



# **SPATIAL DISTRIBUTION PATTERNS AND DETERMINANTS OF POVERTY IN KELANTAN**

by

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A report submitted in fulfillment of the requirements for the degree of  
Bachelor of Applied Science (Sustainable Science) with Honours

**FACULTY OF EARTH SCIENCE  
UNIVERSITI MALAYSIA KELANTAN**

**2021**

## THESIS DECLARATION

I hereby declare that the work embodied in this Report is the result of the original research and has not been submitted for higher degrees to any universities or institutions.

.....

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Date: 24<sup>th</sup> December 2020

I certify that the Report of this final year project entitled 'Spatial Distribution Patterns and Determinants of Poverty in Kelantan' by Siti Sarah binti Harith, matric number E17A0110 has been examined and all correction recommended by examiners have been done for degree of Bachelor of Applied Science (Sustainable Science) with Honours Faculty of Earth Science, University Malaysia of Kelantan.

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## ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious and the Most Merciful.

All praises to Allah the Almighty for making it possible for me to complete this research. I am very thankful for He had made my journey smoother than what I expected. Even so, I must say the journey that I had was not all rainbow and glitter and I had experienced things that had affected me in some ways. But still, I am grateful for all the chances, obstacles and strength that have been bestowed upon me. Without those things, I am probably not where I am right now.

First of all, I would like to extend my gratitude to my research supervisor, Puan Siti Aisyah binti Nawawi, whose tremendous support means very much for me. She had assisted me very well from the start until the end of my journey and not even once she made me feel lost. Without her guidance and utmost patience throughout this process, it would be impossible for me to complete this research. Besides, my knowledge in this field got broadens due to her sharing which I highly appreciate. In all honesty, I could not ask for a better supervisor.

Next, I wish to dedicate my acknowledgement to my family members who had supported me physically and mentally. I am forever thankful for their understanding and help from time to time. Without them, none of this could have happened.

Last but not least, this section will not be complete without mentioning my fellow classmates whom played a big role as well. Despite being occupied with own work, they did not hesitate to offer a helping hand for me. I would like thank them hugely for their endless support and for their words of encouragement every time I was having a hard time. May everyone who was involved in my thesis completion be showered with blessings and success in their future endeavours.

## Spatial Distribution Patterns and Determinants of Poverty in Kelantan

### ABSTRACT

For many years, poverty has been a major social problem that is faced by almost every country in this world. Poverty is regarded as a social disease that is very arduous to eradicate. Even in Malaysia, this issue has been a burden for the government to handle and eliminate because poverty has a strong causal effect on society's quality of life and economic factors. Hence, since independence, Malaysia's development agenda's key development focus has been the elimination of poverty. This research aimed to assess the level of poverty risk in 66 districts in Kelantan and identify factors influencing the poverty. The study focuses on socio-demographic determinants of 12,646 poor households namely, the number of household members, the gender of household heads, age, employment status and level of education. Secondary data of the households from 2010 were obtained from e-Kasih database. The data was analysed using SPSS software to obtain the descriptive statistics. Next, a method known as standardised poverty rate (SPR) was used to assess the level of risk poverty and a poverty distribution map in Kelantan was produced using ArcMap software. In addition, multiple linear regression (MLR) was applied to find out the determinants of poverty. As a result, it is found that half of the districts (33 districts) in Kelantan possess no poverty risk while the remaining districts are vulnerable to poverty. 25 districts fall into high poverty risk while 6 districts are in moderate high poverty risk zone. There are 2 districts which are in hard-core poverty risk zone. As for the second aim of the study, the significant factors influencing poverty are the number of household members, the gender of household heads, age and employment status. Educational level of poor household in Kelantan is proved to be insignificant in contributing to poverty. The outcome of this research presents proof and information that would increase readers' understanding regarding the level and pattern of poverty in Kelantan as well as the significant factors that impact the poverty.

## Corak Taburan Reruang dan Penentu Kemiskinan di Kelantan

### ABSTRAK

Selama bertahun-tahun, kemiskinan telah menjadi masalah sosial utama yang dihadapi oleh hampir setiap negara di dunia ini. Kemiskinan dianggap sebagai penyakit sosial yang sangat sukar untuk dibasmi. Bahkan di Malaysia, masalah ini telah menjadi beban bagi pemerintah untuk menangani dan menghapuskannya kerana kemiskinan mempunyai kesan kausal yang kuat terhadap kualiti hidup masyarakat dan faktor ekonomi. Oleh itu, sejak merdeka, fokus utama agenda pembangunan Malaysia adalah untuk menghapuskan kemiskinan. Tujuan kajian ini adalah untuk menilai tahap risiko kemiskinan di 66 daerah di Kelantan dan untuk mengenal pasti faktor-faktor yang mempengaruhi kemiskinan tersebut. Kajian ini memfokuskan pada faktor penentu sosio-demografi bagi 12,646 isi rumah miskin iaitu jumlah anggota isi rumah, jantina ketua isi rumah, umur, status pekerjaan dan tahap pendidikan. Data sekunder isi rumah dari tahun 2010 diperoleh dari pangkalan data e-Kasih. Data dianalisis menggunakan perisian SPSS untuk mendapatkan statistik deskriptif. Seterusnya, kaedah yang dikenali sebagai kadar kemiskinan standard (SPR) digunakan untuk menilai tahap risiko kemiskinan dan seterusnya, peta taburan kemiskinan di Kelantan dihasilkan menggunakan perisian ArcMap. Sebagai tambahan, regresi linear berganda (MLR) digunakan untuk mengetahui penentu kemiskinan. Hasilnya, didapati bahawa separuh daripada kesemua daerah (33 daerah) di Kelantan tidak mempunyai risiko kemiskinan sementara daerah yang lain terdedah terhadap kemiskinan. 25 daerah tergolong dalam risiko kemiskinan tinggi sementara 6 daerah berada di zon risiko kemiskinan sederhana tinggi. Terdapat 2 daerah yang berada di zon risiko kemiskinan yang kuat. Bagi tujuan kedua kajian, faktor penting yang mempengaruhi kemiskinan adalah jumlah anggota rumah tangga, jantina ketua isi rumah, umur dan status pekerjaan mereka. Tahap pendidikan isi rumah miskin di Kelantan terbukti tidak signifikan dalam menyumbang kepada kemiskinan. Hasil penyelidikan ini menyediakan bukti dan maklumat yang dapat meningkatkan pemahaman pembaca mengenai tahap dan corak kemiskinan di Kelantan serta faktor-faktor penting yang mempengaruhi kemiskinan.

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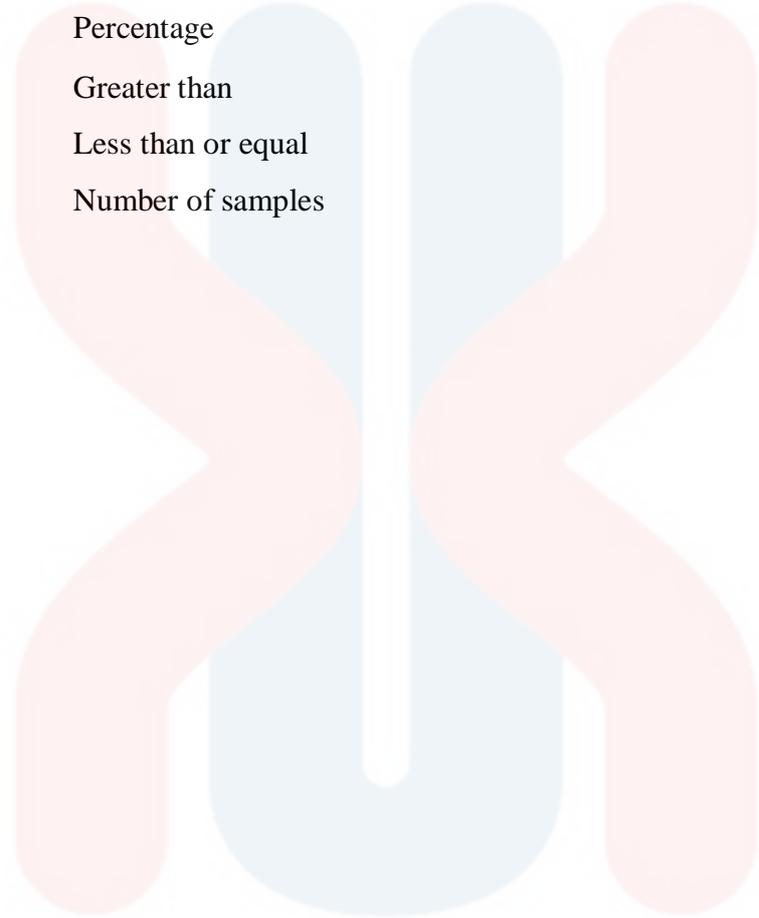
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## LIST OF ABBREVIATIONS

SDGs	Sustainable Development Goals
MDGs	Millennium Development Goals
DOS	Department of Statistics
SPR	Standardised Poverty Rate
PLI	Poverty Line Income
EPU	Economic Planning Unit
GDP	Gross Domestic Product
SPSS	Statistical Package for the Social Sciences
MLR	Multiple Linear Regression
RMSE	Root-mean-square Error
R <sup>2</sup>	Coefficient of Determination

## LIST OF SYMBOLS

%	Percentage
>	Greater than
≤	Less than or equal
N	Number of samples



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## CHAPTER 1

### INTRODUCTION

#### 1.1 Background of Study

Poverty has always become a major significant problem for the human population. This is because poverty has a strong causal effect on society's quality of life and economic factors (Akhtar, Liu & Ali, 2017). Poverty is said to be a social disease that is difficult to eradicate. It has been a yet unsolved problem for many years. Poverty eradication has been the largest global challenge and a necessary condition to achieve sustainable development and stable economic growth (Gopal & Malek, 2015). This matter's seriousness is obviously reflected when it is being included in global agenda such as Sustainable Development Goals (SDGs) since the first goal of SDG is to eliminate deprivation in all forms possible (Cuaresma et al., 2018).

The countries across the globe have been combating this poverty issue for a long time as well (Pratesi, 2016). Poverty is a condition where people cannot fulfil their basic needs due to lack of resources (Ahmad, Mansor & Paim, 2016). There are various factors that can influence poverty incidence and the factors vary according to regions. Previously, researchers had conducted studies on poverty's determinants.

There are various factors that can affect poverty such as demographic variables, human capital attributes, capital of social, bothersome life circumstances as well as neighbourhood-level characteristics (Peng et al., 2019). Demographic attribute is one of the common factors that were usually studied.

Poverty can be reduced if policies are being applied in a wide range because poverty is not focussed solely on monetary and the broader concept of welfare (Pratesi, 2016). Each country might experience a different level of poverty, but the effects are similar in general. Poverty impacts society and the country itself. There is a connection between poverty and human well-being (Ahmad, Mansor & Paim, 2016). Poor people are more likely to live low-quality life due to not having enough necessities such as low income, poor access to food and water, proper education and others (Chen & Wang, 2015). Hence, their life productivity is relatively low. Poverty brings negative consequences to people who are at a disadvantage (Ozawa et al., 2004). Many researchers have developed an interest in this field. As a result, many researchers have carried out relevant studies to study poverty in depth.

## **1.2 Problem Statement**

All countries around the globe are expected to achieve all 17 goals of Sustainable Development Goals (SDG) by the end of 2030. SDG first goal is to eliminate poverty in all forms. Poverty has been an overwhelming issue that concerned many people because it poses a threat to the country. Aside from having to accomplish SDG, Malaysia has also been aiming to become a developed country by the year 2020 (Nor, Samat & Hasan, 2019). Efforts have been put all out as alternatives to reach the goal. However, poverty becomes a barrier that prevents the goal from being reached (Nair & Sagaram, 2017).

The incidence of poverty had reduced from 52.4% to 3.8% in the year 1970 to 2009 (Gopal & Malek, 2015). The government has launched various programmes to help eradicate poverty such as 1AZAM. 1AZAM was launched in 2010 to help generate income for the poor, by encouraging them to get involved in economic activities (Nor & Azhar, 2016). However, despite the effort & achievement in reducing Malaysia's poverty rate for the last decades, poverty remains a big concern in the country (Siwar et al., 2016). According to the Department of Statistics Malaysia (DOS), Kelantan had the highest percentage of poverty in 2016 among other countries, making Kelantan the most impoverished state. Several studies focused on learning about poverty in Kelantan, but the study on the factors of deprivation in the state in detailed is still not available. The previous study by Siwar et al. (2016) estimated poverty rate only in 10 districts in Kelantan. Despite that, there is still a lack of information on the distribution pattern of poverty and the causes affecting the phenomenon taking into account all districts in Kelantan. This problem exists as a gap in this study field. Patterns of poverty in one place can exist in several forms such as uniformly distributed, clustered or randomly distributed. Identifying the spatial distribution pattern of poverty will allow identifying which areas in Kelantan exhibit elevated poverty risk levels. Besides, this research aims to identify factors that positively influence poverty in the state so that extensive alternatives can be planned.

### **1.3 Objectives**

Following are the objectives of this study:

- 1) To assess the level of poverty risk in Kelantan using Standardised Poverty Rate (SPR).
- 2) To identify factors influencing poverty in Kelantan.

### **1.4 Scope of the Study**

This study was conducted in Kelantan which consists of 66 districts. Data of 12,646 households in 2010 were used in this study (DOS, 2010). It was retrieved from the e-Kasih database. For data analysis and mapping, SPSS Statistics and ArcMap software were used respectively.

### **1.5 Significance of the Study**

In academic field, the study will provide new informative literature about the poverty model in Kelantan. Besides, the study also enables the measurement of the poverty level in 66 districts in Kelantan once the factors contributing to poverty are identified. Moreover, statistical knowledge regarding poverty distribution in this state also can be generated. The assessment can help the government or responsible organisations focus their attention on alleviating poverty in those regions with high poverty rates. It is critical to ensure that the poor also reap the benefits of economic development equally. It will help encourage social development and harmony. Besides, decision or policy makers also can make use of the study's outcome in creating new effective policies that can reduce the impoverishment rate in Kelantan.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Poverty at Global View and Its Definitions

Despite the different development levels any country in this world has reached, there is one same major issue that every country is facing: poverty. Poverty is a global phenomenon which induces destruction of socio-economic in society. This issue was the main concern of the Millennium Development Goals (MDGs) and its extension, SDG. Eight MDGs have been established where it gives the highest importance to poverty alleviation. The members were urged to devote themselves to a new international joint effort on extreme poverty eradication.

Meanwhile, SDG was proposed by members of the United Nation states back in 2014 as an on-going effort to proceed with MDG, which had finished its implementation in 2015 (Le Blanc, 2015). SDGs are numbers of global goals and targets that member states of the United Nations can use throughout the next 15 years to as a guideline for their agendas and policies (Hák, Janoušková & Moldan, 2016). It functions as a global call to end starvation, keep the world protected, and ensure everyone's freedom and prosperity by 2030. There are 17 goals and 169 targets in SDGs based on three main sustainability pillars: economic, environmental, and

social. The first goal of SDGs aims to eliminate poverty in the entirety of its structures all over the places in this world. One of the seven targets of this goal is to reduce the numbers of women, men and children, including all age groups living in neediness by at least 50% by 2030.

The word "poverty" has various meanings. There is no fixed definition of poverty due to its always changing nature as time flies. Generally, deprivation can be expressed in two ways which are absolute or relative poverty. Rowntree was the man who developed the idea of absolute deprivation (Nair & Sagar, 2017). The absolute perspective regards poverty as a circumstance in which a person cannot satisfy essential human resources relevant for living such as foods, clothes to wear, and a place to seek refuge. Developing countries usually adopt the absolute approach while relative deprivation is used for medium and high-income countries (Peng et al., 2018). The utilisation of "absolute poverty" term did not last very long because, in the early 1970s, people started to stop using the term. Policy makers used fixed income as the threshold for absolute deprivation. On the other hand, relative poverty is described as a circumstance where unfortunate people fail to live up of some of the quality standards that are considered reasonable to preserve 'decency' in community.

The social, political, cultural and historical aspect of a particular community influences how poverty is defined. The definition of poverty varies according to different areas. Nevertheless, poverty is often viewed as a situation where there is deprivation of necessities, livelihood and human competence (Jansen et al, 2013). According to World Bank (2005), as cited by Siwar, Ahmed & Idris (2013), poverty means a situation in which food, shelter, health care services, education, opportunities to be employed and access to clean water are scarce for humans. It is a phenomenon where specific areas are inhabited by a group of poor and needy people

(Ereinstein, Hellin & Chandna, 2010). Besides, poverty also occurs when economic resources are scarce in one area. For a long period, poverty has been described by using income determinant. Nevertheless, the scope of how poverty is defined is expanded to multidimensional view these days, (Jayasooria, 2015). According to Tahir et al. (2014), poverty can be measured from the sense of starvation, ability for an individual to read, inferior health services, lack of food, insufficient educational resources and unemployment. Economic experts now believe that the changing world needs a multidimensional approach.

It was recorded that in 1990, half of the world's population lived in poverty, with only \$1.25 per day (Seekings & Nattrass, 2015). Since the 1970s, Taiwan has started its research in studying the strategies to reduce poverty. Its government initiated the plan to provide help to the disadvantaged group to lessen the poverty incidence. Unfortunately, the effort to reduce poverty incidence did not succeed, and the residents in Taiwan keep facing difficulties due to economic restraints (Chen & Wang, 2015). Other than that, Africa is one of the countries with the highest rate of poverty in the world. Poverty in Africa has been long acknowledged since 1994. Compared to other middle-income countries, the poverty rate falls very slowly. Racial discrimination in the country becomes the main reason of income poverty (Seekings & Nattrass, 2015). Countries around the world have been working hard to eradicate poverty in many ways. Governments and other agents play their parts in mobilising this effort to achieve zero poverty rates.

## 2.2 Poverty in Malaysia

Malaysia is also no exception among countries with poverty incidence. Rather than defining poverty on the existing narrow meaning of absolute poverty, Malaysia is supposed to conceptualise poverty more inclusively across a wide range of variables. Therefore, programs and projects under the 11<sup>th</sup> Malaysia Plan endorsed this idea of multidimensional poverty. Malaysia's hard work in attempting to diminish deprivation was recognised in World Bank's Global Economic Prospects report in 2014, as it was mentioned that it was a tremendous achievement, practically minimising extreme poverty from over 50 per cent in the 1960s to less than 1 per cent, especially in the rural areas (Nair & Sagar, 2017). Malaysia's government committed itself to the 1997–2006 United Nations Decade for the Eradication of Poverty programme. When the UN Millennium Declaration was adopted in September 2000, devoting countries to a new international strategic alliance namely, MDG to lessen absolute poverty by a 2015 deadline, Malaysia's dedication was further solidified (Majid et al., 2016).

There had been a significant poverty incidence in Malaysia around 1957 which involved majority of the citizen. Since independence, Malaysia has been working on eradicating poverty and closing the gap among ethnics to reduce inequality among society (Majid et al., 2016). Due to the development of policies and economic growth stability, Malaysia's poverty rate was successfully reduced by 47.6%. The poverty rate in 1970 was 49.3% while in 2012, it was 1.7%. There was a declination in the hard-core poverty rate from 6.95% to 0.2% in 1984 to 2012 (Majid et al., 2016). Meanwhile, the ratio of poverty according to headcount at the national Poverty Line Income (PLI) in 2015 was 0.4% (World Bank, 2019) meaning that 0.45% of Malaysians are still living below the PLI.

Poverty incidence in Malaysia is measured using the Poverty Line Income (PLI). The concept of PLI came from the Malaysian Economic Planning Unit (EPU) where poverty is measured through two aspects, which are food and non-food PLI (Nor & Azhar, 2016). It is a poverty threshold that determines the status of a household by using income data. If the income of a household falls below the line, the household is considered poor (Masud, Hamid & Haron, 2015). PLI in the urban area is higher than in rural area due to having a distinct standard of life. According to DOS (2014), households in Peninsular Malaysia, with an average monthly income of less than RM 760, in Sabah less than RM 1050 and in Sarawak less than RM 910 are classified as poor (Nair & Sagarán, 2017). In addition, households living in Peninsular Malaysia, Sabah and Sarawak with median incomes lower than RM 460, RM 630 and RM 590 respectively are categorised as extremely poor.

### **2.3 Factors Influencing Poverty**

Many researchers have studied the demographic factors because it is found that the factors positively influence poverty. Chen & Wang (2015) studied the relationship between the household head's demographic characteristic with poverty in Taiwan. They found that household head's gender and age, marital status, type of family and ratio of household dependency, education level, and level of economic influence poverty. However, the household head's level of education is negatively correlated with the poverty status in Ethiopia (Afera & Sudhakara, 2015).

Other studies in Taiwan found that, female-headed families are more prone to be impoverished than males (Hoynes et al., 2006). Moreover, employment also influences poverty. According to Chen & Wang (2015), it is hard for people with insecure working history to get a primary sector job. This situation will make them

stay in the secondary sector with low payment. Hence, they will be kept in poverty hole for a long time. Characteristics such as age, sex, marital status, job status, family size and dependency ratio are found as the most extensively researched indicators of poverty. Previous researches agreed that the most influential factor contributing to poverty is the academic attainment of the head of the family. To be more specific, those with no education are more likely to be poor than people who received academic lessons (Biyase & Zwane, 2018) It was also mentioned that level of education that level of education of member of the head of the family determined the family's level of poverty.

In addition, Khan et al., (2015) stated that education plays a pivotal role in a household. They considered education as a socioeconomic empowerment since it can enhance human's factual knowledge and consciousness on the resources usage and improve their productivity. Being able to attain education helps a household do well in their life and prevents them from falling into poverty pit (Peng et al., 2019). Besides, it was predicted that having educated parents would negatively affect the likelihood of becoming poor.

Other than that, the researchers also mentioned that the inclination in household size also leads to rising in risk for a household to be poor, which was confirmed by Rodriguez (2003) and Sabir et al. (2006). Next, the study's result concluded that as the ratio of women to men in the household increases, the likelihood of poverty increases as well. As for the factor of age, it was reported by Rahman (2013) that poverty rate is more significant among families with household heads very young and ancient than among those with middle-aged heads. Household income will gradually decline as the head of the household grows old.

Researchers in Hong Kong mentioned significant poverty indicators such as the age of the head of household, gender, presence of life partner, job status, the type of house people live, health status and lastly, academic attainment (Peng et al., 2019). Since the 1970s until now, Kelantan is still found to undergone poverty rates above the national average and almost most of the household in Kelantan live in poverty (Siwar, Ahmed & Idris, 2013; Majid et al., 2016). Thus, this study aimed to examine the factors that influence poverty in the state more accurately through the statistical method.

#### **2.4 Analysis for Poverty Data**

Poverty has become a field that attracts the interests of many researchers around the world. It also becomes a subject that is studied deeply by many of them. The determinants of poverty have been a significant and broad area of study and exploration for a long time. Hence, different methods have been used by researchers who produced various outcomes. Afera and Sudhakara (2015) carried out a research in nonurban Ethiopia to determine the factors contributing to poverty in that region by carrying out a cross-sectional survey on rural households. Poverty index, descriptive statistics and logit regression model were applied to analyse the collected data. Using the household poverty as the dependent variable, the analysis concluded that household resource endowment and educational level significantly affect the poverty in Ethiopia. The finding of the study showed that 51% of the samples were living in poverty.

Meanwhile, a study conducted in South Africa implemented analytical tests to economic data to provide economic relationships with analytical information. With the same purpose as previous research that aimed to investigate the factors

influencing deprivation in the country, this study retrieved data on household welfare from a panel survey conducted from 2008 and six years later. A probit estimation of random effect was then implemented for the analysis of data (Biyase & Zwane, 2018). They chose a family's income per capita and poverty as the dependent variables, and determinants such as household head's educational attainment, race, ratio of dependency, province dummies, strata of the household's location, gender and age, job and marital status, asset possession and the size of the family as the independent variables.

Peng et al. (2019) investigated the factors that cause poverty to happen in Hong Kong. Two types of regressions models were being applied on survey data which were logistic and quintile. The first regression was used to identify the determinants that highly contributed to the poverty rate's inclination in the study area. On the other hand, the latter was incorporated to understand further the degree to which poverty indicators emerge across the range of poverty. The authors reflected the poverty level by groups of five ranges such as exceptionally poor, extremely poor, at the line of poverty, near to poverty and slightly poor.

Moving to the local scale, Nawawi et al. (2019) carried out a research in Kelantan to determine indicators of poverty in terms of socio-demographic using secondary data from e-Kasih database. The researchers applied a few statistical approaches including Poisson generalised linear model, Moran's I and also implemented a conditional regression model called Leroux CAR model. The aforementioned model demonstrated that the size of family, education achievement, and the gender of head household affected poverty profoundly.

## 2.5 Poverty mapping

Poverty visualisation has gained recognition among researchers and policy-makers as a practical tool for evaluating pockets of deprivation and giving relevant information about regional well-being disparities. Comprehensive household data from relatively limited surveys which are not accessible at the community level can be paired with data from census containing a few parameters but offering full household scope with the assistance of poverty visualisation (Grimm, Waibel & Klasen, 2016). The maps will be very beneficial for researchers and policy makers because it will be easier for them to measure deprivation at the local scale. Nawawi et al. (2019) carried out poverty mapping in Kelantan. The study found that the district with the highest poverty risk among 10 districts in Kelantan was Tumpat whereas lower-risk districts were found to be Kota Bharu, Machang and Pasir Mas.

## CHAPTER 3

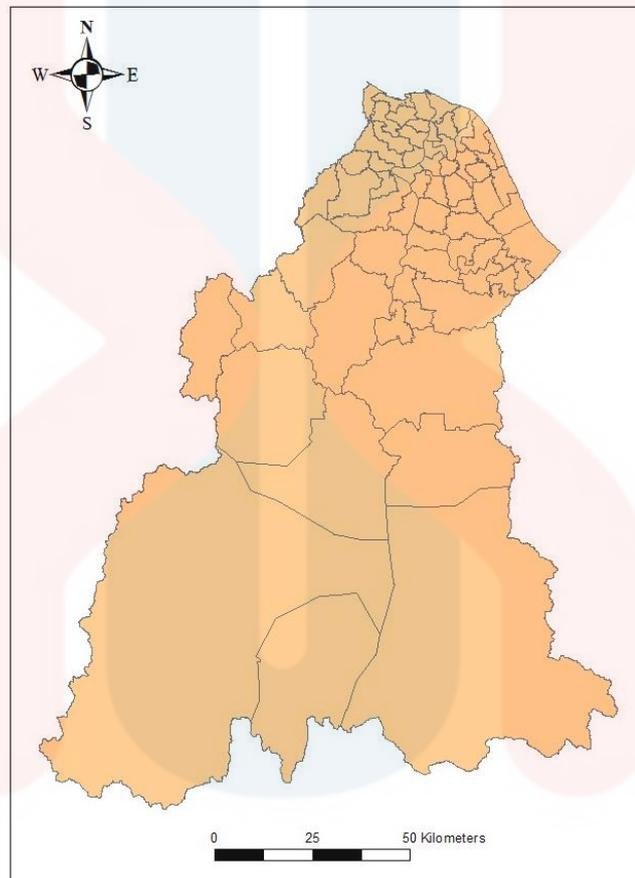
### MATERIALS AND METHODS

#### 3.1 Study Area

The chosen state, Kelantan is located in the north-east of Peninsular Malaysia. It is bounded by Thailand and the South China Sea in the north and northeast respectively. Meanwhile to the south-east, west and south, Kelantan is bordered by Terengganu, Perak and Pahang. This state has land with a total area proximately 15,040 km<sup>2</sup>. As in 2019, total population of Kelantan citizens reaches estimated 1.89 million people, consisting of 0.95 million male and 0.93 million female with the annual growth rate of 1.3 % (DOS, 2020). The citizen of Kelantan comprises of people from different major races which are Malay, Chinese & Indian. Kelantan consists of 11 territories and 66 districts under the respective territories.

It was reported that the highest amount of poor and needy people in Malaysia is concentrated at Kelantan (Siwar et al., 2016). For years, Kelantan has been referred to as an undeveloped state due to slower development compared to other states. Compared to other states, industrialisation in Kelantan has been going slow which leads to low economic growth. In 2018, gross domestic product (GDP) per

capita of the state was RM 13,668 with GDP growth of 2.6%, which was the lowest (DOS, 2020).



**Figure 3.1:** 66 districts of Kelantan.

## **3.2 Data Source**

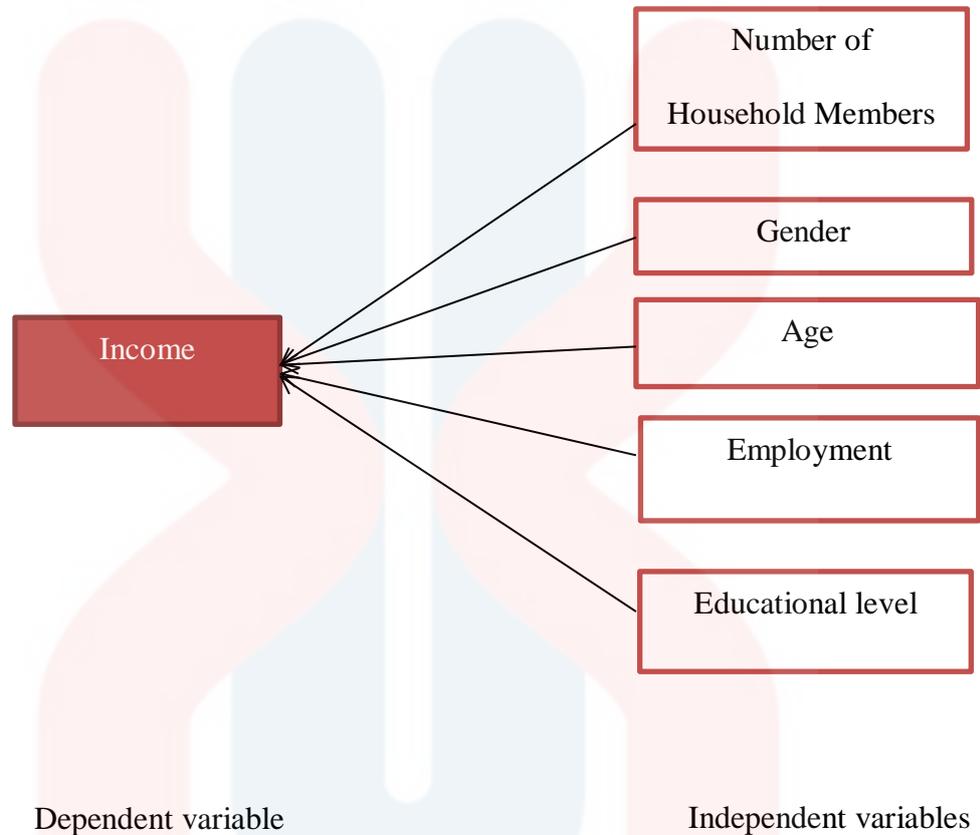
### **3.2.1 Secondary Data from e-Kasih**

Secondary data was used in this study. The data used were on socio-demographic characteristics of the poor household head namely number of household members, gender, age, employment, and education level. The required data were retrieved from the e-Kasih database from the Ministry of Women, Family

and Community Development, and census data from DOS. The data used in this study were based on the poverty profile collected in 2010 because, in order to obtain SPR, data consisting of the number of living households in each district was needed. Those data are obtained every 10 years because the census in Malaysia is conducted every 10 years.

E-Kasih database is a system that collects and stores information related to poverty in Malaysia. It was developed on 31<sup>st</sup> October 2007 due to the Meeting of the Ministerial Council and started being used nationwide in June 2008 (PPPN Perak, 2015). The system was created to help the Malaysian government to identify the amount of poor in the country. In addition, the government or related agencies will be able to plan, implement and monitor poverty programmes conducted in the country (Nor, Samat & Hasan, 2019). DOS carried out poverty census across all the regions in Malaysia to collect data for e-Kasih. Citizens can easily access to e-Kasih web portal to obtain information regarding poverty since the information is made available for the public.

### 3.3 Theoretical Framework



**Figure 3.2:** Theoretical framework

Figure 3.2 shows the theoretical framework of this study. Poor household income is the dependent variable, as a proxy to measure poverty. Meanwhile, the independent variables are the household's demographic characteristics, such as the number of household members, gender, age, employment status and educational level.

### 3.4 Data Analysis

The obtained data were analysed using ArcMap and Statistical Package for the Social Sciences (SPSS) software version 25.0.

#### 3.4.1 Descriptive Statistics

In this study, the poverty data was summarised using descriptive statistics. Descriptive statistics is a tool used to summarise large amounts of data in a way easier to understand. It provides basic information regarding any quantitative data analysis and also to determine a distribution's normality. This study used two types of measure which were a measure of central tendency and a measure of variability. The mean and median were calculated in the first measure while the latter included standard deviation, range, minimum and maximum values.

#### 3.4.2 Standardised Poverty Rate (SPR)

Each district in Kelantan has a different total number of households. This situation causes a difference in the number of poor households between all the districts cannot be accurately identified when data are compared. In order to analyse the disparities, SPR method was used as a normalisation method (Majid et al., 2016; Nawawi et al., 2019). The household data were substituted in a specific formula using SPSS. After the data analysis, the SPR values were generated and provided the rate of poverty in that specific district. The formula is shown in Eq. (3.1) – (3.2):

$$SPR = \frac{y_j}{E_j} \quad (3.1)$$

$$E_j = \frac{\sum y_j}{\sum P_j} \times P_j \quad (3.2)$$

where, SPR is the standardised poverty rate.  $Y_j$  for  $j = 1, \dots, n$  is the number of poor household in district  $j$ . While  $P_j$  is the amount of household living in district  $j$  and  $E_j$  is the expected rate of poverty for district  $j$ .

### 3.4.3 Multiple Linear Regression (MLR)

The linear regression model was used to produce a model to predict the income of the poor household. The model was then used to identify which independent variables have significantly contributed to household income. Since more than one independent variable was studied, a multiple regression analysis was applied.

#### 3.4.3.1 Assumptions of Multiple Linear Regression

In order to ensure the analysis that was carried out is trusted and dependable, some assumptions regarding the analysis had to be reviewed beforehand. The assumptions for the analysis are divided into three main criteria as follow:

- i) The distribution of the dependent variable must be normal for each independent variable (normality).
- ii) The regression line should have a constant variance for all the independent variables (homoscedasticity)
- iii) There should not be a strong correlation among the independent variables (no multi-collinearity).

### 3.4.3.2 Model Fitting for Multiple Linear Regression

A test on the multiple linear regression was done to examine if the model was accurate to use. In statistics, multiple regressions are being widely applied in academic as a tool to induce observation regarding the dependent variable from a set of independent variables. It helps to identify if the two variables are correlated to each other (Peter et al., 2019). The formula of multiple linear regression is shown as in Eq. (3.3) below:

$$Y = k + (b_1 X_1) + (b_2 X_2) + \dots + (b_5 X_5) + \varepsilon \quad (3.3)$$

Here,  $Y$  is the dependent variable while  $k$  is the intercept of the line. The subscripts  $1, 2, \dots, 5$  are the variables involved in this model.  $b_1, b_2, \dots, b_5$  and  $X_1, X_2, \dots, X_5$  are the coefficient of regression and the independent variables respectively. Lastly,  $\varepsilon$  is the residual of the model used.

## 3.4.4 Model Selection

### 3.4.4.1 Root-mean-square Error (RMSE)

Root-Mean-Square Error (RMSE) was applied for the purpose to analyse the performance of the model's fit and sums up the model's cumulative error (Aptula et al, 2005; Chai & Draxler, 2014). Every model has the possibility to produce errors. In determining the best models, the model should have a residual mean square as minimum as possible. This means the best model has the lowest value of RMSE. It is an important step to evaluate the residuals in order to create an RMSE. The

difference between actual ( $y_i$ ) and expected ( $\hat{y}$ ) values would give the residual value. The RMSE aggregates the magnitudes of the errors in forecasting various periods into one common predictive power. Eq. (3.4) below presents the formula used to find the root-mean-square error:

$$\text{RMSE} = \sqrt{\frac{\sum_{i=1}^n (\hat{y}_i - y_i)^2}{n}} \quad (3.4)$$

Here,  $y_i$  is the actual value while  $\hat{y}$  is the expected value. Meanwhile  $n$  is the number of observations.

#### 3.4.4.2 Coefficient of Determination ( $R^2$ )

Coefficient of determination or ‘R squared’ is a statistic coefficient used to explain a linear regression model’s fitness. It is a standard method for deciding the suitability of the models. Coefficient of determination with a value near 1 indicates a strong correlation between a model and the input (Saunders, Russell & Crabb, 2012). According to Di Bucchianico (2008), a negative coefficient means the model gives a poor description of the data used. A value of 0 means the prediction about the dependent variable cannot be made from the independent variable.

$R^2$  provides an accurate result in percentage only if there is no measurement error detected at all when the sample data is observed (Cheng & Garg, 2014). A weak relationship between the independent variables and the dependent variable gives a very low value of  $R^2$ , which is lower than 0.5 (Di Bucchianico, 2008). As the coefficient increases, the percentages of points which fall within a plotted regression

line also increase. The formula of coefficient determination,  $R^2$  is depicted in Eq. (3.5) as follows:

$$R^2 = 1 - \frac{\sum_{i=1}^n (y_i - \hat{y}_i)^2}{\sum_{i=1}^n (y_i - \bar{y})^2} \quad (3.5)$$

$R^2$  is the coefficient of determination.  $y_i - \hat{y}_i$  is the residual (errors) from the regression line while the residual of mean  $y$  value is  $y_i - \bar{y}$ .

### 3.5 Spatial Mapping Using ArcMap

The values obtained from the calculation of SPR were transferred to the ArcMap software to generate the poverty distribution map in Kelantan. The pattern of distribution of poverty in space can be easily through spatial analysis. It is vital to map the poverty rate because it is important in formulating the poverty reduction strategy and policy formulation (Majid et al., 2016). The ArcGIS software makes it possible to visualise location-based data and perform mapping the distribution of poverty.

### RESULTS & DISCUSSION

#### 4.1 Descriptive Statistics

Table 4.1 and Table 4.2 show the descriptive statistics for this data sample. Table 4.1 presents the frequency and percentage for each category of each variable. This study's observation consists of 8141 male (64.4%) and 4504 female (35.6%) from a total of 12646 people. Based on the variable age, 94 of the total household heads are aged 30 years old or above (0.9%). These people are considered young. Middle-aged heads of families are between 30 and 60 years old, which account for a total of 6782 (53.6%) people. In comparison, the remaining 5770 people are considered as older people since their age is older than 60 years old. As for the educational level, 6647 people did not have formal education (52.6%). 1528 of the poor people came from UPSR background of education (12.1%), followed by 2364 having SRP / PMR / LCE certificate (18.7%), 1981 from SPM / SPVM / SMU / MCE (15.7%) and 112 of them acquire STPM / Diploma / STU / HSC certificate (0.9%). Meanwhile, 9 people possess the certificate of skills (0.1%) and the remaining 5 people are from Bachelor educational background (0%). Furthermore, 4730 from 12646 people salaried workers (37.4%), 3591 are not working (28.4%),

3231 people are self-employed (25.5%) and 839 of the sample consist of housewives (6.6%). Besides, there are 42 retirees (0.3%), 21 students (0.2%), only two people who are still considered young (0%) and lastly, 190 of the poor people fall in categories which are not mentioned (1.5%). Referring to the number of a household member, 7596 has 1 to 5 family members (60.1%). Meanwhile, 4844 people consist of 5 to 10 family members (38.3%) and 206 people have family members between 10 to 16 people (1.6%).

**Table 4.1** The demographic profile of the poor household (n=12646)

		Frequency, N	Percentage, %
<b>Gender</b>	Male	8141	64.4
	Female	4504	35.6
	<b>Total</b>	12646	100.0
<b>Age</b>	≤ 30 years old	94	.9
	30 – 60 years old	6782	53.6
	≥ 60 years old	5770	45.5
	<b>Total</b>	12646	100.0
<b>Educational Level</b>	No Formal Education	6647	52.6
	UPSR	1528	12.1
	SRP / PMR / LCE	2364	18.7
	SPM / SPVM / SMU / MCE	1981	15.7
	STPM / Diploma / STU / HSC	112	.9
	Skills of Certificate	9	.1
	Bachelor	5	0
	<b>Total</b>	12646	100.0
<b>Employment</b>	Not working	3591	28.4
	Self-employed	3231	25.5
	Salaried worker	4730	37.4
	Housewife	839	6.6
	Retiree	42	.3
	Student	21	.2
	Still young	2	.0
	Others	190	1.5
	<b>Total</b>	12646	100.0

**Table 4.1** (Continued)

<b>Number of Household Member</b>	1 – 5 people	7596	60.1
	5-10 people	4844	38.3
	10-16 people	206	1.6
	<b>Total</b>	12646	100.0

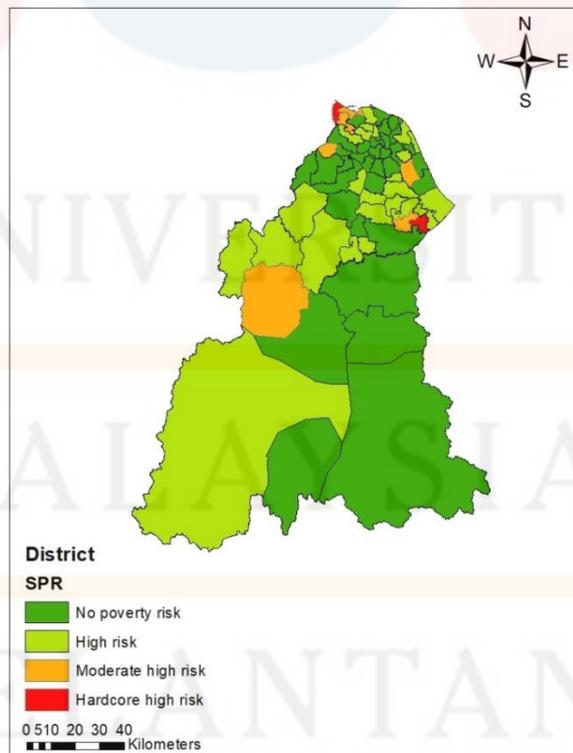
Table 4.2 shows the statistics for this data sample. The total number of sample for this study is N=12646. For the first variable which is monthly income of the poor household head, the range is RM 3075.83. The minimum and maximum values of the income are RM 0 and RM 3075.83 respectively. It has a mean of 821.92 and standard deviation of 445.932. The number of household member ranged between 0 to 15 with the least total member of only 1 person and a maximum of 16 members per household. The average mean of the number of a household member is 4.86 and it differs from the mean value by 2.501. As for the last variable, the range for age is 105. The youngest age for the head of the family is 12 years old while the oldest is 117 years old. The mean and standard deviation for this variable are 60.15 and 13.246 respectively.

**Table 4.2** Descriptive statistics

Variables	N	Range	Min.	Max.	Mean	Std. Deviation
Monthly Income	12646	3075.83	.00	3075.83	821.9257	445.93195
Number of Household Member	12646	15	1	16	4.86	2.501
Age	12646	105	12	117	60.15	13.246

## 4.2 Spatial Poverty Mapping

After the SPR values were calculated, a map of poverty was visualised as represented in Figure 4.1. The four risk classes are visualised in green, light green, orange and red colours according to the risk levels of zero poverty risk, high, moderate-high and hard-core high risk of poverty. According to the map, most of the districts in Kelantan are not vulnerable to poverty as the green areas dominate the map more. The said districts are accumulated at the northern side of Kelantan and also at south-eastern areas of Kelantan. Light green areas (high poverty risk) are also seen scattered in the western part of the map and some are concentrated on the east side of Kelantan although the number is not large. Regions with moderate high risk are concentrated at the upper part of Kelantan and lastly, the districts which are exposed to poverty the most are also located at the upper part of the map.



**Figure 4.1:** Poverty risk map

Table 4.3 shows the classes of the poverty risk and the districts that fall into the following categories. The SPR values show whether the study areas are susceptible to poverty or not. Areas with SPR value below 1.0 are said to have no poverty risk while having value which exceeds 1.0 is regarded as having high poverty risk. If the value is 1.1, it means that the area's poverty risk is 10% more than expected. A value of SPR equals to 2.0 depicts that the cases increase than what is expected by 100% while a value of 3.0 means an increase of 200%. According to the table, there are 33 districts with no poverty risk. As for the second class which is high vulnerability to poverty, there are 25 districts categorised under this level. The areas are more concentrated at the eastern, western and south-western side of Kelantan. There are 6 districts reported to fall in middle high poverty risk class namely Gunong (Gunong Timur), Alor Pasir, Jeram, Jal Besar, Tumpat and Kuala Balah. In addition, only two districts have alarming values of SPR which is more than 3.0 namely Pengkalan Kubor and Gong Datok. Having an SPR value of 3.92 makes Pengkalan Kubor at Tumpat, as the district with the highest poverty risk in Kelantan. This result supports the study conducted by Nawawi et al. (2019) which reported that Tumpat had the highest SPR among other districts. Meanwhile, Gong Datok at Pasir Puteh comes in second place with SPR of 3.34.

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**Table 4.3** SPR readings of 66 districts in Kelantan

SPR value	Districts
$\leq 1.00$ (No poverty risk)	<ol style="list-style-type: none"> <li>1. Telong</li> <li>2. Tanjong Pauh</li> <li>3. Melawi/Pantai Baru</li> <li>4. Badang</li> <li>5. Banggu</li> <li>6. Beta</li> <li>7. Kadok</li> <li>8. Kemumin</li> <li>9. Kota</li> <li>10. Limbat</li> <li>11. Kubang Kerian (Lundang)</li> <li>12. Ketereh (Pangkal Kalong)</li> <li>13. Panji</li> <li>14. Pendek</li> <li>15. Peringat</li> <li>16. Salor</li> <li>17. Sering</li> <li>18. Pangkal Meleret</li> <li>19. Ulu Sat</li> <li>20. Gual Periok</li> <li>21. Kangkong</li> <li>22. Kuala Lemal</li> <li>23. Kubang Gadong</li> <li>24. Kubang Sepat</li> <li>25. Pasir Mas</li> <li>26. Rantau Panjang</li> <li>27. Kusial</li> <li>28. Terbok</li> <li>29. Galas</li> <li>30. Chiku</li> <li>31. Batu Mengkebang</li> <li>32. Olak Jeram</li> <li>33. Dabong</li> </ol>

**Table 4.3** (Continued)

<p>1.01 – 2.00 (High poverty risk)</p>	<ol style="list-style-type: none"> <li>1. Tawang</li> <li>2. Perupok/Paya Mengkuang</li> <li>3. Mahligai</li> <li>4. Beklam</li> <li>5. Kota Bharu</li> <li>6. Labok</li> <li>7. Panyit</li> <li>8. Pulai Chondong</li> <li>9. Temangan</li> <li>10. Bunut Susu</li> <li>11. Chetok</li> <li>12. Padang Pak Amat</li> <li>13. Bukit Abal</li> <li>14. Bukit Awang</li> <li>15. Bukit Jawa</li> <li>16. Limbongan</li> <li>17. Semerak</li> <li>18. Jedok</li> <li>19. Ulu Kusial</li> <li>20. Kebakat</li> <li>21. Sungai Pinang</li> <li>22. Wakaf Bharu</li> <li>23. Bertam</li> <li>24. Batu Melintang (Belimbing)</li> <li>25. Jeli</li> </ol>
<p>2.01 – 3.00 (Moderate high poverty risk)</p>	<ol style="list-style-type: none"> <li>1. Gunong (Gunong Timor)</li> <li>2. Alor Pasir</li> <li>3. Jeram</li> <li>4. Jal Besar</li> <li>5. Tumpat</li> <li>6. Kuala Balah</li> </ol>
<p>&gt; 3.00 (Hardcore poverty)</p>	<ol style="list-style-type: none"> <li>1. Pengkalan Kubor</li> <li>2. Gong Datok</li> </ol>

### 4.3 Multiple Linear Regression

Table 4.4 shows the summary of the model used in this study. The model gives a value of  $R = 0.908$ ,  $R^2 = 0.824$  and adjusted  $R^2 = 0.824$ . If  $R$ 's value is approaching to 1, it means that this model has a strong positive correlation between the dependent and independent variables. Meanwhile, the value of adjusted  $R^2$  means that 82.4% of the variance for monthly income is possible to be explained by the total of household member, gender, level of education, age, and the status of employment.

**Table 4.4** Model summary

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>
1	.908 <sup>a</sup>	.824	.824

Next, the ANOVA table is tabulated as in Table 4.5 below to indicate the level of significance of the analysed model. It is proved that this model is significant since the significant value ( $p = 0.000$ ) is less than 0.05. Having  $p$ -value below 0.05 enables the model to significantly estimate the result of the variables and shows that the multiple linear regression fits the study's data nicely.

**Table 4.5** ANOVA results

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	2071650023.891	5	414330004.778	11825.296	.000 <sup>b</sup>
Residual	442875265.275	12640	35037.600		
Total	2514525289.166	12645			

### 4.3.1 Best Model Fitting

Table 4.6 shows the coefficient for the multiple linear regression. The p-values for the number of a household member, gender, age and employment account for below 0.05. It means that the variables are significant. In other words, only these variables influence the dependant variable, which is the monthly income. In contrast, educational level is found not significant (p = 0.606), having p-value greater than 0.05. This study indicates that the income of the poor household is not influenced by the attainment of education of the household head.

Moreover, the VIF value for all the variables is below 7.5 which are 1.371, 1.200, 1.566, 1.906 and 1.508 respectively for the amount of household member, gender, level of education, age and employment. VIF value less than 7.5 indicates that there is no multi-collinearity between independent variables in this model. All the independent variables are not too correlated with each other. If the dependency between the independent variables is too high, the model's reliability will be declined.

**Table 4.6** Coefficients

	Model	B	Sig.	VIF
1	(Constant)		.839	
	Number of Household Member	.893	.000	1.371
	Gender	-.018	.000	1.200
	Educational Level	-.002	.606	1.566
	Age	.035	.000	1.906
	Employment	-.049	.000	1.508

According to the outcome of the regression, the suitable model of statistics that can be applied to determine the values of monthly income is as shown in Eq. (4.1):

$$Y = 0.893X_1 - 0.018X_2 - 0.002X_3 + 0.35X_4 - 0.049X_5 \quad (4.1)$$

Where  $y$  = Household income

$X_1$  = number of household member

$X_2$  = Gender

$X_3$  = Educational level

$X_4$  = Age

$X_5$  = Employment

Since educational level does not affect the household's monthly income, this model is now unfit to be further used. Hence, the multiple linear had to be run once again. This time, the insignificant variable was excluded in the model. Tabulated in Table 4.7, 4.8 and 4.9 are the outcomes of the second time analysis. Last but not least. The final model for the determinants of poverty in Kelantan is shown as well. Table 4.7 portrays that this new model has the same values for the correlation  $R$ ,  $R^2$  and adjusted  $R^2$  as the previous model. This means that the number of household member, gender, age, and employment are also strongly correlated with monthly income. Next, the ANOVA result shows that the model has a significant value below than 0.05 ( $p = 0.000$ ) which pass the requirement.

**Table 4.7** Model summary of new model

Model	R	$R^2$	Adjusted $R^2$
Regression	.908	.824	.824

**Table 4.8** ANOVA results of new model

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	2071640727	4	517910181.855	14782.413	.000
Residual	442884561.747	12641	35035.564		
Total	2514525289.166	12645			

According to Table 4.8, p-values for the selected independent variables ( $p = 0.000$ ) show that all the variables are significant and contribute as the factors that cause poverty in Kelantan. Changes in these variables will influence how much money the household head can get in a month.

**Table 4.9** Coefficients of new model

Model		B	Sig.	VIF
1	(Constant)		.933	
	Number of Household Member	.893	.000	1.360
	Gender	-.018	.000	1.196
	Age	.034	.000	1.471
	Employment	-.049	.000	1.506

Eq. (4.2) shows the final equation that was used for this model in the study:

$$Y = 0.893X_1 - 0.018X_2 + 0.034X_3 - 0.049X_4 \quad (4.2)$$

Where Y represents the monthly income

$X_1$  represents number of household member

$X_2$  represents gender

$X_3$  represents age

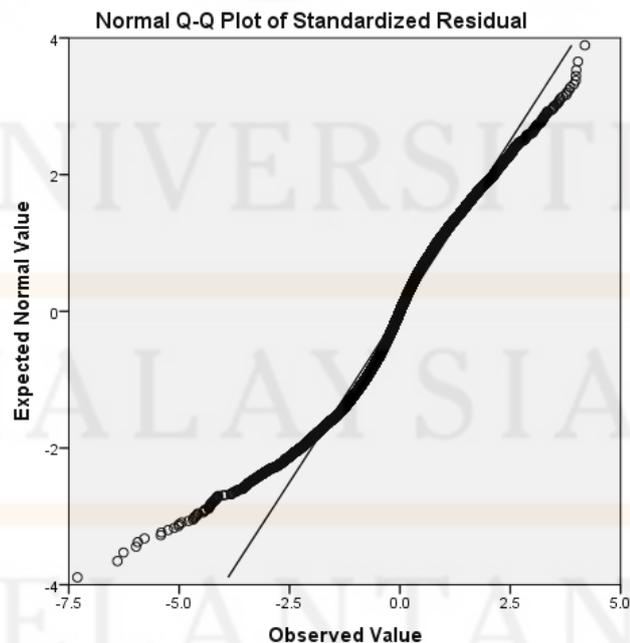
$X_4$  represents employment

From the equation and Table 4.9 above, it is stated that the number of household member increases by one person, then the monthly income increases by 0.893%. As for gender, it is found that gender has a negative significance in influencing the monthly income of the poor family. Increase in one person of female-headed household family, the monthly income will decline by 0.018%. This is in line

with a study conducted by Kudi et al. (2009) in Nigeria which revealed that the household's likelihood was reduced by 31.5% if a unit in age arose. Meanwhile, as the household head's age rise by one year, the income will rise by 0.034%. However, the income only will increase until people reach the age where they are working most actively. Lastly, the analysis's coefficient suggests that an increase in the number of the unemployed household head by one person will decrease the family's monthly earning by 0.049%.

#### 4.3.2 Normality Q-Q Plot

Lastly, the plotted graph below shows a normal Q-Q graph of standardized residual. The values are found to be generally distributed since almost the majority of the values lie along the straight line. A data with a normal distribution pattern is desired as it will be more reliable to be used in the study. Hence, the assumption of normality is achieved.



**Figure 4.2:** Normal Q-Q plot graph

#### **4.4 Determinants of Poverty**

It can be finalised that there are four main significant factors that determine the poverty incidence in Kelantan. The said determinants are the number family members, the gender of the family head, and their age and employment status.

##### **4.4.1 Number of Members in a Poor Family**

The size of a family is significant in determining a family's possibility to be in a poor state or otherwise. As the number of family member increases, the higher chance for the family to fall into the state of poverty. In this study, the minimum number of a family member is one while the maximum is 16. 60.1% of the sample has a family consisting of small families from 1 to 5 family members.

The poverty risk can rise as the family members of a household increases. However, two conditions might arise from this situation. Firstly, suppose the household consist of big number of family members and all of them contribute to income generation. This factor will be a positive cause that can lift the family out of poverty. This can happen with the help of the combined income between the family members who are already working. Their per capita expenditure can be cut off to some extent through sharing (Ali, Ibrahim & Aziz, 2018). Otherwise, if they are not helping the family gain money and only depend fully on the household head, they will be in trouble striving economically. This is because the household head would need to support many members of the family. Besides, the demand for basic necessities such as food will be high for a big family. Rahman (2013) supported that families with considerably higher numbers of children and older people are more vulnerable to poverty.

#### **4.4.2 Gender of the Head of the Poor Family**

Gender of the household head also has a role in influencing poverty. Majority of low-income families in Kelantan have males as their household head, but this study focused on female-headed families. This is because women-headed families are often associated with poverty and the rate of a female headed family falling into poverty keeps rising all over the globe (Liu, Esteve & Treviño, 2017). The phenomenon of ‘feminization of poverty’ exists and is being defined as a situation in which women are the majority of the 1.5 billion people living on 1 dollar a day or less. This clearly shows there is a gap between women and men when it comes to the poverty cycle. Based on this study, it was proven that the female head household tends to fall into the poverty trap. This might be due to females getting paid with lower income than males (Azhar et al. 2016). This unfair system of female worker getting lower paid has long existed in Malaysia culture. In some worst cases, their efforts are not even being rewarded or acknowledged by their employer. Besides, this inequality could exist due to the mind-set of women incapable of being as active as men and having less physical energy. Javed, Hussain and Asif (2011) supported the statement by mentioning that there are limitations to women preventing them from getting full access to assets and skills. As a result, they receive unnecessarily low income which only pushes them into the state of impoverishment.

#### **4.4.3 Age of the Head of the Poor Family**

The vulnerability of falling into poverty pit also depends on the age of the family's head. When a household head grows older, they will gain more real-life experience and become more experienced in their professional field. Hence, more income would also be gained (Rhoumah, 2016). As a result, it is less likely that the

family would become poor. The author once again highlighted that the likelihood of an individual leaving poverty increases as the person's experience in life increases. Besides, young people are said to be more active working as supported by Lhing, Nanseki & Takeuchi (2013) which stated that those whose age is below 50 are more economically active than people who are 50 years old and above. However, their stamina and physical strength may begin to decrease as the head of the household gets older and older. Thus, the chances of being likely to experience poverty will start to get higher.

#### **4.4.4 Employment Status of the Head of the Poor Family**

In this study, the head of the household's occupations are divided into eight groups which are unemployed, self-employed, salaried worker, housewife, retiree, student, still young and others. The MLR analysis reported that the occupation of the household head does play a significant role. Head of the household who is not working contributes to the family being vulnerable to poverty. When the family's head has no job, there will be no income flow. As a result, the family will be facing a hard time to fulfil their family's needs even the basic ones. This will put the family into a poor state. Ullah Awan et al. (2019) reported that having jobs decreases the risk of household poverty, while unemployment typically leads to low incomes, resulting in insufficient consumption and low living standards. In both emerging and developed world economies, the lack of decent work prospects and income inequality are the key reasons behind mass poverty. In addition, it contributes to relative poverty, which is argued to be psychologically destructive since it makes participating in society more difficult and thereby increases the risk of being socially excluded (Stam et al., 2016).

### CONCLUSION & RECOMMENDATIONS

#### 5.1 Conclusion

This study produced two outcomes as elaborated in the previous chapter. First, the distribution of poverty in Kelantan was assessed statistically. A map of poverty risk which covers all 66 districts in Kelantan has been produced. From the map, the level of poverty risk in the state of Kelantan can be assessed in more detailed. This can serve as a new founding since this study will be the first study that highlighted the poverty distribution in all the districts. The risk level was indicated by the SPR value that was calculated beforehand. It can be concluded that half of the districts (33 districts) in Kelantan has no risk of being vulnerable to poverty since the SPR value is below 1.0. Districts with value exceed 1.0 are considered to have high poverty risk. Here, 25 districts are in high risk while 6 districts are found to be in moderate high risk. There are two districts which have the highest SPR value which means the poverty risk of the districts are also the highest in Kelantan. The two alarming districts are Pengkalan Kubor at Tumpat, and Gong Datok at Pasir Puteh. Significant attention by the government is needed on these high-risk areas. Since the poverty hotspots have been identified, it can be seen clearly which districts are the

most vulnerable or the least vulnerable to poverty. This study provides valuable information for the government in order to alleviate poverty. They can hold programmes or events that can improve the poor people's quality of life right at the districts that are highly in risk.

Apart from that, the socio-demographic factors that significantly influenced poverty are also successfully identified. Among the five variables that were originally analysed, four of the variables are found to impact the monthly income of the poor household significantly. The total number of members in a family, the head of poor family's age, gender and their employment are the determinants of poverty in Kelantan. The family size can have both advantages and disadvantages regarding impoverishment. In short, a small family can reduce the need to spend the money on their needs meanwhile a family with many members will only require more money to fulfil their needs. However, the size of the family comes handy if the members are contributing to the family's economic.

Moreover, the age of the household head also plays an important role. A family who's led by a young household head can get away from poverty since young people are actively working and still have the energy to do things that can improve their life. In contrast, families led by the elderly tend to become more vulnerable to fall into the poverty trap. This is due to the old age that restricts the family head to exert energy to find a source of livelihood. Next, female-headed families are more prone to become poor than male-headed household. Last but not least, an unemployed household head is more likely to live in poverty.

## 5.2 Recommendations

There were shortcomings in this study that needs to be improved for future project. The poverty data that was obtained from e-Kasih had missing data on the marital status of the family's head. To produce a more promising result, marital status should have been included as well to identify if it affects poverty or not. The outcome of this study could have come out different if all the data was adequate. For future study, marital status should be included in the analysis since studies had proved the importance of this variable in determining the cause of poverty at a particular region.

In addition, this study involves a big number of data on poor household in all districts in Kelantan. Future researchers can integrate various statistical analyses in the study using the data to produce a more comprehensive outcome. For instance, researchers may do an analysis on the different groups of each independent variable to find out which group influence poverty the most.

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## APPENDIX

**Appendix A.** Results of descriptive statistics of dependent and independent variables

### Descriptive Statistics

	Mean	Std. Deviation	N
Monthly income	821.9257	445.93195	12646
Number of Household Head	4.86	2.501	12646
Gender	.36	.479	12646
Educational level	.53	.499	12646
Age	60.15	13.246	12646
Employment	.28	.451	12646

**Appendix B.** Distribution of number of poor household

### Number of Household Member

	Frequency	Percent	Valid Percent	Cumulative Percent
1	1259	10.0	10.0	10.0
2	1430	11.3	11.3	21.3
3	1350	10.7	10.7	31.9
4	1649	13.0	13.0	45.0
5	1908	15.1	15.1	60.1
6	1840	14.6	14.6	74.6
7	1373	10.9	10.9	85.5
Valid 8	861	6.8	6.8	92.3
9	508	4.0	4.0	96.3
10	262	2.1	2.1	98.4
11	117	.9	.9	99.3
12	46	.4	.4	99.7
13	29	.2	.2	99.9
14	12	.1	.1	100.0
15	1	.0	.0	100.0

16	1	.0	.0	100.0
Total	12646	100.0	100.0	

**Appendix C. Distribution of gender of the household head**

**Gender**

	Frequency	Percent	Valid Percent	Cumulative Percent
1	8141	64.4	64.4	64.4
Valid 2	4505	35.6	35.6	100.0
Total	12646	100.0	100.0	

**Appendix D. Distribution of educational level of the household head**

**Educational Level**

	Frequency	Percent	Valid Percent	Cumulative Percent
1	6647	52.6	52.6	52.6
2	1528	12.1	12.1	64.6
3	2364	18.7	18.7	83.3
Valid 4	1981	15.7	15.7	99.0
5	112	.9	.9	99.9
6	9	.1	.1	100.0
7	5	.0	.0	100.0
Total	12646	100.0	100.0	

Appendix E. Distribution of age of the household head

Age

	Frequency	Percent	Valid Percent	Cumulative Percent
12	1	.0	.0	.0
15	2	.0	.0	.0
16	1	.0	.0	.0
17	2	.0	.0	.0
18	3	.0	.0	.1
20	4	.0	.0	.1
21	3	.0	.0	.1
22	4	.0	.0	.2
23	7	.1	.1	.2
24	7	.1	.1	.3
25	7	.1	.1	.3
26	9	.1	.1	.4
27	9	.1	.1	.5
28	7	.1	.1	.5
Valid 29	20	.2	.2	.7
30	8	.1	.1	.7
31	25	.2	.2	.9
32	25	.2	.2	1.1
33	28	.2	.2	1.4
34	37	.3	.3	1.7
35	48	.4	.4	2.0
36	49	.4	.4	2.4
37	48	.4	.4	2.8
38	99	.8	.8	3.6
39	94	.7	.7	4.3
40	101	.8	.8	5.1
41	137	1.1	1.1	6.2
42	146	1.2	1.2	7.4

43	201	1.6	1.6	9.0
44	214	1.7	1.7	10.6
45	224	1.8	1.8	12.4
46	266	2.1	2.1	14.5
47	288	2.3	2.3	16.8
48	308	2.4	2.4	19.2
49	349	2.8	2.8	22.0
50	384	3.0	3.0	25.0
51	351	2.8	2.8	27.8
52	391	3.1	3.1	30.9
53	381	3.0	3.0	33.9
54	374	3.0	3.0	36.9
55	387	3.1	3.1	39.9
56	355	2.8	2.8	42.7
57	372	2.9	2.9	45.7
58	365	2.9	2.9	48.6
59	352	2.8	2.8	51.3
60	383	3.0	3.0	54.4
61	336	2.7	2.7	57.0
62	355	2.8	2.8	59.8
63	267	2.1	2.1	61.9
64	314	2.5	2.5	64.4
65	272	2.2	2.2	66.6
66	262	2.1	2.1	68.7
67	230	1.8	1.8	70.5
68	268	2.1	2.1	72.6
69	266	2.1	2.1	74.7
70	235	1.9	1.9	76.6
71	259	2.0	2.0	78.6
72	214	1.7	1.7	80.3
73	207	1.6	1.6	81.9
74	244	1.9	1.9	83.9
75	257	2.0	2.0	85.9

76	243	1.9	1.9	87.8
77	175	1.4	1.4	89.2
78	127	1.0	1.0	90.2
79	91	.7	.7	90.9
80	269	2.1	2.1	93.0
81	178	1.4	1.4	94.5
82	97	.8	.8	95.2
83	74	.6	.6	95.8
84	93	.7	.7	96.5
85	29	.2	.2	96.8
86	49	.4	.4	97.2
87	82	.6	.6	97.8
88	32	.3	.3	98.1
89	89	.7	.7	98.8
90	13	.1	.1	98.9
91	23	.2	.2	99.1
92	14	.1	.1	99.2
93	12	.1	.1	99.3
94	46	.4	.4	99.6
95	5	.0	.0	99.7
96	9	.1	.1	99.7
97	10	.1	.1	99.8
98	2	.0	.0	99.8
99	15	.1	.1	99.9
104	3	.0	.0	100.0
105	1	.0	.0	100.0
107	1	.0	.0	100.0
109	1	.0	.0	100.0
117	1	.0	.0	100.0
Total	12646	100.0	100.0	

**Appendix F.** Distribution of employment of the household head

**Employment**

	Frequency	Percent	Valid Percent	Cumulative Percent
1	3591	28.4	28.4	28.4
2	3231	25.5	25.5	53.9
3	4730	37.4	37.4	91.3
4	839	6.6	6.6	98.0
Valid 5	42	.3	.3	98.3
6	21	.2	.2	98.5
7	2	.0	.0	98.5
8	190	1.5	1.5	100.0
Total	12646	100.0	100.0	

**Appendix G.** Model summary for regression analysis

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square
1	.908 <sup>a</sup>	.824	.824

a. Predictors: (Constant), Employment, Gender, Educational level, Number of Household Member, Age

b. Dependent Variable: Monthly Income

**Appendix H. Results of ANOVA**

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2071650023.891	5	414330004.778	11825.296	.000 <sup>b</sup>
	Residual	442875265.275	12640	35037.600		
	Total	2514525289.166	12645			

a. Dependent Variable: Monthly Income

b. Predictors: (Constant), Employment, Gender, Educational Level, Number of Household Member, Age

**Appendix I. Result of coefficients of five independent variables**

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.213	10.909		-.203	.839
	Number of Household Member	159.242	.779	.893	204.298	.000
	Gender	-16.970	3.807	-.018	-4.457	.000
	Educational Level	-2.149	4.171	-.002	-.515	.606
	Age	1.186	.174	.035	6.834	.000
	Employment	-48.691	4.533	-.049	-10.743	.000

a. Dependent Variable: Monthly Income

**Appendix J. Model summary of second analysis**

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.908 <sup>a</sup>	.824	.824	187.17789

a. Predictors: (Constant), Employment, Gender, Number of Household Member, Age

b. Dependent Variable: Monthly Income

**Appendix K. Results of second ANOVA**

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2071640727.419	4	517910181.855	14782.413	.000 <sup>b</sup>
	Residual	442884561.747	12641	35035.564		
	Total	2514525289.166	12645			

a. Dependent Variable: Monthly Income

b. Predictors: (Constant), Employment, Gender, Number of Household Member, Age

**Appendix L. Results of coefficients of four independent variables**

**Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics		
	B	Std. Error	Beta			Tolerance	VIF	
1	(Constant)	-.886	10.600		-.084	.933		
	Number of Household Member	159.279	.776	.893	205.195	.000	.735	1.360
	Gender	-17.083	3.801	-.018	-4.495	.000	.836	1.196
	Age	1.143	.152	.034	7.501	.000	.680	1.471
	Employment	-48.772	4.530	-.049	-10.767	.000	.664	1.506

a. Dependent Variable: Monthly Income