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Does Health Contribute to Economic Growth? An Evidence from Regional Levels in Indonesia

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Abstract

Health can lead economic development in many countries. The higher the quality of health, the more space for increasing economic growth and providing prosperity in the long-run. The current study attempts to estimate the effect of health on regional economic growth in Indonesia. Balanced panel data is set covering 34 provinces from 2015 to 2020. The panel data is estimated using system Generalized Method of Moments (GMM). The findings reveal that smoking level contributes significantly and positively on regional economic growth, while health service has no effect. The non-linear impact of smoking level on regional economic growth is U-shaped. It means that higher smoking level stimulates regional economic growth by the increasing of aggregate spending. The local governments should design health service program and control smoking level properly so that the health risk of cigarette consumption does not offset its benefit to the economy. The policy design will produce better human health and life in all provinces in Indonesia. Consequently, the regional economic growth can be achieved in the long-run.

Keywords: health; economic growth; System-GMM; linear; and non-linear estimation
JEL Classification: E01, H51, I15

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1. Introduction

Health is one of the factors driving development and economic growth (Romer, 1986; Mankiw, Romer & Weil, 1992). The development and economic growth process are also directed at improving public health quality by providing affordable and adequate health services (Hartwig, 2010; Husain, 2010; Gong, Li, & Wang, 2012; Ogundari & Awokuse, 2018). Health status (physical and mental) can be the basis for running economic productivity through labor supply and labor productivity (Zhao & Zhou, 2021). Public health status contributes to a productive workforce. Consequently, workers can earn high wages, increase consumption and investment, and stimulate the economy (Narayan, Narayan, & Mishra, 2010). Thus, health can promote long-term economic growth and development (Hartwig, 2010).

The literature has noted that the level of health could be measured by several indicators such as the level of health expenditure (investment), quality of health services, human capital, human health, infant mortality, life expectancy, smoking level, and the level of health services (Ruhm, 2000; Marti & Schläpfer, 2014; Wang, et al., 2018; Ogundari & Awokuse, 2018; Cole, 2018; Torre, et al., 2019; Kennelly, et al., 2020; Vu, 2020; and Zhao & Zhou, 2021). In developed countries, smoking level is considered on the macroeconomy (Nargis, et al, 2022). Previous empirical research found that health

quality significantly and positively affected economic growth in the short term (Akram, Padda & Khan,2008). However, the effect of health quality could be detrimental to long-term economic growth rates in developing countries. In particular, the smoking level could affect economic activity. For instance, Ruhm (2000) states that the economic recession encourages people to live healthier lives by reducing smoking rates and improving the quality of physical activity and diet. Furthermore, Marti & Schläpfer (2014) found that smoking bans had a negative effect on discotheque activities, but the effect was not significant on bar and restaurant activities. They also noted that smoking bans promoted quality of health. However, policymakers faced difficulties implementing appropriate policies to control smoking levels because of their insignificant effect on the economy. This is contrary to the impact of smoking on public health.

Figure 1 describes the impact between health indicators and regional economic growth in Indonesia. Health indicators included smoking level and health service. Smoking levels had a positive impact with economic growth. Likewise, the level of health services positively influenced with economic growth. However, the coefficient of determination (R^2) of smoking level and economic growth (0.091 or 9.1%) was more significant than the impact of health service and economic growth (0.059 or 5.9%). This condition signaled that the higher the smoking level and health services, the higher the regional economic growth rate. Nargis, et al, (2022) found in United State of America, smoking causes high rate of disease that reduced productivity level and increase health expenditure, while by decreasing smoking level reducing income for the country. However, policymakers at the provincial level should pay more attention because people tend to be more interested in increasing smoking expenditures than receiving or responding to health services.

This research aimed to estimate the health effect on regional economic growth for 34 provinces in Indonesia during the 2015-2020 period. Furthermore, this research contribution was manifested in several forms. *First*, this research paid more attention to two indicators of health level, *smoking level* and *health service*. This is inline with the goals of The United Nations Development Programme (UNDP) of human development in improving their opportunities for education, health care, income and employment (Iskandar, 2017). Smoking behaviour is related to the weak economic and social community, and it is detrimental to the society (Sari et al, 2021). Two previous empirical research that motivated this research consisted of Marti & Schläpfer's (2014) and Zhao & Zhou's (2021). In particular, these indicators have not been widely applied in the empirical analysis of the literature on economic growth in developing countries. *Second*, the balanced panel was analyzed using linear and non-linear GMM systems because relatively little literature applied it. Finally, the research results conveyed the benefits to policymakers at the provincial level in Indonesia to be more careful in regulating smoking levels and facilitating improving the quality of health services. In the long term, the contribution of policymakers could create a healthier and better life for Indonesian people.

Yang et al (2015) stated that there is economic dependence on the tobacco industry, which is a contradiction to public health goals. The study results revealed that smoking levels determined regional economic growth. The higher the smoking level, the higher the regional economic growth. Meanwhile, health services had no significant implications for regional economic growth. In particular, the research results showed that the effect of non-linear smoking levels on economic growth was U-shaped. Thus, policymakers at the provincial level in Indonesia should pay more attention to encouraging the improvement of the quality of health services. In addition, policymakers were also expected to be careful in regulating cigarette consumption levels to ensure a healthier and better life for the community in the long term.

This research was discussed in several sections. The first was an introduction that outlined research problems relevant to the effects of health and economic growth. The second was the research method covering data and System-GMM. Next was the results and discussion.

Meanwhile, the last one was the conclusion and policy implication.

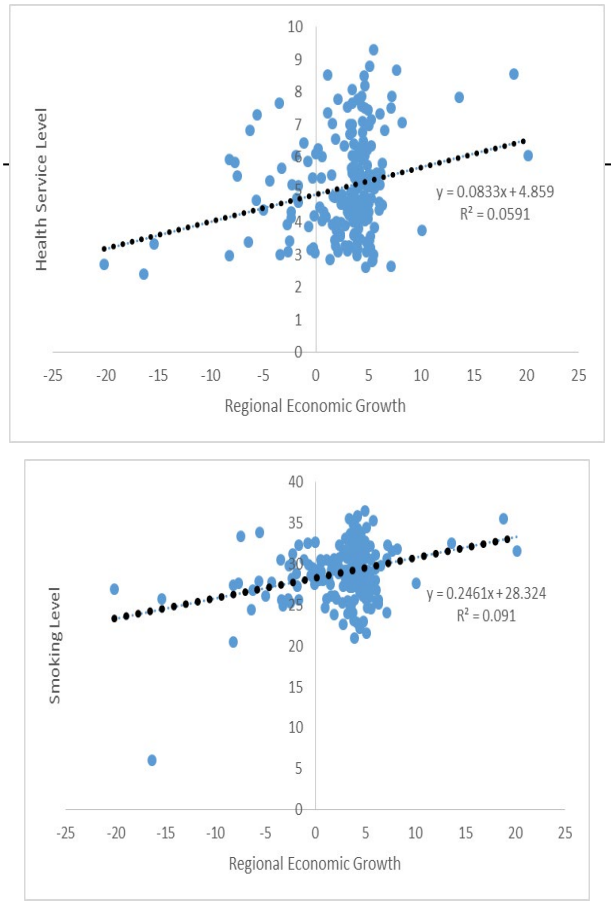

Figure 1. Relationship between Health Indicators and Regional Economic Growth in Indonesia, 2015-2020 (average)

Source: Central Bureau of Statistics (2022, processed)

2. Method

2.1 The Data

This research used regional economic growth (REG) data as the dependent variable. In addition, several independent variables have been determined following the literature, including labor force (L), investment (I), smoking level (SL), health services (HS), health services for pregnant women (BR), and an average length of schooling (SR). According to Husain (2010) health service for pregnant women was vital, since poor fertility and maternal health rates lead to high infant mortality rate, hence Fogel (1994) explained the importance of maternal health and nutrition in order reduce mortality rate.

Table 1 shows the types of data, and descriptive statistics of all variables applied in this research. Dependent variable is regional economic growth, and the regressors are labor force, investment, smoking level, health service, health servise for pregnant woman, and avarge length of schooling. Regional economic growth during the observation period experienced a relatively significant heterogeneity. For instance, the average REG value was 2.77%, while the lowest and highest levels were -20.13% and 20.20%. Papua Province achieved the lowest REG in 2020. Meanwhile, the highest REG occurred in West Nusa Tenggara Province in 2015. This condition indicated that during the Corona Virus Disease 2019 (COVID-19) pandemic, Papua Province received a significant effect of pressure on regional economic growth.

Health indicators, including smoking and health services, had different data distributions. Smoking levels recorded the lowest and highest levels were 20.50% and 36.56%. The higher the smoking percentage, the more people consumed cigarettes. Meanwhile, the level of health service reached the lowest and highest levels of 2.41% and 3.92%.

Table 1. Data and Descriptive Statistics

Variables	Description	Mean	Minimum	Maximum
Regional economic growth (REG)	2010 Constant Price Base Gross Regional Domestic Product Growth (Percent)	2.77	-20.13	20.20
Labor force (L)	Percentage of Formal Workers by Province (Percent)	41.38	18.51	72.96
Total investment (I)	Total investment (billion rupiahs)	8.15	2.17	11.04
Smoking level (SL)	Percentage of Smoking in Population Aged ≥15 Years Old by Province (Percent)	29.10	20.50	36.56

Variables	Description	Mean	Minimum	Maximum
Health Services (HS)	Unmet Need Health Services by Province (Percent)	5.09	2.41	9.32
Health Service for Pregnant Women (BR)	Percentage of Married Women aged 15-49 years old whose last birth was assisted by a trained health worker by province (Percent)	90.91	60.52	100,00
The average length of schooling (SR)	Average Length of Schooling of Population Aged 15 Years Old by Province (years)	8.78	6.27	11.17

Source: Central Bureau of Statistics (2022)

Note: The cross-section is covering 34 provinces, namely: N. Aceh Darussalam, North Sumatera, West Sumatera, Riau, Jambi, South Sumatera, Bengkulu, Lampung, Bangka Belitung Islands, Riau Islands, DKI Jakarta, West Java, Central Java, DI Jogjakarta, East Java, Banten, Bali, West Nusa Tenggara, East Nusa Tenggara, West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan, North Kalimantan, North Sulawesi, Central Sulawesi, South Sulawesi, South East Sulawesi, Gorontalo, West Sulawesi, Maluku, North Maluku, West Papua, and Papua.

2.2 Estimation Model

Health can drive the economy through better human resources and human investment for society. Improving public health can be employed by providing nutritious foods which is expected to extend life expectancy. In addition, several efforts to improve public health can be carried out by improving access to good health facilities, affordable medicines, sports, healthy living behavior, and recreation. This condition can be formulated as follows (Gong, Li, & Wang, 2012):

$$u(c,h) = \ln c + \ln h \quad (1)$$

c is consumption, and h denotes health capital
Therefore, the health cost function is:

$$T = T(h) \quad (2)$$

h is public health level, whereas T (h) equals health investment, with the assumption T'(h) > 0 and T"(h) > 0.

The better the quality of public health, the higher the productivity, so that the supply of quality labor is higher. Therefore, it can be stated that the level of people's income can be influenced by their level of health. If h is the level of health and w is income, k is capital and r is interest rate, so:

$$k = w(h) + rk - c - T(h) \quad (3)$$

From these equations, optimization of society can be obtained:

$$\max_{c,h} = \int_0^{+\infty} u(c,h)e^{-\beta t}dt \quad (4)$$

$$s.t.: k = w(h) + rk - c - T(h) \quad (5)$$

in which β is the discount rate.

This study estimates the impact of health on regional economic growth for 34 provinces in Indonesia. The empirical model applied is the two-step System Generalized Method of Moments (GMM) estimator (Blundell & Bond, 1998). The empirical model can be written as follows:

$$REG_{it} = \alpha_0 + \gamma REG_{it-1} + \beta_1 SL_{it} + \beta_2 HS_{it} + \beta_3 BR_{it} + \beta_4 SR_{it} + \beta_5 I_{it} + \beta_6 L_{it} + \mu_i + \varepsilon_t + v_{it} \quad (6)$$

Equation (6) explains that regional economic growth (REG) is determined by the lagged of dependent variable, smoking level (SL), health service (HS), health service for pregnant woman (BR), average length of schooling (SR), investment (I), and labor force (L).. The *"i"* and *"t"* denote 34 provinces and the period of 2015-2020, respectively. The α_0 is the intercept, while γ, β_1 and β_2 are the parameters of independent

variables. In addition, μ_i represents the province fixed effects, ε_t is the time specific effects, and v_{it} symbolizes the error term. Moreover, v_{it} is assumed to be independent and identically distributed with mean zero and variance of σ^2.
This empirical modeling of Equation (6) can be rewritten as follows, where:

$$u_{it} = \mu_i + \varepsilon_t + v_{it}$$
$$REG_{it} = \alpha_0 + \gamma REG_{it-1} + \beta_1 SL_{it} + \beta_2 HS_{it} + \beta_3 BR_{it} + \beta_4 SR_{it} + \beta_5 I_{it} + \beta_6 L_{it} + u_{it} \quad (7)$$

3. Result and Discussion

3.1 The main findings

This research paid more attention to health's contribution to Indonesia's regional economic growth. It meant that better the quality of health and people's lives in the regions would provide more significant opportunities to encourage economic growth in the long term. It aims at analyzing the impact of health indicators on economic growth in 34 provinces in Indonesia during 2015-2020 by empirical estimation carried out using the dynamic panel of System-GMM according to the concept of Blundell & Bond (1998). Furthermore, it aims to understand the urgency of health on income for the country.

The empirical findings can be seen in Table 2. The table revealed that the lag of the dependent variable had a positive and significant effect at a significance level of 5% for all linear and non-linear estimates, including one-step and two-step estimators. It meant that the dynamic panel regression model provided empirical evidence of the impact of the independent variable on the dependent variable. Meanwhile, the constant (intercept) had a positive and significant impact following the estimation results of linear and non-linear (the non-linear variable was health service).

Table 2. Results of System-GMM Estimation (full sample)

Variables	Linear Estimation		Non-Linear Estimation (Smoking Level)		Non-Linear Estimation (Health Service)	
	One-Step coefficient (SE)	Two-Step coefficient (SE)	One-Step coefficient (SE)	Two-Step coefficient (SE)	One-Step coefficient (SE)	Two-Step coefficient (SE)
Constant	40.14*** (13.49)	40.13*** (6.57)	-80.30 (152.43)	-64.92 (60.48)	35.02** (17.43)	39.36*** (7.69)
REG (-1)	0.26*** (0.09)	0.27*** (0.03)	0.27*** (0.09)	0.28*** (0.03)	0.26*** (0.09)	0.29*** (0.02)
SL	0.30* (0.17)	0.24*** (0.05)	13.70 (15.69)	12.17* (6.34)	0.30* (0.17)	0.24*** (0.05)
SL^2			-0.49 (0.53)	-0.44* (0.22)		
SL^3			0.02 (0.00)	0.01** (0.00)		
BR	0.08 (0.14)	-0.08 (0.07)	0.07 (0.14)	-0.08 (0.07)	0.06 (0.14)	-0.07 (0.06)
HS	-0.17 (0.44)	0.09 (0.16)	-0.15 (0.44)	0.08 (0.17)	3.34 (7.82)	0.68 (3.43)
HS^2					-0.49 (1.40)	0.05 (0.59)
HS^3					0.02 (0.08)	-0.01 (0.03)
SR	-9.84*** (1.74)	-7.83*** (1.06)	-9.84*** (1.76)	-7.85*** (0.08)	-9.82*** (1.76)	-8.05*** (0.97)
I	0.01 (0.00)	0.01 (0.00)	0.01 (0.00)	0.01 (0.00)	0.01 (0.00)	0.01 (0.00)

Variables	Linear Estimation		Non-Linear Estimation (Smoking Level)		Non-Linear Estimation (Health Service)	
	One-Step coefficient (SE)	Two-Step coefficient (SE)	One-Step coefficient (SE)	Two-Step coefficient (SE)	One-Step coefficient (SE)	Two-Step coefficient (SE)
L	0.80*** (0.09)	0.73*** (0.07)	0.80*** (0.09)	0.76*** (0.07)	0.78*** (0.09)	0.71*** (0.06)
AR(1)		-2.52		-2.6		-2.68
p-value		(0.00)		(0.01)		(0.01)
AR(2)		1.58		1.45		1.45
p-value		(0.11)		(0.15)		(0.15)
Sargan Test	62.12	20.55	60.14	20.13	61.4	20.67
p-value	0.00	0.08	(0.00)	(0.09)	(0.00)	(0.08)
Number of Groups	34	34	34	34	34	34
Total Observation	170	170	170	170	170	170

Source: Secondary data processed.

Note: Dependent variable is regional economic growth (REG). The ***, **, and * are significant levels at 1%, 5%, and 10%, respectively.

Linear estimation showed that smoking level had a positive and significant effect on regional economic growth at a significance level of 10% (*one-step estimator*) and 1% (*two-step estimator*). This result signaled to policymakers in the regions that higher community's smoking practice (the level of household expenditure on cigarette consumption) would provide opportunities for increased economic growth. This is inline with a study findings conducted by Nargis, et al (2022) that reducing smoking level is pivotal in improving public health and increasing working participation. On the other side, health services did not contribute significantly to regional economic growth. In this way, policymakers could review the design of health programs and services to create healthier and better people's lives. Interestingly, the average length of schooling had a negative and significant effect on regional economic growth at a significance level of 1%. This research explained that the higher the average length of schooling, the lower the regional economic growth rate. Meanwhile, the labor force could encourage economic growth because it had a positive and significant effect at a significance level of 1%. This indicated that educational services in Indonesia must be improved distributed throughout Indonesia.

This research not only estimated the effect of health on regional economic growth using a linear approach but also a non-linear approach. Linear and non-linear estimates were applied to provide complete empirical evidence of health effects on economic growth. The research results showed that the effect of smoking level on regional economic growth in Indonesia was U-shaped. The U-shaped impact process meant an increased smoking rate would encourage economic growth in the early stages. Furthermore, in the next stage, the impact decreased (negative) and increased again (positive) after passing the lowest point on the quadratic variable (S^2). However, this empirical result was not proven the impact of health services on economic growth. In simple terms, linear and non-linear estimation results proved that health services did not contribute significantly to regional economic growth.

Robustness Checks

This research re-estimated the effect of health on regional economic growth by splitting the sample into Java & Bali and non-Java & Bali. This estimation was carried out to examine more deeply

the impact of health on regional economic growth with a more specific sample. The dynamic panel of the System-GMM estimation method was applied with the estimation results listed in Tables 3 and 4.

Table 3 revealed the effect of health on economic growth in Java & Bali and non-Java & Bali using a linear approach. The research findings explained that smoking levels and health services in Java & Bali did not contribute significantly to regional economic growth. On the other side, smoking levels positively and significantly impacted economic growth in non-Java & Bali provinces at a significant level of 1%. Health services also had no significant effect in non-Java & Bali provinces. Specifically, the labor force had a positive and significant effect on economic growth at a significance level of 1%. Meanwhile, the average length of schooling had a negative and significant effect at the 1% significance level. This result was consistent with the results in Table 2, which applied to the full sample.

Furthermore, non-linear estimation results stated that smoking levels and health services did not contribute significantly to regional economic growth in the Java & Bali provinces (Table 4). However, health service significantly affected economic growth in the non-Java & Bali provinces following the results of the two-step estimator estimation. The effect was manifested in the form of a U-shaped. This form of influence signaled that the early stages of improving health services stimulated an increase in regional economic growth. Furthermore, the initial stage decreased until the influence of the HS^2 variable reflected a certain point. The last stage was the improvement of health services affecting the increase in economic growth.

Table 4 also describes the effect of the average length of schooling and labor force on economic growth. The research results revealed that the average length of schooling had a negative and significant effect on regional economic growth at a significance level of 1%. However, the labor force had a positive and significant effect at the 1% significance level. These results became empirical evidence in the Java & Bali provinces and non-Java & Bali. In addition, these results were also consistent with empirical findings using the full sample, as shown in Table 2.

Table 3. Results of System-GMM Estimation (spilt sample and linear estimation)

Variables	Java & Bali	Non-Java & Bali	
	One-Step	One-Step	Two-Step
Constant	-39.77 (0.331)	44.54 (2.79)***	45.04 (7.24)***
REG(-1)	3.20 (2.14)**	0.24 (2.48)**	0.25 (9.58)***
SL	0.20 (0.80)	0.30 (1.40)	0.26 (4.25)***
BR	0.49 (1.26)	0.03 (0.21)	-0.09 (-1.31)
HS	-0.41 (-0.46)	-0.11 (-0.21)	0.18 (1.29)
SR	-6.73 (-3.48)***	-9.99 (-4.71)***	-8.46 (-10.25)***
I	-0.01 (-1.57)	0.01 (1.54)	0.01 (1.55)
L	0.82 (5.01)***	0.83 (6.68)***	0.76 (14.09)***
AR(1)			-2.53
p-value			(0.01)
AR(2)			1.60
p-value			(0.11)
Sargan Test	22.44	51.35	16.14
p-value	(0.05)	(0.00)	(0.24)
Number of Groups	7	27	27

Variables	Java & Bali	Non-Java & Bali	
	One-Step	One-Step	Two-Step
Total Observation	35	135	135

Source: Secondary data processed.

Note: The t-statistics is in parantheses (). The ***, **, and * are significant levels at 1%, 5%, and 10%, respectively. There is no two-step estimator for Java & Bali due to insufficient number of **observation.**

Table 4. Results of System-GMM Estimation (split sample and non-linear estimation)

Variables	Java & Bali		Non-Java & Bali			
	Smoking Level	Health Service	Smoking Level		Health Service	
	One-Step	One-Step	One-Step	Two-Step	One-Step	Two-Step
Constant	64.77 (0.36)	-23.67 (-0.38)	-130.09 (-0.40)	-136.81 (-0.99)	34.29 (1.69)*	34.78 (4.83)***
REG(-1)	3.25 (2.16)**	2.98 (2.00)**	0.26 (2.58)**	0.25 (8.56)***	0.23 (2.25)**	0.25 (11.23)***
SL	-12.55 (-0.63)	0.17 (0.68)	19.39 (0.59)	20.23 (1.43)	0.29 (1.34)	0.25 (3.75)***
SL2	0.48 (0.67)		-0.69 (-0.63)	-0.72 (-1.51)		
SL3	-0.01 (-0.690)		0.01 (0.68)	0.01 (1.59)		
BR	0.60 (1.37)	0.40 (0.96)	0.04 (0.29)	-0.07 (-1.04)	-0.01 (-0.03)	-0.08 (-1.46)
HS	-0.42 (-0.44)	0.19 (0.01)	-0.10 (-0.19)	0.13 (0.81)	7.14 (0.78)	6.67 (2.64)***
HS2		-0.73 (-0.15)			-1.10 (-0.67)	-0.92 (-2.07)**
HS3		0.09 (0.26)			0.05 (0.55)	0.04 (1.57)
SR	-7.17 (-3.14)***	-6.93 (-3.44)***	-10.18 (-4.74)***	-8.51 (-9.95)***	-9.93 (-4.68)***	-8.85 (-11.64)***
I	-0.01 (-1.51)	-0.01 (-1.59)	0.01 (1.24)	0.01 (1.10)	0.01 (1.44)	0.01 (1.59)
L	0.84 (4.77)***	0.83 (5.08)***	0.85 (6.74)***	0.79 (13.96)***	0.80 (6.32)***	0.74 (15.88)***
AR(1)				-2.64		-2.63
p-value				(0.01)		(0.01)
AR(2)				1.51		1.63
p-value				(0.13)		(0.10)
Sargan Test	22.44	19.57	49.73	16.41	50.56	16.22
p-value	(0.05)	(0.11)	(0.00)	(0.23)	(0.00)	(0.24)
Number of Groups	7	7	27	27	27	27
Total Observation	35	35	135	135	135	135

Source: Secondary data processed.

Note: The t-statistics is in parentheses (). The ***, **, and * are significant levels at 1%, 5%, and 10%, respectively. There is no two-step estimator for Java & Bali due to insufficient number of observations.

4. Discussion

Based on the estimation results using the one-step GMM method, it was found that the lag variable of regional economic growth proved significant at an *error rate* (α) of 0.01. The smoking level also proved significant and positive to regional economic growth. The school rate was significant, and the coefficient was negative, the labor force significantly affected regional economic growth at an *error rate* (α) of 0.01, or it was decided to reject H_0. Based on this one-step GMM method, the birth rate, health services, and investment variables proved insignificant to regional economic growth. This result was quite different from the results of Zhao & Zhou (2021), who found a significant effect of physical capital, health level, education level, and labor quantity on economic growth in 30 provinces in China. The results of the two-step GMM were also the same as those of the one-step GMM, where the birth rate, health services, and investment were insignificant to regional economic growth. This finding was also quite different from Ogundari & Awokuse's (2018) findings, which found that education and health positively affected economic growth in Sub-Saharan Africa. Meanwhile, Genoni (2012) found that the condition of the Indonesian people their productive age who experienced a decline in their level of health was proven to reduce productivity.

Public health could directly or indirectly affect economic performance (Lustig, 2006). Public health conditions have undergone drastic changes during the Covid-19 pandemic. Indonesia guarantees the fulfillment of the health rights of its people through a health system that implements the National Health Insurance program and guarantees the fulfillment of primary health care needs for all citizens. Health financing is a critical aspect of sustaining a health system. Another key aspect of the health system is health service efforts supported by human resources and health infrastructure.

Several studies investigating the impact of health on economic growth include the following Narayan, Narayan, & Mishra (2010) investigated the relationship between the level of health and economic growth through macroeconomic variables such as exports, imports, investment, and research and development in 5 Asian countries using panel data method for the period of 1974-2007. The findings show that health, investment, exports, and research and development have positive impacts on economic output in these 5 countries. Meanwhile, imports are known to have a negative impact. Wang (2011) also estimated panel data consisting of 31 countries in the period of 1986-2007 resulting in health spending triggers an increase in economic growth whereas economic growth actually reduces health spending. There are differences in economic growth between rich countries and poor countries which also cause differences in the amount of public health expenditure. Gong, Li, & Wang (2012) analyze the effect of health investment on economic growth based on Romer's production function and Grossman's utility function. The research method used was panel data at the provincial level in China for the period of 1978-2003. Their findings showed that there was a relationship between economic growth and short-term health. Better human health status creates an increase in economic growth. However, in the long-term, it is known that an increase in human health conditions would actually cause an economic slowdown.

Wang et.al. (2018) conducted a study in 22 OECD countries by analyzing the impact of health condition and life insurance on health spending. Using a panel vector autoregression model which shows that there is a greater impulse response in the research variable in the short term than in the long term. The next finding is the positive impact of public health conditions on economic growth, growth in life insurance, and an increase in health spending. Insurance can be used to finance health care in the short term. It is also found in developed countries that health problems can stimulate the economy whereas health problems reduce the level of health spending in poor countries. Ogundari & Awokuse (2018) investigated the impact of human capital (education and health) on economic growth in Sub-Saharan African countries using a dynamic panel method covering 35 countries from 1980 to 2008. The results show that education and

health have positive impacts on economic growth, especially health which has a greater impact than education. Thus, it is proven that human capital contributes to the sustainability of economic growth in Sub-Saharan African countries.

It is different from a study conducted by Cole (2018) which analyzed the impact of economic growth on public health status (infant mortality, life expectancy, and calorie consumption) in 134 countries from 1970 to 2015. The findings are in the form of growth in per capita income have been shown to increase life expectancy, reduce infant mortality rate, and increase the nutritional intake of the society. Economic growth is proven to contribute to poor countries and agrarian countries. Economic growth also tends to have the strongest effect on reducing infant mortality. Cylus & Tayara (2021) also conducted a study with a sample of 180 countries from 1990 to 2017 using the panel data method. The findings prove that the dependency ratio causes a decrease in national income growth. A change in 1% dependency ratio reduces the rate of national income by 1.1%. Zhao & Zhou (2021) investigated the impact of human health status on economic growth by building a 4-sector economic model in 30 provinces in China for the period 2002-2016. The analysis uses spatial panel, non-spatial panel, and dynamic panel methods with the variables of GDP, physical capital, health level, education level, labor quantity, and energy consumption. The results show that physical capital and human capital can influence economic growth through the utilization of resources. In more details, it is proven that the economic growth of China is influenced by physical capital investment (education and health) and energy consumption.

5. Conclusion and Policy Implication

This research estimated the contribution of health on provincial economic growth in Indonesia during 2015-2020 using the System-GMM. The research results revealed that smoking levels significantly contributed to economic growth, while health services have no significant contribution. The higher the smoking level, the higher the regional economic growth. In addition, the effect of the smoking level was reflected by the U-shaped curve. Other independent variables significantly contributed to economic growth were the average length of schooling and the labor force. This result was consistent using both the full sample and the split sample.

The research results delivered several key takeaways for policymakers. The estimation results showed that the higher the smoking level, the more opportunities for increased economic growth. Higher smoking expenditures could increase aggregate demand, which could lead to increasing output, especially from cigarrete production. However, the consequence of this empirical finding was that local governments would face risks of lowered public health quality. Therefore, policymakers should be able to persuade smokers to not spend too excessively on cigarettes through health campaigns. Most of the Indonesian population are still in poor category, hence it would be better if they spend their money to meet the basic needs rather than on cigarrete. It is also imperative that policymakers pay more attention to the length of schooling and the quality of human resources to encourage economic growth, since educated society could improve productivity and reduce health expenses by having healthy lifestyle. This result was also related to the impact of the labor force quality that could stimulate economic growth. It means that workers need to be supported by the quality of health and proper education.

6. References

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