

## Geographic distribution of voter turnout, ethnic turnout and vote choices in Johor state election

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### Abstract

Voter turnout is a crucial indicator of how citizens participate in choosing the leader of their country. The purpose of this study is to identify the hotspots of voter turnout and ethnic turnout in Johor during the 2022 state election by using Local Indicator Spatial Autocorrelation (LISA) and Getis Ord  $G_i^*$ . This study also verifies whether the state has achieved spatial equality among ethnic turnout. Attribute data consist of voter turnout trends for 2013, 2018 and 2022 and ethnic voters in Johor state election 2022, winning party, candidate ethnic, Parliament name, State Legislative Assembly (DUN) name, whereas spatial data comprises the DUN Johor state election (56 polygon). LISA shows high clustering of voter turnout in Johor, mostly detected in urban areas, whereas rural areas are more likely to have random patterns. Getis Ord  $G_i^*$  revealed that there were 15 areas classified as significant hotspots for Malay, Chinese, and Indian voters respectively. This indicates that the ethnic turnout among Malay, Chinese, and Indians in Johor for the 2022 election was equally distributed. Voter turnout-based ethnicity has converged to stability in its geographical distribution across the Johor DUN boundaries. The result found Malay are homogeneous as they are more likely to vote based on their own ethnicity; however Chinese and Indians in Johor are more heterogeneous as they vote based on party and political candidate, which can contribute to the strength of any political parties in Johor. LISA and Getis Ord  $G_i^*$  are very important in identifying statistically significant spatial clustering of high and low values of Malay, Chinese and Indian voters across DUN boundaries, and this finding contributes to political parties in Johor improving their strategies in future elections.

**Keywords:** Geographic distributions, registered voter, ethnic turnout, vote choices, Johor, LISA, Getis Ord  $G_i$

### Introduction

Malaysian politics encompass a multitude of political parties, and there appears to be a growing trend of collaboration across religious and racial lines, as various communities work together to advance and realize their political ideologies based on social preferences. Malaysia stands out as a unique example of a nation that accommodates each major ethnic group by permitting them to have their own political parties, thus ensuring that Malaysia citizens are reasonably represented in the political landscape. Malaysia has practiced ethnic-based politics within a

coalition framework since 1973 (Mohamad Shukri, 2017). DAP is one of the major political parties in Malaysia, which is supported by the large number of non-Bumiputera population. The origin of DAP is the 1965 split between Singapore and Malaysia. However, when Singapore separated from the Malaysia federation, members of the Singaporean-based People's Action Party (PAP) in Malaysian regrouped and renamed themselves as the Democratic Action Party (DAP). Subsequently, the DAP has emerged as one of the major opposition parties in Malaysia, drawing support from Malaysian Chinese and Indian voters (Chin, 1996). Despite the fact that the DAP is a multi-ethnic party, it was conquered by Chinese and fights for rights and needs of the Chinese community. The DAP consistently excels in urban areas but encounters significant challenges in winning support from rural areas (Fee, 2010). According to Brown (2008), majority of the Malay swing their choices to vote DAP, leading to a decline support to BN and PAS. Thock (2008) also discovered that during that in the 2008 elections, Malay starting to vote for DAP, while the Chinese voters transitioned their support to PAS and some Indians openly showed their supports for PAS by wearing PAS T-shirt. This shift in support was attributed to the weakness in UMNO's performance.

The government places ethnicity as the primary consideration, with the second condition being that Malays should hold control over the executive power, as they seek to comprehend political processes. This approach of structuring political parties based on ethnicity has been in place since the country gained independence in 1957. For example, Barisan Nasional (BN) consists of three coalition parties represented by Malay, Chinese, and Indian namely United Malay National Organization (UMNO), Malaysian Chinese Association (MCA), and Malaysian Indian Congress (MIC) as well as parties that represent ethnic people in Sabah and Sarawak (Saad et al., 2012).

The 15th Malaysia general election results show that Malays have rejected to vote UMNO/BN and are increasingly turning to alternative parties. Both urban and rural Malay voters have started to exploring alternative options and have shifting their voting patterns since the General Election in 2022 (Azlan, 2023). Awang Besar (2023) found that voter support patterns vary greatly depending on a given geographical location, and regional factors are one of the factors that determine voting patterns in Malaysia. Othman and Saahar@Saabar (2023) discovered that racial sentiments, political instability, economic uncertainty, and the image of leaders each exert varying degrees of influence on voting decision.

A study conducted by Khadan et al., (2022) examined the relationship between ethnic divisions and vote selection in Trinidad and Tobago. The study concluded that ethnicity is the main factor associated with voters' choice. Avery and Jeffery (2012) shows that minorities group are more likely to vote for members of their own ethnic in United States. While Banducci et al (2004) provided evidence that the ethnicity of candidates significantly influenced voting behavior in British elections. A research by Gowricharn (2018) examined shifts in party loyalty and identified a growing the erosion of voting loyalties in Surname and Guyana. The voting patterns was influence by party characteristics and election campaigns. According to Bratton and Kimenyi (2008) the African election of December 2007 indicated that voters also consider factors other than ethnicity when selecting their representatives. While electoral choices in Kenya have historically aligned with ethnic divisions and respondents often express a high degree of mistrust toward members of other ethnic groups, government performance in service delivery emerges as a crucial factor influencing voting decisions. This study highlights that voters still consider government performance when choosing the most suitable representative. Bratton et al. (2012) suggest African voters are more likely to vote political candidates of their own ethnic backgrounds when selecting individuals for positions of authority, particularly the top executive spot. Houle et al. (2018) explain why in some instances people vote along ethnic line while others do not because it is influence by economic cleavages. People from the same ethnic are more likely to share similar desire over economic policies and vote for the same

party. That's why mostly people in urban and rural areas of Malaysia are more likely to vote for different party because of the disparities in their economic circumstances. Thus, the socioeconomic inequality influences the ethnic voting.

The previous study on elections in Johor focussed on the perceptions of Johor voters prior to the 2022 Johor State Election (Saahar@Saabar et al., 2022). The study by Mat Jali (2012) also analysed internet access and usage and its impact on political participation among the population in the state of Johor. Mohamed Noor (2021) in his study found that Johor is a stronghold for Barisan Nasional, but in 2018 during the 14th General Election, many opposition parties have succeeded in capturing the area that had previously controlled by BN. Awang Besar (2022) in his study noted that there has been a decline in voter turnout in Johor and the reduced voter does not necessarily indicate electoral outcomes. However, where are the hot spots of registered voters and ethnicity turnout in Johor State Election? Do Johorean vote based on ethnic identities or party characteristics or candidate performance? The purpose of this study is to identify the significant hotspots of registered voters and ethnicity turnout in Johor state election. This study also examines the voting patterns among Malay, Chinese and Indian voters across various Johor DUN boundaries.

## Study area and method

The population of Malaysia reached 32.7 million in 2022, an increase from 32.6 million in 2021. State of Johor comprises 10 regions: Tangkak, Segamat, Kluang, Mersing, Kota Tinggi, Kulai, Johor Bahru, Pontian, Batu Pahat and Muar (Bahagian Perancang Ekonomi, 2020). In total, Johor has 56 DUN boundaries. This selection of Johor as the study area stems from its well-balanced voter composition in terms of ethnicity, geographic location and socioeconomic background (Awang Besar, 2020).

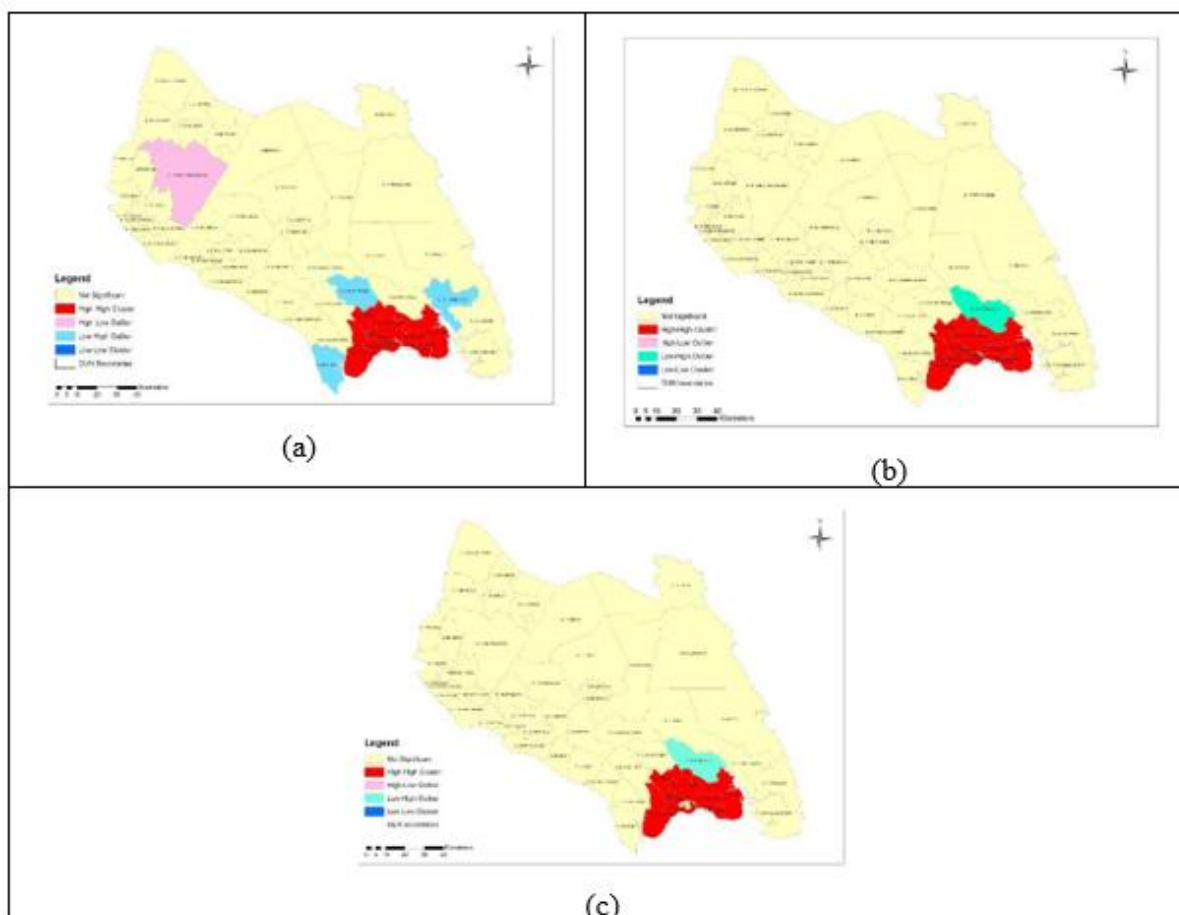
Anselin Local Moran's I (LISA) identifies areas with statistically significant hotspots, cold spots, and spatial outliers. In assessing the areas of significance, the evaluation included three output parameters: the Local Moran's I index, z-score, p-value and COType. Polygon or areas with high positive z-score or high-high cluster with low p-values means statistically significant cluster of high values, statistically significant cluster of low values. However high-low or low-high cluster means spatial outlier which also known as random patterns (ESRI, 2023). In this study, Getis Ord  $G_i^*$  method was applied to pinpoint significant hotspots. The positive and larger z score indicated the more intense the clustering of high values (hotspots) and negative and the smaller the z score indicated the more intense the clustering of low values (cold spots).

## Results

Figure 1 shows the results of the hot spot of voter turnout in DUN Johor for 2013, 2018 and 2022 General Election. According to Figure 1(a), there are as many as 11 areas classified as High-High (HH) voter turnout with a p value  $<0.01$  i.e. significant at 99%. Among the areas categorised as hot spots are Larkin, Permas, Johor Jaya, Tiram, Stulang, Skudai, Nusa Jaya, Puteri Wangsa, Senai, Kempas and Pengkalan Rinting as shown in Figure 1. The highest clustering areas of voter turnout are mostly detected in the DUN in the Johor Bahru area which is located in the Southern part of the state of Johor and adjacent to the Kota Tinggi and Pontian areas. Johor Bahru is a metropolitan city that is experiencing a rapid urbanisation process in Malaysia (Yushaimi et al., 2021). The Johor State Socioeconomic Report (2019) shows that in

2019, Johor Bahru is one of the areas that has the highest population of 1.6 million while the Mersing area is the lowest population area.

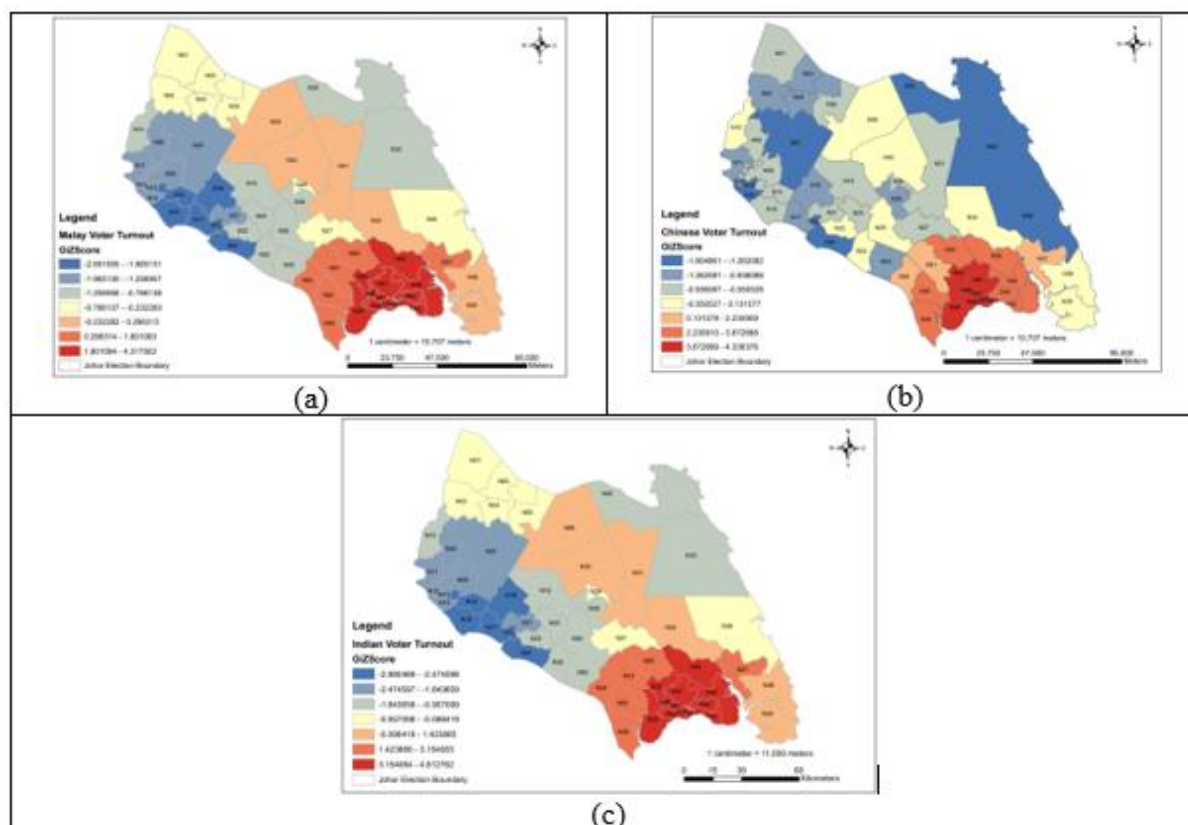
Nevertheless, the study also uncovered noteworthy trends. For instance, Bukit Kepong showed High Low (HL) pattern with a z score value of -2.08 and a p value of <0.05. Conversely, Kukup, Johor Lama and Bukit Permai displayed a Low High (LH) pattern, categorizing these areas as statistically significant voter turnout hotspots. In fact, these regions stood out as hotspots in terms of voter participation. Comparatively, the analysis of the voter turnout hotspots in 2013 election revealed that the number of areas with high voter turnout exceeded those categorized as random. Notably, voter participation appeared to be concentrated in DUN areas with higher population densities.



**Figure 1.** Clustering of voter turnout in Johor election (a) 2013, (b) 2018, (c) 2022

The analysis of voter turnout hotspots in 2018 revealed the identification of a total of 11 areas characterized by high voter turnout groupings, as shown in Figure 1(b). Among the areas classified as high-high in 2018 are Tanjong Puteri, Permas, Johor Raya, Tiram, Stulang, Skudai, Nusa Jaya, Puteri Wangsa, Senai, Kempas and Pengkalan Rinting. The study's findings indicate that only one area, Pasir Raja, is recognised as a Low High area.

The analysis of the 2022 Johor elections revealed the existence of 10 voter turnout hotspot, as shown in Figure 1(c). The DUN areas classified as voter turnout hot spot areas with high-high values include Tanjong Puteri, Permas, Johor Raya, Tiram, Skudai, Nusa Jaya, Puteri Wangsa, Senai, Kempas, Rinting and Pasir Raja.



**Figure 2.** Hot spots of ethnic turnout in Johor state election 2022 (a) Malay, (b) Chinese, (c) Indian

Figure 2 shows the hot spots of ethnic turnout in Johor state election for 2022 by using Getis Ord  $G_i^*$ . But before delving into further details, this section will first provide an explanation of the results related to Malay voter turnout, as presented in Table 1.

**Table 1.** Hot spots of Malay ethnic Turnout in Johor State Election 2022

DUN	Gizscore	Gipvalue	Gi_Bin	Wining party	Candidate ethnic	Urban/rural classification
Tanjung Surat	3.12143	0.0018	Hot spot 99%	BN-UMNO	Malay	Rural
Penawar	3.002967	0.002674	Hot spot 99%	BN-UMNO	Malay	Rural
Larkin	3.629176	0.000284	Hot spot 99%	BN-UMNO	Malay	Urban
Permas	4.317502	0.000016	Hot spot 99%	BN-UMNO	Malay	Urban
Johor Jaya	4.129367	0.000036	Hot spot 99%	PH-DAP	Chinese	Urban
Tiram	4.293644	0.000018	Hot spot 99%	BN-UMNO	Malay	Urban
Stulang	3.629176	0.000284	Hot spot 99%	PH-DAP	Chinese	Urban
Skudai	3.688101	0.000226	Hot spot 99%	PH-DAP	Malay	Urban
Kota Iskandar	3.688101	0.000226	Hot spot 99%	BN-UMNO	Malay	Urban
Puteri Wangsa	3.689014	0.000225	Hot spot 99%	MUDA	Malay	Urban
Senai	3.423644	0.000618	Hot spot 99%	PH-DAP	Chinese	Urban
Johor Lama	3.634407	0.000279	Hot spot 99%	BN-UMNO	Malay	Rural
Pasir Raja	4.055713	0.00005	Hot spot 99%	BN-UMNO	Malay	Rural
Kempas	3.674671	0.000238	Hot spot 99%	BN-UMNO	Malay	Urban
Perling	3.688101	0.000226	Hot spot 99%	PH-DAP	Chinese	Urban
Kukup	1.801093	0.071688	Hot spot 99%	BN-UMNO	Malay	Rural
Sedili	1.653115	0.098307	Hot spot 99%	BN-UMNO	Malay	Rural
Pemanis	-1.6701	0.0949	Cold spot 90%	BN-UMNO	Malay	Semi-urban
Serom	-1.78545	0.074189	Cold spot 90%	BN-UMNO	Malay	Semi-urban
Mahkota	-1.73006	0.08362	Cold spot 90%	BN-UMNO	Malay	Urban
Tangkak	-1.68065	0.09283	Cold spot 90%	PH-DAP	Chinese	Semi-urban
Bekok	-2.03771	0.041579	Cold spot 95%	BN-MCA	Chinese	Semi-urban

Jementah	-2.10066	0.03567	Cold spot 95%	PH-DAP	Chinese	Semi-urban
Kemelah	-2.15944	0.030816	Cold spot 95%	BN-MIC	INDIA	Semi-urban
Tenang	-1.96513	0.049399	Cold spot 95%	BN-UMNO	Malay	Rural
Gambir	-1.97136	0.048682	Cold spot 95%	BN-UMNO	Malay	Semi-urban
Bukit Kepong	-2.69194	0.007104	Cold spot 99%	PN-PPBM	Malay	Rural

From this result, there were 15 areas classified as significant hot spots at 99% of level confidence including N39 Tanjung Surat, N38 Penawar, N44 Larkin, N43 Permas, N42 Johor Jaya, N40 Tiram, N45 Stulang, N48 Skudai, N49 Kota Iskandar, N41 Puteri Wangsa, N52 Senai, N37 Johor Lama, N35 Pasir Raja, N47 Kempas and N46 Perling whereas two others areas were detected as significant hot spots at 90% of level confidence within N56 Kukup and N46 Perling. In the 2022 election, the BN-UMNO secured victory in areas with the highest z-scores, namely Tanjung Surat, Penawar, Johor Lama and Pasir Raja. Notably, these areas are situated in rural regions. BN-UMNO success extended beyond rural regions; they also secured victories in five urban areas characterized by high z score clustering of Malay ethnicity, which include Larkin, Permas, Tiram, Kota Iskandar and Kempas. However, it's worth noting that another five urban areas marked by a high clustering of Malay ethnicity were won by PH-DAP. It appears that BN-UMNO and PH-DAP are engaged in a fierce competition to secure more seats in urban areas. The Getis Ord  $G_i^*$  analysis identified 10 areas as cold spots of Malay ethnic turnout in 2022 election, with five of them won by BN-UMNO namely Pemanis, Serom, Mahkota, Tenang and Gambir. In contrast, PH-DAP claimed victory in two of these areas, while PN-PPBM, BN-MCA and BN-MIC each secured one of the cold spots.

**Table 2.** Hot spots of Chinese Ethnic Turnout in Johor State Election 2022

DUN	GiZScore	GiPValue	Gi_Bin	Wining party	Candidate ethnic	Urban/rural classification
Larkin	4.092682	0.000043	Hot spot 99%	BN-UMNO	Malay	Urban
Permas	3.672688	0.00024	Hot spot 99%	BN-UMNO	Malay	Urban
Johor Jaya	3.508682	0.00045	Hot spot 99%	PH-DAP	Chinese	Urban
Tiram	3.255304	0.001133	Hot spot 99%	BN-UMNO	Malay	Urban
Stulang	4.092682	0.000043	Hot spot 99%	PH-DAP	Chinese	Urban
Skudai	4.336376	0.000014	Hot spot 99%	PH-DAP	Malay	Urban
Kota Iskandar	4.336376	0.000014	Hot spot 99%	BN-UMNO	Malay	Urban
Pekan Nanas	3.301052	0.000963	Hot spot 99%	BN-MCA	Chinese	Semi-urban
Kukup	3.58316	0.000339	Hot spot 99%	BN-UMNO	Malay	Rural
Puteri Wangsa	3.798802	0.000145	Hot spot 99%	MUDA	Malay	Urban
Senai	3.794306	0.000148	Hot spot 99%	PH-DAP	Chinese	Urban
Pasir Raja	3.638108	0.000275	Hot spot 99%	BN-UMNO	Malay	Rural
Kempas	4.015492	0.000059	Hot spot 99%	BN-UMNO	Malay	Urban
Perling	4.336376	0.000014	Hot spot 99%	PH-DAP	Chinese	Urban
Bukit Permai	2.980631	0.002877	Hot spot 99%	BN-UMNO	Malay	Semi-urban
Bukit Batu	2.230909	0.025687	Hot spot 95%	PH-PKR	Chinese	Semi-urban
Tenggaroh	-1.723791	0.084746	Cold spot -90%	BN-MIC	India	Rural
Sedili	-1.804861	0.071096	Cold spot -90%	BN-UMNO	Malay	Rural

Table 2 shows hot spots of Chinese voter turnout in 2022 Johor election, highlighting that Chinese voter turnout is primarily concentrated in urban areas. The Getis Ord  $G_i^*$  analysis indicates the presence of 15 areas with highest z score at 99% of level confidence. These areas include Larkin, Permas, Johor Jaya, Tiram, Stulang, Skudai, Kota Iskandar, Pekan Nanas, Kukup, Puteri Wangsa, Senai, Pasir Raja, Kempas, Perling dan Bukit Permai. There is only one areas with high z score at 95% of level confidence i.e. Bukit Batu. The remaining two areas fall under the classification of cold spot with 90% confidence level. These areas are Tenggaroh and Sedili, indicating the lowest concentration of Chinese voter turnout. The voting pattern

among Chinese voters appears to be a mix of support for various parties, including BN-UMNO, PH-DAP, MUDA, BN-MIC, PH-PKR and MCA.

BN-UMNO emerged victorious in five urban areas categorized as significant hotspots of Chinese turnout. This outcome shows the support for BN-UMNO within the Chinese community in Johor, even in urban areas, which is a positive indicator for the party. Zainudin (2022) found that businessmen and the Chinese community in Johor expressed dissatisfaction, noting that they have not been served well by DAP during its 22 months in power. Furthermore, BN-UMNO managed to secure victory in two semi-urban areas and won in two rural areas with high clustering of Chinese voters. Once more, BN-UMNO secured victory in two rural areas with a low concentration of Chinese voters, indicating that Chinese voters continue to support a Malay party that differ from their ethnic group. Overall, BN-UMNO has secured 11 seats in areas characterized by both hotspots and cold spots of Chinese turnout. This demonstrates that BN-UMNO has garnered support not only from Malay voters but also from the Chinese community.

The Getis Ord  $G_i^*$  results showed that PH-DAP prevailed in one semi urban area and five urban areas with the highest clustering of Chinese turnout. PH-DAP was unable to win control of rural areas because Chinese voters there supported BN-UMNO and BN-MIC. The rural community has a deeper relationship with BN because of their livelihoods and infrastructural needs (Nambiar, 2022).

**Table 3.** Hot spots of Indians Ethnic Turnout in Johor State Election 2022

DUN	GiZScore	GiPValue	Gi_Bin	Wining party	Candidate ethnic	Urban/rural classification
Larkin	4.696847	0.000003	Hot spot 99%	BN-UMNO	Malay	Urban
Permas	4.662673	0.000003	Hot spot 99%	BN-UMNO	Malay	Urban
Johor Jaya	4.712725	0.000002	Hot spot 99%	PH-DAP	Chinese	Urban
Tiram	4.354001	0.000013	Hot spot 99%	BN-UMNO	Malay	Urban
Stulang	4.696847	0.000003	Hot spot 99%	PH-DAP	Chinese	Urban
Skudai	4.687157	0.000003	Hot spot 99%	PH-DAP	Malay	Urban
Kota Iskandar	4.687157	0.000003	Hot spot 99%	BN-UMNO	Malay	Urban
Pekan Nanas	3.081286	0.002061	Hot spot 99%	BN-MCA	Chinese	Semi-urban
Kukup	3.154063	0.00161	Hot spot 99%	BN-UMNO	Malay	Rural
Puteri Wangsa	4.549666	0.000005	Hot spot 99%	MUDA	Malay	Urban
Senai	4.475768	0.000008	Hot spot 99%	PH-DAP	Chinese	Urban
Pasir Raja	4.812762	0.000001	Hot spot 99%	BN-UMNO	Malay	Rural
Kempas	4.447749	0.000009	Hot spot 99%	BN-UMNO	Malay	Urban
Perling	4.687157	0.000003	Hot spot 99%	PH-DAP	Chinese	Urban
Bukit Permai	2.899456	0.003738	Hot spot 99%	BN-UMNO	Malay	Semi-urban
Bukit Batu	2.423373	0.015377	Hot spot 95%	PH-PKR	Chinese	Semi-urban
Pulai Sebatang	2.100307	0.035702	Hot spot 95%	BN-MIC	India	Rural
Johor Lama	1.758161	0.07872	Hot spot 90%	BN-UMNO	Malay	Rural
Serom	-1.921632	0.054652	Cold spot 90%	BN-UMNO	Malay	Semi-urban
Gambir	-1.843659	0.065233	Cold spot 90%	BN-UMNO	Malay	Semi-urban
Bukit Kepong	-2.238492	0.025189	Cold spot 95%	PN-PPBM	Malay	Rural
Penggarang	-2.534529	0.01126	Cold spot 95%	PH-DAP	Chinese	Urban
Senggarang	-2.474598	0.013339	Cold spot 95%	BN-UMNO	Malay	Semi-urban
Parit Yaani	-1.984807	0.047166	Cold spot 95%	BN-UMNO	Malay	Semi-urban
Simpang Jeram	-2.276049	0.022843	Cold spot 95%	PH-PAN	Malay	Urban
Bentayan	-2.096047	0.036078	Cold spot 95%	PH-DAP	Chinese	Urban
Bukit Pasir	-2.345366	0.019008	Cold spot 95%	BN-UMNO	Malay	Semi-urban
Maharani	-2.276049	0.022843	Cold spot 95%	PN-PAS	Malay	Urban
Semerah	-2.880468	0.003971	Cold spot 99%	BN-UMNO	Malay	Rural
Sri Medan	-2.692321	0.007096	Cold spot 99%	BN-UMNO	Malay	Rural
Sungai Balang	-2.751935	0.005924	Cold spot 99%	BN-UMNO	Malay	Rural
Bukit Naning	-2.592256	0.009535	Cold spot 99%	BN-UMNO	Malay	Semi-urban

Table 3 and Figure 2(c) shows hotspots of Indian voter turnout in Johor state election in 2022. Fifteen areas have been categorized as significant hotspots of Indian voter turnout with 99% of level confidence and the highest z-score value. These areas include Larkin, Permas, Johor Jaya, Tiram, Stulang, Skudai, Kota Iskandar, Pekan Nanas, Kukup, Puteri Wangsa, Senai, Pasir Raja, Kempas, Perling, and Bukit Permai. Apart from that, Getis Ord Gi\* also revealed there are two more areas as significant hotspots at a 95% confidence level, namely Bukit Batu and Pulau Sebatang, while Johor Lama was identified as a significant hotspots at a 90% of confidence level. Serom and Gambir were both classified as areas of significant cold spots at a 90% of confidence level. Furthermore, eight more areas were identified as significant cold spot at a 95% confidence level, bringing the total to 12 areas classified as significant cold spots, compared to the four areas originally categorized as such, as shown in Table 3. The most concentrated spatial clustering of Indian voter turnout is primarily situated in urban areas. However, there are urban areas with low clustering of Indian voter turnout, including Penggaram, Simpang Jeram, Bentayan and Maharani. This study found that Indian vote for variety of parties such as BN-UMNO, PH-DAP, BN-MCA, MUDA, PH-PKR, BN-MIC, PN-PPBM and PH-PAN.

## Discussion

### *Registered voters*

In 2013, the number of voter turnout was 1,366,906 and this number increased to 1,505,765 in the subsequent year, marking an increase of 138,859 people or a growth of 9.2%. However, the number of voter turnout has decreased by 154,701 or 11.4% in 2022 election. The main factor for the decline in voter turnout can be attributed to the impact of the COVID-19 pandemic. The fear and anxiety surrounding the COVID-19 outbreak, coupled with concerns about the ability to return to vote following a stay outside the State Legislative Assembly (DUN) or the voting location, are contributing factors (Rohaniza Idris, 2022). The factor the reduced voter turnout in Johor in 2022 is also supported by the research findings of Awang Besar et al. (2022). The election which was held on 12 March 2022 was considered as controversial because it was held at the height of the COVID 19 transmission and the prevailing economic constraints that affected the people. The Local Indicator Spatial Autocorrelation (LISA) analysis revealed that the high-high cluster of registered voters in Johor state election in 2013 was predominately concentrated in urban areas, where intense competition prevailed between BN and DAP. Interestingly, in 2018, the high-high cluster of voter turnout were found in the areas where the various party won the contested such as Bersatu, DAP, PKR, AMANAH, DAP and BN in 2022 Johor state election. The LISA results demonstrate that the clustering area of high voter turnout occurred in the DUN areas situated within the Johor Bahru region during the year 2013, 2018 and 2022. The voter turnout is influenced by size and population density. This is because the total population in Johor Bahru area is the highest compared to other areas in Johor. Johor Bahru was declared the capital and administrative centre of the Kingdom of Johor Darul Ta'zim on 1 January 1896. Thus, Johor Bahru area continues to grow and is going through a rapid transformation in terms of economic development. It has been recognised as a competitive city besides Kuala Lumpur, Kuching and Kota Kinabalu. Furthermore, the establishment of Iskandar Regional Development (IRDA) in Johor Bahru has played a significant role in fostering various developments, particularly in terms of instilling confidence in domestic and foreign investors. They have undertaken numerous high-impact investments in the region (Majlis Bandaraya Johor Bahru, 2022). In addition to these factors, the results indicate that



urban areas tend to have a higher level of awareness among the population when it comes to participating in elections and fulfilling their responsibilities as voters.

### *Voting patterns among Malay, Chinese and Indian*

#### a. Malay

In the Johor state election of 2022, BN-UMNO emerged as the predominant winner in the areas detected as highest and lowest clustering of Malay voter turnout, as compared to PH-DAP. This suggests that Malays are more inclined to voter based on ethnicity. The analysis of Getis Ord Gi\* and election result shows that ethnicity remains the main factors that influence Malay voters political choices. Mohamad and Suffian (2023) found that voting patterns in Malaysia particularly among Malay voters, still predominantly align with ethnic considerations. There are various factors that influence ethnic voting such as inequality between and within groups, information shortages, patronage network (Huber & Suryanarayan, 2016; Chandra, 2004; Birnir, 2007). Nonetheless, others prior studies have suggested that ethnic voting may also be influenced by linguistic, religious and racial (Crisp & Hewstone, 2007; Roccas & Brewer, 2022). Apart from that, Shukrimun and Hussin (2022) concurred that in Malaysia, Malay voters largely continue to choose political parties based on ethnicity, primarily driven by party identification and sociological factors. In addition, family factors and ethnicity play a significant role in influencing political choices among communities in Bayan Baru, Pulau Pinang (Ali, 2015). This study found that the Malay in Johor Jaya, Stulang, Skudai, Senai and Perling vote for PH-DAP which is the coalition political party from PKR, PAS and DAP. Malay in these areas are still voting for the party even though the candidate of the party is represented by non-Malay ethnic. International Movement for Just World president said people are more concerned about a party's or candidate's track record (Arfa Yunus, 2022). This study also found that ethnic loyalties are still remained strong in Tanjung Surat, Penawar, Larkin, Permas, Tiram, Kota Iskandar, Johor Lama, Pasir Raja, Kempas, Kukup, Sedili, Pemanis, Serom, Mahkota, Tangkak, Jementah, Tenang and Gambir. All of these areas cast their votes in favor of for BN-UMNO, a Malay-centric party. The Malay community and the government rely on the benefits derived from this relationship (Mohd Noor et al., 2016).

#### b. Chinese

Chinese residents in Johor Jaya, Stulang, Skudai, Senai, Perling, Bukit Batu are more likely inclined to cast their votes in alignment with their own party, primarily supporting DAP and PKR, as many political candidates in these areas hail from the Chinese ethnic background. This result doesn't mean that the Chinese refuse to vote for Malay party. Chinese people who are living in others areas such as Larkin, Permas, Tiram, Kota Iskandar, Pekan Nanas, Kukup, Pasir Raja, Kempas, Bukit Permai, Tenggara and Sedili tend to vote for BN. The Chinese voters from these areas harbor distrust towards PH party, mainly because a significant portion of the Chinese community expressed their frustration with the PH administration, which they perceive as having failed to deliver on its promises of development in the state constituencies won during the GE14 in 2018 (Anonymous, 2022). Thus, this finding shows that the Chinese community in Johor vote not only along their ethnic lines but also based on the political party and the performance of individual political candidates that can help them to fulfil their needs. Chinese voters tend to shift their voting preferences if their elected representatives underperform and fail to fulfil their responsibilities. BN secure victory in 11 seats across areas with the high and low clustering of Chinese voters turnout, whereas PH only won six seats. This clearly demonstrates that BN's electoral dominance over PH in Johor. In addition Hing

and Pong (2014) identified that UMNO 's strength in Johor is bolstered by the party's historical establishment in its capital, Johor Bahru and various issues and concerns that significantly shaped Chinese voting behavior. Apart from that, some Chinese voters opt to switch their votes between DAP and BN, as they aim to send a message to both parties and gauge whether changing their voting behavior leads to any noticeable improvements (Yunus & Harun, 2022). Such a shift in the channels of political participation from voting the old party to new party puts serious pressure on governments (Solijonov, 2016). Fee (2010) in his study found that the political landscape has shifted from communal-based politic to multi-ethnic-based politics. Political parties or candidates should prioritize addressing the needs of communities within constituencies, extending their focus beyond urban areas to rural regions where assistance is essential.

### c. Indian

BN secured 20 seats in areas that are classified as significant hotspots and cold spots of Indian voter turnout, while PH won nine seats, PN two seats and MUDA claimed only one seats. The Indian voter base plays a crucial role in shaping the election outcomes. Despite being a minority ethnic in Johor, Indians can still contributes to the strength of any political parties in Johor. This is evident in the results, as Indian also lend their support to other parties with candidate s from different ethnic background. Four rural areas with a high clustering of Indian voters have been identified, namely Kukup, Pasir Raja, Pulai Sebatang, and Johor Lama. In these areas, BN predominantly secure support from Indian voters, which illustrates the continuing belief of the Indian community in BN's ability to help them fulfil their needs, develop infrastructures and enhance the quality of life in rural areas. As shown in Table 3, there is only one Indian candidate from the BN party won in Pulai Sebatang area. In the 2022 Johor election, the majority of BN candidates were Malay while majority of PH candidates were Chinese. It appears that these two major ethnic groups are more prominent in political contest compared to the Indian community in Johor. Overall, Indian voters alone consist of 7% compared to Chinese that make the majority of 37% voter turnout while Malay make up 55% in the 2022 Johor state election. Indian voters in Johor is more politically tolerant in voting as this community tend to vote Malay and Chinese parties such as BN, PH, PN and MUDA. This finding also supported by Mohd Nizah et. al. (2018) that Indian are more likely to be more political tolerant even though they believe cooperation with another party may harm their own party. Thus, Indian voters in Johor tend to choose candidates based on the party they represent.

## Conclusion

The competition among political parties in Johor has intensified, resulting in distinct voting preferences among Malay, Chinese and Indian. What's most important is that each of political parties should nominate the high quality candidates, with particular attention to the influence of Indian voters. In the context of spatial statistics, it is evident that LISA could help to identify the patterns of registered voters across DUN boundaries. Additionally, Getis Ord GI\* plays a significant role in comprehending the distributions of Malay, Chinese and Indian voters. These findings contribute to political science literature and can help political parties in Johor to improve their strategies for future election.

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