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The Future of Morbidity and Increasing Productivity in Indonesia

Kurniawan ^{1*}, Made Kembar Sri Budhi ², I Nyoman Mahaendra Yasa ², Ni Made Tisnawati ²

¹ Doctoral Program in Economics, Udayana University, Indonesia,

² Department of Economics, Udayana University, Indonesia,

* Corresponding author: kurniawan.2390611005@student.unud.ac.id

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Abstract: Good health and well-being constitute the third goal of the Sustainable Development Goals. One of the key indicators for assessing health-sector development is the morbidity rate. Morbidity reduces productivity and income per worker, thereby affecting broader economic performance. In Indonesia, development disparities remain evident between provinces in Java and those outside Java. This study aims to analyse the effects of economic, social, environmental, lifestyle, and health-service factors on morbidity in Java and outside Java. The study employs panel data regression using secondary data from Statistics Indonesia for the period 2017–2024, covering six provinces in Java and 28 provinces outside Java. The results show that social factors, particularly education, have a negative and significant effect on morbidity in Java. Outside Java, environmental factors, represented by access to decent housing, have a negative and significant effect on morbidity, while lifestyle factors, represented by smoking, and health-service factors, represented by unmet need for health services, have positive and significant effects. These findings highlight the importance of improving individual awareness of the role of smoking in increasing morbidity, which may ultimately reduce productivity and per capita income. The study also emphasizes the need for targeted interventions to reduce health-service gaps between Java and regions outside Java, particularly by lowering unmet needs for health services and reducing morbidity outside Java. Overall, the findings confirm that the determinants of morbidity differ significantly between Java and outside Java. Spatially targeted interventions that consider multidimensional factors may help reduce morbidity, improve labor productivity, and support economic growth in Indonesia.

Keywords: Economic factors; Environmental factors; Health services; Lifestyle; Morbidity; Social factors.



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印度尼西亚发病率的未来趋势及其生产率提升路径

摘要：

良好健康与福祉是可持续发展目标的第三项目标。评估卫生部门发展的关键指标之一是发病率。发病率会降低劳动生产率和劳动者收入，从而影响更广泛的经济绩效。在印度尼西亚，爪哇地区各省与爪哇以外地区各省之间的发展差距仍然明显。本研究旨在分析经济、社会、环境、生活方式和卫生服务因素对爪哇地区及爪哇以外地区发病率的影响。本研究采用面板数据回归方法，使用印度尼西亚中央统计局2017–2024年的二手数据，研究对象包括爪哇地区6个省和爪哇以外地区28个省。研究结果表明，社会因素，尤其是教育，对爪哇地区的发病率具有显著的负向影响。在爪哇以外地区，以获得适宜住房为代表的环境因素对发病率具有显著的负向影响，而以吸烟为代表的生活方式因素以及以未满足的卫生服务需求为代表的卫生服务因素则具有显著的正向影响。这些发现强调了提高个人对吸烟在增加发病率中作用的认知的重要性，因为发病率上升最终可能降低劳动生产率和人均收入。本研究还强调，有必要采取有针对性的干预措施，以缩小爪哇地区与爪哇以外地区之间的卫生服务差距，特别是通过降低未满足的卫生服务需求并减少爪哇以外地区的发病率来实现。总体而言，研究结果证实，影响爪哇地区和爪哇以外地区发病率的决定因素存在显著差异。基于空间条件并综合考虑多维因素的针对性干预措施，有助于降低发病率、提高劳动生产率，并促进印度尼西亚的经济增长。

关键词：

经济因素；环境因素；卫生服务；生活方式；发病率；社会因素。

1. Introduction

The third sustainable development goal (SDGs) is to ensure healthy lives and improve the well-being of all people of all ages [1]. The basic indicator to assess the success of development in the health sector is morbidity [2]. Morbidity or the number of people with health complaints in Indonesia in 2024, is 27.34 percent. This means that 3 out of 10 Indonesians have morbidity problems. A total of 13 provinces with morbidity above the national average [3]. This means that there is a health gap between provinces in Indonesia.

The population has morbidity resulting in the disruption of daily activities in Indonesia by 12.12 percent in 2024 [4]. This means that as many as 12.12 percent of the Indonesian population has reduced productivity due to morbidity. Indonesia's labor productivity in 2025 will be \$15.7 per working hour. Meanwhile, Singapore's labor productivity is \$96.9 per hour, Brunei Darussalam \$71.3 per hour, Malaysia \$30.4 per hour, and Thailand \$18.5 per hour [5]. This means that productivity in Indonesia is lower than in some countries in Southeast Asia.

Endogenous growth theory explains investment in human resources in the form of education to encourage economic growth. Economic growth improves health. Harrod Domar growth theory also explains that savings

and investments drive economic growth. Savings increase investment in education and health which ultimately drives economic growth [2]. Empirical evidence explains that labor productivity affects economic growth [6]. Health status is a differentiator in per capita income [7, 8]. Human resource development increases productivity and economic growth [9]. By 2025, Indonesia's economy of 56.93 percent is spatially located in provinces in Java. Meanwhile, 43.07 percent in provinces outside Java [10]. This means that there is a gap between provinces in Java and outside Java.

Social determinants of health status in the form of socioeconomic status, education level, poverty, living environment, social isolation, occupation, environment, food security, and difficulties in childhood affect cardiovascular morbidity and mortality [11]. The Rainbow model explains that the determinants of health are economic, social, cultural, and environmental factors [12]. The social determinants of health equity are the economic system, social infrastructure, structural discrimination, conflict, forced migration and displacement, climate opportunity and digitalisation [13]. There are various factors as determinants of health. This study offers empirical evidence that explains the determinants of morbidity in Java and outside Java.

This research also provides empirical evidence that is in accordance with the Endogenous Growth Theory and Harrod Domar Growth Theory which, explains the importance of health to promote economic growth.

2. Methods and Materials

The analysis technique chosen in this study is comparative descriptive. This technique was chosen to explain the differences in the determinants of morbidity in Java and outside Java. This study identifies indicators of sustainable development goals that are relevant to morbidity. Next, classify variables based on previous theory and empirical evidence.

1. Economic factors are GDP growth per capita, unemployment, formal labor, and minimum wage.
2. Social factors are education and insufficient food consumption.
3. Environmental factors are access to proper drinking water, access to proper sanitation, and access to decent housing.
4. Lifestyle factors include smoking, preventive health costs, family planning programs, and self-treatment.
5. Health service factors are in the form of *unmet need* for health services, mothers giving birth in health facilities, and health insurance.

This study utilises secondary data from the Indonesian Central Statistics Agency for 2017-2024. This research covers 6 provinces on the island of Java and 28 provinces outside the island of Java. A total of 4 newly formed provinces have been covered in their parent province. The data analysis technique chosen is panel data regression. Data analysis was carried out using the Soft Statistical Soft for Data Science (STATA) version 18.

According to [14], the best model for estimating panel data is the *fixed effect*. Here is the basic equation of panel data regression.

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \dots + u_i \tag{1}$$

Y (dependent variable), β (slope), u (unobservable variable), X (independent variable), i (scope), and t (time period).

$$Y1_{it} = \beta_0 + \beta_1 X1_{it} + \beta_2 X2_{it} + \beta_3 X3_{it} + \beta_4 X4_{it} + \beta_5 X5_{it} + \beta_6 X6_{it} + \beta_7 X7_{it} + \beta_8 X8_{it} + \beta_9 X9_{it} + \beta_{10} X10_{it} + \beta_{11} X11_{it} + \beta_{12} X12_{it} + \beta_{13} X13_{it} + \beta_{14} X14_{it} + \beta_{15} X15_{it} + \beta_{16} X16_{it} + u_i \tag{2}$$

Equation 2 is a model to explain the determinants of morbidity in Java and outside Java. According to [14], to obtain unbiased estimation results, a classical assumption test was carried out. First, the heteroscedasticity test is used to find out whether the variant of the error term is not constant. Second, a

multicollinearity test to find out the linear correlation between variables.

3. Results

3.1 Diagnostic Tests

First, the results of the heteroscedasticity test with Breusch-Pagan in Java produced a probability of 0.8387, lower than 0.05. This means that there is no heteroscedasticity problem in the estimation model in Java. Subsequently, the results of the heteroscedasticity test with Breusch-Pagan outside Java produced a probability of 0.0605, lower than 0.05. This means that there is no heteroscedasticity problem in the estimation model outside Java.

Second, the results of the multicollinearity test explained that there was no correlation between variables that exceeded 0.08 in the estimation model in Java. This means that there is no problem of multicollinearity in the estimation model in Java. Furthermore, the results of the multicollinearity test explained that there was no correlation between variables that exceeded 0.08 outside Java. This means that there is no problem of multicollinearity in the estimation model outside Java.

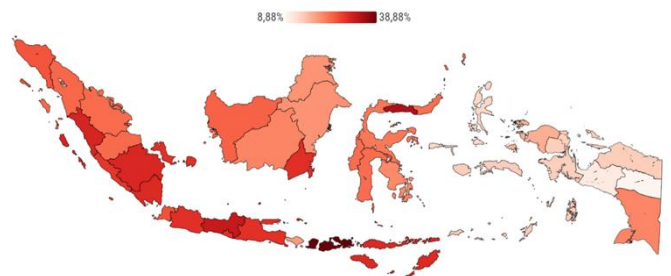


Figure 1. Percent of Morbidity Overview in Indonesia in 2024

The data in Figure 1 explain that provinces in Java have higher morbidity than provinces outside Java. This means that provinces in Java have lower productivity.

3.2 Descriptive Statistic

The summary of the data used in this study is as follows.

Table 1. Summary Data in Java

Variable	Mean	Std.Dev	Min	Max
Y1	30.41083	4.254882	16.78	38.07
X1	4.176667	2.689588	-3.39	6.59
X2	5.790833	1.975542	2.84	9.01
X3	48.30125	9.764141	36.14	71.55
X4	2.277583	.9877069	1.337	5.067
X5	9.299167	1.081671	7.77	11.49
X6	6.545833	3.76576	1.43	13.82
X7	90.64229	8.972695	66.11	99.96

X8	83.09396	9.565889	64.02	97.12	Sanitation Access (X8)	.2684251	0.456
X9	70.91208	20.44921	33.18	99.49	Housing Access (X9)	-.0654627	0.308
X10	28.46521	3.661803	21.25	35.78	Lifestyle Factors		
X11	7.641521	5.16089	2.813	33.34	Smoking (X10)	.5588553	0.165
X12	57.08354	4.508602	47.85	63.64	Preventive Cost (X11)	-.1831726	0.303
X13	75.94833	7.667004	58.02	88.77	Family Plan (X12)	.5211973	0.248
X14	4.940625	1.342911	1.56	8.28	Self Medication (X13)	.1774424	0.333
X15	93.57833	6.643317	75.46	100	Health Services Factor		
X16	72.51854	10.98477	53.36	95.34	Unmet Need Health Service (X14)	.6365687	0.192
					Health Facilities (X15)	-.3577929	0.392
					Health Insurance (X16)	-.0862544	0.741

The lowest morbidity in Java is 16.78 percent and the highest is 23.07 percent. There are differences in morbidity between provinces in Java.

Table 2. Summary Data outside Java

Variable	Mean	Std.Dev	Min	Max
Y1	26.28656	6.075844	11.68	44.39
X1	4.462857	4.035968	-15.74	22.94
X2	4.546339	1.457866	.88	10.12
X3	39.65339	9.898585	15.57	70.43
X4	2.673424	.4730691	1.525	4.024
X5	9.048036	.7845615	6.58	11.7
X6	12.21848	8.50433	1.78	38.35
X7	82.09509	10.25445	43.83	98.42
X8	76.3725	12.47425	32.56	96.83
X9	67.79571	18.19311	26.16	99.29
X10	28.38772	3.344184	17.91	36.56
X11	4.778	2.704591	1.13	19.08
X12	52.21777	10.90399	20.46	70.08
X13	74.8567	8.771294	50.98	92.53
X14	5.345491	1.658999	2.04	10.21
X15	80.91049	14.88508	30.21	100
X16	70.35844	11.61963	37.76	97.72

The lowest morbidity outside Java was 11.68 percent and the highest was 44.39 percent. There are differences in morbidity between provinces in outside Java.

3.3 Panel Data Estimation

The estimated results in Java are as follows.

Table 3. Estimation Result in Java

Variable	Coefficient	P-Value
Economics Factors		
GDP Per Capita (X1)	-.1006807	0.677
Unemployment (X2)	-2.1038658	0.063
Formal Labor (X3)	-.2777008	0.469
Minimum Wage (X4)	-.5006607	0.899
Social Factors		
Education (X5)	-16.43242	0.033
Undernourishment (X6)	.0360123	0.943
Environmental Factors		
Water Access (X7)	.2468756	0.265

The results of the estimates outside Java are as follows.

Table 4. Estimation Result outside Java

Variable	Coefficient	P-Value
Economics factors		
GDP Per Capita (X1)	-.0829652	0.084
Unemployment (X2)	-.0789584	0.776
Formal Labor (X3)	.1386367	0.104
Minimum Wage (X4)	-2.38604	0.086
Social Factors		
Education (X5)	.212706	0.849
Undernourishment (X6)	.0590673	0.442
Environmental Factors		
Water Access (X7)	.0219923	0.668
Sanitation Access (X8)	-.0375084	0.409
Housing Access (X9)	-.090568	0.000
Lifestyle Factors		
Smoking (X10)	.7438458	0.000
Preventive Cost (X11)	.1414295	0.161
Family Plan (X12)	-.0058409	0.951
Self Medication (X13)	-.0665663	0.119
Health Services Factor		
Unmet Need Health Service (X14)	2.104581	0.000
Health Facilities (X15)	.0330314	0.413
Health Insurance (X16)	-.0304942	0.312

4. Discussion

Economic factors on morbidity

Economic factors in the form of GDP growth per capita have a negative and insignificant effect on morbidity in Java and outside Java. Other empirical evidence suggests that there is a causal relationship between health and economic growth in developing countries [15]. Economic growth has an impact on maternal and child mortality [16]. Per capita income affects universal health coverage [17]. Second, economic factors in the form of unemployment have a negative and insignificant effect on morbidity in Java and outside Java. Other empirical evidence explains that construction sector workers have occupational health and safety risks [18]. Unemployment increases morbidity due to economic problems [19].

Third, economic factors in the form of formal labor have a negative and insignificant effect in Java and a positive and insignificant effect on morbidity outside Java. Other empirical evidence suggests that formal workers have better health [20]. Formal workers with overworked hours increase mental problems [21]. The risk of cognitive impairment is high among informal workers, while formal workers suffer greatly from chronic health conditions and functional limitations [22]. Fourth, economic factors in the form of drinking wages have a negative and insignificant effect in Java and outside Java. Other empirical evidence explains that higher minimum wages affect poverty, the proportion of the population with unmet medical needs, the number of doctor's visits, tobacco consumption, calorie intake, and the likelihood of people becoming overweight [23]. Violations of the minimum wage because employers pay wages below the set minimum wage cause harm to workers' health [24].

Social factors on morbidity

First, social factors in the form of education have a negative and significant effect on morbidity in Java and have a positive and insignificant effect on morbidity outside Java. This empirical evidence in accordance with Harrod Domar theory of growth, also explains that savings and investment drive economic growth. Savings increase investment in education and health, which ultimately drives economic growth. Other empirical evidence also suggests that education levels are associated with decreased morbidity and mortality [25,26]. Education contributes to specific mortality [27]. Second, social factors in the form of insufficient food consumption have a positive and insignificant effect on morbidity in Java and outside Java. Other empirical evidence suggests that individuals with food insecurity have a significantly higher probability of death, especially in children and the elderly. Food safety contributes to mortality risk factors [28]. Malnutrition causes malnutrition in children [29].

Environmental factors on morbidity

Environmental factors in the form of access to drinking water should have a positive and negative effect on morbidity in Java and outside Java. Other empirical evidence suggests that access to clean water is appropriate to reduce morbidity due to diarrhea, typhus, cholera, diarrhoea, and hepatitis [30]. Access to clean water and better sanitation reduces the probability of death in children [31]. Second, environmental factors in the form of access to proper sanitation have a positive and insignificant effect on morbidity in Java and have a negative and insignificant effect on morbidity outside Java. Other empirical evidence explains that access to proper sanitation, clean water, and hygiene leads to better health [32,33]. Third, environmental factors in the form of access to decent housing have a negative and

insignificant effect on morbidity in Java and have a negative and significant effect on morbidity outside Java. Other empirical evidence explains that home insecurity affects health, especially in the elderly [34]. Unaffordable housing access increases mental health problems [35].

Lifestyle factors on morbidity

Lifestyle factors in the form of smoking have a positive and insignificant effect on morbidity in Java and have a positive and significant effect on morbidity outside Java. Other empirical evidence suggests that poor lifestyle smoking increases morbidity and mortality [36]. Smoking causes specific mortality such as cancer, heart disease, respiratory tract disease, and cardiovascular disease [37]. Smoking is detrimental to health and the economy [38]. Second, lifestyle factors in the form of preventive health costs have a negative and insignificant effect on morbidity in Java and have a positive and insignificant effect on morbidity outside Java. Other empirical evidence suggests that preventive health efforts are essential to reducing the prevalence and impact of chronic diseases [39]. Health preventive efforts reduce morbidity and mortality [40].

Third, lifestyle factors in the form of family planning programs have a positive and insignificant effect on morbidity in Java and have a negative and insignificant effect on morbidity outside Java. Other empirical evidence suggests that family planning programs affect maternal and child health [41]. Access to family planning programs affects maternal mortality [42]. Fourth, lifestyle factors in the form of self-treatment have a positive and insignificant effect on morbidity in Java and have a negative and insignificant effect on morbidity outside Java. Other empirical evidence suggests treating yourself appropriately and responsibly can improve health [43]. Interventions to promote responsible self-medication and reduce health-related risks [44].

Health service factors on morbidity

Health service factors in the form of unmet need for health services have a positive and insignificant effect in Java and have a positive and significant effect on morbidity outside Java. Other empirical evidence explains that the need for health services affects health outcomes [45]. The need for health services for people with mental illness increases the risk of death [46]. The need for health services affects health, especially in the elderly [47]. Second, health service factors in the form of mothers giving birth in health facilities have a negative and insignificant effect on morbidity in Java and have a positive and insignificant effect on morbidity outside Java. Other empirical evidence suggests that adequate health facilities and workers affect maternal health [48]. Lack of access to health facilities leads to high maternal mortality [49]. Third, the health service

factor in the form of health insurance has a negative and insignificant effect on morbidity in Java and outside Java. Other empirical evidence explains that health insurance ownership affects mortality in the elderly [50]. Increased health insurance enrollment lowers mortality rates and improves health status [51].

5. Conclusion

There are significant differences in factors affecting morbidity in Java and outside Java. Social factors in the form of education have a negative and significant effect on morbidity in Java. Environmental factors in the form of access to decent housing have a negative and significant effect, lifestyle factors in the form of smoking, and health service factors in the form of unmet need for health services have a positive and significant effect on morbidity outside Java. Interventions to improve education are the best way to reduce morbidity on the island of Java. Interventions to increase access to decent housing, reduce poor lifestyles, smoking and unmet need for health services are the best ways to reduce morbidity outside Java. An individual's understanding of the role of smoking in increasing morbidity and decreasing productivity is essential. Policies to reduce disparities in health infrastructure development between Java and outside Java are important to reduce health disparities and economic equity in Indonesia

Declarations

Author Contributions

Conceptualization, K, M.K.S.B, I.N.M.Y, and N.M.T.; methodology, K and N.M.T.; software, K.; validation, M.K.S.B and I.N.M.Y.; formal analysis, K.; investigation, K.; resources, K.; data curation, K.; writing original draft preparation, K.; writing review and editing, N.M.T.; visualization, K.; supervision, M.K.S.B.; project administration, K.; funding acquisition, K. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by faculty economics and business, Udayana University.

Conflicts of Interest

The author declares that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and

redundancies have been completely observed by the authors.

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