ASM Sc. J., 19, 2024

https://doi.org/10.32802/asmscj.2023.1543

The Insufficiency to Control COVID-19 Epidemic in Residential and Shopping Malls (Case Study of Bukit Bintang-Kuala Lumpur)

R.D.A. Qwasmi*, A.B. Abdullah, N.M. Noor and Z.B.T. Asmawi

Kulliyyah of Architecture & Environmental Design. International Islamic University Malaysia.

In December of 2019, SARS-CoV-2 (COVID-19) was found in Wuhan, China. With fatalities and confirmed cases in so many countries, WHO declared a worldwide pandemic. Territorial public and private socialising during the pandemic allowed the virus to spread rapidly. This study investigates the efficacy of social distance rules in preventing the spread of COVID-19 in Bukit Bintang, Malaysia, during the Recovery Movement Control Order period. The researchers in this study used both qualitative (structured observation) and quantitative (questionnaire) approaches to learn more about the role of environmental elements such as urban fabric, density, milieu, and accessibility in the spread of COVID-19 in Bukit Bintang. These elements were studied through structured observations and statistical analysis. In order to learn about respondents' concrete understanding of these elements' role in the COVID-19 spread, a questionnaire survey was used as part of the quantitative approach. The researchers surveyed 250 people for this study. The results of this study corroborate that the insufficiency to control COVID-19 spread strongly correlates with resident and shopping mall elements. The spread and mortality rate of COVID-19 is significantly influenced by social distance. The study found that people who disregarded the social distance rule spread the virus widely.

Keywords: Urban Fabric; Density; COVID-19; Human Behaviour; Social Distance

I. INTRODUCTION

COVID-19 is not the first pandemic that has occurred in the world. In the past, other pandemics have swept across the globe and claimed the lives of millions of people (LePan & Routley, 2020). The Black Death in Europe, which occurred during the 14th century, was one of the most devastating pandemics that has ever been perpetrated on humankind (Littman, 2009). Outbreaks of typhoid fever and cholera that occurred earlier in 1908 in Philadelphia were caused by the mingling of sewage with the water source in the Schuylkill River. Other recent outbreaks included tuberculosis in South Africa in 2006, Ebola in West Africa in 2014, and the fast-spreading infectious virus of COVID-19, which has recently been added to the extensive list of contagious diseases affecting humans in this century. To contain a spreading virus, the quality of life for people who live in cities with their environmental elements towards social distancing is essential.

The efficacy and quality of life for people who live in cities are substantially impacted by the interconnections between various components of the urban environment, such as buildings, streets, public parks, and infrastructure (Kibert, 2016). People leaving their place of residence to fulfil their needs, make social contact, meet new people, and spend more time outside the home, increased infection risk at an earlier stage of an outbreak. During the COVID-19 period in Malaysia, the government-imposed restrictions on people's freedom of movement. After the government lifted restrictions

*Corresponding author's e-mail: alqawasmi_malaysia@hotmail.com

on business and public spaces, millions of people started moving around again, increasing the number of people infected with the virus during the Recovery Movement Control Order (RMCO) period. Shopping and using public spaces to meet with neighbours, friends, or family, as well as the workplace, were among the allowed activities. Bukit Bintang's district in Kuala Lumpur had the highest number of reported cases of COVID-19 throughout the period. Hence, this paper identifies some causes of Bukit Bintang's insufficiency to shield its inhabitants and visitors from the epidemic's effects.

II. LITERATURE REVIEW

Many earlier studies have considered the postulated elements that cause an increase in the rate of the spread of the epidemic in different regions of the world. These elements include urban fabric, density, milieu, and accessibility. These are the factors that are evaluated in this study.

A. Urban Fabric

The inability to use cultural centres and other parts of our urban fabric is a temporary problem during a pandemic outbreak. An epidemic worsens preexisting problems or drives individuals to adopt new behaviours that could permanently strand assets, such as shopping malls that are seeing businesses shift online and less use of urban environments, such as public parks and infrastructure. Numerous studies employing a variety of instruments have examined the importance of walking and its connection to the built environment for the city's fabric.

For instance, LaRiccia *et al.* (2019) evaluated the walkability of the Italian town of Torino using various metrics gleaned from geospatial databases and geographic information systems (GIS). The GIS proved helpful for planning, displaying, and understanding footpaths. Using data on network design (block length, census-block density, and intersection type), sidewalks, and the roadside-built environment. Parks (2006) created objective measurements of the pedestrian environment (setbacks and parking). Twenty-three (23) Chicago neighbourhood data were gathered using GIS. The information was used to determine what laboratory measurements most accurately reflected the pedestrian environment factor and the pedestrian friendliness index.

B. Building Design

The design of the building is the most all-encompassing and cutting-edge tactic for improving occupant well-being and decreasing the adverse effects of the workplace on workers' health and productivity. Ecological buildings are defined in this research as structures that minimise negative impacts on occupants by their design characteristics, such as high levels of indoor air quality, natural lighting, temperature regulation, zoning, square footage, and the presence of a healthy and secure work environment (Cirrincione, 2020; Zeigler, 2012). House Acts were passed to improve the deplorable state of tenement housing. As a result of the Acts, the "dumbbell" housing design became commonplace, which included a central light well to enhance ventilation and daylighting throughout the residence (Arbuckle, 2016; Giacobbe, 2020). Recent evidence suggests that the COVID-19 epidemic has highlighted the connection between people's health and their surrounding building environments. While much information must be gathered about this virus, real estate developers must take numerous research measures to protect their building inhabitants. New studies have shown that COVID-19 is spread through the air and is more common in confined, poorly ventilated indoor spaces (Megahed & Ghoneim, 2021). There is evidence that the COVID-19 infection can be spread through the air (Awada *et al.,* 2021).

C. Open Space

Open space in a city refers to any area of land or water not occupied by cars or buildings or any piece of land or water that has not been built upon. Without imposing aesthetic requirements, it can further be defined as the region between buildings in a metropolitan area geometrically constrained by different elevations. On the other hand, the structural interdependence of detail defines the aesthetic quality of each component of the urban environment (Krier & Rowe, 1979).

According to Krier and Rowe (1979), a city consists primarily of streets and public spaces. The open space norm is something cities like Tokyo, Hong Kong, and Buenos Aires work hard to achieve (Gungor, 2017).

Therefore, a universally applicable ratio such as the one established by the WHO might not be suitable in a place like Chittagong. According to UN-Habitat, cities like Mexico City, Buenos Aires, Dhaka, and Mumbai in South Asia are in various stages of urban development. As two of the world's most rapidly urbanising countries, Turkey (Istanbul) and Malaysia (Kuala Lumpur) are also considered rapidly expanding and emerging cities (Habitat, 2016). Making people feel welcome and secure is a primary goal of urban designers in open spaces. Research on public perception of public spaces is an important area of study (Pugalis, 2009; Heffernan *et al.,* 2014); these views may inform design choices. However, the current epidemic poses a severe threat to alter our connection to such places, especially in the company of others.

D. Density

In terms of density, from March to May of 2020, Wong *et al.* (2020) demonstrated that population density was a significant predictor of cumulative infection cases in the United States at the county level and evaluated the impact of population density on the distributions of infection cases across the country. The estimated percentages of people of colour, Hispanic descent, and the elderly were also provided on a logarithmic scale. As a second method for addressing the spatial spillover effect, spatial regression models with a spatial error specification were applied. While the impact of the other three population subgroups was significant, they varied over time, and the effects of population density remained relatively constant after the first few weeks of March to late May 2020.

This demonstrated the importance of population density in determining the spread of infection within and between counties. Thus, transmission models that forecast the effects of COVID-19 need to explicitly incorporate population density and the sizes of sensitive population subgroups. To conduct their cross-sectional analysis of the infection rate per capita, Wheaton and Thompson (2020) analysed data from cities in Massachusetts. Using statistical analysis and regression direct, they discovered that population density has an economically and statistically significant positive effect on the incidence of the virus. Also, councils with higher density and a more considerable share of land use in commercial categories have a higher per capita incidence of the virus. However, they did not take into account other controlling factors.

E. Milieu

Kuchler *et al.* (2020) used anonymised and aggregated data from Facebook to show that regions with higher social relationships were associated with the two early COVID-19 "hotspots." This was demonstrated concerning Westchester County, NY's milieu in the U.S. and Lodi province in Italy. They found a correlation between the physical distance between two locations, the number of hotspots in those locations, and a correlation between income and population density in those areas. Based on these findings, the data are valuable to epidemiologists and researchers interested in forecasting communicable diseases like COVID-19. This is because epidemiologists hope to be able to predict the spread of infectious diseases. It was hypothesised that two geographical areas linked by a significant number of people would likely have more residents engaging in face-to-face contact with one another, which would result in an increased number of opportunities for the transmission of infectious diseases. And they showed that areas with more robust social ties were connected to the early COVID-19 "hotspots" in each country, in the United States and Italy. Both regions had more documented COVID-19 cases per resident as of March 30, 2020.

F. Accessibility

By creating a SIRD Model taking into account the factors of "lockdown" and "riot," Zhicheng *et al.* (2021) forecasted the pandemic trends of national and state regional administrative units in the U.S. from July 27, 2020, to January 22, 2021. The data demonstrated that geographical proximity had a role in the epidemic's spread across the United States. There was a

high link between the number of people infected with COVID-19 and the percentage of time spent in parks or other public spaces during the lockdown. Understanding the connection between human activity and the spread of COVID-19, as argued by Jianwei *et al.* (2020), is crucial for a successful response to the pandemic. Using confirmed case data gathered in Hong Kong, they investigated the link between the built environment and the risk of COVID-19.

Tertiary Planning Unit (TPU) based COVID-19 risk assessment and exploration of spatial patterns based on Incidence Rate (R1) and Venue Density using data on residential buildings and places visited for each case. Next, they used the Global Poisson Regression (GPR) and the Geographically Weighted Poisson Regression (GWPR) Models to look into the connections between several elements of the built environment (such as nodal accessibility and green space density) and the risk of contracting COVID-19. The findings point to hotspots in Hong Kong where the danger of exposure to COVID-19 is severe. However, the risk of COVID-19 transmission may be underestimated in some suburban areas if the incidence rate is used as an indicator. The generalised estimating equation and generalised estimating marginal effects models imply a close and spatially heterogeneous link between the selected built-environment variables and the risk of COVID-19 transmission.

III. RESEARCH METHODOLOGY

To reach the goals of this paper, qualitative (structured observation) and quantitative (explanatory) investigation methods are used to analyse the study location (Bukit Bintang, Kuala Lumpur) data. In contrast to naturalistic and participant observation, structured observation focuses on one or more specific insufficiencies to control parameters in either an uncontrolled (such as a residence) or regulated (such as a shopping mall) context. However, for the explanatory investigation, to achieve a 95% confidence level with a 5% margin of error, Krejcie and Morgan's (1970) table was used to deduce a sample size of 250 respondents for this study population of 750 respondents. In addition, the necessary information was gathered via a questionnaire. The instrument constructs have been borrowed from research already employed and confirmed their reliability and validity. Ramzi *et al.* (2022) provided more study location justification in our previous work.

IV. RESULT AND ANALYSIS

This part of the result presents this study's observational and statistical analysis.

A. Observation Analysis

Before this study observation analysis is depicted, it is necessary to mention that the following elements i) urban fabric, ii) density, iii) accessibility and iv) milieu contribute to a safe built environment. For this study analysis, these elements analysis is proficient with a thorough literature review, using secondary data sources, ArcGIS software data and government publications.

1. Urban Fabric

Walkability (sidewalk safety and comfort), building design, and open space were recognised and categorised as the three significant elements contributing to the quality of the urban fabric based on the literature review.

Urban Fabric (Walkability)

In this study, the researchers further differentiate walkability and accessibility. Walkability is an environment built to be friendly to residents living within shopping malls, visiting locations, and so on. In contrast, accessibility is a proxy for numerous social interaction-related (easy access to the location). When walkability and accessibility are insufficient to manage, i.e., including amenities that limit access to the environment or the space, it encourages easy access to an area for social gatherings, which increases social contact levels and higher COVID-19 contagion rates. In this study, we examine the safety and comfort of Bukit Bintang's walkways.

Sidewalk Safety

Two indices of sidewalk safety are the width and COVID-19 case rate. As lockdown reduces, foot traffic increases and sidewalk widths become a problem. The Bukit Bintang's walkway was surveyed and studied under the following classifications, less than 3m, 3-4m, 4-5m, and more than 6m sidewalks. Recommended interpersonal distance for infection control is 2 metres. We considered each person's space (0.6m) from this premise, applied 2-metre spacing for either standing or moving persons and assumed different sidewalk portions. We created intervals to evaluate sidewalk width suitability, as shown in Figure 1, which measures the net walkable width of the sidewalk.

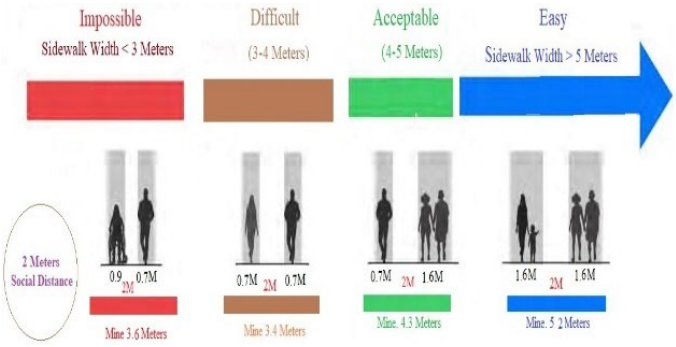

Figure 1. Image of sidewalk width example

Bukit Bintang's sidewalk widths were mapped. The ratio was calculated by dividing each sidewalk's square metres (m^2) by the overall sidewalk area. The higher the ratio, the safer the area is expected to be. For instance, it was observed that 76.2% of the width of the sidewalks in Bukit Bintang does not adequately allow social distancing to be practised (< 3 metres). In comparison, 9.9% held 3-4 metres, and 9.7% had 4-5 metres, which is barely adequate, using the 2-metre social distance guideline by the government.

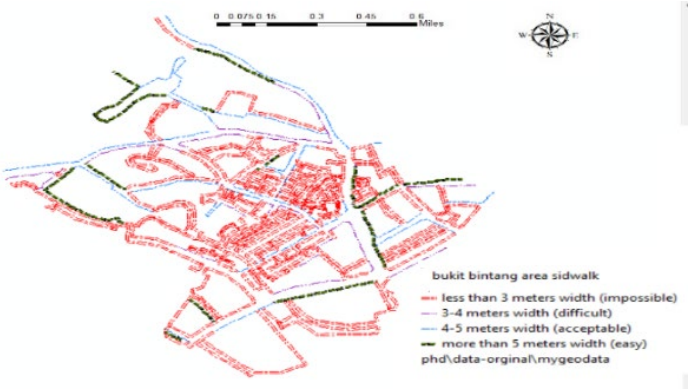

Figure 2. Sidewalk width classification according to social distance rules

This observation is noted because the sidewalks are narrower than the prescribed width needed to practice social distancing. The map shown in Figure 2 depicts how small the sidewalks are in Bukit Bintang, with colours placed on the grid. Bukit Bintang's sidewalks are too narrow to follow the 2-metre social distance requirement, which increases the chances of COVID-19 spreading on the sidewalk.

Although the plants on the sidewalk provide an aesthetic view and encourage people to walk, they are a potential problem in maintaining social distance while walking. It was observed that the planting space on the sidewalk is reducing the sidewalk width, leading to less safety for walking within a 2-metre social distance. This is seen as a COVID-19 safety risk factor, as shown in Figure 3.

Figure 3. The planting space on the sidewalk reduces the sidewalk width

Further observation in the area where foreign employees were concentrated shows that the area has almost no walkways. Most of the pedestrian street is co-mingled with traffic, and people cannot isolate themselves socially, as seen in Figure 4.

Figure 4. Sidewalks are non-existent in the area of foreign workers

Unlike regions that report only imported cases, affected areas are defined as actively experiencing transmission of COVID-19. The COVID-19 spread rate cases also correlate substantially with an increased probability of safe walking and the sidewalks' widths. It is important to remember that the virus can spread in poorly ventilated or crowded settings, where people spend more extended time. This is because aerosols can float in the air for a long time or travel long distances (a phenomenon known as long-range aerosol or airborne transmission). This is why the need for people to avoid walking in red zone locations with a high risk of infection is required. Residents of Kuala Lumpur city were discouraged by the Malaysian government from visiting or travelling to regions designated as orange or red zones. A standard operating procedure (SOP) should be followed at all times; therefore, if somebody needs to leave the building quickly, they should do so only under extreme emergency (Daim, 2020).

Sidewalk Comfort

Sidewalks must be clear of obstructions that restrict pedestrians. Sidewalk comfort indicators include walking freely with fewer obstructions on the sidewalks, such as motorbikes, sidewalk food vendors, and rubbish. During the observational study in Bukit Bintang, motorcyclists ride on the sidewalks beside pedestrians. This showed that not much has changed over time. In front of the Grand Millennium Hotel Kuala Lumpur, Jalan Alor and Jalan Bedara, the sidewalk pavements became parking and "additional lanes" during rush hour for motorcycles to bypass the traffic jam. The pedestrians appear to be used to them, as depicted in Figure 5. Thus, some sections in Bukit Bintang are scarcely walkable due to motorbikes as a sidewalk obstacle, leading to crowded spaces and a surge in COVID-19 instances.

Figure 5. Sidewalk obstructions: Motorbikes use walkways to circumvent traffic jams and as parking space

Drink and food vendors also dominated many Bukit Bintang sidewalks, providing little option for pedestrians to walk comfortably. This forced pedestrians to walk in the street, endangering their lives between trucks and automobiles and harassing drivers. People are forced to share the road with bicycles and vehicles, putting them in danger of being run over. It is almost impossible to walk on the pedestrian lane due to eateries occupying the sidewalks, as shown in Figure 6. Thus, some parts of Bukit Bintang are not walkable since drink and food vendors occupy the sidewalks, leading to congested spaces and a surge in COVID-19 cases. The lack of supervision and the cheapness attractiveness of these eateries relative to incomes worsens the problem, especially in an area with high foreign workers.

Figure 6. Eateries occupying the sidewalk

Finally, rubbish on the pedestrian way also affects walking comfort; some individuals use the sidewalk for waste disposal. Once a little mound of litter collects on a pavement, it attracts more rubbish, which obstructs the pedestrian path. Even the roads in the central business district are littered, not limited to only foreign worker residences, marketplaces, or commercial districts, as shown in Figure 7.

Figure 7. Rubbish on the pedestrian path

Urban Fabric (Building Design)

Before COVID-19, gardens and outside sceneries were once seen as extravagances (Post, 2020). But in the wake of COVID-19, they have become a necessity (Rebecca, 2020). During the epidemic, people began spending more time on their balconies and outside; outdoor design became the centrepiece of residential landscapes (Post, 2020). Outdoor spaces become places for sunbathing, fitness, relaxing, working, studying, and a multi-functional garden for hobbies or growing food. Gardens and green outside can relieve stress and anxiety, promote motivation, and boost immunity. Despite COVID-19 limits being relaxed, some individuals may still spend more time at home, making outside areas a requirement.

Table 1. Classification of affected buildings according to Malaysian building classification

Building Type	No. of affected buildings	Percentage
Condominium	73	34.2%
Flat apartment	107	50.2%
Service residence	16	7.5%
Semi-d	1	0.4%
Terrace house	11	5.1%
Townhouse	2	0.9%
Bungalow	3	1.4%

Landscapers must be imaginative to make every inch of the outdoor area usable. Outdoor space, especially vast gardens, was once a luxury; even the smallest outdoor area has become part of our daily life during the lockdown period, including almost all outdoor locations.

Figure 8. The smaller "faux" balconies hung with clothes.

According to residential property categories in Malaysia (Lee, 2021), COVID-19 impacted resident apartment data from February 15, 2020, to January 15, 2021, was published. The affected buildings were filtered, verified, and classified based on property and house classification in Malaysia. The statistical results in Table 1 and Figure 8 indicate that the flat apartment category attracted the most significant number of affected residential buildings, with a percentage of 50.2. The condominium building at 34.2% followed this. The service

residence held 7.5%, while the other affected buildings were terrace houses at 5.1%, bungalows at 1.4%, semi-d at 0.4% and townhouses at 0.9%.

In the urban fabric (building design), balconies provided road views, daylight, and nature exposure throughout the pandemic. This did help reduce stress and anxiety and improves health (Peters & Halleran, 2020). Balconies also allowed socialising without physical contact, where digital networking platforms were adopted by neighbours to organise gatherings and performances from their balconies. A field investigation of the balconies of the study location flat homes or houses revealed that they were functionally unvalued.

Their dimensions and proportions were a significant reason for their inefficiency in the social distance; in most cases, it was used for storing and drying clothing, as shown in Figure 8. The inability of these spaces to promote inhabitants' health and welfare and provide spatial and thermal variety in compact apartments added more cleaning labour and changes of getting infected from a neighbour's sneeze to the household.

Figure 9. Residents using the sidewalk and the streets as front yard

Residents of flats, which are small apartments with few common areas compared to other types of residential buildings like service apartments or condominiums, congregate on the sidewalks and streets to socialise because their buildings have no outdoor spaces, gardens, or backyards on a residential block as shown in Figure 9. The gardens and backyards on a residential block refer to a piece of property closest to the road, also known as the front yard (in the United States, Canada, and Australia) or the front garden (in the United Kingdom and Europe).

Figure 10. Flat apartment with a lack of lanes and corridors

Also, another factor to consider in the building design is the corridor design and parameters. In this study, a corridor is a small hallway or gallery that connects building sections. A corridor has room entrances. In a study by Li *et al.* (2020), a computational simulation was used to accurately predict airflow and droplet dispersal patterns in COVID-19-infected buildings.

Figure 11. The entrances that are common in a flat apartment

The result of the study shows that in some cases, such as behind fast-moving people in a long, narrow hallway, children face a higher COVID-19 transmission risk. The studies illustrate the importance of spatial shape in modelling virus-laden droplet movement. Simulations identify flow patterns behind a walker in different-shaped settings. Therefore, designing anti-virus-spreading entrances and corridors is crucial. The observational field study makes it abundantly

clear that the flat apartment has no corridor because it is located in a building with many compact units, where the residential unit is entered directly from the stairs. Since the staircase in these types of buildings is considered a corridor, two people walking in the opposite direction cannot maintain social distancing rules, as shown in Figure 10.

Building design entryways are also an essential factor. An entrance area serves as a foundation for the outside and inside of a building; it must convey the structure's function and meet safety, composition, aesthetics, and, more recently, health criteria (Dudzinski, 2020). The entrance design has never been better than the corridors, as depicted in Figure 11. The observed buildings show that entrances in flats are very narrow, directly connected with the stairs, which is a corridor, and there is no gate area or lobby. If we consider two people only (out and in) simultaneously, there is no chance of achieving social distancing rules, hence, the spread of COVID-19.

Urban Fabric (Open Space)

In addition to its environmental benefits, open space in the city significantly positively affects people's quality of life. However, the COVID-19 pandemic has changed people's habits regarding outdoor activities. To assess Bukit Bintang's public spaces' availability and usage, we first had to collect the relevant GIS data, determine the descriptive information like link information (distance, time spent, and speed), and incorporate all spatial data into a unified projection system. This was done to analyse the surface networks like sidewalks, bus stops, train stations, and open space layers. The second step was to conduct an accessibility analysis based on the service area analysis to evaluate the state of the open space in the study area and establish the coverage area in terms of accessibility.

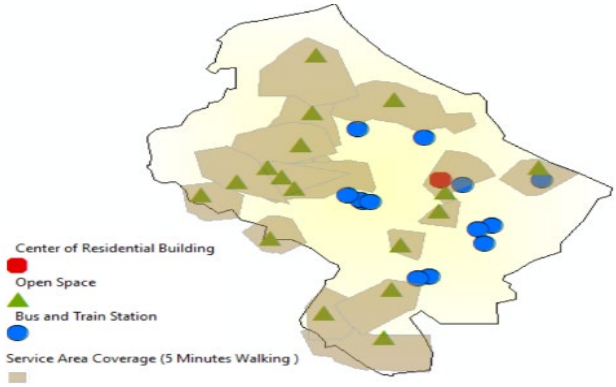

Figure 12. GIS data of Bukit Bintang area to open space

The study is implemented when the sidewalk (road network) is built and determines where features like parks, shopping districts, and subway stops will be located. It was clear from the GIS data that the study area had bad service coverage and more than a 5-minute walking distance between the feature and open space in the study location. The GIS data result was not consistent with the UN-Habitat consulted national "acceptable walking distance" to public open spaces, which determined that 400 metres is a 5-minute walk. Thus, increasing COVID-19 spread in the study location.

2. Density

Density affects pandemic outbreak timing by connecting dense locations. For residential neighbourhood density, there are no slums in Bukit Bintang. However, there are foreign worker's quarters known as "setinggan" in Malay (squatters in abandoned buildings or land without the owner's consent), as depicted in Figure 13. The observation studies show that residents leave their homes every day to go to work, buy groceries, and do laundry, and live in inadequate homes and overcrowded conditions in low-income worker zones. Most residents in these communities are daily wage earners in the informal sector, with irregular income and insecure jobs. Overcrowding prevents them from practising social distancing, hence the increase in COVID-19 spread.

Figure 13. Foreigners' worker zones in Bukit Bintang

According to this study observation, the neighbourhood of the foreign worker area (setinggan) is always congested at night. During the day, it is empty, as shown in Figure 14. This is tolerable since workers are at work during the day. However, the neighbourhood streets were congested at night owing to a shortage of amusement venues fit for their income, leading to the spread of COVID-19.

Figure 14. Foreigner's worker's area neighbourhoods at night and daytime

Malaysia is a developing nation with a high population density in Kuala Lumpur. Most municipal governments in Malaysia use the density Table 2 (Kuala Lumpur Local Plan). In Malaysia, 30 houses/ha is considered a modest density compared to U.K. and U.S. cities. Malaysia's cultural density is moderate.

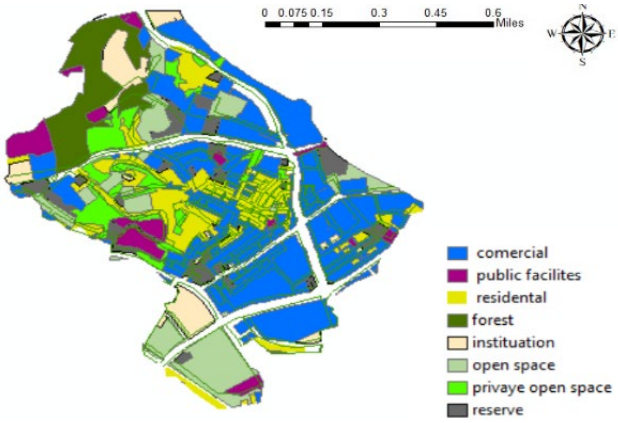

Figure 15. Land use cover for the study area

Furthermore, GIS/ArcMap was used to compute home square metres, calculated as net neighbourhood residential density, where the number of residential residence units is divided by the total residential land area (Forsyth, 2003). Figure 15 shows the number of residences in the residential area, including independent flat units, apartments, service residences, and condominiums.

Table 2. Density control in residential zones in most Malaysia cities (Kuala Lumpur city hall, 2008) Kuala Lumpur structure plan

	Maximum density allowable	
	Person-ha	**Unite-ha**
Low density	10	2
	30	7
	40	15
	100	29
Medium density	100	30
	200	50
	300	75
High density	300	80
	600	150
	850	200
	900	250
Public housing	900	250

The percentage and size of land use groups in square metres were retrieved using GIS software data is depicted in Table 3. At the same time, the number of household units was approximated by utilising 25 floors as the average block floor,

ten (10) units as the typical floor unit, and 25 floors as the average block floor, as shown in Figure 16.

	No. of residential blocks	Total no. of residential units	Est. total no. of units	Total size of residential land	Est. total no. units - acre	Est. total no. people	Density no. of person per resident_m²
Apartment	15 blocks	15*25 floor * 10unites = 3,750 units	8,343 units	253,575m² 62.6acre	1,332	8343 * 4 =33,372 = 533	0.131 m²
Service resident	9 blocks	9*25 floor * 10 unites = 2,250 units					
Condominium	8 blocks	8*25 floor * 10 unites =2,000 units					
Independent flat	361 blocks	361 units					

Figure 16. The number of residences in the residential area

With a density of 0.03 households per metre squared of total residential land, the numbers add up to an acceptable number. According to Malaysian standards (Abdullah *et al.,* 2020), a population density of 133.2 units per acre is considered high, and the estimated total population density is 533 people per acre. According to the study observation, there are homes in the study area that should technically be classified as businesses area due to the crowd. These areas are so vast, and their inhabitants so concentrated that there is much-unused space.

$$\text{Household Density} = \frac{Number\ of\ households}{totals\ of\ land\ \text{use}} \quad (1)$$

$$= \frac{8343}{256.341}$$

$$= 0.03\ unit\ m^2$$

Table 3. The percentage and the size of land use categories

Categories	Percentage	Size(sq.m)
Public Facilities	5.4%	8050
Commercial	39.5%	710.312
Reserve	6.7%	121.091
Institution	6.1%	110.774
Open Space	12 %	215.424
Residential	14.2%	256.341
Forest	8.6	155.062
Private Open Space	7.2	131.032
Total	100%	1.798.087

Also, it was further observed that there is so much clustering in the business districts of Bukit Bintang, notably in the region of foreign workers' housing. At the same time, the other part of the residential area is nearly empty, as demonstrated using a kernel density analysis, shown in Figure 17.

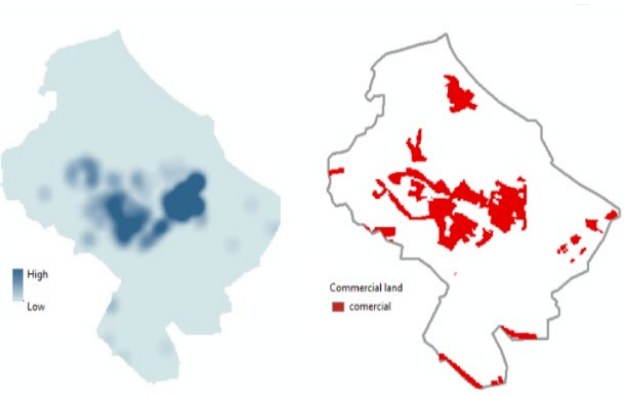

Figure 17. Kernel density analysis shows the distribution of residential buildings in the study location

Concerning the Bukit Bintang business districts, the district stands out because it has some of the trendiest shops and tallest buildings and is a place where fun goes on 24 hours a day, seven days (7) a week.

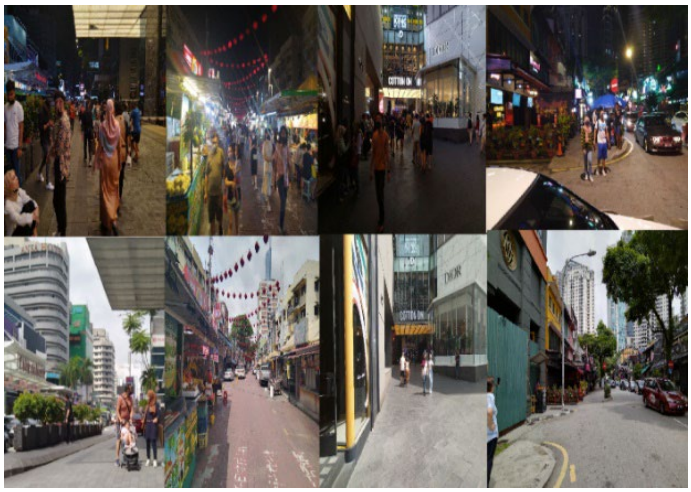

Figure 18. The contrast in retail stores crowd level on night and daytime in the same places

There are a lot of stores and shopping malls, both old and new. And no matter the individual budget, there are things for everyone. Lot 10, one of the city's oldest malls, and Pavilion are two of the best places to shop. In Kuala Lumpur, there are many stores on both sides of the road just outside these big malls. The research observation found that commercial areas like shopping malls and stores in the Bukit Bintang area are

busy at night. While almost empty during the day, as shown in Figure 18. This difference is due to students or workers being engaged in the morning.

There are several ways to quantify population density in an area, but one of the most common is to look at indicators like the ratio of shops to total floor space. Due to the busy nature of the business districts of Bukit Bintang, shop spacing was calculated and evaluated for COVID-19 spreading. Using the Floor Area Ratio (FAR), this study attempts to calculate the FAR for Bukit Bintang shop space. FAR is commonly used in conjunction with Land Use Mix (LUM) to indicate a pedestrian-friendly layout. A low FAR value suggests that a large portion of a commercial lot is used for non-building purposes, such as parking, shopping centres, or office buildings. According to this research GIS data study, as shown in Figure 19, GIFAR was used to determine the entire area of commercial land by dividing the sum of all retail buildings' footprints in square metres.

$$\text{FAR} = \frac{\text{the ratio of retail area in m2}}{\text{total of commercial land}} = \frac{104.586m^2}{710.312m^2} = 0.15m^2$$

Based on the results, the retail floor area ratio (FAR) is 0.15 m^2 of retail land for every square metre of commercial land. It took up 15.7% of all commercial land. A larger ratio would suggest a dense urban development. At first glance, it does not appear that there is a density of retail stores in the commercial area as a whole because the commercial area is rather vast, and the retail stores cluster in certain places, leaving much space empty. Figure 18 depicts a clustering in the core of Bukit Bintang, especially near foreign worker residences and Sultan Ismail Street. The rest of the commercial area is used for parking, malls, and offices. Foot traffic makes retail locations valuable. Often, they are positioned near "anchor" stores, such as grocery stores, which can boost foot traffic, leading to crowding and a lack of defensible spaces to maintain social distancing, hence the spread of COVID-19.

Figure 19. Retail floor area ratio (FAR) of the total commercial land

3. Milieu

Based on prior studies by Qwasmi *et al.* (2022), the nature and patterns of the spatial distribution to discover the imbalance, as a poor distribution that creates overcrowding, are examined. In this part of the analysis, properly distributing community services, such as malls, restaurants and other, decrease overcrowding. This section focuses on the most visited location (site attractions) in Bukit Bintang. This is tailored toward the nature of the spatial distribution of points of interest (POI) and the spatial distribution pattern of visited features in the Bukit Bintang area.

The nature of the spatial distribution of POI in Bukit Bintang

Exploiting the spatial distribution approach of Qwasmi *et al.* (2022), the first analysis is performed on the ArcGIS data obtained from the study location to determine the nature of the spatial distribution of POI. This process was required to locate the mean centres of the study area, where the results show that the mean centre of the visited places (POI) is concentrated in the Northeast of the Bukit Bintang area. As a result, this area represents the centre of attraction of the districts or the geographical centre of the concentration. Furthermore, standard deviations and the three-sigma rule were employed to allow a better comprehension of the dispersion or spread of the data. The three-sigma rule conveys the percentage of data values that will lie between one, two, and three standard deviations of the mean. This implies that

68.1%, 95.5%, and 99.7% of the data values lie within one, two, and three standard deviations of the mean, assuming a normal distribution.

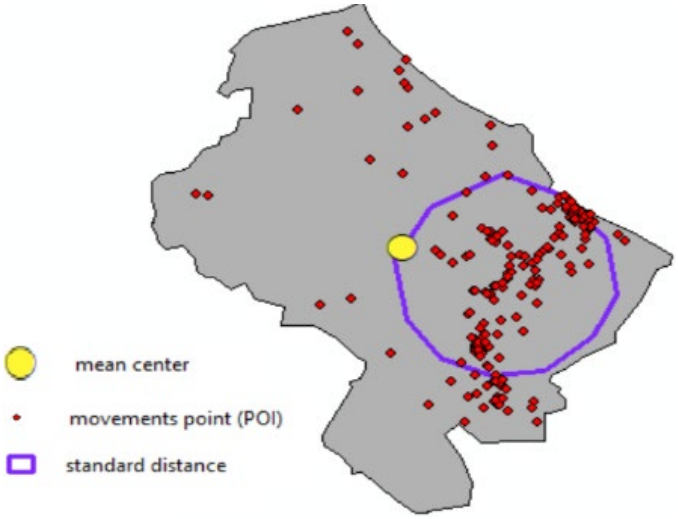

Figure 20. The nature of the spatial distribution of Bukit Bintang's POI geographic distribution

The computed results, as shown in Figure 20, show that 72.2% (150 POI) of the total 207 POI in the study region are within the standard distance, indicating that the visited sites are regularly distributed and likely to be crowded because they are expected to comprise circles. If the distribution is regular and the ratio is close to standard, 68.0% of the apparent elements positively connect with dispersion. So, increasing the standard distance from the average centre increases contrast and dispersion. The higher the feature concentration, the shorter the standard distance. To this end, an increase in the number of POI greater than 150 POI in the study area will result in widespread COVID-19.

The Pattern of Spatial Distribution of Visited Features

The primary goal of this analysis is to ascertain whether the spatial orientation of the data is dispersed (i.e., approximately equally distributed across an area), random, or clustered by examining the spatial distribution pattern of visited features in Bukit Bintang using the average nearest neighbour analysis. By comparing the actual lengths between each point and its nearest neighbour to the distance expected based on a hypothetical random pattern, the closest neighbour analysis statistical approach is used to determine if there is a pattern in a population of points (Clark & Evans, 1954). The resulting ratio (R) shows how the features under the study location are clustered, scattered, and randomly distributed. If the R-value is zero (0), the data points all plot on the same line. Clustering is indicated by R values < 1, while widespread dispersion is denoted by R values > 1.

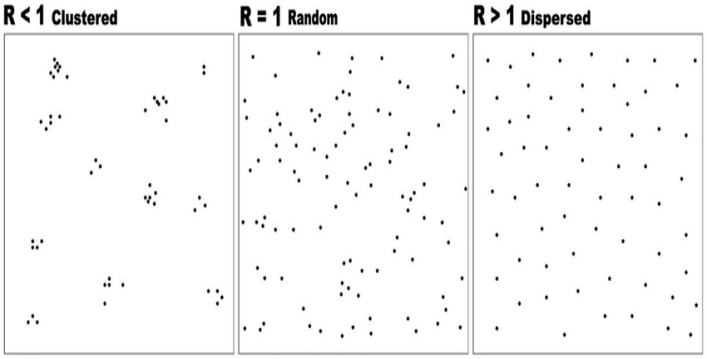

Figure 21. The types of patterns R-values reflect

The maximum theoretical dispersion is R= 2.149, suggesting points form a triangular lattice. Examples of the patterns captured by these numbers are displayed in Figure 21, and the range of possible R values is described. Based on the Nearest Neighbour Ratio of roughly 0.57 shown in the Average Nearest Neighbour output report in Figure 22, we may infer that our data is not uniformly scattered but rather clustered and dispersed.

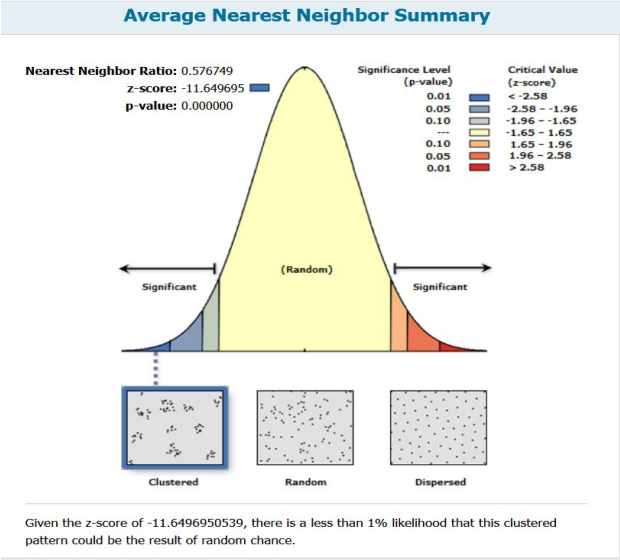

Figure 22. POI Average Nearest Neighbour analysis indicates a clustering pattern based on the p-value

Using the output's z-score and crucial values, we determine that our data clusters in the left tail of the normal distribution (i.e., less than -2.58). The findings also show that the possibility of the grouping being the result of random chance is extremely low. A highly clustered region of the visited features leads to more COVID-19 spread.

4. Accessibility

According to Littman (2017), accessibility refers to the capacity to reach desired goods, services, activities, and destinations. Easy access to a place increases the possibility of people meeting and interacting due to the increased density of facilities. In this way, we hypothesise that accessibility acts as a proxy for numerous social interaction-related qualities. Areas with greater accessibility promote higher social interaction levels, therefore, higher COVID-19 infection rates. In this paper, we look at three crucial trends in geographic access in the Bukit Bintang area. These are diversity, proximity, and connectivity. Diversity is the spatial arrangement of how land is used, which affects the type and nature of travel, while proximity and connectivity are two ways to think about diversity. A well-mixed land use supports and offers many different services in the area. This reduces travel time and makes walking more appealing (Feng, 2010).

Using the Euclidean distance tool, we performed proximity assessments between various land use types, such as residential, commercial, public facilities, institutions, and open spaces. We extracted each class as a distinct layer from the land use map (ArcMap 10). All proximity map findings were normalised to a scale from 1 to 5 (1 indicates no mixed-use, and 5 indicates proximity to the relevant land use type). The locations (pixels) close to a greater variety of land uses were then visualised by adding up all the standard maps and giving each one the same weight. The map in Figure 23 displays the study area's mixed land use features at the pixel level. To determine the proportion and area in square metres (m^2) of high-mix zones relative to the overall area, ARCGIS10.x was used. Higher ratios indicate greater diversity; for example, Figure 23 shows that 44.42 per cent, or 889.379 square metres (m^2), of the study area, has a very high ratio of different types of land use.

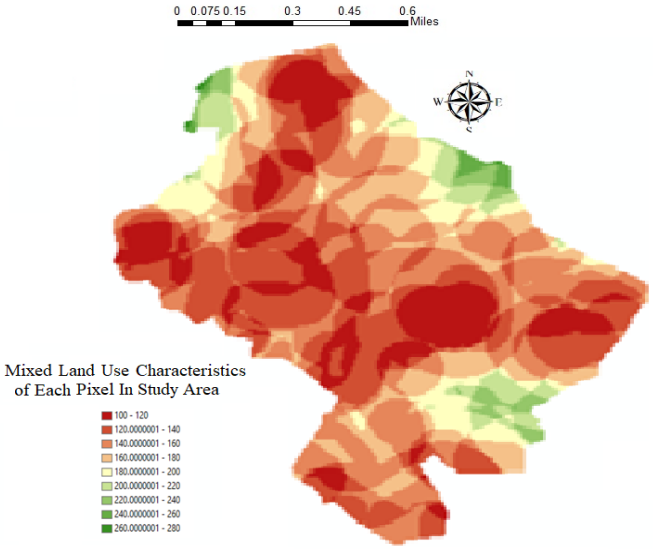

Figure 23. the ratio of high-mix zones

Proximity is the second metric to determine a neighbourhood's suitability for accessibility. It is related to the amount and variety of attractions within a certain distance of a given location. That depends on how numerous and varied the population is. It is more likely that the distance between points of destinations will decrease when proximity and directness increase, which minimises the need to drive. It is acceptable to infer that walking is preferred to driving when the distance between locations is less than one kilometre (Watts *et al.,* 2015). Numerous studies have found that walking and other forms of physical exercise are consistently connected with close access to parks, walkways, trails, schools, and recreational facilities (Berke, 2007; Tucker, 2009; Lovasi, 2008; Curran, 2006). The proximity to shops is also a plus (Krizek & Johnson, 2006). The following are some of the broad types of stores that can be found in the retail sector, as described by Krizek and Johnson:

- Food and beverage stores
- Health and personal care stores
- Clothing and clothing accessory stores
- Sporting goods, hobby, book, and music stores, general merchandise stores

- Miscellaneous stores (e.g., used merchandise, pet, art, tobacco etc.)
- Food services and drinking places.

Additionally, it has been hypothesised that areas with good pedestrian access tend to have plentiful public transportation options and many users. Therefore, there is less reliance on automobiles in these areas. It is common practice to evaluate the correlation between an individual's level of physical activity and their proximity to a public transit stop (Tomalty, 2009; Watts *et al.,* 2015; Devlin, 2009). Figure 24 displays the developed distance-based service areas for 207 Bukit Bintang tourist spots during RMCO, in addition to the residential hub located at the centre of the map. All visited locations, including the heart of the residential area, were within the boundaries of the service area (light brown), indicating their proximity to one another and the resulting congestion and high COVID-19 spread.

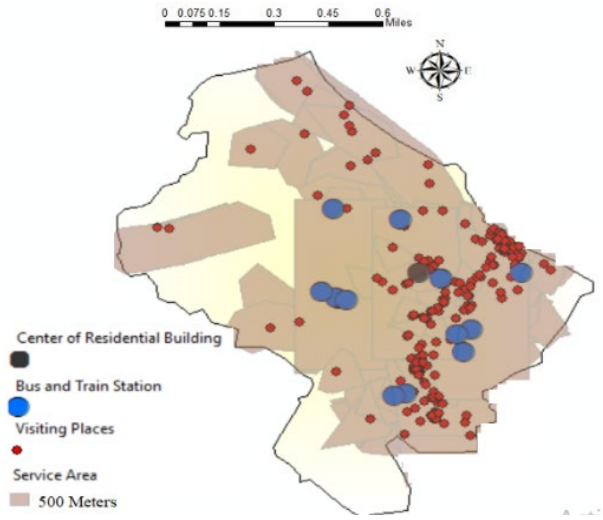

Figure 24. Developed distance-based service areas for 207 Bukit Bintang tourist spots during RMCO

Street connectivity is another metric used in the accessibility index for gauging a neighbourhood's overall usability. Roads, byways, pedestrian walkways, and trails are said to have high levels of connectivity if they all lead to and from one another (Axelson, 1999). Because of the good effect on accessibility, high connectivity is intended to facilitate transit and travel between locations by providing shorter and more alternative routes. As connectivity develops, travel distance lowers, and route alternatives rise. Reduced travel times, increased access to alternative ways, and less reliance on major thoroughfares are all benefits of a well-connected system of pedestrian walkways, bike lanes, and pathways. When there are more points of connection, the network is more well-connected.

Centreline vector data from sidewalks were used to calculate connectivity, with attention paid solely to intersections where pedestrians would be able to cross rather than at road crossings that are too fast or too dangerous for them to utilise. Network Analysis in Arc GIS was used to select actual intersections. If two intersections are less than 15 metres apart, they are combined into one using the integrated tool. Other research has also suggested a 15 metres separation (Dobesova & Krivka, 2012). The GIS analysis shows a cluster of intersections in the studied region. Any clustered area in this study exposes its occupants to the high risk of COVID-19. The characteristics of a well-connected sidewalk or path network include short block lengths, multiple three and four-way intersections and minimum dead-ends. Increases in communication provide shorter distances and more flexible itineraries, as shown in Figure 25.

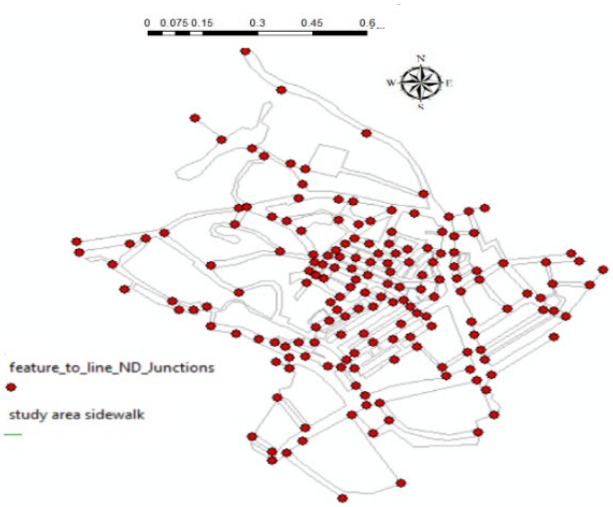

Figure 25. Increases in communication provide shorter distances and more flexible itineraries

The researcher determined that the target study location (Bukit Bintang) has good transportation links. From what we can tell on the ground during the observation, the study

location walkway has excellent foot traffic flow. Strong connections between tourist attractions and places are straightforward to get around. There are two main components to connectivity: the paths taken to get from one attraction to another and the overall traffic patterns of the area under consideration.

B. Statistical Analysis

In this part of the research, quantitative analysis is used to corroborate the results of the observation and GIS data-based analysis of the different elements. This is achieved via surveying foreign workers' residences and shopping mall visitors in the study areas. Below, we discuss the outcomes of the pilot and primary survey of residents of the research area.

Construct Code Definition

Urban Fabric Quality (Walkability)	-	UFQW
Urban Fabric Quality (Building Design)	-	UFBD
Urban Fabric Quality (Open Space)	-	UFOS
Density	-	D
Accessibility	-	A
Millie	-	M
Insufficiency to Control	-	IC

1. Reliability and Pearson Correlation Test

The questionnaire's reliability was analysed to determine its dependability. Cronbach's alpha is used to measure the reliability of 14 different questions. The questionnaire was shared online using a QR code for ease of scan by the foreign worker's residents, and shopping mall visitors in the study areas. This was done to see how readily, comprehendible and trustworthy the questionnaire replies were from the respondents. Since the questionnaire link was made public, 50 valid responses were relieved for the pilot study.

Table 4. Reliability Test Result for Pilot Study (Resident)

No.	Construct	Alpha Coef.	No. of item
1.	UFQW	.867	6
2.	UFQBD	.931	6
3.	UFOS	.930	6
4.	D	.890	6
5.	A	.898	6
6.	M	.901	6
7.	IC	.701	6

As shown in Table 4, the internal reliability tests on each construct show that resident Alpha Coeff. data values range from 0.701 to 0.931 for each item that makes up the construct. "Residential: Insufficiency to control" had the lowest alpha, 0.701, while the Residential: Urban fabric (Building Design) had the most significant alpha coefficient, 0.931. These multiple constructs underwent the same review procedure; each is trustworthy and passes all requirements for the primary data-gathering questionnaire.

Table 5. Reliability Test Result for Pilot Study (shopping mall)

No.	Construct	Alpha Coef.	No. of item
1.	UFQW	.914	6
2.	UFQBD	.859	6
3.	UFOS	.851	6
4.	D	.882	6
5.	A	.877	6
6.	M	.865	6
7.	IC	.700	6

Table 5 shows responses from the questionnaire distributed in the shopping mall centre, with Alpha Coef. data values range from 0.700 to 0.914. Insufficiency to control was the lowest-scoring construct in terms of internal consistency (alpha=0.700), while the highest internal consistency was in the "Urban fabric (Walkability)" construct at 0.914. This means that the data collected for each construct were consistent with each other and to reach this research objective. It also means that the reliability stand of the questionnaire was met and understood.

Table 6. Pilot Data Pearson Correlation for Resident

		U.B.	D	A	M	F.C.
UFQ	Pearson Correlation	1				
D	Pearson Correlation	.499**	1			
A	Pearson Correlation	.609**	.545**	1		
M	Pearson Correlation	.603**	.603**	.578**	1	
FC	Pearson Correlation	.629**	.704**	.640**	.683**	1

Sig. (2-tailed)	.000	.000	.000	.000	
N	50	50	50	50	50

Table 6 shows the results of the Pearson Correlation and Sig for the resident survey. The results of a two-tailed test (2-tailed) of the correlation between insufficiency to control urban fabric quality, density, accessibility, and milieu show that both values are statistically significant at the 0.0000 level (< 0.05). Based on the results, the respondent's answers to insufficiency to control (certain place restrictions on the study elements) strongly correlate with other constructs.

Table 7. Pilot Data Pearson Correlation for shopping mall

		UFQ	D	A	M	FC
UFQ	Pearson Correlation	1				
D	Pearson Correlation	.623**	1			
A	Pearson Correlation	.511**	.706**	1		
M	Pearson Correlation	.384**	.509**	.601**	1	
FC	Pearson Correlation	.565**	.474**	.454**	.434**	1
	Sig. (2-tailed)	.000	.001	.001	.000	
	N	50	50	50	50	50

Table 7 presents the statistical analysis of the shopping mall survey questions. Results show a high construct correlation. The connection between the insufficiency to control urban fabric quality, density, accessibility, and milieu is statistically significant at the 0.001 level (<0.05). This shows that the questions on the different parts of the questionnaire are related in important ways. Hence, the questionnaire ended up being used for the primary data collection for the study.

Table 8. Reliability Test Result for Main Data (Resident)

No.	Construct	Alpha Coef.	No. of item
1.	PSUFQW	.896	6
2.	PSUFQBD	.914	6
3.	PSUFOS	.941	6
4.	PSD	.878	6
5.	PSA	.902	6
6.	PSM	.882	6
7.	IC	.903	6

According to Malhotra's reliability definition in Malhotra (2002), the primary data for the resident question is similar to the result, as shown in Table 8. The construct results' values range from .878 to .941 showing solid internal consistency across all constructs. This indicates that each construct's data was consistent and that responders comprehended the questionnaire's questions.

Table 9. Reliability Test Result for Main Data (shopping mall)

No.	Construct	Alpha Coef.	No. of item
1.	UFQW	.841	6
2.	UFQBD	.891	6
3.	UFOS	.909	6
4.	D	.874	6
5.	A	.899	6
6.	M	.912	6
7.	FC	859	6

Table 9 lists the alpha coefficient for all shopping mall-related constructs. The findings vary from .859 to .912. Malhotra's questionnaire reliability requirements are met, and all data are reliable and relevant to this study.

2. *Inferential Analysis*

The primary purpose of this analysis is to corroborate that the following current elements, i) urban fabric, ii) density, iii) accessibility and iv) milieu settings, contribute to COVID-19's spread. In this study, the author generalises people's familiarity with their resident and shopping mall physical space element situations. Hence, the test of study data normality is performed to proceed with the inferential analysis. This test determines if data are normal or not normally distributed. After the normality test result is known, the primary study's analysis type will be decided.

The Shapiro-Wilk normality test is used for determining this study's data normality, performed to show if the study's data follow a particular distribution. Based on the test result obtained, the inherent data's low p-value (<.05) shows that the data did not follow a normal distribution. If Shapiro-Wilk >.05, the data has a normal distribution. If less than .05, the data deviates significantly from a normal distribution.

Because of the nature of the respondent's inherent data, non-parametric analysis is the appropriate analysis to assess

this study's objective. Table 10 summarises the study's purpose, hypotheses, and analysis type.

Table 10. Research Test and Analysis Methods

		Analysis
Objective	To Investigate the insufficiency to control the epidemic and physical space.	Ordinal Regression
Hypothesis 1	There is a positive relationship between the insufficiency to control COVID-19 and physical space in residential.	&
Hypothesis 2	There is a positive relationship between the insufficiency to control COVID-19 and physical space in shopping malls.	Spearman Correlation

V. DISCUSSION

A non-parametric analysis is a statistical approach to analysing assumptions, especially if the data is not normally distributed. Non-parametric tests are often called non-distributed tests.

Spearman Correlation

The Spearman correlation coefficient measures the strength and direction of two or more ordinal variables. This index can identify if variables are linked. r_s denotes this concept in popular parlance (Hair *et al.,* 2006; Malhotra, 2007). This test is conducted when Pearson's correlation assumptions cannot be met, which is the situation for ordinal variables and non-normal continuous data. The researcher utilised Spearman's correlation to measure how often residential and shopping physical space elements fail to control COVID-19 spread. Spearman's correlation test compares each construct. In Table 11, all resident constructs have a strong positive association, while Table 12 shows a moderate positive connection across all shopping mall constructs. Physical space elements helped restrict COVID-19 proliferation in shopping malls.

Table 11. Spearman's Correlation Test Result for Main Data (Resident)

			UFQ	D	A	M	FC
Spearman's rho	UFQ	Correlation Coefficient	1.000				
	D	Correlation Coefficient	.460**	1.000			
	A	Correlation Coefficient	.468**	.767**	1.000		
	M	Correlation Coefficient	.431**	.610**	.686**	1.000	
	FC	Correlation Coefficient	.433**	.643**	.622**	.857**	1.000
		Sig. (2-tailed)	.000	.000	.000	.000	.
		N	250	250	250	250	250

Hypothesis 1*: There is a positive relationship between the insufficiency to control COVID-19 and physical space elements in residential.*

Table 11 established results reveal that the insufficiency to control in different construct has a significant 0.000 (less than 0.005) for a range of coefficient from .433** .643** .622** .857**. The physical space elements failed to control the COVID-19 spread, as shown by the correlation result of the respondent. The physical space element urban fabric quality for both walkability, building design and open space held a correlation of .433**. This means that urban fabric quality did not achieve robust social distancing, safe working, balcony or building design, good conditioning, enough space, and suitable corridor links to the residential buildings. This finding also held for element density at the correlation value of .643** as the neighbourhood area is always crowded both day and night, with more visitors in the residential neighbourhood area.

For the element accessibility, the correlation value is .622**. This means that the Bukit Bintang area was easy to access by visitors, with extensive land use and various interconnected sidewalks. This leads to easy access to the area and the residential neighbourhood area, increasing COVID-19 spread. For the element milieu, the finding revealed that the Bukit Bintang area is always crowded, with almost all required

services walkable to malls and other services sectors, leading to the high increase in the spread of COVID-19 in the area with a correlation of .857**. The study verdict shows that the elements (urban fabric quality, density, accessibility, and milieu) did fail to control the COVID-19 spread in the residential neighbourhood area.

Previous research has critically examined the following topics: the impact of lockdowns on air pollution concentrations (Abdullah *et al.,* 2020; Nakada & Urban, 2020; Tanzer-Gruener *et al.,* 2020; Tobías *et al.,* 2020; Venter *et al.,* 2021; Yuan *et al.,* 2021); the association between air pollution and COVID-19 cases (Accarino *et al.,* 2021; Tello-Leal & Macías-Hernández, 2020), Changes in the weather and air pollution (Hossain *et al.,* 2021; Sulaymon *et al.,* 2021); shifts in traffic and mobility (Aloi *et al.,* 2020); and the implementation of statistical and modelling techniques (Bao & Zhang, 2020; He *et al.,* 2020; Liu *et al.,* 2020). Even though the majority of the attention in this investigation is on the risks that urban air pollution poses to people who are not at risk of developing cancer, this study also analyses the effects air pollution has on malls and residential building areas in insufficiency to control COVID-19 spread.

Table 12. Spearman's Correlation Test Result for Main Data (shopping mall)

			UFQ	PSD	PSA	PSM	FC
Spearman's rho	T-UFQ	Correlation Coefficient	1.000				
	PSD	Correlation Coefficient	.333**	1.000			
	PSA	Correlation Coefficient	.202**	.473**	1.000		
	PSM	Correlation Coefficient	.217**	.460**	.413**	1.000	
	FC	Correlation Coefficient	.545**	.417**	.449**	.408**	1.000
		Sig.(2-tailed)	.000	.000	.000	.000	.000
		N	250	250	250	250	250

Hypothesis 2*: There is a positive relationship between the insufficiency to control COVID-19 and physical space in shopping malls.*

Furthermore, it is clear from the results provided in Table 12 earlier that the inability to restrict the spread of COVID-19 in public locations (shopping malls) holds a weak coefficient ranging from .545** .417** .449** to .408** with a significant level of 0.000 (lower than 0.005). This also demonstrates that the elements in shopping malls conform less to help keep the spread of COVID-19 minimal. There was a correlation of .545** between walkability, building design, and open space as components of urban fabric quality for the shopping mall element.

This means that the shopping mall buildings lacked sufficient social distance (even though it was observed by few), safe working conditions around the malls, indoor and outdoor robust design, quality air conditioning, adequate spacing, and appropriate corridor connections with better social distancing rules enforced, less space of activities, poor conditions and poor accessibility to Bukit Bintang area. At a correlation value of .417**, this was also true for the density elements, which is to be expected given the constant presence of people in and around the malls, restaurants, and sidewalks at all hours of the day, night, weekdays, and weekends.

The accessibility elements have a correlation coefficient of .449**. Because of Bukit Bintang's central location, extensive land use, and network of interconnected sidewalks, the Bukit Bintang district was easily accessible by tourists and locals, which likely contributed to the rapid spread of the COVID-19 virus in the area. The element milieu findings showed a low increase in the spread of COVID-19 in the Bukit Bintang area, with a correlation of .408**. This is because the area is always busy, has nearly all necessary services, and is within walking distance to malls and other service sectors. The research results indicate that the elements (urban fabric quality, density, accessibility, and milieu) did not prevent the spread of COVID-19 in the shopping mall areas. In addition to Spearman's correlation study, ordinal regression analysis is done to support the correlation study.

The insufficiency to control COVID-19 in residential elements.

Ab Hamid (2015), Jagun (2020), Özogul and Tasan-Kok (2020) all agree that property development has a significant impact on national economies by bringing economic stability, creating jobs, promoting community cohesion, and maintaining or increasing home values. Regulations on the profit and political potential of property developments in Asia are tightening (Chen & Shin, 2019; Schmidt, 2019). Governments started meddling in housing policy and market-driven practices to make property development a lucrative business venture. Governments can exert more influence over the construction of public and private buildings if they serve in both capacities (Bragaglia & Caruso, 2020).

In recent years, the government of Malaysia has enacted policies and regulations that have encouraged the construction of more and larger project units across the country. Multiple people have worked on the site, and numerous construction and development projects have been ongoing. Resulting of it, enormous changes have been and are still being made all over the country. Due to the nature of the construction industry, wherein workers frequently interact with one another and wherein a high likelihood of transmission due to contact between several workers is substantial, COVID-19 has spread in large part due to the sheer number of workers present on the site and living in a residential apartment (Gan & Koh, 2021).

The significance of the insufficiency to control foreign workers' activity in public residential areas to the transmission of COVID-19 is ranked using ordinal regression in this study. Insufficiency to control was found to be the most reliable predictor. According to the assumptions of ordinal regression, there is a consistent correlation between the insufficiency to control COVID-19 and residential elements. Researchers check the significance of the parallel line test results to determine if the criteria have been met. Evidence of statistical insignificance is used to reject the null hypothesis. The result is shown in Table 13, and since the p-value is >.05, the study is regarded as supporting the hypothesis.

Table 13. Test of Parallel Lines[a]

Model	-2 Log-Likelihood	Chi-Square	df	Sig.
Null Hypothesis	297.356			
General	0.000[b]	297.356	48	.621

The findings of the parallel line test prove that the established correlation between the various constructs is real. Since the study's aim was achieved, it is safe to assume that the insufficiency to control COVID-19 in the residential element will continue to increase COVID-19 in Kuala Lumpur in a residential setting. Menara City One in Kuala Lumpur was placed under the Enhanced Movement Control Order (EMCO) after the condominium reported 17 confirmed cases of COVID-19 (Bernama, 2020). As of May 1, 2020, migrant workers, and refugees in EMCO-controlled areas such as Menara City One, Malayan Mansion, and the surrounding neighbourhoods were subject to widespread raids by the Immigration Department and the RMP (Amnesty International, 2020). This is because the insufficiency to control the migrant worker's activities in the condominium caused the spread of COVID-19 within the residential building and the surrounding neighbourhoods.

Table 14. Pseudo R-Square

Methods	Coe.
Cox and Snell	.806
Nagelkerke	.841
McFadden	.517

To further understand the explainability of the constructs, values in Table 14 labelled pseudo-R-squared are assumed to be close approximations of the R-squared value used in ordinal regression. Little guidance on how to use or understand this discovery is provided in the existing literature (Lomax & Hahs-Vaugn, 2012; Osborne, 2015; Pituch & Stevens, 2016; Smith & McKenna, 2013). The Nagelkerke coefficient for the residential element constructs in this study is .841, which indicates that the residential element accounts for 84.1% of the variance insufficiency to control COVID-19 spread. It should be noted, however, that the authors who analyse the pandemic from different angles (Abu Aisheh *et al.,*

2021; Tanrvermiş, 2020) all agree that the spread of COVID-19 through foreign site workers influences the insufficiency the control the COVID-19 spread.

The insufficiency to control COVID-19 in shopping mall elements.

Table 15 shows that the results of the parallel line test support the existence of the hypothesised relationship between the variables. The p-value is more than .005, and it is plausible to assume that some elements of Kuala Lumpur's shopping malls contribute to the increasing spread of COVID-19.

Table 15. Test of Parallel Lines[a]

Model	-2 Log-Likelihood	Chi-Square	df	Sig.
Null Hypothesis	331.275			
General	000[b]	331.275	48	.539

To explain the constructs for this study, elements in shopping mall explains 50.9% of the variation in the insufficiency to control the COVID-19 spread, as shown by the study's Nagelkerke coefficient of .509 in Table 16.

Table 16. Pseudo R-Square

Methods	Coe.
Cox and Snell	.475
Nagelkerke	.509
McFadden	.238

Malaysia has been dealing with a rise in the average number of new COVID-19 cases per day, which is related to increased sporadic instances of clusters. On April 29, 2020, 5945 cases of COVID-19 were reported in Malaysia; of these cases, 4300 (or 72% of the total COVID-19 patients) have a clustering origin. The Sri Petaling cluster, which occurred due to a large-scale religious event in Kuala Lumpur from February 27 to March 1, 2020 (Mat *et al.,* 2020), was linked to the highest number of COVID-19 cases. There were 2287 cases associated with this cluster. After it came the Hulu Langat, Pesantren, and Kluang clusters, each of which had a cumulative case count in the triple digits. As a result, four phases of the MCO were enforced in Malaysia. Phase I lasted from March 18 to 31, 2020; Phase II lasted from April 1 to April 14. Phase III lasted from April 15 to April 28, 2020, and Phase IV lasted from April 29 to May 12, 2020. These phases were implemented to reduce possible clustering and prevent the wide spread of the COVID-19 disease (Mat *et al.,* 2020).

Hence, the ordinal regression theory predicts that the insufficiency to control COVID-19 spread strongly correlates with resident and shopping mall elements. The hypothesis is approved by showing that the evidence is statistically insignificant. To ascertain whether or not the requirements have been met, the researcher evaluates the significance of the parallel line test results. Since the p-value of both results is more significant than .05, the researcher infers that the hypothesis is supported.

VI. CONCLUSION

In Malaysia, starting in March 2020, a growing number of daily new COVID-19 cases were documented, suggesting the insufficiency of social distancing as a COVID-19 prevention method (MOH, 2019; Yezli & Khan, 2020). This is especially true because massive cultural and religious gatherings led to cluster cases like Sri Petaling, Simpang Rengam, and Bangi after the first COVID-19 case was registered in the country on February 25, 2020. Other clusters of COVID-19 instances during the MCO showed non-compliance with social distancing norms. The government of Malaysia deployed an improved MCO (also known as condition (CMCO) from May 13 to June 9) in point sources with large COVID-19 outbreaks where strict enforcement (army and roadblocks) broke the spread chains (Adib & Teh, 2020).

Malaysia's COVID-19 curve became flat after three months of uninterrupted MCOs and CMCOs (Mat *et al*., 2020; Adib & Teh, 2020). This is because the government followed the (WHO, 2020) provide guidelines. Insufficiency to comply with social distance rules caused clustering cases, which required MCO and enhanced (EMCO) enforcement procedures. In future epidemics, public preventive measures like social distancing, hand cleanliness, and personal protective equipment can be employed. Better residential and shopping mall element design is required for post-COVID, where this

will reduce possible lockdowns and improves a country's economy in the next pandemic.

VII. REFERENCES

Ab Hamid, MRB 2015, 'Value-based performance excellence model for higher education institutions', Quality & Quantity, vol. 49, no. 5, pp. 1919-1944.

Abdullah, J, Ahmad, CB, Sa'ad, SRM & Wahab, SS 2015, 'Public Participation in the Kuala Lumpur Draft City Plan 2020', Procedia-Social and Behavioral Sciences, vol. 168, pp. 70-75.

Abdullah, S, Mansor, AA, Napi, NNLM, Mansor, WNW, Ahmed, AN, Ismail, M & Ramly, ZTA 2020, 'Air quality status during 2020 Malaysia Movement Control Order (MCO) due to 2019 novel coronavirus (2019-nCoV) pandemic', Science of the Total Environment, vol. 729, pp. 139022.

Abu Aisheh, YI, Tayeh, BA, Alaloul, WS & Almalki, A 2021. 'Health and safety improvement in construction projects: A lean construction approach. International journal of occupational safety and ergonomics,' pp.1-13.us/PKPD-Kes-MenaraCity-One-berkait-dengan-kluster-tabligh.

Accarino, G, Lorenzetti, S & Aloisio, G 2021, 'Assessing correlations between short-term exposure to atmospheric pollutants and COVID-19 spread in all Italian territorial areas', Environmental Pollution, vol. 268, pp. 115714.

Adib, P & Teh, AY 2020, Emco enforced on KL skyscraper; 3,200 affected | New Straits Times. New Straits Times Press, viewed 23 July 2022, <https://www.nst.com.my/news/nation/2020/03/579651/emco-enforced-kl-skyscraper-3200-affected>.

Aloi, A, Alonso, B, Benavente, J, Cordera, R, Echániz, E, González, F, Ladisa, C, Lezama-Romanelli, R, López-Parra, Á, Mazzei, V & Perrucci, L 2020, 'Effects of the COVID-19 lockdown on urban mobility: Empirical evidence from

the city of Santander (Spain)', Sustainability, vol. 12, no. 9, pp. 3870.

Arbuckle, A 2022, Inside the squalid tenements of 1890s New York City, Mashable, Mashable Inc. viewed 30 July 2022: <https://mashable.com/archive/new-york-tenement-photos>.

Awada, M, Becerik-Gerber, B, Hoque, S, O'Neill, Z, Pedrielli, G, Wen, J & Wu, T 2021, 'Ten questions concerning occupant health in buildings during normal operations and extreme events including the COVID-19 pandemic', Building and Environment, vol. 188, pp. 107480.

Axelson, PW, Chesney, DA, Kirschbaum, JB, Longmuir, PE, Lyons, C, Wong, KM & Galvan, DV 1999, 'Designing Sidewalks and Trails for Access', Part I of II: Review of Existing Guidelines and Practices.

Bao, R & Zhang, A 2020, 'Does lockdown reduce air pollution? Evidence from 44 cities in northern China', Science of the Total Environment, vol. 731, pp. 139052.

Berke, EM, Koepsell, TD, Moudon, AV, Hoskins, RE. & Larson, EB 2007, 'Association of the built environment with physical activity and obesity in older persons', American Journal of Public Health, vol. 97, no. 3, pp. 486-492.

Bernama O 2020, PKPD: Kes Menara City One berkait dengan kluster tabligh, Sinar Harian. Sinar Harian, viewed 20 May, 2022, <https://www.sinarharian.com .my/article/76661/KHAS/Koronavirus/PKPD-Kes-MenaraCity-One-berkait-dengan-kluster-tabligh>.

Bragaglia, F & Caruso, N 2022, 'Temporary uses: a new form of inclusive urban regeneration or a tool for neoliberal policy?', Urban Research & Practice, vol. 15, no. 2, pp. 194-214.

Cheah 2020, Crackdown on migrants and refugees an appalling violation of human rights, Amnesty Malaysia. Amnesty International. viewed 25 July, 2022, <https://www.amnesty.my/2020/05/01/crackdown-on-migrants-and-refugees-an-appalling-violation-of-human-rights/>

Chen, YL & Shin, HB 2019, 'Centering housing questions in Asian cities. In Neoliberal Urbanism, Contested Cities and Housing in Asia,' Palgrave Macmillan, New York, pp. 1-19.

Cirrincione, L, Plescia, F, Ledda, C, Rapisarda, V, Martorana, D, Moldovan, RE, Theodoridou, K & Cannizzaro, E 2020, 'COVID-19 pandemic: Prevention and protection measures

to be adopted at the workplace', Sustainability, vol. 12, no. 9, pp. 3603.

Clark, PJ & Evans, FC 1954, 'Distance to nearest neighbor as a measure of spatial relationships in populations', Ecology, vol. 35, no. 4, pp. 445-453.

Curran, A, Grant, J & Wood, ME 2006, 'Indicators for community action: Built environment and community health', Journal of Rural and Community Development, vol. 2, no. 1.

Daim, N 2020, True colours: If you live in a COVID-19 red or orange zone, stay home, New Straits Times. New Straits Times, viewed 13 July 2022, <https://www.nst.com .my/news/nation/2020/11/637820/true-colours-if-you-live-covid-19-red-or-orange-zone-stay-home>.

Devlin, A, Frank, L & VanLoon, J 2009, Physical activity and transportation benefits of walkable approaches to community design in British Columbia, Report prepared for the British Columbia Recreation and Parks Association.

Dobesova, Z & Krivka, T 2012, 'Walkability index in the urban planning: A case study in Olomouc city', Advances in spatial planning, vol. 2.

Dudzinski, A 2019, 'Architectural Challenges of Designing Front Entrance Area at City Schools', In International Conference on Applied Human Factors and Ergonomics, Springer, Cham, pp. 256-265.

Feng, J, Glass, TA, Curriero, FC, Stewart, WF & Schwartz, BS 2010, 'The built environment and obesity: a systematic review of the epidemiologic evidence', Health & Place, vol. 16, no. 2, pp. 175-190.

Forsyth, A 2003, 'Measuring density: working definitions for residential density and building intensity', Design brief, vol. 9, no. 1, pp. 2-8.

Gan, WH & Koh, D 2021, 'COVID-19 and return-to-work for the construction sector: lessons from Singapore', Safety and Health at Work, vol. 12, no. 2, pp. 277-281.

Giacobbe, A 2020, How the COVID-19 pandemic will change the built environment, Architectural Digest.

Gungor, BS & Ozanguc, KC 2017, 'Functional Use Change in Green Spaces: A Case Study of Kirklareli Province', In IOP Conference Series: Materials Science and Engineering, vol. 245, no. 5, pp. 052008

Habitat, U 2016, 'Urbanization and development: emerging futures', World cities report, vol. 3, no. 4, pp. 4-51.

Hahs-Vaughn, D & Lomax, R 2013, An introduction to statistical concepts, Routledge.

Hair, JF, Black, WC, Babin, BJ, Anderson, R & Tatham, R 2006, 'Multivariate Data Analysis', Pearson Prentice-Hall, Upper Saddle River, NJ.

He, G, Pan, Y & Tanaka, T 2020, 'The short-term impacts of COVID-19 lockdown on urban air pollution in China', Nature Sustainability, vol. 3, no. 12, pp. 1005-1011.

Heffernan, E, Heffernan, T & Pan, W 2014, 'The relationship between the quality of active frontages and public perceptions of public spaces', Urban Design International, vol. 19, no. 1, pp. 92-102.

Hossain, MS, Ahmed, S & Uddin, MJ 2021, 'Impact of weather on COVID-19 transmission in South Asian countries: An application of the ARIMAX model', Science of The Total Environment, vol. 761, pp. 143315.

Huang, J, Kwan, MP, Kan, Z, Wong, MS, Kwok, CYT & Yu, X 2020, 'Investigating the relationship between the built environment and relative risk of COVID-19 in Hong Kong', ISPRS International Journal of Geo-Information, vol. 9, no. 11, pp. 624.

Jagun, ZT 2020, 'Risks in feasibility and viability appraisal process for property development and the investment market in Nigeria', Journal of Property Investment & Finance, vol. 38, no.3, pp. 227-243.

Kibert, CJ 2016, Sustainable construction: green building design and delivery, John Wiley & Sons.

Krejcie, RV & Morgan, DW 1970. 'Determining sample size for research activities,' Educational and psychological measurement, vol. 30, no. 3, pp. 607-610.

Krier, R & Rowe, C 1979, Urban Space. Academy Editions, London.

Krizek, KJ & Johnson, PJ 2006, 'Proximity to trails and retail: Effects on urban cycling and walking', Journal of the American planning association, vol. 72, no. 1, pp. 33-42.

Kuchler, T, Russel, D & Stroebel, J 2020, The Geographic Spread of COVID-19 Correlates with the Structure of Social Networks as Measured by Facebook. NBER Working Paper Series, National Bureau of Economic Research, Cambridge, MA

LaRiccia, L, Cittadino, A, Fiermonte, F, Garnero, G, Guerreschi, P & Vico, F 2019, 'The Walkability of the Cities: Improving It Through the Reuse of Available Data and

Raster Analyses', In Spatial Planning in the Big Data Revolution; IGI Global: Hershey, PA, USA, pp. 113–137.

Lee Long Hui, personal communication via email, March 18, 2021 longhui@malaysiakini.com

LePan, N & Harrison, S 2022, Visualizing the history of pandemics, Visual Capitalist, viewed 20 May, 2022, <https://www.visualcapitalist.com/history-of-pandem ics-deadliest>.

Li, Z, Wang, H, Zhang, X, Wu, T & Yang, X 2020, 'Effects of space sizes on the dispersion of cough-generated droplets from a walking person', Physics of Fluids, vol. 32, no. 12, pp. 121705.

Littman, RJ 2009, 'The plague of Athens: epidemiology and paleopathology', Mt Sinai J Med, vol. 76, no. 5, pp. 456-67.

Littman, T 2017, Transit Oriented Development: Using Public Transit to Create More Accessible and Livable Neighborhoods. TDM Encyclopedia; Victoria Transport Policy Institute: Victoria, BC, USA.

Liu, J, Zhou, J, Yao, J, Zhang, X, Li, L, Xu, X, He, X, Wang, B, Fu, S, Niu, T & Yan, J 2020, 'Impact of meteorological factors on the COVID-19 transmission: A multi-city study in China', Science of the total environment, vol. 726, pp. 138513.

Lovasi, GS, Moudon, AV, Pearson, AL, Hurvitz, PM, Larson, EB, Siscovick, DS, Berke, EM, Lumley, T & Psaty, BM 2008, 'Using built environment characteristics to predict walking for exercise', International Journal of Health geographics, vol. 7, no. 1, pp. 1-13.

Malhotra, A, Schuler, SR & Boender, C 2002, 'Measuring women's empowerment as a variable in international development', In background paper prepared for the World Bank Workshop on Poverty and Gender: New Perspectives, Washington, DC: The World Bank.

Malhotra, N, Nunan, D & Birks, D 2017, Marketing Research: An Applied Approach. Pearson.

Martinez-Haro, M, Green, AJ & Mateo, R., 2011, 'Effects of lead exposure on oxidative stress biomarkers and plasma biochemistry in waterbirds in the field', Environmental Research, vol. 111, no. 4, pp. 530-538.

Mat Che, NF, Edinur, HA, Abdul Razab, MKA & Safuan, S 2020, 'A single mass gathering resulted in massive transmission of COVID-19 infections in Malaysia with further international spread', Journal of Travel Medicine, vol. 27, no. 3, pp. taaa059.

Megahed, NA & Ghoneim, EM 2021. 'Indoor Air Quality: Rethinking rules of building design strategies in post-pandemic architecture,' Environmental Research, vol. 193, pp. 110471.

MOH 2019, 'Kenyataan Akhbar Kementerian Kesihatan Malaysia Situasi Semasa, Ministry of Health Malaysia. viewed 30 June, 2022, <https://www.moh .gov.my/index.php/database_stores/attach_download/337/ 1572>.

Nakada, LYK & Urban, RC 2020, 'COVID-19 pandemic: Impacts on the air quality during the partial lockdown in São Paulo state, Brazil', Science of the Total Environment, vol. 730, pp. 139087.

Osborne, JW 2015, 'Curvilinear effects in logistic regression', Best Practices in Logistic Regression. London: Sage Publications, pp. 200-42.

Özogul, S & Tasan-Kok, T 2020, 'One and the same? A systematic literature review of residential property investor types,' Journal of Planning Literature, vol. 35, no. 4, pp. 475-494.

Parks, JR & Schofer, JL 2006, 'Characterizing neighborhood pedestrian environments with secondary data', Transportation Research Part D: Transport and Environment, vol. 11, no. 4, pp. 250-263.

Peters, T & Halleran, A 2020, 'How our homes impact our health: using a COVID-19 informed approach to examine urban apartment housing', Archnet-IJAR: International Journal of Architectural Research.

Pituch, KA & Stevens, JP 2016, Applied Multivariate Statistics for the Social Sciences, 6th edn, New York and London.

Post, G 2020, Impact of covid-19 on garden design, outdoor living spaces, Total Landscape Care, viewed 03 July 2022, <https://www.totallandscapecare.com/design-build/article/15042646/impact-of-COVID-19-on-garden-design-outdoor-living-spaces>.

Pugalis, L 2009. 'The culture and economics of urban public space design: Public and professional perceptions,' Urban Design International, vol. 14, no. 4, pp. 215-230.

Qwasmi, R, Abdullah, AB, bt Asmawi, Z & Noor, NM 2022, 'The Impact of Human Mobility of COVID-19 Epidemic in Kuala Lumpur using GIS', American Journal of Agricultural Science, Engineering, and Technology, vol. 6, no. 2, pp. 25-36.

Ramzi, Q, Alias bin, A, Norzailawati MN & Zainora bt. A 2022, 'Establishing a Covid-19 Defensible Space According to Urban Fabric Using Analytical Hierarchy Processes (AHP): Case Study in Bukit Bintang, Kuala Lumpur', American Journal of Agricultural Science, Engineering, and Technology, vol. 6, no. 3, pp. 62-72.

Rebecca, G 2020, After covid-19, what's next for Landscape Architecture? Metropolis. SANDOW. viewed 19 July 2022, <https://www.metropolismag.com/architecture /landscape/COVID-19-landscape-architecture>.

Schmidt, JD 2019, 'The challenge from South East Asia: Social forces between equity and growth', In Uneven Development in South East Asia, Routledge, pp. 21-44

Smith, TJ & McKenna, CM 2013, 'A comparison of logistic regression pseudo R2 indices', Multiple Linear Regression Viewpoints, vol. 39, no. 2, pp. 17-26.

Sulaymon, ID, Zhang, Y, Hopke, PK, Zhang, Y, Hua, J & Mei, X 2021, 'COVID-19 pandemic in Wuhan', Ambient air quality and the relationships between criteria air pollutants and meteorological variables before, during, and after lockdown. Atmospheric research, vol. 250, pp. 105362.

Tanrıvermiş, H 2020, 'Possible impacts of COVID-19 outbreak on real estate sector and possible changes to adopt', A situation analysis and general assessment on Turkish perspective. Journal of Urban Management, vol. 9, no. 3, pp. 263-269.

Tanzer-Gruener, R, Li, J, Eilenberg, SR, Robinson, AL & Presto, AA 2020, 'Impacts of modifiable factors on ambient air pollution', A case study of COVID-19 shutdowns. Environmental Science & Technology Letters, vol. 7, no. 8, pp. 554-559.

Tello-Leal, E & Macías-Hernández, BA 2021, 'Association of environmental and meteorological factors on the spread of COVID-19 in Victoria, Mexico, and air quality during the lockdown', Environmental Research, vol. 196, pp. 110442.

Tobías, A, Carnerero, C, Reche, C, Massagué, J, Via, M, Minguillón, MC, Alastuey, A & Querol, X 2020, 'Changes in air quality during the lockdown in Barcelona (Spain) one month into the SARS-CoV-2 epidemic', Science of the total environment, vol. 726, pp. 138540.

Tomalty, R & Haider, M 2009, BC sprawl report. desLibris.

Tucker, P, Irwin, JD, Gilliland, J, He, M, Larsen, K & Hess, P 2009, 'Environmental influences on physical activity levels in youth', Health & Place, vol. 15, no. 1, pp. 357-363.

Watts, A, Ferdous, F, Diaz Moore, K & Burns, JM 2015, 'Neighborhood integration and connectivity predict cognitive performance and decline', Gerontology and Geriatric Medicine, vol. 1, pp. 2333721415599141.

Wheaton, WC & Kinsella Thompson, A 2020, Doubts about density: COVID-19 across cities and towns. Available at SSRN 3586081.

WHO 2020, Maintaining Essential Health Services and Systems, World Health Organization, World Health Organization, viewed 15 July, 2022, <https://www. who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/maintaining-essential-health-services-and-systems>.

Wong, DW & Li, Y 2020, 'Spreading of COVID-19', Density matters. PLOS One, vol. 15, no. 12, p. e0242398.

Yezli, S & Khan, A 2021, 'COVID-19 pandemic: it is time to temporarily close places of worship and to suspend religious gatherings', Journal of travel medicine, vol. 28, no. 2, pp taaa065.

Yuan, Q, Qi, B, Hu, D, Wang, J, Zhang, J, Yang, H, Zhang, S, Liu, L, Xu, L & Li, W 2021, 'Spatiotemporal variations and reduction of air pollutants during the COVID-19 pandemic in a megacity of Yangtze River Delta in China', Science of the Total Environment, vol. 751, pp. 141820.

Zeigler, PM 2012, What is a green building? Fundamental principles of green building and sustainable site design.

Zheng, Z, Xie, Z, Qin, Y, Wang, K, Yu, Y & Fu, P 2021, 'Exploring the influence of human mobility factors and spread prediction on early COVID-19 in the USA', BMC Public Health, vol. 21, no. 1, pp. 1-13.