Availability of Infrastructure and Covid-19 Prevention Behavior in Public Place

Putri Winda Lestari, Gusti Kumala Dewi
Fakultas Ilmu Kesehatan dan Teknologi, Universitas Binawan, Indonesia

Abstract
Public places or facilities are places that can be the locus of the spread of Covid-19. Previous research shows that the application of health protocols in public places is still low in the discipline. The purpose of this study is to find out how the availability of infrastructure impacts the behavior of preventing Covid-19 in public places. This research is a cross-sectional study, with the independent variable being the availability of infrastructure in public places and the dependent variable being the behavior of preventing Covid-19. It took time in 2021. Public places, include malls/shopping centers, traditional markets, places of worship, and public service places. The sample is 264 people with incidental sampling techniques. Data collection was through the distribution of online questionnaires. Data were analyzed by univariate and bivariate with the Chi-Square test ($\alpha <0.05$). There is a relationship between the availability of infrastructure and behavior in preventing Covid-19 in public places. Public Places with adequate infrastructure are more supportive of the implementation of the behavior of Covid-19 prevention. The government, community leaders, and public place managers must monitor the availability of infrastructure to prevent the spread of Covid-19. There needs to be special attention to the implementation of Covid-19 prevention in public places, especially in traditional markets or street vendors.

Introduction
Nowadays, there has been a novel coronavirus pandemic SARS-CoV-2 (Covid-19 disease, previously 2019-nCov) where the epicenter was from Hubei Province, China, and spread to various countries in the world (Velavan & Meyer, 2020). As of November 2021, 224 countries, areas, and territories worldwide infected with Covid-19. The number of cases reached 252 million, with fatality or death totaling 5 million people. In Indonesia alone, to date, the total number of cases is 4.2 million, with deaths reaching 143,592 people (Worldometers, 2021).

The Covid-19 pandemic causes various impacts, ranging from health, economic, and agricultural to environmental. Not only morbidity and mortality, but Covid-19 also affects mental health. There was an increase in anxiety, depression, post-traumatic stress disorder, psychological distress, and stress in populations in China, Spain, Italy, Iran, the United States, Turkey, Nepal, and Denmark during the Covid-19 pandemic (Xiong et al., 2020; Cao et al., 2020). From an economic perspective, the length of lockdown, monetary policy, and international travel restrictions affect economic activity (Ozili & Arun, 2020) and increase the number of unemployed (Song & Zhou, 2020). The Covid-19 pandemic also impact the agricultural sector, where restrictions on mobility affect the food supply chain, thus impacting food security (Siche, 2020). From the environmental side, Covid-19 has had a positive impact in the form of improving air quality (Saadat et al., 2020), reducing carbon emissions, and cleaner air which are the effects of the lockdown policy (Wang & Su, 2020; Lal et al., 2020). However, the pandemic is increasing the amount of bio-medical waste as well as the use of plastics (Debata et al., 2020; Chowdhury et al., 2021).
Covid-19 can be transmitted between humans Liu et al., (2020), or through close contact with an infected person through oral and nasal secretions. These secretions include saliva, respiratory secretions, or droplet (splash) secretions (Baghizadeh Fini, 2020; Jayaweera et al., 2020). Some of the efforts that can be taken to prevent the transmission of Covid-19 are maintaining distance, self-isolation, washing hands, using a hand sanitizer, routinely disinfecting surfaces that are frequently touched, and wearing masks (Kumar & Morawska, 2019; Chu et al., 2020).

The Indonesian government has launched various programs to prevent the spread of Covid-19. Some steps to prevent the spread of Covid-19 are using masks, washing hands, maintaining distance, reducing mobility, and avoiding crowds. However, conditions on the ground state that public compliance with COVID-19 prevention behavior is still lacking. BPS data shows that the implementation of health protocols still needs attention, such as not being obedient in avoiding crowds (22%), washing hands with soap/hand sanitizer (25%), and maintaining a minimum distance of 2 meters (33%) (Tusianti et al., 2021).

The application of health protocols in public places needs special attention because they potentially be the locus of the spread of Covid-19. Public places such as shopping centers or malls, or traditional markets have the potential to create crowds, making it hard to maintain a distance. Compliance with the application of health protocols in public places is still not optimal. It is known from many researches conducted in public places such as markets and places of worship. As many as 55.63% of Padang Bulan Morning Market traders in Medan City do not implement health protocols (Ginting et al., 2021). Based on the survey on compliance with the implementation of the Covid-19 health protocol, some mosque congregations do not apply health protocols, such as not wearing masks and not washing their hands with soap or hand sanitizer, and still crowding after prayers. (Mudhofar, 2021).

The formation of a person's behavior, including Covid-19 prevention behavior, is affected by several factors. One of the enabling factors for COVID-19 prevention behavior is the availability of facilities and infrastructure. The study's purpose is to find how the availability of infrastructure impacts the behavior of preventing Covid-19 in public places.

**Method**

This study is an observational analytic study with a cross-sectional approach. The independent variable in this study is the availability of infrastructure (hand washing facilities, hand sanitizers, thermometers). The dependent variable is Covid-19 prevention behavior, including using masks, washing hands or using a hand sanitizer, and keeping a distance. The population is Indonesian people who visit public places. The sample was taken by incidental sampling where the determination is based on chance, and who was deemed suitable could be used as a sample, with the respondents' criteria being over 17 years old and willing to become respondents by agreeing with informed consent. The sample obtained were 264 people. It is calculated based on the formula for the hypothesis test for two population proportions (two-sided test), where the value of the population proportion comes from similar studies.

The instrument in this study was a questionnaire containing questions about the availability of infrastructure and Covid-19 prevention behavior. The scale used was the Guttman scale which consisted of two answer choices, namely yes and no. The instrument has been tested for validity and reliability. Data collection was by distributing online questionnaires by google form and analyzed by univariate and bivariate with Chi-Square Test with a significance value of = 0.05. This research has passed the ethical review of the Malang Health Polytechnic with the number Reg.No.: 071/ KEPK-POLKESMA/2021.

**Results And Discussions**

A total of 264 respondents participated in this study. They were from 21 provinces in Indonesia. Most are from West Java, DKI Jakarta, Central Java, and Banten. Consisting of 190 female respondents and 74 male respondents. The average age of the respondents is 26 years, with the youngest age 18 years and the oldest at 62 years, and the majority of respondents aged
25 years. Most respondents have an SMA/SMK (high school) equivalent (Table 1).

Of a total of 264 respondents, 230 respondents visited malls or modern shopping centers (87.12%), 208 traditional markets or street vendors (78.78%), 219 places of worship (82.95%), and services public (samsat, banks, government offices, etc.) as many as 218 people (82.57%) (Image 1).

Table 1. Respondents’ Characteristics

| Characteristics | Frequency (n) | Percentage (%) |
|-----------------|---------------|----------------|
| **Gender**      |               |                |
| Male            | 74            | 28.03%         |
| Female          | 190           | 71.97%         |
| **Age**         |               |                |
| ≤ 25 years      | 165           | 62.50%         |
| 26-45 years     | 87            | 32.95%         |
| >45 years       | 12            | 4.55%          |
| **Education**   |               |                |
| Junior High     | 2             | 0.80%          |
| Senior High     | 121           | 45.80%         |
| Under Graduate  | 40            | 15.20%         |
| Graduate        | 62            | 23.50%         |
| Post Graduate   | 39            | 14.70%         |

Source: Primary Data, 2021

Public places in the form of malls, worship places, and public service places (samsat, banks, government offices, etc.) have adequate facilities and infrastructures such as hand washing facilities, hand sanitizers, and thermometers for temperature checks. However, public places like traditional markets or street vendors have inadequate infrastructure because not all provide hand washing facilities or hand sanitizers and rarely provide thermometers for checking the temperature of visitors or traders. In contrast to malls, places of worship, and public service places where there is usually a person in charge at each entrance to check the temperature of visitors or traders, traditional markets, tend to be difficult. Apart from the absence of someone responsible for temperature checks, there are also many market entrances. The availability of hand washing facilities also needs attention. Because of the research results, not all traditional markets provide adequate hand washing facilities. It requires serious attention from various elements, both regional heads and traditional market managers to improve infrastructure for Covid-19 prevention.

Respondents stated that most Covid-19 prevention behavior in public places such as malls, worship places, and public services is well. But the Covid-19 prevention behavior in traditional markets was not good because visitors or traders found it difficult to keep their distance and avoid crowds. It is in line with Nugroho’s research which states that people have implemented social distancing in their daily lives but do not comprehensively implement it because of situations that are not possible (Nugroho et al., 2021). Keeping a distance can not only reduce transmission or transmission (Chian et al., 2020) but also reduce the number of unknown contacts that are difficult to trace (Kucharski et al., 2020). Research with computational fluid dynamics analysis shows that in no wind conditions, simulating breathing and coughing by keeping a distance of 1-2 meters is considered effective. However, when sneezing, the recommendation is at least 2.8 meters to reduce droplet exposure.
Evaluation by assuming the presence of wind in the environment shows that when breathing in light wind conditions, maintain the recommended distance of 1.1 meters. When coughing at least 4.5 meters and when sneezing at least 5.8 meters. Therefore, mask use can protect during static air conditions (Chea et al., 2021). The mask usage also potentially prevents transmission and reduces the pandemic burden (Eikenberry et al., 2020). The use of masks is considered cost-effective. It is not only a form of self-protection but also a form of concern for the larger community in tackling the Covid-19 pandemic (Cheng et al., 2020).

The results of the bivariate test with the Chi-Square test showed a relationship between the availability of facilities and infrastructure in modern malls or shopping centers with Covid-19 prevention behavior ($p = 0.000; PR 3.716$), meaning that modern malls or shopping centers have the less risky infrastructure. 3.7 times to allow less Covid-19 prevention behavior to occur. Covid-19 prevention behavior in other public places such as traditional markets, places of worship, and public services is also influenced by the availability of infrastructure with a $p$-value of 0.000 and a PR value of 2.074, respectively; 3.364; 6.324. It shows that the absence or inadequate infrastructure, both in malls or modern shopping centers, traditional markets or street vendors, places of worship, and public services, can increase the risk of visitors not implementing Covid-19 prevention behavior or health protocols (Table 2).

Table 2. Relationship of Facilities and Infrastructure Availability with Covid-19 Prevention Behavior in Public Places

| Facilities and Infrastructures  | Covid-19 Prevention Behavior | p-value | PR (95% CI)               |
|--------------------------------|------------------------------|---------|---------------------------|
|                                | Poor | Good | Total |                              |                |
| Mall                           |      |      |       |                              |                |
| Inadequate                     | 20   | 16   | 36    | 0.000                       | 3.716 (2,382 - 5,800) |
| Adequate                       | 29   | 165  | 194   |                              |                |
| Traditional Market or Hawker   |      |      |       |                              |                |
| Inadequate                     | 143  | 32   | 175   | 0.000                       | 2.074 (1,351 - 3,185) |
| Adequate                       | 13   | 20   | 33    |                              |                |
| Worship Places                 |      |      |       |                              |                |
| Inadequate                     | 51   | 36   | 87    | 0.000                       | 3.364 (2,230 – 5,076) |
| Adequate                       | 23   | 109  | 132   |                              |                |
| Public Service Places          |      |      |       |                              |                |
| Inadequate                     | 25   | 23   | 48    | 0.000                       | 6,324 (3,575 – 11,188) |
| Adequate                       | 14   | 156  | 170   |                              |                |

Source: Primary Data, 2021

One of the things that can be done to prevent the spread of Covid-19 is to wash your hands using antiseptic soap and with clean running water for at least 20 seconds before consuming food, after touching your nose, coughing, or sneezing to ensure that your hands are free of germs and also kill SARS-CoV-2 (Ayenigbara et al., 2020). However, the practice of washing hands will be difficult if there is no water availability or there is no water distribution mechanism (Ray, 2020). The water availability is vital because washing hands under running water is the primary approach to reducing the transmission of Covid-19 (Antwi et al., 2021). So that the lack of availability and access to water can increase the risk of Covid-19 (Ghosh & Das, 2020), and increase the incidence of several infectious diseases such as diarrhea, cholera, typhoid, hepatitis (Hathi et al., 2017) and global mortality (Adelodun et al., 2020).

During the Covid-19 pandemic, there was an increase in global water use (Amuakwa-Mensah et al., 2021; Sowby, 2020). It is undeniable that not all Indonesians have access to adequate clean water. Access to clean water in Indonesia reaches 87.75%, but only 6.8% of the population has safe access (Purwanto, 2020). BPS data shows that the proportion of households that have hand washing facilities
with soap and water in Indonesia in 2020 is around 78.3% (BPS, 2020). One alternative if hand washing facilities such as water and soap are unavailable is to use a hand sanitizer. Hand sanitizers containing alcohol can inactivate viruses and improve hand hygiene, especially when hand washing is difficult, like in locations with a high contact risk, such as transportation facilities or shopping centers (Howard et al., 2020). In addition, the use of hand sanitizer is considered efficient, accessible, and requires relatively little time to use (Hakimi & Armstrong, 2020). To prevent the spread of Covid-19, the improvement of hand hygiene in the community is necessary (Wu et al., 2020).

What can be done regarding increasing the availability of Covid-19 prevention facilities and infrastructure is to change the paradigm that water and sanitation are the pillars needed to create a healthy society (McGriff & Denny, 2020). Not only limited to the availability, but hand washing facilities provided in public places should also use the stampede model or other automatic models to minimize the touch of visitors’ hands. Smart tech such as touchless is currently identified as one of the priorities in preventing Covid-19. Hand sanitizer can be provided as an alternative if water availability is difficult to obtain at the location. Both the availability of water, soap, and hand sanitizer must be checked regularly and refilled as soon as they run out. The provision of a thermometer is also necessary to ensure that visitors who come are not in a fever condition. Regional heads, people in charge of public places, and community leaders can collaborate across sectors in realizing the availability of sustainable Covid-19 prevention infrastructure. Public and government awareness is a vital component in reducing Covid-19 cases throughout Indonesia (Agustin et al., 2021).

**Conclusion**

There is a relationship between the availability of infrastructure and Covid-19 prevention behavior in public places. Public Places with adequate infrastructure are more supportive of the implementation of Covid-19 prevention behavior or health protocols. The government, community leaders, and public place managers must monitor the availability of infrastructure to prevent the spread of Covid-19. Special attention on the implementation of Covid-19 prevention in public places is needed, especially in traditional markets or street vendors. In addition to being able to provide education, it is necessary to provide adequate infrastructures such as hand washing facilities or hand sanitizers and thermometers. Supervision or inspections also need to be carried out to ensure that people comply with health protocols.

**Acknowledgement**

We would like to acknowledge the Deputy for Research and Development Reinforcement of the Ministry of Research and Technology/National Research and Innovation Agency for providing research grants and the Binawan University LPPM for supporting this research.

**References**

Adelodun, B., Odedishemi, F., Gbemisola, R., Olalekan, H., & Choi, K., 2020. Snowballing Transmission of COVID-19 (SARS-CoV-2) Through Wastewater: Any Sustainable Preventive Measures to Curtail the Scourge in Low-Income Countries? *Science of the Total Environment*, 742, pp.140680.

Agustin, D., Apriyan, N., Susanti, F., Aprilia, Y.T., Cahy-, S., H, P.T.A., Agustina, L., Endah, D., Suratmi, T., Indrawati, L., Rosa, T., Irawaty, D.K., & Rahardjo, T.B.W., 2021. The Role of Caregivers in Elder Care during Coronavirus Disease-2019 Outbreaks. *Jurnal Kesehatan Masyarakat UNNES*, 17(1), pp.85–93.

Amuakwa-Mensah, F., Klege, R.A., Adom, P.K., & Köhlin, G., 2021. COVID-19 and Handwashing: Implications for Water Use in Sub-Saharan Africa. *Water Resources and Economics*, 36.

Antwi, S.H., Getty, D., Linnane, S., & Rolston, A., 2021. COVID-19 Water Sector Responses in Europe: A Scoping Review of Preliminary Governmental Interventions. *Science of the Total Environment*, 762, pp.143068.

Ayenigbara, I.O., Adeleke, O.R., Ayenigbara, G.O., Adegboro, J.S., & Olofinuyi, O.O., 2020. COVID-19 (SARS-CoV-2) Pandemic: Fears, Facts and Preventive Measures. *Germs*, 10(3), pp.218–228.

Baghizadeh-Fini, M., 2020. What Dentists Need to Know About COVID-19. *Oral Oncology*, 105, pp.104741.

BPS., 2020. *Proporsi Rumah Tangga Yang Memiliki*
Fasilitas Cuci Tangan Dengan Sabun Dan Air Menurut Provinsi. https://www.bps.go.id/indikator/indikator/view_data/0000/data/1273/sdgs_6

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J., 2020. The Psychological Impact of the COVID-19 Epidemic on College Students in China. Psychiatry Research, 287, pp.112934.

Chen, K.K., Lam, T.H., & Leung, C.C., 2020. Wearing Face Masks in the Community During the COVID-19 Pandemic: Altruism and Solidarity. The Lancet, 2019(20), pp.2019–2020.

Chian, W., Naing, L., & Wong, J., 2020. Estimating the Impact of Physical Distancing Measures in Containing COVID-19: An Empirical Analysis. International Journal of Infectious Diseases, 100, pp.42–49.

Chowdhury, H., Chowdhury, T., & Sait, S.M., 2021. Estimating Marine Plastic Pollution from COVID-19 Face Masks in Coastal Regions. Marine Pollution Bulletin, 168, pp.112419.

Chu, D.K., Akl, E.A., Duda, S., Solo, K., Yaacoub, S., Schünemann, H.J., & Urgent, C.-S., 2020. Physical Distancing, Face Masks, and Eye Protection to Prevent Person-To-Person Transmission of SARS-CoV-2 and COVID-19: A Systematic Review and Meta-Analysis. The Lancet, 395, pp.1973–1987.

Debata, B., Patnaik, P., & Mishra, A., 2020. COVID-19 Pandemic! It's Impact on People, Economy, and Environment. Journal of Public Affairs, 20(4), pp.1–5.

Eikenberry, S.E., Mancuso, M., Iboi, E., Phan, T., Eikenberry, K., Kuang, Y., Kostelich, E., & Gumel, A.B., 2020. To Mask or Not To Mask: Modeling the Potential for Face Mask Use by the General Public to Curtail the COVID-19 Pandemic. Infectious Disease Modelling, 5, pp.293–308.

Ghosh, S., & Das, A., 2020. Since January 2020 Elsevier has Created a COVID-19 Resource Centre with Free Information in English and Mandarin on the Novel Coronavirus COVID-19. The COVID-19 Resource Centre is Hosted on Elsevier Connect, the Company's Public News and Information. Public Health, 185,34–36.

Ginting, T., Kaban, D.L., & Ginting, R., 2021. Kepatuhan Pedagang Pasar Pagi dalam Melaksanakan Protokol Kesehatan Pencegahan COVID-19. Jurnal Prima Medika Sains, 3(1), pp.6–12.

Hakimi, A.A., & Armstrong, W.B., 2020. Hand Sanitizer in a Pandemic: Wrong Formulations in the Wrong Hands. Journal of Emergency Medicine, 59(5), pp.668–672.

Hathi, P., Haque, S., Pant, L., Coffey, D., & Spears, D., 2017. Place and Child Health: The Interaction of Population Density and Sanitation in Developing Countries. Demography, 54(1), pp.337–360.

Howard, G., Bartram, J., Brocklehurst, C., Colford, J.M., Costa, F., Cunliffe, D., Dreibelbis, R., Eisenberg, J.N.S., Evans, B., Girones, R., Hrudey, S., Willetts, J., & Wright, C.Y., 2020. COVID-19: Urgent Actions, Critical Reflections and Future Relevance of “WaSH”: Lessons for the Current and Future Pandemics. Journal of Water and Health, 18(5), pp.613–630.

Jayaweera, M., Perera, H., Gunawardana, B., & Manatunge, J., 2020. Transmission of COVID-19 Virus by Droplets and Aerosols: A Critical Review on the Unresolved Dichotomy. Environmental Research, 188, pp.109819.

Kucharski, A.J., Klepac, P., Conlan, A.J.K., Kissler, S.M., Tang, M. L., Fry, H., Gog, J.R., Edmunds, W.J., Emery, J.C., Medley, G., Munday, J.D., Russell, T.W., Leclerc, Q.I., Diamond, C., Procter, S.R., Gimma, A., Sun, F.Y., Gibbs, H.P., Rosello, A., & Simons, D., 2020. Effectiveness of Isolation, Testing, Contact Tracing, and Physical Distancing on Reducing Transmission of SARS-CoV-2 in Different Settings: A Mathematical Modelling Study. The Lancet Infectious Diseases, 20(10), pp.1151–1160.

Kumar, P., & Morawska, L., 2019. Could Fighting Airborne Transmission be the Next Line of Defence Against COVID-19 spread? City and Environment Interactions, 4(2019), pp.100033.

Lal, P., Kumar, A., Kumar, S., Kumari, S., Saikia, P., Dayanandan, A., Adhikari, D., & Khan, M.L., 2020. The Dark Cloud with A Silver Lining: Assessing the Impact of the SARS COVID-19 Pandemic on the Global Environment. Science of the Total Environment, 732, pp.139297.

Liu, Y.C., Kuo, R.L., & Shih, S.R., 2020. COVID-19: The First Documented Coronavirus Pandemic in History. Biomedical Journal, 43(4), pp.328–333.

McGriff, J.A., & Denny, L., 2020. What COVID-19 Reveals about the Neglect of WASH within
Infection Prevention in Low-Resource Healthcare Facilities. *American Journal of Tropical Medicine and Hygiene*, 103(5), pp.1762–1764.

Mudhofar, M., 2021. Kepatuhan Rumah Ibadah Dalam Penerapan Protokol Kesehatan Covid-19 Di Era New Normal. *Journal of Education, Humaniora and Social Sciences (JEHSS)*, 4(1), pp.145–153.

Nugroho, E., Ningrum, D.N., Sarifah, M., Adeliani, M., Ulfah, N., & Yuswantoro, R.N., 2021. Urban Community’s Perceptions and Experiences about Social Distancing During the Covid-19 Pandemic. *Jurnal Kesehatan Masyarakat UNNES*, 17(1), pp.137–143.

Ozili, P.K., & Arun, T., 2020. Spillover of COVID-19. *SSRN Electronic Journal*, March 2020, 27.

Purwanto, E.W., 2020. Pembangunan Akses Air Bersih Pasca Krisis Covid-19. *Jurnal Perencanaan Pembangunan: The Indonesian Journal of Development Planning*, 4(2), pp.207–214.

Ray, I., 2020. Viewpoint – Handwashing and COVID-19: Simple, Right There?. *World Development*, 135, pp.105086.

Saadat, S., Rawtani, D., & Hussain, C.M., 2020. Environmental Perspective of COVID-19. *Science of the Total Environment*, 728, pp.138870.

Siche, R., 2020. What is the Impact of COVID-19 Disease on Agriculture?. *Scientia Agropecuaria*, 11(1), pp.3–9.

Song, L., & Zhou, Y., 2020. The COVID-19 Pandemic and Its Impact on the Global Economy: What Does It Take to Turn Crisis into Opportunity? *China and World Economy*, 28(4), pp.1–25.

Sowby, R.B., 2020. Emergency Preparedness after COVID-19: A Review Of Policy Statements in the U.S. Water Sector. *Utilities Policy*, 64, pp.101058.

Tusianti, E., Gunawan, I.G.N.A.R., Santoso, D.H., Paramartha, D.Y., Riyadi., & Kristanti, H.D., 2021. Perilaku Masyarakat pada Masa PPKM Darurat.

Velavan, T.P., & Meyer, C.G., 2020. The COVID-19 Epidemic. *Tropical Medicine and International Health*, 25(3), pp.278–280.

Wang, Q., & Su, M., 2020. A Preliminary Assessment of the Impact of COVID-19 on Environment – A Case Study of China. *Science of the Total Environment*, 728, pp.138915.

Worldometers., 2021. Coronavirus Cases. [https://www.worldometers.info/coronavirus/#countries](https://www.worldometers.info/coronavirus/#countries)

Wu, H., Huang, J., Zhang, C. J. P., He, Z., & Ming, W., 2020. Facemask Shortage and the Novel Coronavirus Disease (COVID-19) Outbreak: Reflections on Public Health Measures. *EClinicalMedicine*, 21, pp.1–7.

Xiong, J., Lipsitz, O., Nasri, F., Lui, L.M.W., Gill, H., Phan, L., Chen-Li, D., Iacobucci, M., Ho, R., Majeed, A., & McIntyre, R.S., 2020. Impact of COVID-19 Pandemic on Mental Health in the General Population: A Systematic Review. *Journal of Affective Disorders*, 277, pp.55–64.