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Health and socioeconomic development and morbidity: A district case in Indonesia

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Abstract: - There was a substantial inequality in health status across districts in Indonesia. The purpose of this study was to examine the association between health and socioeconomic development and morbidity in districts in Indonesia. The data used came from the Indonesia Database Policy and Economic Research (INDO-DAPOER) of the World Bank. The unit analysis was district. The observation period was 2011 and 2014. Multiple regression analysis was employed to study the impacts of health and socioeconomic development on morbidity in districts in Indonesia. The dependent variable was the morbidity rate. The health and socioeconomic development variables included the time, number of medical doctors, number of health centres and its line services, monthly per capita household health expenditure, and access to safe sanitation. The results of the study indicate that, in districts in Indonesia, lower morbidity rate was significantly associated with increasing time, higher number of medical doctor, higher number of health centres and its line services, higher monthly per capita household health expenditure, and higher access to safe sanitation. These results imply that to reduce morbidity rate, the regional governments in Indonesia should improve their health and socioeconomic development.

Keywords: Health and socioeconomic development, morbidity, multiple regression, districts, Indonesia.

1. Introduction

The World Development Indicators reported that, in 2015 there was 4.45 million infant deaths globally. This fact implies that there were 32 infant deaths per 1,000 live births in 2015 (Lu et al. 2019). These deaths can also be caused by morbidity among infants.

Morbidity denotes to experiencing an illness or a sign of illness both physically or psychologically including because of accident or other causes that can interfere daily activities. In general, the main health complaints experienced by the people are cold, headache, cough, flu, diarrhoea, asthma/breathless, and toothache. Persons who suffer from chronical illnesses are considered having health problems although in the survey (usually in the last month) the illnesses do not relapse.

In short, morbidity refers to the aggregate immunity from illnesses, including incidence or prevalence of specific diseases as well as the broader measurement of health condition related to the more general diseases (Javaid et al. 2015). Disease incidence denotes to the number of new cases of a disease in population. Prevalence indicates the old and new cases of a disease in population. The other more general measurements include self-reported health status, comorbidity, and disability adjusted health measurement. Other broader measurements relate to nutrition, such as weight, height, body mass index (BMI), and stunting. The broader measure of stunting is associated with specific disease condition, such as mental illnesses or a disease outcome, such as cognitive function deterioration because of diarrhoea on children. These common morbidity measures are displayed in Table 1.

Table 1 Common Morbidity Measure

	Assessment of Morbidity	Description or Sample Measurement
Direct measures	Disease specific : incidence, Prevalence	Incidence: (number of case of a disease)/(population at risk)
Self-reported health and self-assessed health (often from survey data)	• International surveys, e.g. Demographic and Health Surveys). • Disease-specified, e.g. Malaria Indicator Survey	Survey to tabulate key malaria indicators Self-Related Health: rating personal health on a scale

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	• Country health reports • Morbidity index e.g. Self-rated Health • Global Activity Limitation Index • Disability assessment schedule	
Disability adjustment calculation	• Healthy life expectation (HALE) • Year of life lost (YLL), Years lived with disability (YLD): disability Adjusted Life-Years (DALY's), Quality -Adjusted life Years (QALY)	YLL: (number of death) x (standard life expectancy at death). YLD: (Number of incident case) x (disability severity index) x (average duration of disability) DALYS=YLL + YLD
Comorbidity assessment	• Charlson comorbidity Index	Summed score for a total of 22 conditions including heart disease, AIDS, and cancer Risk of death determines level of each disease's component score
Nutritional measures	• Stunting and wasting • Iron deficiency • Caloric intake • Outcomes of poor nutrition, e.g. diarrheal disease	• Weigh for age stature -for age z score (children) • Weight-for-length, head circumference (infant) • Weigh for height • BMI, BMI for age
Cognition: Adult	• IQ • Mental Health assessments,	• Executive function, attention, episodic memory, language processing speed, working memory.
Cognition children	• Direct assessment • Ratings and report	Rating and report: scales of checklist completed by informants who know the child well answer question about child ability

Source: Javaid et al. (2015).

In Indonesia, morbidity is still one of development problems. Morbidity is still high and need better management in order to achieve the President's vision of developed Indonesia in 2045, that is to be the fourth best economy in the world. As it can be seen in Figure 1, morbidity rate in some provinces were still high during 1996–2018, even increased in the later years except in South Kalimantan.
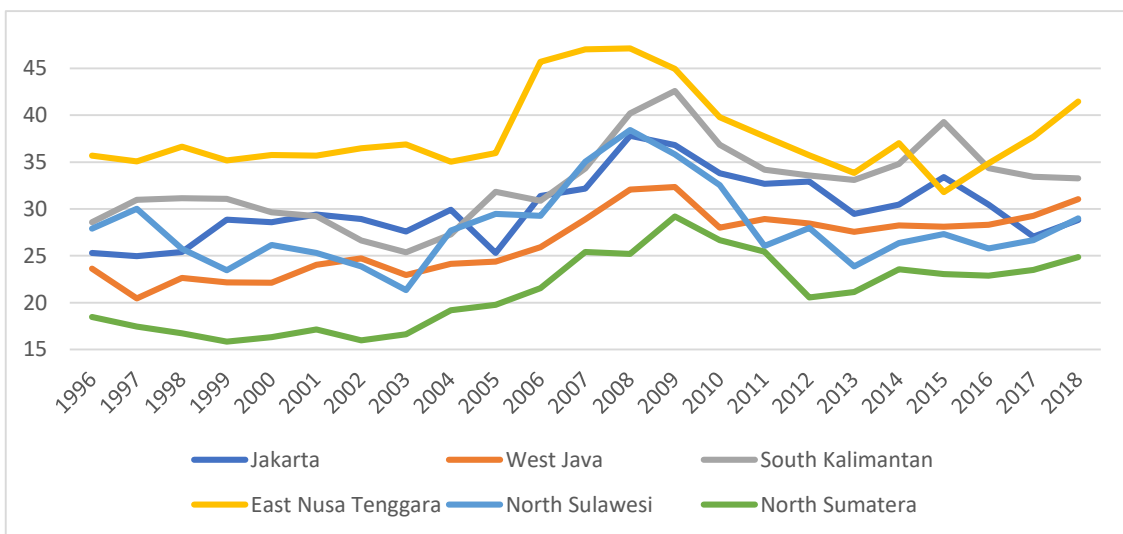
Source: World Bank (2022) (Author's compilation).

Figure 1 Morbidity rate (%) in selected provinces: Indonesia, 1996–2018

The health of population has an impact on economic growth and welfare. High morbidity will have adverse effect on economic growth and welfare. Rocco et al. (2021), in their study using data from 135 countries during 1990–2014 found that reducing mortality and disability adjusted life years (DALYs), that combined morbidity and mortality, boosted GDP per capita growth. Therefore, it is important to study the role of health and socioeconomic development in morbidity.

1.1. Objectives

In general, this study aimed to investigate the association between health and socioeconomic development and morbidity in districts in Indonesia. Specifically, the objectives of the study were to (1) examine the effects of number of medical doctors and number of health centres and its line services on morbidity in districts in Indonesia; (ii) analyse the influences of monthly per capita household health expenditure and access to safe sanitation on morbidity in districts in Indonesia.

2. Literature Review

In this study, it would be discussed that morbidity can be reduced through development improvement, that is sanitation, health expenditure, and medical doctor and health centre provision improvement.

A number of studies confirmed that morbidity reduction can be done through sanitation infrastructure (Jung et al. 2017a; Jung et al. 2017b; Wolf et al. 2018; Lung-fei et al. 1997; Fahira et al. 2021). Jung et al. (2017a) carried out a study to identify the impacts of the exposure of wastewater at neighbourhood level and sanitation facility on diarrhoea. From 21 non-randomized and one randomized controlled trial that consisted of six data sets of neighbourhood sanitation condition (8,271 subjects) and 20 data sets of households (20,021 subjects) it was found that good sanitation in household and neighbourhood environment can provide main protection against diarrhoeal morbidity. Further, Jung et al. (2017b) conducted a research to examine the association between neighbourhood sanitation coverage and diarrhoeal morbidity among children aged under five years and to evaluate the exposure-response relationship. Using data from the Demographic and Health Surveys (DHSs) of 29 developing countries in sub-Saharan Africa and South Asia, carried out between 2010 and 2014. The main findings were diarrhoeal incidence in two weeks among under five year children ($n = 269,014$), employing a three-level logistic regression and applied cubic spline to examine the trends between neighbourhood-level coverage and diarrhoeal morbidity. The results of the study show that there was a significant association between neighbourhood level coverage of improved household sanitation and diarrhoeal morbidity. In addition, the results of exposure-relationship analyses show that sanitation coverage improvement reduced diarrhoeal morbidity both in

Safe water, sanitation, and cleanness are the protection against diarrhoea which is the main cause of child death. Wolf (2018) conducted a research on the impacts of unsafe water, sanitation, and hygiene (WaSH) on diarrhoea among children. Using meta-analysis and meta-regression it was found that intervention on WaSH was associated with lower diarrhoeal morbidity risk. This study recommended that household connection with water supply and higher levels of community coverage for sanitation seem very impactful and is aligned with the SDGs targets.

The effects of child health intervention through household resource allocation change through the effectiveness of sanitation facility reduces child mortality and morbidity (Lung-fei et al. 1997).

Indonesia has a low hygienic welfare rate where access to safe water and family sanitation was poor. Fahira et al. (2021) carried out a study on the influence of water consumption and sanitation facility existence on child diarrhoeal rate in Indonesia. The results of their study found that there was sanitation facility had significant effect on child diarrhoeal in urban areas in Indonesia.

Empirical studies found the association between health expenditure and morbidity. A study in Southeast Asia found the association between catastrophe finance and 12-month deaths due to cancer (Action Study Group 2015). Therefore, morbidity management should be carried out with intensely.

Further, a study by Lu et al. (2019) found that sanitation, water facility, and health expenditure had impacts on morbidity and then on infant mortality rate. Using panel data of 84 developing countries from 1995 until 2013 they found that health expenditure per capita was negatively associate with morbidity and mortality in developing countries and over all the world.

Dongre et al. (2010) carried out a study on the impact of health expenditure in government and private sectors on under-five general morbidity in Warda, India. They found that about 10% household income was allocated from acute child morbidity. They also found that higher household health expenditure was associated with declining and lower child morbidity. In addition, a study in Mongolia showed that beside higher health insurance, higher health expenditure had positive impact on health, morbidity, and mortality (Dugee et al. 2019).

Studies found that the next effort to reduce morbidity is through health and health personnel provision development. The availability of medical doctor was found to be associated with morbidity (Imo 2017; Fahrenkopf et al. 2008; Axisa et al. 2019; Fallowfield et al. 2001, and Krishnamoorthy et al. 2020).

Wasserman (2019) studied the association between the primary care provider and morbidity in Arizona. Using a linear regression model it was found that the increase of primary care provider, in this case the number of medical doctor, was associated with significantly lower mortality due to all deaths, heart disease, all cancer, chronic lower respiratory diseases, and all accidents and lower morbidity due to chronic diseases, congestive heart failure, hypertension, uncontrolled diabetes, and stroke.

Respiratory tract infection is the main cause of morbidity and mortality of infectious diseases in the world. Treatment therapy for this disease includes giving antibiotic and symptomatic treatment (Dewi et al. 2020). A study conducted by Dewi et al. (2020) in Puskesmas Sungai Abang Kabupaten Tebi using healthcare facility and antibiotic use accuracy found that the presence of healthcare facility had significant effect in reducing morbidity.

Health facility utilization has strong impact in achieving the sustainable development goal (SDG) target on child survival in high mortality countries. A study carried out by Liu et al. (2019) in Malawi shows that inconsistent healthcare utilization and low service quality can cause the SDG target on health unachieved. In this case, the utilization and availability of healthcare facility can reduce mortality and morbidity.

Based on the above literature review, it was hypothesized that household access to safe sanitation, monthly per capita household health expenditure, number of medical doctors, and number of health centres (Puskesmas) and its line services had negative association with morbidity rate in districts in Indonesia.

3.   Data and Methods

Data

The data used in this study came from the Indonesia Database Policy and Economic Research (INDO-DAPOER) of the World Bank. The unit analysis was district. The observation period was 2011 and 2014. There were 496 six districts in the study that had been established in 2011. Therefore, there were 992 observations in the study. The dependent variable was the morbidity rate. The health and socioeconomic development variables included the time, household access to safe sanitation, monthly per capita household health expenditure, number of medical doctors, and number of health centres (Puskesmas) and its line services.

Methods

Univariate, bivariate, and multivariate analyses were employed in this study. Univariate analysis was carried out to assess the summary statistics of variables used in this study. These included the number of observations, mean, standard deviation, and minimum and maximum values. Bivariate analyses were done to evaluate the bivariate association between each independent variable and dependent variable through scatter diagram. A multiple regression analysis was performed to examine the join and individual effect of all independent variables on the dependent variable.

4.   Results and Discussion

The results of univariate analysis were presented in Table 2. It can be seen that there were 992 observations in the study. The morbidity rate ranged from 5.3% in Maybrat District in West Papua Province to 77.1% in Nduga District in Papua Province. Meanwhile, the percentage of households that had access to safe sanitation varied greatly from a lowest of 1.6% in Puncak District in Papua Province to a highest of almost universal, 97.2%, in Depok City in West Java Province. In addition, the lowest and highest monthly per capita household health expenditure was, respectively, Rp.514 in Yalimo District in Papua Province and Rp.84,375 in Batam City in Riau Island Province. Further, the number of doctors ranged between none in Seribu Island Administrative City of the capital special region, Jakarta, and 2,180 in Surabaya City in East Java, while the number of Puskesmas and its line services varied from only five in Barito Kuala in South Kalimantan Province to 244 in North Tapanuli District in North Sumatra. These findings reflected the inequality in health and socioeconomic development across districts in Indonesia that have impacts on morbidity variation.

Table 2 Variables, Observation, Mean, Standard Deviation, Minimum, and Maximum

Variables	Observation	Mean	Standard Deviation	Minimum	Maximum
Morbidity Rate (in %)	992	28.67	8.60	5.3	77.1

| Household Access to Safe Sanitation (in % of total Household)	992	64.23	17.81	1.6	97.2
Monthly Per Capita Household Health Expenditure (in IDR)	992	19,645.40	13,184.13	514.2	84,375.4
Number of Doctors	992	104.86	181.64	0	2,180
Number of Puskesmas and its line services	992	68.39	40.34	5	244

Source: World Bank (2022) (Authors' compilation).

The results of bivariate analyses were displayed in Figure 2 – Figure 5. It can be seen that there were negative association between the percentage of households that had access to safe sanitation, number of doctors, and number of Puskesmas and its line services with morbidity rate in districts in Indonesia. It means the higher the percentage of households that had access to safe sanitation, number of doctors, and number of Puskesmas and its line services, the lower the morbidity rate. An increase of one percent in the percentage of households that had access to safe sanitation, one doctor, and one Puskesmas and its line services in a district was associated with a decline of 0.0359%, 0.0016%, and 0.0137% in morbidity rate, respectively. Meanwhile, an increase of one rupiah in monthly per capita household health expenditure will increase of 0.00006% in morbidity rate. This is not as expected. This finding suggests that morbidity was higher in better off districts or cities in Indonesia.
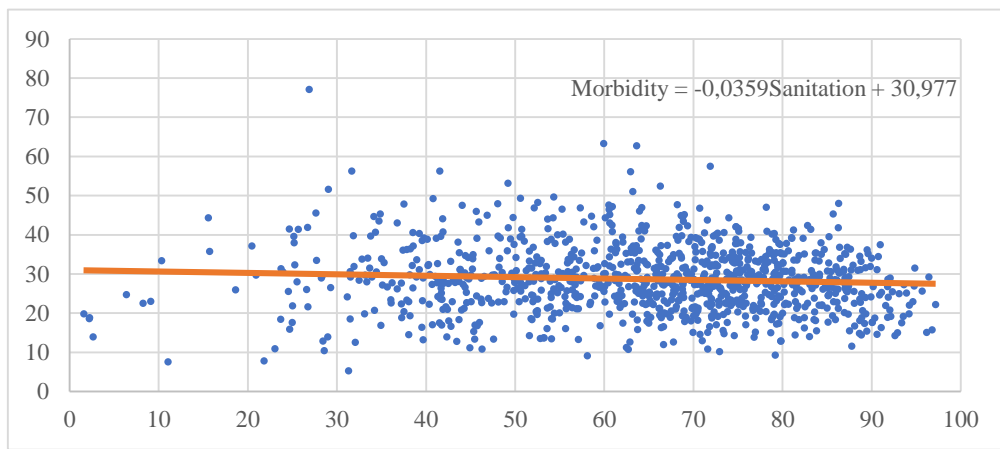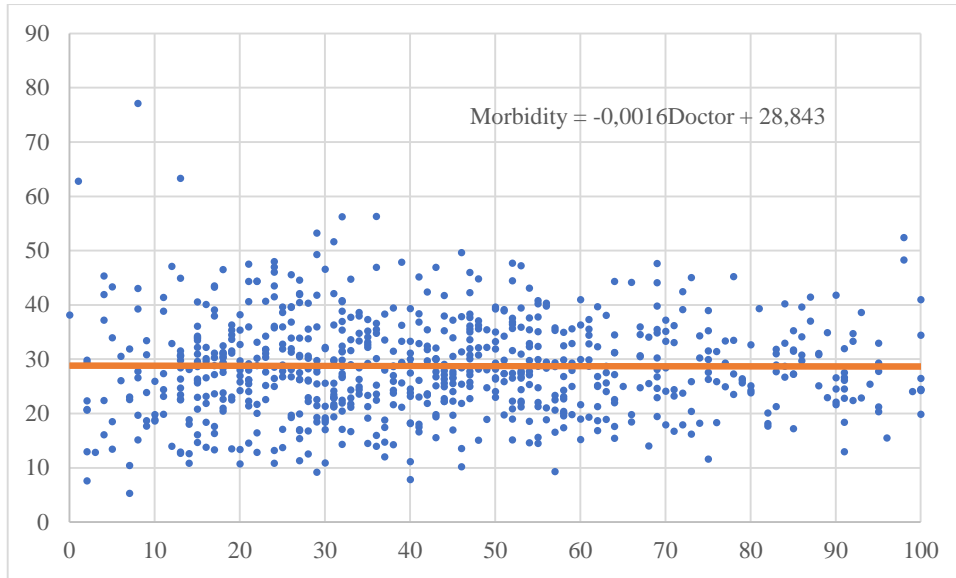

Source: World Bank (2022) (Authors' compilation).

Figure 2 Household Access to Safe Sanitation (in % of total Household) and Morbidity Rate (in %) in Districts: Indonesia 2011 and 2014
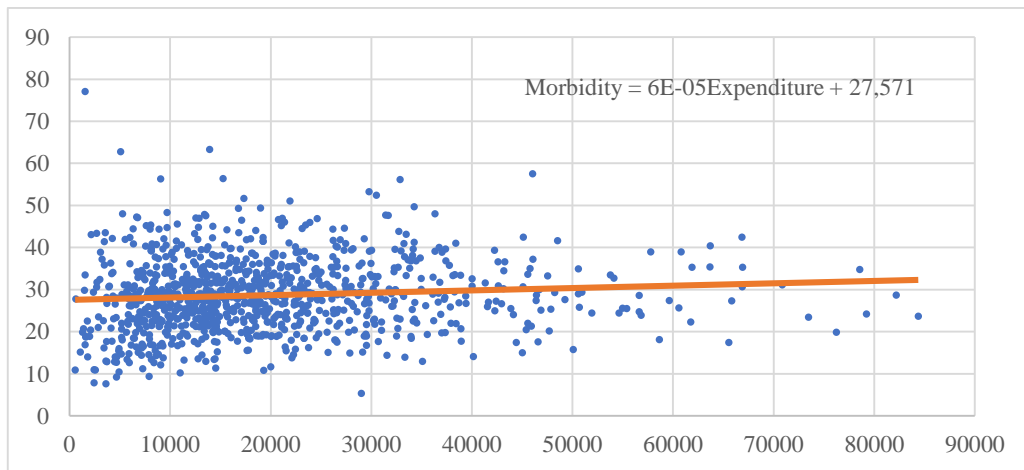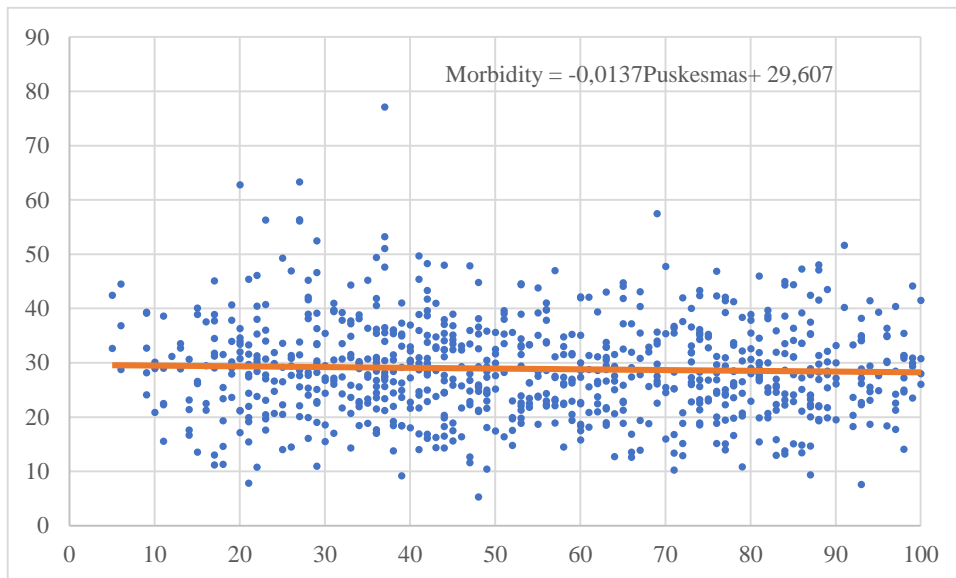

Source: World Bank (2022) (Authors' compilation).

Figure 3 Monthly Per Capita Household Health Expenditure (Rupiah) and Morbidity Rate (in %) in Districts: Indonesia 2011 and 2014

Source: World Bank (2022) (Authors' compilation).

Figure 4 Number of Doctors and Morbidity Rate (in %) in Districts: Indonesia 2011 and 2014

Source: World Bank (2022) (Authors' compilation).

Figure 5 Number of Puskesmas and Its Line Services and Morbidity Rate (in %) in Districts: Indonesiar 2011 and 2014

The results of multivariate analysis of the association between health and socioeconomic development and morbidity in districts in Indonesia were given in Table 3. It can be seen that time, household access to safe sanitation, monthly per capita household health expenditure, number of medical doctors, and number of health centres (Puskesmas) and its line services statistically and significantly were associated negatively with morbidity in districts in Indonesia.

Other things being the same, morbidity rate was lower in 2014 than in 2011. On average, morbidity rate was lower 2.12% in 2014 than in 2011. It is as expected as this indicates better health development achievement in districts in Indonesia in recent years.

Ceteris paribus, an increase of one percent in households that had access to safe sanitation was associated with a lower morbidity rate by 0.069%. It is as expected as access to safe sanitation will reduce exposure to diseases and hence lowers morbidity rate.

After controlling for the effects of other factors, an increase of one rupiah in monthly per capita household health expenditure was associated with a decline of 0.000148% in morbidity rate. It is as expected as higher monthly per capita household health expenditure allows household to access healthcare services more that can increase their protection against diseases and thus reduces morbidity rate.

Other things being the same, an increase of one medical doctor was associated with a decline in morbidity rate by 0.004%. It is expected as the presence of medical doctor can increase people's access to healthcare aid in particular during the period of having illnesses that can increase their health recovery and consequently decreases morbidity rate.

Ceteris paribus, an increase one health centre (Puskesmas) and its line services was associated with lower morbidity rate by 0.013% in districts in Indonesia. It is as expected as the existence of health centres can increase people's access to healthcare assistance when they have health problems and therefore diminishes morbidity rate.

Table 3 Coefficient, Standard Error, Statistic t, p-value, and 95% Confidence Interval of the Multiple Regression Model of the Determinants of Morbidity Rate in Districts in Indonesia: 2011 and 2014

Morbidity Rate (in %)	Coefficient	Standard Error	Statistic t	p-value	95% Confidence Interval]	
Constant	32.599	1.105	29.511	0.000	30.432	34.767
Time	-2.118	0.556	-3.812	0.000	-3.208	-1.028
Household Access to safe Sanitation (in % of total Household)	-0.069	0.017	-3.973	0.000	-0.104	-0.035
Monthly Per Capita Household Health Expenditure (in IDR)	.000148	0.000	5.769	0.000	0.0001	0.0002
Number of Doctors	-0.004	0.002	-2.346	0.019	-0.007	-0.001
Number of Puskesmas and its line services	-0.013	0.007	-2.013	0.044	-0.026	0.000

Source: World Bank (2022) (Authors' compilation).

Note: $R^2 = 0.048$; F-statistic = 10.025; Sig.=0.000.

5. Conclusion

This study examined the association between health and socioeconomic development in districts in Indonesia. The results of this study found that time, household access to safe sanitation, monthly per capita household health expenditure, number of medical doctors, and number of health centres (Puskesmas) and its line services statistically and significantly influenced morbidity negatively in districts in Indonesia. This means that higher household access to safe sanitation, monthly per capita household health expenditure, number of medical doctors, and number of health centres (Puskesmas) and its line services was associated with lower morbidity rate.

The findings from this study confirm the findings from the previous studies on the role of health and socioeconomic development in morbidity reduction (e.g. Jung et al. 2017a; Lu et al. 2019; Wasserman 2019; Dewi et al. 2020). Therefore, in order to reduce morbidity in districts in Indonesia, the regional government should improve household access to safe sanitation, monthly per capita household health expenditure, number of medical doctors, and number of health centres (Puskesmas) and its line services in their districts.

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