LESSON FROM INDONESIA, A COUNTRY WITH HIGHEST COVID-19 MORTALITY RATE IN THE WORLD: DISSECTING MULTIPLE ASPECTS

Muhammad Miftahussurur1,2, Camilia Metadea Aji Savitri2, Langgeng Agung Waskito2,3, Yudith Annisa Ayu Rezkitha2,4, Inge Dhamanti5-7, Diah Indriani8, Bagong Suyanto9, Raissa Virgy Rianda10, Yoshio Yamaoka11,12

1Division of Gastroentero-Hepatology, Department of Internal Medicine, Faculty of Medicine-Dr. Soetomo Teaching Hospital, Universitas Airlangga, Surabaya, Indonesia
2Helicobacter pylori and Microbiota Study Group, Institute of Tropical Disease, Universitas Airlangga, Surabaya, Indonesia
3Department of Internal Medicine, Faculty of Medicine-Dr. Soetomo Teaching Hospital, Universitas Airlangga, Surabaya, Indonesia
4Department of Internal Medicine, Faculty of Medicine, Universitas Muhammadiyah, Surabaya, Indonesia
5Department of Health Policy and Administration, Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia
6Center for Patient Safety Research, Universitas Airlangga, Surabaya, Indonesia
7School of Psychology and Public Health, La Trobe University, Melbourne, Australia
8Department of Epidemiology, Biostatistics and Behavioral Science, Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia
9Department of Sociology, Faculty of Social and Political Sciences, Universitas Airlangga, Surabaya, Indonesia
10Siti Khodijah Hospital, Sidoarjo, Indonesia
11Department of Environmental and Preventive Medicine, Faculty of Medicine, Oita University, Oita, Japan
12Department of Medicine, Gastroenterology and Hepatology Section, Baylor College of Medicine, Houston, TX, USA

First published: 10 Aug 2022, 11:920
https://doi.org/10.12688/f1000research.111285.1

Abstract
COVID-19 has been infecting every continent and Indonesia had suffered greatly as it ranked first for confirmed cases in Southeast Asia region with almost 100,000 deaths. We summarized Indonesian population demographic, socio-behavior, multiple government policy and public health interventions contributed to the high mortality. Although the virulence of COVID-19 strain was found to be similar as other countries, it might be inaccurate due to the low amount of sequenced genome and publicly accessible data of the virus' strain. As Indonesia recorded higher testing number than WHO's target, there were imbalances of testing capacity between capital cities and remote areas, hence the actual case number would be larger. The availability of healthcare facilities and skilled healthcare workers were also dispersed unevenly, causing Indonesian health systems near collapsing. Moreover, individual sense of urgency and hazard of the pandemic were low, as shown by the low compliance of wearing masks and social distancing. Even though Indonesia was unprepared early in the pandemic, currently these systems are being improved.
Indonesia has experienced an extensive problem in conquering the pandemic, hence, the country needed a comprehensive approach from the government, citizens, even private sectors to cease the pandemic.

**Keywords**
COVID-19, intervention, disease burden, mortality

This article is included in the Emerging Diseases and Outbreaks gateway.

This article is included in the Coronavirus collection.

**Corresponding author:** Muhammad Miftahussurur (muhammad-m@fk.unair.ac.id)

**Author roles:** Miftahussurur M: Conceptualization, Writing – Original Draft Preparation, Writing – Review & Editing; Savitri CMA: Formal Analysis, Writing – Original Draft Preparation; Waskito LA: Formal Analysis, Writing – Original Draft Preparation; Rezkitha YAA: Data Curation, Writing – Original Draft Preparation; Dhamanti I: Data Curation, Writing – Review & Editing; Indriani D: Data Curation, Writing – Original Draft Preparation; Suyanto B: Formal Analysis, Writing – Review & Editing; Rianda RV: Data Curation, Writing – Original Draft Preparation; Yamaoka Y: Conceptualization, Writing – Review & Editing

**Competing interests:** No competing interests were disclosed.

**Grant information:** This study was supported by Top-Tier COVID-19 grants from Universitas Airlangga. Number 1035/UN3.14/PT/2020

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

**Copyright:** © 2022 Miftahussurur M et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**How to cite this article:** Miftahussurur M, Savitri CMA, Waskito LA et al. Lessons from Indonesia, a country with highest COVID-19 mortality rate in the world: dissecting multiple aspects [version 1; peer review: awaiting peer review] F1000Research 2022, 11:920

https://doi.org/10.12688/f1000research.111285.1

**First published:** 10 Aug 2022, 11:920 https://doi.org/10.12688/f1000research.111285.1
**Introduction**

Coronavirus disease 2019 (COVID-19) had been declared a pandemic by World Health Organization (WHO) on January 30th 2020. It kept spreading worldwide, despite different continents separated by oceans. Few coronaviruses came with mild symptoms, upon exception was severe acute respiratory syndrome coronavirus (SARS-CoV) which infects more than 8,000 people in China during 2002-2003 and Middle East respiratory syndrome (MERS) coronavirus (MERS-CoV) in 2012, infected 2494 people and claimed lives of 858 in Saudi Arabia. Worldwide confirmed cases was a staggering 196 million with more than 4 million deaths. Indonesia held second position only to India in Southeast Asia. Last known confirmed cases were more than three million alongside almost 100,000 deaths. With numbers growing every day, Indonesia’s case fatality rate (CFR) had reached 2.8%, higher than worldwide which is 2.2%. The CFR had been worse early in the pandemic, reaching 9% on April. COVID-19 infection had claimed myriad of lives, from the tip of Sumatera through remote islands of Molucca and Papua. Host, agent, and environment interactions were crucial in the progression of infectious disease. Therefore, high mortality rates should be dissected from multiple aspects. Epidemiological assessment may be relevant to understand the patterns of transmission. From host side, it has been a mystery whether population characteristic and behavior contribute to the continuation of the disease. The recognition of disease’s contributing factor might give an insight to government policies. With better policies, countries would be able to control one variable in infection management. In this review, we will discuss COVID-19 infection in Indonesia thoroughly, from its genealogy, demography, to health policies and capabilities of healthcare resources. Some information will be our original investigation. These data support our hypothesis regarding the reason behind the worse condition in Indonesia.

**Prevalence and distribution across provinces**

Among Southeast Asia nation countries, Indonesia was leading for confirmed cases. Indonesia had crossed the one million mark on January 26th, 2021. Daily addition of confirmed cases ranged around 30,000 cases, currently around 30,000-40,000. Highest record of new confirmed cases of 56,757 people had been reported on July 15th. Moreover, Indonesia had the highest deaths of almost 100,000 people. As of August 1st 2021, Indonesia had more than 3.4 million confirmed cases with more than 500,000 active cases. Currently, the case progression is soaring. The distribution of cases varied across the country. With 34 provinces and population of 240 million, each province had different demographic, infrastructures, and socioeconomic conditions. Jakarta, the capital city of Indonesia held most cases of more than 260,000, followed by West Java, East Java, Central Java, and South Sulawesi. The capital counted 2,487 cases per 100,000 people, the highest in the country. On the other hand, East Java held first position for deaths of 7,805 people (6.92% deaths out of all confirmed cases). It seemed higher case number did not align with higher population; even though larger population made more potential hosts for the virus, since Jakarta was not the most populated city. However, it is the province with the highest population density of 16,704 people per km², therefore, with higher density and mobility, is a promoting factor for COVID-19 transmission. Studies from India and Algeria concluded that case number grew as urban density climbs. Provinces in Indonesia had different result, nevertheless. There were few provinces with higher cases amidst less population density and vice versa. This paradox could stem from the uneven availability of diagnostic tools in some areas, while many lived in remote ones. Even though Indonesia had tested more than 300,000 people, almost half originated from Jakarta alone. This phenomenon revealed testing imbalances in other 33 provinces. Moreover, there were vague sources whether the number stands for one person-one testing or one person tested more than once. Therefore, adequate availability of diagnostic tools across country to equalize testing coverage is essential. Adequate diagnosis would help isolate and contain the disease.

**Genealogy and viral mutation**

The SARS-CoV-2 genome is a single stranded positive-sense RNA. This virus has ~30Kb in size, 38% of GC ratio and composed of 13-15 open reading frames (ORFs). It has 11 protein-coding genes with 12 expressed proteins among the constructed ORFs. The ORFs arrangement is very similar with SARS-CoV and MERS-CoV. It is arranged as replicase and protease (1a-1b), followed by major S, E, M and N protein in a typical 5'-3' order. These protein products play an essential role in pathogenesis, attachment, fusion, and survival in host cells. Recent universally-used classification methods for SARS-CoV-2 are Nextstrain, GISAID clades and PANGO lineages. Both Nextstrain and GISAID described a broad-brush characterization of globally available databases, whereas pangolin lineages aimed at the outbreak sources in a dynamic manner. The latter grant access to create variants based on several occurred mutations, currently referred as Variants of Interest (VOI) and Variant of Concern (VOC) by WHO and CDC. VOCs had evidence to high transmissibility or virulence with reduction of neutralization.
ability through vaccination or natural immunity and evade detection. The VOI solely reported as genetic marker that might be correlated to some characteristic that VOC has, with evidence of increased case proportion.31

Indonesian SARS-CoV-2 had currently deposited 2,549 genomes in GISAID. Indonesian SARS-CoV-2 had VOI of Eta (5 genomes), Iota (2 genomes) and Kappa (2 genomes). As for VOC were Delta (382 genomes) and Alpha (49 genomes). The Delta variant or B.1.617.2 lineage were predominantly found especially in sequences submitted after April 2021. It is characterized by spike mutations of T19R, G142D, Δ157-158, L452R, T478K, D614G, P681R, and D950N.22 The prime feature of this variant is its high transmissibility, potential reduction in neutralization by some EUA monoclonal antibody and potential post-vaccination immunity reduction.23,24 Therefore, Delta might be responsible for Indonesia’s current second wave, as it is also reported as the main cause of second wave in India.21 Alpha variant, first emerged in England, is the second most predominant in Indonesian SARS-CoV-2. It is characterized by seven missense mutations (N501Y, A570D, D614G, P681H, T716I, S982A, D1118H) and three deletions in spike (69/70del and 144del).22 Therefore, dissemination of these variants in Indonesia might be due to the lack of international travel restrictions.

The accelerated number of sequenced viruses is essential for genome surveillance to understand circulating viruses in population. However, it only covered for less than 1% of total cases in Indonesia. As the available genome sequencing equipment are centralized in capital cities, the tiny proportion of virus collected might lead to the misinterpretation of current circulating virus. Therefore, increased availability of genome sequencing equipment or divergent distribution for viral DNA transport across country is crucial.

Socio-behavioral factors
COVID-19 had brought substantial changes on how people lived. One underlying factor was the perceived risk of getting infected.25 Moreover, proper knowledge of COVID-19 and awareness for WHO recommendations were equally essential.26 Case numbers in Indonesia are proliferating, owing to not only multiple violations of preventive measures, but also a lack of social construct of COVID-19 to begin with. Some even concluded COVID-19 as a harmless disease.27

Since there is no definitive treatment available, the government had implemented multiple preventive measures. However, data from the Indonesian government stated that only 29% of all cities nationwide had >90% docility to wear masks. Restaurants were the primary place where people do not wear masks, followed by private housing and public places. The social-distancing compliance also had similar results with gym, home, and tourist attractions as places where people do not socially distanced.28 This phenomenon can be attributed to the lenient implementation of these measures, complemented by the lack of knowledge and awareness. On the contrary, a study of a student population in China found that 75% considered wearing masks when going outside is beneficial for themselves, even when the pandemic is over.29

Studies have found health behavior to be influenced by perceived severity and susceptibility of COVID-19.29–31 One study found older people regarded themselves as more susceptible to the disease,30 while other study found older people worried less than younger ones.32 Awareness to the disease was more emphasized by highly educated people. Older and educated people lean more towards comply with precautionary measures.30 In addition, adherences to precautionary measures were found to be correlated with trust in the government, probably due to the validity of information they have given.31 Indonesians had low confidence in the government in COVID-19 management, which might be the reason why there was low compliance on preventive measures nationwide.34,35 As fear of the disease is associated with motivation of engaging to behavioral change,36 broadening the sense of crisis and awareness of COVID-19 are imperative, with the expectation of increased awareness in Indonesians.

Government policy
Indonesia had been preparing for COVID-19 since January, by assembling referral hospitals, strict supervision in entry routes (airports, harbors, roads), and performing detection in risky cities with direct access to China. Early on, non-pharmaceutical interventions (NPIs) were applied to inhibit transmissions. Individual measures include hand hygiene, usage of mask, social distancing, isolation, quarantine for contacts, and avoidance of crowded places. Environmental measures could be achieved by well ventilated rooms and routine cleaning of surfaces exposed to public. Community measures include restricting access to public places which were not essential to daily life.37 Moreover, task forces were formed,38 hospitals for COVID-19 were added, school and public prayer places were closed. Despite of NPIs, WHO recommended detection and isolation of infected individuals, contact tracing, treatment regimen, and travel measures regulation.39

In April, large-scale social restrictions were applied at multiple cities in Indonesia, with protocol to close schools, offices, public places as well as restriction of public transportation. Massive scale of social distancing would have the largest impact, especially when combined with other interventions.40 Measures were taken as cluster cases have been reported in
confined and crowded places such as shopping malls, offices, public transportations, and hospitals. Moreover, several officials in some countries were diagnosed with COVID-19 after participating in public gatherings without masks.\(^{43}\)

Early intervention was essential to suppress transmission before overwhelming healthcare resources.\(^{39}\) China did a lockdown policy after the virus was identified. It appeared to be effective, showed by flattened curve, considering it has high population density. China’s first wave lasted only for 20 days, while majority of countries lasted over 40 days. Countries with shorter first wave includes South Korea, which also has strict lockdown policies.\(^{31}\) Unfortunately, restrictions in Indonesia did not seem to flatten the curve. The failure was probably due to its short duration and inability to maintain the policy persistently. Hence, transmission could rebound, potentially at the scale in which no interventions had been implemented.\(^{39}\)

While Indonesia was incapable to implement prolonged mass social restrictions, combination of case isolation, self-quarantine, and social distancing can be alternatives.\(^{39}\) Most of Indonesia’s cluster cases occurred in office settings, raising concern whether health protocols in workplaces are effective.\(^{32}\) As of 9th November 2020, the highest number of cluster cases was held by Indonesian Ministry offices of 1,935 cases; with Ministry of Transportation (332 cases) and Health Ministry (314 cases) in first and second, followed by private offices (1,533 cases).\(^{43}\)

More flexible interventions to compensate economic burden can be done if high-risk groups are carefully protected.\(^{44}\) Indonesian government had enforced vaccination for population at risk, with the hope for a fully vaccinated country. However, doubts circulating the vaccine efficiency shadowed the program. As of February 3rd 2021, only 600,000 healthcare workers out of the 1.5 million have been vaccinated.\(^{35}\) Even though vaccination had started, citizens will require mask for months or even years to come, since asymptomatic COVID-19 spread was a huge issue early on. Moreover, vaccine needed time to develop immunity.

Government policy had gravitated toward the lenient way. The name might have changed but there were voids in implementation. Enforcement of these policies, both as an example by government officials and citizens, is paramount, considering Indonesia’s new record cases every day. However, the longer the pandemic, more strain were put on healthcare, hence, more burden will arise in various sectors.

**Healthcare resources**

One year to the pandemic and yet, definitive treatment has not available although vaccines showed promising results. Lack of resources complicates the capability to provide adequate testing, setting up isolation wards, and providing critical care.\(^{26}\) Indonesia had 2,813 hospitals with various accreditation and ownership status.\(^{30}\) From those, government have appointed 940 COVID-19 referral hospitals and even requested non-referral hospitals to provide service to COVID-19 patients.

Hospitals around the world have been overwhelmed by the pandemic beyond their available reserves. The field assessment of pandemic preparedness conducted in fifteen provinces identified gaps in the healthcare system, such as the availability of ICUs and other facilities in the event of increased cases.\(^{50}\) In September 2020, the community health centers and ambulances were struggling to refer patients to temporary hospitals in Jakarta.\(^{48}\) Meanwhile in January 2021, the occupancy rate of referral hospitals in Jakarta entered critical points at 95%.\(^{39}\)

During the pandemic, temporary hospitals were the solution because they were cheaper and easier to build and run.\(^{50}\) It had significantly improved diagnosis, admission, and treatment.\(^{51}\) Protocols and procedures needed to be developed as soon as the hospital operates. Moreover, healthcare workers (HCWs) and staffs needed training in infection control to ensure safe, high-quality, and efficient service\(^{41}\) because rapid redesign and redeployment of health system around the world created environment that threaten patient safety and to some extent, promote the development of harmful malpractices.\(^{52}\) Most of the participants in our study described that hospitals need to adjust the hospital service flow, add infrastructures, carry out screening at emergency departments, apply zoning areas, and cohort COVID-19 patients. We also found types of administrative errors, delayed referral and care, prescription errors, and misdiagnoses. Delayed care has been identified more than other accidents. Administrative errors were found higher in field or temporary hospitals while delayed treatment were found at all types of hospitals.

Despite the availability of healthcare facilities, WHO has been raising concern for scarcity of HCWs worldwide, especially in developing countries. Contributing factors are poor remuneration and working conditions, completed with pandemic situation.\(^{53}\) In Indonesia, more than 200 healthcare workers’ lives have been taken by COVID-19. With a very low doctor to population ratio; only 1:250,000. Deceased doctors cannot be replaced easily since the experience will not match up. Each hospital had different strategies to manage this problem, for example, by using medical, nursing and midwifery apprentices. At temporary hospitals in Jakarta and Surabaya, HCWs were recruited by Ministry of Health or sent by organizations or Indonesian Police Force.
New infectious disease outbreaks challenged HCWs due to insufficient knowledge of the emerging threat. In addition, ensuring adequate access to skilled HCWs especially in rural and remote communities is a challenge considering disparities in both areas.53 Most hospitals in Indonesia had provided adequate training or sent their HCWs to major cities to train with the government. Only one participant reported that HCWs there did not receive any training. However, that hospital developed Standard Operational Procedure (SOP) to be followed.

Skilled HCWs needed to be equipped with appropriate personal protective equipment (PPEs) as they are notably at risk for COVID-19 infection. Higher number of infection were contributed by long shifts; owing to increased number of patients and staff shortages, and excessive fatigue which weakened the immune system.54 However, as infection progressed, availability of PPE becomes an issue.53 Mask prices increased aggressively, some people even stole or fought for mask in some regions.55 A member of a District-Government Hospital in Indonesia reckoned wearing raincoats and triple cloth masks as a PPE replacement. Furthermore, in other hospitals, HCWs would only wear PPE when required to go inside the isolation room.

When Indonesia was faced with the scarcity of PPE early in the pandemic, there were many community movements involving housewives, disabled community, and university students to produce PPE.56–58 However, these good intentions raised the question of standardization, as some PPEs did not comply with WHO requirements and were provided directly to health care or HCWs. As a result, it was questionable not only the comfort, but also the efficacy in preventing transmission. Providing HCWs with proper training in patient care and hospital management complemented with adequate PPEs could reduce the burden of the pandemic in our healthcare facilities.

Conclusion
COVID-19 pandemic is a global burden including in Indonesia. With proper strategies to overcome the pandemic, it could reduce the number of transmissions which lead to lower case fatality rate. As known, Indonesia had a high case fatality rate with total death more than 1 million. With low number of sequence available, it is difficult to trace the viral mutations that occur in Indonesia. The disparities of healthcare facilities to diagnose and treat patients between urban and rural region expands the problem. Moreover, the awareness and knowledge of the disease is inadequate in majority of Indonesian citizen. The problem is extensive. Hence, it needs a comprehensive approach from the government, citizens, even private sectors to cease the pandemic.

Data availability
No data are associated with this article.

Author contribution
Miftahussurur M: Conceptualization, Writing – Original Draft; Writing – Review & Editing; Savitri, CAM: Formal Analysis, Writing – Original Draft; Waskito LA: Formal Analysis, Writing – Original Draft; Rezkitha YAA: Data Curation, Writing – Original Draft; Dhamanti I: Data Curation, Writing – Review & Editing; Indriani, D: Data Curation, Writing – Original Draft; Suyanto B: Formal Analysis, Writing – Review & Editing; Rianda, RV: Data Curation, Writing – Original Draft; Yamaoka Y: Conceptualization, Writing – Review & Editing.

References
1. Ahn DG, Shin HJ, Kim MH, et al.: Current status of epidemiology, diagnosis, therapeutics, and vaccines for novel coronavirus disease 2019 (COVID-19). J. Microbiol. Biotechnol. 2020; 30(3): 315–324. Publisher Full Text
2. Pascarella G, Strumia A, Pileggi C, et al.: COVID-19 diagnosis and management: a comprehensive review. J. Intern. Med. 2020; 288(2): 192–206. Publisher Full Text
3. World Health Organization: WHO Coronavirus Disease (COVID-19) Dashboard, Global Situation. 2021.
4. The Indonesian Task Force for COVID-19: Perkembangan COVID-19 per Hari. Kemenkes. 2021.
5. Tosepu R, Gunawan J, Effendy DS, et al.: Correlation between weather and Covid-19 pandemic in Jakarta, Indonesia. Sci. Total Environ. 2020; 725: 138436. PubMed Abstract | Publisher Full Text
6. Byass P: Eco-epidemiological assessment of the COVID-19 epidemic in China, January-February 2020. Glob. Health Action. 2020; 13(1): 1760490. PubMed Abstract | Publisher Full Text
7. Ministry of Health of the Republic of Indonesia: Recent Situation on COVID-19 in Indonesia. 2021.
8. WHO SEARO ES: Weekly Situation Report Week 3 of 2021. 2021; January(November): 1–7.
9. Burhan E, Susanto AD, Nasution SA, et al.: Guidelines for COVID-19 Management. 2020.
10. Jamshidi S, Baniasad M, Niyogi D: Global to USA county scale analysis of weather, urban density, mobility, homesty, and mask use on COVID-19. Int. J. Environ. Res. Public Health. 2020; 17(21): 1–17.
11. Eryando T, Sipahutar T, Rahardiantoro S: The Risk Distribution of COVID-19 in Indonesia: A Spatial Analysis. Asia-Pacific J. Public
28. The Indonesian Task Force for COVID-19: A sociology of Covid-19. 2020.
29. Harper CA, Satchell LP, Fido D, Shamshiripour A, Rahimi E, Shabanpour R, Elbe S, Buckland-Merrett G: Data, disease and diplomacy: SARS-CoV-2 Variant Classifications and Definitions. 2021.
30. Olapegba PO, Chovwen CO, Ayandele O, Rambaut A, Holmes EC, O'Roarke Á, Toole Á, Lazarevic I, Pravica V, Miljanovic D, Hadfield J, Megill C, Bell SM, Deng X, Garcia-Knight MA, Khalid MM, Rambaut A, Holmes EC, et al: NextStrain: Real-time tracking of pathogen evolution. Bioinformatics. 2018 Dec; 34(23): 4121–4123.
31. Elbe S, Buckland-Merrett G: Data, disease and diplomacy: GISAID's innovative contribution to global health. Glob. Challenges. 2017 Jan; 1(1): 33–46.
32. Rambaut A, Holmes EC, O’Roarke Á, et al: A dynamic nomenclature proposal for SARS-CoV-2 lineages to assist genomic epidemiology. Nat. Microbiol. 2020 Nov; 5(11): 1403–1407.
33. CDC: SARS-CoV-2 Variant Classifications and Definitions. 2021.
34. Lazarivc I, Pravica V, Miljanovic D, et al: Immune Evasion of SARS-CoV-2 Emerging Variants: What Have We Learned So Far? Viruses. 2021 Jun; 13(7): 1192.
35. Allen H, Vusirikala A, Flannagan J, et al: Increased household transmission of COVID-19 cases associated with SARS-CoV-2 Variant of Concern B.1.617.2: a national case-control study. Public Health England (PHE). 2021; 12: 100252.
36. Deng X, Garcia-Knight MA, Khalid MM, et al: Transmission, infectivity, and antibody neutralization of an emerging SARS-CoV-2 variant in California carrying a L452R spike protein mutation. medRxiv Prepr. Serv. Heal. Sci. 2021.03.07.21252647.
37. Shamshiripour A, Rahimi E, Shabanpour R, et al: How is COVID-19 reshaping activity-travel behavior? Evidence from a comprehensive survey in Chicago. Transp. Res. Int. Tred. 2020; 7: 100216.
38. Macbodd A, Khan NZ: Analyzing barriers for implementation of public health and social measures to prevent the transmission of COVID-19 disease using DEMATEL method. Diabetes Metab. Syndr. Clin. Res. Rev. 2020; 14(5): 887–892.
39. Matthweyman S, Huppatt K: A sociology of Covid-19. J. Sociol. 2020; 56(4): 675–683.
40. The Indonesian Task Force for COVID-19: Health Protocol Monitoring in Indonesia. Vol. January 20, 2020.
41. Harper CA, Satchell LP, Fido D, et al: In the COVID-19 Pandemic. 2021; 1875–1888.
42. Anaki D, Seryaj: Predicting health behavior in response to the coronavirus disease (COVID-19): Worldwide survey results from early March 2020. PLoS One. 2021; 16(1): January; e0244534–e0244516.
43. Olorunbo PO, Chovwen CO, Ayandele O, et al: Fear of COVID-19 and Preventive Health Behavior: Mediating Role of Post-Traumatic Stress Symptomatology and Psychological Distress. Int. J. Ment. Health Addict. 2021; 1–12.
44. Barber SJ, Kim H: COVID-19 Worries and Behavior Changes in Older and Younger Men and Women. J. Gerontol. - Ser. B Psychol. Sci. Soc. Sci. 2021; 76(2): E17–E23.
45. Weismüller B, Schweda A, Dörrie N, et al: Different Correlates of COVID-19-Related Agitated and Dysfunctional Safety Behavior. Front. Public Health. 2021; 8(January): 1–10.
46. Karzoo R, Erysa MP: Analysis of the Level of Public Trust in the Implementation of the Covid-19 Handling Policy by the Kubung District, Indonesia. J. Sociol. Educ. 2021; 4(4).
47. Mufti M, Gatra AAS, Afriela A, et al: Analysis of Public Trust Measurement in the Government: Strength for Community-Based COVID-19 Handling. Lp2M. 2020: 1–13.
48. Fraunfelder RL, Santavicca T, LIZY, et al: COVID-19 Experiences and Social Distancing: Insights From the Theory of Planned Behavior. Am. J. Health Promot. 2021; 35(B): 1095–1104.
49. Ministry of Manpower of Republic Indonesia: Regulations of the Ministry of Manpower regarding COVID-19 Prevention in Companies and Business Continuity Plan. 2020.
50. Ferguson N, Laydon D, Nedjati-Gilani G, et al: Report 9 - Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand|Faculty of Medicine|Imperial College London. Imperial College COVID Response Team; 2020.
51. Garcia LP, Duarte E: Nonpharmaceutical interventions for tackling the COVID-19 epidemic in Brazil. Epidemiol. E Serv saude Rev do Set Único Saúde do Br. 2020; 29(2): e2020222.
52. Ministry of Manpower of Republic Indonesia: Regulation of the Government Policy Regarding the COVID-19 Outbreak. April 2020.
53. Sun Z, Zhang H, Yang Y, et al: Impacts of geographic factors and population density on the COVID-19 spreading under the lockdown policies of China. Sci. Total Environ. 2020; 746(666): 141347.
54. The Jakarta Post: Health Ministry largest virus hotbed in Jakarta. 2020.
55. Jakarta Provincial Government: COVID-19 Cluster Transmission in Jakarta. 2020.
56. Stedman M, Davies M, Lunt M, et al: A phased approach to unlocking during the COVID-19 pandemic—Lessons from trend analysis. Int. J. Clin. Pract. 2020; 74(8): 1–7.
57. Meters W o: Reported case and death by territory. 2021.
58. Ministry of Health, PTM prevalence reduction and AKI-AKN reduction through the filling of infrastructure facilities in health services facilities. 2019.
59. World Health Organization: Field assessment of COVID-19 pandemic preparedness and response capacity in 15 provinces. 2020.
60. The Jakarta Post: Indonesian health system might collapse soon: COVID-19 task force. 2020.
61. Templo: COVID-19 Referral Hospitals in Jabodetabek 95% Full: ARSSI. 2021.
62. Zhu W, Wang Y, Xiao K, et al: Establishing and managing a temporary coronavirus disease 2019 specialty hospital in Wuhan, China. Anesthesiol. J. Am. Soc. Anesthesiol. 2020; 132(1): 1339–1345.
63. Jamil KF, Winardi W, Yusika A, et al: Knowledge of coronavirus disease 2019 (COVID-19) among healthcare providers: A cross-sectional study in Indonesia. Asian Pac. J. Trop. Med. 2020; 13(9): 402.
64. Armitage R, Nellums LB: Whistleblowing and patient safety during COVID-19. Vol. 24, EClinicalMedicine. Lancet Publishing Group; 2020; 100426.
65. Mbungu E: Effects of COVID-19 in South African health system and society: An explanatory study. Diabetes Metab. Syndr. Clin. Res. Rev. 2020; 14(2): 1809–1814.
66. Ajalar C, Oztirk ED: Protective measures for covid-19 for healthcare providers and laboratory personnel. Turkish. J. Med. Sci. 2020; 50(6-1): 578–584.
67. Maida AN, Qurani B: PKM Menjatuhkan Busana Apal Pelindung Diri (APD) dan Masker Untuk Pencegah Covid-19 pada Ibu-Ibu Rumah Tangga di Kec. Biringkanaya Kota Makassar. Seminar Nasional Pengabdian Kepada Masyarakat. 2020.
57. Rofiah SK, Zuchdi MZ, Rieuwpassa DO, et al.: *Workshop and Training on Making Personal Protective Equipment during the COVID-19 Pandemic as a Form of Empowering Persons with Disabilities*. 1st International Conference on Information Technology and Education (ICITE 2020), Atlantis Press; 2020; p. 374-80.

58. Faslih A, Jaya SN, Al-Ikhsan A, et al.: *Sinergitas Masyarakat pada Pembuatan Alat Pelindung Diri Tepat Guna Dalam Rangka Pencegahan dan Pengendalian Penyebaran Covid-19 di Wilayah Provinsi Sulawesi Tenggara*. *J. Pengabdi Masy Ilmu Terap.* 2020; 2(2): 7-16.

Publisher Full Text
The benefits of publishing with F1000Research:

• Your article is published within days, with no editorial bias
• You can publish traditional articles, null/negative results, case reports, data notes and more
• The peer review process is transparent and collaborative
• Your article is indexed in PubMed after passing peer review
• Dedicated customer support at every stage

For pre-submission enquiries, contact research@f1000.com