PUBLIC EXPENDITURE ON HEALTH AND ITS IMPACT ON HEALTH INFRASTRUCTURE AND HEALTH STATUS IN HARYANA

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Voice of Research
Volume 5, Issue 2
September 2016
ISSN 2277-7733

Abstract

Health is an important factor for human resource development and is affected by availability of healthcare services. In this regard, the role of public expenditure on health to provide better health facilities and to improve health status of the masses becomes indispensible in any economy including Haryana. With this backdrop, the present study is an attempt to examine the impact of public expenditure (PEH) on health infrastructure and health status for the State of Haryana. For the same, the indicators of health infrastructure and status are selected and the data on the specified indicators are collected for the period of 1990-91 to 2011-12. Thereafter, the indicators of health infrastructure and health status are regressed on public expenditure on health (PEH) and its ingredients namely development revenue expenditure on health (DREH) and capital expenditure on health (CEH). It is found that these three expenditures have same direction of influences but difference occurs in the magnitude of their impacts. These expenditures having appreciable compound annual growth rate (CAGR) are impacting number of primary health centers (PHCs), community health centers (CHCs), sub-centers (SCs), total number of allopathic as well as ayurvedic, unani and homoeopathic (AUH) institutions positively. While their impact on number of hospitals, dispensaries, beds, BR, DR and IMR is negative. However, the remaining indicators are found to be expenditure inelastic which calls for further judgments of the cause of such results along with negative impact of public expenditure on health infrastructure. Also, magnitude of effects is found to be more in case of DREH followed by PEH and CEH despite lower CAGR of DREH than PEH and CEH. Accordingly, DREH calls for more emphasis; due to its highest impacts and a hope can be made that increase in DREH will essentially enhance health infrastructure and health status efficiently. Moreover, with DREH, there is strong case to raise CEH being a major source of creating health infrastructure. Above all, Government must increase public expenditure on health with its components (DREH and CEH) in every year's budget; so that their positive impact could be sustained and demand-supply gaps in health facilities could be filled. Along with this, there is rationale for adopting good governance to check corrupt practices; and to allocate funds adequately on each and every health facility without financial leakages and wastages of funds so that our health infrastructure could be developed in sufficient quantity and better quality; and consequently, health status can be upgraded in Haryana.

Keywords: *Public Expenditure, DREH, CAGR, Health infrastructure, Health*

Importance of health as a basic human right has been recognized all over the world. According to Noble Laureate Amartya Sen, health is a kind of empowerment that gives value to human life. It will lead to individual growth capacity and economic security for the individuals and families. Therefore, the provision of appropriate health infrastructural facilities and services become obligatory in any economy which demand appropriate amount of financial or economic resources. In this regard, the role of public expenditure on health becomes indispensible for making healthcare services accessible and affordable as the public provision of healthcare services is one of the important ways to improve living conditions as well as overall health capital (UNDP, 1990; Anyanwu and Erhijakpor, 2007; Bokhari et al., 2007). By and large, in any economy, health spending takes the form of public expenditure and private expenditure on health. But, according to Keynesian hypothesis, public expenditure leads to economic growth; accordingly, it devises that health spending is a prime duty of the Government and thus public expenditure on health is justified (Duggal, 2007; Goel and Garg, 2011).

Moreover, health which refers to the state of complete physical, mental, spiritual and social well-being, have received the prominent place in Millennium Development Goals (MDGs: 2000 – 2015) and now in Sustainable Development Goals also (SDGs: 2015 – 2030). Consequently, to overcome the gaps in the attainment of MDGs; to achieve SDGs successfully and to fulfill the ever increasing demand for good health; it is essential to attain equity, efficiency and adequacy in public expenditure on health. However, United Nation (UN) has recommended an average of 8 to 10 per cent of the gross domestic product (GDP) as benchmark expenditure on health for a country (Oni, 2014). As health is wealth, any amount spent on health by a nation cannot become enough since it is very difficult to achieve sufficiency in spending on health. So, every country makes all possible efforts to spend appropriately on health sector to improve the health status of their people so that they can contribute to economic progress of their economy (Yaqub et al., 2012). No doubt, the productivity and benefit of health spending depends on how funds are allocated within the health sector. Therefore, the proper utilization of these funds is equally important because all efforts may go in vein if these financial resources are not able to bring optimum returns. Keeping this backdrop, the present study is undertaken to make an analysis of public expenditure on health in Haryana by studying its impact on health infrastructure and health status.

The paper is organized as follows: Section two reviews the concerned literature and Section three explains research parameters. Section four and five is about research methodology and analysis. Lastly, section six concludes the study with policy implications.

Review of Literature

In this section, literature is bifurcated into two parts. Firstly, those studies are reviewed which have undertaken the impact of health expenditure on health infrastructure; secondly, studies are discussed upon which have aligned health expenditure with health status.

Health Expenditure and Health Infrastructure: A significant amount of research has been done by the academicians and researchers on establishing a cause and effect relationship between health expenditure and infrastructure.

Goel and Ahlawat (1993) analyzed the growth of health expenditure and existing health infrastructure in Haryana. They emphasized on the need for investment in health sector for creating health culture and proper health planning to make health care services accessible for the rural and poor people. According to Berger and Messer (2002), governments can alter their healthcare delivery systems by increasing public funding of healthcare infrastructure. Further, Das (2008) studies the correlation between health expenditure and health infrastructure. He remarks both are interdependent and identified a feedback type of relationship. With high level of expenditure high level of infrastructure is created and with high level of infrastructure, investment is poured out to improve the existing level of health care facilities.

Health Expenditure and health Status/Outcomes: There exists vast number of studies with regard to public expenditure on health and its relationship with health status. Some studies have found the significant impact of Government's health expenditure on health status (Bidani and Ravallion, 1997 and Cremieux et al., 1999). On the other hand, according to some researchers, health spending is not a strong determinant of health status (Schell et.al, 2007). Filmer and Pritchett (1999) found that public spending and health outcomes are tenuously related. According to them, doubling public spending on health from 3 to 6 per cent of GDP would improve child mortality by 9 to 13 per cent. Or (2000) concluded that public financing of health care lowered premature mortality for men and women. Bokhari et al. (2007) too showed that increased government spending contributed to positive status in under-five and maternal mortality. Further, Rajkyman and Swaroop (2007) concluded that in countries with good governance, increasing public health spending by 1 percentage point reduces the under-5 mortality rate by 0.32 per cent. This effect decreases to 0.20 per cent in countries with average governance and has no effect in countries with weak governance. In addition, Schell et al. (2007) found that at any level of development public health spending remained non-significant contributor in reducing IMR. Yaqub et al. (2012) have regressed data on public health expenditure and governance captured by the corruption perception index on infant mortality, under-five mortality and life expectancy. The results showed that public health expenditure has negative effect on infant mortality and under-five mortalities when the governance indicators are included. Next, Compah-Keyeke et al. (2013) examined the relationship between public spending and health status in Ghana, using simple but conventional econometric techniques. One measure of health status [under – five mortality rate (per 1000 live births)] was used as an indicator of health status. The results revealed that the availability of physicians and health insurance are the most important determinants of health status in Ghana. It would imply that, better health status seem to be associated with Higher health spending and more physicians.

A comprehensive analysis of above literature shows that majority of studies have identified the relationship of health expenditure with health infrastructure and status in isolation. However, there are only few studies which examine the causal relationship of health expenditure with health infrastructure and health status simultaneously. Moving in this direction, this research is based on these three parameters (public expenditure on health, health infrastructure and health status); and the impact of health expenditure on health infrastructure and status are investigated in a single research. Also, a thorough review of research aided in selecting indicators of research parameters. Aligning with this, research parameters and their selected indicators are defined next.

Research Parameters and Their Indicators

As it has already been mentioned that this research is based on three parameters; here an attempt is made in defining these parameters and their indicators that are selected to be studied.

Public Expenditure on Health: Public expenditure on health consists of revenue expenditure and capital spending from the government budgets, external borrowings and grants and social health insurance funds. On the one hand, *Revenue expenditure* on health is the sum of expenditures on all health goods and services, except for health capital. It is incurred for the normal and routine running and maintenance of health care services. Expenditure on medicines and salaries of doctors are a few names to mention which is of revenue nature. While on the other hand, *Capital expenditure* on health creates assets (e.g. hospital building) in the form of health infrastructure and raises the capacity to produce more health services in future.

In line with the above, in the present paper, impact of public expenditure is analyzed in three forms in which first is total public expenditure (accumulation of development revenue expenditure and capital expenditure). Second is development revenue expenditure and third is capital expenditure.

Health Infrastructure: In accordance with World Health Organization, public health infrastructures are formal and enduring structures that support public health having both tangible and intangible aspects. They may exist inside and outside the Government sector. They may also be directly protective of health (as in public sanitation systems) or they may support other activities that protect and enhance health. More fundamentally, they comprise of: institutions and capacity, knowledge (of public and professional), commodities (physical infrastructure). As this paper talks about Government spending on health; here, health infrastructure is meant by the health structure in Government

health sector only. Generally in India and particularly in Haryana, Allopathic, Ayurvedic, Unani and Homoeopathic medical practices are performed. So, health infrastructural indicators are sub-divided into two types: for allopathic medical resources and for Ayurvedic, Unani and Homoeopathic (AUH) health resources.

Allopathic Resources: The selected indicators of allopathic health infrastructure are: Number of hospitals[1], primary health centers (PHCs)[2], dispensaries[3], community health centers (CHCs)[4], sub-centers (SCs)[5], total number of medical institutions, number of doctors, nurses, other staff and total medical staff. The indicator total number of medical institutions is arrived at by summing the numbers of hospitals, PHCs, dispensaries, CHCs and SCs. Similarly, indicator total medical staff is created by integrating the indicators like number of doctors, nurses and other staff.

AUH Resources: Here, the selected indicators are: total number of ayurvedic, unani and homoeopathic (AUH) institutions, staff including number of vaidyas/hakims/homoeopathic doctors, dispensers/compounders, and total medical personnel (summation of former two indicators).

Health Status: Health status is a generic term referring to the health (good or poor) of a person, group or population in a particular area, especially when compared to other areas or with national data. Level of health or health status is assessed in terms of certain health indicators namely birth rate, death rate, infant and maternal mortality rates, life expectancy at birth, and various indicators of diseases burden etc (Mwabu, 2008). In the present study, selected indictors of health status are: Birth rate (BR)[6], death rate (DR)[7] and infant mortality rate (IMR)[8].

Research Methodology

This section elaborates about the research methods that are put into practice to achieve the purpose.

Research Period and Data Collection: The research period is 22 years that is 1990-91 to 2011-12. Secondary data for research indictors as described above are collected from various issues of 'Booklet on Haryana Economy' and 'Statistical Abstracts of Haryana' published by Department of Economic and Statistical Analysis, Government of Haryana.

Research Model: Figure 1 describes the research model of the study in which as to the purpose, it is assumed that public expenditure on health influences the levels of health infrastructure and health status. That's why, health expenditure with its three forms is explanatory or independent variable(s); and indicators of health infrastructure and health status are the effect/dependent or criterion variables. It is manifested in the figure that three models (model 1, model 2 and model 3) are to be examined. In model 1, public expenditure on health takes the place of explanatory variable, followed by development revenue expenditure in model 2 and capital expenditure in model 3.

Next, table 1 is prepared to draft out a picture of indicators of model variables for each of the model. In all the models, dependent variables that are indicators of health infrastructure and health status remain same. Though, in each of the model independent variable (three forms of health expenditure) has been altered.

Figure 1 Research Model

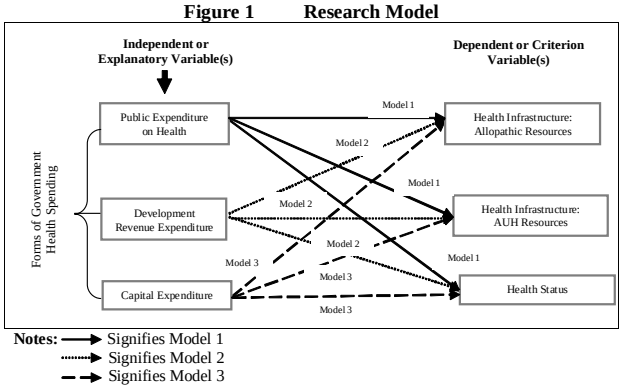

Table 1 - Indicators of Variables in the Research Model

Model Variables	Regression Model 1	Regression Model 2	Regression Model 3
Independent Variable ➡ Government Health Spending	• Public expenditure on health (PEH)	• Development Revenue Expenditure (DREH)	• Capital Expenditure (CEH)
Dependent Variable ➡ Health Infrastructure: Allopathic Resources	• Number of Hospitals • Primary Health Centers (PHCs) • Dispensaries • Community Health Centers (CHCs) • Sub-Centers (SCs) • Total number of medical institutions • Number of doctors • Nurses • Other staff • Total medical staff.		
Dependent Variable ➡ Health Infrastructure: AUH Resources	• Total number of AUH institutions • Staff including number of vaidyas / hakims / homoeopathic doctors, and dispensers / compounders • Total medical personnel		
Dependent Variable ➡ Health Status	• Birth Rate (BR) • Death Rate (DR) • Infant Mortality Rate (IMR)		

Research Techniques: Data has been analyzed with two research tools namely Compound Annual Growth Rate (CAGR) and Log-linear regression.

Compound Annual Growth Rate (CAGR): In order to judge the rate of growth of selected variables, CAGR is used which is computed through Ordinary Least Square (OLS) technique by fitting the exponential function to the available data. Exponential trend equation is defined as

$Y = Y_0 (1 + r)^t$ ……. (1) Where, 'r' is the compound growth rate.

Taking natural logarithm, we get: $\text{Ln } Y = \text{Ln } Y_0 + t \text{ Ln } (1 + r)$ ……. (2)

Assume, $\text{Ln } Y = Y^*$; $\text{Ln } Y_0 = b_0$; $\text{Ln } (1 + r) = b_1$

Now equation (2) can be rewritten as: $Y^* = b_0 + b_1 t$ ……. (3)

Equation (3) is showing a log linear function. Here, the values of parameters, b_0 and b_1 are estimated by using Ordinary Least Square (OLS) method. CAGR is computed by following formula:

CAGR (r) = [Antilog ($\overline{b_1}$) – 1] × 100 ……. (4)

Log-Linear Regression: To examine the impact of public expenditure on the selected indicators of health infrastructure and health status, following regression model in log-linear form is utilized.

$Ln\ Y_t = á + â\ Ln\ X_t + U_t$ ……. (1)

In the above model (1), 'Ln Y_t' and 'Ln X_t' imply natural logarithm of dependent variable 'Y' and explanatory variable 'X' respectively, 'á' is regression intercept, 'â' denotes the regression coefficient (slope) and 'U_t' is randam disturbance term. Here, Ordinary Least Square (OLS) method is employed for estimating the unknown parameters (á and â). The estimated value of â will measure the elasticity of variable Y with respect to variable X, as $\hat{\beta} = \frac{dLn\ Y}{dLn\ X}$ …… (2)

Analyses and Results

Firstly, the growth of public expenditure on health and various indicators of health infrastructure as well as health status is investigated by calculating their CAGR for the period 1990-91 to 2011-12 and results are presented in table 2. It is found that all types of health expenditure have appreciable positive growth rate among which capital expenditure is grown at the highest rate of 22.75 per cent compounded annually followed by public expenditure (15.14%) and development revenue expenditure (13.42%).

Table 2 - CAGR of Health Expenditure, Health Infrastructure and Health Status

Research Parameters		Variables/Indicators	CAGR (%) (During 1990-91 to 2011-12)
Health Expenditure		Public Expenditure on Health	15.14
		Development Revenue Expenditure on Health	13.42
		Capital Expenditure on Health	22.75
Health Infrastructure	Allopathic Medical Resources	Hospitals	-1.00
		PHCs	0.40
		Dispensaries	-1.09
		CHCs	2.74
		SCs	0.40
		Total Allopathic Institutions	0.40
		Doctors	0.40
		Nurses	-0.20
		Other Staff	-0.50
		Total Allopathic Medical staff	-0.30
		Total Beds	-0.70
	AUH Resources	Total AUH Institutions	1.01
		Vaidyas/Hakims/ Homoeopathic Doctors	0.00
		Dispensers/ Compounders	0.30
		Total Medical Personnel	0.10
Health Status		Birth Rate	-1.98
		Death Rate	-1.39
		IMR	-2.08

With regard to health infrastructure, number of AUH institutions and their staff is grown at positive rate while in allopathic institutions and their staff some indicators have shown negative rate of growth. Where, number of hospitals, dispensaries, nurses, other staff, total staff and beds have experienced negative CAGR, other indicators have positive CAGR. However, number of CHCs have compounded annually at 2.74 per cent rate of growth which along with PHCs as well as SCs looking helpful in making the growth of allopathic institutions positive by overcoming the impact of negative growth of number of hospitals as well as dispensaries up to a certain extent. It is also important to mention that number of vaidyas/hakims/homoeopathic doctors in AUH institutions shows no growth. But the CAGR of AUH institutions (1.01%) and their total medical staff (0.10%) is better than allopathic institutions (0.40%) and their total staff (-0.30). Moreover, the indicators of health status including BR, DR and IMR have negative CAGR; thereby, implying their reduction over the years. But from the comparative point of view, more improvement is seen in IMR followed by BR and DR. However, negative growth of BR, DR and IMR is a good indication for the State of Haryana.

Now analogous to research purpose, three regression models are tested, dependent variables remaining same and by changing the form of explanatory variable as remarked before.

Impact of Public Expenditure on Health (PEH): Firstly, public expenditure on health is taken as explanatory variable and the results of log-linear regression are presented in table 3 which are obtained when various indicators of health infrastructure and status in natural logarithmic form are regressed one by one on public expenditure on health (taken in natural logarithmic terms) for the period 1990-91 to 2011-12.

In the table, column labeled á signifies the values of model's intercept; followed by values of regression coefficients (â) with its standard error (S.E.) in parentheses. The t-statistics in next column becomes the basis for statistical significance of â and are derived by (â/S.E.). Next columns tagged as 'R' and 'R^2' denotes correlation coefficient (simple correlation between independent and dependent variables) and coefficient of determination (variance explained by independent variable in dependent variable) respectively. Further, F-statistics in last column judges the statistical significance of overall regression model. Computed values of R for various significant regression models explore that PEH is highly correlated with dependent variables except number of hospitals and beds where correlation is moderate. Meanwhile, the values of R^2 as well as Adj.R^2 indicate that PEH is explaining 98 per cent variations in BR, more than 80 per cent variations in number of PHCs, CHCs, DR and IMR, more than 65 per cent variations in number of dispensaries, SCs, total number of allopathic institutions as well as AUH institutions, but less than 50 per cent variations in number of hospitals as well as beds. Regression models for these indicators are overall significant as the value of F-statistic is sufficiently high and is found to be greater than tabulated values of F.

Table 3 - Results of Regression Models for the period 1990-91 to 2011-12
(Explanatory Variable is Public Expenditure on Health: PEH)

Dependent Variables ↓			α	β (S.E.)	$t_β$ (Sig.)	R	R^2	Adj. R^2	F (Sig.)
Health Infrastructure	Allopathic Medical Resources	Hospitals	5.851	-0.068 (0.017)	-4.082 (0.001)	0.674	0.454	0.427	16.661 (0.001)
		PHCs	5.390	0.027 (0.003)	10.202 (0.000)	0.916	0.839	0.831	104.086 (0.000)
		Dispensaries	7.156	-0.078 (0.012)	-6.558 (0.000)	0.826	0.683	0.667	43.010 (0.000)
		CHCs	-0.117	0.191 (0.016)	11.639 (0.000)	0.933	0.871	0.865	135.470 (0.000)
		SCs	7.122	0.028 (0.004)	6.484 (0.000)	0.823	0.678	0.662	42.041 (0.000)
		Total Allopathic Institutions	7.420	0.027 (0.004)	6.512 (0.000)	0.824	0.680	0.664	42.412 (0.000)
		Doctors	6.848	0.022 (0.025)	0.878 (0.390)	0.193	0.037	-0.011	0.771 (0.390)
		Nurses	8.628	-0.017 (0.016)	-1.061 (0.302)	0.231	0.053	0.006	1.125 (0.302)
		Other Staff	9.823	-0.036 (0.025)	-1.437 (0.166)	0.306	0.094	0.048	2.064 (0.166)
		Total Allopathic Medical Staff	10.033	-0.023 (0.019)	-1.218 (0.237)	0.263	0.069	0.023	1.485 (0.237)
		Total Beds	10.276	-0.044 (0.011)	-4.117 (0.001)	0.677	0.459	0.432	16.952 (0.001)
	AUH Resources	Total AUH Institutions	4.664	0.066 (0.008)	8.234 (0.000)	0.879	0.772	0.761	67.791 (0.000)
		Vaidyas/Hakims/ Homoeopathic Doctors	6.121	-0.003 (0.015)	-0.197 (0.846)	0.044	0.002	-0.048	0.039 (0.846)
		Dispensers/ Compounders	5.583	0.019 (0.020)	0.916 (0.371)	0.201	0.040	-0.008	0.839 (0.371)
		Total Medical Personnel	6.548	0.008 (0.014)	0.556 (0.584)	0.123	0.015	-0.034	0.310 (0.584)
Health Status		Birth Rate	6.559	-0.144 (0.005)	-29.999 (0.000)	0.989	0.978	0.977	899.954 (0.000)
		Death Rate	4.204	-0.097 (0.010)	-9.455 (0.000)	0.904	0.817	0.808	89.395 (0.000)
		IMR	7.472	-0.147 (0.015)	-9.821 (0.000)	0.910	0.828	0.820	96.451 (0.000)

Source: Researchers' Calculations by using SPSS Version 20.0

The regression coefficient (â) which judges the strength of independent variable in predicting the dependent variable is found to be insignificant for number of doctors, nurses, other staff as well as total staff in allopathic institutions; and number of vaidyas/hakims/homoeopathic doctors, dispensers/compounders and total medical personnel in AUH institutions. Moreover the fit of these models are also not good due to low R^2 as well as F-statistic. Therefore, in these cases, the impact of public expenditure on dependent variables cannot be explained statistically. However, for the remaining dependent variables, â is found to be significant at 0.1 per cent level of significance. Indeed, the statistical values of â reveal that one per cent increase in PEH results in a rise of PHCs by 0.027 per cent, CHCs by 0.191 per cent, SCs by only 0.028 per cent, and total number of allopathic medical institutions as well as AUH institutions by 0.027 per cent and 0.066 per cent respectively.

On the other hand, with the negative values of â, it can be said that the same rise in PEH also decreased the health infrastructure namely number of hospitals by 0.068 per cent, dispensaries by 0.078 per cent and total number of beds by 0.044 per cent. This mathematical finding is somewhat awkward, so requires appropriate judgment that this has happened not because of increase in public health expenditure rather some other factors may have been responsible for the same. Further, for the highest value of regression coefficient (â = 0.191) for CHCs, this analysis also points up that public expenditure has a major impact on increasing the number of CHC's than its impact on increasing PHCs, SCs and total number of allopathic and AUH institutions. Public expenditure has also been able to significantly reduce BR, DR and IMR. Birth rate is reduced by 0.144 per cent, death rate by 0.097 per cent and IMR by 0.147 per cent as evident by the negative sign of regression coefficients. Though, the infant mortality rate and birth rate are more affected if compared with death rate.

Impact of Development Revenue Expenditure on Health (DREH)

Table 4 highlights that the regression models with dependent variables including number of doctors, nurses, other staff and total staff in allopathic institutions; and number of vaidyas/hakims/homoeopathic doctors, dispensers/ compounders and total staff in AUH institutions are not statistically noteworthy as their âs are insignificant and F-statistic as well as R^2 are very low. Therefore, the impact of explanatory variable on these dependent variables cannot be identified like the results in table 1.

Contrary to it, the remaining regression models are overall significant. Their âs which are statistically significant at 0.1 per cent level of significance reveal that an increase of 1 per cent in DREH brings a rise of 0.031per cent in number of PHCs as well as SCs, 0.206 per cent in number of CHCs, 0.030 per cent and 0.071 per cent in total number of allopathic medical institutions as well as AUH institutions respectively. Also, one per cent rise in DREH is associated with decrease in number of hospitals by 0.072 per cent, dispensaries by 0.086 per cent, total number of beds by 0.048 per cent, birth rate by 0.159 per cent, death rate by 0.107 per cent and IMR by 0.165 per cent.

Table 4 - Results of Regression Models for the period 1990-91 to 2011-12
(Explanatory Variable is Development Revenue Expenditure on Health: DREH)

Dependent Variables ↓			α	β (S.E)	$t_β$ (Sig.)	R	R^2	Adj. R^2	F (Sig.)
Health Infrastructure	Allopathic Medical Resources	Hospitals	5.926	-0.072 (0.019)	-3.758 (0.001)	0.643	0.414	0.385	14.126 (0.001)
		PHCs	5.315	0.031 (0.003)	11.808 (0.000)	0.935	0.875	0.868	139.425 (0.000)
		Dispensaries	7.302	-0.086 (0.014)	-6.257 (0.000)	0.814	0.662	0.645	39.155 (0.000)
		CHCs	-0.420	0.206 (0.021)	9.752 (0.000)	0.909	0.826	0.818	95.107 (0.000)
		SCs	7.066	0.031 (0.005)	6.275 (0.000)	0.814	0.663	0.646	39.371 (0.000)
		Total Allopathic Institutions	7.363	0.030 (0.005)	6.404 (0.000)	0.820	0.672	0.656	41.006 (0.000)
		Doctors	6.816	0.024 (0.028)	0.850 (0.405)	0.187	0.035	-0.013	0.723 (0.405)
		Nurses	8.656	-0.018 (0.018)	-1.032 (0.314)	0.225	0.051	0.003	1.066 (0.314)
		Other Staff	9.970	-0.043 (0.028)	-1.553 (0.136)	0.328	0.108	0.063	2.412 (0.136)
		Total Allopathic Medical staff	10.120	-0.027 (0.021)	-1.298 (0.209)	0.279	0.078	0.032	1.686 (0.209)
		Total Beds	10.359	-0.048 (0.012)	-4.016 (0.001)	0.668	0.446	0.419	16.130 (0.001)
	AUH Resources	Total AUH Institutions	4.567	0.071 (0.010)	7.253 (0.000)	0.851	0.725	0.711	52.611 (0.000)
		Vaidyas/Hakims/ Homoeopathic Doctors	6.165	-0.005 (0.016)	-0.299 (0.768)	0.067	0.004	-0.045	0.089 (0.768)
		Dispensers/ Compounders	5.542	0.021 (0.023)	0.915 (0.371)	0.200	0.040	-0.008	0.837 (0.371)
		Total Medical Personnel	6.548	0.008 (0.016)	0.506 (0.618)	0.112	0.013	-0.037	0.256 (0.618)
Health Status		Birth Rate	6.847	-0.159 (0.007)	-21.278 (0.000)	0.979	0.959	0.957	472.123 (0.000)
		Death Rate	4.394	-0.107 (0.012)	-8.900 (0.000)	0.894	0.798	0.788	79.207 (0.000)
		IMR	7.839	-0.165 (0.016)	-10.449 (0.000)	0.919	0.845	0.837	109.175 (0.000)

Source: Researchers' Calculations by using SPSS Version 20.0

Besides, it is clear from the values of R, R^2 and Adj.R^2 that DREH is highly correlated with dependent variables including number of PHCs, CHCs, SCs, total number of allopathic as well as AUH institutions, BR, DR and IMR. It explains 96 per cent variations in BR and more than 65 per cent variations in remaining variables. But, correlation of DREH with number of hospitals as well as number of beds is moderate and less than 50 per cent variations in these variables are explained by it. However, the fit of these regression models are good as the value of F-statistic is sufficiently high which are in excess of the tabulated F-value. Accordingly, it is clear that developmental revenue expenditure has a major impact on increasing the number of certain indicators of health infrastructure, but its utmost impact is noticed on CHCs (â=0.206). Although it is able to improve health status in terms of decreasing birth rate, death rate and infant mortality rate, but again health status is improved more in terms of infant mortality rate and birth rate than death rate in the State.

Impact of Capital Expenditure on Health (CEH): It is explored from the results presented in table 5 that the regression models which are found to be significant in the earlier two cases (table 3 and 4), are also significant here as the calculated F-statistics for them are found to be greater than the tabulated value of F at 0.1 per cent level of significance. Also, calculated R^2s are having good score. Moreover, âs are statistically significant at 0.1 per cent level of significance which reveal that 1 per cent increase of CEH leads to a rise in numbers of PHCs by 0.016 per cent, CHCs by 0.127 per cent, SCs by 0.017 per cent, and total number of allopathic medical institutions as well as AUH institutions by 0.016 per cent and 0.044 per cent respectively. On the other hand, same rise in CEH decreases the numbers of hospitals by 0.042 per cent, dispensaries by 0.046 per cent,

total number of beds by 0.024 per cent, birth rate by 0.091 per cent, death rate by 0.060 per cent and IMR by 0.088 per cent. Alike with previous two cases (table 3 and 4), the highest impact of explanatory variable is found on number of CHCs (â=0.127). But, dislike with earlier results, CEH is influencing BR more than IMR.

Moreover, the values of R signify that CEH is highly correlated with number of PHCs, CHCs, SCs, total number of AUH institutions and health indicators including BR, DR and IMR. But its correlation is moderate with number of dispensaries, total number of allopathic medical institutions and their total beds. Further, from the computed values of R^2 as well as Adj.R^2, it becomes clear that the variations explained by CEH are more than 90 per cent in number of CHCs and BR, more than 70 per cent in total number of AUH institutions and DR, above 60 per cent for number of PHCs and IMR and in remaining cases except number of hospitals more than 50 per cent. Whatsoever be the variations are explained by explanatory variable CEH in these variables, the regression models fitted are good as the value of F-statistic is sufficiently high.

Table 5 Results of Regression Models for the period 1990-91 to 2011-12 (Explanatory Variable is Capital Expenditure on Health: CEH)

Dependent Variables ↓			α	β (S.E)	t_β (Sig.)	R	R^2	Adj. R^2	F (Sig.)
Health Infrastructure	Allopathic Medical Resources	Hospitals	5.204	-0.042 (0.011)	-3.754 (0.001)	0.643	0.413	0.384	14.091 (0.001)
		PHCs	5.677	0.016 (0.003)	6.116 (0.000)	0.807	0.652	0.634	37.411 (0.000)
		Dispensaries	6.362	-0.046 (0.009)	-5.076 (0.000)	0.750	0.563	0.541	25.762 (0.000)
		CHCs	1.510	0.127 (0.009)	14.942 (0.000)	0.958	0.918	0.914	223.260 (0.000)
		SCs	7.407	0.017 (0.003)	5.110 (0.000)	0.753	0.566	0.545	26.113 (0.000)
		Total Allopathic Institutions	7.698	0.016 (0.003)	4.915 (0.000)	0.740	0.547	0.524	24.153 (0.000)
		Doctors	6.954	0.018 (0.016)	1.149 (0.264)	0.249	0.062	0.015	1.321 (0.264)
		Nurses	8.522	-0.013 (0.010)	-1.280 (0.215)	0.275	0.076	0.030	1.639 (0.215)
		Other Staff	9.287	-0.014 (0.017)	-0.797 (0.435)	0.176	0.031	-0.018	0.636 (0.435)
		Total Allopathic Medical staff	9.703	-0.009 (0.013)	-0.729 (0.475)	0.161	0.026	-0.023	0.531 (0.475)
		Total Beds	9.789	-0.024 (0.008)	-3.111 (0.006)	0.571	0.326	0.292	9.681 (0.006)
	AUH Resources	Total AUH Institutions	5.241	0.044 (0.005)	8.669 (0.000)	0.889	0.790	0.779	75.147 (0.000)
		Vaidyas/Hakims/ Homoeopathic Doctors	6.076	-0.001 (0.010)	-0.100 (0.921)	0.022	0.001	-0.049	0.010 (0.921)
		Dispensers/ Compounders	5.843	0.008 (0.013)	0.569 (0.576)	0.126	0.016	-0.033	0.323 (0.576)
		Total Medical Personnel	6.661	0.003 (0.009)	0.326 (0.747)	0.073	0.005	-0.044	0.107 (0.747)
Health Status		Birth Rate (BR)	5.225	-0.091 (0.006)	-15.970 (0.000)	0.963	0.927	0.924	255.028 (0.000)
		Death Rate (DR)	3.264	-0.060 (0.008)	-7.318 (0.000)	0.853	0.728	0.715	53.560 (0.000)
		IMR	5.998	-0.088 (0.013)	-6.817 (0.000)	0.836	0.699	0.684	46.477 (0.000)

Source: Researchers' Calculations by using SPSS Version 20.0

Also, table 5 highlights that the regression models having dependent variables: number of doctors, nurses, other staff as well as total staff of allopathic medical institutions; and number of vaidyas/hakims/homoeopathic doctors, dispensers/compounders and total medical personnel in AUH institutions are not statistically significant due to the insignificance of computed â, low values of F-statistic as well as R^2. Again, the impact of explanatory variable on these dependent variables cannot be identified like the results in table 3 and 4.

Summarization of Regression Results and Comparisons between PEH, DREH and CEH: The results of various regression models are compiled in table 6 for abridging the impact of Government health spending on health infrastructure and health status in the form of direction and magnitude of effects. Related with the direction of effects, the results for PEH, DREH and CEH are consistent as they are found to be influencing the dependent variables in the same direction.

Positive (+) and negative (-) signs in rows/columns signify that increase in government health spending (PEH, DREH and CEH) has a significant positive and negative (inverse)

impacts respectively on corresponding dependent variable. Though, the last three columns of the table highlight that DREH have impacted the dependent variables robustly as its effect size is greater followed by PEH and CEH. A sign of +) for certain indicators point up that none of the kind of health spending has a significant impact on them; and the effect sizes are just because of chance but not by the impact of the forms of health expenditure. However, the negative (-) sign in the cells for indicators of health infrastructure including number of hospitals, dispensaries and beds suggest that spending on health inversely influences these variables. No doubt, rows of health status indicators are also showing negative (-) sign thereby implying that increase in PEH, DREH and CEH, is reducing BR, DR and IMR, likewise health status is improved with rising health spending. The effect sizes once again favor DREH for its larger size of effect than its correspondents that are PEH and CEH. However, among indicators of health infrastructure highest positive impact of three expenditures is seen on number of CHCs. Table 6 also reveals that AUH institutions are influencing greater by all forms of health expenditure than total number of allopathic institutions. In case of health status, PEH and DREH are affecting IMR in comparison of BR as well as DR while CEH has more impact on BR than IMR and DR.

Table 6 - Summarized Results for Comparing the Effects

Dependent Variables ↓			Direction of effect			Magnitude of effect (β)		
			PEH	DREH	CEH	PEH	DREH	CEH
Health Infrastructure	Allopathic Medical Resources	Hospitals	-	-	-	0.068	0.072	0.042
		PHCs	+	+	+	0.027	0.031	0.016
		Dispensaries	-	-	-	0.078	0.086	0.046
		CHCs	+	+	+	0.191	0.206	0.127
		SCs	+	+	+	0.028	0.031	0.017
		Total Allopathic Institutions	+	+	+	0.027	0.030	0.016
		Doctors	□	□	□	0.022	0.024	0.018
		Nurses	□	□	□	0.017	0.018	0.013
		Others	□	□	□	0.036	0.043	0.014
		Total Allopathic Medical staff	□	□	□	0.023	0.027	0.009
		Total Beds	-	-	-	0.044	0.048	0.024
	AUH Resources	Total AUH Institutions	+	+	+	0.066	0.071	0.044
		Vaidyas/Hakims/ Homoeopathic Doctors	□	□	□	0.003	0.005	0.001
		Dispensers/ Compounders	□	□	□	0.019	0.021	0.008
		Total Medical Personnel	□	□	□	0.008	0.008	0.003
Health Status		BR	-	-	-	0.144	0.159	0.091
		DR	-	-	-	0.097	0.107	0.060
		IMR	-	-	-	0.147	0.165	0.088

Source: Compiled from Regression Results.
Note: '□' indicates nil impact.

Conclusion and Policy Implications

Firstly, the present study computes compound annual growth rate (CAGR) for selected variables. The estimated values of CAGR reveals that number of hospitals, dispensaries, nurses, other staff, total staff, beds, birth rate (BR), death rate (DR) and infant mortality rate (IMR) has experienced negative CAGR while others have positive. Highest growth rate is achieved by capital expenditure and number of CHCs among all health expenditure and health infrastructural facilities respectively. Also, positive growth rate of CHCs along with PHCs as well as SCs remain helpful in making the growth of allopathic institutions positive by overcoming the impact of negative growth of number of hospitals as well as dispensaries up to a certain extent. It is also noteworthy that CAGR of AUH institutions and their total medical staff are found to be better than allopathic institutions and their total staff. However, a serious cause of concern which requires further research is the negative growth rate of some health infrastructural facilities despite tremendous growth of public expenditure on health. Meanwhile, negative growth rates of BR, DR and IMR implying that health status has improved in the State of Haryana which provides motivation for the Government to enhance availability, accessibility and affordability of health infrastructure for all through proper health spending.

Thereafter, from the examination of the impact of health

expenditure on the indicators of health infrastructure and health status it is found that there is consistency in the impacts of PEH, DREH and CEH. They have same direction of influences that is positive impact on number of primary health centers (PHCs), community health centers (CHCs), sub-centers (SCs), total number of allopathic as well as ayurvedic, unani and homoeopathic (AUH) institutions; whereas, negative on some indicators including number of hospitals, dispensaries, beds, BR, DR and IMR. But the magnitudes of the effects are found to be more in case of DREH followed by PEH and CEH despite that DREH has low growth rate than CEH and PEH. But CEH with highest CAGR have lowest effect size which is surprising. However, the remaining indicators are found to be expenditure inelastic and here the effect sizes are just because of chance but not by the impact of the forms of health expenditure. No doubt, the impact of PEH, DREH and CEH, is negative on BR, DR and IMR which imply BR, DR and IMR are reducing likewise health status has improved with rising health spending. The effect sizes once again favour DREH for its larger size of effect than its correspondents that are PEH and CEH. Accordingly, DREH calls for more emphasis; due to its highest impacts and a hope can be made that increase in DREH will essentially enhance health infrastructure and health status efficiently. With this, it is also essential to raise CEH being a major source of creating health infrastructure and enhancing the capacity to provide more health services.

Above all, the positive impact of Government's health spending on health infrastructure implicated that Government must increase public expenditure on health along with its both components in every year's budget; so that their impact could be sustained and demand-supply gaps in health facilities could be filled. Unfortunately, it seems paradoxical that public expenditure on health produce negative and nil impact on certain indicators of health infrastructure. Therefore, it needs further judgments that what is the actual reason for this negative and zero impact. It may be due to the inadequate attention towards those indicators while resource allocation. It may also be credited to disinvestment or non-replacement of depreciated infrastructure and conversion of hospital and dispensary to other health centers due to their inadequate size, urbanization and demographic reasons. Moreover, financial leakages and wastages of funds should be plugged. Along with this, Government must adopt good governance to check corrupt practices; and to allocate funds adequately on each and every health facility so that our health infrastructure could be developed quantitatively and qualitatively better which in turn will be helpful in promoting health status in the State of Haryana.

Future Research Directions

From the findings of the present study, directions for future researchers can also be drawn. Firstly, research can be conducted to examine that despite double digit compound annual growth of public expenditure on health, the health infrastructural facilities have not grown in same manner while some of them have experienced negative growth. In other words, researchers can investigate the causes of negative impact of public expenditure on some indicators of health infrastructure and expenditure inelastic behavior of some others. It is also interesting to examine the differences in the magnitude of the effects of various types of Government expenditures. Moreover, it can also be studied that how much the time lag is involved in the best possible effects of public expenditure on health sector as this expenditure is an investment which requires some time period to receive returns.

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Endnotes

[1] Hospitals imply government hospitals where number of beds varies from 75 to 500 depending upon the size, terrain and population of each district. Hospitals form an apex institute in the hierarchy of health care system and play an important role in providing the preventive, promotive and rehabilitative services to local community including training and research.

[2] Primary Health Centre (PHC) is a medical institute having one MBBS doctor. Also, 14 Para-medical and other supporting staff form a basic part of the health care system in PHCs. It may have 4-6 beds for patients and performs curative, preventive, promotive and Family Welfare services. A typical Primary Health Centre covers a population of 20,000 in hilly, tribal, or difficult areas and 30,000 populations in plain areas with 6 indoor/observation beds. It acts as a referral unit for 6 Sub-Centres and refer out cases to CHC (30 bedded hospital) and higher order public hospitals located at sub-district and district level.

[3] Dispensary is a medical institute where one physician and one pharmacist provide outdoor treatment.

[4] Community Health Centre (CHC) is a 30-bedded health institute with four specialists including a surgeon, a physician, a gynecologist and a pediatrician supported by 21 Para-medical and other staff. It possess one operation theatre, X-Ray machine, labour room and laboratory facilities providing specialist care in Medicines, Obstetrics and Gynaecology, Surgery and Paediatrics.

[5] Sub-centre (SC) is the most peripheral health institution available to the rural population. Its main functions are: maternity and child health, collection of vital statistics, treatment of minor ailments, immunization, and prevention of malnutrition. It also provides health education in respect of common communicable diseases and in cases of family planning.

[6] Birth rate is the total number of live births per thousand of population in a year.

[7] Death rate refers to the total number of deaths per year per thousand people.

[8] Infant mortality rate implies the number of deaths of infants less than of 1 year old per 1,000 live births.