

# **A Spatial Analysis Approach for Johor's Demographic Profile : Soft Warning of the Decline Birth Number Associated with Gender Gap in Johor**

**Tuti Purwaningsih and Arum Primandari**

Islamic University of Indonesia  
e-mail: tuti.purwaningsih@uii.ac.id,  
primandari.arum@uii.ac.id

## **Abstract**

*Population growth is important for a country, but the balance number between genders is more important since it will influence the birth number. This research aims to discuss the result of analysis of Gap Gender in Johor. It will be associated with the number of birth to Fig. out the trend of number of Sex, Ethnic, and Age Data from year 2010 until year 2014. The analysis will include spatial approach for fig. out the correlation between area in Johor. The result is a soft warning for government in Johor to make some policy to support the case of decline number of birth related to gap gender.*

*Keywords: birth number, decline, gap gender, spatial analysis, trend analysis.*

## **1 Introduction**

According to the medium fertility estimate by the United Nations Department of Economic and Social Affairs, Population Division, the world population (the total number of living humans on Earth) was 7.349 billion as of July 1, 2015 [1]. According to Fig. 1, the decline trend of growth in the world, with the number of yearly growth rate is about 1.13% [2]. Based on that overview, it is interesting to discover the relation between growth number and gender data on a country.



Fig. 1. World yearly growth rate (%)

Johor will be the target location for analysis because of its outstanding number of population compared to other states in Malaysia. Johor, as one of Malaysian state, is located in the southern portion of Peninsular Malaysia. It is one of the most developed states in Malaysia. The capital city of Johor is Johor Bahru. The royal city of the state is Muar and the old state capital is Johor Lama. Johor is surrounded by Pahang to the north, Malacca and Negeri Sembilan to the northwest, and the Straits of Johor to the south, which separates Johor and the Republic of Singapore. The state also shares a maritime border with the Riau Archipelago from the east and Riau mainland on the west by the South China Sea and the Strait of Malacca respectively, both of Indonesian territories [3].

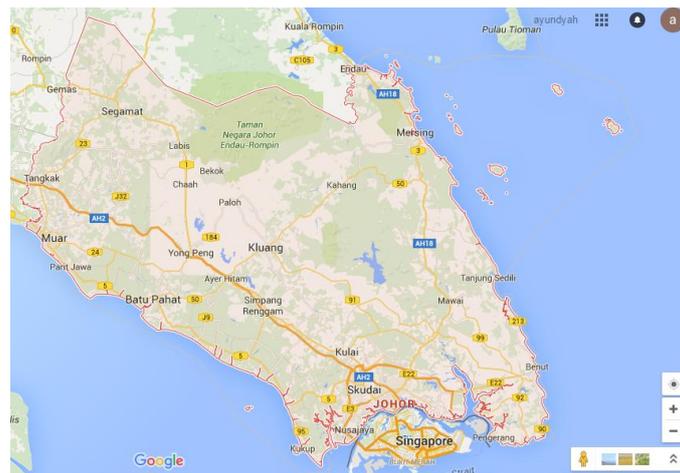


Fig. 2. Map of Johor

## 2 Problem Formulations

The main problem in this research is the declining number of birth represented by birth data each year which will be associated with the imbalance number of gender represented by gap gender data. Other analysis is try to Fig. out the growth of ethnics in Johor. The ethnics are classified into five types, they are Melayu, Cina, India, Bumiputera, etc. This is cotinued by analyzing the increasing number of ethnics from 2010 until 2014. The special issue is that there is spatial corelation between gap gender data in each districts in Johor.

**Definition 2.1** .*Gap Gender* is the difference between number of female and male, represented by bellow equation:

$$\text{Gap Gender} = \text{Number of Male} - \text{Number of Female}$$

In addition, we employ spatial correlation index, Moran's Index is used to calculate the correlation between districts in Johor [4][5][7].

$$I = \frac{N \sum_i \sum_j W_{i,j} (X_i - \bar{X})(X_j - \bar{X})}{(\sum_i \sum_j W_{i,j}) \sum_i (X_i - \bar{X})^2}$$

where :

N is the number of cases

$X_i$  is the variable value at a particular location

$X_j$  is the variable value at another location

$\bar{X}$  is the mean of the variable

$W_{ij}$  is a weight applied to the comparison between location i and location j

## 3 Spatial Analysis for Johor's Demographic data

The Data is taken from Departement Statistics of Malaysia. There are many information about the number of gender, ethnic and age data from year 2010 until 2014. Moreover, there is data of population for each district which has the detail number of male and female. From the data, we try to recalculation until gaining the new data of Gender gap data, difference percentage of ethnic between 2010 and 2014.

### 3.1 Descriptive Analysis for Population Distribution by location and Ethnic in Johor

Fig. 3 displays the population distribution in Johor from 2010 until 2014. It shows us that there are a slow increasing number of populations each year.

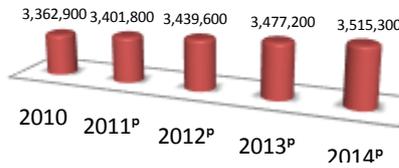


Fig. 3. Population Distribution of Johor Each Year

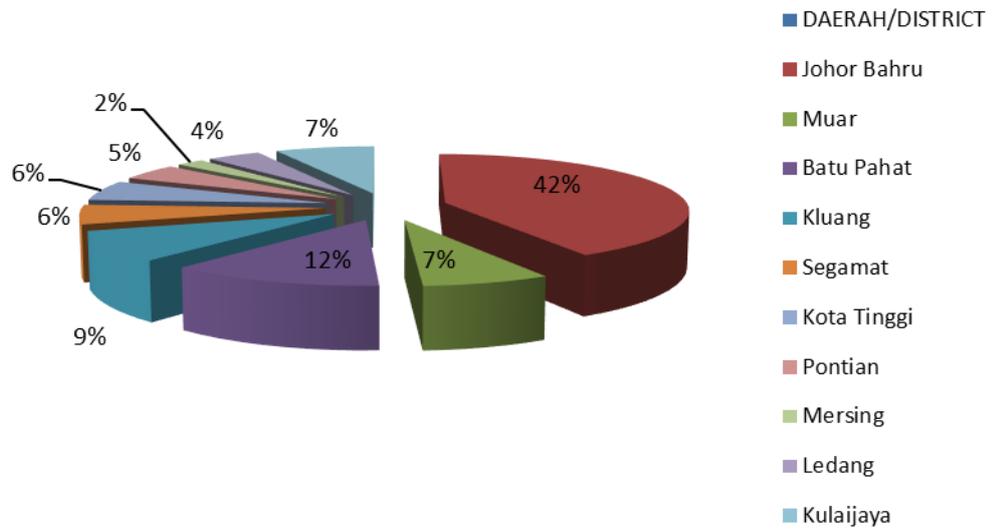


Fig. 4. Pie Chart of Population Number of Johor

Fig. 4 shows that Johor Bahru has the biggest number of population compared to other districts.

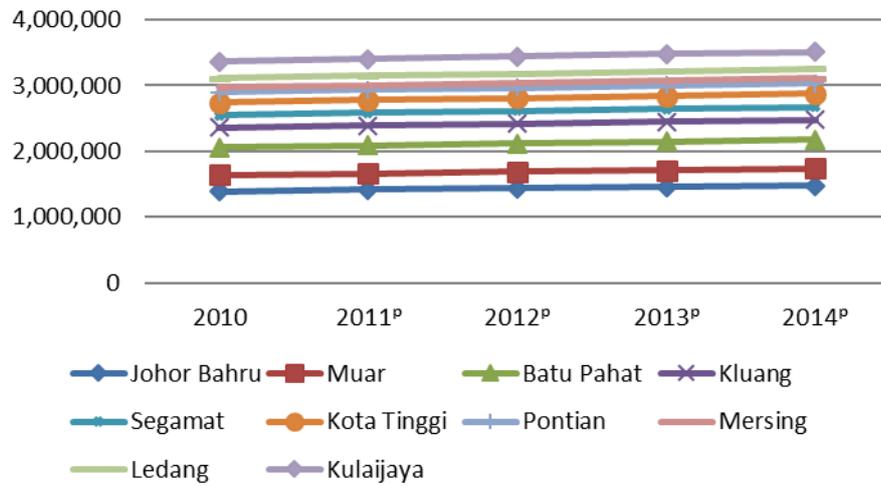


Fig. 5. Trend of Population in Johor

Fig. 5 shows that each year the number of population is increasing. The Increase has a slow progression from 2010 until 2014.

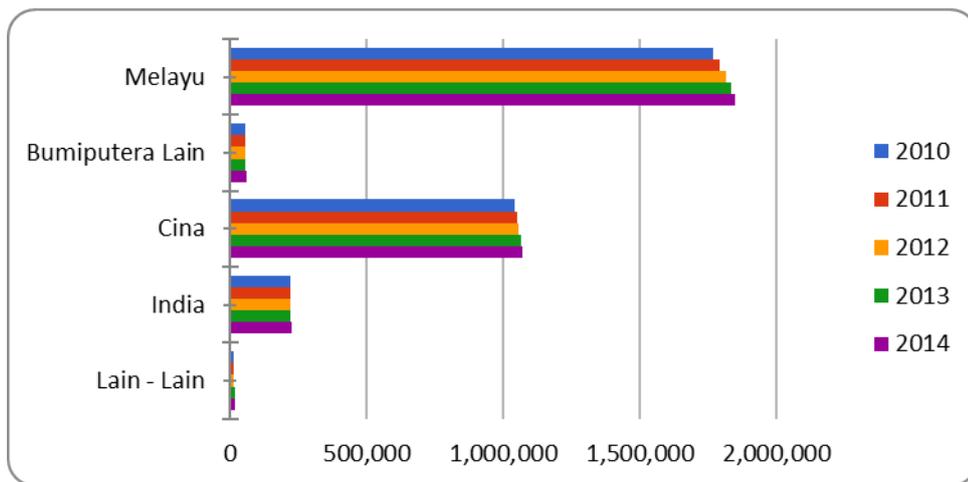


Fig. 6. Ethnic expansion trend depends on year

Fig. 6 shows that the number of Ethnic is dominated by Melayu Ethnic, followed by China Ethnic, and the India. The trend of number is increasing slowly year by year in Melayu and China Ethnic; it is different from other Ethnic.

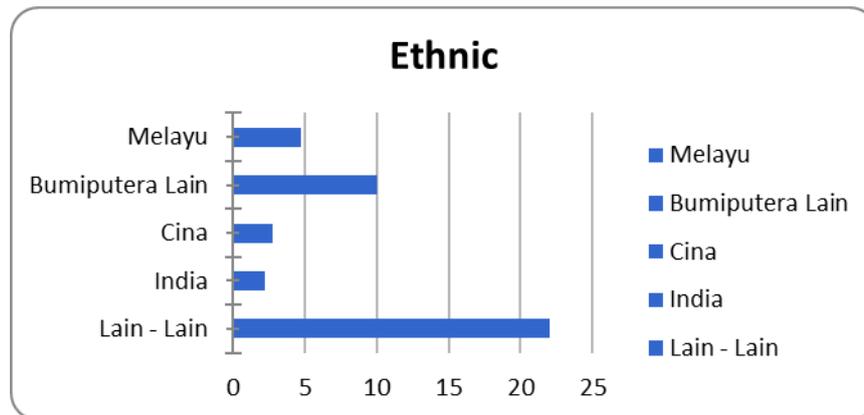


Fig. 7. The Increase Number of Ethnic from 2010 until 2014 of Johor

From Fig. 7, we can say that Bumiputera Ethnic has higher increase based on 2010's data than other ethnic. Meanwhile, Melayu comes after Bumiputera. In the future, there is a possibility that the number of Bumiputera is higher than other Ethnic if the future trend is the same.

### 3.2 A Spatial Analysis approach for Johor's Demographic Profile with Lifting up Gender Gap Cases

Spatial Statistics is one of advance analytics that allow us to learn more about the connection between locations. One of indicators which indicate the size of relation between locations is called as Moran's Index. It shows us about how big and how significant the relation between locations/areas is. Here is some data used to analyze the spatial profile of Johor. There are Population data, Percentage of Male, Percentage of Female and Gender Gap of each district in Johor.

Table 1. Population & Gender Data of Districts in Johor

DISTRICT	Population	Male	Female	Gap_Gender
Johor Bahru	1.474.300	52,9%	47,1%	5,8%
Muar	261.300	52,2%	47,8%	4,3%
Batu Pahat	438.700	51,1%	48,9%	2,1%
Kluang	304.500	55,2%	44,8%	10,5%
Segamat	195.500	50,5%	49,5%	1,0%
Kota Tinggi	201.500	52,2%	47,8%	4,4%
Pontian	162.800	52,0%	48,0%	3,9%
Mersing	73.000	53,0%	47,0%	6,0%
Ledang	142.200	51,4%	48,6%	2,8%
Kulaijaya	261.500	53,2%	46,8%	6,4%
Average		52,4%	47,6%	4,7%

Source : recalculation from demographic data at Malaysia Statistics Departement

Based on Table 1, the proportion of male is bigger than female, with the average of 52.4% for Male and 47.6% for female. It leads us to know the gap between genders in each district. According to the information above, we can see that Kluang has the biggest gap of gender and Segamat has the smallest gap of Gender. The average of Gender gap is about 4.7%. This percentage is still considered high even if the population is large. Here, the biggest population is Johor Bahru District with the gender gap is bigger than the average gender gap. It shows us that in Johor Bahru male has dominant number; it can be caused by the number of people who transmigrate to Johor is mostly male.

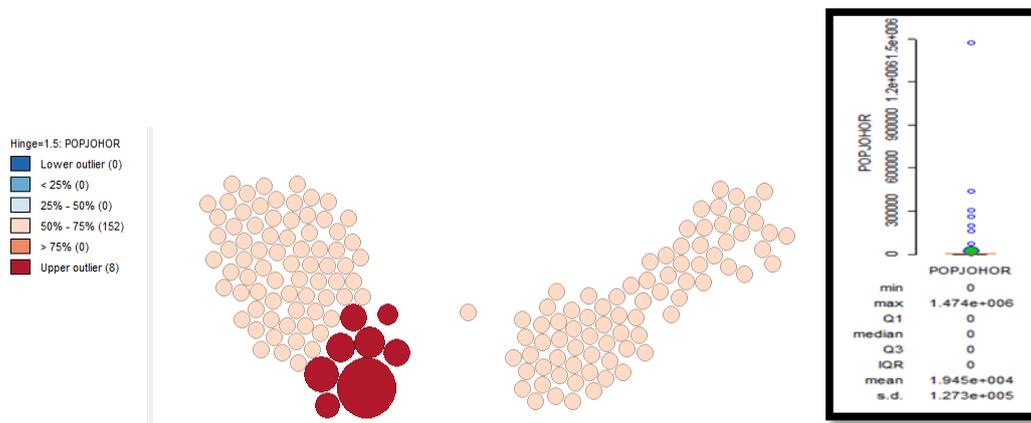


Fig. 8. Cartogram Graph & Boxplot of Population in Each Districts in Johor

Fig. 8 shows us that there is an outlier in number of population which is lead to Johor Bahru. Based on the information from table 1, the number of populations is 1.474.300 in 2014; meanwhile other districts are still less than 500.000 people. This must get more attention from the government since there is a big gap of gender that is about 5.8%.

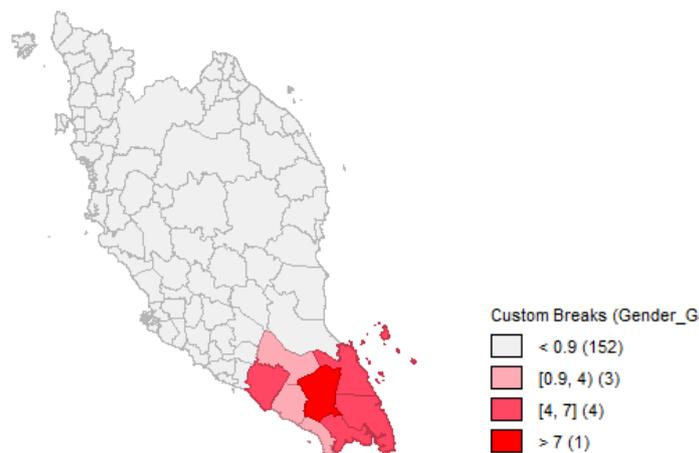


Fig. 9. Profile of Johor Gender Gap & Population of Districts in Johor

Based on Fig. 9 we can point out that the distribution of Gap has unique pattern, in the left side and right side. There is a tendency to have positive correlation between the nearest area. It can be seen from the pattern of colour they have. From Fig.9, it can be hypothesized that the gap of gender of each districts influences each other to have some pattern. It tempts us to proof it with a statistical index.

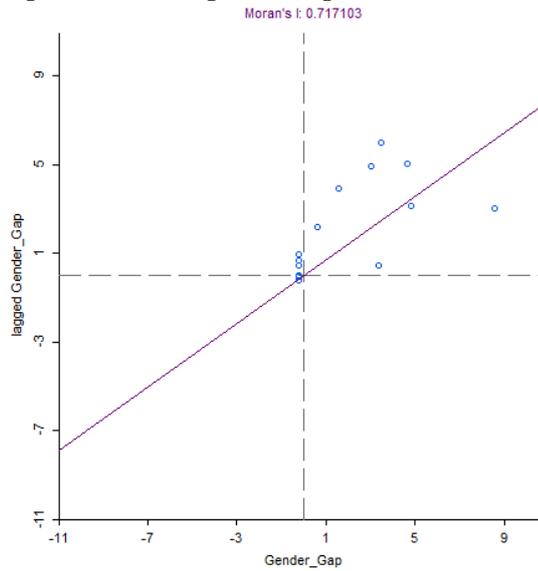


Fig. 10. Moran's Index Scatter plot of Gender Gap

One of statistical indexes shows us the size of Spatial Correlation is Moran's Index. From Fig. 10, we can Fig. out that there is a positive correlation between the districts in Johor. It can be seen from the pattern of dots which tend to go to the right arrow with index is about 0.717. This value is tend to 1, when moran's Index close to 1 so it tends to have high positive correlation and vice versa.

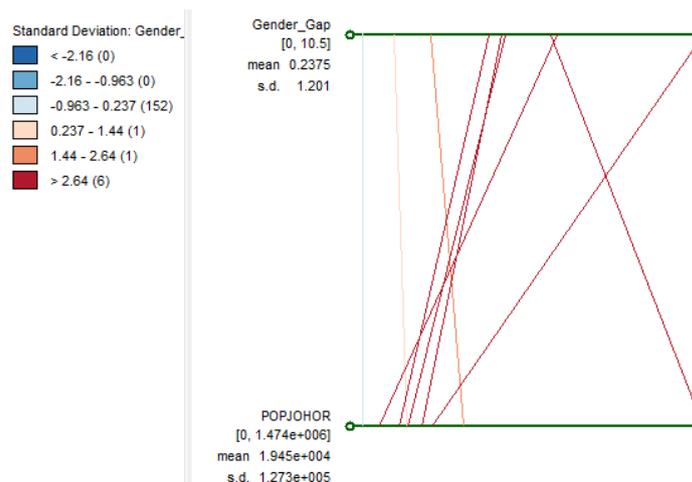


Fig. 11. Association graph of Gender Gap and Population

Fig. 11 has unique information that shows us about the association between two variables/attributes of Gender gap and number of population of each Districts in Johor. It seems that there is cluster pattern between the districts. **Cluster 1**, the pattern is when the number of population is small and the percentage of gender gap is also small. **Cluster 2**, small number of population relates to bigger percentage of gender gap and **Cluster 3** is only one district which has big number of population with the percentage of Gap gender is relatively small.

## 4 Conclusion

Female is less than male and it will influence the decline of Birth Number.

Table 2. Percentage of Age each year

Age	2011	2012	2013 <sup>p</sup>	2014 <sup>e</sup>
0 - 9 year	17,3%	17,0%	16,6%	16,3%
10 - 19 year	18,2%	18,1%	17,9%	17,8%
20 - 29 year	19,5%	19,3%	19,1%	18,9%
30 - 39 year	15,2%	15,4%	15,6%	15,8%
40 - 49 year	12,3%	12,3%	12,3%	12,3%
50 - 59 year	9,0%	9,2%	9,3%	9,5%
60 - 69 year	5,1%	5,3%	5,5%	5,7%
70 year	3,4%	3,5%	3,6%	3,7%

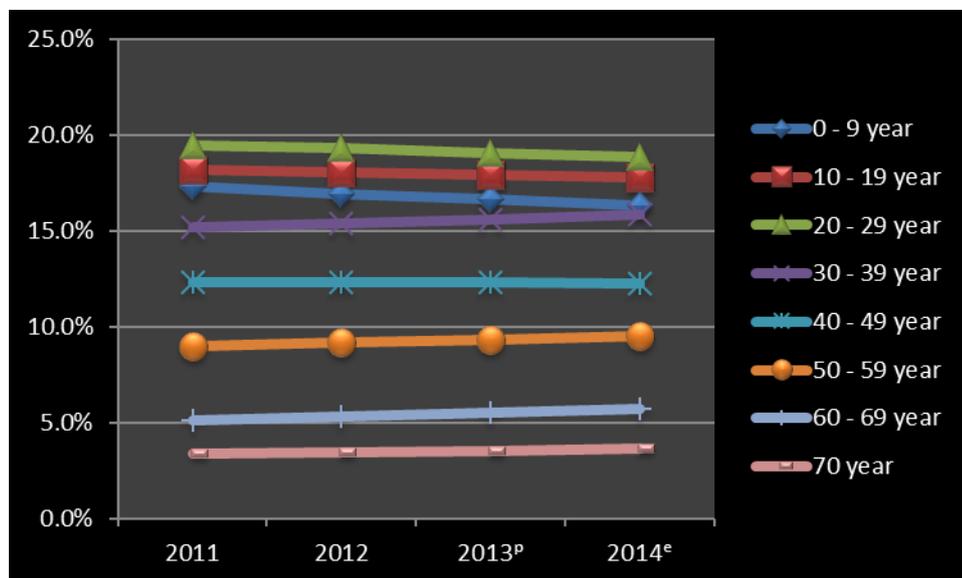


Fig. 13. Pattern of Population Splitted By Age Level

If we focus on age level 0-9 year at Fig. 13, we will know that the trend of that age level is declining every year. It is a soft warning for government that making

some policy to support this cases is important; so, the number of birth have a steady expansion since the development of a country is also depending on the number of optimum population.

## 5 Open Problem

This research needs more analysis on comparing other factors related to gender gap, declining of birth number. It still can be more explored in relation to spatial regression analysis of all possible factors that may influence the decline of birth number.

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