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CAUSES OF DIFFERENCES IN AGING PERIOD BETWEEN PROVINCES IN INDONESIA: ANALYSIS USING PANEL DATA AND LOGISTIC REGRESSIONS

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ABSTRACT

Indonesia entered a period of aging population in 2022 with the percentage of the elderly population reaching 7% and an elderly dependency ratio reaching 10%. This aging condition is experienced differently between provinces. Some provinces have entered this period, while others haven't. This study aims to describe the process of population aging at the provincial level as well as examine the causes of differences in population aging periods between provinces in Indonesia. This study uses secondary data from the Central Bureau of Statistics covering 33 provinces in Indonesia in 2010, 2015, and 2020. Aggregate (macro) data were analyzed descriptively using the aging degree index to describe differences in the speed of the population aging process and by statistical inference using binary logistic method and panel data regression to identify causes of variations in population aging period between provinces. Logistic regression results show that provinces with characteristics of many residents migrating out, high population density, many people who already have proper sanitation, high per capita spending, and low unemployment rates, have the opportunity to enter a period of population aging more quickly than provinces without these criteria. Panel data regression results show that the aging population in Indonesia is more dominated by socioeconomic factors than demographic, health, and environmental factors. The results confirm that a holistic development approach must be pursued by the government. More attention should be given to demographic, health, and environmental aspects. Thus, population aging occurs in a quality manner accompanied by the welfare of the elderly population.

Kata kunci:
penuaan penduduk,
regresi logistik,
data panel,
aging
degree index

ABSTRAK

Indonesia tercatat memasuki periode penuaan penduduk di tahun 2022 dengan persentase penduduk lansia mencapai 7% ke atas dan dependency ratio tua mencapai 10%. Kondisi penuaan ini dialami berbeda antar provinsi. Sebagian provinsi sudah memasuki periode ini, sementara sebagian yang lain belum. Penelitian ini bertujuan mendeskripsikan proses penuaan penduduk pada level provinsi sekaligus menelaah penyebab perbedaan periode penuaan penduduk antar provinsi di Indonesia. Penelitian ini menggunakan data sekunder dari Badan Pusat Statistik yang mencakup 33 provinsi di Indonesia pada tahun 2010, 2015, dan 2020. Data agregat (makro) yang ada dianalisis secara deskriptif dengan menggunakan the aging degree index untuk mendeskripsikan perbedaan kecepatan proses penuaan penduduk dan secara inferensia statistik dengan menggunakan metode binary logistic regression dan panel data regression untuk mengidentifikasi penyebab variasi periode penuaan penduduk antar provinsi. Hasil regresi logistik menunjukkan bahwa provinsi dengan karakteristik banyak penduduk yang bermigrasi keluar, kepadatan penduduk yang tinggi, banyak masyarakat yang sudah memiliki sanitasi yang layak, pengeluaran per kapita yang tinggi dan tingkat pengangguran rendah, memiliki peluang untuk lebih cepat memasuki periode aging population dibanding dengan provinsi tanpa kriteria tersebut. Hasil regresi data panel menunjukkan penuaan penduduk di Indonesia lebih didominasi faktor sosial ekonomi dibanding faktor demografi, kesehatan maupun lingkungan. Hasil penelitian mengkonfirmasi bahwa pendekatan pembangunan yang holistik harus terus diupayakan oleh pemerintah. Perhatian lebih harus diberikan pada aspek demografis, kesehatan, dan lingkungan. Berdasarkan hal tersebut, penuaan penduduk terjadi secara berkualitas bersamaan dengan kesejahteraan penduduk lansia.

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INTRODUCTION

Changes in the age structure of the population that have developed recently have made Indonesia enter a period of population aging. The condition of changes in the age structure in developed countries is almost complete or super-aging, but many occur in developing countries with a faster process (1). The growth of the elderly population between developed and developing countries is experiencing a different trend, where it tends to decrease in developed countries, while in developing countries it has increased so that the world becomes imbalance with an estimated 70% of the elderly population gathered in developing countries (2).

Demographically, population aging can be seen from several dimensions (3). First, the old dependency ratio has reached at least 10%, or the young dependency ratio is less than or equal to 30%. The second measure is that the number of residents aged 60 years and over has reached more than 7%. Third, seen from the size of the median age of the population.

One of the causes of population aging is socioeconomic changes which are also interrelated with health (4). Development programs that have been carried out have had a real impact on increasing life expectancy, reducing the death rate which, in turn, has changed the demographic structure in Indonesia. The first demographic transition theory introduced changes in the population structure from youth to aging caused by falling birth and death rates. Sometime later, the second theory of population transition perfected the first theory by explaining that population migration also affects changes in population structure(5). This second theory of demographic transition discloses that the birth rate, death rate, and population migration are direct causes and determinants of population aging (6).

The problem of population aging has been investigated by various branches of science, including sociology, demography, economics, and psychology (6,7). This discipline focuses on the implications of aging population problems for economic conditions and social conditions, security and social assistance for the elderly population, the behavior of the elderly population, and their psychological needs (6,7).

Research on population aging in Indonesia has also been widely studied, such as research on the impact of population aging on public finances in Indonesia (8). A deeper study of the condition of the elderly found that their condition during the demographic bonus period in Indonesia was mostly conditions of low socioeconomic level and conditions of health problems (9). The main reason for those in the elderly category in Indonesia to work is the economic condition of the family (10). Other studies have found that the elderly in Indonesia is dominated by women with low levels of education, no longer working, divorced marital conditions, and low health status (11).

Research on population aging at the regional level for the Indonesian context has also been carried out extensively. The aging population in Banyumas Regency is dominated by elderly women and the aging process of the population is faster than at the provincial and national levels (12). Meanwhile, the percentage of elderly people in North Sulawesi Province will reach 17% in 2035, or the fifth largest in Indonesia (13). Another study examines population aging in East Java Province, especially the City of Surabaya, and the readiness of the local government to prepare its territory as an elderly-friendly city (14).

Population projection data released by the Central Statistics Agency (BPS) show that Indonesia will begin to enter a period of population aging in 2022. If viewed by province, every province in Indonesia will enter an aging period at different periods. Several provinces have entered the population aging stage since 2010, while several provinces in 2020 have not reached 7% of the elderly population.

Although research on population aging has been quite extensive in the case of Indonesia; to our knowledge, research focusing on the causes of differences in aging periods between provinces in Indonesia is still very limited. Recent research on the determinants of the causes of gaps in the aging period between regions, among others, was conducted in the Yangtze River Delta in China (6,7).

The Aging Degree Index

Research on the aging population gap in China uses the Aging Degree Index which divides the aging structure into five levels, namely: Growth (G) if the percentage of the elderly population is below 4%, Early-aged (L1) if the percentage is between 4% and 7%, Mid -aged (L2) if the percentage is above 7% but below 10%; Late-aged (L3) is between 10% to 14%, and Super-aged (S) if the percentage of elderly is above 14%. This study found that the Aging Degree Index in the Yangtze River Delta region generally increased from the L2 to L3 category in 10 years (7). They also found that the aging population in China is increasingly diverse and complex. Meanwhile, other researchers investigated the spatial disparities and factors driving population aging in China using a spatial econometric model (6). These two studies in China found that there is a regional relationship to the aging population of districts in China and these differences are influenced by demographic, socioeconomic, health, and natural environmental factors (6,7).

The Aging Degree Index in this study is used to describe the speed of the aging process of the population at the provincial level and differences in the speed of population aging between provinces during the period 2010 to 2020.. This research is expected to enrich the study literature on the causes and determinants of variations in population aging between provinces in Indonesia.

METHODS

This study uses secondary data from various sources. The research units are 33 provinces in Indonesia which were observed over five years from 2010 to 2020. The available aggregate (macro) data were then analyzed using panel data regression and binary logistic methods. This study uses a macro-econometric approach that is applied to secondary data compiled from various sources.

Panel Data Regression Model

Panel data regression focuses on the analysis of the determinants that cause differences in the aging period of the population between provinces in Indonesia from 2010 to 2020. The dependent variable is the percentage of elderly, namely those aged 60 years and over in a province. The independent variables represent demographic, health, environmental, and socioeconomic variables. The health aspect is represented by Life Expectancy or *Umur Harapan Hidup* (UHH), Net Migrant Rate whose data come from Population Projections (15,16). The health aspect is represented by the coverage of national health participation, namely the National Health Insurance or *Jaminan Kesehatan Nasional* (JKN) whose data come from the Social Security Administration Agency or *Badan Penyelenggara Jaminan Sosial* (BPJS) for Health (17–19). Environmental aspects are represented by the Water Quality Index or *Index Kualitas Air* (IKA) and Land Cover Quality Index or *Indeks Kualitas Tutupan Lahan* (IKTL) whose data come from the Statistical Information System of the Ministry of Environment and Forestry or *Sistem Informasi Statistik Kementerian Lingkungan Hidup dan Kehutanan* (SISKLHK). The available IKA and IKTL data per province are data for 2015 and 2020, while for 2010 data the proportional average data from 2015 and 2020 are used. The socioeconomic aspect is represented by Gross Regional Domestic Product per capita or *Produk Domestik Regional Bruto per kapita* (PDRB_CAP), the average length of schooling or *Rata-rata Lama Sekokah* (RLS), and the number (%) of the population in urban areas (URBAN) are sourced from The Central Bureau of Statistics. An explanation of the independent and dependent variables can be seen in Table 1.

Panel data regression is a test for cross-sectional data measured at different times so that the observations become more numerous (20). There are 33 provinces in Indonesia as cross-section units and 2010, 2015, and 2020 are the time series units.

Three models offered in panel data regression are Common Effect Model (COM), Fixed Effect Model (FEM), and Random Effect Model (REM). The regression equation is as follows:

Common Effect Model (CEM) Equations

$$Y_{it} = \beta_0 + \sum_{j=1}^{k} \beta_1 X_{jit} + \varepsilon_{it}$$

Fixed Effect Model (FEM) Equation:

$$Y_{it} = \beta_0 + \sum_{j=1}^{k} \beta_1 X_{jit} + \mu_i + \varepsilon_{it}$$

Equated Random Effect Model (REM)

$$Y_{it} = \beta_{0i} + \sum_{j=1}^{k} \beta_1 X_{jit} + \varepsilon_{it}$$

Determination of the best model suitable for a study in panel data regression is by carrying out three tests, namely the Chow test, the Lagrange Multiplier (LM) test, and the Hausman test. F test, t-test, and Coefficient of Determination test (R2) are used to determine the significance of the panel data regression.

The advantage of panel data regression is that it is more informative and there is less collinearity between variables so the tests that need to be carried out are autocorrelation and heteroscedasticity (21). The panel regression model is as follows:

$$\begin{aligned} ELDERLY_{it} = \; & \beta_0 + \beta_1 UHH_{it} + \\ & + \beta_2 Net_{Migrasi_{it}} + \\ & \beta_3 Health\ Insurance_{it} + \\ & \beta_4 IKA_{it} + \beta_5 IKTL_{it} + \\ & \beta_6 PDRB\_CAP_{it} + \beta_7 RLS_{it} + \\ & + \beta_8 URBAN_{it} + + e_{it} \end{aligned}$$

Logistic Regression Models

The logistic regression model is used to enrich the analysis regarding the causes of differences in population aging periods between provinces. Variables that affect the probability of a province experiencing population aging in 2020 are identified. The dependent variable is a dummy variable of the population aging status of a province in 2020, which has a value of 1 if a province is in the population aging phase and 0 otherwise. The independent variables are variables that are expected to explain the aging status of the population in 2020, as presented in Table 2.

Binary logistic regression is a regression analysis with the dependent variable being binary (categorical). This response variable is assumed to have a Bernoulli distribution for each observation (22).

The value of E (Y|x) in linear regression

$E(Y|x) = \beta_0 + \beta 1x$

While in logistic regression it is in the range of 0 and 1 so the logistic regression model is:

$$(x_i) = \frac{e^{\beta_0 + \beta_1 x_{1i} + \cdots + \beta_p x_{pi}}}{1 + e^{\beta_0 + \beta_1 x_{1i} + \cdots + \beta_p x_{pi}}} \; i = 1, \ldots, n$$
$$X = (X_1, \ldots, X_p)$$

Rewriting this regression is:

$$\pi(x) = \frac{1}{1 + e^{-\beta_0 - \beta_1 x}}$$

Regression of opportunity models uses the odds ratio or probability in interpreting the results. This transformation into odd form is written in terms of $\pi(x)$ and is defined as:

$$g(x) = \ln[\frac{\pi(x)}{1 - \pi(x)}] = \beta_0 + \beta_1 x$$

Table 1. Panel Data Variable Description

No	Independent Variable		Dependent Variable
1	UHH	Life expectancy at birth (years)	Percentage of the elderly population (percentage)
2	Net migration rate	The difference between the number of migrants entering and leaving an area per 1000 population in one year (percentage)	
3	Health Insurance	National health participation coverage (percentage)	
4	IKA	The water Quality Index is measured based on seven parameters (percentage)	
5	IKTL	Land Cover Quality Index (percentage)	
6	GRDP_Cap	Gross Regional Domestic Product per capita (Thousand Rupiah)	
7	RLS	Average Length of Study (years)	
8	URBAN	Percentage of population in urban areas (percentage)	

Table 2. Description of Logistic Regression Variables

No		Independent variable	dependent variable
1	UHH	Life expectancy at birth (years)	*Dummy* variable where a value of 0 indicates a province that has not yet entered the aging period and 1 is a province that has entered an aging period
2	Net migration rate	The difference between the number of migrants entering and leaving an area per 1000 population in one year (percentage)	
3	Proper sanitation	Households with proper sanitation category (percentage)	
4	IKA	The water Quality Index is measured based on seven parameters (percentage)	
5	IKU	Air Quality Index (percentage)	
6	Captor_Cap	Average expenditure per capita household (Thousand Rupiah/Person/Year)	
7	TPT	Number of unemployed to total labor force (percentage)	

RESULT

Aging Degree Index Calculation Results

Based on the aging degree index, in 2010, there were eight provinces whose percentage of the elderly population was above 7% to below 10% or were already in the mid-aged category (West Sumatra, Lampung, West Java, Bali, NTB, NTT, North Sulawesi and South Sulawesi). Three provinces, namely the Special Region of Yogyakarta, East Java, and Central Java, have even entered the late-aged category with an elderly population percentage of between 10% and 14%.

While for most of the other provinces, as many as 19 provinces are still in an early-aged condition, with an elderly percentage of between 4% and 7%. The provinces of Papua, West Papua, and the Riau Archipelago are still at a growth level with the percentage of the elderly population below 4%.

Ten years later, the percentage of the elderly population rose to 9.92% and almost entered the late-aged period. Provinces in Indonesia, which were dominant in the early-aged category in 2010, will then transform into mid-aged in 2020. Eighteen provinces have entered the mid-aged level, namely the Provinces of Aceh, North Sumatra, Jambi, South Sumatra, Bengkulu, Lampung, Bangka Belitung Islands, Jakarta, West Java, NTB, NTT, West Kalimantan, South Kalimantan, Central Sulawesi, South Sulawesi, Southeast Sulawesi, Gorontalo, and Maluku.

The other two provinces, namely the Riau Archipelago Provinces and West Papua, have transformed from growth to early-aged. Meanwhile, three other provinces transformed from mid-aged to late-aged, namely West Sumatra, Bali, and North Sulawesi.

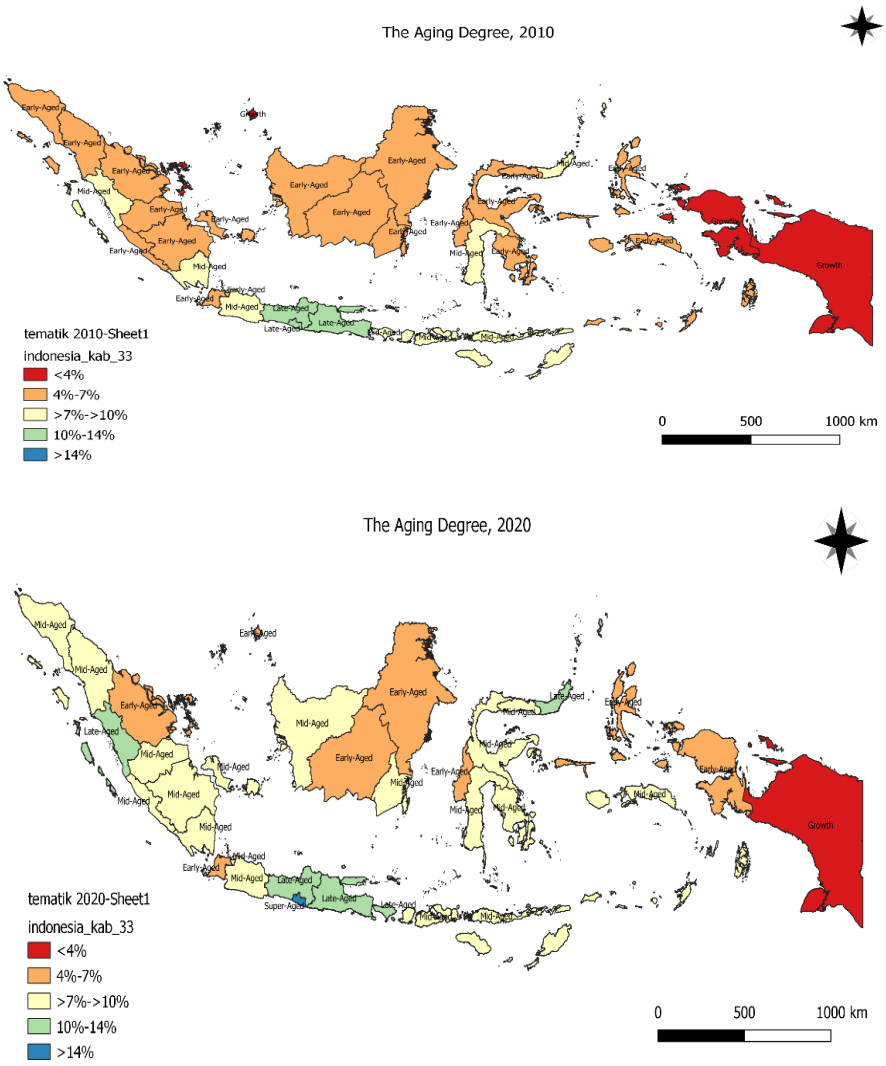
The Province of the Special Region of Yogyakarta with the percentage of elderly reaching 14.71% entered the super-aged category in 2020. Meanwhile, Papua Province is still at the growth level.

Panel Data Regression Estimation Results

Table 3 shows the results of the correlation test confirming that there is no correlation value of 0.8 and above between the independent variables, so that it can be concluded that the regression is free from multicollinearity problems. The results of the Chow test, Lagrange Multiplier (LM) test, and Hausman test indicate that the Fixed Effect Model (FEM) method is the most suitable regression model for this study.

The regression model is estimated with a robust standard error to handle the problem of heteroscedasticity of the data. Table 3 displays the results of the regression using the FEM and REM methods.

The F-statistics of the Fixed Effect Model regression display a Prob>chi2 value of 0.0000, which indicates the independent variables in the model simultaneously significantly affect the dependent variable. The goodness of fit test with an R2 value of 0.91548733, indicates that the independent variable can explain the dependent variable by 91.5%, the rest is explained by other variables not involved in the model. The estimation results show that all independent variables, except life expectancy, net migration, and land cover quality index, are significant at the 5% significance level.



Growth (G): The percentage of the elderly population is below 4%,
Early-aged (L1): The percentage of elderly is between 4% and 7%,
Mid-aged (L2): The percentage of elderly is above 7% but below 10%,
Late-aged (L3): The percentage of elderly is between 10% and 14%.
Super-aged (S): Percentage of elderly above 14%.

Figure 3. The Aging Degree Index for 2010 and 2020

Table 3. Regression Results with FEM and REM

Classification	Variables	FEM (robust)	REM (robust)
Demographics	**UHH**	.02650084	.44712897**
	net_migras~e	-.02708615	-.07457798**
Health	**Health Insurance**	.00773666***	.01334207***
Environment	**IKA**	-.01189805**	-.00512499
	IKTL	-.03017353	-.01404261
Socioeconomic	**PDRB_CAP**	. .00001324***	1.602e-06
	RLS	1.0040648***	.77487496***
	URBAN	.08853233**	-.00213012
	_cons	-5.4429745	-29.690998**
	N	99	99
	r2	.91548733	
	r2_a	.9079751	

Description: *p<0.1; **p<0.05; ***p<0.01

Logistic Regression Results

The results of the calculation of the correlation coefficient show that there is no correlation value greater than 0.8 so it can be concluded that the regression is free from multicollinearity problems. Regression has implemented a robust standard error which guarantees that the regression results have been cleared of heteroscedasticity problems. The Wald chi2 test value from the logistic regression results was 16.39, with a Prob>chi2 value of 0.03710 confirming that the independent variables in the model can simultaneously explain the speed of population aging between provinces in Indonesia.

Sall partial test results for each independent variable, the Prob>chi2 value of the net migration rate, population density, proper sanitation, air quality index, average expenditure per capita, and the unemployment rate are less than 0.05 so it can be concluded that each variable independently significantly affects the speed of population aging in the province. The Pseudo R2 value was recorded at 0.6752, meaning that the independent variable can explain the population aging rate of 67.5%. Therefore, more in-depth research is needed to find out other factors that have not been included in this study.

The results of the logistic regression show that the coefficients with a negative sign are the net migration rate and open unemployment rates. Meanwhile, variables with a positive sign are life expectancy at birth, population density, proper sanitation, water, and air quality index, and average per capita household expenditure.

Table 4 presents the results of logistic regression processing and the transformation of the regression coefficient to *odds ratio*. The estimation results show that the probability of a province entering an aging period is significantly influenced by demographic factors, namely net migration rate and population density. Health and environmental factors (the number of households in the province that have adequate sanitation and the air quality index) also significantly influence the chances of a province entering a period of rapid population aging. In addition, socioeconomic factors, namely the average household expenditure and the open unemployment rate also have a significant effect.

Table 4. Variable Data and Statistics

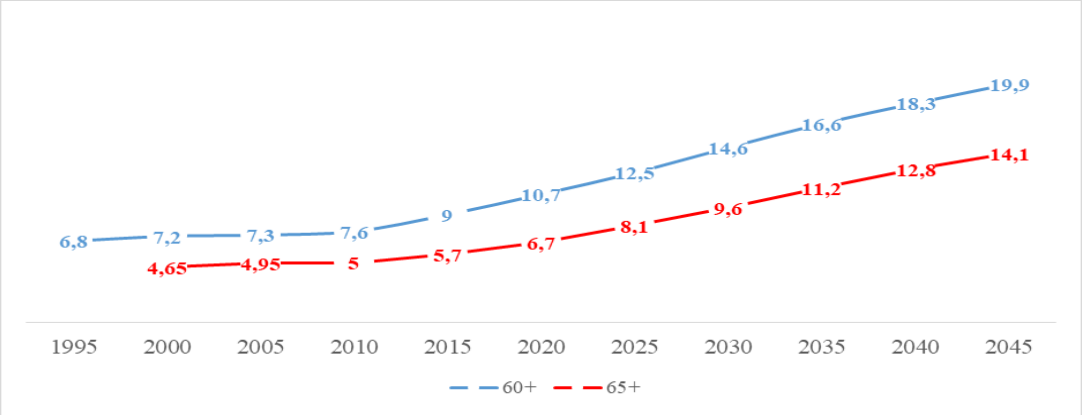
Classification	Variables	Coef. (Robust SE)	Odds Ratio
Demographics	**UHH**	.6273215	1.872588
	net_migrasrate	-5.113955***	.0060123
	congested	.0314153**	1.031914
Health	**san_deserved**	.1355665**	1.145185
Environment	**IKA**	.0350125	1.035633
	IKU	1.418147**	4.129463
SocialEconomy	**taster**	.0015745***	1.001576
	TPK	-3.241825**	.0390925
	_cons	-109.4518	4.80e-80

Description: *p<0.1; **p<0.05; ***p<0.01

DISCUSSION

July 11 is designated as World Population Day. The commemoration of this moment in 2022 is special because it coincides with the world's population being recorded at 8 billion people. The large population of the Earth and changes in the global population have made demographic resilience an issue of global concern, including in Indonesia.

Based on the concept of population aging, since 2022 the structure of Indonesia's population has shown its occurrence of population aging, with the percentage aged 65 years and over as much as 7.3%. If using the size of the elderly aged 60 years and over, since 2000 Indonesia has entered the stage of population aging. This figure continues to increase significantly and will reach 19.9% in 2045.



Source: Population Projection 2015-2045, Population Projection 2010-2035, Population Projection 2000-2010

Figure 1. Percentage of Elderly Population in Indonesia, 1995-2045

The results of calculating the aging degree index for 2010 and 2020 show that the population aging process does not occur uniformly across provinces in Indonesia. The speed of population aging varies between provinces. This is of course influenced by differences in characteristics between provinces related to demographic, health, environmental, and other socioeconomic conditions. In general, the process of aging of the population occurs more quickly in areas that have been the center of the national economy, such as the provinces on the island of Java and Sumatra.

The regression results show that the aging population in Indonesia is more dominantly influenced by social and economic factors than health, environmental and demographic factors. Since the 1980s, the Indonesian government has invested heavily in education and spurred infrastructure development. The impact was seen a few periods later when Indonesia managed to record high economic growth. This development policy significantly also influences demographic variables. Infrastructure development makes it easier for people to access health facilities. Economic growth is important in raising people's living standards (23).

In addition to increasing economic growth, since the 1980s the Indonesian government has also massively promoted family planning programs. Based on studies on demographic transition, in the early stages, the death rate generally decreases earlier than the birth rate (24). The decline in the fertility rate in Indonesia is faster than the reduction in the mortality rate, where from 1990 to 2020, the fertility rate in Indonesia has decreased by around 40%, while life expectancy at birth has only increased by around 17% (25). The results of previous studies have identified that the declines in fertility and mortality between provinces do not occur simultaneously (24, 25).

The findings of this study confirm previous studies which found that socioeconomic variables, as well as the success of family planning programs in each province, affected the speed of the demographic transition in each region which ultimately led to differences in the percentage of the elderly population in each province (26). Likewise, other studies concluded that the development programs that have been carried out, including the family planning program which the government is intensively promoting, have had a real impact on increasing the life expectancy of the population so that the percentage of the elderly population in a province becomes large (9).

The average length of schooling, GRDP per capita, the coverage of participation in national insurance, and the number of areas that are already in the urban category are the factors that most influence the aging population in Indonesia. GRDP per capita is often used as an indicator of the level of welfare of the population. Provinces with higher levels of population welfare will of course find it easier to meet a more decent standard of living which, in turn, can increase the life expectancy of their people.

Government investment to increase the education level of its population is evident from the increase in the average length of schooling completed by the Indonesian people. People who are increasingly aware and open about knowledge will have broad insights and

choices about medicine and health for their lives. Likewise with urbanization, where this process becomes a driver of social, economic, and environmental changes that provide opportunities and alternatives for the community. This is in line with modern demographic transition theory which emphasizes the important role of the modernization process, whereby improving the level of public education, and urbanization as part of the modernization process, effectively drives down birth and death rates (6).

The dominance of socioeconomic factors on population aging is also in line with research in China, where economic development plays a two-way role in population aging. Economic acceleration on the one hand improves people's quality of life, together with health increases life expectancy. On the other hand, economic development will attract inward migration and dilute the aging rate of the population locally (7).

JKN participation coverage variable (which is a health factor) is confirmed to have a strong effect at a significance level of 1% on population aging. This is in line with the tendency that the demographic transition occurs due to social and economic changes that are reciprocally related to health (4). Improving the health dimension or health facilities accessible to the community can drive a reduction in the death rate and increase life expectancy.

Environmental factors, which in this study are represented by the variable water quality index and land cover index in a province, are not determinants of population aging in Indonesia, but when viewed from the direction of their influence, these findings support that the better the water quality and the more areas covered with green land (green cover) the better public health to reduce mortality rates and increase people's life expectancy. In Indonesia, which is still relatively new to entering population aging, environmental factors have not yet become dominant. This is in line with research finding that for people over 65 years, longevity is more influenced by economic factors than environmental; whereas for people aged 100 years and over, it is more influenced by environmental rather than economic factors (27).

Life expectancy has a positive relationship with the percentage of elderly, while net migration has a negative relationship. Although these two variables are not significant in the FEM regression, in the REM regression, both affect population aging. High life expectancy can be used as an indicator of the success of socioeconomic development in a region (28). The results of the estimation of the regression coefficient for UHH confirm the theory of the demographic transition, namely population aging is an implication of the longer life span of the community due to improved health facilities, sanitation, nutrition, level of education, and the community's economy. The relationship between net migration and the percentage of the elderly population which has a negative sign is in line with the condition that provinces that have entered the population aging phase earlier tend to have a lot of population migrating out and conversely provinces that have recently entered the population aging phase tend to have a lot of in-migration to their provinces.

For a clearer description of the characteristics of which provinces are more rapidly entering the aging period, the results of the logistic regression show that, in general, provinces that are more likely to enter a period of population aging are provinces that are characterized by high levels of outward migration, high population density, high percentage of population who already have sanitation, the average per capita household expenditure is high and the open unemployment rate is low. The results of the odds ratio estimation show that the higher the life expectancy at birth, the proportion of the population enjoying proper sanitation, the population density, water, and air quality, and per capita expenditure, the greater the chance for a province to enter a period of population aging.

CONCLUSIONS AND SUGGESTIONS

Conclusion

The elderly population in Indonesia has increased by 30.70% to 9.92% over 10 years (2010 to 2020) and is almost entering the late-aged period. Provinces in Indonesia, which in 2010 had the early-aged elderly category, will transform into mid-aged in 2020. Provinces with the characteristics of high rates of outward migration, high

population density, a high proportion of people who have proper sanitation, high per capita income, and low unemployment rate have the opportunity to enter a period of population aging more quickly than provinces without these criteria.

The aging population in Indonesia is more dominated by socioeconomic factors than demographic, health, and environmental factors. Even the last confirmed factor has no significant effect on the aging population in Indonesia. Economic development, high levels of education, the process of urbanization, and improvement of the health system for the community are the driving force behind reducing mortality and increasing life expectancy for the community and are determinants of population aging in Indonesia.

Suggestion

Differences in population aging periods between provinces are a reality and cannot be avoided. The active role of the central government is needed to minimize this difference by reducing socioeconomic disparities between provinces in Indonesia, paying special attention to areas that are still lagging in efforts to improve the quality of human resources.

Accelerating development and opening job opportunities in underdeveloped areas is important so that residents do not migrate to find work in other areas. In addition, the active role of local governments is also needed by paying attention and taking into account the condition of the population structure in making development policies in their area.

The development carried out must focus on sustainable development programs, namely development that takes into account the balance between population, resources, environment, and infrastructure development. Development is not only thinking about current conditions but also considering future generations.

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