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SPATIAL DEMOGRAPHIC DATA FOR PLANNING AND RESEARCH

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Abstract

In Malaysia, spatial demographic studies are lacking due to data paucity. This exploratory study illustrates the relevance of spatial demographic data for development and business planning at the local level. Data for this study came from Malaysian population censuses, vital statistics reports and social statistics bulletins. Bivariate analyses were performed to present some examples of the potential use of spatial demographic data for more target-oriented planning. Data show that the population in several densely populated districts continues to grow rapidly. Hence, development planning should aim to forestall the exacerbation of the regional imbalance. Localities with high birth rate and rapid population ageing must be prepared to cope with the changing demographic scenario. The wide variations in pupil-teacher ratio across districts indicate the need for resource reallocation. The under-reporting of births and deaths in the remote areas may result in misallocation of health and educational resources. Comparisons of indicators from different data sources demonstrate data inconsistency and deficiency. This study aims to present a strong case for collecting and disseminating small area statistics to enhance spatial demographic research for socio-economic development, infrastructural, regional and business planning.

Keywords: Spatial demographic data, sub-national levels, state, district, births, older people

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INTRODUCTION

The vast literature on the inter-relationships between population and development testifies the importance of population factors in development planning. The 2030 Development Agenda on Sustainable Development Goals calls for leaving no one behind and targeting those who are left furthest behind. It is crucial to have disaggregated data for small geographical areas and pockets of marginalised population for a more targeted service delivery, as well as allocation of resources to bring about a more balanced regional growth. For instance, the B40 income group must be indentified and located for the delivery of the financial assistance. Small area statistics are also essential for business planning by the private sector (Noordini Che'Man & Harry Timmerman, 2016).

Data impacts development through better policy making and public service delivery, enhances research and facilitates the private sector to contribute to economic growth. Reliable and timely data allow policymakers, planners, administrators, companies and the public to make better, timely and more informed decisions, and enhance accountability. The public sector is increasingly using data to formulate, monitor and evaluate policies to improve public service delivery. Researchers use data to undertake empirical analysis to inform policy. The private sector uses data for product development, market analysis, and evidence-based decision-making or assessment (Ministry of Health, 2018; World Bank, 2017).

While the five-year development plans, the National Physical Plans and the National Urbanization Policy provide a framework for development planning at the national level, all the states have formulated and implemented the state structure plans or master plans to deal with the regional and local issues. All mega projects are also required to have a social impact assessment. All these master plans and assessments would require spatial demographic data.

There is a rather sizable literature on Malaysia's demographic dynamics at the national level (Arshat et al., 1988; Chander et al., 1977; Cheong & Lim, 1982; Leete, 1996, 2007; Lim, 1983; National Population and Family Development Board, 2016, 2018; Saw, 2007; Sidhu & Jones, 1981; Tey et al., 2015, 2020). Although space is a crucial element in demographic studies and a good knowledge of spatial demography is crucial for planning (de Castro, 2007), demographic analysis at the sub-national levels is deficient due to data paucity. The few spatial demographic analyses reveal wide differentials in the demographic dynamics and socio-economic and health outcomes across the districts (Diah Intan 2020; Abd Majid, N et al.,n 2019; Siti Uzairiah Mohd Tobi, 2018; Md Bohari, et al., 2019; Abdul Rashid, M. F., 2017; Hazrin, H., 2013; Masron, T., 2012; Abdul Rahman & Zakaria, 2012; Azreena et al., 2016; Hutchinson, 2008; Ibrahim Ngah, 2010; Khalid Zanudin et al., 2019; Ling et al., 2014; Mohamad Fadhli Rashid et al., 2019; Nuzlinda & Syerrina, 2012; Tey, Tan, & Arshat, 1985).

In keeping with the increasing demand for small area statistics (SAS), the Department of Statistics Malaysia (DOSM) has been publishing SAS, such as the decennial population censuses, annual vital statistics, data bank, social statistics, wholesale and retail trade, as well as other statistics by state and district. DOSM initiated the publication of My Local Statistics in 2019. Despite these efforts, there is still a need to expand the collection and dissemination of SAS to enhance spatial demographic analysis. For planning purposes, the data must be disaggregated by gender, age and socio-economic characteristics.

This study is exploratory and illustrative to stimulate spatial demographic analysis and more effective use of demographic data for development planning and business planning. This study also aims to highlight the deficiency in spatial data so that measures can be taken to fill the gaps. It covers selected aspects of the population, including population density, population growth and distribution or concentration, fertility and mortality, pupil-teacher ratio in the secondary school, and population ageing. The data for this study came from the published reports of the population censuses, vital statistics reports and state or district social statistics reports. Simple tabulations, scatter-plots and maps were used to present the findings.

FINDINGS

Population Density and Rate of Population Growth

Malaysia has a population density of about 100 people per square kilometre in 2010, ranging from 19 people per square kilometre in Sarawak to 6,891 in the Federal Territory of Kuala Lumpur. In Peninsular Malaysia, besides Kuala Lumpur, Timur Laut and Petaling are the two most densely populated districts (with a population density of 4,330 and 3,012, respectively). On the other hand, Gua Musang, Jerantut, Lipis, and Ulu Perak have the lowest population density of around 13 to 17 people per square kilometre.

Between 2000 and 2015, the rate of population growth ranged from 1.2 per cent per annum in Perak to 2.6 per cent in Selangor. The variation in the rate of population growth was even more striking across the districts, ranging from -1.0 per cent in Jempol to a high percentage of 6 per cent in Sepang during the intercensal period from 2000 to 2010. Figure 1 shows that a few densely populated districts have a high rate of population growth. The rapid growth will result in further population concentration and aggravation of regional inequality.

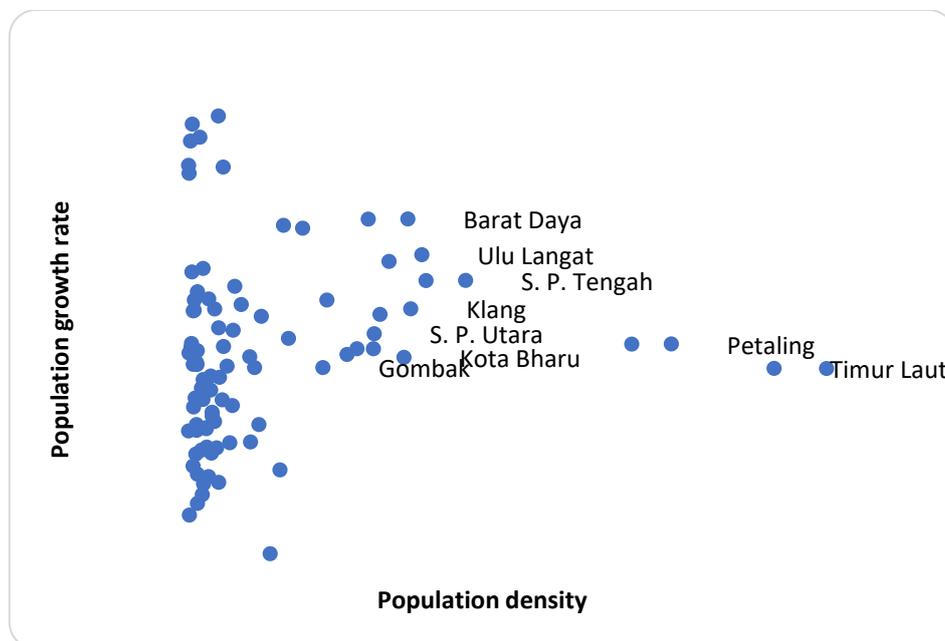


Figure 1: Population density and rate of population growth, by district

Note: Excluding Wilayah Persekutuan Kuala Lumpur (population density 7,089 persons per square km, with an annual rate of population growth of 2.8%)

Source: DOSM (2011): *Population Distribution by Local Authority Areas and Mukims, 2010*; *Population Censuses, 2000, 2010*

The population of Petaling district increased almost five folds from 360 thousand in 1980 to 1.77 million in 2010, at a rate of 5.3 per cent per annum. Consequently, Petaling had overtaken Kuala Lumpur as the most populous district. The population of Johor Bahru increased more than three folds between 1980 and 2010, making it the third most populous district. Ulu Langat, which was the ninth most populous district in 1980, witnessed the most rapid population growth at 6.2 per cent per annum over this period, to leapfrog into the fourth place in 2010. With a population growth rate of 3.7 per cent per annum over the three decades, Klang remained the fifth most populous district in 2010. Even though Kinta remained the sixth most populous district in 2010, its population grew much slower than many other districts.

More than a third (34.4 per cent) of the national population now lives in the ten most populous districts: Petaling, Kuala Lumpur, Johore Bahru, Ulu Langat, Klang, Kinta, Gombak, Kuching, Seremban, and Timur Laut. The National Physical Plan projected a population of 10.37 million, 2.42 million, 2.40 million, and 1.38 million for Greater Kuala Lumpur (including Petaling Jaya), Georgetown, Johor Bahru, and Kuantan, respectively in 2020. The combined total population of 16.57 million in these four conurbations will make up about 70 per

cent of the urban population or 60.4 per cent of the total population in Peninsular Malaysia (Federal Department of Town and Country Planning, 2010).

There are several reasons for the phenomenal population growth in these districts. Petaling and the other four districts in the Klang Valley have attracted migrants from all over the country to take up jobs in administration, commercial, financial, industrial, educational, and service sectors. The various economic policies and programmes require relocation to the cities, leading to dramatic population redistribution over the last few decades.

Eight districts had experienced depopulation between 1970 and 2010. These districts included Sabak Bernam, Temerloh, Julau, Betong, Dalat, Sri Aman, and Hilir Perak. Sabak Bernam and Temerloh had a deficit of more than 50,000 people between 1980 and 2010 at a rate of -2.7 per cent and -1.0 per cent per annum, respectively. During the 1991-2000 inter-censal period, the population of Sabak Bernam decreased 6.6 per cent per annum, while that of Temerloh decreased 3.6 per cent annually. There was a reversal in Temerloh during the ensuing decade, as the population grew at 1.7 per cent per annum. Julat and Betong (both in Sarawak), had a different demographic trend. The population of Julat decreased by half between 2000 and 2010. On the other hand, the population of Betong has been increasing since 1991 after registering a sharp decline between 1980 and 1991.

Births and Deaths

The fertility rate and mortality rate in Malaysia have fallen to a low level. The total fertility rate has fallen below the replacement level since 2012. Non-Bumiputeras are now having ultra-low fertility of about 1.2 children per woman. Nevertheless, wide variations in the fertility and mortality rates persist across regions and sub-groups of the population. The government agencies require information on the number of births in small geographical areas for short-term and medium-term planning to provide health care and educational services and facilities, and other infrastructures. Information on the number of births and children is also essential for business planning, such as infant and child products, childcare centres, kindergartens, and other services.

The crude birth rate (CBR) ranged from 4.5 per thousand population in Kinabatangan to 26.4 in Kuala Terengganu, while the crude death rate (CDR) ranged from 1.0 per thousand population in Kinabatangan to 9.1 in Kanowit (see Tables 1 and 2). Four of the six districts with the highest CBR are in Terengganu. Kinabatangan has registered the lowest CBR and CDR in the country. The extremely low CBR and CDR in Kinabatangan is likely due to under-registration, as the district has a very high proportion of non-citizens.

The proportion of the older population aged 60 and above is directly related to CDR at the district level. The strong positive association between these two variables indicates that CDR is affected by the population's age structure.

The ultra-low CDR in some districts could be due to under-registration or misreporting, especially in the remote areas in Sabah and Sarawak. There is a need for an evaluation of the extent of under-reporting in these remote areas.

The child-woman ratio for each district was estimated using data from the population censuses. Assuming that the child-woman ratio is a fairly good indicator of fertility, there is evidence of under-and over-reporting of births in some districts. Attention should be given to districts and small areas where the birth rate is incredibly low or high. Nonetheless, the extremely low fertility and mortality rates in these districts may be due to misclassification of births and deaths by the place of registration rather than the usual place of residence.

Table 1: Districts with the highest and lowest crude birth rate, 2017

		CBR	Rank	Child-women ratio	Rank
Highest	Putrajaya	28.8	1	454	22
	Kuala Terengganu	26.4	2	335	97
	Marang	26.0	3	402	48
	Julau	24.7	4	360	73
	Besut	24.5	5	470	15
	Setiu	24.0	6	567	3
	Tumpat	22.9	7	351	81
	Pasir Puteh	22.7	8	412	41
	Pasir Mas	21.7	9	346	86
	Tanah Merah	21.7	10	436	29
Lowest	Kinabatangan	4.5	144	316	115
	Putatan	5.6	143	470	16
	Pakan	6.4	142	170	140
	Bagan Datuk	8.3	141	271	130
	Timur Laut	8.4	140	213	138
	Belaga	8.6	139	399	49
	Kampar	9.0	138	182	139
	Tongod	9.2	137	166	142
	Beluran	10.2	136	422	36
	Sandakan	10.4	135	218	137

Source: DOSM: Vital Statistics Report, 2018

Table 2: Districts with the highest and lowest crude death rate, 2017

		CDR	% aged 65+	Median age
Highest	Kanowit	9.1	15.6	30
	Sabak Bernam	8.8	11.9	26
	Kuala Pilah	8.7	14.5	30
	Pendang	8.7	12.6	27
	Dalat	8.6	12.6	27
	Kuala Kangsar	8.5	14.2	28

	Rembau	8.4	12.8	29
	Jelebu	8.3	13.8	29
	Baling	7.9	10.8	24
	Kampar	7.8	14.5	30
Lowest	Kinabatangan	1.0	1.3	23
	Samarahan	2.1	5.0	22
	Kunak	2.1	2.9	24
	Belaga	2.4	6.3	24
	Tongod	2.4	3.3	18
	Labuan	2.5	4.0	25
	Bintulu	2.6	4.7	24
	Beluran	2.6	3.0	21
	Lahad Datu	2.6	2.9	27
	Putrajaya	2.6	1.4	25

Source: DOSM: Vital Statistics Report, 2018

While the rates are commonly used in demographic analyses, the actual numbers may be more relevant for planning purposes. Educational planners need to know the number of school-going children to plan the human resources and school facilities to cater to new school entrants as newborns reach the school-going age. The vital statistics report depicts that a large number of births in some districts. Petaling registered the largest number of births at 30,044, followed by Johor Bahru, Kuala Lumpur, Ulu Langat, and Klang (see Table 3).

Table 3: Ten districts with the highest number of births, 2017

Districts	Number	CBR	Districts	Number	CBR
Malaysia	508685	15.9	Gombak	14035	17.5
Petaling	30044	14.2	Kota Bharu	12316	21.0
Johor Bahru	25750	16.5	Kinta	10297	12.5
Kuala Lumpur	24732	13.8	Seremban	9616	15.7
Ulu Langat	21684	16.1	Kuantan	9128	17.7
Klang	16574	16.6			

Source: DOSM: Vital Statistics Report, 2018

Pupil-teacher ratio

The pupil-teacher ratio is an indicator of the distribution of human resources in the education sector. This section uses the pupil-teacher ratio in secondary schools for illustrative purposes. In 2013, the pupil-teacher ratio in secondary school ranged from 9.7 in Putrajaya to 15.1 in Selangor. The spatial differential in the pupil-teacher ratio was even wider across districts, ranging from 7.4 in Maran to around 16 in Klang and Gombak, Ulu Langat and Bau (see Table 4). Districts with high population density and rapid population growth tended to have a higher pupil-teacher ratio. The large number of births in Klang, Gombak and

Ulu Langat would strain the educational facilities. Hence, more teachers are required in states or districts with a high pupil-teacher ratio to achieve the standard of 10:1 in developed countries.

Table 4: States or districts with the highest and lowest pupil-teacher ratio in secondary schools, 2013

		Highest		Lowest
State	Selangor	15.1	Putrajaya	9.7
	Sabah	13.7	Labuan	10.5
	Pulau Pinang	13.6	Perlis	11
	Sarawak	13.6	Pahang	11.2
	Kedah	13.3	Terengganu	11.8
District	Klang	16.1	Maran	7.4
	Gombak	16.0	Putrajaya	9.7
	Ulu Langat	16.0	Beaufort	9.9
	Bau	15.6	Port Dickson	10.1
	Patatan	15.3	Kuala Pilah	10.1

Source: DOSM: State/District Social Statistics, Malaysia, 2013

Note: More recent data on pupil-teacher ratio are not available.

Population Ageing

Consequent to the continuing fertility decline and gain in life expectancy, the Malaysian population is ageing rapidly. Malaysia will become an ageing nation in 2030 when 15 per cent of the population will be aged 60 and over. In 2010, two districts and 98 mukims had an ageing population (see Figure 2). Based on the population projection, the number of districts and mukims with an ageing population has probably increased to about 12 and more than 200, respectively, today.

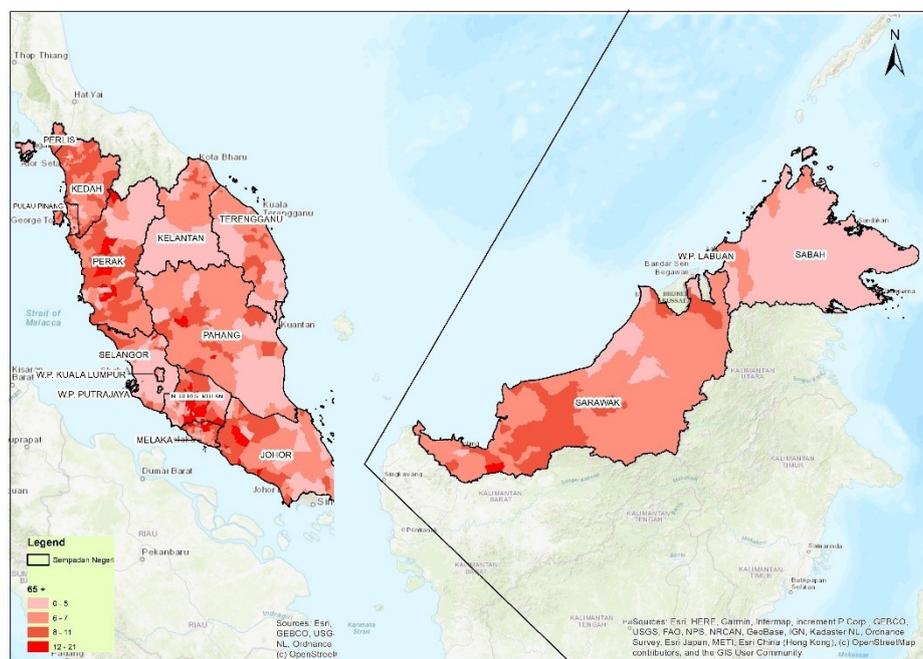


Figure 2: Map on population ageing (per cent aged 65 and above)
Source: DOSM: Population and Housing Census, 2010

In 2010, 19 mukims had more than 10,000 older people, ranging from 10,617 in Batu to 50,288 in Ulu Kinta. Petaling registered the most rapid rise in the number of older adults. In most of these mukims, the older population had increased more than six per cent per annum, resulting in the doubling of the older population between 2000 and 2010 (see Table 5).

Out-migration of the youths has exacerbated population ageing in the less developed areas. Geographic information on the distribution of older people and their profiles is crucial for providing goods and services and public amenities to those in need. It is also imperative to provide older people with opportunities to continue their active engagement in society.

Table 5: Mukim with at least 10,000 people aged 65 and above in 2010 and growth between 2000 and 2010

	2000	2010	Annual rate of growth	Percentage change
Plentong	6607	15,562	8.6	235.5
Pulai	4617	11,704	9.3	253.5
Tebrau	4272	10,725	9.2	251.1
Kluang	5636	10,733	6.4	190.4

Kuala Kuantan	6305	13,531	7.6	214.6
Ulu Kinta	28735	50,288	5.6	175.0
Georgetown	14607	19,083	2.7	130.6
Paya Terubong)	7822	14,833	6.4	189.6
Batu (Selangor)	5584	10,617	6.4	190.1
Klang	10388	19,963	6.5	192.2
Damansara	8172	18,078	7.9	221.2
Petaling (Selangor)	6434	17,871	10.2	277.8
Sungai Buloh	8080	19,086	8.6	236.2
Ampang	7605	12,814	5.2	168.5
Bandar KL	8978	10,728	1.8	119.5
Batu (Wilayah)	8587	17,133	6.9	199.5
Kuala Lumpur	10002	18,918	6.4	189.1
Petaling (Wilayah)	6690	13,483	7.0	201.5
Setapak	6118	11,081	5.9	181.1

Source: DOSM (2001, 2011): Population Distribution by Local Authority Areas and Mukims, Population Censuses, 2000, 2010

DISCUSSION AND CONCLUSION

This study used spatial data to demonstrate the unbalanced population distribution across regions, and portray the potential use of demographic data for planning purposes. The study has also highlighted demographic outcomes that warrant policy intervention. Additionally, it has raised some data reliability issues which require remedial actions to improve the registration and reporting systems. For instance, the under-reporting of births in a number of rural districts may have serious consequences such as resource misallocation and deprivation of services to those affected.

Population mobility and redistribution generally result in more efficient utilisation of human resources by moving surplus labour from one region to another region, in which there is a labour shortage. However, these processes also aggravate regional inequality. In its efforts to bring about a more balanced regional development, the Malaysian government has developed five development corridors and implemented other strategies. As the population continues to gravitate towards the central region, it appears that these development corridors have thus far been ineffective in population redistribution. Therefore, there is a need to find more effective ways to redistribute the population and improve the management of the cities. Detailed disaggregated socio-demographic data should be collected and analyzed for the formulation, implementation and evaluation of the state master plans, the National Physical Plans and the social impact assessment of mega projects.

While the fertility level in Malaysia has fallen below the replacement level, high fertility persists in certain localities, in which family planning practice is at a low level, and the unmet need for contraception is high. These localities

require more family planning efforts to provide couples with the necessary information and service to exercise their reproductive rights and plan their family size. A better understanding of the reasons for the higher mortality rate in some groups and localities can lead to measures to reduce the high death rate for these groups.

An in-depth analysis of the spatial distribution of the target groups is required for the allocation of resources to meet the needs of specific target groups, such as school-going children, the poor and the elderly. Multivariate analyses are needed to determine the covariates and confounding factors.

As stated at the outset, the purpose of this study is to present a case to the Department of Statistics Malaysia, as the central agency for official statistics to improve the collection, analysis and dissemination of spatial demographic data. The 2020 population census provides an excellent opportunity to fill the data gaps to develop SDG indicators to target the under-served and the needy to achieve the goal of "leaving no one behind."

LIMITATIONS

This study is exploratory, and it is meant to be illustrative of the relevance of spatial demographic data for planning in the public and private sectors. Some data are somewhat out-dated and are not sufficiently disaggregated for planning purposes. There are only a few readily available indicators. Data limitation precludes multi-layered analysis and analysis for smaller areas needed to improve the provision of targeted service and assistance.

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