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EXPLORING THE RELATIONSHIP BETWEEN URBAN DENSITY AND MENTAL WELL-BEING IN FIVE MAJOR CITIES IN MALAYSIA

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ABSTRACT

Mental health is the leading cause of mortality, with the number of cases expected to increase by around 10 per cent by 2030 in the global context. In Malaysia, the prevalence of mental health disorders among Malaysian adults 16 years old and older increased by 29.2 per cent in 2015 from 10.7% in 1996. This study explored the relationship between urban density and mental health in five major Malaysian cities: Kuala Lumpur, Johor Bahru, Melaka Tengah, Penang, and Ipoh. This study used comparative analysis and correlation analysis to compare several data according to urban density, such as the urban population's highest density per kilometre square and open space ratio by state. The mental health measurement by the suicide cases by state and five cities area. The results of this study suggested evidence of urban density living with mental health due to factors of environmental overcrowding and the limitation of space. This study showed that the level of urban density could influence the level of mental health among the communities. Suicide cases are related to mental health, implying a connection between the occurrence of suicide cases and the overall state

of well-being among individuals. Suicide is a complex and multifaced issue influenced by various factors, including mental health, social, economic, and environmental factors.

Keywords: *'Mental Health, Urban Density, Relationship, Malaysian Cities'*

INTRODUCTION

Mental health is the leading cause of mortality, and it will increase by around 10 per cent in 2030 in the global context (Azuddin, 2020). In Malaysia's context, the National Health and Morbidity Survey (2015) reported that the prevalence of mental health disorders among Malaysian adults aged 16 and older increased by 29.2 per cent in 2015 from 10.7 per cent in 1996. It shows that there is a tendency for yearly increases in Malaysia. In addition, Malaysia is ranked eighth with a 54.1 per cent overall score, revealing wide diversity in mental health integration rather than New Zealand with 94.7 per cent (Asian Scientist, 2016). The increase in the percentage of mental health disorders in Malaysia emphasises the need to implement effective mental health policies to overcome the prevalence of mental health disorders among Malaysians, especially Malaysian adults. As the urban population will rise in 2040 and beyond, this study used comparative analysis and correlation analysis to compare several data to measure the urban density and mental health subject. This topic was chosen to align with the Sustainable Development Goals (SDGs), particularly the third goal on good health and well-being and the eleventh goal on sustainable cities and communities.

This study compared several data on the urban population's highest density per kilometre square, open space ratio, and suicide cases. This study answered whether environmental overcrowding and the provision of space contributed to mental health. According to Yeh et al. (2019), mental health condition is associated with an increased risk of suicide. For example, Qiu et al. (2019) demonstrate that urban density is positively associated with mental health. Therefore, this study aimed to compare the relationship between urban density, open space ratio, and mental health in Malaysia, especially in Kuala Lumpur, Johor Bahru, Melaka Tengah, Ipoh and Georgetown, Penang. The study aided in identifying the comparison between the city regarding the element of the subject it was compared.

Generally, emotional well-being is interrelated with mental well-being (Red Oak Recovery, 2022). The suicide attempt is also reflected based on the leading from human decision-making. An important to address well-being is to ensure that humans can cope with their stress and ability to avoid dangerous actions. Mental health does not only affect adults but also adolescents and children. One may have had mental health problems since childhood, and some due to several factors or experiences. According to the World Health Organisation (2020), almost one billion people are living with mental disorders, and one person dies every 40 seconds by suicide. Moreover, the number of people with depression is 264 million and anxiety disorders around 284 million in 2017 worldwide (Ritchie & Roser, 2018). This study reviewed suicide cases in the five main cities in Malaysia.

In Southeast Asian countries, Malaysia has the highest percentage of mental disorders, and the prevalence is increasing and worsening during the pandemi c (Ali & Rashid, 2020). Mental disorders can affect people, with people can suffer from more than one disorder at a time. However, people with mental disorders are among the most marginalised in most developing countries (World Health Organisation, 2010). Socioeconomic status may cause a higher prevalence of mental disorders in urban areas, living conditions, surrounding environment, and education level. Many studies found that people born and raised in urban areas have an increased risk of mental disorders (Hoisington et al., 2019). According to McDonald et al. (2018), urban living with a higher population density is associated with a greater incidence of mental health problems. Previous studies also mentioned that population density and environmental crowding are associated with mental health problems.

Urban areas offer a limited provision of spaces, housing, land, facilities, and green spaces, which could not suffice the increasing number of populations. Nonetheless, the projection of the urban population rose from 28.6 million in 2010 to 32.6 million in 2020 and will increase to 36.1 million in 2030 and 38.4 million in 2040 (Peng et al., 2014). Figure 1 shows that the urban population will increase in 2040 by 32.6 million per 38.4 million people (85 %), while the rural area is only 5.7 million per 38.4 million (15 %). The most urbanised areas by population are Kuala Lumpur, Georgetown, Johor Bahru, Ipoh, and Melaka Tengah, as shown in Figure 2. As the number of people moving to urban areas is increasing by the year,

the rate of mental health problems in urban areas is also increasing in line with the number of populations (Srivastava K., 2009).

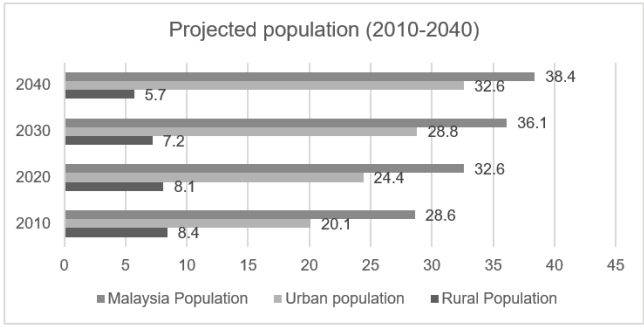

Figure 1. Statistic of Population Projection in Malaysia, 2010-2040
Source: Adapted from Peng et al. (2014)

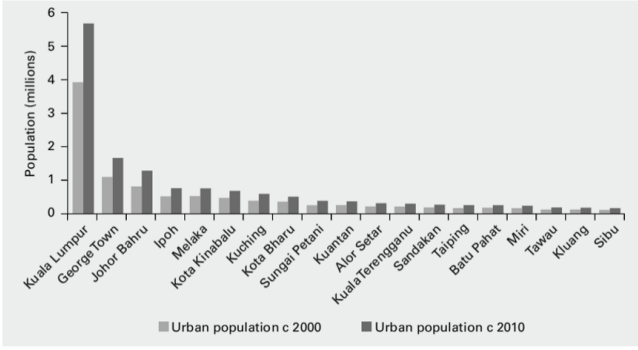

Figure 2. Statistic of Malaysia's Urban Areas by Population, 2000 and 2010
Source: World Bank (2015)

Mental Health

World Health Organisation (2022) defined 'health' as 'physical, mental, and social well-being.' Mental health can lead to long-term disability with a more crucial risk factor for humans (Prince et al., 2007). Several types of mental disorders, including anxiety disorders, depression, bipolar disorder, Post-Traumatic Stress Disorder (PTSD), Schizophrenia, eating disorders, disruption behaviour and dissocial disorders, and neurodevelopmental disorders (World Health Organisation, 2022).

According to the World Health Organisation (2022), a suicide death occurs somewhere in the world every 30 seconds. Most people who commit suicide are between the ages of 15 and 29 (World Health Organisation, 2022). Globally, Azuddin (2020) reported that mental health problems are the leading causes of mortality, and it will increase by around 10 per cent in 2030. According to Soga et al. (2021), there is a global increase in mental health problems, especially depression, suggesting it as the worst mental health problem in the global context.

In Malaysia's context, Ali and A Rashid (2020) and the National Health and Morbidity Survey (2015) stated that mental illness in Malaysia is the second highest illness in 2020 after heart disease. Furthermore, the National Health and Morbidity Survey (2015) reported that the prevalence of mental health disorders among Malaysian adults 16 years old and older increased by 29.2 per cent in 2015 from 10.7 per cent in 1996. In the same period, younger children (5–9 years old) were more likely to experience mental health problems at 13.1 per cent than older children (10–15 years old) at 11.4 per cent. In addition, according to Macrotrends (2022), Malaysia's suicide rate in 2019 increased by around 5.70 (male 8.90 and female 2.30) as compared to 2018 (see Figure 3).

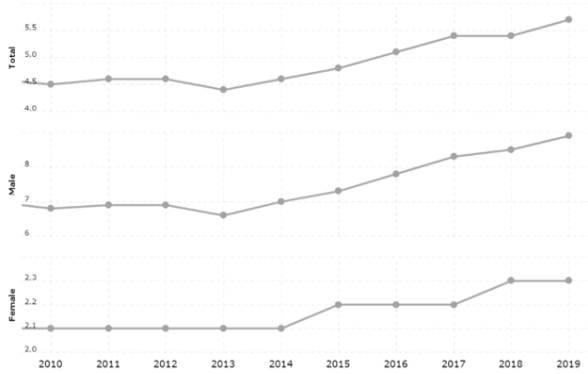

Figure 3. Malaysia's Suicide Rate

Source: Macrotrends (2022)

This study gathered and compared population density and open space ratio. Figure 4 shows the trend and statistics of suicide attempts in Malaysia from 2015 to 2020. The rising trend shows that the urban areas with the highest population have the highest suicide attempts in Malaysia, such as

Selangor, Kuala Lumpur, and Johor Bahru . Refer to Figure 5. There are many factors that cause suicide attempts among Malaysian citizens, such as the high cost of living, financial, social isolation, and other factors.

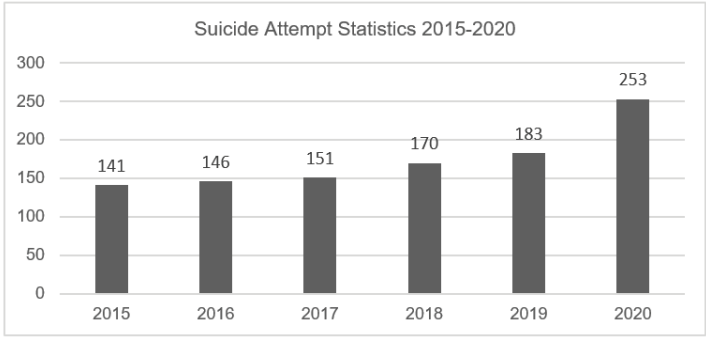

Figure 4.The Trend and Statistics of Suicide Attempts in Malaysia from 2015 to 2020

Source: Fire and Rescue Department of Malaysia (2020)

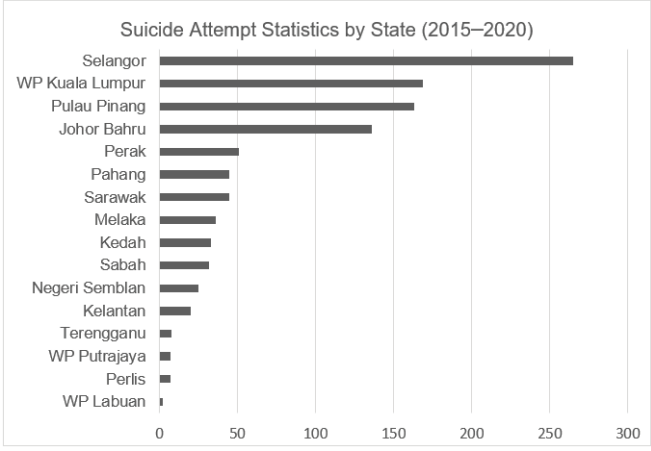

Figure 5. The Highest Population have the Highest Suicide Attempts in Malaysia

Source: Author

Positive emotions create a positive mindset that enhances cognitive abilities, resilience, information processing, perspective, and social interaction (Fredrickson, 2001). These factors collectively contribute to improved decision-making leading to more effective and positive outcomes.

A suicide attempt is also reflected based on the leading from human decision-making. As suicide cases are related to mental health perspectives (Yeh et al., 2019), addressing mental health to ensure that people can cope with their stress and ability to avoid dangerous actions is crucial. Emotions provide valuable guidance in decision-making processes, which act as an internal signal, helping people assess situations and priority choices. For example, fear alerts potential danger, prompting precautionary actions while promoting joy and excitement to encourage involvement in pleasurable and fulfilment activities. In short, emotions can provide valuable insight and help create informed decisions.

High-density or overcrowding areas can affect mental health. There is evidence that shows that urban density is positively associated with mental health (Qiu et al., 2019). Urban density is calculated as the ratio of built volume over an area. Town and Country Planning Act 1976 (Act 172) described density as 'the intensity of use of land reckoned or expressed in terms of number of persons, dwelling units, or habitable rooms or combination of those factors, per unit area of land'. Specifically, Kuala Lumpur City Hall (DBKL) in Kuala Lumpur City Plan 2020 defines density as the number of persons in the land area assisting population distribution and planning for facilities, utilities, infrastructure, and services.

METHODOLOGY

Comparative Study

This study focused on urban density and mental health. This research compared urban density, as in the data of the urban population's highest density per kilometre square and open space ratio of different states. Regarding the mental health aspect, this research reviewed the statistics of suicide cases. The measurement of urban population density is essential to ensure the provision of an area can bring the quality of life towards mental health. This study used the comparative study and correlation analysis to review and reveal the facts and figures based on the data from the agencies with cross-sectional studies.

This study presented data based on tables and figure maps. The urban population's highest density per kilometre square is presented in Table 1. Meanwhile, Figure 6 shows the city with the highest density population was Kuala Lumpur, with 8,167 people per kilometre square, and the lowest was Ipoh, with 681 people per kilometre square. The city with the highest urban population was Kuala Lumpur, followed by Johor Bahru, and the city with the lowest urban population per kilometre square was Kuala Lumpur. It made Kuala Lumpur the city with the highest number of people per kilometre square.

Table 1. Urban Population Highest Density Per Kilometre Square

Area	Urban population	Area Per Kilometre square	People per kilometre square
Kuala Lumpur	1,982,112	242.7 km2	8,167 people per km2
Johor Bahru	1,711,191	1,064 km2	1,608 people per km2
Georgetown	556,575	119.0 km2	4,677 people per km2
Ipoh	888,767	1,305 km2	681.0 people per km2
Melaka Tengah	597,135	299.0 km2	1,997 people per km2

Source: City population (2022)

Public spaces consist of several elements: streets, open spaces, public facilities, local parks, pocket parks, district or city open spaces, and national open spaces (Rudd, 2020). The essential things in public space are required universal access, inclusive and accessible by all categories. This research utilised the open space in a public space as a ratio measurement. The open space study is also important to ensure the space provision for users. Sustainable Development Goal 11, specifically target 11.7, highlights the provision of safe, inclusive green access. and public spaces. It aims to provide women and children, older people, and people with disabilities universal access to safe, inclusive, and green public space by 2030. These principles will allow people access to inclusive and high-quality public spaces.

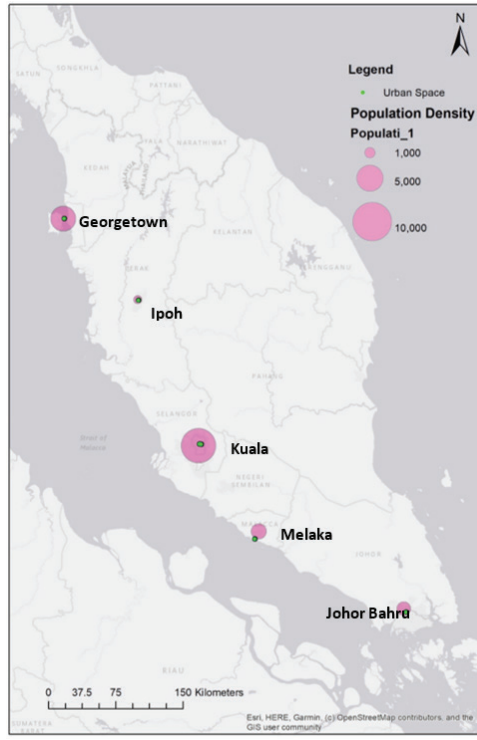

Figure 6. Population Density

Source: Author

Table 2 and Figure 7 show the open space ratio by state, which considers the current ratio (hectare per 1,000 population). Based on the data, Penang had the lowest open space ratio, followed by Kuala Lumpur, Ipoh, and Johor Bahru. According to Plan Malaysia (2021), 2 hectares of open space for each 1000 urban population is required for Malaysia to achieve a developed country status. However, most states in Malaysia have not reached the target of the open space ratio. This study compared the states with the highest and the lowest open space ratio. The result found the highest open space ratio was Melaka (7.05), while Kuala Lumpur (1.22) and Johor (1.75).

Table 2. Open Space Ratio by State

State	Open Space	Current ratio (Hectare per 1,000 population)
Kuala Lumpur	2,162.17 hectare	1.22 hectare

Johor	4,857.03 hectare	1.75 hectare
Penang	1,347.00 hectare	0.80 hectare
Perak	2,988.30 hectare	1.43 hectare
Melaka	6,499.69 hectare	7.05 hectare

Source: Plan Malaysia (2021)

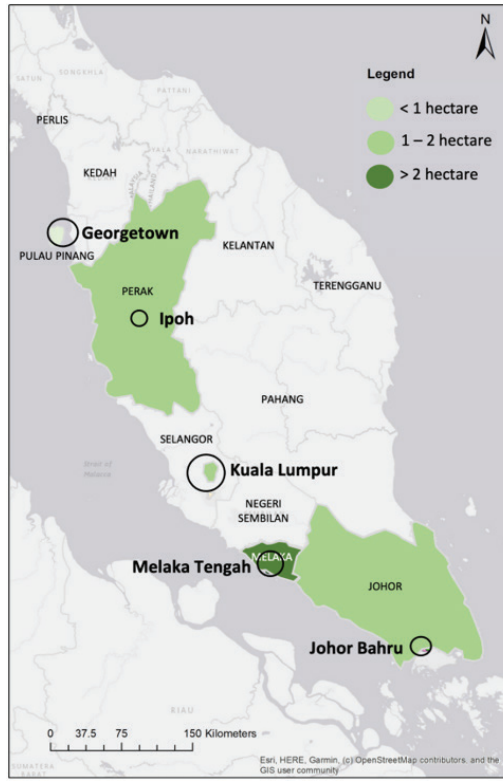

Figure 7. Open Space Ratio in Five Cities in Malaysia

Source: Author

Table 3 shows the number of suicide cases according to states from 2016 to 2022. The table shows that the highest number of suicide cases were in Selangor (1091 cases), Johor (735 cases), Kuala Lumpur (526 cases), Pulau Pinang (558 cases), and Perak (517 cases). Based on the five main cities discussed in this study, the highest number of suicide cases were recorded in Kuala Lumpur (526 cases) and Johor Bahru (242 cases), and the lowest was in Melaka Tengah (90 cases), as shown in Table 4.

Table 3: Suicide Cases by State

State	2016	2017	2018	2019	2020	2021	2022	Total
Johor	71	75	83	101	101	139	139	735
Kedah	37	36	24	35	16	65	48	261
Kelantan	12	9	9	18	30	12	11	102
Kuala Lumpur	42	56	52	82	60	129	105	526
Melaka	12	27	23	12	22	26	16	138
Negeri Sembilan	38	34	25	42	44	51	39	273
Pahang	34	27	27	35	37	45	42	247
Perak	74	68	54	42	56	112	111	517
Perlis	3	2	1	1	0	5	5	17
Pulau Pinang	76	75	78	63	65	114	87	558
Sabah	26	34	45	24	49	56	58	292
Sarawak	32	24	26	54	40	64	39	279
Selangor	114	134	99	90	96	284	274	1091
Terengganu	9	9	2	10	15	14	7	66
Total	580	610	548	609	631	1142	981	5101

Source: The Royal Malaysia Police (2022)

Table 4. Suicide Cases by Cities

Locality	2016	2017	2018	2019	2020	2021	2022	Total
Johor Bahru	24	30	29	51	26	50	32	242
Melaka Tengah	10	23	15	7	10	14	11	90
Kuala Lumpur	42	56	53	82	60	129	105	526
Georgetown	19	22	28	27	22	42	29	189
Ipoh	16	12	9	2	22	40	47	148
Total	111	143	133	169	140	275	224	1195

Source: The Royal Malaysia Police (2022)

The selection of the study was measured to identify the highest, medium, and lowest number of suicide cases in the main southern, middle, and northern cities in Malaysia. The research aimed to compare the different levels of suicide cases by area with the different levels of open space ratio and population density. Melaka was also included in this study because the area had the highest open space ratio by state. There was a comparison distinction between the areas rather than focusing on all the highest.

The suicide cases trend in Figure 9 shows that the number of suicide cases increased in 2019 in Kuala Lumpur and Johor Bahru while decreasing in Ipoh, Melaka Tengah, and Georgetown. The trend of suicide cases in 2020 increased in Ipoh and Melaka Tengah but declined in Kuala Lumpur, Johor Bahru, and Georgetown. In 2021 most cities show an increase in suicide cases in Kuala Lumpur, Johor Bahru, Georgetown, Ipoh, and Melaka Tengah. The pandemic year showed an increase the reported suicide cases in most cities in Malaysia and around the world. Figure 8 shows the number of suicide cases according to state, particularly in five cities.

In 2022, the number of suicide cases showed an increase in Ipoh and slowly a decrease in Kuala Lumpur, Johor Bahru, Georgetown, and Melaka Tengah. After the pandemic, the endemic phase allowed people to join outdoor activities and gather in public spaces. In short, people go for public spaces, which can generate mental health and reduce stress. A public area is a fundamental component of an urban area, globally (Ferdhaus et al., 2021). Public spaces can impact people's social, economic, and environment. People gather in the community in public areas, resulting in them being the place where the people can generate economy through commercial activities. Therefore, it can generate environmental impact and develop more green spaces in cities which can mitigate the effects of urban heat islands (Zhou et al., 2023). However, the urban surfaces reflected the heat, raising the temperature relative to the surrounding environment (Yusof et al., 2017).

Figure 8. Suicide Cases by State and Cities

Source: Author

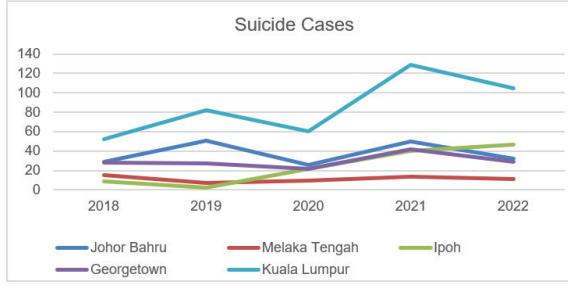

Figure 9. Suicide Cases Trend by State

Source: Author

DISCUSSION

This study compared three elements: people per km square, the current ratio of open space, and the number of suicide cases in the five cities. To explore the relationship between the ratio of open space and suicide cases, a correlation analysis was conducted. This helped clear the misunderstanding of any linear relationship between these two variables. The correlation coefficient result between the ratio of open space (hectares per 10,000 population) and suicide cases was approximately R=−0.52. This indicates a moderate negative correlation, suggesting that as the ratio of open space increases, the number of suicide cases tends to decrease. However, it's important to note that correlation does not imply causation.

Other factors could be influencing both variables. Additionally, the correlation was only moderate, so while there was a tendency for these variables to move in opposite directions, the relationship was not strong. The scatterplot in Figure 10 visually represents this relationship, with each point representing an area's open space ratio and its corresponding number of suicide cases.

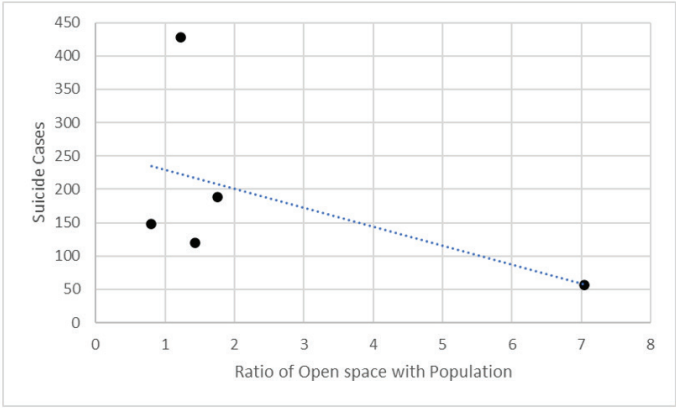

Figure 10. Linear Correlation between Suicide Cases and the Ratio of Open Spaces with Population

Sorce: Author

The results show the city with the highest urban density had the highest number of suicide cases. Furthermore, the space provision of the current open space ratio in Table 5 indicates that cities with the highest urban

density, such as Kuala Lumpur and Georgetown, had the lowest current ratio of open space per one thousand population. Thus, urban density and the current ratio of open space could influence the number of suicide cases.

In addition, Table 5 and Figure 11 show the number of suicide cases in the five study areas. Melaka had below two thousand population urban density, with more than two hectares of current ratio open space and had the lowest suicide cases. This result provides a potential association between suicide cases and mental health. Nonetheless, other factors can also be aligned with mental health, such as the highest urban density and the provision current ratio of open space per thousand population. Moreover, the study found people need space to improve their mental health based on the assumptions in the comparison between the elements in Table 5.

Figure 11. Map Comparison

Source: Author

Table 5. Study Area Comparison

Area	People per kilometre2	Current Ratio Open Space (Hectare per 1,0000 population)	Suicide Cases
Kuala Lumpur	8,167 people	1.22	428
Johor Bahru	1,608 people	1.75 (Johor)	188
Melaka Tengah	1,997 people	7.05 (Melaka)	57
Ipoh	681 people	1.43 (Perak)	120
Georgetown	4,677 people	0.80 (Penang)	148

Source: Author

CONCLUSION

Suicide is a complex and multifaced issue influenced by various factors, including mental health, social, economic, and environmental factors. Poor mental health is a significant contributor to suicidal thoughts and behaviours. Mental health disorders such as depression, anxiety, and other mood disorders, can negatively impact an individual's mental health. Based on the results of the current study, there was evidence that suicide cases are related to mental health. This implies a connection between the occurrence of suicide cases and the overall state of mental health among individuals.

As the number of people moving to urban areas increases every year, it is important to ensure safe and sufficient public spaces to prevent the rates of mental health problems from increasing. The public space development should provide liveable and quality space to the public to ensure they can maximise mental health and cognition, especially for children's development.

However, this study only covered suicide cases, open space ratio, and urban population in the five cities in Malaysia. This study used a cross-sectional study because it has some limitations regarding the suicide case data and open space ratio. However, this research conducted self-reported scales with a cross-sectional study, which could cause bias. A longitudinal study is suggested for further studies on the relationship between urban high-

density living and mental health in various scopes, such as through social interaction, floor-level living, green and recreational spaces, and location of the residential area or other types of public spaces. The research also suggests future research to overview other cities in Malaysia. Recognising the signs of distress, improving mental health awareness, and providing accessible mental health services are crucial for suicide prevention and promoting overall mental health.

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AUTHOR CONTRIBUTIONS

Maheran Hamzah is the main author, wrote, provided a literature review, methodology, cross-comparison study and concluded the research. Gobi Krishna Sinniah did the revisions and approved the article submission. Noradila Rusli provided linear correlation, further concluded the research, did the revision and approved the article submission. Nur Hanie Irdina Jamaludinprovided a literature review and concluded the research.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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