

Original Article

**An association between change in health expenditures and health indicators;
A cross country comparison**Mohammad Qolipour¹ Farzad Faraji Khiavi² **Mohammad Saadati**^{*3}

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Abstract

Background and purpose: Improved life standards, over the past few decades, had led to an increase in health expenditures. The aim of this article was to compare the trend of health expenditure per capita and its association with health indicators in selected countries.

Materials and Methods: The health indices of World Health Organization and World Bank health statistics for 10 years (2003 to 2013) were employed. Countries includes Denmark, the Netherlands, Saudi Arabia, Turkey, Iran, Nigeria and Liberia. Six indices were compared with the global average in 5 income groups.

Results: Denmark with health expenditure per capita more than the Netherlands had higher life expectancy at birth and more deaths as a result of alcohol abuse and tobacco smoking. Nigeria's health spending per capita was 2.5 times more than that of Liberia, because it had worse results in all health indicators with high mortality rate due to lower vaccination coverage for malaria, AIDS, and tuberculosis, and at the same time, high costs for the labor force and corruption in health system. Iran with health expenditure per capita less than Turkey had lower total mortality rate of infants and children under 5 years and lower total fertility. Well-organized PHC system and highly qualified professionals in the field of healthcare are among the strengths of the healthcare system in Iran.

Conclusion: Increasing trend of health expenditures in selected countries did not have a significant impact on the health indicators trend. Countries must identify and invest on their health priorities to improve population health status.

Keywords: Health expenditure per capita; Health indicators; Comparative study

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1. Introduction

Nowadays, most countries have recognized this important issue that health as a public right and the most important factor of sustainable development requires special attention and funding by governments. Health sector is one main segment of a country's economy that is regarded as infrastructure in the process of economic development (1, 2). Since healthcare services are distinct from other markets due to the properties of unknown outbreaks, asymmetric information between physician and patient, limited competition, catastrophic health expenditure, and inequity in access have all led the governments to allocate a share of Gross Domestic Product (GDP) to health sector as expenditure (3-5). On the other hand, it should be noted that it is not clear how health expenditure trend have impact on access to health and health indicators, such as infant mortality rate, mortality rate of children less than 5 years of age, life expectancy at birth, annual population growth rate, and total fertility rate (6-8). Over the past few decades, health costs had a significant increase with a rise in the standard of living and welfare in societies, the development of technology, and increase in people's health awareness and expectations. The examination of the amount of these increases reveals that the amount of costs is extremely inconsistent among different countries (European, Asian, and African countries). For example, even though many Western and South Asian countries had an average health expenditure per capita less than \$50, several other countries in the region had benefited health expenditure per capita more than \$ 500 (9, 10). Since low expenditure in health sector leads to reduction in the rate of return on investment on human resources and the profitability of investment

in health and eventually has a negative impact on the overall economy (11), it is quite clear that the health expenditure per capita share in developed countries is mostly more than developed countries (12). A significant relationship was observed between healthcare data and its outcomes. The relationship between health expenditure and the improvement in infant mortality rate was also significant; however, in European countries, there was a slight relationship between the increase in health expenditure and the increase in life expectancy rate (13). Studies in Iran revealed that the mortality rate of children under 5 years has a 0.16 to 0.42 decrease for every 1% increase in health expenditure through different estimation methods (14). In a study examined the relationships between health expenditure per capita by the government and two health indicators (infant mortality and maternal mortality) in developing countries, and found that the ratio of the average of children's mortality rate and the maternal mortality to the costs by the government are -0.33 and -0.50, respectively, which is indicative of the great importance of the government's expenditure on improving health conditions in different countries (15). Financial resources are considered as the most vital resources for each country, and health budget share of country total income has always been a conflicting issue between policy makers and health professionals, and statesmen emphasized inefficiency of increasing financial resources in improving health status. In return, health professionals assumed that increasing health expenditure per capita leads to the improvement of health indicators. The present study aimed at comparing the change trends in health expenditure per capita during 2003 to 2013 years and its effect on

increasing or decreasing health indices in selected countries to provide the necessary information to answer to this effect.

2. Materials and Methods

As an applied research, the current study was of comparative type. The data were obtained from the World Health Organization and the World Bank health statistics in the years 2003 to 2013 (16, 17). In addition to Iran, six other countries were considered for the current study. Saudi Arabia and Turkey had cultural and religious similarities, and their health expenditures and health system structures were similar to Iran. Denmark and the Netherlands were among the countries with the highest quality of healthcare and highest health expenditure in the world. Nigeria and Liberia, as the poorest countries in Africa, were among the countries with the lowest quality of healthcare. In this research, the changes in health expenditure per capita index and the indicators of mortality rate for children under five years of age, infant mortality rate, total fertility rate, annual growth rate of population, and life expectancy at birth were all studied. These six indicators make the most important tool to assess a

country's health system. To calculate the standard of these indicators, the average value of each indicator was used in five income groups, and using figure, the changes in the period of 10 years in health expenditure per capita were compared. The year 2013 was settled as the base year for other indicators. Hence, six indices were compared with the global average in five groups as high income, upper-middle-income, middle-income, lower-middle income and low income in 2013.

3. Results

Based on the findings of the current study, it was revealed that the health expenditure per capita in the studied countries, had almost been rising from 2003. Figure 1 illustrates the changes in health expenditure per capita in U.S. dollars for five selected countries from 2003 to 2013. Due to the large amount of health expenditure per capita for Denmark and the Netherlands than that of other selected countries, the health expenditure per capita of these two countries were not included in the diagram as they could lessen the precision of the diagram while drawing.

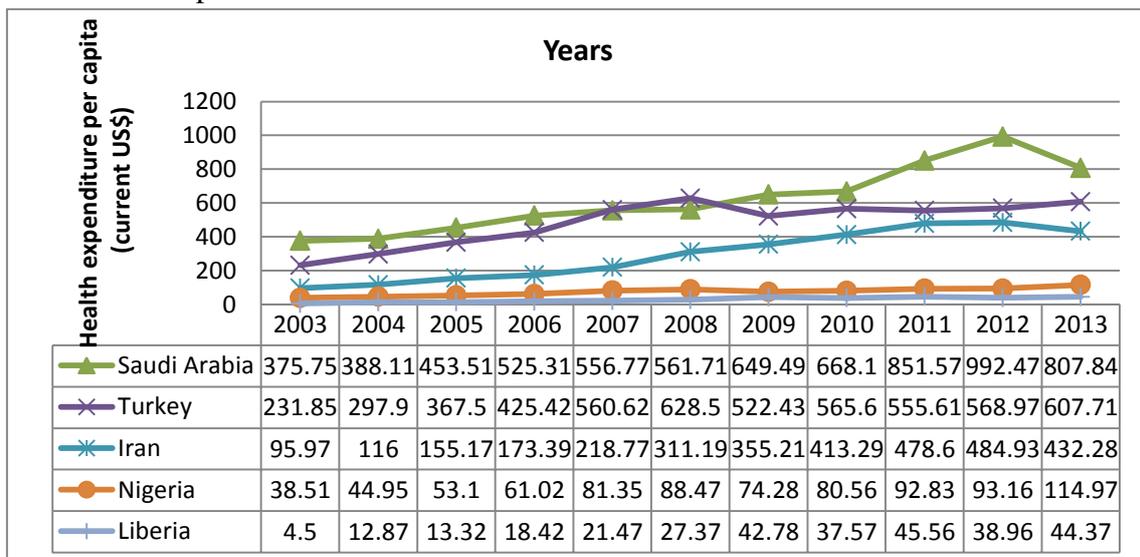


Figure 1. Trend of health expenditure per capita in selected countries 2003-2013

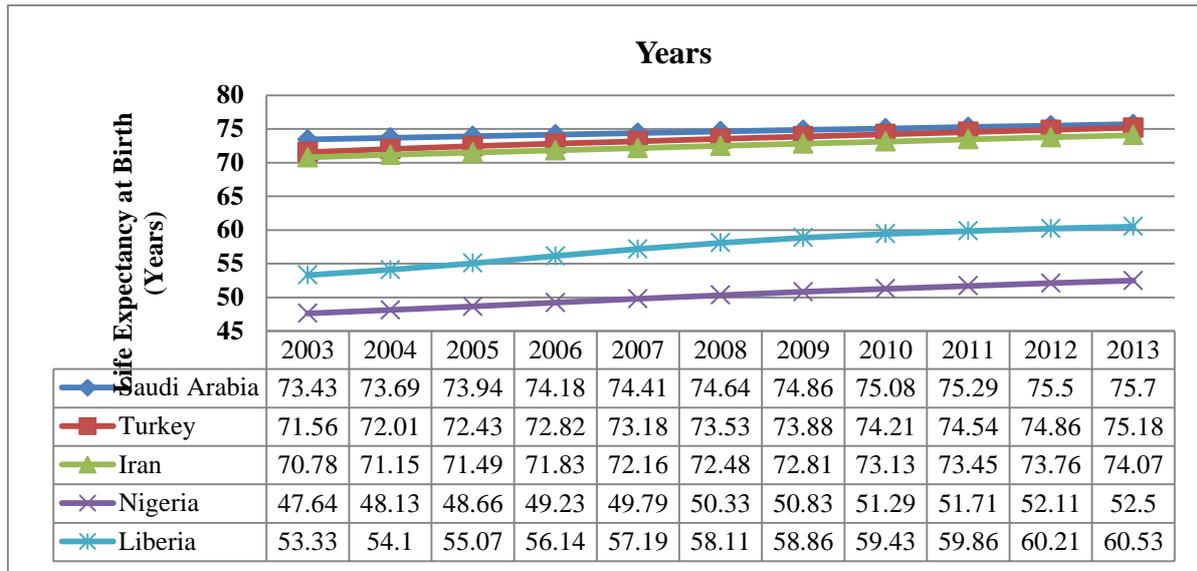


Figure 2. Trend of life expectancy at birth in selected countries 2003-2013

Table 1 presents the indices with regard to the definition of the World Health Organization and the World Bank. In a general examination of health indicators, it was important that any increase in the countries' income rate resulted in the health expenditure per capita indicators and life expectancy at birth to be increased. Meanwhile, it was observed that the mortality rate for infants and children under five years of age indices, total fertility rate, and annual population growth fell down. The results also showed that Denmark with a higher health expenditure per capita than that in the Netherlands has experienced a better performance in reducing mortality rates for children under five years of age and infants but it has shown a weak performance in reducing the total fertility rate, annual growth

of population, and increased life expectancy. Saudi Arabia, with a higher health expenditure per capita than Turkey and Iran, has had higher mortality rate of infants and children under five years of age, total fertility rate, and annual population growth; but life expectancy in Saudi Arabia was found to be lower than that of Turkey and higher than life expectancy in Iran. Despite Iran's lower health expenditure per capita than that of Turkey, it has experienced lower mortality rate of infants and children under age five and lower total fertility rate. Liberia, with lower health expenditure per capita than that of Nigeria, has entailed lower rate of mortality of infants and children under five years of age, total fertility rate, annual population growth rate, and higher life expectancy.

Table 1. Comparison of health indices in the selected countries in 2013

Index (Mean) (2013)	Country						
	Denmark	Netherlands	Saudi Arabia	Turkey	Iran	Nigeria	Liberia
Health expenditure per capita (current US\$)	6269.54	6144.87	807.84	607.71	432.28	114.97	44.37
Mortality Rate, Under 5	3.5	4	15.5	19.2	16.8	117.4	71.1
Infant Mortality Rate	2.9	3.3	13.4	16.5	14.4	74.3	53.6
Total Fertility Rate	1.73	1.72	2.64	2.04	1.92	5.98	4.79
Population growth (annual %)	0.42	0.29	1.89	1.26	1.33	2.79	2.44
Life expectancy at birth	80.3	81.1	75.7	75.18	74.07	52.5	60.53

In Table 2, the average indices in the world countries according to their income are classified into five levels, including below average, average, above average, and high. These indices were obtained through averaging the income of all developed, developing, and underdeveloped countries by the World Bank. Thus, it was determined that if a country is placed in a high-income group (the income of group A), it has the related index of the high-income group (indicator A). The table above shows high-income countries

with A, upper-middle-income countries with B, middle-income countries with C, lower middle-income countries with D, and low-income countries with E.

With an overview of Table 2, it is shown that as the progress result of low-income countries goes toward high-income countries, health per expenditure capita and life expectancy at birth increases, and the mortality rate of infants and children under five years old, annual growth of population, and total fertility rate decreases.

Table 2. Health indices average at different income levels of world countries

Index (Mean) (2013)	Level of Income				
	High income (A)	Upper middle income (B)	Middle income (C)	Lower middle income (D)	Low income (E)
Health expenditure per capita (Current US\$)	4686.74	478.92	277.34	88.26	35.6
Mortality Rate, Under 5	6.3	19.6	43.4	59	76.3
Infant Mortality Rate	5.3	15.6	32.7	44	52.9
Total Fertility Rate	1.69	1.88	2.38	2.87	4.02
Population growth (Annual %)	0.53	0.77	1.14	1.49	2.24
Life expectancy at birth	79.37	74.33	70.26	66.42	62.03

Table 3 shows that the Netherlands and Denmark with health expenditure per capita in A level had an A level performance in all indices (performance related to high-income countries). Saudi Arabia with B health expenditure per capita has acquired D performance for the total fertility rate (performance related to lower-middle income countries), the E performance for the annual population growth rate (performance related to low-income countries), and E performance for the rest of the indices (high performance

for middle-income countries). Turkey with expenditure per capita equal to B has received C performance in the annual population growth rate (performance related to middle-income countries) and B performance for the other indices. Iran with expenditure per capita B has had D performance for the annual population growth rate, and B performance for the rest of the indices. Whereas, Nigeria with D performance and Liberia with E performance in health expenditure per capita have both had E performance in all indices.

Table 3. Comparison of health indices of selected countries relative to their income level

Country	Level of Index					
	Health expenditure per capita	Mortality Rate, Under 5	Infant Mortality Rate	Total Fertility Rate	Population growth	Life expectancy at birth
Denmark	A	A	A	A	A	A
Netherlands	A	A	A	A	A	A
Saudi Arabia	B	B	B	D	E	B
Turkey	B	B	B	B	C	B
Iran	B	B	B	B	D	B
Nigeria	D	E	E	E	E	E
Liberia	E	E	E	E	E	E

4. Discussion

The research question addressed in this study was whether the increase in health expenditure per capita leads to improvement in the performance of the health sector of the selected countries or not? The findings of the current study revealed that the Netherlands and Denmark were among the countries with high income rates, while the Netherlands experienced a lower health expenditure per capita over the years 2003 to 2013, and had a lower total fertility rate and annual population growth rate along with increased life expectancy at birth.

Given the first two indicators, the policies adopted by most of these countries was to increase fertility and rejuvenate the population because of the increasing aging population in Europe; so that, unlike lower-income countries, these countries have directed their health expenditure per capita to increase the total fertility rate and the rate of annual population growth (with measures such as the rise in the number of days of maternity leave after childbirth, birth bonuses for mothers, child care services, etc.) (2, 18, 19). It should be mentioned that the lower life

expectancy at birth in Denmark was due to the different lifestyles, while the more deaths were due to alcohol abuse and tobacco smoking especially in the female population between the years 1978 to 1995; so that with a four-year increase in life expectancy over the years in the Netherlands, Denmark has had only less than one year increase. More health expenditure per capita in high-income countries has also led to benefits, such as reinforcement of health infrastructure, development of information technology areas, traditional medicine, and nanotechnology for surgeries. On the other hand, it has increased the elderly population age and the need for special care and treatment services for the elderly (2, 18-21). In spite of the changes in the amount of health expenditure per capita, Nigeria has not witnessed significant changes in the slope of all indices for the years 2012 and 2013, and its rising process has stopped except for the annual population growth rate. Considering the major changes in the health expenditure per capita in Liberia (55% increase in 2009 and 15% decrease in 2012), this country has not witnessed significant changes in the slope of all indices for the years 2008 and 2009, and its decreasing process has stopped except for the annual population growth rate.

Although the health shares of GDP in Nigeria and Liberia have been 6.1% and 15.5%, respectively, the amount of health expenditure per capita in Nigeria was 2.5 times more than that of Liberia. It was also documented that Nigeria did not achieve better results in all health indicators, because it is the most crowded country in Africa and it suffers one of the highest rates of child mortality in the world. Infectious diseases, especially malaria, AIDS, and tuberculosis are among the major health problems of this country, and the

highest number of malaria-related deaths are observed in children under five years of age. Half of Nigeria's population lives in rural areas, in which the rate of infant and maternal mortality is twice more than that of urban areas due to the weakness of primary healthcare (PHC) in providing maternal and childcare services and lack of water supply in these areas; while Liberia is in a better position in terms of infrastructure and water facilities. The vaccination coverage in Nigeria is 40%, whereas it is in the range of 75% to 100% in Liberia. The major health expenditure per capita in Nigeria is also spent on health manpower costs (the largest number of health workers to the population ratio in Africa) and their training (306 health training centers) (2, 17).

The results of a study by Yaqub and colleagues showed that an increase in public sector health expenditure had a negative impact on reducing the mortality rate of children under five years of age (22), while the issues such as the reports of financial corruption in health system (since 2001 it has taken an upward turn), poor referral system, inadequate and dilapidated infrastructure, poor monitoring system of healthcare, and lack of appraisal system of health expenditure have been documented as the main causes of Nigeria's rising health expenditure (2, 23, 24). Despite some major changes in the amount of health expenditure per capita in Saudi Arabia (e.g. 48% rises in 2012), the slope of changes in its health indicators has not shown any significant variation. Despite the decline in Saudi Arabia in recent years and given the backdrop of the cultural and religious issues and low literacy rate of women, the total fertility rate and the annual population growth rate are high as compared to other countries with similar income (2, 25).

Several reasons can be outlined for the rise in health expenditure in Saudi Arabia. The number of health centers has been increasing over the past three decades. There have been heavy costs, yet lots of efforts to train local workforce so as to compensate for the lack of such personnel. The large area of the country and population density (tribal life) has also led to the employment of a large number of health workforces. Despite 100% vaccination coverage of the population, the most common cause of infant mortality has been premature birth and congenital abnormalities which typically require high expenditure in genetic modern sciences. Health services have been the main focus in the public sector. At the same time, risk factors related to diseases associated with the elderly have risen sharply. Thus, increase in health expenditure per capita has had slight impact on health indicators (2, 17, 26, 27). Turkey's health expenditure per capita in 2008 increased by 47%, while there were observed no significant change trends in health indicators (2). The main expenditure spent by Turkey has been related to its health reform since 2003. Population health insurance coverage in 2010 has reached 98%. A development has also occurred in National Health Information System, and, as a result, family doctors and health centers have developed. In addition, the number of healthcare professionals and training centers of these work forces have increased, and the vaccination coverage of children has reached 100%. Given these facts, there was documented no main expenditure spent in terms of new genetic knowledge (premature birth and congenital abnormalities are the leading causes of death for children), reinforcement of the supervision of the Ministry of Health, and the healthcare dimension (5, 28). In Turkey, despite the

higher annual growth rate of the population than countries with similar income, the study of Canpolat and his colleagues showed that the annual growth rate of the population will be negative by the year 2023 (29). Regarding Iran, the health expenditure per capita in 2008 had increased by 42%, while it has fallen by 10% in 2013. There have also been no significant change in the slope of the increase in life expectancy, total fertility rate, and the rate of annual growth, and a decreasing slope in the mortality rate of infants and children under five years of age between the years 2007 and 2008, while the significantly increasing process of annual population growth rate between the years 2012 and 2013 has experienced a slow slope, and the total fertility rate between the years 2012 and 2013 has remained without any change, although it has had an increasing trend the year before (2). The overall index of expenditure in Iran in the past 20 years has increased 30 times, while the growth in health expenditure has increased by 71 times (30). Focusing too much on healthcare dimension, holding the hospital tariff down to maintain the reimbursement power of insurance organizations, increasing patients out-of-pocket pay (even though reducing it from 60% to 30% has been among the goals of the Fourth Development Plan), increasing pharmaceutical costs by 107 times in the past decade, and child mortality due to congenital abnormalities and premature birth and so on have all led to an increase in health expenditure per capita (31, 32). In a study by Fatahi and Barkhordari, the average technical efficiency of health spending in the public and private sectors has been 0.63 and 0.25, respectively (4). The comprehensive and well-organized PHC system and the highly qualified professionals in the field of health

are among the strengths of the healthcare system in Iran. Additionally, for the purpose of implementing the second phase of Iranian Targeted Subsidy Plan, “Health Reform Program” was designed, and a large budget was allocated to the health sector. The project consisted of seven programs including special packages to reduce the costs of patients in public hospitals, but it cannot yet be judged due to the unavailability of data about it (33, 34). According to the new population policy, and in order to increase the country’s population, the annual population growth rate and total fertility rate will probably increase. Given the lower health expenditure per capita compared to the countries with similar income in terms of the mortality rate of children and infants, almost identical results have been obtained due to the implementation of the PHC system for decades and nearly 100% vaccination coverage for children. The life expectancy rate at birth in Iran has one-year difference with that of Saudi Arabia and Turkey, which could be due to the mortality rate resulting from accidents and particularly car accidents in Iran (2, 35).

Overall, the results of the present study showed that the increase in health expenditure per capita in the selected countries had no significant effect on the trends of health indicators. It was also revealed that improvement in health system infrastructure is very costly; therefore, an increase or decrease in health expenditure per capita in the short term cannot make significant changes in health indices. Subsequently, the indices for measuring the development of health system infrastructure need to be considered. In Iran, a large budget has been allocated to the health system through targeted subsidies in recent years to reduce the costs paid by patients and improve the

quality of hospital services. Therefore, basic and firm steps need to be taken to examine the further influence of health expenditure on Iran’s health indicators in the field of prevention issues.

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Conflict of interest

None declared.

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