The Impact of Socioeconomic and Behavioral Factors on Health Indicators in OIC Countries

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Abstract. Health sector indicators are important basis of determining the overall state of a nation's wealth and welfare. Apart from this broad and conventional perspective on the role of health, in many Islamic countries, health is also part of objective of 'maqashid sharia' that needs to be maintained to sustain life. Accordingly, countries invest substantial share of national resources to sustain critical health systems. Notwithstanding these commitments, health service delivery remains a major challenge in these countries, as indicated by the low average life expectancy and the high mortality rate caused by communicable diseases. This study aims to describe and analyze the factors influencing health outcomes, namely life expectancy and mortality rate, in Muslim countries using secondary data from 46 OIC countries from 2010-2018. Employing panel data estimation, the study finds evidence suggesting the important role of a nation's wealth, health expenditure, educational achievement and the prevalence of smoking as important determinants of life expectancy in OIC countries. In particular, the results show that high incidence of communicable diseases in countries with lower than mean years of schooling and those with significantly wide prevalence of smoking habits may have contributed to high mortality in these countries.

Key words: Education, inequality, life expectancy, mortality rates, smoking behavior.

Abstrak. *Kesehatan merupakan komponen penting dalam menilai kemajuan pembangunan suatu bangsa dan merupakan salah satu maqashid syariah yang harus dijaga untuk menjalankan kehidupan. Namun, rendahnya rata-rata angka harapan hidup (AHH) dan tingginya angka kematian akibat penyakit menular (AKPM) menunjukkan bahwa masalah kesehatan masih ada di negara-negara anggota Organisasi Kerja Sama Islam (OKI). Data sekunder yang digunakan dalam penelitian ini berasal dari 46 negara OKI dari tahun 2010 hingga 2018. Tujuan dari penelitian ini adalah untuk memberikan gambaran umum dan menganalisis faktor-faktor yang memengaruhi indikator kesehatan di negara-negara tersebut. Analisis deskriptif dan inferensia menggunakan regresi data panel digunakan. Hasil estimasi dalam penelitian ini menunjukkan bahwa Produk Domestik Bruto (PDB), pengeluaran di bidang kesehatan, rata-rata lama sekolah dan perilaku merokok berpengaruh signifikan terhadap AHH di negara OKI. Adapun faktor yang berpengaruh signifikan terhadap AKPM di negara OKI yaitu rata-rata lama sekolah dan perilaku merokok.*

Kata Kunci: *Angka Harapan Hidup, kesenjangan, pendidikan, perilaku merokok, tingkat kematian.*

INTRODUCTION

Health is a dynamic, progressive and continuous condition that is not fixated on the state of health or illness at a given point in time (Notoatmodjo, 2008). The World Health Organization (WHO) recognizes this dynamic attribute of a nation's state of health. It defines health as a condition of the physical, mental and social system which is unity and not only free from disease or disability (WHO,

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2003). In this case, the economic dimension is also closely related to a person's health condition. Improving the health and longevity of the population is generally considered an end in itself, and also a fundamental goal of economic development. For this reason, health has an essential role in assessing the progress of a nation's development (Vongsaroj, 2004). According to Bloom et al. (2004), good health has a positive and significant impact statistically on economic growth because the quality of a person's health affects work productivity. As for higher incomes, both individually and nationally, economic growth also affects health outcomes because it will impact the increasing demand and supply of health services (WHO, 2008).

In addition, according to the perspective of Islam, health is the second greatest gift from God after faith (Al-Khayat, 2004). Health is the principal capital for Muslims to carry out life, including worship obligations (Nurhayati and Fitriyana, 2020). In this case, health is also an integral part of maqashid sharia, three of which are related, namely the obligation to maintain life (*hifzu al-nafs*), intellect (*hifzu al-'aql*) and lineage (*hifzu al-nasl*) (Shihab, 2007).

One of the leading indicators that can be used to assess the population's health status can be seen from life expectancy (Mahumud et al., 2013). However, the problem regarding the low life expectancy still occurs in several countries in the world, one of which is in member countries of the Organization of Islamic Cooperation (OIC). This statement can be proven in the data stated in the World Development Indicators (WDI), which shows that life expectancy in OIC countries is still below the average for non-OIC countries and the world. From 2010 to 2018, the average life expectancy age in 57 OIC countries is only 68 years. Meanwhile, the average life expectancy in non-OIC countries and the world has reached the age of 73 and 72 years.

In addition, based on Henrik L. Blum's theory, the population's health status can also be seen in the mortality and morbidity in the region (Karisoh et al., 2020). This statement also aims at OIC countries with relatively high mortality rates due to communicable diseases (Kemenkes, 2019). The process of communicable diseases is caused by interactions between disease agents (living microorganisms such as viruses, bacteria, fungi, and parasites), humans and the environment (Darmawan, 2016). In 2015, communicable diseases accounted for 30% of the mortality rate in OIC countries. This figure far exceeds the death rate in non-OIC developing countries and the world by 24% and 22%, respectively (RMOL.ID, 2018). The types of communicable diseases studied included eight diseases that cause the highest mortality in the world: respiratory tract infections, lower back, diarrhoea, tuberculosis, measles, tetanus, malaria, meningitis and HIV/AIDS.

For this reason, health issues are one of the main concerns in Sustainable Development Goals (SDGs) number 3, which aims to create a healthy life and prosperity for everyone of all ages (WHO, 2022). One of the efforts to make things happen is through strengthening the health system, which must also refer to several factors that are considered important in influencing the health of people around the world by analyzing the determinants of health. Dahlgren and Whitehead (1991) describe the social determinants of health at various levels in the eco-social model of health. In this case, service health is not the only determinant of health but only one of many factors that affect the health of individuals and populations. This statement is, of course, related to health indicators in general and socioeconomic status, including political, economic, social, technological and environmental conditions (Kamiya, 2010).

According to As-Syatibi, the benefit can be realized if the five main elements in maqashid sharia can be maintained. Based on the model of Dahlgren and Whitehead (1991), four factors can represent whether a population has realized the maintenance of maqashid sharia and can determine the health quality of a population. The four factors include behaviour and lifestyle, social and community influences, structural factors, and macro conditions and policies. However, the representation of these factors still shows the existence of various problems such as high levels of tobacco consumption, economic instability, low education index and limited access to health services.

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Despite commitments and resources allocated for health improvement, inconsistencies remain in health achievements across OIC countries. This paradox highlights the potential influence of various socioeconomic and behavioral determinants. Previous studies suggest that variables such as income level, public health spending, education, and smoking behavior can play significant roles in shaping health outcomes (Vongsaroj, 2004; Or, 2000; Kamiya, 2010). Nonetheless, empirical research focusing on OIC countries remains limited. Therefore, this study aims to describe the general condition of socioeconomic and behavioral health determinants in OIC countries and to analyze the extent to which GDP per capita, health expenditure, educational attainment, and smoking behavior influence life expectancy and mortality rates from communicable diseases. By focusing on these specific variables, the study intends to provide a sharper understanding of key health determinants in the Islamic world context health determinants in the Islamic world context.

LITERATURE REVIEW

Health and Maqashid Sharia

Etymologically, maqashid shari'ah consists of two words, namely maqashid and shari'ah. Maqashid has something, intention and purpose, while shari'ah has the meaning of a path to water sources or can also be interpreted as a path to the primary sources of justice. As for the term, maqashid shari'ah, the values and objectives of the law that star in the most significant part of its laws (Al-Qardhawi, 2007). Meanwhile, Asy-Syatibi (2014) argues that maqashid shari'ah aims to realize human benefit in the world and the hereafter. In this case, the benefit is defined as everything related to the sustenance and fulfilment of human life (Edwin and Aprianto, 2017). The benefit of maqashid shari'ah consists of different levels. The first level is *dharuriyat* which is the leading and essential date. The second level is *hajiyat*, which includes everything needed to support the main event. Then the last level, *tahsiniyat*, is a refinement that completes the first and second levels (Al-Qardhawi, 1999).

The recommended rules in Islam in maintaining health following maqashid shari'ah criteria identifies some primary consideration, integrity and other supporting elements (Edwin and Aprianto, 2017). According to al-Zuhaili (1997), maqashid shari'ah must refer to five main benefits consisting of maintaining religion (*hifz al-din*), guarding the soul (*hifz al-nafs*), maintaining reason (*hifz al-'aql*), guarding offspring (*hifz al-nasl*) and guarding property (*hifz al-maal*) at every level. Three of the five benefits are directly related to health maintenance, namely guarding the soul (*hifz al-nafs*), maintaining reason (*hifz al-'aql*) and guarding offspring (*hifz al-nasl*) (Shihab, 2007). In this case, Islamic law provides information on maintaining health or avoiding disease, maintaining cleanliness broadly, and so on (Halimang, 2016).

Social Determinants of Health

According to WHO (2013), social determinants of health are conditions in which people are born, live, grow, work, and grow old, including the health system of an individual. These conditions are often determined by the distribution of money, power, and resources at various global, national and local levels. For this reason, the conceptual framework for the determinants of health that is widely recognized is the level of individual health and the distribution of health determined by many factors at various levels.

In the eco-social theory of health, Dahlgren and Whitehead (1991) state that many factors influencing an individual's health or disease exist in several environmental layers. However, most of these health determinants are modifiable factors. Figure 1 shows that the health position of the individual who wants to improve lies at the centre, along with constitutional factors (genes) and microenvironmental systems. The model of the eco-social determinants of health can be seen in Figure 1.

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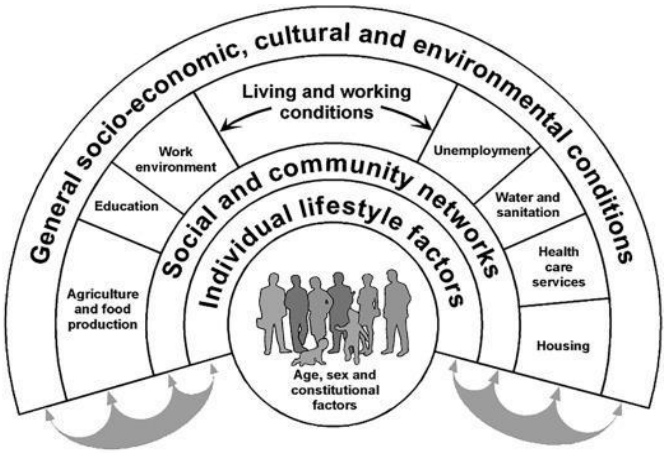

Source: Dahlgren and Whitehead, 1991.

Figure 1 Dahlgren and Whitehead's model of eco-social determinants of health (1991)

The first layer is also called the micro level or downstream. Health determinants in this layer include individual behaviours and lifestyles that enhance or harm health, such as smoking. In this case, constitutional genetic factors will interact with environmental exposures, showing the individual's strength in dealing with environmental exposures. In addition, individual behaviour and characteristics are influenced by family upbringing, friendships, and norms in the community. In the second layer (Meso level), the determinants of health consist of social and community influences, which include community norms, values, community institutions, social capital, and social networks. At the community level, social factors can impact community members differently: providing practical health support or vice versa (Dahlgren and Whitehead, 1991).

The Exo level's third layer includes structural factors consisting of the residential environment, food availability, energy, conditions in the workplace, clean water supply and environmental sanitation, access to quality health services, and access to quality education and employment opportunities. The outermost layer, called the macro or upstream level, covers various macro socioeconomic, cultural, political, and physical conditions and policies. In addition, macro factors included in this layer are public policy, social stability, economy, politics, international relations or global partnerships, investment in economic development, war or peace, climate change and weather, eco-systems and natural disasters either occur naturally or as a result of human factors (Dahlgren and Whitehead, 1991).

Based on the description of Dahlgren and Whitehead's (1991) model of eco-social determinants of health, several factors related to this research are as follows.

a. Gross Domestic Product

According to BPS (2022), Gross Domestic Product (GDP) is one of the essential indicators to know economic conditions in a country in a certain period. Norton (2002) stated that if GDP per capita growth is high, there are many better jobs and higher income levels. Even income will impact better health levels (Arka and Yasa, 2015). Accounting for this income effect on health outcomes require adjusting the GDP values to reflect units that are comparable across countries. Broadly, GDP is the amount of added value generated by all business units in a particular country or the total value of final goods and services produced by all economic units (BPS, 2022). From national GDP values, per capita GDP values are calculated by dividing a country's income by population at mid-year (Handayani et al., 2016). GDP per capita figures are further adjusted for currencies' purchasing power variations in each country to obtain comparable Purchasing Power Parity (PPP) values.

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b. Health Expenditure

Widodo et al. (2011) stated that there are at least two sectors that need to be considered by the government in order to be able to create decent living conditions for the population, one of which is health. In economics, the health sector has an essential role in sustainable development because it affects the productivity of human resources. Improving the quality of health can be realized through the allocation of government spending in the sector. For this reason, the allocative role is the role of the government, which is essential in promoting the welfare and prosperity of the country (Heka et al., 2017). Through this role, the government can allocate existing economic resources, especially in the fiscal management of the health sector, to be optimal and efficient.

Government spending on the health sector is also used to fulfil one of the fundamental rights of the community to obtain health services in the form of facilities and infrastructure (Todaro and Smith, 2003). With the fulfilment of this allocation, it is expected to improve population productivity (Darmayanti and Rustariyuni, 2019). Increased productivity, in turn, can increase human development, impacting life expectancy and suppressing mortality rates.

c. Education

The education sector has a significant role in shaping a country's ability to absorb modern technology and develop production capacity to create sustainable growth and development (Todaro and Smith, 2003). For this reason, education is one of the primary elements of human capital that must be met to achieve national development goals (Darmayanti and Rustariyuni, 2019). According to Sriyono (2015), there is a reasonably close relationship between education and health. In this case, education is a means used by an individual to be able to gain an understanding of health awareness.

Bilas et al. (2014) stated that countries with less advanced education and health care systems experience more difficulty achieving sustainable development. His research also shows that the level of education completed affects life expectancy. In this case, the length of education taken is one of the determining factors in the high and low life expectancy (Sirait, 2022). For this reason, the length of education time taken can indicate the quality of public education in an area (BPS 2022). The assumption is that the higher the level of education a person takes, the higher the quality of human resources, both in terms of mindset and patterns of action, especially those related to health (Wasista, 2020).

d. Social Gap

The level of inequality is considered relatively dangerous (Syawie, 2011). The impact that can occur from inequality is unequal access to economic resources. The problem of inequality is a problem of justice related to social problems, including the problem of poverty. The level of poverty is not just a problem of lack of food but has reached the worst stage where there is a shortage and scarcity of food. Many people succumb to suffering from hunger and malnutrition, which ultimately leads to premature death (Syawie, 2011). For this reason, poverty due to social inequality can affect a person's life expectancy and death rate.

The level of inequality in an area can be seen from the Gini index (Gini ratio), which is based on the Lorenz curve. This cumulative expenditure curve compares the distribution of a particular variable (e.g. income) with a uniform distribution representing a cumulative percentage population. The size of the Gini index as a measure of income distribution has a range of values between 0 to 1. If the Gini index is close to zero, it indicates the presence of low inequality. On the other hand, if the Gini index is close to one, it shows a high inequality (BPS, 2022).

e. Unemployment Rate

Unemployment is the labour force that does not get the desired job but is actively looking for work at a certain wage level (Sukirno, 2004). It is one of the main problems faced by several countries because it involves social problems and affects economic growth in a country. Several factors can cause unemployment, including economic conditions, government

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policies, low education, lack of skills, and limited employment opportunities (Ishak, 2018).

Unemployment is also often a form of social and material exclusion, which can affect mental health (Jumhur, 2020). This statement is proven through a series of studies conducted by Noordt et al. (2014), which states that there is a significant relationship between unemployment and health problems, one of which is a bad mental state due to emotional stress. Therefore, apart from impacting the economy and the environment, unemployment also directly or indirectly impacts health. The form of indirect influence results from the relationship between unemployment and poverty. The higher the number of unemployed, the more people find it challenging to meet their needs due to limited income, so they are on the poverty line (Fitri and Junaidi, 2016). These needs cover all types of needs, including the need for health services.

f. Smoking Behavior

Smoking has a detrimental impact on health. Various diseases can be caused by this behaviour, namely cancer, bronchitis or inflammation of the throat branch, and coronary heart disease (Hammado, 2014; Herawardhani et al., 2021). This implication happens because of cigarettes' many harmful chemical compounds, such as cyanide, tar, arsenic, benzene, and other harmful compounds (Herawardhani et al., 2021). In addition to active smokers, passive smokers also can feel the same impact due to exposure to cigarette smoke around them. In fact, the smoke inhaled by passive smokers is more dangerous than the smoke inhaled by active smokers (FK UI, 2019).

Smoking habits have polluted various circles. Several factors can influence the transmission of these habits, including peer pressure, low socioeconomic status and being in an active smoker environment (Damang et al., 2019). Habits that are addictive (addiction) can form a person's bad character, one of which is egoism. It can be proven by the number of active smokers in public places, which can endanger the people around them (Hammado, 2014).

METHOD

Descriptive and inferential analysis was carried out through the panel data regression method to describe the general overview and analyze the influencing socioeconomic factors on health indicators in the OIC countries. The data used in this study is secondary data obtained from the World Development Indicators (WDI) and the World Health Organization (WHO). The data is in the form of panel data consisting of cross-section data from 46 OIC countries (Albania, Algeria, Azerbaijan, Bangladesh, Benin, Burkina Faso, Cameroon, Chad, Comoros, Ivory Coast, Djibouti, Egypt, Gabon, Gambia, Guinea, Guinea-Bissau, Guyana, Indonesia, Iran, Iraq, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Malaysia, Maldives, Mali, Mauritania, Morocco, Mozambique, Niger, Nigeria, Pakistan, Qatar, Saudi Arabia, Senegal, Sudan, Suriname, Tajikistan, Togo, Tunisia, Turkey, Turkmenistan, Uganda and the United Arab Emirates) and time series data for 9 years from 2010 to 2018. Due to data availability constraints, this study did not include the other 11 OIC countries (Bahrain, Brunei Darussalam, Kuwait, Libya, Oman, Palestine, Somalia, Syria, Yemen, Sierra Leone and Afghanistan).

The dependent variables used to measure health outcomes are life expectancy at birth (LEB) and mortality rate from communicable diseases (MRCD). Life expectancy is widely regarded as a summary measure of the overall health of a population, while the mortality rate from communicable diseases directly reflects public health infrastructure and behavioral risk exposure. To identify the socioeconomic and behavioral determinants that influence these indicators, this study includes six explanatory variables: GDP per capita (log-transformed), health expenditure as a percentage of GDP, mean years of schooling, Gini Index (as a measure of income inequality), unemployment rate, and smoking behavior.

Each independent variable is grounded in theory and empirical literature. Higher GDP per capita is expected to improve health outcomes as economic prosperity enhances access to better nutrition,

AL-MUZARA'AH Vol. 13 No. 1, 2025
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housing, and healthcare services (Kamiya, 2010). Health expenditure, which represents the government's financial commitment to the health sector, is assumed to contribute positively to life expectancy and reduce disease-specific mortality (Or, 2000). Education, measured by average years of schooling, is linked to increased health awareness and improved health behaviors, which in turn lead to longer life expectancy and reduced vulnerability to diseases (Vongsaroj, 2004).

The Gini Index captures income inequality, which can negatively affect health by limiting access to healthcare for disadvantaged groups (WHO, 2008). The unemployment rate is another relevant indicator, as it is frequently associated with economic stress, mental health challenges, and reduced access to health resources (Noordt et al., 2014). Lastly, smoking behavior is included as a proxy for behavioral risk. The detrimental effects of smoking on both chronic and infectious diseases are well documented and consistently linked to lower life expectancy and higher mortality rates (WHO, 2022). To empirically test the influence of these variables on health outcomes, the study estimates two panel regression models:

Model 1: Life Expectancy (LIFE)

$$LIFE_{it} = \alpha + \beta_1 LN\_GDP_{it} + \beta_2 HEXP_{it} + \beta_3 SCH_{it} + \beta_4 GINI_{it} + \beta_5 UNEMP_{it} + \beta_7 SMOKE_{it} + \varepsilon_{it}$$

Model 2: Mortality Rate caused by Communicable Diseases (MCD)

$$MRCD_{it} = \alpha + \beta_1 LN\_GDP_{it} + \beta_2 HEXP_{it} + \beta_3 SCH_{it} + \beta_4 GINI_{it} + \beta_5 UNEMP_{it} + \beta_7 SMOKE_{it} + \varepsilon_{it}$$

Where i represents each country, t denotes the year, and ε_{it} is the error term.

The study applied three common panel models: the Common Effect Model (CEM), the Fixed Effect Model (FEM), and the Random Effect Model (REM). To determine the most appropriate specification, the Chow test was used to compare CEM and FEM, while the Hausman test was conducted to distinguish between FEM and REM. Based on the Chow test and Hausman test, both the model for both the first model (life expectancy) and the second model (mortality rate caused by communicable disease) shows a value of the probability of 0.0000 or less than the level of significance = 0.05, which means there is sufficient evidence for reject H_0 so that the best model used in this study is FEM.

To ensure the validity of the estimation results, classical assumption tests were performed. Multicollinearity was tested through the correlation matrix approach, where correlation coefficients above 0.8 would indicate potential collinearity problems (Gujarati, 2004). Heteroskedasticity was tested using the Glejser method. The normality test was deemed unnecessary based on the Best Linear Unbiased Estimator (BLUE) theorem, which asserts that with large samples ($n > 30$), non-normality does not bias the regression results (Basuki, 2015). Additionally, given the nature of panel data that is dominated by cross-sectional units, the autocorrelation test was not conducted, in line with the recommendation from Gujarati (2003).

Based on theoretical frameworks and empirical literature, the the study proposes the following hypotheses:

- H1**:** GDP per capita is positively associated with life expectancy and negatively associated with the mortality rate caused by communicable diseases.
- H2: Health expenditure (% of GDP) has a positive effect on life expectancy and a negative effect on the mortality rate caused by communicable diseases.
- H3: Mean years of schooling has a positive effect on life expectancy and a negative effect on the mortality rate from communicable diseases.
- H4: Income inequality (Gini Index) is negatively associated with life expectancy and positively associated with the mortality rate caused by communicable diseases.
- H5: Unemployment rate negatively influences life expectancy and positively influences the mortality rate caused by communicable diseases.
- H6: Smoking behavior is negatively associated with life expectancy and positively associated with the mortality rate caused by communicable diseases.

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RESULTS AND DISCUSSION

Overview of Socio-Economic Factors Affecting Health Performance in OIC Countries

The Organization of Islamic Cooperation (OIC) is the second largest international organization after the United Nations (UN). The OIC comprises 57 countries with a majority Muslim population, mainly in Asia and Africa. However, most OIC member countries are categorized as developing countries (SESRIC, 2014; Kemen PPPA, 2016). The parameters for grouping developed and developing countries according to the United Nations Development Program (UNDP) can be seen from several criteria, including education level, per capita income, livelihood, population growth, job opportunities, health level and mastery of technology.

Based on the income level, the United Nations classifies developing countries into three groups: the poorest or least developed countries, developing nations and rich countries (oil exporters). Some of the OIC member countries included in these criteria can be seen in Table 1.

Table 1 Classification of developing countries according to the United Nations

Category	Country	Continent
Least Developed	Benin, Burkina Faso, Chad, Djibouti, Gambia, Guinea, Guinea-Bissau, Comoros, Mali, Mauritania, Mozambique, Niger, Senegal, Sierra Leone, Somalia, Sudan, Togo, Uganda, Afghanistan, Bangladesh and Yemen	Africa
Developing Nation	Indonesia, Kazakhstan, Kyrgyzstan, Azerbaijan, Bahrain, Brunei Darussalam, Lebanon, Maldives, Malaysia, Oman, Pakistan, Syria, Tajikistan, Turkmenistan, Uzbekistan and Jordan	Asia
	Albania and Turkey	Europe
	Guyana and Suriname	America
	Cameroon, Morocco, Egypt, Ivory Coast and Tunisia	Africa
Oil Exporters	Saudi Arabia, United Arab Emirates, Iraq, Kuwait, Iran, Qatar	Asia
	Nigeria, Algeria, Libya, Gabon	Africa

In this case, the economic condition in a country is closely related to its population's level of welfare, including health. This is also indicative of problems in health indicators that occur in several OIC countries, including low life expectancy and high mortality rates caused by communicable diseases. Several factors are thought to influence these health indicators, as explained in the following sections.

Gross Domestic Product (GDP)

According to the OIC Economic Outlook (2014), the primary sector that contributed as an added value to GDP in the OIC countries from 2010 to 2012 was the agricultural sector, with a total GDP of 45.8%, 44.3% and 44.7%, respectively. In addition, it is supported by the industrial sector (non-manufacturing) with a total percentage of GDP of 29.1%, 31.0% and 31.6%, respectively. The other two sectors, the industrial sector (manufacturing) and the service sector, only contributed under 15% of GDP.

AL-MUZARA'AH Vol. 13 No. 1, 2025
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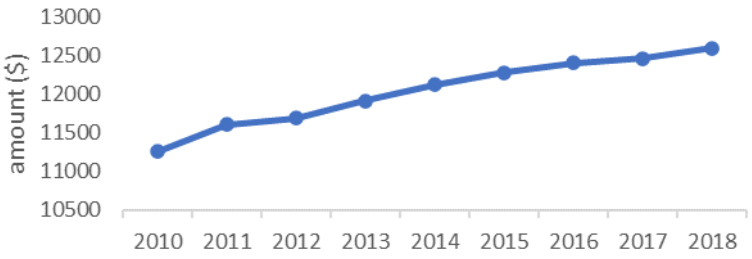


Source: WDI, 2022.

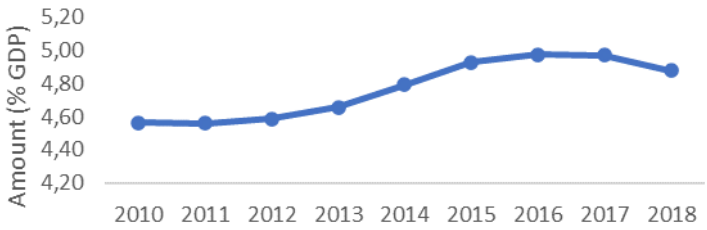
Figure 2 Average real GDP per capita constant (2017) OIC countries 2010-2018

Based on Figure 2, the average real GDP per capita of 46 OIC countries from 2010 to 2018 has increased yearly. The total real GDP per capita in 2010 was $11,258.61, increasing to $12,598.5 in 2018. The country with the highest average real GDP per capita from 2010 to 2018 was owned by Qatar, which was $95,185.68. This fact is due to the high income the Organization of the Petroleum Exporting Countries (OPEC) member countries receive, especially from oil and gas mining products. Therefore, Qatar is categorized as a high-income country and even one of the ten wealthiest countries in the world, assessed by gross national income (World Population Review, 2022).

The country with the lowest average GDP is Niger, with a total of $1,112,551. The country is classified as one of the poorest Muslim-majority countries in the world because it has a landlocked geographical condition on the African continent. In addition, food insecurity, lack of industry, high population growth, and a weak education sector have made Niger the second least developed country after Sierra Leone in the United Nations in 2016 (Arbar, 2021).

Health Expenditure

Based on data obtained from WDI, the average expenditure in the health sector in 46 OIC countries show significant variation between countries in the period ranging 2010 to 2018. In 2010, the average total expenditure was 4.57%, which decreased to 4.56% in 2011. However, there was an increase again by 0.03% in 2012 to 4.59%. This expenditure continued to increase until 2016, which was the highest peak of 4.98%, but in the end, it decreased again in 2017 to 4.97% and 4.88% in 2018. The three countries with the highest total expenditure owned the Maldives (8.55%), Lebanon (7.67%) and Jordan 7.65%.



Source: WDI, 2022.

Figure 3 Average health expenditure in the OIC countries in 2010-2018

The country with the lowest expenditure is Qatar (2.4%), due to the excellent quality of health system services in the country (one of which is by providing access to free medical treatment for the community), making Qatar categorized as the healthiest country according to 24/7 Wall St. For this reason, the death rate in Qatar is very low (Varma et al., 2022). This preliminary evidence is suggestive of the declining health expenditures faced by countries as they attain advanced levels of health and medical advancement.

AL-MUZARA'AH Vol. 13 No. 1, 2025
(ISSN p: 2337-6333; e: 2615-7659)
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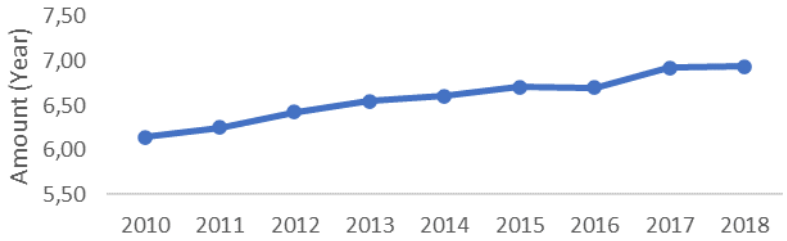
Mean Years of Schooling

Figure 4 shows that the average length of schooling in 46 OIC countries from 2010 to 2018 has increased every year, except in 2016. In 2010, the average length of schooling undertaken by residents in the OIC countries was 6.15 years which then continued to increase to 6.71 years in 2015. However, there was a decline even though it was only 0.01 years in 2016 to 6.70 years. After that, the increase again occurred in 2017 and 2018, which were 6.92 and 6.94 years, respectively.



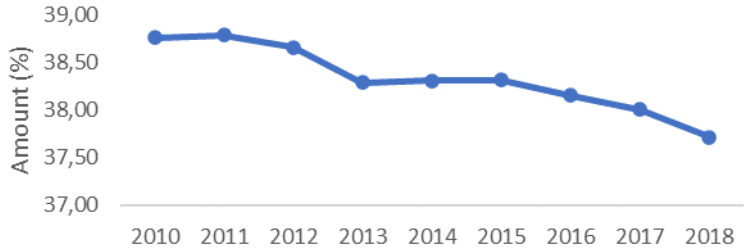
Source: WDI, 2022.

Figure 4 Average mean years of schooling of OIC countries in 2010-2018

Kazakhstan has the highest average number of years of schooling (11.68 years) due to a ten-year compulsory education program, starting from 7 to 17 years old. Meanwhile, the country with the lowest average number is Burkina Faso, which is only 1.43 years. The high education cost relative to low per capita incomes is why many children drop out of school in Burkina Faso. Thus, the percentage of adults who can read and complete secondary education is deficient (Utami, 2022).

Gini Index

Based on Figure 5, the average Gini index of 46 OIC countries has fluctuated from 2010 to 2018, even though it has seen quite a decline. In 2010 inequality in the OIC countries decreased from 38.76% to 38.29% in 2013. However, in 2014 and 2015, it increased again to 38.31% and 38.32%, respectively. In the end, the average Gini index in 2018 again declined to the lowest point of inequality, which was 37.72%.



Source: WDI, 2022.

Figure 5 Average Gini index for OIC countries in 2010-2018

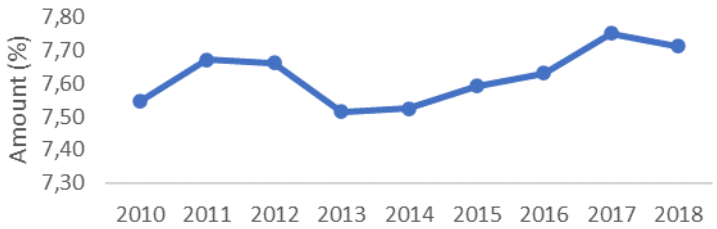
The country with the highest Gini index is Suriname, with a value of 57.9%. The high rate of inequality was caused by the economic crisis in 2016, such as the decline in global commodity prices, high inflation rates and the drastic decline in gold and oil prices as primary export commodities (Nursya'bani and Nursakilah, 2016).

Unemployment Rate

The average unemployment rate of 46 OIC countries in Figure 6 shows substantive fluctuations between 2010 and 2018. In this case, an early peak in unemployment was realized in 2011 with

AL-MUZARA'AH Vol. 13 No. 1, 2025
(ISSN p: 2337-6333; e: 2615-7659)
DOI: 10.29244/jam.13.1.27-46

7.67%, before a subsequent increase occurred again from 2014 to 2017, resulting in a higher peak at 7.75%. However, in the end, average unemployment rate again decreased in 2018 to 7.71%.

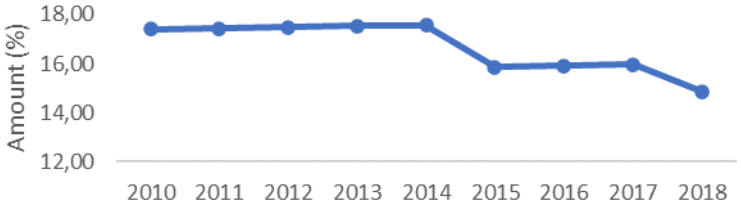


Source: WDI, 2022.

Figure 6 Average unemployment rate of OIC countries in 2010-2018

The country with the highest unemployment rate is Djibouti with 26.52%. The high percentage is caused by various factors that influence each other, including the very dry climate factor due to natural conditions, which generally consist of plateaus and lowlands (resulting in limited natural resources), resulting in minimal development of the industrial and agricultural sectors. In addition, kills deficiency and skills mismatch are factors that contributed to the high unemployment rates in this country (Annur, 2022). Therefore, Djibouti is included in the top ten countries with the highest number of unemployed in the world (World Population Review, 2022). In the contrast, economic successes of Qatar has made it possible for the country to sustain lower rates on unemployment at 0.28%.

Smoking Behavior



Source: WDI, 2022.

Figure 7 Average tobacco consumption in OIC countries in 2010-2018

Based on data obtained from WDI, the average level of tobacco consumption that that is used to measure smoking behaviour in 46 OIC countries from 2010 to 2018 is characterized by both cross sectional and over time variations. Total share of tobacco-consuming population in the first four years increased yearly from 17.40% in 2010 to 17.57% in 2014. However, in 2015 there was a significant decline to 15.86%. The increase again occurred in 2016 and 2017, but in the end, it decreased again to 14.85% in 2018. The three countries with the highest incidence of tobacco consumption are Bangladesh, which is 41.32%, followed by Lebanon and Indonesia, with 38.89% and 36.53%, respectively. In this case, Bangladesh and Indonesia are included in the three countries with the highest tobacco industry interference index in Asia and Japan (Pratomo, 2018).

Panel Data Regression Analysis

Classical assumption test result

a. Multicollinearity test

Multicollinearity is a condition in the regression model in which the relationship or correlation is relatively high between the independent variables. Data is free from multicollinearity if each variable has a coefficient value less than 0.8.

AL-MUZARA'AH Vol. 13 No. 1, 2025
(ISSN p: 2337-6333; e: 2615-7659)
DOI: 10.29244/jam.13.1.27-46.

Table 2 Multicollinearity test results in the research of the impact of socioeconomic and behavioral factors on health indicators in OIC countries

	LN_GDP	HELP	SCH	GINI	UNEP	SMOKE
LN_GDP	1.000	-0.068	0.754	-0.128	0.140	0.198
HEXP	-0.068	1.000	0.090	0.034	0.147	0.158
SCH	0.754	0.090	1.000	-0.259	0.102	0.272
GINI	-0.128	0.034	-0.259	1.000	-0.100	-0.344
UNEP	0.140	0.147	0.102	-0.100	1.000	-0.043
SMOKE	0.198	0.158	0.272	-0.344	-0.043	1.000

Source: Authors, 2024 (processed data).

Based on the estimation results in the two models shown in Table 2, each variable has a correlation coefficient value of < 0.8. So it can be concluded that each variable does not have any relationship with the other in the first model (life expectancy) and the second model (mortality rate caused by communicable disease) so that it is free from multicollinearity constraints.

b. Heteroscedasticity test

One of the heteroscedasticity problems can be identified through the Glejser test. Glejser Test is done by regressing the independent variables to the absolute value of the residual (Gujarati, 2004).

Table 3 Glesjer test results in the research of the impact of socioeconomic and behavioral factors on health indicators in OIC countries

Variable	**Life Expectancy**	**Mortality Caused by Communicable Disease**
	Prob. Value	**Prob. Value**
C	0.387	0.808
LN_GDP	0.647	0.932
HEXP	0.390	0.562
SCH	0.406	0.521
GINI	0.830	0.080
UNEP	0.054	0.167
SMOKE	0.090	0.072

Source: Authors, 2024 (processed data).

Table 3 shows that all variables are suitable in the first model (life expectancy). The second model (mortality rate caused by communicable disease) has a probability value greater than 0.05. Therefore, there is sufficient evidence to accept H_0 so that it can be concluded that there is no heteroscedasticity problem in both models.

Model feasibility test

a. F statistic test

The F statistical test (simultaneous) was used to test the model's feasibility and the parameters' overall regression. Based on the results of the regression on the Fixed Effect Model (FEM), both the first model (life expectancy) and the second model (mortality rate caused by communicable disease) show a probability value of F statistic of 0.000, which is smaller than the significance level of 0.05, meaning that all independent variables used in the study simultaneously had a significant effect on the two dependent variables are life expectancy and mortality caused by a communicable disease.

b. t statistic test

Based on the Fixed Effect Model (FEM) regression results, the variables that have a significant effect in the first model (life expectancy), namely LN_GDP, HEXP, SCH and SMOKE. Meanwhile, the variables GINI and UNEMP have no significant effect because they have a probability value above 0.05. The variables that have a negative relationship are the Gini index and unemployment rate, and the rest has a positive relationship with life expectancy.

AL-MUZARA'AH Vol. 13 No. 1, 2025
(ISSN p: 2337-6333; e: 2615-7659)
DOI: 10.29244/jam.13.1.27-46

In the second model (mortality rate caused by communicable disease), the variables SCH and SMOKE significantly affect mortality caused by communicable disease because they have a probability value below the level significantly = 0.05. In contrast, the LN_GDP, HEXP, GINI and UNEMP variables have no significant effect. Therefore, the two variables with positive coefficient values are only HEXP and SMOKE, and the rest has a negative coefficient value which means it is negatively related to mortality caused by a communicable disease.

c. Coefficient of determination (R^2)

The coefficient of determination shown by each model is 0.992 or 99.2% in the first model (life expectancy) and 0.95 or 95% in the second model (mortality caused by communicable disease). Then conclude that all independent variables can explain the effect of 99.2% on the life expectancy variable and 95% on the mortality caused by communicable disease in 46 OIC countries in 2010-2018. The rest of 0.8% in the first model and 5% in the second model are explained by other variables outside this research.

Model interpretation

Table 4 Results of the model panel data regression (life expectancy model) in the research of the impact of socioeconomic and behavioral factors on health indicators in OIC countries

Dependent Variable: Life Expectancy			
Independent Variable	Coefficient	t-statistic	Probability
LN_GDP	6.019235	9.561237	0.0000*
HEXP	0.132586	2.061650	0.0400*
SCH	0.575393	5.259149	0.0000*
GINI	0.012648	0.634187	0.5264
UNEP	-0.009166	-0.246393	0.8055
SMOKE	-0.220921	-6.545302	0.0000*
C	13.12453	2.318143	0.0210
R-squared		0.992096	
Prob(F-statistic)		0.000000	

Note: *) significant at a 5% level
Source: Authors, 2024 (processed data).

Based on the results of the tests carried out, the equation of the estimation model of the factors which affect life expectancy in the OIC countries is as follows:

$$LIFE_{it} = 13.12453 + 6.019235\ LN\_GDP_{it} + 0.132586\ HEXP_{it} + 0.575393\ SCH_{it} + 0.012648\ GINI_{it} - 0.009166\ UNEMP_{it} - 0.220921\ SMOKE_{it} + \varepsilon_{it}$$

Table 5 Results of the model panel data regression (mortality rate caused by communicable disease model) in the research of the impact of socioeconomic and behavioral factors on health indicators in OIC countries

Dependent Variable: Mortality Rate Caused by Communicable Disease			
Independent Variable	Coefficient	t-statistic	Probability
LN_GDP	-6.066715	-1.182278	0.2379
HEXP	0.370555	0.706909	0.4801
SCH	-2.537210	-2.845117	0.0047*
GINI	-0.301333	-1.853726	0.0646
UNEP	-0.019965	-0.065847	0.9475
SMOKE	1.208594	4.393059	0.0000*
C	98.17986	2.127512	0.0341
R-squared		0.948244	
Prob(F-statistic)		0.000000	

Note: *) significant at a 5% level
Source: Authors, 2024 (processed data).

AL-MUZARA'AH Vol. 13 No. 1, 2025
(ISSN p: 2337-6333; e: 2615-7659)
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The panel data regression model is used to analyze the influencing factors toward the mortality rate caused by communicable disease in the OIC countries, namely:

$$MRCD_{it} = 98.17986 - 6.066715\ LN\_GDP_{it} + 0.370555\ PPKES_{it} - 2.537210\ SCH_{it} - 0.301333\ GINI_{it} - 0.019965\ UNEMP_{it} + 1.208594\ \text{SMOKE}_{it} + \varepsilon_{it}$$

Gross Domestic Product

In this study, several variables are significant in influencing health in OIC countries, one of which is the Gross Domestic Product (LN_GDP) variable. These variables are considered significant in influencing the first model (life expectancy) but not significant in the second model (mortality rate caused by communicable disease). The coefficient values listed (6.019235 in the first model and -6.066715 in the second model) based on the estimation results of the two models show conformity with the initial hypothesis, which states that the LN_GDP variable has a positive effect on life expectancy and a negative effect on mortality rate caused by a communicable disease, meaning that if there is an increase in GDP of 1 dollar, it will increase the life expectancy in the OIC by 6.019235 years and reduce the mortality rate caused by the communicable disease by 6.066715 individual deaths per 100,000 population (ceteris paribus).

The suitability of theories and hypotheses in the first model has been proven through a series of studies conducted by Shkolnikov et al. (2019), which suggests a positive correlation between economic growth and life expectancy. Countries with the high-income category usually have a lower death rate than low-income countries, so that they will have a longer life expectancy.

Health expenditure

The health expenditure variable (HEXP) affects the two models differently. In the first model (life expectancy), this variable has a significant and positive relationship with a life. That is, every 1% increase in expenditure will also increase the life expectancy in the OIC countries by 0.132586 years (ceteris paribus). This evidence follows the initial theory and hypothesis as well as research conducted by Jaba et al. (2014), Prasetyo and Zuhdi (2013) and Merini and Saputra (2013), which show that spending in the health sector has a significant effect on life expectancy. The higher a country's expenditure in the health sector, the higher its life expectancy, and vice versa.

However, in the second model (mortality rate caused by communicable disease), the HEXP variable shows an insignificant effect. It is also positively correlated with the mortality rate caused by communicable diseases with probability and coefficient values of 0.4801 and 0.370555, respectively. As earlier presented in the descriptive section of this paper, there are evidence that countries may be facing lower health expenditures as they attain higher levels of medical and health advancement. The estimation results are similar to research by Filmer (1999), which failed to prove the significant effect of government spending on health on child mortality rates. Then, Filmer and Prichett rejoined Hammer to conduct empirical research on a similar subject using government spending allocations for primary health. However, they still failed to prove statistically to produce a significant effect (Pradipta and Renyowijoyo, 2005). In addition, research conducted by Kamiya (2010) did not succeed in showing the significance of government health spending on under-five mortality.

Mean years of schooling

The variable mean years of schooling (SCH) significantly affects both models. This evidence confirms the initial theory that education strongly correlates with health. In addition, the coefficient value also shows conformity with the initial hypothesis (positively related to life expectancy and negatively related to mortality rate caused by communicable disease) in both models, which are 0.575393 and -2.537210, respectively. That is, if there is an increase in the average years of schooling for 1 year, it will increase the life expectancy by 0.575393 years and reduce the mortality caused by communicable disease in the OIC countries by 2.537210 individual deaths per 100,000 population (ceteris paribus).

This result confirms the theoretical expectation that education is a crucial determinant of population health. Educated individuals are more likely to possess higher health literacy, enabling them to make

AL-MUZARA'AH Vol. 13 No. 1, 2025
(ISSN p: 2337-6333; e: 2615-7659)
DOI: 10.29244/jam.13.1.27-46

informed decisions regarding preventive health behavior, hygiene practices, nutrition, and access to healthcare services. Studies by Meik et al. (2018) and Lager and Torssander (2012) corroborate that higher education levels are positively associated with life expectancy due to better health behaviors and lower risk exposure.

Recent empirical evidence further strengthens this argument, IHME-CHAIN Collaborators (2024), in a large-scale meta-analysis published in *The Lancet Public Health*, found that each additional year of education reduces the risk of mortality by approximately 1.9%, with even higher benefits observed in younger populations. Their study concludes that a lack of formal education may pose health risks equivalent to long-term tobacco use, making education a powerful tool for improving both health and longevity. In developing regions, including many OIC countries, improving educational attainment may thus serve as a dual investment in both human capital and public health outcomes.

Gini index

Based on the estimation results, the Gini index variable (GINI) has a similar effect on the two models. These variables show probability values of 0.5264 and 0.0646, meaning they have no significant effect on life expectancy and mortality rate caused by a communicable disease. In addition, this variable is inconsistent with the initial theory, which states that the higher the income inequality, the higher the poverty in an area, and it will ultimately harm the health of the population in the region. In addition, the coefficient value shown does not follow the initial hypothesis (adverse effect on life expectancy and positive effect on mortality rate caused by communicable disease), with values of 0.012648 and -0.301333, respectively. This evidence is due to economic growth, as indicated by an increase in the average GDP in the OIC countries, which means that poverty has also decreased.

Unemployment rate

The unemployment rate variable (UNEMP) has no significant effect on both models, both the first model (life expectancy) and the second model (mortality rate caused by communicable disease). However, the first model has a relationship that follows the initial hypothesis, which is negatively related to life expectancy as indicated by the probability values of 0.8055 and 0.9475, respectively and the coefficient values of -0.009166 and -0.019965. The discrepancy with the initial theory and hypothesis was also proven by a series of studies conducted by Chalirafi et al. (2020), which shows a partially insignificant relationship between life expectancy and the unemployment rate in Aceh Province (Indonesia), even though it has a negative correlation. In addition to these earlier findings, quality of employment and unemployment data in some of the OIC country remains a challenge.

Smoking behaviour

The estimation results show a significant effect of smoking behavior on both models. The coefficient values in the two models are -0.220921 and 1.208594, respectively, which means that if there is an increase in smoking behaviour of 1%, it will reduce life expectancy by 0.220921 years and increase the mortality rate caused by communicable disease in OIC countries by 1.208594 deaths individuals per 100,000 population (ceteris paribus).

The estimation results follow the initial theory and hypothesis that smoking behaviour dramatically influences a person's health. Several studies have similar estimation results, including research conducted by Gabrela et al. (2019) which states that one of the factors that have a significant effect on life expectancy is smoking habits. In addition, research from the Aceh Provincial Health Office (2019) also states a negative and significant relationship between smoking behaviour and life expectancy. Individuals with long-term smoking habits are estimated to have a reduced life expectancy of 10 to 17.9 years compared to non-smokers (Dinkes Aceh, 2019).

Contemporary findings from Saint-André et al. (2024) published in Nature further reveal that the impact of smoking on the immune system persists for years, even after cessation. This long-term immune suppression increases susceptibility to communicable diseases, thus explaining the significant association in the mortality model. In addition, Zhang et al. (2023) in a Chinese cohort study confirmed that smoking is linked to all-cause mortality and causes significant reductions in both quality and length of life, particularly in populations with weak public health enforcement. These

AL-MUZARA'AH Vol. 13 No. 1, 2025
(ISSN p: 2337-6333; e: 2615-7659)
DOI: 10.29244/jam.13.1.27-46.

findings emphasize the importance of implementing stronger tobacco control policies in OIC countries, where the prevalence of smoking remains relatively high and regulations are often inadequately enforced. Without such policies, smoking will continue to be a major barrier to improving public health and achieving health-related Sustainable Development Goals (SDGs).

CONCLUSION

This paper examines the factors (both socioeconomic and health system components) on health indicators (life expectancy and mortality rate caused by communicable diseases) in OIC countries. The analytical method used is panel data regression analysis on 46 OIC member countries. The results showed that the factors that had a significant and positive relationship with life expectancy in the OIC countries were Gross Domestic Product, health expenditures and mean years of schooling. In contrast, smoking behaviour had a negative relationship. The factors that significantly affect the mortality rate caused by communicable diseases in the OIC countries are the mean years of schooling and smoking behaviour, each of which has a negative and positive correlation.

Based on the results obtained in this study, the authors provide suggestions as follows. First, the governments in OIC countries need to increase the allocation of funds in the health sector, especially in providing facilities and infrastructure based on halal as a characteristic of the OIC country with a majority Muslim population. The provision of health services must, of course, also be followed by guarantees that all levels of society can enjoy these services equally, for example, by promoting a national health insurance program in a sharia manner, especially for the poor, so that they can get promotive, preventive, curative and rehabilitative health services with a broader area coverage.

Second, the governments in OIC countries should increase the employment expansion program so that it can absorb more labour so that it will reduce social inequality and impact the decline in the Gini index. The employment system needed is labour intensive, especially in the service sector, which still has a percentage contribution to GDP lower than the agricultural or industrial sector.

Third, it is necessary to develop a sharia system in state life, especially regarding health, as it reflects a country with a Muslim majority population, one of which is by creating regulations to reduce people's smoking habits. Several regulations can be applied, for example, by increasing tobacco excise rates or expanding places where smoking is prohibited.

Finally, for future research, it is fruitful to include some other variables in the analysis, especially those related to Islamic social finance, such as zakat, infaq, sadaqah and waqf, will be able to show how the influence of these variables on the development of sectors in a country, especially health sector

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AL-MUZARA'AH Vol. 13 No. 1, 2025
(ISSN p: 2337-6333; e: 2615-7659)
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