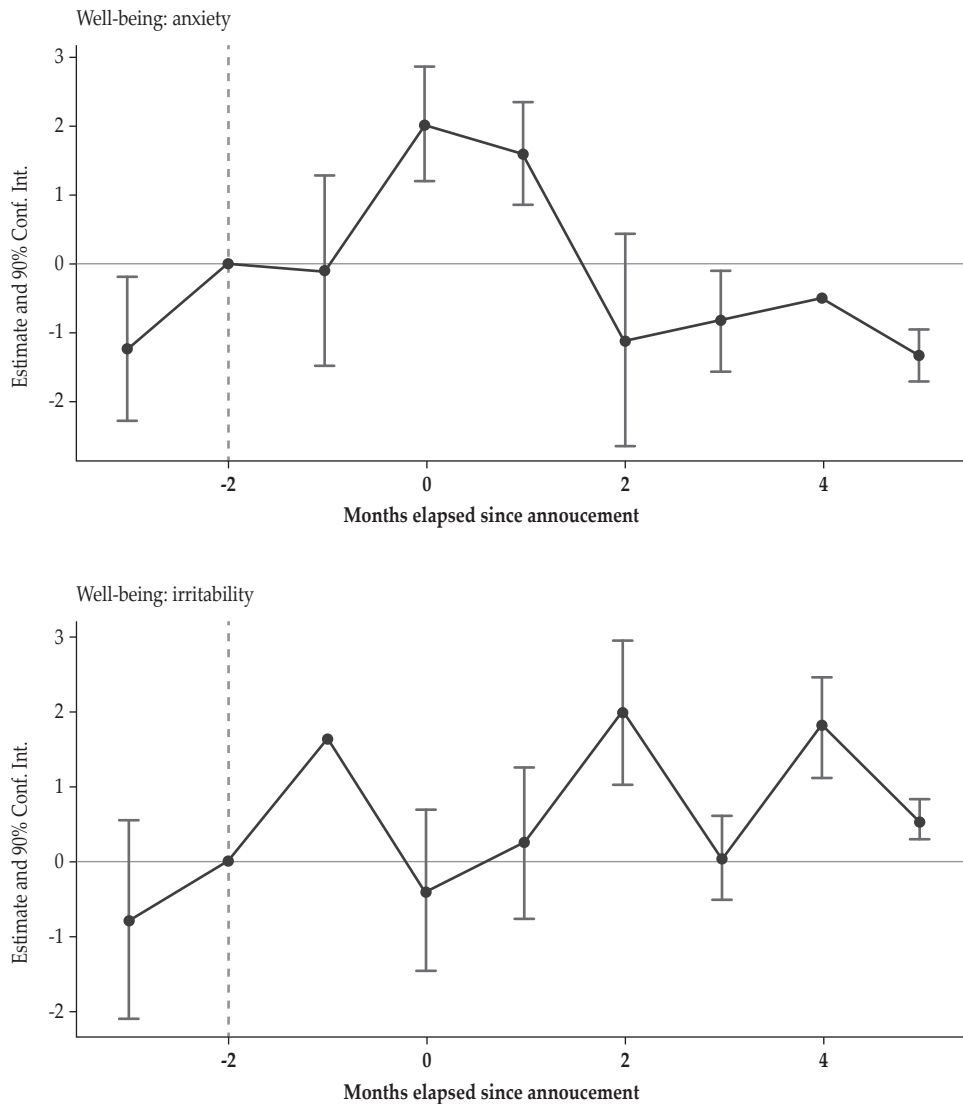
Well-being: anxiety

Well-being: irritability

Figure 2.
People's Adaptation to the Stay-at-home and Lockdown Announcement
(Continued)

Well-being: panic

Religiosity: pray
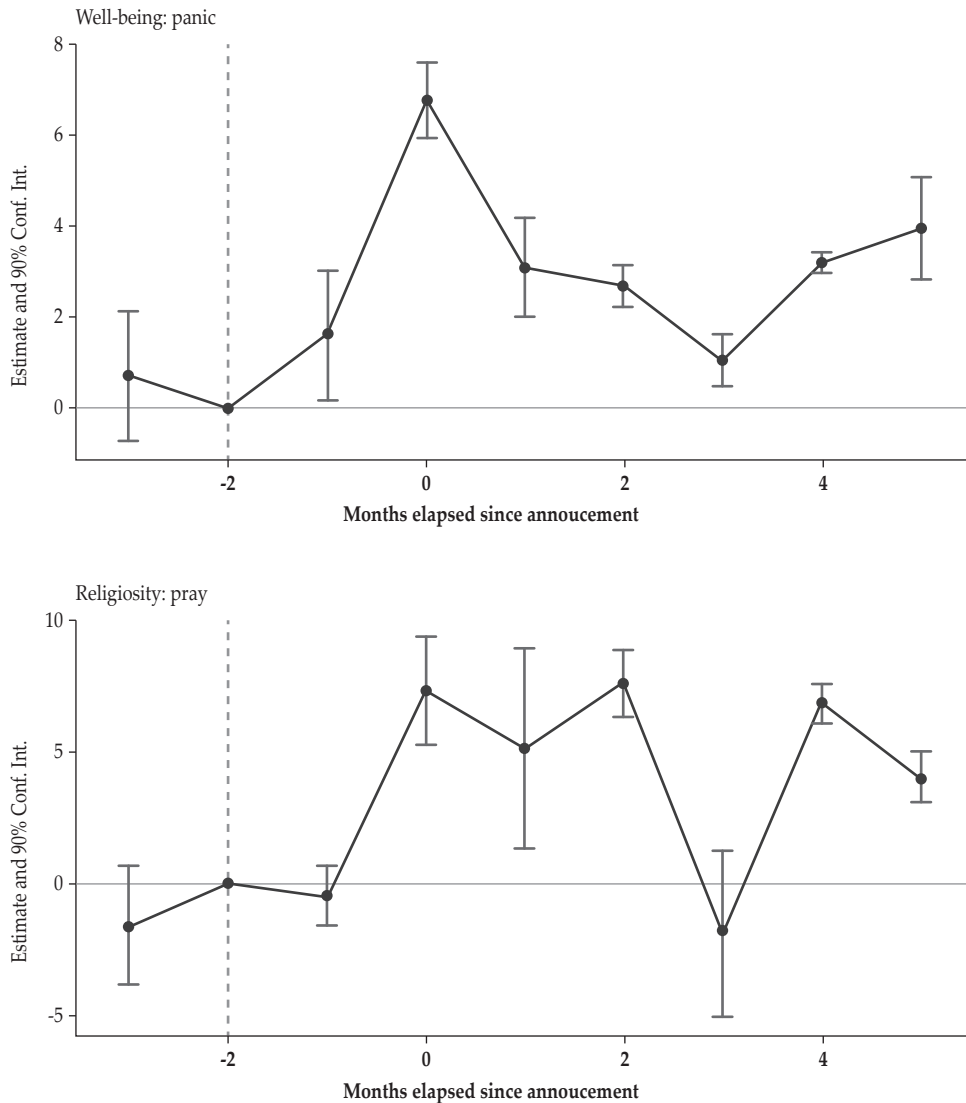
Figure 2.
People's Adaptation to the Stay-at-home and Lockdown Announcement
(Continued)

Our findings showed that staying at home because of the lockdown may have worsened people's mental health. In addition, the increasing searches for *prayer* become a sign of peoples' interest in prayer increasing during the pandemic. The study from Bentzen (2021) suggests that global religiosity has grown as a corollary of the pandemic. Nonetheless, some keywords decline after the lockdown announcement, e.g., *panic* and *anxiety*. It may be because the restlessness felt by society has calmed down a little bit as lockdowns are finally implemented after active cases heightened remarkably. Indonesia was reportedly late in implementing

lockdowns[12], in addition to little preparation for it. Although the declines only last for a while before they go up again.

4.3. Two-Stage Least Squares (TSLS) Results

The TSLS method is advantageous for tackling endogeneity and reverse causality issues. The use of TSLS is to resolve potential problems and minimize bias. Two assumptions ought to be fulfilled when using the TSLS method (Woolridge, 2016): 1) instrument exogeneity (exclusion restriction); and 2) instrument relevance. Following a study from Coibion et al. (2020), this research uses the number of active cases as the instrument.

The first assumption implies that the instrument does not affect the outcome directly because media is needed for active cases to possess partial effects on mental well-being and religiosity, which in this case is lockdowns. Previous studies have employed the number of active cases to decide on issuing a lockdown policy (Atalan, 2020; Coibion et al., 2020). However, other channels may be the medium effects of active cases on mental health. To ensure that lockdown is the only medium and to check the validity of active cases, this research conducts a validity test to examine if active cases satisfy the exclusion restriction assumption. The results are presented in Table A.4 in the Appendix. The exclusion restriction results show that the instrument is insignificant in all keywords. Therefore, the number of active cases is a valid instrument in explaining variations of lockdown policy on mental well-being and religiosity.

The second assumption is the relevance assumption. This assumption suggests that $cov(lockdown, number\ of\ COVID\text{-}19\ active\ cases) \neq 0$, which means that lockdown policy should be highly correlated with the instrument. It can be checked through the first-stage regression of TSLS. The results of relevance assumption fulfillment can be seen in Table A.5 in the Appendix. The table shows that the number of active areas is highly correlated with the lockdown dummy in both models. Adding some relevant covariates increases the adjusted R-squared in our first-stage regression. The results adequately suggest statistical evidence for the number of active cases as a good instrument for the variation of lockdowns in Indonesia.

Table 1 shows the impact of the COVID-19 lockdown on mental well-being and religiosity. Generally, a lockdown policy is a significant contributor to mental well-being (except for *irritability*) and religiosity. The effects of lockdown on search volume index *insomnia* are 10.969, significant at 0.01. This result is similar to previous studies with related context (Brodeur, Clark, et al., 2021; García-Prado et al., 2022; Lemoine et al., 2022; Silverio-Murillo et al., 2021). *Hopelessness* also shows a positive and significant result at 0.01 with coefficients of 9.275. The connection found in this study is shared with previous research by Shawcroft et al. (2022).

Similar to the studies by García-Prado et al. (2022) and Silverio-Murillo et al. (2021), our findings also show positive and significant results on *anxiety*. The estimate is 13.996, and it is significant at 0.01. However, as mentioned before, we do not find a significant relationship between lockdown policy and the search

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[12]See news from the National Geographic (2020): https://www.nationalgeographic.com/history/article/indonesia-government-slow-lock-down-people-took-charge

volume index for *irritability*. Brodeur, Clark, et al. (2021) also find that *irritability* is insignificantly affected by lockdowns in western European countries. Furthermore, *panic* also shows a significant result at 0.01, with a coefficient of 6.061. Among all keywords, *prayer* has the highest estimated effects: 32.927, significant at 0.01. This result confirms the findings from a survey of 34 countries by Tamir et al. (2020), which note that Indonesia is the most religious country in the world, alongside the Philippines. Moreover, global religiosity has grown, as Google searches for *prayer* in 107 countries increased significantly during the pandemic (Bentzen, 2021).

Table 1.
Impact of COVID-19 Lockdowns on Mental Well-being and Religiosity

	(1)	(2)	(3)	(4)
	OLS	TSLS	OLS	TSLS
Panel 1 Dependent Variable: Mental Well-being – Insomnia				
Dummy Lockdown	13.239***	11.770***	12.706***	10.969***
	(1.532)	(2.239)	(1.525)	(2.142)
Observation	131,300	131,300	131,300	131,300
Adj. R-squared	0.664	0.663	0.666	0.665
Kleibergen-Paap First-stage F-Stats		13.782		13.433
Panel 2 Dependent Variable: Mental Well-being – Hopelessness				
Dummy Lockdown	2.787	8.795*	2.684	9.275**
	(1.669)	(4.664)	(1.591)	(4.709)
Observation	131,300	131,300	131,300	131,300
Adj. R-squared	0.633	0.618	0.633	0.617
Kleibergen-Paap First-stage F-Stats		13.782		13.433
Panel 3 Dependent Variable: Mental Well-being – Anxiety				
Dummy Lockdown	10.103***	14.309***	9.569***	13.996***
	(1.588)	(1.013)	(1.620)	(1.013)
Observation	131,300	131,300	131,300	131,300
Adj. R-squared	0.724	0.718	0.725	0.719
Kleibergen-Paap First-stage F-Stats		13.782		13.433
Panel 4 Dependent Variable: Mental Well-being – Irritability				
Dummy Lockdown	0.845	6.048	0.873	6.601
	(1.279)	(4.130)	(1.180)	(4.293)
Observation	131,300	131,300	131,300	131,300
Adj. R-squared	0.269	0.243	0.270	0.241
Kleibergen-Paap First-stage F-Stats		13.782		13.433
Panel 5 Dependent Variable: Mental Well-being – Panic				
Dummy Lockdown	7.016***	6.622***	6.613***	6.061***
	(1.165)	(1.155)	(1.137)	(1.101)
Observation	131,300	131,300	131,300	131,300
Adj. R-squared	0.382	0.382	0.384	0.384
Kleibergen-Paap First-stage F-Stats		13.782		13.433

Table 1.
Impact of COVID-19 Lockdowns on Mental Well-being and Religiosity
(Continued)

	(1)	(2)	(3)	(4)
	OLS	TSLS	OLS	TSLS
Panel 6 Dependent Variable: Religiosity – Prayer				
Dummy Lockdown	19.206***	33.619***	17.537***	32.927***
	(1.938)	(6.001)	(2.015)	(5.654)
Observation	131,300	131,300	131,300	131,300
Adj. R-squared	0.362	0.215	0.391	0.236
Kleibergen-Paap First-stage F-Stats		13.782		13.433
Income	No	No	Yes	Yes
Covariates	No	No	Yes	Yes
Sector Dummies	No	No	Yes	Yes
Month Dummies	Yes	Yes	Yes	Yes
Province Dummies	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the province level in parentheses. The samples include 12 provinces in Indonesia, i.e., DKI Jakarta, West Java, Central Java, East Java, Banten, North Sumatera, South Sumatera, West Sumatera, West Kalimantan, South Kalimantan, East Kalimantan, and South Sulawesi. The dependent variable here is the search volume index of the selected search terms related to mental well-being and religiosity. The value of the dependent variable is between 0 and 100. The covariates are sex, age, education level, and job category. Dummy lockdown is instrumented by the number of active cases (in 000). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

When estimating the heterogeneous effects of lockdown policy on mental well-being and religiosity, we find that regions with a lower share of Muslim experience worse mental well-being (see Table A.2 in the Appendix). Significance and magnitude-wise, the impacts are more conspicuous in regions with a lower percentage of Muslim populations (or a higher percentage of non-Muslim as the minority religious group). The evidence can be obtained from the search volume index of *insomnia*, *hopelessness*, and *anxiety*. From these results, we can confirm that the impacts of lockdown are proportional to the density of certain groups in a population (Shadmi et al., 2020). A group of the majority experiences different COVID-19 effects as compared to minorities. As the largest of Muslim adherents in the world, Indonesia is a religiously diverse country and prides itself on religious tolerance. However, many Indonesians face religious discrimination (Colbran, 2010). Furthermore, Sumaktoyo (2020) finds that Indonesia's state discrimination level against religious minorities has become more restrictive over the last two decades than in most other Muslim countries. Several studies also document that some racial/ethnic minority groups are associated with poorer mental health (e.g., depression and anxiety) during the pandemic due to discrimination and minority stress (Jaspal & Lopes, 2021; Nguyen et al., 2022; Zhou et al., 2021).

Another possible explanation is related to the cultural characteristics of Indonesia. More than half of the Muslim adherents in Indonesia come from Java Island.[13] According to Indonesia's 2010 Population Census, Indonesia's population

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13 The information can be accessed from https://data.kemenag.go.id/statistik/agama/umat/agama (Accessed: August 1st, 2022)

is dominated by Javanese and Sundanese who come from Java Island. They account for 56% of the Indonesian population.[14] In a collective way, the Javanese hold strong cultural values and norms convictions that play a vital role in cultural communities (Rahiem & Rahim, 2021). These cultural values and norms encourage social relations, collective cognition, and behavioral equality, which can lead to the development of social capital (Herdaetha et al., 2021). Herdaetha et al. (2021) find that the interplay between social capital and Javanese cultural values positively affects mental health status. In addition, Rahiem & Rahim (2021) suggest that the involvement of cultural figures in the COVID-19 crisis responses should consider the population's cultural context.

Interestingly, when estimating the heterogeneous effects based on the percentage of the Muslim population, we also find that the coefficients of search volume index *prayer* are higher in regions with a low percentage of the majority group, those experiencing high levels of *insomnia*, *hopelessness*, and *anxiety*. A possible explanation is that mentally disturbed people tend to lean on religion to cope during uncertain times and stressful life events. The evidence is well-documented by AbdAleati et al. (2016) and Pirutinsky et al. (2020).

Furthermore, we also provide the heterogeneous religiosity effects of the lockdown policy on mental well-being and religiosity (see Table A.3 in the Appendix). From the results, it can be inferred that regions with fewer Mosques suffer from greater mental disturbances. The results are particularly obvious in the estimated effects on *anxiety*, *panic*, and *prayer*. Due to the restriction policy, people can barely go to public worshipping places because it is forbidden to do so. Consequently, people who live in the regions where Mosques are smaller in quantity will be more confined from praying. Although prayers can be done at home, worshipping places may increase the resilience of religion-affiliated people, as proven in a study by Schwalm et al. (2022), which finds a moderately positive relationship between religion and resilience. It might explain why people living in regions with fewer Mosques experience higher mental distortions.

Lastly, our study also runs a robustness check using the alternative specification of TSLS regression. As an alternative independent variable, we use the length of lockdown days and estimate its effect on mental well-being and religiosity (see Table A.6 in the Appendix). The alternate independent variable results are similar to those obtained with a dummy lockdown. It implies that our model is robust in estimating the relationship between COVID-19 with mental well-being and religiosity in Indonesia.

V. CONCLUSION AND RECOMMENDATION

Online search activities are gaining more attention to study phenomena for which timely and high-frequency data are not readily available. Using Google Trends search terms, we identify the search queries linked to the underlying phenomenon of interest. The lockdown policy is positively associated with search intensity of mental well-being and religiosity. We find that mental well-being might have been

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14Based on the publication of Statistics Indonesia *(Badan Pusat Statistik,* BPS): Kewarganegaraan, Suku Bangsa, Agama, dan Bahasa Sehari-hari Penduduk Indonesia – Hasil Sensus Penduduk 2010.

distorted before the stay-at-home order, and the lockdown policy exacerbated those conditions. However, people adapt to staying at home and social restriction policies, where the effect subsides as the pandemic continues. The lockdown policy significantly contributes to mental well-being (except for *irritability*) and religiosity. The impacts of lockdown on mental well-being (*insomnia*, *hopelessness*, and *anxiety*) are more notable in regions with a lower percentage of Muslim populations. In addition, regions with fewer Mosques suffer from higher mental disturbances (*anxiety* and *panic)*. However, search intensity for *prayer* is higher in regions with a lower percentage of the majority group. The findings suggest that the impacts of lockdown differ by the density of majority or minority groups. Furthermore, mentally disturbed people tend to lean on religion to cope with stressful events during a crisis.

Our study examining the effects of COVID-19 lockdowns on mental health and religiosity has important policy implications. Considering the importance of mental health for people and society, in times of unprecedented emergency conditions, the government could issue a less restrictive policy (e.g., travel bans across regions can be imposed instead of enforcing limitations on large gatherings and increasing testing and contact tracing to minimize deaths). The policy stringency is also associated with worse mental health (Aknin et al., 2022). Secondly, there is little support for and exposure to the needs of taking mental care in Indonesia. These are due to poor knowledge and misconceptions about mental health, frequently judged as 'not religious enough', and other detrimental stigmas (Putri et al., 2021). Therefore, providing access to information, developing a guidebook that sheds light on where to seek help, and enhancing the number of mental health facilities can help reduce the detrimental effects on mental health of the COVID-19 pandemic and similar negative events in the future.

This study provides clear evidence of a significant rise in search popularity of several search terms related to mental well-being and religiosity in the post-lockdown period. However, the impacts are only observed in a relatively short period. This finding indicates that people have become tired of the restrictions and adapted to current conditions. A prior study suggests that behavioral fatigue may arise when individuals are increasingly tired of self-regulating throughout time (Sibony, 2020). In particular, when various countries, including Indonesia, are experiencing several waves of the COVID-19 pandemic due to the virus mutation. Therefore, the government needs to emphasize the health benefits of the lockdown and ensure appropriate emergency government support during the pandemic to minimize potential social unrest.

This study suggests that Google Trends data available in a multi-language context can provide valuable insights following sudden shocks such as COVID-19. Moreover, web search data are relevant to study various events, policies, and economic indicators, especially when administrative or survey data are not timely available or comparable (Caperna et al., 2022). However, not without limitations, this study opens further research opportunities. First, estimating the influence of COVID-19 on our outcome variables using lockdowns may suffer from measurement errors due to several identification problems. For instance, lockdown implementations by the local government may be influenced by local characteristics, concerns about the effectiveness of the policy implementation, and

the fact that lockdown may affect people's behavior without changing their mental health and religiosity. Second, there may be a selection issue on how mental health and religiosity are proxied using Google Trends. Various factors might influence Google search activity, e.g., people's preferences, search habits, and internet access—search data only covers the society who have access to search engine platforms and may be influenced by regions' internet penetration rate. Thereby, our findings should be interpreted as the impact of lockdowns on Google users' mental health rather than the effect on those with pre-pandemic mental health problems. Lastly, this study only focuses on Indonesia as a developing country with the world's largest Muslim population. The selected keywords are limited and solely represent this country's public interests. Therefore, future studies can explore the impact of lockdowns on mental well-being and religiosity in other developing countries with different proxies of majority religion populations.

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APPENDIX

Table A.1
Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Panel A: Main Independent Variable					
Dummy lockdown	131,300	0.14	0.34	0.00	1.00
Length of lockdown	131,300	3.15	8.52	0.00	31.00
Active cases	131,300	1,311.04	4,131.87	0.00	44,527.54
Panel B: Dependent Variable					
Insomnia	131,300	37.65	15.91	0.00	92.60
Hopelessness	131,300	26.21	16.12	0.00	71.40
Anxiety	131,300	29.80	18.50	0.00	76.75
Irritability	131,300	12.42	10.48	0.00	50.60
Panic	131,300	15.23	11.91	0.00	82.60
Prayer	131,300	15.40	12.14	0.00	68.25
Panel C: Control Variable					
Change in income	131,300	-0.02	0.97	-2.00	2.00
Male	131,300	0.48	0.50	0.00	1.00
Female	131,300	0.52	0.50	0.00	1.00
Age	131,300	35.95	10.89	25.00	65.00
Senior high school	131,300	0.66	0.47	0.00	1.00
Diploma/Bachelor	131,300	0.32	0.47	0.00	1.00
Master/PhD	131,300	0.02	0.14	0.00	1.00
Formal	131,300	0.36	0.48	0.00	1.00
Informal	131,300	0.64	0.48	0.00	1.00

Table A.2
Heterogeneity Impact of COVID-19 Lockdown on Mental Health and Religiosity-related Terms based on a Share of the Majority Religious Group Population

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	TSLS	OLS	TSLS	OLS	TSLS	OLS	TSLS
	Share of Muslim population < 77%				Share of Muslim population > 77%			
Panel 1 Dependent Variable: Mental Well-being – Insomnia								
Dummy Lockdown	3.136	37.229***	2.414***	32.861***	13.609***	11.544***	13.213***	10.881***
	(0.802)	(0.130)	(0.019)	(2.251)	(1.520)	(2.201)	(1.437)	(2.150)
Observation	19,570	19,570	19,570	19,570	111,730	111,730	111,730	111,730
Adj. R-squared	0.703	0.582	0.714	0.618	0.651	0.649	0.652	0.650
Kleibergen-Paap First-stage F-Stats		207.395		152.556		13.724		13.325
Panel 2 Dependent Variable: Mental Well-being – Hopelessness								
Dummy Lockdown	-1.326	54.322***	-1.854	51.910***	2.969	8.045*	3.044*	8.715*
	(2.203)	(1.236)	(1.521)	(1.093)	(1.706)	(4.507)	(1.560)	(4.594)
Observation	19,570	19,570	19,570	19,570	111,730	111,730	111,730	111,730
Adj. R-squared	0.472	0.010	0.483	0.054	0.652	0.640	0.652	0.640
Kleibergen-Paap First-stage F-Stats		207.395		152.556		13.724		13.325
Panel 3 Dependent Variable: Mental Well-being – Anxiety								
Dummy Lockdown	7.432*	38.807***	6.869***	35.181***	10.393***	13.779***	9.972***	13.611***
	(0.649)	(3.175)	(0.029)	(0.847)	(1.683)	(0.900)	(1.694)	(0.971)
Observation	19,570	19,570	19,570	19,570	111,730	111,730	111,730	111,730
Adj. R-squared	0.482	0.339	0.494	0.379	0.731	0.727	0.731	0.727
Kleibergen-Paap First-stage F-Stats		207.395		152.556		13.724		13.325
Panel 4 Dependent Variable: Mental Well-being – Irritability								
Dummy Lockdown	-6.207	-26.151***	-5.985	-23.763***	1.198	6.390	1.117	6.872
	(1.414)	(0.122)	(1.451)	(0.912)	(1.281)	(4.195)	(1.175)	(4.354)
Observation	19,570	19,570	19,570	19,570	111,730	111,730	111,730	111,730
Adj. R-squared	0.219	0.095	0.234	0.135	0.295	0.268	0.296	0.265
Kleibergen-Paap First-stage F-Stats		207.395		152.556		13.724		13.325

Table A.2
Heterogeneity Impact of COVID-19 Lockdown on Mental Health and Religiosity-related Terms based on a Share of the Majority Religious Group Population (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	TSLS	OLS	TSLS	OLS	TSLS	OLS	TSLS
	Share of Muslim population < 77%				Share of Muslim population > 77%			
Panel 5 Dependent Variable: Mental Well-being – Panic								
Dummy Lockdown	1.315	4.249	1.332	5.396***	7.182***	6.698***	6.637***	5.993***
	(1.229)	(2.620)	(1.319)	(1.797)	(1.165)	(1.186)	(1.153)	(1.137)
Observation	19,570	19,570	19,570	19,570	111,730	111,730	111,730	111,730
Adj. R-squared	0.299	0.296	0.302	0.297	0.408	0.408	0.411	0.411
Kleibergen-Paap First-stage F-Stats		207.395		152.556		13.724		13.325
Panel 6 Dependent Variable: Religiosity – Prayer								
Dummy Lockdown	15.700**	78.577***	14.577**	69.245***	19.685***	32.640***	18.251***	32.390***
	(1.203)	(7.015)	(0.532)	(5.133)	(1.962)	(5.766)	(2.000)	(5.501)
Observation	19,570	19,570	19,570	19,570	111,730	111,730	111,730	111,730
Adj. R-squared	0.179	-0.538	0.270	-0.268	0.409	0.277	0.432	0.287
Kleibergen-Paap First-stage F-Stats		207.395		152.556		13.724		13.325
Income	No	No	Yes	Yes	No	No	Yes	Yes
Covariates	No	No	Yes	Yes	No	No	Yes	Yes
Sector Dummies	No	No	Yes	Yes	No	No	Yes	Yes
Month Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the province level in parentheses. The sample in Columns (1)-(4) are provinces with a share of Muslim population below 77%, i.e., West Kalimantan and North Sumatera. In columns (5)-(8), provinces with a share of the Muslim population of more than 77%, i.e., DKI Jakarta, West Java, Central Java, East Java, Banten, South Sumatera, West Sumatera, East Kalimantan, South Kalimantan, and South Sulawesi. The covariates are sex, age, education level, and job category. Dummy lockdown is instrumented by the number of active cases (in 000). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3
Heterogeneity Impact of COVID-19 Lockdown on Mental Health and Religiosity-related Terms based on Mosque Proportion

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	TSLS	OLS	TSLS	OLS	TSLS	OLS	TSLS
	Lower Mosque proportion				Higher Mosque proportion			
Panel 1 Dependent Variable: Mental Well-being – Insomnia								
Dummy Lockdown	11.950***	11.928***	11.300***	10.982***	15.339***	12.166***	14.916***	11.345***
	(2.438)	(3.638)	(2.387)	(3.184)	(1.514)	(2.725)	(1.582)	(2.981)
Observation	87,600	87,600	87,600	87,600	43,700	43,700	43,700	43,700
Adj. R-squared	0.578	0.578	0.582	0.582	0.776	0.772	0.777	0.772
Kleibergen-Paap First-stage F-Stats		215.580		313.946		8.901		9.725
Panel 2 Dependent Variable: Mental Well-being – Hopelessness								
Dummy Lockdown	1.471	5.890	1.160	5.886	4.968	10.854*	5.274*	11.755**
	(2.186)	(4.781)	(1.944)	(4.398)	(2.305)	(5.908)	(2.197)	(5.931)
Observation	87,600	87,600	87,600	87,600	43,700	43,700	43,700	43,700
Adj. R-squared	0.604	0.597	0.605	0.598	0.715	0.697	0.716	0.696
Kleibergen-Paap First-stage F-Stats		215.580		313.946		8.901		9.725
Panel 3 Dependent Variable: Mental Well-being – Anxiety								
Dummy Lockdown	9.701***	16.185***	8.983***	15.764***	10.937***	11.710***	10.687***	11.506***
	(2.517)	(1.308)	(2.555)	(1.346)	(1.680)	(0.997)	(1.575)	(1.012)
Observation	87,600	87,600	87,600	87,600	43,700	43,700	43,700	43,700
Adj. R-squared	0.683	0.670	0.685	0.673	0.798	0.798	0.799	0.798
Kleibergen-Paap First-stage F-Stats		215.580		313.946		8.901		9.725
Panel 4 Dependent Variable: Mental Well-being – Irritability								
Dummy Lockdown	-1.070	1.830	-0.970	2.292	3.847	8.438	3.762	8.872
	(0.917)	(3.356)	(0.715)	(3.452)	(3.442)	(7.226)	(3.259)	(7.239)
Observation	87,600	87,600	87,600	87,600	43,700	43,700	43,700	43,700
Adj. R-squared	0.325	0.318	0.327	0.318	0.233	0.211	0.235	0.210
Kleibergen-Paap First-stage F-Stats		215.580		313.946		8.901		9.725

Table A.3
Heterogeneity Impact of COVID-19 Lockdown on Mental Health and Religiosity-related Terms based on Mosque Proportion (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	TSLS	OLS	TSLS	OLS	TSLS	OLS	TSLS
	Lower Mosque proportion				Higher Mosque proportion			
Panel 5 Dependent Variable: Mental Well-being – Panic								
Dummy Lockdown	5.973**	8.137***	5.566**	7.759***	8.754***	6.299***	8.306***	5.549***
	(1.802)	(1.852)	(1.699)	(1.726)	(0.618)	(1.001)	(0.708)	(0.808)
Observation	87,600	87,600	87,600	87,600	43,700	43,700	43,700	43,700
Adj. R-squared	0.412	0.409	0.414	0.411	0.315	0.310	0.319	0.313
Kleibergen-Paap First-stage F-Stats		215.580		313.946		8.901		9.725
Panel 6 Dependent Variable: Religiosity – Prayer								
Dummy Lockdown	19.920***	38.502***	18.030***	37.642***	18.470***	30.222***	16.991***	29.885***
	(3.059)	(10.840)	(3.148)	(10.423)	(0.840)	(6.716)	(1.470)	(6.523)
Observation	87,600	87,600	87,600	87,600	43,700	43,700	43,700	43,700
Adj. R-squared	0.345	0.131	0.380	0.158	0.421	0.295	0.444	0.306
Kleibergen-Paap First-stage F-Stats		215.580		313.946		8.901		9.725
Income	No	No	Yes	Yes	No	No	Yes	Yes
Covariates	No	No	Yes	Yes	No	No	Yes	Yes
Sector Dummies	No	No	Yes	Yes	No	No	Yes	Yes
Month Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the province level in parentheses. The sample in Columns (1)-(4) are provinces with a Mosque proportion lower than the National median, i.e., North Sumatera, West Sumatera, South Sumatera, DKI Jakarta, East Java, Banten, South Kalimantan, and East Kalimantan. In columns (5)-(8), provinces with Mosque proportion higher than the National median, i.e., West Java, Central Java, West Kalimantan, and South Sulawesi. The covariates are sex, age, education level, and job category. Dummy lockdown is instrumented by the number of active cases (in 000). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4
Exclusion Restriction Checks

Dependent Variable:	(1) Insomnia	(2) Hopelessness	(3) Anxiety	(4) Irritability	(5) Panic	(6) Prayer
Number of active cases (in 1000)	0.062	0.089	-0.474	0.089	-0.663	4.580
	(0.165)	(0.408)	(0.390)	(0.049)	(0.354)	(0.458)
Income	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Month Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Month Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Province Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observation	15,199	15,199	15,199	15,199	15,199	15,199
Adj. R-squared	0.183	0.109	0.178	0.119	0.220	0.336

Notes: Robust standard errors clustered at the province level in parentheses. The independent variable is the number of active cases (in 000). The covariates are sex, age, education level, and job category. Samples are the only areas that never had a lockdown policy throughout the period of the study: West Kalimantan and East Kalimantan. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5
First-Stage Regression

Dependent Variable:	(1) Dummy Lockdown	(2) Dummy Lockdown
Number of active cases	0.044***	0.041***
(in 1000)	(0.012)	(0.011)
Income	No	Yes
Covariates	No	Yes
Sector Dummies	No	Yes
Month Dummies	Yes	Yes
Province Dummies	Yes	Yes
Observation	131,300	131,300
Adj. R-squared	0.368	0.396

Notes: Robust standard errors clustered at the province level in parentheses. The instrument here is the number of active cases (in 000). The covariates are sex, age, education level, and job category. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6
Robustness Test Using the Length of Lockdown as an Alternative Independent Variable

	(1)	(2)	(3)	(4)
	OLS	TSLS	OLS	TSLS
Panel 1 Dependent Variable: Mental Well-being – Insomnia				
Length of Lockdown	0.502***	0.478***	0.477***	0.443***
	(0.071)	(0.092)	(0.071)	(0.086)
Observation	131,300	131,300	131,300	131,300
Adj. R-squared	0.654	0.654	0.657	0.657
Kleibergen-Paap First-stage F-Stats		12.979		12.771
Panel 2 Dependent Variable: Mental Well-being – Hopelessness				
Length of Lockdown	0.144**	0.357*	0.142**	0.375*
	(0.063)	(0.191)	(0.061)	(0.191)
Observation	131,300	131,300	131,300	131,300
Adj. R-squared	0.634	0.623	0.635	0.623
Kleibergen-Paap First-stage F-Stats		12.979		12.771
Panel 3 Dependent Variable: Mental Well-being – Anxiety				
Length of Lockdown	0.383***	0.581***	0.359***	0.565***
	(0.054)	(0.047)	(0.055)	(0.048)
Observation	131,300	131,300	131,300	131,300
Adj. R-squared	0.719	0.712	0.721	0.714
Kleibergen-Paap First-stage F-Stats		12.979		12.771
Panel 4 Dependent Variable: Mental Well-being – Irritability				
Length of Lockdown	0.058	0.245	0.061	0.267
	(0.064)	(0.168)	(0.061)	(0.173)
Observation	131,300	131,300	131,300	131,300
Adj. R-squared	0.270	0.250	0.271	0.248
Kleibergen-Paap First-stage F-Stats		12.979		12.771
Panel 5 Dependent Variable: Mental Well-being – Panic				
Length of Lockdown	0.222***	0.269***	0.201***	0.245***
	(0.047)	(0.048)	(0.046)	(0.046)
Observation	131,300	131,300	131,300	131,300
Adj. R-squared	0.368	0.367	0.371	0.370
Kleibergen-Paap First-stage F-Stats		12.979		12.771

Table A.6
Robustness Test Using the Length of Lockdown as an Alternative Independent Variable (Continued)

	(1)	(2)	(3)	(4)
	OLS	TSLS	OLS	TSLS
Panel 6 Dependent Variable: Religiosity – Prayer				
Length of Lockdown	0.736***	1.365***	0.667***	1.330***
	(0.066)	(0.238)	(0.069)	(0.220)
Observation	131,300	131,300	131,300	131,300
Adj. R-squared	0.332	0.164	0.366	0.191
Kleibergen-Paap First-stage F-Stats		12.979		12.771
Income	No	No	Yes	Yes
Covariates	No	No	Yes	Yes
Sector Dummies	No	No	Yes	Yes
Month Dummies	Yes	Yes	Yes	Yes
Province Dummies	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the province level in parentheses. The samples include 12 provinces in Indonesia, i.e., DKI Jakarta, West Java, Central Java, East Java, Banten, North Sumatera, South Sumatera, West Sumatera, West Kalimantan, South Kalimantan, East Kalimantan, and South Sulawesi. The dependent variable here is the search volume index of the selected search terms related to mental well-being and religiosity. The value of the dependent variable is between 0 and 100. The main independent variable is the length of the lockdown in days. The covariates are sex, age, education level, and job category. The length of the lockdown is instrumented by the number of active cases (in 000). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

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