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RESEARCH PAPER

Public Health Expenditure, Financial Development and Health Outcomes in Pakistan: An Analysis

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ABSTRACT

This study aims to find out the impact of public health expenditure and financial development on health outcomes in Pakistan. An Autoregressive Distributed Lag (ARDL) cointegration framework has been used to analyse data of Pakistan. The results reveal that public health expenditure and financial development affect health outcomes in long and short run, the results based on the cointegration estimations show that a stable, long-run, significant relationship exists between health outcomes and its determinants. Using the error correction mechanism (ECM) for estimation of short run relationship revealed that life expectancy (LE), infant mortality (IM), under five mortality (UFM) have inverse and statically significant relationship with both public health expenditure (PHE) and domestic credit to private sector to GDP ratios (DCPS), which mean expectancy (LE), infant mortality (IM) and under five mortality (UFM) will adjust more quickly towards equilibrium in long run. On the base of our outcomes we suggest the Ministry of Health Pakistan to conduct more consultations with other ministries and other stakeholders in health services as to identify the needs and emphasize on the importance of health program to the society. At the same time, attention should be given to reduce cost of health services especially for the people who can't afford along with increase in public health expenditure government should release more domestic credit to people so that they can afford more better life style and also focus on female literary can work more effectively as literate mother can understand things more efficiently and with more job opportunities they will become more strong financially.

KEYWORDS ARDL, Financial Development, Health Outcomes, Public Health Expenditure, Time Series Data

Introduction

Health plays an important role in determination of human capital. People with illness, diseases and malnutrition act like a barrier to economic progress. Health is positively correlated with both skilled and unskilled labor productivity (Kumar and Ober, 2012). Health outcomes are very important factor for nation as it is reflection of nation wellbeing, indicates condition of human capital and productivity of a nation. Government play important role in finance of health sector as big part of health expenditure authorized by government and their decision of allocation on health sector reflect commitment to the improvement of health outcomes. According to the World Bank in most developing countries public health expenditure consists of recurrent capital spending from government budgets, external borrowing and grants, including donations from international agencies, non-governmental organizations and social health insurance funds.

Government provide different type of facilities to people to get more efficient and productive human capital, public health expenditure has positive impact on economic growth. when a government increase its public health expenditures the people of nation can avail better health facilities in low or no cost which will have long term impact in term of better health outcomes similarly if financial development will improve in a country its people will have access to more finance which mean they have more money now by which

they can afford more better life style so they will contribute this for utilizing better nutrition and health too. Public spending on health vary for different countries its less than 1% of GDP for different developing countries and more than 10% for different develop countries (Raj) 2008.

As health plays important role in economic growth, therefore a lot of work has been done globally. Ahmad *et al.* (2016) findings about health care system in Malaysia are that there is a long term relationship between health facilities and health outcomes. Kim *et al.* (2013) finding about 17 developed countries is that improvement in health care reforms and health policies improved life quality of citizen's. Edeme *et al.* (2017) findings about Nigeria are that more investment on health care by government encourage positive health outcomes. "The channels through which the effect of financial development runs to health capital accumulation are primarily the income effect, educational effect, infrastructure development, and risk management"(Bhatta,2013),Chireshe *et al.* (2020) findings about Sub-Saharan African countries are that financial development play important role in improvement of health outcomes in these countries.

Globally huge empirical work has been done on health (Ahmad *et al.*, 2016; Edeme *et.al.*, 2017; Jaison *et. al.*, 2020) but in Pakistan mostly theoretical work has been done before on this idea (Akram *et al.*, 2008; Afzal *et al*., 2013), public health expenditure is most impactful variable in case of health outcomes, these variables play key role on good or bad health condition of any country (Farag *et al*. (2013)), financial development contribute positively in healthcare system (Chireshe *et. al.* (2020)). Healthy people are more productive and play vital role in economic growth, health expenditure is most important determinant for better health and economic growth (Gupta *et al.* (2004)).As most of the previous studies done before about health outcomes were based upon theoretical work very rare researcher tried to find out the empirical impact of public health expenditures with other aspect for Pakistan like Hakro and Akram(2007) study the incidence of government expenditures on education and health: microeconomic evidence from Pakistan. so in this research, we used quantitative data to find out impact of public health expenditure, GDPPC, % of employed female (CFWF), female literacy and financial development (domestic credit to private sector to GDP ratios) on health Outcomes (life expectancy, infant mortality, under five mortality) in Pakistan, data was ttaken from World Development Indicator (WDI) of year 1980 to 2020 and time series analysis by ARDL method was done to provide empirical results.

Main objective of study is to examine the relationship between public health expenditure and health outcomes (Life expectancy, Infant mortality and Under-five mortality) in Pakistan, secondly to examine the relationship between GDPPC and health outcomes (Life expectancy, Infant mortality and Under-five mortality) in Pakistan and to examine the relationship between financial development and health outcomes (Life expectancy, Infant mortality and Under-five mortality) in Pakistan.

Literature Review

Theoretical Background

Schools of Thought on Government Involvement

The debate over government involvement in social sectors like health through public spending can be traced back to early schools of thought populated by researchers like Musgrave (1996), who identified the major economic rationales for government intervention in the health sector. According to this viewpoint, government intervention can be utilized to increase efficiency when market failures result in inferior social welfare outcomes, as well as to improve equity when market allocations result in perceived unfair outcomes. Externalities, the public good nature of certain health initiatives, and the

prevalence of large information asymmetries all justify government engagement in the health sector.

Wagner's Law of Increasing State Activity

on the basis of comparisons from several countries, Wagner propose with the idea that in progressive societies, the scope and speed of federal government and regional government activities grow as the government takes on additional duties for the population benefit.

Peacock and Wiseman Hypothesis

According to Peacock and Wiseman (1955), grow in government spending are dependent on income collection. Peacock and Wiseman also pointed out that there is a significant disconnection between people's expectations for government spending and their tolerance for taxation. Governments cannot therefore disregard the population's requests for diverse services, particularly while revenues are increasing at a consistent rate.

The Production Function Approach

In opinion of this perspective, medical care has no principal value in and of itself, but rather is an intermediary product whose value is derived from its contribution (together with other inputs such as environmental and social factors) to the production of health. Like a result, healthcare can be considered as any other item or service in which each individual maximizes usefulness while working within a budget. Health status is defined in the production approach as measures of an individual's or a population's physical and emotional well-being.

The Demand for Health

Grossman model state that an individual's health stock is determined through the primary level of health stock. These stock of health decreases with age until death at an increasing rate and can be increased (decreased) by positive (negative) investment in health over time. When health stock is less than critical level at some points of time, death occurs. In addition, Grossman states that health can be viewed both as a consumption commodity and as an investment commodity. In consumption perspective, health makes people feel better, and in the view of investment, it increases the number of healthy days to work and to earn income.

Empirical Background

In 1900's researchers started study on role of health in economic growth, main focus was on, what is impact of public spending on economic growth? Bad health discourages economic growth? Barro 1990 study findings are that government spending on health has a positive relationship with economic growth, Heshmati 2001 findings are same for study about 15Organization for Economic Co-operation countries and Development (OECD) by using Solow growth model, According to Akram et al. 2008 there is a long run relationship between health outcomes and economic growth for study about Pakistan, Mahumud et al. 2013 find out that life expectancy has positive relationship with economic growth for study about Bangladesh. After evaluating importance of good health for economic growth researchers started working on different factors related to health.

Numerous studies have been done before on public health expenditure and health outcomes; from the previous studies this is proved that PHE has significant impact on health outcomes. Gupta *et al.* (1999) findings are that improvement in per capita income will increase life expectancy and decrease infant mortality in India, Bhalotra (2007) findings are

that changes in state health expenditure is affecting infant mortality in rural India, according to Kim *et al.* (2013) PHE has positive relationship with LE and negative relationship with IM for US and 17 other developed countries similarly Hassan *et al.* (2014) investigated that what is impact of public health expenditure on health outcomes in SAARC region, show that there is long run relationship between public health expenditure ,economic growth and health outcomes in SAARC region in the same way Edeme et al. 2017 findings are that public health expenditure and GDP per capita are positively related to life expectancy and reduce infant and under five mortality in Nigeria on the other hand Golinelli *et al.* (2017) study about 20 Italian regions findings are that only direct provide services has negative relationship with child mortality and other public expenditure are not useful to reduce child mortality, Byaro (2016) study about Tanzania findings are that public health expenditure have no impact on health outcomes and GDP Per Capita has positive effect on health outcomes, in the same way another study about south Sudan tested the relationship between public spending and health outcomes and concluded that public spending have no impact on child health outcomes in south Sudan (Mayai, 2016).

Chireshe *et al.* (2020) study about relationship between financial development and health outcomes in sub-Saharan African countries and find out that financial development has positive impact on life expectancy and negative relationship with under five mortality rate, Bhatta *et al.* (2013) study about financial development and health capital accumulation for OECD countries and find out that financial development has positive impact on health capital accumulation, Kuloglu *et al.* (2017) studied about health development index and financial development index for higher income countries and find out that there is long run relationship between health development index and financial development, Arif *et al.* (2019) studied about the role of financial development in human capital development for Pakistan and stated that financial development has positive impact on health in Pakistan in the same way Sherawat *et al.* (2014) study about the relationship between financial development indicators and human development for India and findings were same in case of India too.

Issa *et al.* 2005 study about 160 developed and developing countries state that female literacy has strong negative relationship with infant mortality, Anyanwu *et al*. (2009) study about Africa finds that female literacy has negative relationship with IM and MRU5, Mayai (2016) and Barenberg *et al.* (2017) findings are same for study about south Sudan and India, Pillai *et al.* (2013) study about 143 developing countries state that female literacy has negative relationship with IM, Batool *et al.* (2020) study about Kashmir find out that female literacy has negative relationship with IM on the other hand Makochekanwa *et al.* (2016) study about Zimbabwe states that female literacy has no significant relationship with infant and under five mortality.

Tulasidhar *et al.* (1993) try to find out relationship between female employment, health outcomes and child mortality ratio for case study about India and find out that high income has positive relationship with life expectancy and negative relationship with child mortality ratio, Propper *et al.* (2007) try to find out the relationship between child health and household for UK and find out that income of family plays important role in health condition of child, Siah *et.al* (2015) did a study to test the relationship between female employment and infant mortality for Malaysia, they find out women employment has significant and long run impact on child mortality rate, similarly Narayan *et.al* (2005) try to test the relationship between female participation in labor force and mortality rate with the help of time series data of year 1960 to 20000 for Australia and find out that female participation in labor force has no impact on infant mortality also Currie *et al.* (2007) did a study to find out relationship between health outcomes and family income but failed to find statistically significant relationship of income on life expectancy and child mortality for study about England.

Nixon *et al*. (2006) did a study about European countries and find out that PHY(Number of Physicians) has significant relationship with life expectancy, infant mortality and under five mortality and its impact on life expectancy was positive, was negative for infant and under five mortality, Akikugbe *et al.* (2009) did a study about African countries and find out that PHY has significant impact for LE, IM and UFM and its increase in number of doctors will help to improve life expectancy ratio and mortality will reduce in the same way Anyanwu *et al*. (2009) did a study to find out relationship between public health expenditure and health outcomes for study about Africa and find out that PHY(Number of Physicians) has significant relationship with LE, IM and UFM and its impact on life expectancy was positive, was negative for infant and under five mortality for Africa and Makochekanwa *et al*. (2015) try to find out relationship between health expenditure and health outcomes for Zimbabwe with the help of time series data and find out that PHY(Number of Physicians) has significant relationship with LE but has no relationship with infant and under five mortality in case of Zimbabwe.

Material and Methods

Model and Methodology

Wagner propose the idea that in progressive societies, the scope and speed of federal government and regional government activities grows as the government takes on additional duties for the population benefit, model used in this study is similar to model used in study of public health expenditure governance and health in Malaysia done by Ahmed and Hasan (2016) and ARDL method was used for estimation. In this study health outcomes (life expectancy at birth, infant mortality and under 5 mortality) are dependent variables, public health expenditure is Independent variable and GDPPC, female literacy rate, domestic credit to private sector to GDP ratios, number of physician are control variables, financial development proxy is domestic credit to private sector to GDP ratios .we have used different independent variables for different health outcomes (dependent variables)

H0=f (PHE, GDPPC, DCPS, FLR, CFWF, PHY)

$$LE_t = \beta_o + \beta_1 PHE_t + \beta_2 GDPPC_t + \beta_3 DCPS_t + \beta_4 FLR_t + \beta_5 CFWF_t + \varepsilon_t$$

$$IM_t = \beta_o + \beta_1 PHE_t + \beta_2 GDPPC_t + \beta_3 DCPS_t + \beta_4 FLR_t + \beta_5 PHY_t + \varepsilon_t$$

$$UFM_t = \beta_o + \beta_1 PHE_t + \beta_2 GDPPC_t + \beta_3 DCPS_t + \beta_4 FLR_t + \beta_5 PHY_t + \varepsilon_t$$

Where,

H0= Health outcomes and health outcomes are LE, IM, UFM here.

Life expectancy at birth =LE, Infant mortality=IM, under five mortality rate =UFM

Public Health Expenditure = PHE, GDP per capita = GDP, Female literacy rate=FLR

Contributing Female Family Worker =CFWF,

Domestic credit to private sector to GDP ratios=DCPS,

PHY= Number of physician per 1000 person

Estimation Technique

This study used ARDL bounds test to test the relationship of public health expenditure and financial development on health Outcomes in Pakistan. ARDL test was presented by Pesaran, Smith and Shin (2001) to test the relationship between variables.

This study used ARDL technique for few reasons:

1. ARDL tests presence of long run relationship between variables and it give consistent result for small size too, other techniques are not able to do this for small sample size.

2. Estimation is possible even for endogenous independent variables.

Long run relationship of time series annual data can be achieved through cointegration technique. First time the idea of cointegration technique was given by Granger (1981) and Engel and Granger (1987). Their estimation technique provides help to approach the existence of long-term relationship all selected variables within a dynamic specification context. However, Johansson technique is applied to conclude the long run association if all the selected variables have same integration order. While, autoregressive distributive lag (ARDL) method is applied for cointegration analysis if all variables have mixed order of integration like I (0) and I (1), but the variables should not have I (2) integration order.

For one vector cointegration Juselius and Johansen (1990) approach of co-integration cannot be used. Hence, it becomes authoritative to apply autoregressive distributive lag (ARDL) technique proposed by Shin- and Pesaran- (1995) and Pesaran et al (1996) for co-integration, or bound mechanism to analyze the long- term association, irrespective of whether the selected variables have mixed stationary features like I (0) and I (1). In this situation the autoregressive distributive lag (ARDL) cointegration technique would provide the correct results.

The cointegration technique of Juselius- and Johansan- (1990) did not cooperate in analyzing cointegrating vector, however the autoregressive distributive lag (ARDL) method is suitable to study the cointegration. If there is single equation which is well-known and each of the selected variables stands as single long run equation, the autoregressive distributive lag (ARDL) technique of the co integration vector is reparametrized into error correction mechanism (ECM). The reparametrized result concludes both the short and long-run relationship of the selected variables of a model. Distributive lag model (ARDL) is basically expressions of the existence of infinite lag length of the independent variable in a regression function. For multiple cointegration analysis (ARDL) approach could not be used.

In this current study, autoregressive distributive lag (ARDL) Bound-Testing approach for co integration is applied to explore the long run relationship between the selected variables.

Data

In this study country level time series yearly data of sample 1980 to 2020 used, data of public health expenditure as % of GDP, life expectancy at birth, infant mortality (per 1,000 live births), under 5 mortality (per 1,000 live births), Gross domestic products per capita, Contributing female family workers, domestic credit to private sector to GDP ratios and female literacy rate was taken from WDI. For estimation of data ARDL model was used.

Results and Discussion

Diagnostic Test

Unit Root Test

Before applying autoregressive distributive lag model, we conducted following tests to check all variables, order of integration, Augmented Dickey Fuller (ADF) is applied where all the variables have mix order of integration like I (0) and I (1), so we can apply autoregressive distributive lag (ARDL) co integration technique

Table 1
Serial Correlation LM and Heteroscedasticity Table

Test	Model 1, Dependent Variable LE	Model 2, Dependent Variable IM	Model 3, Dependent Variable MRU5
Serial Correlation LM	3.3947(0.1832)	2.239(0.1345)	4.7362(0.0937)
Heteroscedasticity	20.5220(0.7189)	14.7067(0.9980)	16.7082(0.8608)

CUSUM stability diagnostic test

To check the stability of data **CUSUM stability diagnostic test was used** where all the values lies within the red lines or under the 5% level of significance the CUSUM, and CUSUM of squares figures proof that models are stable

ARDL Cointegration Technique

Firstly ARDL cointegration technique was applied and its first step was to conduct VAR analysis to select the optimal lag length of selected variables, Akaike's information criterion (AIC) was applied to choose optimal lag length and then was ARDL cointegration technique.

H0=f (PHE, GDPPC, DCPS, FLR, CFWF, PHY)

ARDL cointegration technique can represent as follows

$$D(LE) = \beta_0 + \sum_{i=1}^{q} \beta_{1i} D(LE)t\text{-}1)q + \sum_{i=1}^{q} \beta_{2i} D((PHE)t\text{-}1) + \sum_{i=1}^{q} \beta_{3i} D((GDPPC)t\text{-}1) + \sum_{i=1}^{q} \beta_{4i} D((DCPS)t1) + \sum_{i=1}^{q} \beta_{5i} D((FLR)t\text{-}1 + \sum_{i=1}^{q} \beta_{6i} D((CFWF)t\text{-}1) + \Upsilon_o(LE)\ t\text{-}1 + \Upsilon_1(PHE)\ t\text{-}1 + \Upsilon_2(GDPPC)\ t\text{-}1 + \Upsilon_3(DCPS)\ t\text{-}1 + \Upsilon_4(FLR)t\text{-}1 + \Upsilon_5(CFWF)\ t\text{-}1 + u_t \quad (1)$$

ARDL cointegration technique can represent as follows

$$D(IM) = \beta_0 + \sum_{i=1}^{q} \beta_{1i} D(IM)t\text{-}1)q + \sum_{i=1}^{q} \beta_{2i} D((PHE)t\text{-}1) + \sum_{i=1}^{q} \beta_{3i} D((GDPPC)t\text{-}1) + \sum_{i=1}^{q} \beta_{4i} D((DCPS)t1) + \sum_{i=1}^{q} \beta_{5i} D((FLR)t\text{-}1 + \sum_{i=1}^{q} \beta_{6i} D((PHY)t\text{-}1) + \Upsilon_o(IM)\ t\text{-}1 + \Upsilon_1(PHE)\ t\text{-}1 + \Upsilon_2(GDPPC)\ t\text{-}1 + \Upsilon_3(DCPS)\ t\text{-}1 + \Upsilon_4(FLR)t\text{-}1 + \Upsilon_5(PHY)\ t\text{-}1 + u_t \quad (2)$$

ARDL cointegration technique can represent as follows

$$D(MRU5) = \beta_0 + \sum_{i=1}^{q} \beta_{1i} D(MRU5)t\text{-}1)q + \sum_{i=1}^{q} \beta_{2i} D((PHE)t\text{-}1) + \sum_{i=1}^{q} \beta_{3i} D((GDPPC)t\text{-}1) + \sum_{i=1}^{q} \beta_{4i} D((DCPS)t1) + \sum_{i=1}^{q} \beta_{5i} D((FLR)t\text{-}1 + \sum_{i=1}^{q} \beta_{6i} D((PHY)t\text{-}1) + \Upsilon_o(MRU5)\ t\text{-}1 + \Upsilon_1(PHE)\ t\text{-}1 + \Upsilon_2(GDPPC)\ t\text{-}1 + \Upsilon_3(DCPS)\ t\text{-}1 + \Upsilon_4(FLR)t\text{-}1 + \Upsilon_5(PHY)\ t\text{-}1 + u_t \quad (3)$$

In equations q is presetting optimal lag length, in eq 1,2,3 β_0 is intercept and $\beta_{1i}, \beta_{2i}, \beta_{3i}, \beta_{4i}, \beta_{5i}, \beta_{6i}$ are the short run coefficient and Υ_o,Υ_1, Υ_2, Υ_3, Υ_4, Υ_5 are long run coefficient and u_t is error term.

Bond Test

Table 2
Bond Test

Models	LE	IM	UFM
F-Statistics	19.00	5.0125	5.1729
Significance	**Lower bond Critical value**	**Upper bond Critical value**	**Co-integration**
10%	2.08	3	Co-integration Exist for all models
5%	2.39	3.38	Co-integration Exist for all models
1%	3.06	4.15	Co-integration Exist for all models

As results shows in table II for all models F-Statistics value is greater than all upper bond critical values 3, 3.38, 4.15 on different level of significance 1%, 5% and 10% proves that long run relationship exist between dependent and independent variables of models.

Cointegration and Long Run form Test

Table 3
Cointegration and Long Run form Test

Variables	**Model 1 (LE)**	**Model2 (IM)**	**Model 2 (UFM)**
Public health expenditures as % of GDP	(0.2251) 0.2492	(-11.0708) 0.0041**	(-12.9978) 0.0005***
Gross domestic product per capita	(0.1897) 0.0008***	(-0.08493) 0.8669	(-0.5063) 0.2798
Domestic credit to private sector (% of GDP)	(0.1023) 0.0068**	(-0.3103) 0.0817*	(-0.4286) 0.0007***
Female literacy rate	(0.1484) 0.0000***	(-1.3947) 0.0000***	(-0.1782) 0.0000***
Contributing female family workers	(0.0793) 0.0000***		
Number of Physicians per 1000 Person		(-67.6203) 0.0874*	(-29.5053) 0.0120**
C	(55.8541) 0.0000***	(168.5510) 0.0000***	(225.9801) 0.0000***

Note;***indicates 1% level of significance in the same way ** indicates 5% level of significance and *indicates 10% level of significance and parentheses used to present coefficients value.

Results for Model 1

For model 1 (LE) GDPPC, DCPS, FLR and CFWF have positive and significant impact on health outcome life exptancy. Long term cointegration equation results show 1unit increase in GDP Per Capita, Life Expectancy rate increased by 22.51units, the effect of GDP Per Capita on life expectancy is statistically significant. For example, current result is consistent with a study done by Aslam *et al* (2012), in the same way domestic credit to private sector to GDP ratios (DCPS) has positive impact on life expectancy as one unit increase in DCPS will improve life expectancy by 18.97 unit these results have similarity with study done by Chireshe *et al.* in 2020.

Furthermore, female literacy rate has statistically significant relationship with life expectancy rate, FLR, CFWF have positive relationship with life expectancy as we can figure out from results that 1unit increase in female literacy rate will improve life expectancy by 14.84 units and similarly 1 unit increase in Contribution of female worker will improve Life Expectancy by 7.9 units, these outcomes are similar to Issa *et al.* (2005) study about 160 countries and find out strong significant positive impact of female literacy on life expectancy similarly Tulasidhar *et al.* (1993) findings were similar to this study outcomes that female employment has significant positive impact on life exptancy.

On the other hand PHE is statically insignificant for life expectancy this outcome findings are same as study of Bavro *et al.* (2016) for Tanzania where findings were that public health expenditure has impact on health outcomes also Mayai *et al.* (2016) study results were quite similar that public health expenditure has impact on life expectancy for case study about south Sudan.

Results for Model 2

For model 2 (IM) PHE, DCPS, FLR and PHY have negative and significant impact on health outcome infant mortality rate. results show significant relation exist between PHE and infant mortality rate, PHE has negative impact on infant mortality rate, 1unit increase in public health expenditure decrease infant mortality rate by 11.07 units same as finding of Hassan *et al.* (2014) findings that were public health expenditure has negative impact on mortality rate also Anyanwu *et al.* (2009) findings were similar for case study about Africa that public health expenditure has negative impact on child mortality rate also find out that female literacy has negative impact on child mortality.

in the same way FLR has statistically significant impact on infant mortality as 1 unit increase in FLR will reduce under five mortality1.39 unit also DCPS has negative and significant impact on infant mortality rate as 1unit improvement DCPS will help to reduce infant mortality by 0.3103 unit these results have similarity with of study done by Bhatta *et al.* in 2013 study about financial development and capital accumulation for OECD countries and find out that financial development has negative impact on child mortality rate.

furthermore number of physicians also has negative impact on infant mortality rate as by increase of 1unit in PHY infant mortality will reduce by 67.62 units these results are similar to Nixon *et al.* (2006) study about European countries and find out that PHY(Number of Physicians) has significant relationship with infant mortality increase in PHY will decrease infant mortality. On other side all other variables like GDPPC has statistically insignificant relationship with infant mortality rate.

Results for Model 3

For model 3 (UFM) PHE, DCPS, FLR and PHY have negative and significant impact on health outcome under five mortality rate. results show there is statistically significant relation between PHE and under five mortality rate, public health expenditure has negative impact on infant mortality rate, 1unit increase in public health expenditure decrease under five mortality rate by 12.99 units same as findings of Hassan *et al.* (2014) that were public health expenditure has negative impact on mortality rate also Anyanwu *et al.* (2009) findings were similar for case study about Africa that public health expenditure has negative impact on child mortality rate also find out that female literacy has negative impact on child mortality.

in the same way FLR has statistically significant impact on under five mortality as 1unit increase in FLR will reduce under five mortality1.61 unit result of this study are quite similar to Pillai *et al.* (2013) about developing countries that female literacy has negative impact on infant mortality rate which means improvement in FLR will help to reduce child

mortality also DCPS has negative and significant impact on under five mortality rate as 1unit improvement DCPS will help to reduce infant mortality by 0.4286 unit these results have similarity with of study done by Kuloglu *et al.* (2017) that was improvement in financial development will help to reduce child mortality rate.

In the same way number of physicians also has negative impact under five on mortality rate as by increase of 1unit in PHY under five mortality will reduce by 29.50 units these results are similar to Anyanwu *et al.* (2009) study to find out relationship between public health expenditure and health outcomes for study about Africa and find out that PHY(Number of Physicians) has significant relationship with under five mortality increase in PHY will reduce under five mortality, on other side all other variables like GDPPC has statistically insignificant relationship with under five mortality rate.

Overall all variables have significant impact on health outcomes in case of Pakistan, government can achieve goal of better health of its nation by focusing on all or combination of few factors like if PHE will increase by government it will help to reduce child mortality and along with this increase in GDPPC will help out to improve life exptancy at birth in same way by improving DCPS government can get two benefits by one change only, improvement in DCPS is going to help to improve LE and reduce Child mortality at the same time similarly by focusing on FLR, CFWF and PHY or one of them life expectancy rate at birth will show improvement and child mortality will be reduced.

To check the short run relation for models Error Correction method was applied and Error Correction Model for all models are mentioned below

Model 1 LE

$$D(LE)_t=\beta_0+\sum_{i=1}^{P}\beta_{1i}\text{D(LE)t-1)q}+\sum_{i=1}^{q}\beta_{2i}\text{D((PHE)t-1)}+\sum_{i=1}^{q}\beta_{3i}\text{D((GDPPC)t-1)}+\sum_{i=1}^{q}\beta_{4i}D\text{((DCPS)t-1)}+\sum_{i=1}^{q}\beta_{5i}D\text{((FLR)t-1}+\sum_{i=1}^{q}\beta_{6i}\text{D((CFWF)t-1)}+\delta ect_{t_{-1}}+u_t$$

Model 2 IM

$$D(IM)_t=\beta_0+\sum_{i=1}^{P}\beta_{1i}\text{D(IM)t-1)q}+\sum_{i=1}^{q}\beta_{2i}\text{D((PHE)t-1)}+\sum_{i=1}^{q}\beta_{3i}\text{D((GDPPC)t-1)}+\sum_{i=1}^{q}\beta_{4i}D\text{((DCPS)t-1)}+\sum_{i=1}^{q}\beta_{5i}D\text{((FLR)t-1}+\sum_{i=1}^{q}\beta_{6i}\text{D((PHY)t-1)}+\delta ect_{t_{-1}}+u_t$$

Model 3 MRU5

$$D(MRU5)_t=\beta_0+\sum_{i=1}^{P}\beta_{1i}\text{D(MRU5)t-1)q}+\sum_{i=1}^{q}\beta_{2i}\text{D((PHE)t-1)}+\sum_{i=1}^{q}\beta_{3i}\text{D((GDPPC)t-1)}+\sum_{i=1}^{q}\beta_{4i}D\text{((DCPS)t-1)}+\sum_{i=1}^{q}\beta_{5i}D\text{((FLR)t-1}+\sum_{i=1}^{q}\beta_{6i}\text{D((PHY)t-1)}+\delta ect_{t_{-1}}+u_t$$

$\beta_{1i},\beta_{2i},\beta_{3i},\beta_{4i},\beta_{5i},\beta_{6i}$ Short term dynamic coefficient, δ is adjustment speed, p and q are optimal lag length for dependent and independent variables respectively.

Table 4
Error Correction Mechanism

Variables	LE	IM	UFM
Coint Eq(-1)	-0.0107(0.0000)***	-0.0727(0.0000)***	-0.0866(0.0000)***

The value of error correction term (ECT) in model 1, which is -0.0107 and significant at 1% level, it means that tuning speed of the model from short to long-term equilibrium is 1.07 The system is obtaining adjustment toward the long-term equilibrium at the speed of 1.07%. for first model all variables public health expenditure (PHE), GDP per capita (GDPPC), domestic credit to private sector to GDP ratios (DCPS), contributing female family worker/% of females employed (CFWF), female literacy rate (FLR) have significant long run

relationship with dependent variable life expectancy(LE) and have significant short run relationship too.

The coefficient error correction mechanism (ECM) suggests that the adjustment process is moderately slow and 1.07 percent of the former year's imbalance in life expectancy from its equilibrium path will be corrected in the present year.

The value of error correction term (ECT) in model 2, which is -0.0727 and significant at 1% level, it means that tuning speed of the model from short to long-term equilibrium is 7.27. The system is obtaining adjustment toward the long-term equilibrium at the speed of 7.27%. for second model almost all variables public health expenditure (PHE), GDP per capita (GDPPC), domestic credit to private sector to GDP ratios (DCPS), female literacy rate (FLR), number of physicians(PHY) have significant long run relationship with dependent variable infant motility rate (IM) and have significant short run relationship.

The coefficient error correction mechanism (ECM) suggests that the adjustment process is moderately 7.27 percent of the former year's imbalance in under five mortality from its equilibrium path will be corrected in the present year.

The value of error correction term (ECT) in model 3, which is -0.0866 and significant at 1% level, it means that tuning speed of the model from short to long-term equilibrium is 8.66. The system is obtaining adjustment toward the long-term equilibrium at the speed of 8.66%. for second model almost all variables public health expenditure (PHE), GDP per capita (GDPPC), domestic credit to private sector to GDP ratios (DCPS), female literacy rate (FLR), number of physicians(PHY) have significant long run relationship with dependent variable under five motility rate (MRU5) and have significant short run relationship.

The coefficient error correction mechanism (ECM) suggests that the adjustment process is moderately 8.66 percent of the former year's imbalance in under five mortality from its equilibrium path will be corrected in the present year.

Conclusion

It is a saying that "health is wealth" but an individual's health is equally important for economic growth as it is important for himself, its work in a systemic way as his bad health condition will affect his physical and mental activity by which he can't work efficiently and productivity will get affected. To improve productivity, we need efficient worker and worker can work more efficiently if he is physically and mentally fit. to find out the relationship between health outcomes and government spending, financial development this study has been done and in this study health outcomes (life expectancy at birth, infant mortality and under 5 mortality) are dependent variables, public health expenditure is Independent variable and GDPPC, female literacy rate, domestic credit to private sector to GDP ratios, number of physician are control variables, financial development proxy is domestic credit to private sector to GDP ratios, we used different independent variables for different health outcomes (dependent variables) in model for estimation. Most of variable have significant relationships with all health outcomes in short run as well in long run too also have positive impact on life expectancy and negative impact for both mortality rates. PHE has strong impact on both mortality rates as 1% change in PHE will affect infant mortality by 11.07% and under five mortality by 12.99%, GDPPC have positive impact on life expectancy as 1% change in GDPPC will affect life expectancy by 0.1897%, DCPS has significant impact on all health outcomes as 1% change in DCPS will bring change of 0.1023 on life expectancy, change of 0.3103 on infant mortality and change of 0.4286 on under five mortality in the same way 1% change in FLR will affect life expectancy by 0.1484%, infant mortality by 1.39% and under five mortality by 0.1782% similarly CFWF has significant impact on life expectancy as 1% change will bring change of 0.0793% on life expectancy and PHY also have significant impact on both mortality rates as

1% change in PHY Will affect infant mortality by 67.62% and under five mortality by 29.50%. Using the error correction mechanism (ECM) for estimation of short run relationship find out that life expectancy (LE), infant mortality (IM), under five mortality (UFM) have inverse and statically significant relationship with both public health expenditure (PHE) and domestic credit to private sector to GDP ratios (DCPS), which mean expectancy (LE), infant mortality (IM) and under five mortality (UFM) will adjust more quickly towards equilibrium in long run.

Recommendations

As health is very important factor of individual life and has impact on productivity as well as government should focus on it while policy making decision, good health facilities are basic right of each individual. Government should make sure to provide better health facilities to each and every individual of country. Government should focus on public health expenditure as it's very impactful to reduce child mortality rate, government should release more domestic credit to people so that they can avail better lifestyle and can afford better health services, female literacy is also a key factor that can improve child health so government should pay more attention on female education, less number of doctors is also a big issue of Pakistan in spite of this fact that large number of our youngsters want to become doctors but cannot because this is a costly profession government should reduce this cost so that more and more people can become doctors.

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