# DOES SPENDING MATTER IN IMPROVING HEALTHCARE ACROSS MENA REGION

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## Abstract

This study addresses the impact of healthcare spending on quality of health. Particularly, it investigates the impact of health budget allocation, health system performance, a nation's income, and demographic aspects on prompting health quality across the MENA region. The yearly data sample used covers the period 1995–2016. The estimated model is tested using the appropriate GLS random effects method. The findings do not show support for public spending on healthcare to improve healthcare quality across the MENA region. However, higher private spending on healthcare leads to lower infant mortality rates, thus improving healthcare quality. The results also show that the improvement in income per-capita for oil-exporting countries leads to improved quality of healthcare as well as in non-oil-exporting countries, however the marginal benefit is lower for oil-exporting countries, compared to non-oil-exporting countries. This might suggest that oil-exporting countries have already reached a significant floor level of infant mortality rate that cannot be improved. However, non-oil-exporting countries still have potential to reduce the infant mortality rate and improve the quality of healthcare.

**Keywords:** Health Quality, Budget Allocation, Oil Exporters, MENA

## I. Introduction

The level of economic and social development is a key for the government to spend on different economic sectors. Addressing the issue of budget allocation within the health sector is very important for low-income, developing countries. This is as the rapid growth of spending on health attracts more attention by household, businesses, and government. However, the issue might be not so different for certain high-income countries, especially in the Middle East and North Africa (MENA) region.

The justification of higher health spending for better healthcare quality is that more spending leads to better allocation of economic resources, which leads to better health outcomes (i.e. Ali, Ismatullah, and Ashghar, 2017; Anand and Ravallion, 1993; Bakare, and Olubokun, 2011, Bedir, 2016; Churchill, Yew, and Ugur, 2015; Hojman, 1996; and Serdar, 2015). Investigating the impact of health spending on health quality is very important. Although there is a large amount of literature studying the impact of health expenditure on healthcare quality (Anand and Ravallion, 1993; Hojman, 1996; Filmer, Hammer and Pritchett, 1998; Ravallion and Bidani, 1999; Gupta, Verhoeven and Tiogson, 2002; Mendis and Ichihashi, 2014), there is limited literature regarding developing countries, especially in the MENA region. Thus, this paper contributes to the literature by studying the case of the MENA region. In addition, this study shows the difference in health expenditure between public and private sectors, according to health funding mechanisms, and thus investigates the impact of public and private healthcare expenditure on health quality for the MENA region. This paper also makes a distinction between oil-exporting countries and non-oil-exporting countries across the MENA region. This study shows the different impact of healthcare expenditure on health quality between oil-exporting and non-oil-exporting countries. This paper is not in a position to determine or conclude what may be the main drivers of healthcare quality. However, it provides key considerations for future plans and strategies, in light of these findings, for shaping a better, coherent system.

Filmer *et al.* (1998) investigated the influence of public spending on health. However, their key finding was not clear. Others, such as Baltagi and Moscone (2010), examined the economic link between health spending and income across the Organization for Economic Co-operation and Development (OECD) countries. They found the relationship between health spending and income to exist in the long run. The link between spending in healthcare and economic growth was examined by Ndedi, Metha, and Nisabwe (2017). They found that more health expenditure promotes economic growth. Accordingly, this study attempts to extend the literature to investigate the relationship between spending on healthcare and healthcare quality. This paper seeks to reassess the case of the MENA region by using different specifications, such as private versus public health expenditure and oil exporting countries versus non-oil exporting countries, across the MENA region.

This paper uses yearly data samples from 1995–2016. The benchmark estimated model is tested using the GLS random effects method. The findings confirm that higher private spending on healthcare leads to a better quality of healthcare. However,

the findings show no significant result for public spending on healthcare influencing healthcare quality across the MENA region. Specifically, the higher the income per capita, the higher quality of healthcare for oil-exporting countries as well as non-oil-exporting countries; however, the marginal benefit of spending on healthcare was found to be lower for oil-exporting countries, compared to non-oil-exporting countries.

The remainder of this paper is organized as follows. Section II is a review of the relevant literature. After that, the paper provides an overview of the health sector environment in the MENA region. Then the methodology and data are described in Section IV. The empirical results are presented, and, finally, conclusions and some policy recommendations are provided in Section VII.

## II. Literature Review

Economists have tried to empirically link the effect of public budget allocations to healthcare outcomes (i.e. Fosu, 2008). Mendis and Ichihashi (2014) investigated the influence of Sri Lanka's government expenditure on healthcare development. Their findings suggested that government spending has an influence on infant mortality rates. A study by Rajkumar and Swaroop (2008) investigated the impact of government spending along with health determinates on healthcare outcomes across 27 countries. The results showed that public health spending and per-capita income have a negative effect on child mortality rates. However, their paper showed that, as the level of corruption falls, public spending on health becomes more effective on lowering child mortality. A study by Ravallion and Bidani (1999) investigated the impact of

public spending on the health status. They found that spending stimulates health outcomes across 35 countries. Of the countries they studied, only Algeria, Jordan, and Tunisia were are in the MENA region.

Another study by Gupta *et al.* (2002) examined the effectiveness of public expenditure on healthcare outcomes across 50 developing and transitioning countries. Their findings supported other studies in which public spending had a negative relationship with mortality rates. However, a study by Filmer *et al.* (1998) failed to find a statistically significant influence of public healthcare spending on infant mortality rates. There have been many studies that have found a link between spending more on healthcare and better health outcomes. These include Anand and Ravallion (1993) and Hojman (1996). On the other hand, Cima and Almeida (2018) analyzed the dynamics of GDP and health expenditure for 25 OECD countries from 1993–2015. They concluded that health status is caused by GDP growth rather than by health spending growth. These results showed that countries mostly financed by compulsory health insurance schemed had a worse health status, even though there was no decrease in the growth of health expenditure.

The determinants of health expenditure may vary according to the size of the economy. Yazdi and Khanalizadeh (2017) examined the role of economic growth and the quality of the environment as the determining factors for health expenditure in the MENA region. The study concluded that environmental quality has a statistically significant impact on health expenditure. Wang and Lee (2018) investigated the role

of another determinant of health expenditure, in the context of economic growth. They tested the impact of life insurance on health expenditure and economic growth. The conclusion was summarized in two different scenarios. If the life insurance scheme in an economy is low, the decrease in life insurance can stimulate health expenditure as well as economic growth. If life insurance is on the rise, there is no significant impact of life insurance health expenditure and economic growth.

Cooray (2013) divided data into two categories and explored the effect of health capital on economic growth. First, the data was segregated by gender and revealed that health capital does not have a significant and robust impact on economic growth. Second, the data was segregated by income level and revealed that the effect of health capital on economic growth was statistically significant in higher- and upper-middle-income economies. In low-income economies, the impact of health capital on economic growth is significant only if engaged in education.

Many studies have investigated the case of MENA region (i.e. Mehrara, Akbar, Abbas, Reza, 2012; Sadr, and Gudarzi, 2013; and Verhoeven, Gupta, and Tiongson, 1999). Importantly Verhoeven, Gupta, and Tiongson, 1999 used a sample of 50 developing and transitioning countries to show that expenditure allocations reduced mortality rates for infants and children. Some of the 50 countries in Verhoeven *et al.* (1999) were in the MENA region, such as Jordan, Tunisia, Egypt, and Morocco. The main result of that study was that there is little empirical evidence to support the claim that public spending improves education and health indicators.

Schultz (1993) estimated the effect of state public health spending in India on mortality across all age groups. The study showed that a 10% increase in public spending on health decreases the average probability of death by about 2%, which affects mainly the young, the elderly, and women. Other major factors affecting mortality are rural residency, household poverty, and access to toilet facilities.

Swift (2011) examined the relationship between health and gross domestic product (GDP) for 13 OECD countries over the last two centuries. A long-run relationship between life expectancy and GDP per-capita was found for all countries. The results showed that a 1% increase in life expectancy will result in a 5% increase in GDP per capita. In addition, total GDP and GDP per-capita also had a significant influence on life expectancy for most countries.

According to previous studies, higher spending on healthcare leads to better quality of healthcare (Anand and Ravallion, 1993; Hojman, 1996). Studies have also pointed out the effect of other control variables on healthcare quality. Better immunization against measles, as a result of improved children's immunization coverage, may lead to better health quality (Hojman, 1996). Higher life expectancy rates in a community indicate lower mortality rates. Better economic resource allocation leads to improvements in total health status. This is because quality of health is improved as a result of increasing individual incomes (Ke, Saksena, and Holly, 2011). Studies also find that increases in urbanization lead to better healthcare quality (Schultz, 1993; Verhoeven *et al.*, 1999). This is because infant mortality rates rise in rural areas as well as low-income household regions.

### III. The Evolution of Health across MENA Region

Development of the public health status across the MENA region shows that life expectancy at birth has been enhanced among all MENA countries over the last two decades. As shown in Figure A1, the average life expectancy across MENA countries increased from 68 years in 1995 to 73 years in 2015, which is higher than the world average life expectancy.[1] Table A1 compares life expectancy for each country in 1995 and 2015. Malta, Qatar, and Lebanon had the highest life expectancy among all MENA countries, which reached to 82, 79, and 79 years, respectively, in 2015, compared to 77, 76, and 72 years, respectively, in 1995. Djibouti and Yemen recorded the lowest life expectancy among all MENA countries, which reached 62 and 64 years, respectively, in 2015, compared to 57 and 58 years, respectively, in 1995. The figures shown in Table A1 demonstrate that life expectancy for women in all MENA countries was higher than that of men in both years.

MENA countries have made considerable improvements over the last 20 years with respect to the average infant mortality rate. Figure A2 shows that the average infant mortality rate across MENA countries decreased by 50% in 2015, to reach 20.6 deaths per 1,000 live births, compared to 41.6 deaths per 1,000 live births in 1995.[2] In addition, Table A2 presents country-specific data for the MENA region for some health indicators: infant mortality per 1,000 live births, under-5-years child mortality per 1,000 live births, and children's

immunization against measles as a percentage of children aged 12–23 months. Malta, the United Arab Emirates (UAE), and Kuwait had the lowest infant and under-5-years child mortality rates in 1995, about 8, 9, 11, 13, and 13, 15 per 1,000 live births for both indicators, respectively. However, the picture of the progress made by other MENA countries to reduce both the infant and under-5-years child mortality rates had changed by 2015. Six countries were found to have deaths less than 10 per 1,000 live births. Malta had 5 and 7 deaths per 1,000 live births in infants and children under 5-years old, respectively. Bahrain and UAE had 6 infant deaths per 1,000 live births and 7 under-5-years deaths per 1,000 live births. Infant and under-5-years child mortality rates in Qatar, Lebanon, and Kuwait reached 7,8, 7,9, and 8,9 per 1,000 live births, respectively. All MENA countries, except Djibouti, Lebanon, and Yemen, achieved higher levels of measles immunization that covered more than 93% of children in 2015.

Figure A3 shows that the average total health expenditure (ATHE) as a percentage of GDP across MENA countries slightly increased, from 4.2% in 1995 to 5.4% in 2015. The MENA region's ATHE is considered relatively low, compared to some other regions. For instance, the world's ATHE was 9.9% in 2015, whereas in Euro Area, it was 10.2%. Latin America, the Caribbean and OCED recorded 7.4% and 12.5%, respectively. However, the MENA region's ATHE was equal to that of Sub-Saharan and higher than that of South Asia, which was 3.7% in in 2015. Furthermore, the data in Table A3 shows

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[1] The average world life expectancy was 66 years in 1995 and 72 years in 2015.

[2] The average world mortality rate was 60.5 and 31.4 per 1,000 live births rate in 1995 and 2015, respectively.

that in 2015, public health expenditure as a share of government expenditure varied among MENA countries, with the highest value (18%) in Iran and the lowest value (4%) in Yemen. Over the period 1995–2015, public health expenditure as a share of government expenditure increased for most MENA countries, except Bahrain, Egypt, Iran, UAE, and Yemen. Table A3 also illustrates that governments finance a high proportion of health expenditure in most MENA countries.

It is worth mentioning that public health expenditure as a percentage of total health expenditure reached 63–90% in all MENA countries in 2015, except for Egypt, Iran, Lebanon, Morocco, and Yemen. This high proportion explains the absence, or shrinking role, of private-sector involvement in the healthcare market. Figures in Table A3 denote that the Gulf Cooperation Council (GCC) countries, as high-income countries, had the highest health expenditure per capita among MENA countries in 2015. In Qatar, health expenditure per capita reached 2,106$, 1,243$ in Bahrain, 1,611$ in UAE, 1,386$ in Kuwait, and 1,147$ in Saudi Arabia. Despite these high values, MENA countries' average health expenditures per capita in 2015 (415$) was below the world average of 1,002$, Euro Area (3,487$), OECD (4,526$), and Latin America and the Caribbean (636$) but were higher than that of South Asia (58$) and sub-Saharan (84$).

## IV. Methodology

This study empirically examines the impact of healthcare expenditure on the quality of health across MENA countries. In specific, the objective of this paper is to examine the impact of health expenditure, immunization against measles, life expectancy, per-capita income, and urbanization on health quality.

The study employs panel techniques by using pooled OLS, fixed effects and random effects. Using the fixed effects approach helps isolate any variations across individuals, while the random effects approach is better used by allowing variations across individuals (Kreft and De Leeuw, 1998, and Seddighi, and Lawler, 2000). Specifically, estimation using the generalized least squares (GLS) random effects regression allows time-invariant factors (such as time-invariant dummy variables) to be efficiently tested and estimated as explanatory variables. Also, GLS allows the maximum likelihood estimate coefficients at what time the residual term is of unequal variance (Aitken, 1936). Accordingly, the Hausman test is applied to choose the appropriate estimating model between fixed effects and random effects. Several tests are then applied to expand the findings and reach a better understanding of health quality determinants across the MENA region.

The choice of the explanatory variables affecting the quality of healthcare relies on different aspects (Newhouse, 1977, and Verhoeven *et al*., 1999). These factors include health budget allocation, health system performance, the nation's income, and demographics. Health budget allocation represents how much of its budget the country devotes to healthcare (Anand and Ravallion, 1993; Schultz, 1993; Hojman, 1996; Gupta *et al.,* 2002; Ke *et al.*, 2011; Mendis and Ichihashi, 2014; and Rhee, 2014). Theoretically, higher spending on health leads to a higher quality of healthcare in a country. This effect can be captured through the variable of healthcare expenditure. In addition, the importance of the health system depends on the performance factors that reflect the efficiency of healthcare services in the

country. Therefore, indicators of health performance may be good signs of the healthcare status of the country. These indicators can include the independent variables life expectancy and immunization. In addition, controlling for the income in the country relies on the fact that identities of government and household sectors depend heavily on the capacity of country's wealth and income. This is because high-income countries allocate a higher budget share to healthcare spending than low-income countries. The independent variable that captures this is per-capita GDP. Finally, the demographic factor ,which is controlled by urbanization, suggests that unplanned urbanization is frequently related with limited healthcare. This is because people's needs in these areas exceed the healthcare service capacity of the country. Therefore, it is expected that higher urbanization leads to higher healthcare quality. The following equation represents the main determinants of healthcare quality:

$$(Health\ Quality)_{it} = f\ (\ Budget, Health\ System,\ Income, Demography)_{it} \quad (1)$$

where *Health Quality* indicates the healthcare quality for country $i$ at time $t$. The control factors include budget allocation that is represented expenditure on health, indicators of healthcare include expectancy life rate and immunization, income is represented by the level of GDP per capita in the country, finally demographic factor which is represented by urban population.

Accordingly, the reduced form of the estimated model closely follows the work of Verhoeven *et al.* (1999) and can be expressed as the following:

$$(Health\ Quality)_{it} = \propto + \beta_1(Expendiure)_{it} + \beta_2(Immunization)_{it} + \beta_3(Life\ Expectancy)_{it} + \beta_4(PC\ GDP)_{it} + \beta_5(Urbanization)_{it} + \varepsilon_{it} \quad (2)$$

where *Health Quality* is the dependent variable measured by infant mortality per 1,000 live births. *Expenditure* is measured by the share of total health expenditure to GDP. *Immunization* is measured by the measles immunization of children. *Life Expectancy* indicates the life expectancy of both males and females. *PC GDP* indicates per-capita GDP. *Urbanization* represents the share of the urban population to total population; $i$ indicates the country, and $t$ represents the time period.

This study covers previous work by extending the estimated model to include a sample of countries in the MENA region. The estimated model also separates the test for oil-exporting versus non-oil-exporting countries in the MENA region, to analyze the influence of health expenditure on healthcare quality. Furthermore, the impact of health expenditure is classified into private versus public spending, which is then examined to see how the different spending affects health status.

## V. Data Description

In this study, the annual data used is mainly obtained from the World Bank database, and the missing economic data is obtained from the IMF database. Some of the missing data obtained from IMF include the exchange rates to convert local currency data to US dollar.. The data covers the period from 1995–2016 for 20 selected countries in the MENA region. The selection of countries was based on data availability in the MENA region, taking

into consideration different income distributions across these countries. It is noteworthy that data availability limits adding more control variables, especially for the health data. As a result, the MENA countries are Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Qatar, Saudi Arabia, Syrian, Tunisia, UAE, and Yemen.

The under-5-years mortality rate is the likelihood per 1,000 live births that a child will die earlier than age five. All health expenditure variables are expenditure on health from domestic sources as a percentage of the economy, as measured by GDP. Child immunization is the ratio of children ages 12–23 months who received the measles vaccination prior to being 12-months old. Life expectancy measures the years that a newborn infant may be alive at the time of its birth were to stay the same during its life. Finally, urbanization measures the urban population as a percentage of total population living in zones where the elevation is 5 meters or less.

## VI. Empirical Results

Table A4 shows the summary statistics for the variables used in the study. Table B1 shows the benchmark findings for all variables in the estimated model, using pooled OLS, fixed effects, and GLS random effects models.

According to findings of the pooled OLS method, in column 1 of Table B1, only three variables are statistically significant and are consistent with other studies. The findings show that the estimated coefficient for measles immunization in children tends to be negative and statistically significant at a 1% level of significance. This suggests that higher rates of measles immunization

lead to 0.137% lower infant mortality rates, which reflects a better quality of healthcare. The life expectancy variable's estimated coefficient is statistically significant at a 1% level of significance, with a negative sign. This indicates that higher life expectancy leads to a lower infant mortality rate, reflecting improved quality of healthcare, by 2.50%. In addition, the results show that higher per-capita income across the MENA region leads to better healthcare. The estimated coefficient for per-capita GDP tends out to be negative and statistically significant at a 1% level of significance. This suggests that higher per-capita income leads to a lower infant mortality rate, by 0.026%, indicating a marginal improvement in the quality of healthcare.

However, there is no evidence that higher spending on healthcare in the MENA region leads to lower infant mortality rates. Further investigation is carried out in the extended regressions in columns 2 and 3 of Table B1. The findings of all estimated coefficients in column 2 are statistically significant and consistent with their expected signs. The findings in column 3 show that all estimated coefficients are statistically significant, with their expected signs, with the exception of urbanization, which is insignificant.

In Table B2, the Hausman test showed that Prob>Chi2=0.9892, which is more than 0.05. This confirms the use of the random effects technique. As a result, the justification of the main findings should rely on the results from the random effects model, to more precisely interpret the coefficients.

In more specification testing in Table B3, The Breusch-Pagan Lagrange Multiplier can help decide between a GLS random

effects regression and a Pooled OLS regression. According to Table B3, the Prob>Chi2=0.0000 is less than 5%. This suggests rejection of the null; therefore the random effects model is an appropriate method to use.

Accordingly, the results of Table B1 can be further interpreted based on the findings of Table B2 and Table B3. The findings of estimation using the GLS Random effects model reveal that all estimated coefficients are statistically significant and consistent with other studies, with the exception of urbanization, which tends to be insignificant. In particular, the estimated coefficient of healthcare expenditure is statistically significant at a 1% level of significance, suggesting that an increase in spending on health by 5% leads to a decrease in the infant mortality rate by 3.18 per 1,000 live births. The estimated coefficient for immunization suggests that 5% higher measles immunization for children decreases the infant mortality rate by 0.42 per 1,000 live births. The estimated coefficient for life expectancy indicates that a 1% increase in life expectancy decreases the infant mortality rate by 2.25 per 1,000 live births. Finally, findings for the per-capita income variable show that improving per-capita income by 5% leads to a decrease in the infant mortality rate by 0.17 per 1,000 live births. These results indicate that the benefits from spending in healthcare across the MENA region are significant enough to improve the quality of healthcare.

In order to examine the effect of private healthcare expenditure on health quality versus public healthcare expenditure, Table B4 shows the findings of the estimated model using the GLS random effects method. The results show that, across the

MENA region, private healthcare expenditure have a negative impact on infant mortality rates, meaning that higher healthcare expenditure by the private sector result in lower mortality rates, indicating better healthcare. The finding is highly significant at a 1% level of significance. It suggests that increasing private spending on health by 1% would decrease the infant mortality rate by 1.27 per 1,000 live births. Surprisingly, the finding shows no evidence of public healthcare expenditure influencing the quality of healthcare. That finding is statistically insignificant. This results in Table B4 indicate that the healthcare sector would benefit from reallocation of health resources to the private sector, as opposed to spending in the public sector.

In Table B5, the estimated model is again tested, using a separate test on a sample of oil-exporting countries and non-oil-exporting countries. This examination investigates the likelihood of being a wealthy country (in this case, an oil-exporting country) versus a low-income country (in this case, a non-oil-exporting country) and how that will reflect on the healthcare performance of the country. The findings in Table B5 show evidence that, for oil-exporting countries, all variables are statistically significant, with the expected signs. Specifically, the estimated coefficient of healthcare expenditure is statistically significant at a 1% level of significance, indicating that a 5% increase in spending on health will lead to a decrease in the infant mortality rate by 3.6 per 1,000 live births. For non-oil-exporting countries, the estimated coefficient of healthcare expenditure is also statistically significant at a 1% level of significance. The finding suggests that a 5% increase in spending on

health would decrease the infant mortality rate by 4.9 per 1,000 live births. This indicates that the benefits from spending on healthcare has marginal potential for non-oil-exporting countries, compared to oil-exporting countries. This may be because non-oil-exporting countries, which are mostly low-income countries (compared to oil-exporting countries) have more potential to improve their quality of health by spending on healthcare services. Whereas oil-exporting countries may have reached a point of healthcare quality at which any more spending on healthcare will increase its quality, but at a diminishing rate. This takes into consideration that people of oil-exporting countries have more opportunities to get medical treatment abroad.

Another interesting finding in Table B5 is about per-capita GDP. For oil-exporting countries, the findings show that improving per-capita income by 5% leads to a decrease in the infant mortality rate by 0.127 per 1,000 live births. However, for non-oil-exporting countries a 5% increase in per-capita income would decrease the infant mortality rate by 0.387 per 1,000 live births. This slight difference of increasing per-capita income on health quality between oil-exporting countries and non-oil-exporting countries suggests that the marginal benefit of healthcare is expected to be relatively lower as income increases (oil-exporting countries) compared to non-oil-exporting countries. An explanation may be that oil-exporting countries (which are considered wealthy) have already reached a significant floor level of infant mortality rate that cannot be improved; however, the case is different for non-oil-exporting countries (which are considered low-income) because they still have potential to reduce the mortality rate and

catch up with other, high-income economies.

## VII. Conclusions and Policy Recommendations

The purpose of this study was to investigate factors affecting healthcare quality across large, selected countries in the MENA region. Accordingly, the study used annual sample data for the period 1995–2016. The estimated model used the pooled OLS, fixed effects, and GLS random effects models. According to the appropriate GLS random effects model, the findings indicate higher health spending, higher rates of immunization for measles, higher life expectancy, and higher per-capita income all lead to a lower infant mortality rate, which means improved healthcare quality across the MENA region.

Interestingly, there is evidence that higher private spending on healthcare in the MENA region leads to lower infant mortality rates, meaning improved healthcare quality. Whereas, no evidence is found for the impact of public healthcare spending on the infant mortality rate. In addition, the results of this study confirm that improvement in per-capita income will improve healthcare quality across the MENA region. Specifically, results for non-oil-exporting countries show that the improvement in per-capita income, leading to a lower infant mortality rate, is more significant than for oil-exporting countries.

A key policy implication can be drawn from the main findings of this study. These findings can support policy makers in drawing up better future plans. Importantly, the implication is that improving and making serious effort toward efficiency may help effectively allocate resources, especially in oil-exporting countries. It might be the case that these countries need

to direct more-efficient spending toward the healthcare sector. In the meantime, non-oil exporting countries should maintain the development that has been achieved on universal healthcare coverage and ensure delivery of the basic health services that provide quality in practice.

Without a doubt, obtaining a certain level of economic development leads to more spending on social services, such as health, but it does not mean a certain quality might be obtained in return. Therefore, if countries in the MENA region need to promote economic growth and development, their governments should pay more attention to improve expenditure allocation in the health sector.

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**Appendix A**

Figure A1: Average Life Expectancy at Birth across MENA Countries
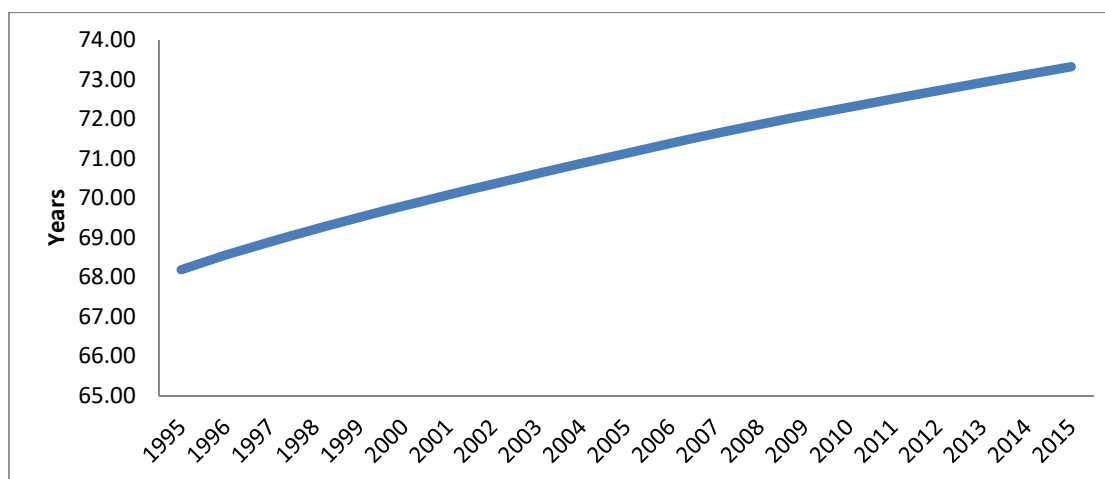


 Source: World Bank database

Table A1: Life Expectancy at Birth across Selected MENA Countries (in years)

| | 1995 | | | 2015 | | |
|---|---|---|---|---|---|---|
| Country | Male | Female | Total | Male | Female | Total |
| Algeria | 67 | 70 | 68 | 73 | 78 | 75 |
| Bahrain | 73 | 75 | 74 | 76 | 78 | 77 |
| Djibouti | 56 | 59 | 57 | 60 | 64 | 62 |
| Egypt | 64 | 69 | 67 | 69 | 73 | 71 |
| Iran | 68 | 69 | 69 | 74 | 77 | 75 |
| Jordan | 70 | 72 | 71 | 72 | 76 | 74 |
| Kuwait | 72 | 74 | 73 | 73 | 76 | 75 |
| Lebanon | 71 | 74 | 72 | 79 | 82 | 79 |
| Malta | 75 | 80 | 77 | 80 | 84 | 82 |
| Morocco | 65 | 69 | 67 | 73 | 75 | 74 |
| Oman | 68 | 72 | 70 | 75 | 79 | 77 |
| Qatar | 75 | 77 | 76 | 77 | 80 | 79 |
| Saudi Arabia | 69 | 73 | 71 | 73 | 76 | 74 |
| Tunisia | 69 | 74 | 72 | 73 | 77 | 75 |
| UAE | 72 | 74 | 73 | 76 | 79 | 78 |
| Yemen | 58 | 61 | 58 | 63 | 65 | 64 |

 Source: World Bank database

Figure A2: Average Infant Mortality Rate across MENA Countries
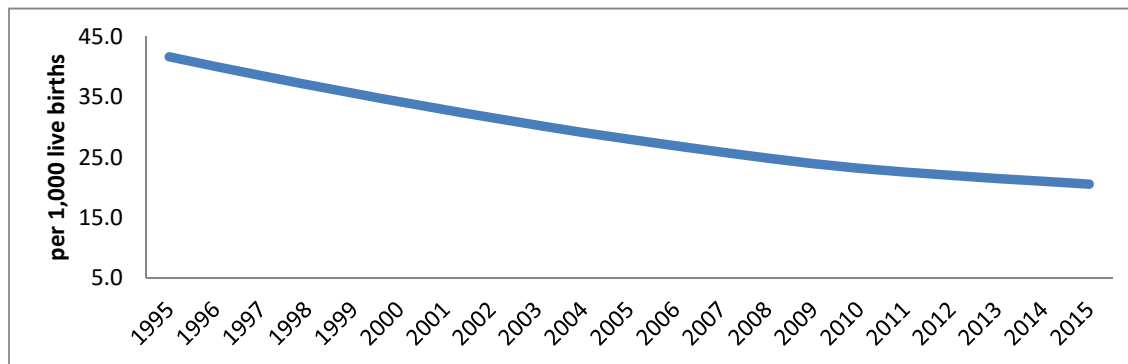


Source: World Bank database

Table A2: Health Indicators across Selected MENA Countries

| Country | 1995 | | | 2015 | | |
|---|---|---|---|---|---|---|
| | Mortality rate, infant | Mortality rate, under 5 years | Immunization (measles) | Mortality rate, infant | Mortality rate, under 5 years | Immunization (measles) (% of children ages 12-23 months) |
| Algeria | 37 | 43 | 89% | 22 | 26 | 95% |
| Bahrain | 16 | 18 | 95% | 6 | 7 | 99% |
| Djibouti | 86 | 110 | 41% | 56 | 67 | 71% |
| Egypt | 49 | 65 | 89% | 21 | 25 | 93% |
| Iran | 36 | 45 | 95% | 14 | 16 | 99% |
| Jordan | 26 | 32 | 92% | 16 | 19 | 98% |
| Kuwait | 13 | 15 | 98% | 7 | 9 | 93% |
| Lebanon | 22 | 26 | 85% | 8 | 9 | 79% |
| Malta | 8 | 9 | 51% | 5 | 7 | 98% |
| Morocco | 52 | 63 | 88% | 25 | 29 | 99% |
| Oman | 21 | 25 | 98% | 10 | 12 | 99% |
| Qatar | 31 | 15 | 87% | 7 | 8 | 99% |
| Saudi Arabia | 25 | 30 | 94% | 13 | 15 | 98% |
| Tunisia | 36 | 45 | 91% | 13 | 15 | 98% |
| UAE | 11 | 13 | 90% | 6 | 7 | 94% |
| Yemen | 80 | 112 | 40% | 34 | 42 | 67% |

Source: World Bank database

Figure A3: Average Total Health Expenditure (% of GDP) across MENA Countries
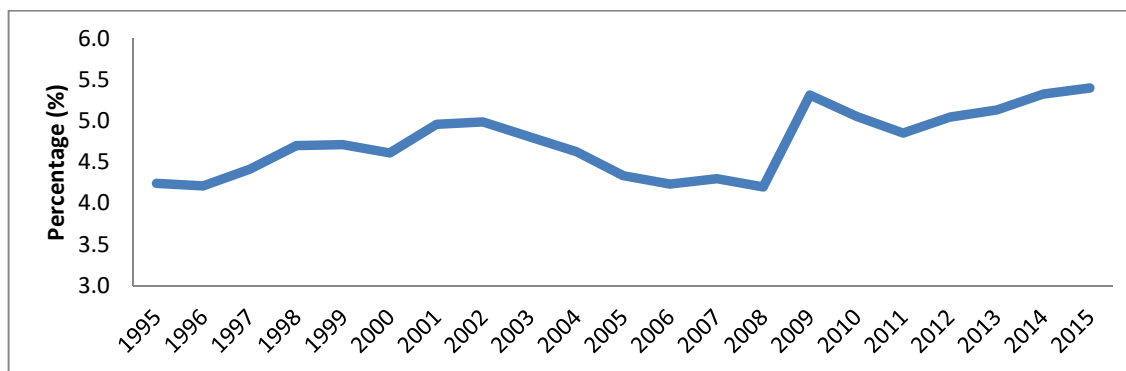
Source: World Bank database

Table A3: Health Expenditure (HE) Across Selected MENA Countries

| Country | 1995 | | | 2015 | | |
|---|---|---|---|---|---|---|
| | Public Health Expenditure (% gov exp) | Public Health Expenditure (% total HE) | Health Expenditure per capita (USD) | Public Health Expenditure (% gov exp) | Public Health Expenditure (% total HE) | Health Expenditure per capita (USD) |
| Algeria | 9 | 72 | 54 | 10 | 73 | 362 |
| Bahrain | 11 | 69 | 485 | 10 | 63 | 1243 |
| Djibouti | 6 | 60 | 30 | 14 | 64 | 191 |
| Egypt | 5 | 47 | 37 | 6 | 38 | 177 |
| Iran | 6 | 45 | 68 | 18 | 41 | 351 |
| Jordan | 15 | 63 | 132 | 14 | 70 | 359 |
| Kuwait | 6 | 83 | 619 | 6 | 86 | 1386 |
| Lebanon | 14 | 34 | 461 | 11 | 48 | 569 |
| Malta | 10 | 68 | 610 | 16 | 69 | 2470 |
| Morocco | 5 | 33 | 48 | 6 | 34 | 190 |
| Oman | 7 | 84 | 227 | 8 | 90 | 675 |
| Qatar | 5 | 63 | 602 | 6 | 86 | 2106 |
| Saudi Arabia | 4 | 53 | 221 | 8 | 75 | 1147 |
| Tunisia | 11 | 49 | 127 | 14 | 57 | 305 |
| UAE | 8 | 79 | 737 | 9 | 72 | 1611 |
| Yemen | 6 | 32 | 40 | 4 | 23 | 80 |

Source: World Bank database

Table A4: Summary Statistics

| | Observation | Mean | Std. Dev. | Minimum | Maximum |
|---|---|---|---|---|---|
| Mortality Rate | 420 | 22.36381 | 17.50209 | 3.2 | 86.2 |
| Health Expenditure | 392 | 5.155519 | 2.204962 | 1.8747 | 13.43731 |
| Public Health Expenditure | 392 | 2.924081 | 1.267616 | 1.267616 | 6.750848 |
| Private Health Expenditure | 392 | 2.225966 | 1.464178 | 0.2911267 | 8.44557 |
| Immunization | 420 | 88.25476 | 13.91688 | 21 | 99 |
| Life Expectancy | 420 | 72.3981 | 5.248327 | 56.98146 | 82.15366 |
| Log Per-capita GDP | 414 | 8.714746 | 1.288106 | 5.627538 | 11.39149 |
| Urbanization | 440 | 73.76296 | 17.93477 | 23.76 | 99.317 |

## Appendix B

Table B1: Benchmark Results

| Dependent Variable: Health Quality | Pooled OLS | Fixed Effects | GLS Random Effects |
|---|---|---|---|
| Health Expenditure | 0.1769933 (0.1551384) | -0.7257963*** (0.2123502) | -0.6367887 *** (0.1837365) |
| Immunization | -0.1371536 *** (0.0226906) | -0.0751791*** (0.0293425) | -.0846208 *** (0.0273022) |
| Life Expectancy | -2.577104*** (0.0905587) | -1.899666 *** (0.2390683) | -2.255107 *** (0.1694999) |
| Log Per-capita GDP | -2.618209*** (0.5240777) | -3.301929 *** (0.7742987) | -3.464257*** (0.6834372) |
| Urbanization | 0.0341137 (0.0267281) | -0.293039 * (0.1788341) | 0.0114894 (0.0641918) |
| | | | |
| Obs. | 381 | 381 | 381 |
| Adjusted R2/Within R2 | 0.9245 | 0.7001 | 0.6963 |

Table B2: Results Using the Hausman Test

| Dependent Variable Health Quality | Fixed Effects | Difference |
|---|---|---|
| Health Expenditure | -0.7257963 | -0.0890076 |
| Immunization | -0.0751791 | 0.0094417 |
| Life Expectancy | -1.899666 | 0.3554402 |
| Log Per-capita GDP | -3.301929 | 0.1623278 |
| Urbanization | -0.293039 | -0.3045284 |
| | | |
| Chi2 (5) | 0.57 | |
| Prob>Chi2 | 0.9892 | |

Table B3: Breusch-Pagan Lagrange Multiplier Test for Random Effects

| Estimated Results | Variance | Standard Deviation |
|---|---|---|
| Dependent Variable Health Quality | 320.4025 | 17.89979 |
| E (country, time) | 11.1779 | 3.343336 |
| U (country) | 16.50229 | 4.062301 |
| Test: Var (u) =0 | | |
| Chi2 (1) | 779.47 | |
| Prob>Chi2 | 0.0000 | |

Table B4: Extended Results–GLS Random Effects

| Dependent Variable: Health Quality | Public Health Expenditure | Private Health Expenditure |
|---|---|---|
| Health Expenditure | -.0476152 (0.3382278) | -1.276061 *** ( 0.2602997) |

| | | |
|---|---|---|
| Immunization | -0.1159696 *** (0.0280649) | -0.0910223 *** (0.0258091) |
| Life Expectancy | -2.324677 *** (0.1729904) | -2.275175 *** (0.1686093) |
| Log Per-Capita GDP | -2.959822 *** (0.7024361) | -3.267584 *** (0.6648816) |
| Urbanization | -.0268782 (0.0667452) | -0.0231248 (0.064601) |
| | | |
| Obs | 381 | 381 |
| Adjusted R2/Within R2 | 0.6825 | 0.7058 |

Note: The table reports the standards error in parentheses

    * Significant at 10%; ** significant at 5%; *** significant at 1%

    Robust standard errors (White test)

Table B5: Extended Results: Oil-exporting versus Non-oil exporting Countries using GLS Random Effects

| Dependent Variable: Health Quality | Sample of Oil-exporting Countries | Sample of Non-oil-exporting Countries |
|---|---|---|
| Health Expenditure | -0.7208167 *** (0.1698824) | -0.9575439 *** (0.2817913) |
| Immunization | -0.0928483 *** (0.0362772) | -0.015471 (0.0368467) |
| Life Expectancy | -1.302155 *** (0.1691771) | -2.191673 *** (0.2717035) |
| Log Per-capita GDP | -2.540255 *** (0.4706346) | -7.733103 *** (1.358331) |
| Urbanization | -0.1400902 ** (0.0677416) | 0.1267888 (0.095197) |
| | | |
| Chi2 (5) | 168 | 213 |
| Prob>Chi2 | 0.8519 | 0.7299 |

Note: The table reports the standards error in parentheses

    *Significant at 10%; ** significant at 5%; *** significant at 1%

    Robust standard errors (White test)

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