

THE DUBAI INITIATIVE

برنامج دبي

**Health Financing and Health Outcomes  
in the Eastern Mediterranean Region**

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**BELFER CENTER**

for Science and International Affairs • HARVARD Kennedy School



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Dubai Initiative – Working Paper

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## Table of Contents

Abstract.....	1
1. Introduction.....	2
2. Data.....	
3. Methods.....	4
4. Health Spending in the Region .....	4
4.1. Health Spending .....	6
4.2. Elasticity of Health Spending in the Region.....	6
5. Health Resources and Service Outputs .....	8
6. Health Spending and Health Outcomes .....	8
6.1. Health Outcomes .....	11
6.2. Does Health Spending Matter?.....	11
7. Conclusions.....	14
References.....	15



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*This paper presents an overview of health spending and health outcomes in the WHO Eastern Mediterranean region over the time period 1995-2006, using cross-country and over-time comparisons. Overall, the region experienced improvements in health outcomes measured in terms of reductions in infant, under-5 child mortality and maternal mortality. However, there are notable exceptions to this trend of declining mortality in countries such as Afghanistan. In addition to providing an overview of changes in health outcomes and health spending over the 12-year period, the paper examines the following two issues:*

- 1) The responsiveness of health care spending to changes in a country's income, and*
- 2) The impact of spending on health care services on health outcomes.*

*The methodological approach adopted in this paper is multivariate regression analysis. I employ random effects models with year dummies, which are appropriate for panel data analysis. I also use double-log formulas for econometric necessity and ease of interpreting the results. The findings indicate that a 1 percent increase in GDP per capita is associated with 0.89 percent increase in health spending in the region and that income growth does not explain all the variation in health spending, indicating that other factors, such as the organization of the health care system, influence health care spending levels. This is an important finding because it suggests that on the one hand cost-containment and on the other mobilizing more funds for the health care sector are possible with appropriate interventions. The findings on the importance of spending on health care for achieving better health outcomes demonstrate that investing in health care matters; a 1 percent increase in health spending is associated with 0.11 percent reduction in infant mortality and 0.14 percent reduction in under-5 child mortality. These results are likely to be underestimating the effect of health spending because of the inclusion of a country's income in the models. Gender parity in secondary school education also had a significant impact on reducing infant and child mortality. Government effectiveness had a strong and significant effect on reducing maternal mortality. The results contradict the notion that increases in income through better nutrition and living conditions alone are responsible for improvements in health outcomes. The results of this analysis clearly indicate that investing in health care also matters.*

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## 1. Introduction

This paper is a study of health financing and health outcomes in the Eastern Mediterranean region as defined by WHO<sup>i</sup>, excluding Iraq due to data availability and quality concerns. It aims to provide an overview of health financing and health outcomes in the region using cross-country and over-time comparisons. It also aims to answer the following two main questions:

- 1) How important is income growth for investments in the health care sectors in the region?
- 2) Is investing in health care important for achieving better health outcomes?

The methodological approach adopted is based on multivariate regression analysis using random effects methods, which are appropriate for panel data structures. I find that even though income growth is the most important driver of health spending growth, other factors explain part of the variation in health spending growth, as well. The results also show that investing in health care services has a significant influence on improvements in health outcomes (infant mortality and under-5 child mortality), as well as gender parity in secondary school education.

## 2. Data

A panel dataset (1995-2006) of 20 Eastern Mediterranean countries was constructed from multiple sources, mainly the National Health Accounts (NHA) country level data.<sup>ii</sup> Primary data sources for NHA and estimation methods are not discussed here, as they are discussed in detail elsewhere.<sup>iii</sup> The resulting dataset has 215 observations.

The importance of supporting the NHA effort at the country level in order to produce better quality NHA data cannot be stressed enough.

The quality of the information varies considerably among countries. However, NHA estimates constitute the only available data that allow for country level analyses to be conducted for non-OECD countries. The importance of supporting the NHA effort at the country level in order to produce better quality NHA data cannot be stressed enough.

The second source is the World Bank's Worldwide Governance Indicators (WGI) project<sup>iv</sup>. Country Governance Indicators used in the analysis are Government Effectiveness, and Voice and Accountability at the country level for the years 1996-2006. However, the indicators are available only for eight of the 12-year period.

The third source of data is the World Resource Institute's Earth Trends Environmental Information Portal.<sup>v</sup> The country data I obtained from this source includes agriculture share of the economy, primary school enrolment ratio, percent of deliveries attended by a skilled health professional, the GINI coefficient, life expectancy at birth, and the number of physicians per 100,000 people.

Table 1 clearly indicates that countries of the region vary widely in terms of economic status and health spending. The mean of GDP per capita over the time period 1995-2006 measured in deflated international dollars varied from a minimum of approximately 536 PPP\$ to 62,727 PPP\$. Similarly, annual health spending per capita varied from just above 17 PPP\$ to 2,571 PPP\$. The percentage of GDP spent on health care also varied widely across countries, from 2 percent to 11.60 percent.



**Table 1: Summary Statistics - Income and Health Spending**

<b>for the period of 1995-2006</b>	No. of countries	No. of observations		mean	st. Dev	Min	Max
<b>Income and Health Spending</b>							
Per capita health expenditure PPP constant dollars	20	210	Afghanistan, Bahrain, Djibouti, Egypt, Iran Islamic Rep, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Morocco, Oman,	468	470	17.11	2,571
Per capita GDP PPP constant dollars	20	210	Pakistan, Qatar, Saudi Arabia, Somalia, Sudan, Syrian Arab Rep, Tunisia, United Arab Emirates, Yemen	11,493	13,711	535.6	62,727
Percentage of GDP spent on health	20	210		4%	2.10%	2%	11.60%

Estimates are presented using Purchasing Power Parity (PPP) constant 2000 dollars

Source: Author's analysis of NHA data

**Table 2: Summary Statistics - Health Outcomes**

<b>for the period of 1995-2006</b>	No. of countries	No. of observations		mean	st. Dev	Min	Max
<b>Health Outcomes</b>							
Infant Mortality	20	80	Afghanistan, Bahrain, Djibouti, Egypt, Iran Islamic Rep, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Morocco, Oman,	44.30	40.01	7	165
Under 5 years Child Mortality	20	80	Pakistan, Qatar, Saudi Arabia, Somalia, Sudan, Syrian Arab Rep, Tunisia, United Arab Emirates, Yemen	61.70	63.89	8	257
Maternal Mortality	20	40		320.50	469.32	4	1900

Source: Author's analysis of WRI data

**Table 3: Summary Statistics - Demand and Supply For Health Care Proxy Variables**

<b>for the period of 1995-2006</b>	mean	st. Dev	Minimum	Maximum
Physicians per 100,000 people	127.00	88.20	4.00	272.00
Percent of Deliveries attended by a skilled health professional	0.78	0.26	0.14	0.99
Gini income inequality index	37.11	2.94	31.20	39.80
Life expectancy at Birth	66.00	10.00	41.00	77.00

Source: Author's analysis of WRI data

The main health outcomes investigated in this paper include infant mortality, under-5 child mortality and maternal mortality. Table 2 demonstrates that also these health outcomes varied very widely across the region.

Maternal mortality reached a shocking high of 1,900 deaths in one of the countries in the region.

The mean of infant mortality (infant deaths per 1000 live births) over the time period 1995-2006 varied from a minimum of seven infants per 1000 live births in a year to 165, and a similar pattern is observed for under-5 child mortality. Maternal mortality also reached a shocking high of 1,900 deaths in one of the countries in the region.

Table 3 presents examples of the pattern of investments in health care inputs, such as physicians per 100,000 people, and some measures of health care utilization such as the percent of deliveries attended by a skilled professional.

### 3. Methods

In this paper, I used multiple sources of data to construct a dataset, which contains information on investing in the health sector, on health resources, service outputs and health outcomes in the WHO Eastern Mediterranean region. The analysis begins with cross-country and over-time comparisons, providing an overview of the situation in the region.

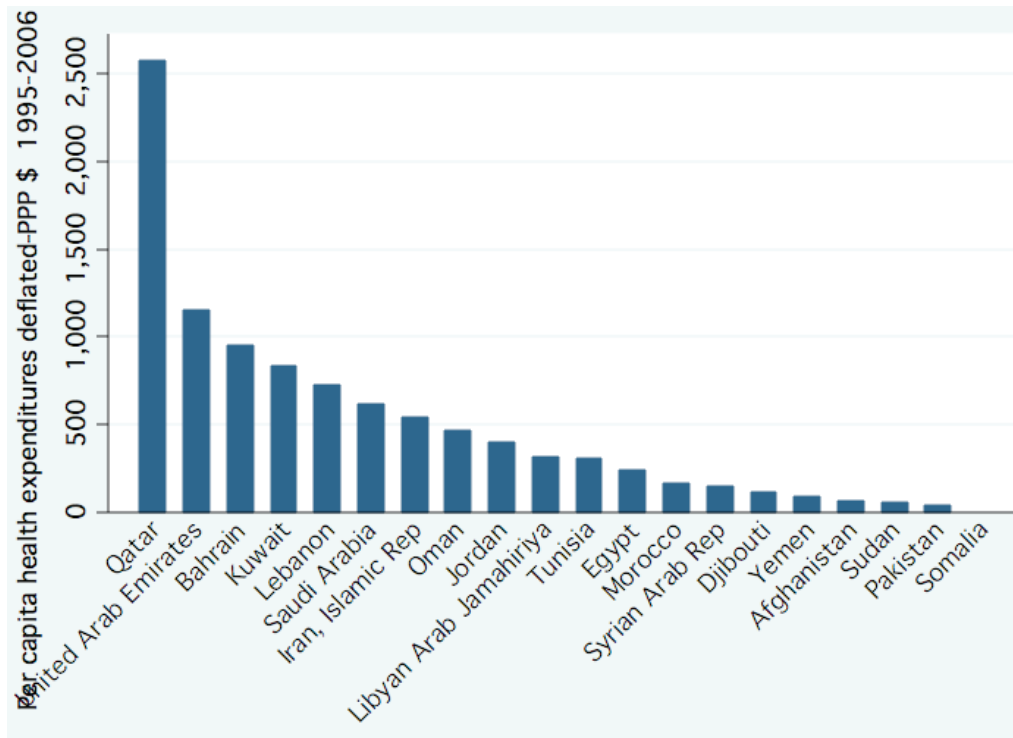
Secondly, in order to answer the questions this paper is raising about investments in health care services and whether this is worthwhile, I employ random effects models with year fixed effects, which control for country and year-specific unobservable determinants of health expenditure, which are major concerns with panel datasets. I performed the Hausman test to determine whether a random or fixed effects model is more appropriate, and it indicated that a random effects model is a superior option in this case. I use double-log formulas for econometric necessity and because it allows for the interpretation of the results as elasticities/percentage changes.

Since the models used in this paper are random effects models with year dummies<sup>vi</sup>, which control for unobserved country level determinants of health expenditures and unobserved year specific shocks/influences on health spending, any bias resulting from time-invariant country level factors is removed. This has been a major concern in early research on the topic, biasing their results upwards.

### 4. Health Spending in the Region

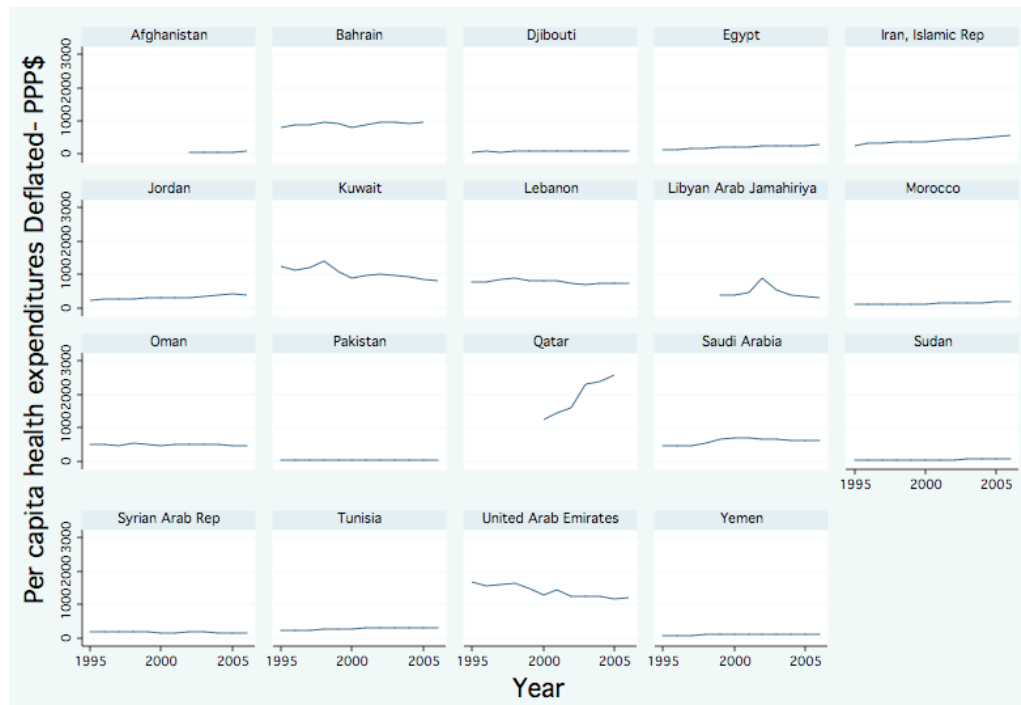
As is evident in the summary statistics above, the Eastern Mediterranean region is far from homogeneous. There is great variation in economic status, level of investments in health care, and in health outcomes. The first section of this paper explores the pattern of health expenditure levels, and over time. It also examines the income elasticity of demand for health care (i.e. the responsiveness of health care spending to changes in a country's income).

**Figure 1: Per Capita Annual Health Expenditures Constant PPP\$—mean for 12 Years (1995-2006)**



Source: Author's analysis of NHA data

**Figure 2: Growth in Per Capita Health Care Expenditure (1995-2006)**



Source: Author's analysis of NHA data

#### 4.1. Health Spending

Figure 1 shows that based on the mean for the time period 1995-2006 of annual per capita health care expenditure in constant international dollars, Qatar had the highest per capita health care spending in the region, followed by the United Arab Emirates and Bahrain. Pakistan, Sudan and Afghanistan spent the least on health care for the same time period, with countries like Jordan, Libya and Egypt placing in the middle of the distribution.

The trend of per capita health care expenditure is characterized by a slight increase in most countries of the region as shown in figure 2, with Qatar experiencing a steep increase. The UAE and Kuwait, on the other hand, both experienced a decline, then a flattening out of the curve, with expenditure remaining somewhat constant the last years of the study.

The government's share of total health care expenditure varied from a low of 10 percent in Afghanistan to a high of 94 percent in Saudi Arabia.

#### 4.2. Elasticity of Health Spending in the Region

The income elasticity of demand for health care is a measure of the responsiveness of health care spending to changes in a country's income. If the elasticity exceeds 1, health care spending grows faster than income. If it is less than 1 the opposite is true. Much of the early research has been based on a single year of international country cross-sectional data from developed OECD countries. The

most well-known paper in this area is Newhouse's,<sup>vii</sup> which used a year's cross-sectional data from 13 developed countries and estimated an elasticity exceeding 1. Parkin et al<sup>viii</sup> estimated an elasticity of 0.90 using a cross-section of data from 18 countries, for which estimates of purchasing power parity (PPP) index for health care were available and were used to deflate health care expenditure. However, later work by Gerdtham et al<sup>ix</sup> estimated an income elasticity of 1.43 using a 1985 cross-section of OECD data, whether per capita health care spending was deflated by a health care PPP index or by a general PPP index. More recent work suggests that the findings obtained in earlier studies may be the result of using a single cross-sectional dataset structure that ignored the presence of unobservable country effects. The most recent research moves away from single year cross-sectional data to pooled cross-sectional data (panel data).<sup>x</sup>

In this paper, I use the Eastern Mediterranean dataset to determine whether health spending increases faster or slower than income in this region (if elasticity is above 1, then it is increasing faster than income, and vice versa).

Results show that the elasticity of demand for health care spending in the region is 0.908 if governance variables are not included, and drops to 0.889 if they are. This indicates that a 1 percent increase in GDP per capita is associated with 0.889 percent increase in health spending in the region. However, the confidence interval around these estimates (0.73-1.04) is relatively wide, indicating that countries in the region exhibit different patterns of growth in health care spending in response to income growth. The difference between the model that includes governance variables and the one that does not is that variables besides national income influence the level of health spending. An R-square of 0.88 suggests that even though income is the most important driver of growth in health care spending, there is a part of the variation in health spending that is not explained by income. Because of data limitations, I could not examine this hypothesis further to explore

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**Table 4: Income Elasticity of Demand For Health Care**

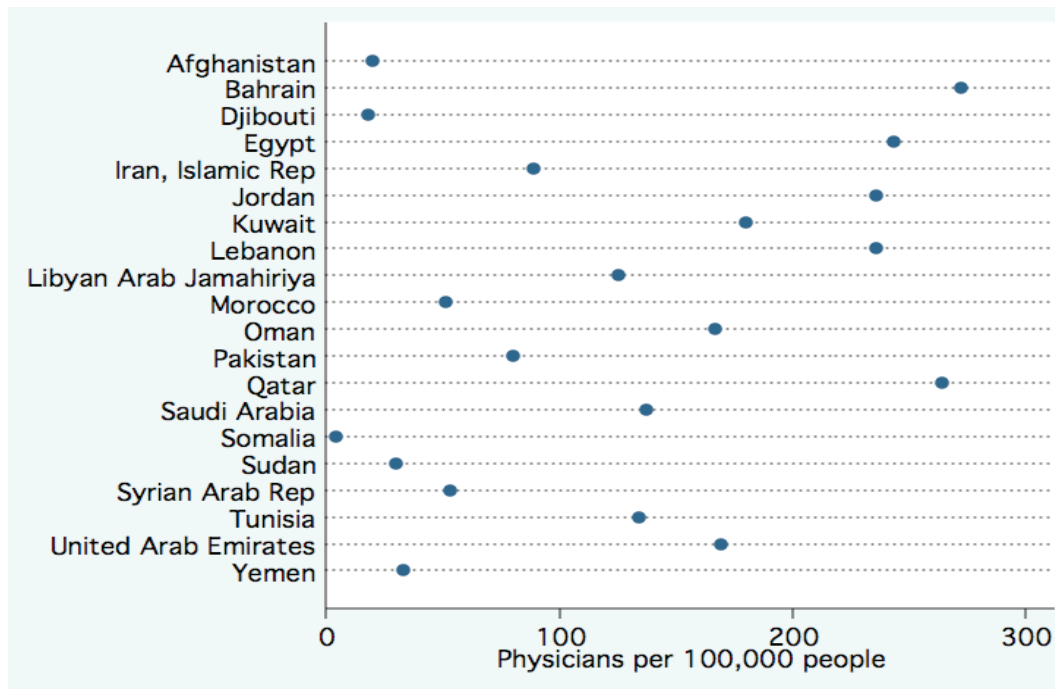
Explanatory Variables	Per capita health spending per capita (PPP constant dollars)	Per capita health spending per capita (PPP constant dollars)
GDP per capita-ppp constant dollars (log)	0.908*** (0.0641552)	0.889*** (0.0781134)
Voice and Accountability		-.025 (0.092304)
Government Effectiveness		0.078 (0.0956641)
No. of observations	210	143
Number of countries used in the analyses	19	19
Number of panel years	12	12
Year fixed effects	YES	YES
Country fixed effects	YES	YES
R-square	0.885	0.883

\*\*\* Significant at 1%, \*\*Significant at 5%, \*Significant at 10%

Standard errors are found in parentheses below estimated coefficients.

Empirical results were obtained by regressing the above variables on per per capita health expenditures for 19 countries between 1995-2006.

Source: Author's analysis of NHA data

**Figure 3: Physicians Per 100,000 People (Mean 1995-2006)**

Source: Author's analysis of WRI data

the variations that could potentially influence health care spending other than income. However, the results are important in that they indicate that on the one hand, health care spending does not necessarily grow faster than income, and therefore there is scope and utility for cost-containment measures for countries with increasing health care costs. On the other hand, since other factors (such as organization of the health care sector) may affect the amount of financing that goes into health care, countries at the low end of the health care spending spectrum could deliberately funnel more funding into the health care sector to cover the increases in health care spending that are driven by growing national income.

## 5. Health Resources and Service Outputs

the availability of specific resources in itself does not guarantee better health outcomes

Different levels of spending on health care are also naturally accompanied by different patterns of investments in health care resources. The “Physicians per 100,000 people”-measure is an indication of health care input distribution across the region. Afghanistan and Djibouti have the lowest physicians per capita ratios, while Bahrain, Qatar and Egypt have the highest. However, as can be seen from Figure 4, the ratio of physician-to-population does not translate directly into utilization of health care services. For example, while Egypt has one of the highest physician-to-population ratios in the region, it does not score very high in terms of deliveries attended by a health professional. In other words, the availability of specific resources in itself does not guarantee better health outcomes. There are supply-side barriers such as the way the health care system is organized and how facilities are distributed across countries, as well as demand-side barriers such as cultural norms that promote certain behaviours which may not be consistent with health care best practices.

Even though health spending does matter, it is not only the availability of resources that is relevant but how these are used.

Figure 5 shows that Afghanistan and Somalia have the highest number of under-5 deaths per 1000 births in the region. In Afghanistan, the number reaches a high of 250 children per 1000 live births. The United Arab Emirates has the lowest rate of under-5 mortality. It is obvious from figure 1 that spending on health care does not correspond directly with better health outcomes. Qatar has the highest per capita health care spending in the region, yet ranks fifth in under-5 child mortality. Even though health spending does matter, it is not only the availability of resources that is relevant but how these are used. Maternal education level also plays a significant role.

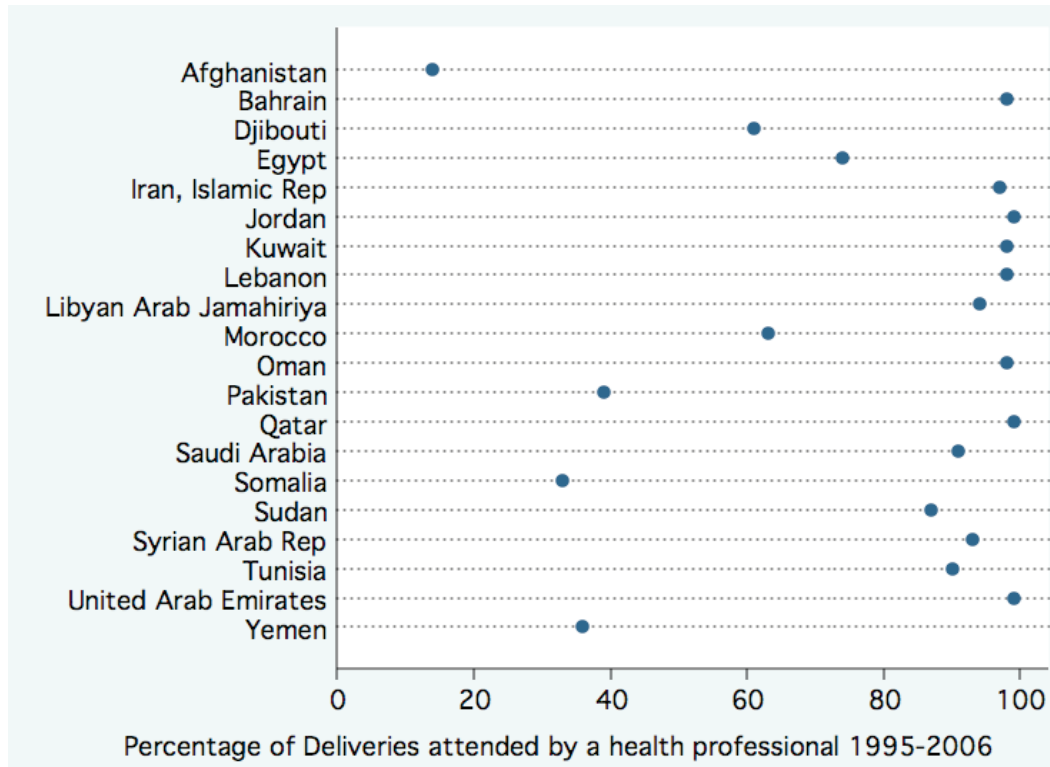
Figure 6 exhibits changes in under-5 child mortality rates in the period 1995-2006. The overall tendency shows that under-5 child mortality is falling in most countries. However, in Afghanistan, it seems persistently high and shows no sign of decline.

Infant mortality follows a very similar pattern to the one observed for under-5 mortality, as can be seen in figures 7 and 8.

## 6. Health Spending and Health Outcomes

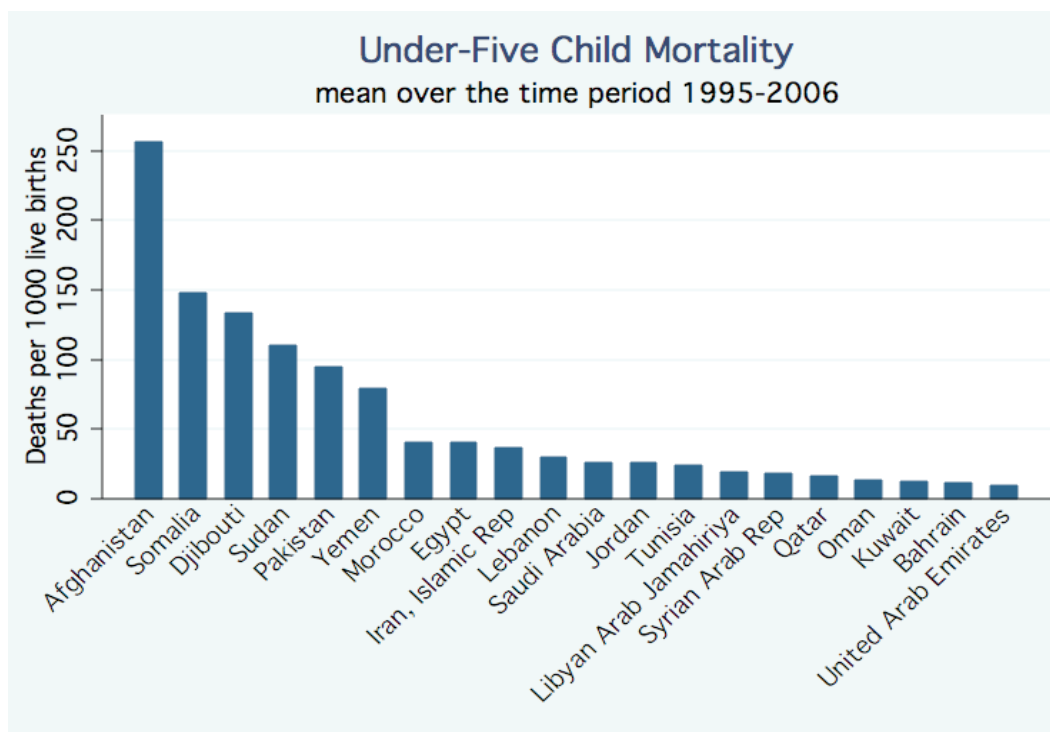
The last section of this paper examines health outcome variations across the region, and the relationship between health care spending and health outcomes.

**Figure 4: Percentage of Deliveries Attended by a Skilled Health Professional (Mean For the Time Period 1995-2006)**



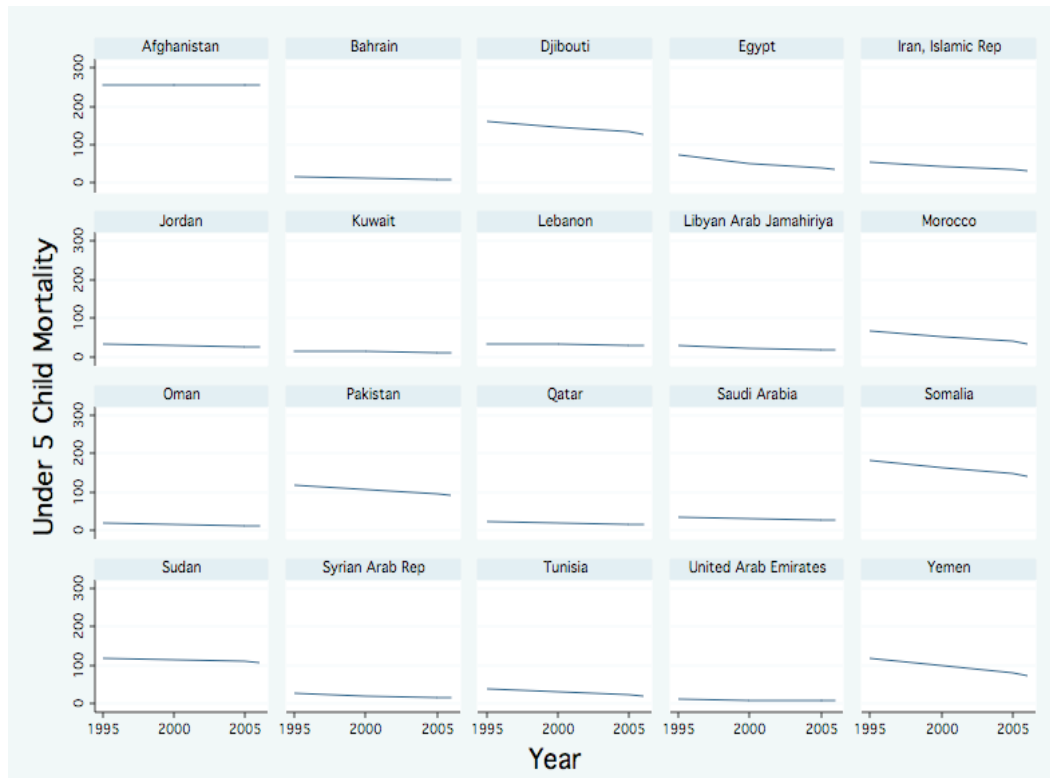
Source: Author’s analysis of WRI data

**Figure 5: Under-5 Child Mortality – Mean 1995-2006**



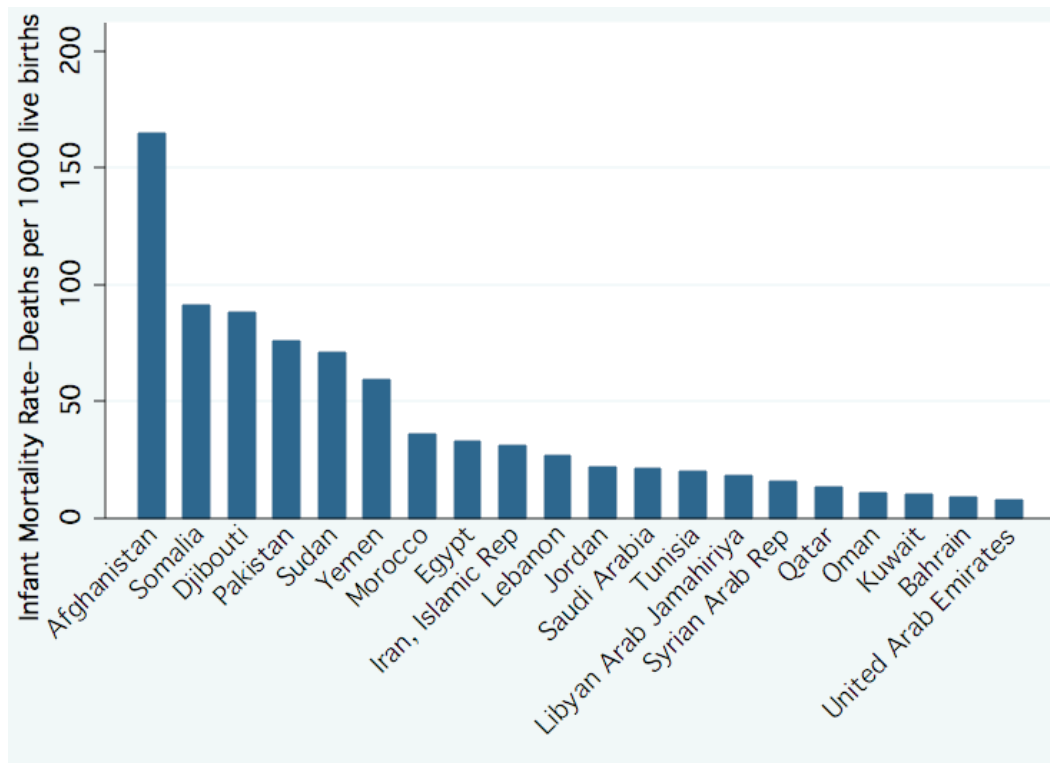
Source: Author’s analysis of WRI data

**Figure 6: Under-5 Child Mortality (1995-2006)**



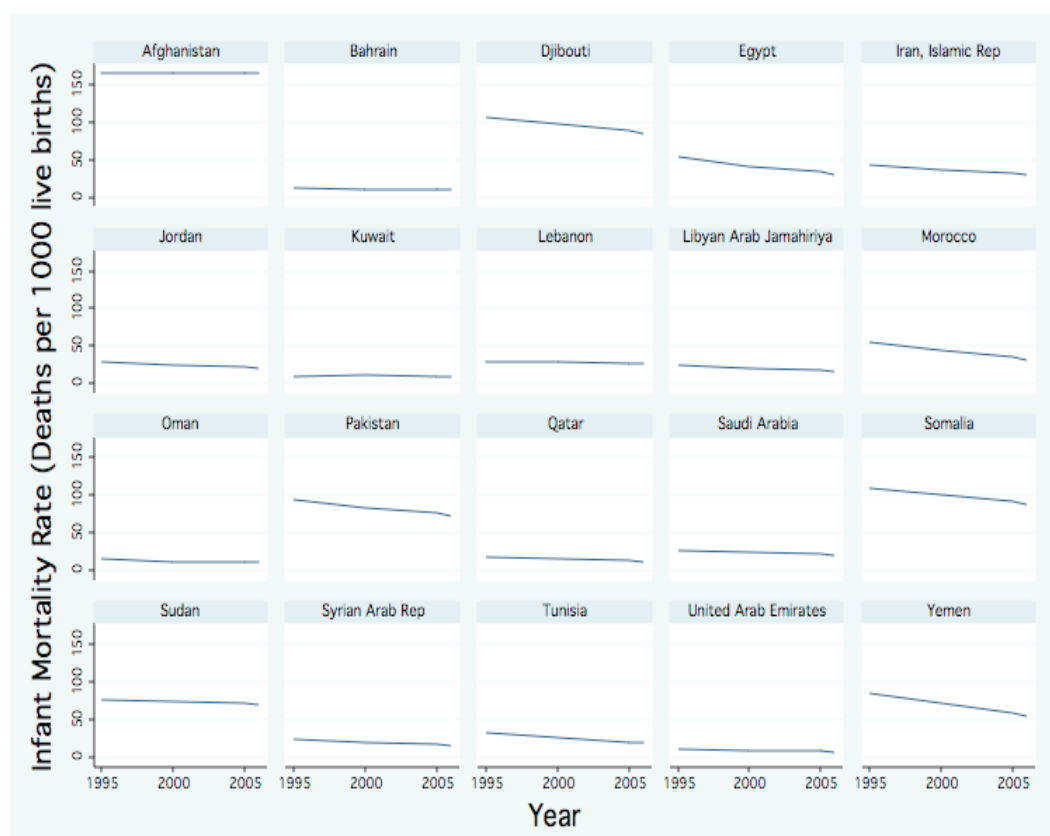
Source: Author’s analysis of WRI data

**Figure 7: Infant Mortality – Mean 1995-2006**



Source: Author’s analysis of WRI data



**Figure 8: Infant Mortality – (1995-2006)**

Source: Author's analysis of WRI data

### 6.1. Health Outcomes

I use three standard health outcomes including infant mortality and under-5 child mortality rates, for which three years' worth of data is available, as well as maternal mortality with data from two years.

### 6.2. Does Health Spending Matter?

Whether spending on health care services matters for achieving better health outcomes is a question that has received much attention in the literature. It has been asked about developed as well as developing countries, at the aggregate country level and the regional level within one country, and using a wide range of measures to capture health outcomes such as longevity, maternal and child mortality rates, as well as cancer deaths. Some studies examined the effects of total health spending on health outcomes, while others investigated the effects of government health spending on health outcomes. The empirical evidence has so far been inconclusive regarding the link between health care spending and health outcomes.

Most early evidence generated from developed country data showed that spending on health care services was not associated with noticeable improvements in health outcomes, leading to the notion that health care services play more of a "caring" rather

The empirical evidence has so far been inconclusive regarding the link between health care spending and health outcomes.

than “curing” role in developed countries. “Countries that spend more may well buy more caring, but little additional curing.”<sup>xi</sup>

Anderson et al found that while health spending per capita in the US increased by 4.3 percent per year from 1990 to 1997, compared with the OECD median of 3.8 percent, the US was generally in the bottom half according to available measures. And, its relative place has been declining since 1960<sup>xii</sup>. Using US Medicare data, Fisher et al found that patients’ health status was similar across five regions with different spending levels, but those who lived in high-spending regions utilized more health care services. Furthermore, the researchers found “no evidence of lower death rates, better functional status, or consistently better satisfaction with care for patients in the high-spending regions”<sup>xiii</sup>.

There are however studies showing a positive effect of health spending on health outcomes in developed countries. Cremieux et al examined the relationship between health care spending and health outcomes using province-specific Canadian data, and found evidence that lower health care spending was associated with a statistically significant increase in infant mortality and a decrease in life expectancy, controlling for economic, socio-demographic, nutritional and lifestyle factors, as well as time trends and province-level factors. More specifically the study found that a 10 percent reduction in health care spending was associated with an increase in infant mortality rates of 0.5 percent among males and 0.4 percent among females, and life expectancies for men declined by six months and by three months for women<sup>xiv</sup>. Martin et al also found a negative effect of health spending on cancer and circulatory disease deaths using English program budgeting data<sup>xv</sup>.

Empirical literature on the link between health spending and health outcomes using data that includes developing countries is equally inconclusive. Some studies find little evidence for a link between public health spending and health outcomes. Earlier work by Musgrove, for example, found no evidence that public health spending had any impact on child mortality, but that infant mortality was strongly related to income per capita<sup>xvi</sup>. Using a cross-sectional dataset of 117 countries (developing and some developed countries) for one year (1993), Zahir et al also found that spending on health care plays a minor role in determining infant mortality rates<sup>xvii</sup>.

However, a larger body of literature has found evidence of the impact of health expenditure on outcomes. Anand et al attributed “two-thirds of the elasticity of life expectancy with respect to average income to the positive effect of income on public health spending.”<sup>xviii</sup> Bidani et al using a random coefficients model regressing aggregate life expectancy and infant/perinatal mortality rates across 35 countries against data on the distribution of consumption per person and allowing for differential impacts of public health spending and primary schooling found that public health spending matters and suggested that it matters most for poor people living in these countries<sup>xix</sup>. Bokhari et al treated government health expenditure and income as endogenous variables, and used instrument variables (GMM-H2SL) to assess the relationship between government health expenditure and health outcomes. The authors found that the elasticity of under-5 mortality with respect to government expenditure is about 0.33, and about 0.50 for maternal mortality in developing countries. The authors emphasized that even though economic growth is important for achieving better health outcomes, government spending on health is “just as important”<sup>xx</sup>.

Research on the significance of health care spending for health outcomes leaves a lot to be desired. There is a clear research gap and need to gain more clarity about the comparative effectiveness of investing in health. The overwhelming majority of cross-country studies (especially on developing countries) use cross-sectional datasets to explore the effectiveness of health spending. However, our understanding of this issue would benefit greatly from using a panel dataset adequately controlling for country and year effects. This is rarely utilized in the literature due to the unavailability of panel data. I use the dataset constructed for the Eastern Mediterranean region to conduct this analysis.

I estimated random effects models with year dummies where the dependent variable is the log of infant mortality in the first model and the log of under-five child mortality in the second. The main explanatory variable of interest is health spending per capita. Other explanatory variables included in the models include GDP per capita, government effectiveness (WB indicator), and gender parity in secondary school education.

The results in table 5 show that investing in health has a significant effect on health outcomes over and above the improvements in health outcomes associated with income growth. A 1 percent increase in health spending is associated with a 0.11 percent reduction in infant mortality. Income also has a negative effect on infant mortality as expected. A 1 percent increase in GDP per capita is associated with 0.37 percent reduction in infant mortality. However, since GDP per capita and health spending per capita are highly correlated, it is very likely that the income effect dominated the health spending effect, and therefore, I expect that the coefficient on health spending to be underestimated. However, it was not possible to use an instrumental variable approach in this model because of the small number of observations and the lack of data on potentially appropriate IVs. The coefficient on gender parity in high school education was also significant, indicating that gender equality and women's education in terms of achieving better health outcomes in the region play a significant role.

The last model estimated in this paper is one where the dependent variable is maternal mortality. The explanatory variables here are health spending per capita and government effectiveness (WB indicator). The income effect dominates the effect of health spending and other variables. Even if there clearly is an endogeneity problem when income is not included in the model, I excluded it knowing that the coefficient will be biased upwards. The results from this model show that a 1 percent increase in health spending was associated with a reduction of 0.45 percent in maternal mortality and that improvements in government effectiveness were associated with a reduction of 0.93 percent in maternal mortality. When income was included, it dominated all other variables. The results in this model are biased upwards as a result of excluding income. However, they clearly indicate that improvements in government effectiveness could potentially have an even larger effect than an increase in health spending has on maternal mortality.

investing in health has a significant effect on health outcomes over and above the improvements in health outcomes associated with income growth.

**Table 5: The Effect of Investing in Health Care on Infant Mortality and Under-5 Child Mortality**  
 Dependant Variables

Explanatory Variables	Infant Mortality (log)	Under 5 Child Mortality (log)
GDP per capita-ppp constant dollars (log)	-0.375*** (0.0595005)	-0.414*** (0.0624614)
Health Spending per capita (log)	-0.110** (0.0872816)	-0.147** (0.0942779)
Government Effectiveness	0.016 (0.0623995)	0.077 (0.0655275)
Gender parity in secondary school enrollment	-0.0107*** (0.0623997)	-0.0122*** (0.0020512)
Number of countries used in the analyses	18	18
Number of panel years	3	3
Year fixed effects	YES	YES
Country fixed effects	YES	YES
R-square	0.828	0.8133

\*\*\* Significant at 1%, \*\*Significant at 5%, \*Significant at 10%  
 Standard errors are found in parentheses below estimated coefficients.  
 Empirical results were obtained by regressing the above variables on health outcomes for 18 countries between 1995-2006.

Source: Author’s analysis of NHA, WRI and WB data

## 7. Conclusions

The Eastern Mediterranean region is far from being homogeneous in terms of economic status, investments in health care services or health outcomes. There is large variation among these countries, underlining the fact that they are grappling with very different health system problems. While some countries at the high end of the spectrum might be concerned with cost-containment, the concern in others such as Afghanistan and Somalia is how to mobilize more resources for the health care sector. This paper presented an overview of the status quo and developments in terms of health financing and health outcomes in the region from 1995-2006. The income elasticity of demand for health care in the region indicates that health care spending growth is slower than income growth in the region overall. Again, there is large variation across the region from an elasticity of 0.77 to 1.04. It is also clear that income does not explain all the variation in health spending (R2 of 0.88), suggesting that deliberate interventions to influence the health care market can be made to either slow down growth or mobilize more funds for health care.

Moreover, there is very wide variation in terms of health outcomes, with some of the worst performing countries in the world included in this region. However, there seems to be notable progress in infant mortality,

...there seems to be notable progress in infant mortality, under-five child mortality and maternal mortality rates.

under-five child mortality and maternal mortality rates, with clear exceptions to this trend such as Afghanistan.

It is well established in the literature that income growth is associated with improvements in health outcomes through better nutrition and better living conditions. However, the link between investing in health care services and positive health outcomes has been more tenuous. This paper shows that investing in health care services in the region results in better health outcomes and that it has a salutary effect on mortality in children, beyond the effect of increasing national income. It also shows that gender equality matters. Gender parity in high school education reduces infant and child mortality, an observation consistent with the hypothesis that more educated mothers are better able to care for their children. Government effectiveness as measured by the World Bank Governance Project was also highly significant in reducing maternal mortality, showing that not only does health care spending matter but governance and how funds are utilized are equally significant for improving the lives of the people in the region.

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