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The Strategic Relationship between Health Status, Total Health Expenditure and Economic Growth in Jordan

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Abstract—*improvement in health is considered as much important as country's income improvement, no way to separate between them especially when thinking about achieving development and human welfare**. Health status is measured by several key indicators, this study utilized three indicators that include infant mortality rate (IMR), crude death rate (CDR), and under-five mortality (u5m). This research paper aims to examine the relationship between the health status, the health care expenditure and the economic growth through the period 1995-2013. Research objectives Due to the great emphasis of health role on economic growth and its significance, this study has been designed and implemented within the Hashemite Kingdom of Jordan to investigate and explore a research model that determines the relationship between the health–health expenditure and economic growth To achieve the first goal, the ARDL approach was utilized to estimate a logarithmic form of the traditional production function where output was a function of health expenditure, capital and labor and foreign aid. According to the results of the estimated elasticities of the output with respect to health expenditure, capital, labor and foreign aid were 0.21, 0.125,042; -0,011 respectively. The results identified a positive impact of health expenditure on economic growth which indicates the importance and necessity to developand recommend a comprehensive strategic plan for the health sector. The results also revealed a positive impact of both gross domestic product and Per capita health expenditure on health indicators.*

Keywords—*Economic Growth, Health Care Expenditure, Health Status, ARDL, Granger Causality.*
JEL. *F31, O24, F14.*

I. INTRODUCTION

Regardless of gender, age or socioeconomic status, healthcare is considered one of the top priorities in an individual's life. As health status gets more complex so do the expenses associated. Situation can get more complex especially within developing countries.

Health care spending is characterized in most developing nations by inverted nature of spending pyramid. Ogungbenle, *et al,* (2013) revealed that three quarter of public health expenditures are trending towards increased healthcare costs thus limiting the benefits gained through only a small part of the population, especially those living in urban areas. In such cases the nations failed to achieve the desired economic growth and the best health outcomes benefiting community.

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The figure below shows that efficient health expenditure will push in both directions of the health and economic growth, this dynamic relationship makes health and health expenditures one of the top priorities for countries, especially developing nations who believe in human capital investment.

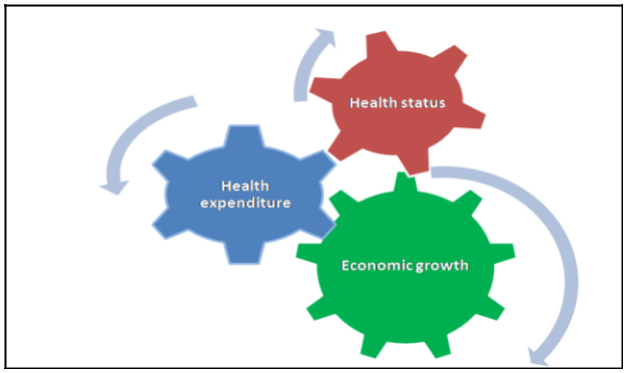

Figure 1. *Dynamic relationship between health expenditure and economic growth.*

The problem emerges through a content analysis of literature review as[1], revealed that a country's income is an important factor in enhancing health care expenditures but the impact of this expenditure must be reflected and implemented towards a constructive, healthier and productive society. [2]who investigated a Nigerian case, showed that there is a relationship between the size of health expenditures and achieving direct and substantial economic growth and this is observed only if the funds are spent on the right channels in an effective way.

Therefore, this research is seeking to identify a solution for such a problem by answering the following questions:

1. How does the expenditure pattern in Jordan impact the health sector?
2. How has the government expenditures on health transmitted to Jordanian economy?
3. How to investigate the role of health investment in explaining the variations of country's output through human capital enhancement and labor productivity?

By reviewing previous research studies related to three interlinked areas, "Health- health expenditure Growth", the below observations formulate the research gaps and contribution.

1. Scarcity of researches in developing countries negotiates existence relationship between health and development
2. Inequality of health services within the same region in Jordan draw attention towards analyzing time series data.
3. Many studies implemented a cross sectional approach analysis rather than a time series analysis that this study utilizes, thus giving this research an advantage by attaining a robust production function that can be easily examined.

II. LITERATURE REVIEW

Improvement in health is considered as much important as country's income improvement[3], no way to separate between them especially when thinking about achieving development and human welfare[4].
Investment in health is part of human capital investment which is considered as an agent of national development that plays a vital role in achieving sustainable economic growth[5].

The role of human capital in growth was investigated in new growth theories which concentrate on enhancing human potentials by improving human capital formation and methods of promotion, such as education and health[6].

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[7]shows that many developing countries failed to translate health expenditure to better health status; he investigated thoroughly the effectiveness of public health expenditure in Nigeria by taking into consideration the impact of governance on health indicator[8],

In contrast [9]concluded that although better health status provides the market a good labor force, increase in the demand on health service due to ageing population will inversely affect economic growth.

The link between health and economic growth was identified by [10]who investigated the mechanisms by which health and education affect demographic transformation needed to enhance economic growth; according to the study the major cause of poverty includes ill health[11]. Once health diminishes there is a high tendency to become poor. Poverty, especially if the illness persists, considering health as a human capital, can affect growth directly through its impact on labor productivity[12].[13]utilized a two stage least squares techniques to estimate the impact of life expectancy and schooling on GDP, the study showed that any improvement in health will increase output in two ways, first by enhancing productivity of labor and secondly by enhancing capital accumulation. The net result in this study revealed that improvement in one year in population life expectancy leads to increase output by four percent[14].

The importance of human capital development on economic process wasalso investigated by [15]who examined the role of different measures of human capital on economic growth enhancement in Nigeria, the study proxy education, health by adult literacy rate, life expectancy and analyzed the model by ordinary least square technique. The results revealed a positive relationship. Numerically 1% increase in literacy rate resulted in 2.465% increase in growth, while 1% increase in life expectancy leads to 2.73% in growth resulting that such an investment is worthwhile. There are two–way relationships between health expenditure and economic growth. A series of studies investigated the relationship between health expenditure and economic growth that resulted in divergent views about such a relation. In regard to developing countries [16]explore the relationship between health care expenditure and economic growth through the period of (1990–2009). Utilizing the panel co–integration technique in VECM framework, the finding revealed that the direction of the causality comes from GDP towards health spending not vice versa in short run speaking, while in long run, bidirectional causality between them appeared. [17]through a study conducted in 30 developing countries during the period 1995–2011, states the effect of both health and military expenditure in developing countries on economic growth. The relationship is tested empirically with dynamic panel analysis in accordance to endogenous growth model. In contrast to endogenous growth model which resulted expected that defends the productivity of some public expenditure. The results in this study revealed an insignificant relationship between both expenditure and economic growth. This result supports and is in alignment with the neoclassical growth models.

III. HEALTH SECTOR IN JORDAN

The health sector in Jordan has made major positive steps towards the development of a comprehensive health sector compared to the regional and developing countries. The progress in the Jordanian health sector is not limited to treatment, but it has made important developments in other health services such as school health, hygienic education, vocational health, maternity and early childhood, family health, vaccinations and communicable diseases[18].

Despite the limited natural and financial resources, Jordan has achieved major progress in the health sector and its services quality have even become as developed countries provide for their citizens. Healthcare services are provided at high stake levels for the majority of Jordanian and non-Jordanian citizens with the best quality.

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Jordan has made major steps in disease prevention measures as the national disease prevention programs have led to high percentage of disease control. The high vaccination rate in Jordan is clear evidence of success in the diseases prevention measures

While investigating important health indicators in Jordan as compared to the averages of health indicators in the Middle East countries and the ones located in the lower rank of middle-income GDP, it can be observed that Jordan's health sector is in the right direction compared to Middle East countries and similar income countries. Table (1) shows this:

Table 1. Health Indicators in Jordan compared to the means scores of health indicators inthe Middle East countries and similar income countries

Table 1. *Health Indicators in Jordan compared to the means scores of health indicators in the Middle East countries and similar income countries*

Indicator	Jordan	Averages of health indicators in the lower rank countries	Middle East countries average
Newborns\ per1000	32	19.6	21.7
Deaths\ per 1000	5	8.6	6.5
Children's death rates\ per each 1000 live births	29	35.2	45
Population growth average	2.8	1.1	2.1

Source: Bakir & Kharabsheh, (2006).

The health sector in Jordan contains the following (Jordan Ministry of Health Annual Report, 2013**)**

3.1. Public sector

This sector includes Ministry of Health, Royal Medical Services, Medical services in the public universities and the health services in the public ministries and institutions.

The Ministry of Health in Jordan was established in 1950 and it provides primary, secondary and third level health services:

3.2. Primary health care services

The Ministry of Health in Jordan is the primary authority that is responsible for providing primary health services and this includes the treatment of communicable diseases, emergency health services[19], prevention vaccination health services, maternity and early childhood health services, school health services, public health services, environmental health services and health education services. The ministry of Health in Jordan has adopted health services delivery policy for all Jordanians and non– Jordanians and its services are on all the geographical regions. The comprehensive health care centers have totaled (95) on 2013, and the number of primary health care centers was (375) while the number of secondary health care centers was (205). As for maternity and early childhood care centers, they totaled (448) and the following table shows the numbers of health care centers in the various Jordanian regions (2009-2013):

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Table 2. *The development of health care services*

Indicator		2009	2010	2011	2012	2013
Number of population		5980.0	6113.0	6249.0	6388.0	6530.0
(in thousands)						
Number of population under		37.3	37.3	37.3	37.3	37.3
(15)%						
Number of population in the age group		59.4	59.4	59.4	59.4	59.4
(15-64) %						
Population over 65%		3.2	3.2	3.2	3.2	3.2
Number of hospitals		104	106	106	106	103
Number of beds		11351	11779	11991	12106	12081
Population average per bed		526.8	519.0	521.0	528	541
Doctors average per (10000) persons.		24.5	26.5	25.5	27.1	28.6
Number of comprehensive health care		70	84	86	92	96
centers in ministry of health						
Number of primary health care centers		378	368	371	372	375
in ministry of health						
Ministry of health budget from the		8	7.9	6.3	6.3	6.7
general budget %						
	Cholera	**0**	**0**	**0**	**0**	**0**
Communicable	Smallpox	**0**	**0**	**0**	**0**	**0**
	Epidemic	33	16	9	2	13
diseases	Meningitis					
	Paralysis	**0**	**0**	**0**	**0**	**0**

Source: (The annual statistics, General statistics)

As seen in the previous table, Jordan has achieved major developments in the health sector whether on the population related vital indicators and these are concerned with the numbers of hospitals, beds and doctors. These developments also include the elimination of communicable diseases as a result of the improvement in the living

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standards of Jordanians and the improvements in the health care services. It must be noted that epidemic meningitis has reported higher rates in (2013) and this may be attributed to the growing numbers of Syrian refugees in Jordan[20].

3.3. The Royal Jordanian medical care services

These provide treatment services (second and third level services) for the Jordanian Army recruiters and their families by (12) hospitals. The number of beds in these hospitals totaled (2439) and they represent (20.2%) of public health services.

3.3.1. University of Jordan Hospital

The hospital provides its health services for University of Jordan employees, their families, university students, and patients referred from the Ministry of Health in accordance to agreements signed between the two parties. In addition, the hospital provided health services to poor patients who can't afford paying the treatment costs. The hospital contains (534) beds.

3.3.2. King Abdullah I University Hospital

The hospital provides health care services for Jordan University for Science and Technology University employees, their families, university students, and patients referred from the Ministry of Health in accordance to agreements signed between the two parties. The hospital contains (501) beds.

3.4. Second: The Private sector

This sector includes private hospitals, doctors' clinics, diagnosis and treatment centers, and supporting medical professions in the private sector. The health care private sector is an investment one in health care and health services and provides these services by (58) hospitals. In 2013, the number of beds in private sector hospitals totaled (3989) and this represents (33.0%) of the total health sector services.

3.5. Second and third level health care services (Hospitals)

The ministry of health in Jordan provides treatment services by (31) hospitals. Number of beds in these hospitals totaled (4618) and this number represented (38.2%) of total public sector services. Table (3) shows the development of second and third level health care services:

Table 3. *Second and third level health care services (Hospitals)*

Year	**Sector**	**Ministry of**	**Royal Medical**	**Public Universities**		**Private Sector**
		Health	Services	University	King	
				of Jordan	Abdullah I	
2009	No. of hospitals	30	11	1	1	61
	No. of Beds	4358	2131	519	494	3858

Third: International and Charitable Sector

This includes the UNRWA health care services and the health care clinics affiliated to the domestic and international charitable societies.

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International Relief Agency

It is one of the most significant and biggest international organizations providing health care services in Jordan as they have (104) health care centers in the different refugee's camps. The most significant health care services include: Maternity and early childhood health care services, Family health care, Vaccinations, Nutrition and health guidance, School health in addition to treatment services.

Fourth: Boards and institutions

These include The Higher Health Board, The Jordanian Medical Board, The Jordanian Nursing Board and The Food& Medication Authority.

The health care sector in Jordan is well known of providing high quality health care services and this has made Jordan one of the most significant centers in the region. This is confirmed by the pioneering efforts by the Jordanian health care policies in adopting the technical developments in the field and providing complicated surgical operations. these include number of newborns, number of deaths and the estimated age average. It can be noticed that ratio of newborns to deaths confirm a significant improvement in the health care services. Table (4) shows the improvements in the health care services

Table 4. *Health in Jordan*

Year	Newborns/1,000 people	Deaths/1,000 people	estimated average age year
1995	33	5	71
1996	33	4	71
1997	32	4	71
1998	32	4	71
1999	32	4	71
2000	31	4	72
2001	28	5	72
2002	29	5	72
2003	29	5	72
2004	29	7	72
2005	29	7	73
2006	29.1	7	73
2007	29.1	7	73
2008	28	7	73
2009	30.6	7	73
2010	30.1	7	73
2011	28.9	7	74
2012	28.1	7	74
2013	28.1	7	73

Gross Domestic Product (GDP)

GDP is defined as the total domestic production which is the total added value of all the resident producers contributing in the economy in addition to any taxes paid by the producers minus any support aids not included in the products value. GDP is calculated without the deduction of any asset damages or any other forms of deductions due to lack of resources. The GDP is expressed using the US dollar current value. The national GDP is calculated by the sum of all product prices in the local currency transferred to the US dollar in accordance to the currency exchange value for one year. The actual price does not reflect the official currency price that is applied when calculating the GDP. Table (5) shows the development of Jordan GDP (1995-2013).

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Received: 15 Dec 2019 | Revised: 02 Jan 2020 | Accepted: 15 Jan 2020

Table 5. *Total GDP in Jordan (1995-2013).*

Year	GDP (Real GDP BILLION JD)
1995	6.467
1996	6.324
1997	6.422
1998	6.801
1999	6.964
2000	7.182
2001	7.484
2002	7.848
2003	8.158
2004	8.895
2005	9.482
2006	10.673
2007	11.584
2008	13.065
2009	14.265
2010	15.073
2011	15.704
2012	16.115
2013	16.804

Source: World Bank, 2013.

Expenditure on Health Sector in Jordan

The expenditure on health sector is the total public and private health expenses and it covers the delivery of health care services (prevention and treatment) family health care services, nutrition services, emergency aids provided for health care. These do not include the water and sanitation.

Table 6. *Total health expenditures percentage from GDP (1995- 2013).*

Year	Expenditure as % GDP
1995	8.5
1996	8.9
1997	9.0
1998	9.3
1999	9.4
2000	9.7
2001	9.9
2002	9.7
2003	9.2
2004	9.1
2005	8.9

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2006	8.1
2007	8.3
2008	8.8
2009	9.5
2010	8.5
2011	8.8
2012	9.8

Source: (World Bank, 2013)

As seen in the previous table, there is a variation in the expenditure on the health care sector in Jordan as it reported the lowest rate in (2006) while the highest rate was reported in (2012).

Comparison between public and private sectors health care expenditure

The general expenditure on health care includes the recurrent expenditure and the capital expenditure from the governments budgets (central and regional), debts and grants (and these include the donations provided by the international agencies and non–government organizations) and the social and mandatory health insurance funds. The health care expenditure include the direct and indirect living expenses, special insurance, charities and the direct private companies' payments.

The private sector contributes in high rates of health care services expenditure as seen in the following table:

Table 7. *Comparison between public and private sectors health care expenditure as % ofGDP*

	95	96	97	98	99	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Public %GPD	5.3	5.4	5.1	5.3	5.0	4.6	4.8	4.8	4.5	4.7	4.8	4.5	5.0	5.4	6.7	5.7	5.8	6.2
Private% GDP	3.1	3.5	3.9	4.0	4.4	5.0	5.1	4.9	4.7	4.4	4.1	3.6	3.4	3.3	2.8	2.8	3.2	2.5

Source (World Bank, 2014)

As seen in the previous table, the highest public expenditure on health care services was in (2012) while the highest private expenditure on health care services was in (2002). The lowest public expenditure on health care services was in (2006) and for the private sector in (2010).

IV. MODEL SPECIFICATION AND ECONOMETRIC METHODOLOGY

4.1. Methodology

This study is based on the use of the two approaches, descriptive analysis and Econometric analysis to study of the relationship between health; health care expenditure and economic growth, using ARDL model on time series data.

4.2. Definitions of the variables and the data sets

Annual time series data for the model variables over the period (1995-2013) is used, as follows:

4.3. Gross Domestic Product (GDP)

Data of GDP at constant market prices (1994=100) is taken from the online database of the Central Bank of Jordan (CBJ) measured in million Jordanian Dinars (JD million). To get real figures, this series is adjusted using the Consumer Price Index (CPI) series for the period1995-2013from(CBJ).

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4.4. Health care expenditure

Data about health care expenditure are gathered from the annual reports of the World Bank and Ministry of Health the annual reports.

4.4.1. Capital Stock (K)

Data of (K) proxied by Gross Fixed Capital Formation at local current unit collected from the Central Bank of Jordan online database.

4.4.2. Labor (L)

The labor variable is proxied by the compensation of employees. To get real figures, this series is also adjusted using CPI series for the period 1995– 2013.

4.5. Health indicator

Infant mortality rate, under five mortality rates and crude death rate are the health indicator gathered from World Bank data base and ministry of health annual report during the period 1995–2013.

V. FINDINGS

5.1. Unit root test

Definition

Consider a discrete-time stochastic process $\{y_t, t = 1, \ldots, \infty\}$, and then it can be written as an autoregressive process of order p:

$$y_t = a_1 y_{t-1} + a_2 y_{t-2} + \cdots + a_p y_{t-p} + \varepsilon_t.$$

Here, $\{\varepsilon_t, t = 0, \infty\}$is considered a serially uncorrelated which means zero stochastic process with constant variance σ^2.For convenience, assume $y_0 = 0$.If $m = 1$ is a root of the characteristic equation:

$$m^p - m^{p-1}a_1 - m^{p-2}a_2 - \cdots - a_p = 0$$

The stochastic process has a unit root or, alternatively, is integrated of order one, denoted $I(1)$.If m = 1 is a multiplicity, then the stochastic process is integrated of order r, denoted I(r).

Table 8. Unit Root Test for equation 4-4

Variable		Level			First difference	
	Adf	Critical value	Result	Adf	Critical value	Result
ΔGDP	0.040	3.05	No stationary	4.9	3.06	Stationary
K	1.67	3.05	No	5.36	3.06	Station(5%)
Wpop	0.16	3.05	No	4.09	3.08	Station(5%)
AD	0.0005	3.05	No	3.00	2.67	Station(10%)
GV	0.34	3.05	No	2.9	2.67	Station(10%)
PH	1.8	3.05	No	2.72	2.67	Station(10%)

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5.2. Granger causality test

Table 9. Granger Causality Test for equation 4-4

Causality direction		**Lag 2**		**Lag 4**
	f- value	**Probability**	**f- value**	**Probability**
Ln ΔGDP does not Granger Cause lnGV	0.75	0.49	2.02	0.21
Ln GV does not Granger Cause Ln ΔGDP	0.72	0.50	0.84	0.54
Ln ΔGDP does not Granger Cause LNAD	3.8	0.05	1.54	0.30
LNAD does not Granger Cause Ln ΔGDP	1.5	0.25	0.87	0.53
LNK does not Granger Cause Ln ΔGDP	2.5	0.11	7.38	0.01
Ln ΔGDP does not Granger Cause LNK	5.2	0.02	0.90	0.51
LNTHE does not Granger Cause Ln ΔGDP	2.8	0.09	3.15	0.10
Ln ΔGDP does not Granger Cause LNTHE	1.3	0.3	6.68	0.02
LNWPOP does not Granger Cause Ln ΔGDP	4.6	0.03	11.1	0.006
Ln ΔGDP does not Granger Cause LNWPOP	1.2	0.32	1.69	0.26
LNWPOPL does not Granger Cause LnΔGDP	0.07	0.92	9.75	0.00
LNGDP does not Granger Cause LNWPOPL	0.11	0.89	0.77	0.57
PR does not Granger Cause Ln ΔGDP	1.25	0.31	1.12	0.42
LNGDP does not Granger Cause lnPR	2.0	0.17	9.4	0.009

Granger causality test show these results

1- According to granger causality hypothesis that Ln ΔGDP does not granger lnAD, due to results above we refuse this hypothesis based on f-value 3.8 and prob(0.05) this indicate that Ln ΔGDP cause lnAD.

2- Study hypothesis Ln ΔGDP does not cause granger cause lnk, we can refuse this hypothesis and accept other that lnGDP cause lnk based on f-value 5.2 and p-value 0.02 .

3- The result of this hypothesis (LnTHE does not granger cause Ln ΔGDP, we refuse this hypothesis and accept other one that lnTHE cause Ln ΔGDP according to f-value 2.8 and p- value 0.09.

4- According to the hypothesis lnWpop does not cause granger Ln ΔGDP, we refuse and accept alternative hypothesis that indicate lnWpop cause Ln ΔGDP with f-vale 4.6 and p-value 0.03.

5- According to this hypothesis result (Ln ΔGDP does not Granger Cause PR) we reject it and accept alternative one that based on f-value 9.4 and p-value 0.009.

Second model

5.4.1. Model specification

The structural equations to study the effect of both health care expenditure and GDP on health status are examined in many studies as the following general equation:

$$Y_{it} = f(H_{it}, X_{it})$$

Y is considered health outcome indicators that reflect health status of the country, H is considered as per capita health expenditure, X is a vector of socio-economic vector. The infant mortality, under five mortality and crude death rates are considered the best indicators of the health status of the population (Sen, 1998). The vector of socio-

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economic variables includes GDP growth, Per capita health expenditure, immunization rates, urbanization rates and calorie intake. No data available in Jordan about calorie intake so we omit it from this vector.

IMR=∝+β1ΔGDP+β2PCH+β3IMU+β4URB

U5M=∝+β1ΔGPD+β2PCH+β3IMU+β4URB

CDR= ∝+β1GDP+β2PCH+β3IMU+β4URB

5.4.2. Unit root test

Table 10. Unit Root Test for second model

Variable		Level			First difference	
	Adf	Criticalvvalue	Result	Adf	Critical value	Result
LnY	0.37	3.05	No stationary	-4.841591	3.06	Stationary (2df)
Ln URB	-1.611847	3.05	No	-4.345169	3.06	Station
Ln IMU	-0.251472	3.05	No	-4.351738	3.08	Station (2df)
Ln PCH	-2.577534	3.05	No	-4.891838	2.67	Station
Ln U5M	-3.661660	3.05	Station			
Ln IMR	2.608415	3.05	No	-4.381938	2.67	Station

5.5. Granger causality

5.5.1. A First equation

IMR=∝+β1ΔGDP+β2PCH+β3IMU+β4URB4.7

Table 11. Granger Causality Test for equation 4-7

Causality direction	Lag 2		Lag 4	
	f- value	Probability	f- value	Probability
IMR does not cause IMU	3.14	0.07	4.72	0.04
IMU dose not cause IMR	1.55	0.25	2.23	0.18
PCH does not cause IMR	0.05	0.84	0.17	0.94
IMR does not cause PCH	2.83	0.09	8.7	0.011
URB does not cause IMR	**8.68**	**0.004**	3.75	0.07
IMR does not cause URB	**2.17**	**0.15**	3.76	0.07
ΔGDP does not cause IMR	2.69	0.10	1.40	0.33
IMR does not cause ΔGDP	5.18	0.023	0.72	0.60

5.5.2. Granger causality test show these results

1- According to granger causality hypothesis below we can see that IMR does not granger cause IMU, due to results above this study refuses this hypothesis based on f-value 3.14 and prob(0.07) this indicate that IMR cause IMU and vice versa.

2- Study hypothesis PCH does not cause granger cause IMR, this study accepts this hypothesis based on f-value 0.17 and p-value 0.94, while on the other hand IMR granger PCH based on f-value 8.7 and b value 0.011.

3- The result of this hypothesis (URB does not granger cause IMR ,this study refuses this hypothesis and accept other one that URB cause IMR according to f-value 3.75 and p- value 0.07.

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4- According to the hypothesis ΔGDPdoes not cause granger IM , this study refuses and accepts alternative hypothesis that indicateΔGDPcause IMR with f-vale 1.4 and p-value 0.33.

5- According to this hypothesis result (IMR does not Granger Cause ΔGDP) this study rejects it and accepts alternative one that based on f-value .72 and p- value 0.6.

5.5.3. Second equation

$U5M = \propto + \beta 1 \Delta GPD + \beta 2 PCH + \beta 3 IMU + \beta 4 URB 4.8$

Table 12. Granger Causality Test for equation 4-8

Causality direction		**Lag 2**		**Lag 4**
	f- value	**Probability**	**f- value**	**Probability**
U5m does not cause IMU	2.8	0.09	2.15	0.19
IMU does not cause U5M	9.3	0.00	4.17	0.059
PCH does not cause U5M	**0.33**	**0.72**	0.35	0.83
U5M does not cause PCH	2.36	0.13	5.76	0.029
URB does not cause U5M	6.60	0.011	8.66	0.011
U5M does not cause URB	**10.8**	**0.002**	5.02	0.040
ΔGDP does not cause U5M	**7.63**	**0.007**	2.72	0.13

5.5.4. Granger causality test show these results

1- According to granger causality hypothesis below, U5M does not granger cause IMU, due to results above this study refuses this hypothesis based on f-value 2.15 and prob(0.19) this indicate that U5M cause Imu and vice versa, IMU cause U5M based on f-value 4.17 and prob(0.059)

2- Study hypothesis PCH does not cause granger cause U5M, this study accepts this hypothesis based on f-value 0.35 and p-value 0.83, while on the other hand U5M granger PCH based on f-value 5.76 and b value 0.029.

3- The result of this hypothesis (URB does not granger cause U5M, this study refuses this hypothesis and accepts other one that URB cause IMR according to f-value 8.66 and p- value 0.011 and vice versa U5M grander URB based on f-value 5.02 and p-value .04.

4- According to the hypothesis ΔGDP does not cause granger U5M, this study refuses and accepts alternative hypothesis that indicate ΔGDP cause U5M with f-vale 2.72 and p-value 0.13.

5- According to this hypothesis result (U5M does not Granger Cause ΔGDP) this study rejects it and accepts alternative one that based on f-value 3.18 and p- value0.09

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Received: 15 Dec 2019 | Revised: 02 Jan 2020 | Accepted: 15 Jan 2020

5.5.5. Third equation

$CDR = \propto + \beta 1 \Delta GDP + \beta 2PCH + \beta 3IMU + \beta 4URB4.9$

Table 13. *Granger Causality Test for equation 4-9*

Causality direction	**Lag 2**		**Lag 4**	
	f- value	**Probability**	**f- value**	**Probability**
IMU does not cause CDR	17.89	0.00	2.01	0.21
CDR does not cause IMU	2.44	0.12	1.62	0.28
PCH does not cause CDR	**0.78**	**0.47**	0.91	0.51
CDR does not cause PCH	1.93	0.18	8.53	0.01
URB does not cause CDR	15.13	0.00	14.16	0.003
CDR does not cause URB	**9.93**	**0.002**	5.98	0.027
ΔGDP does not cause CDR	**14.24**	**0.00**	1.55	0.29
CDR does not cause ΔGDP	1.62	0.23	**1.39**	**0.34**

5.5.6. Granger causality test show these results

1- According to granger causality hypothesis below IMU does not granger cause CDR, due to results above this study refuses this hypothesis based on f-value 2.01 and prob(0.21) this indicate that IMU cause CDR and vice versa, CDR cause IMU based on f-value 1.62 and prob(0.28).

2- Study hypothesis PCH does not cause granger cause CDR, this study refuse this hypothesis based on f-value 0.91 and p-value 0.51, and on the other hand CDR granger PCH based on f-value 8.53 and b value 0.01.

3- The result of this hypothesis (URB does not granger cause CDR, this study refuses this hypothesis and accepts alternative one that URB cause IMR according to f-value 14.16 and p- value 0.003 and vice versa CDR grander URB based on f-value 5.98 and p-value .027.

4- According to the hypothesis ΔGDP does not cause granger CDR, this study refuses and accepts alternative hypothesis that indicate ΔGDP cause U5M with f-vale 1.55 and p-value 0.29.

5- According to this hypothesis result (CDR does not Granger Cause ΔGDP) this study rejects it and accepts alternative one that based on f-value 1.39 and p- value0.34.

5.6. Regression result for the second model

5.6.1. First equation

$$IMR = \propto -b1\Delta GDP - b2PCH - b3IMU - b4URB$$

IMR= 16.26-0.0086ΔGDP-1.93PCH-0.39IMU-1.39URB

Through the regression shown above this study concluds the following:

- Decrease the gross domestic product by one unit will affect negatively infant mortality rate by 0.008 units.
- Decrease per capita health expenditure by one unit will affect negatively on infant mortality rate by 1.93 units.
- Decrease immunization rate by one unit lead to decrease infant mortality rate by 0.39 units.
- Increase urbanization by one unit will lead to decrease infant mortality rate by 1.39 units.

5.6.2. Second equation

$U5M = \propto + \beta 1 \Delta GPD + \beta 2PCH + \beta 3IMU + \beta 4UR$

$5 = \propto -0.0086\Delta \quad - 1.32 \quad - 0.37 \quad - 1.95$

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The above analysis indicated to the following notes:

- One-unit enhancement in delta Gross domestic product leads to decrease under five mortality rate by 0.0086.
- One-unit enhancement in per capita health expenditure leads to decrease under five mortality rate by 1.32.
- One-unit enhancement in immunization and urbanizations lead to decrease under five mortality rate by 0.37, 1.95 respectively.

5.6.3. Third equation

$$CDR = \propto +\beta 1GDP + \beta 2PCH + \beta 3IMU + \beta 4URB$$

$$= \propto -0.002\Delta \quad -0.17 \quad -0.03 \quad -3.2$$

The above third equation is related to crude death rate as a health indicator; here the equation shows the following result:

- Enhancement by one unit of ΔGDP will lead to decrease crude death rate by 0.002 units.
- Enhancement by one unit of per capita health expenditure leads to decrease crude death rate by 0.17 units.
- Enhancement in immunization by one unit leads to decrease crude death rate by .03 while urbanizations result shows that one unit enhancement in this variable leads to decrease crude death rate by 3.2.

VI. DISCUSSION AND RECOMMENDATIONS

This research implemented ARDL model to investigate the relationship between health expenditure and economic growth and also to study the relationship between both health expenditure and economic growth on health indicator in Jordan through the period between 1995-2013.

This study employs the Granger-Causality to test for the existence and direction of causality between economic growth, health expenditure and health indicators.

The econometric result shows the following:

1-Granger causality test shows relationship between gross domestic product and total health expenditure.

2-ARDL result shows the following:

- Increase foreign aid will decrease economic growth.
- Decrease labor force has a negative impact on economic growth.
- Increase total health expenditure will increase economic growth by 0.21.

3-There is a statistically significant causality relationship between

- Infant mortality rate and immunization
- Infant mortality rate and per capita health expenditure.
- Infant mortality rate and urbanization.2.

4-There is causality relationship between crude death rate and per capita health expenditure.

5-According to ARDL regression for health indicators the following results seen:

- Increase both economic growth and per capita health expenditure by one unit will decrease infant mortality rate by 0.0086 and 1.93 respectively.
- Increase both economic growth and per capita health expenditure by one unit will decrease under five mortality by 0.0086 and 1.32 respectively.
- Increase both economic growth and per capita health expenditure by one unit will decrease under five mortality by 0.002 and 0.17 respectively.

Based on above results, this study recommends that:

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1.The need to show more interest by the government in supporting the public health sector.

2.Working to develop a comprehensive strategic plan for the development of the public health sector in right way and appropriate fund because of its impact on the overall economic on developed nation which is considered a leading model in economic development.

The need for integration between public and private health institutions in the provision of health services to citizens in order to develop processes to obtain health service for all.

Work on the use of successful international experiences on the development of the health sector and its impact on economic growth.

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