



**Relationship Between Health Expenditures and Life
Expectancy in Pakistan**

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Author: Ejaz Ahmed

Co-Authors: Dr. Muhammad Jahangir Khan

Dr. Fazli Hakim Khattak

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¹Ejaz Ahmed

²Dr. Muhammad Jahangir Khan

³Dr. Fazli Hakim Khattak

¹ AUTHOR IS MPHIL SCHOLAR AT DEPARTMENT OF HEALTH ECONOMICS AT PIDE ISLAMABAD

² AUTHOR IS THE ASSISTANT PROFESSOR, DEPARTMENT OF HEALTH ECONOMICS AT PIDE ISLAMABAD

³ AUTHOR IS THE HEAD, DEPARTMENT OF HEALTH ECONOMICS AT PIDE ISLAMABAD

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ABSTRACT

This study examine an empirical evidence of the specific impact of public health expenditures on life expectancy in Pakistan using time series data span between 1980 and 2016. This study made use of the recent bound testing co-integration approach developed within the frame work of the autoregressive distributed lag (ARDL) procedure to determine the long run relationship between public health spending and life expectancy in Pakistan. Empirical finding suggest that a long run relationship between health expenditure, life expectancy, literacy rate exist in Pakistan. The results show that GDP and mortality rate insignificant and indirectly influence the rate of life expectancy of Pakistan. On the other hand GDP and mortality rate was found to be insignificant in both short run and long run contrary to economic theory. Therefore, based on the finding of this study recommends that government should increase and restructure the public health expenditures allocation to the health sector.

Key words: Health Expenditures, Life Expectancy, GDP, Literacy Rate, Mortality Rate

1. INTRODUCTION

Life expectancy at birth measures how long on average a newborn can expect to live, if current death rates do not change. However, the actual age-specific death rate of any particular birth cohort cannot be known in advance. The average period that a person may expect to live is life expectancy. Life expectancy is a measure of the average time of people is expected to live based on the year of its birth. Its current age and other demographic factor including gender. The most commonly used measure of life expectancy is at birth. Which can identify two way selected causes of health and population dynamic for Pakistan including life expectancy by age and history. Health expenditures per capita are defined on the basis of their primary or predominant purpose of improving health. Regardless of primary function or activity of entity providing or paying for the associated health services (OECD, 2019). Life expectancy at birth, widely used as an indicator of overall development of a country, has increased over the last ten years in most of the countries of the world. This has a particular indication for the developing world since they are striving earnestly for achieving socio-economic progress through investing significantly on social sectors like health, education, sanitation, environmental management and sustainability, and social safety nets. Per capita income of the developing countries has increased and translated into higher level of expenditure on medical care and composite commodities. Improvements in incidence of poverty, nutrition, adult literacy, access to safe drinking water, burden of diseases, and sanitation have also been remarkable over the years that would have impacted positively on life expectancy (Kabir, 2008). Life expectancy is affected by many factors such as socioeconomic status, including employment, income, education and economic wellbeing; the quality of the health system and the ability of people to access it; health behaviors such as tobacco and excessive alcohol consumption, poor nutrition and lack of exercise; social factors; genetic factors; and environmental factors including overcrowded housing, lack of clean drinking water and adequate sanitation (Health.gov.au, 2019). Life expectancy in Pakistan for male is 65.7 year and female is 67.4 year, total life expectancy 66.5 years (2018). According to WHO Pakistan life expectancy ranking is 133 number. Health expenditures surpassed the budget allocation of Rs273.34 billion set for the fiscal year 2016-17 while in terms of GDP these increased to 0.91pc from 0.77 recorded in the fiscal year 2015-16. health expenditures per capita in Pakistan is 36.15 (2014). GDP per capita 1547.85 USD (2017) of Pakistan. infant mortality in Pakistan 50.40 per 1000 births (2018). literacy

rate is very low in Pakistan as compared to other countries Pakistan literacy rate has declined from 60% to 58 % (Alvi, 2019).

Life expectancy rate can be determined from crude birth rate which is average births per 1000 in a year and crude death rate is average deaths per 1000 in a year. Life expectancy is the average number of years an individual life from the day of his birth. The year of an individual's life can be increased and can be made better off by providing better medication and by providing better vaccination to protect the individual against diseases. In OECD countries, life expectancy at age 65 has increased significantly for both men and women during the past 50 years. Some of the factors explaining the gains in life expectancy at age 65 include advances in medical care combined with greater access to health care, healthier life styles and improved living conditions before and after people reach age 65. A growing share of the population is now age 65 and older. Longer life expectancy is accompanied by good health among ageing populations has important implications for health and long-term care systems. The relationship between health expenditures and life expectancy. Increased life expectancy at age 65 does not necessarily mean that the extra years lived are in good health. In Europe, an indicator of disability-free life expectancy known as healthy life years has recently been developed and is calculated regularly, based on a general question about disability in the European Survey of Income and Living Conditions (EU-SILC). Given that this indicator has only recently been developed, long time series are not yet available (Sghari *et al.*, 2016). In Pakistan Healthcare spending is low but over the time it's raising. The country is spending 0.5 to 0.8 percent of its GDP on health over the last 10 years for public sector. These percentages are less than the WHO benchmark of at least 6 percent of GDP required to provide basic and lifesaving services. During 2015-16, total expenditure increased by 13 percent over 2014-15, and during current fiscal year (July-March) 2016-17, the expenditure remains at 145.97 billion showing an increase of 9 percent over the same period of last year. According to the world Bank latest report, currently, Pakistan's per capita health spending is US \$ 36.2 which is below than the WHO'S low-income countries benchmark of US\$ 86 (Basharat, 2019).

2. Literature Review

Relationship between health expenditures and life expectancy is major factor for development of any country. In pervious show, there is some link between health expenditure and life expectancy. In developed and developing countries there is lot difference in many condition. Develop countries health system and health care expenditures are more efficient according to country GDP and some other variables of development. But in most developing countries are many issues about their healthcare system and health expenditures to allocate a better health facilities and delivery.

According to Sghari and Hammami (2016) The relationship between life expectancy and health spending. the relationship between health spending per capita and life expectancy in the OECD. An important lesson from the work of McKeown is that it cannot be automatically assumed that more medical care always leads to an increase in life expectancy. Since the 1950s causes of death have changed from mainly infectious diseases to chronic diseases, and medical care has changed in response to this epidemiological transition.

Jaba *et al.* (2014) The relationship between life expectancy at birth and health expenditures estimated by a cross-country and time-series analysis. to analyze the relationship between the dynamics of the inputs and the outputs of health care systems. The resources of health systems are measured by several indicators such as health expenditures (total expenditures on health per capita, health expenditure as percentage of GDP, percentage of public expenditure in total health expenditure), number of physicians, number of hospital beds, number of computed tomography scanners .The indicator considered in this study for measuring the health input is total health expenditures per capita. The output of the health systems is expressed either by longevity indicators such as life expectancy (life expectancy at birth, life expectancy at 65 years, healthy life expectancy) for total population and by gender, or by mortality indicators (mortality rate, infant mortality rate, potential years of life lost). These indicators are considered good proxies for measuring the health status of a population.

Sanya and Yemisi (2017) Health Expenditure Distribution and Life Expectancy in Nigeria. the relationship between life expectancy and Government Expenditure in Nigeria between 1980 and 2015.The study employed a Feder-Ram Approach as estimation technique. Findings from the study showed that the relationship between Government Health Expenditure and Economic

Growth was positive during the study period. That is, when government expenditure on health improves economic growth improves.

Besley and Kudamatsu (2006) They also argue that higher health spending and more superior healthcare policy are associated with better health outcomes, though their argument states that the effect of these policies goes through the political system and it is stronger in democracy. Put simply, health policy interventions are superior in democracies, which in turn results in better health outcomes.

Nikoloski and Amendah (2011) Does a country's greater health care spending lead to better health outcomes for its population?. This report aims to determine whether health expenditure has increased generally and whether this increase, if any, led to improved health indicators in Africa. Descriptive, and multivariate analyses were conducted with health indicators as dependent variables on one hand and public and private health expenditures as the main independent variables. Life expectancy at birth was the dependent variable with income per capita, illiteracy rate, food availability, ratio of health expenditure to GDP, urbanization rate and carbon dioxide emission per worker being the explanatory variables. The empirical results suggested that an increase in income per capita, a decrease in illiteracy rate, and increase in food availability were associated with improvement in life expectancy at birth. Health expenditure had a negative relationship with life expectancy at birth, however, this result might have been due to the methodology adopted. Finally and most recently, using a panel data analysis from 1995 to 2010 covering 44 countries also showed an association between increased health care expenditure on the one hand and reduced neonatal mortality rates and increased life expectancy at birth on the other.

Brown (2015) The current focus of medical research on increasing the quantity, rather than the quality, of life is damaging our health and harming the economy. Should medical research be focused on increasing the quantity or quality of life For a variety of reasons, past research has focused more on quantity of life, but the resultant life extension, without reducing ageing, has increased the extent of ageing and age-related disease, plus pension, and social and medical costs, in an unsustainable way. I argue here that medical research urgently needs to be refocused away from cancer and cardiovascular research, and onto reducing ageing and age-related morbidity, thereby increasing both our health and our wealth.

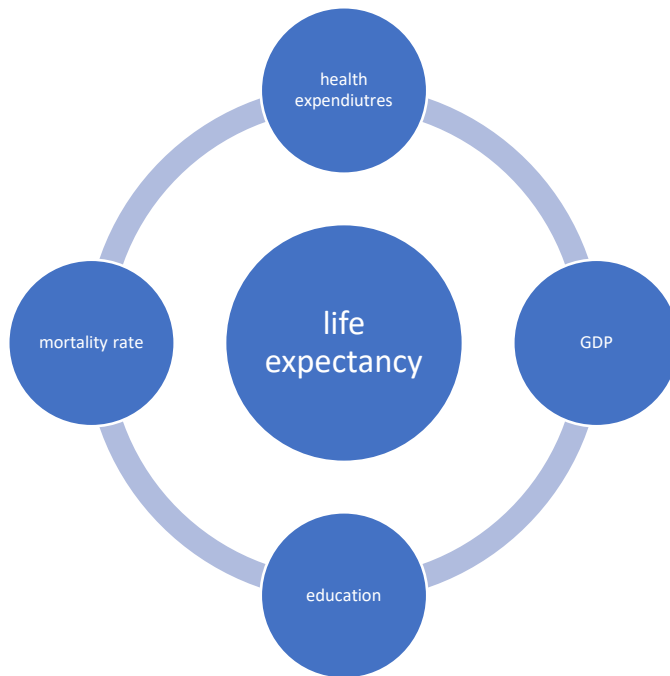
3. Theoretical Framework

This part includes the theoretical and methodology framework of the study and discussion about the data source of variables. List of variables and source, methodology is clarified in this study. The theoretical framework of the study has been presented to analyze the possible theoretical channels and links through which explanatory variables like (health expenditure, GDP, education and mortality rate can affect the dependent variable, Life expectancy) can be explained.

As shown in figure 1 below, the risk factors of life expectancy are discussed like better health care, income, infectious disease. These determinants will affect the life expectancy at any human age. In this study, we make some links between the variables which affect the life expectancy of any age group of human. This is economic factors to make a link or relationship between the dependent variable life expectancy and independent variables.

Using the previous study of research relationship of health expenditure and life expectancy is depends on better allocation of funds. Several studies have been conducted to establish the causal relationship between government expenditure and health both in developed and developing nation. However, majority of these studies only considered the relationship between the health and macroeconomic variables. Therefore, it is essential to consider the nexus between government expenditure and life expectancy. This paper is structured as follows; this introductory section is followed by section that discusses conceptual issues and empirical literature. Section two presents methodology & theoretical underpinning, methods and materials. Section three is centered on results and its interpretation while section four concludes the paper.

Figure.1: **Diagram of Theoretical Framework**



This diagram show the relationship between the dependent variables and independent variables of study. Life expectancy is depends on these variables which show some impact on health care, which result of increase or decrease in life expectancy of population. Life expectancy is effected by these variables of which are link by one other. There is some relationship between these variables. In this study independent variable life expectancy is effected by health expenditures and health expenditures effects by GDP. Health expenditures are part of GDP and it will be link to GDP for to allocation of resources. Education is also make some connection to life expectancy for knowledge about the health care and facilities. Mortality rate is also effect on life expectancy to increase and decrease of life expectancy.

4. Data and Methodology

4.1 Study Design and Method

This is time series study based on time series data from 1980-2017 of Pakistan. Data is taken from the world development indicators. In this research use one dependent variable which is life expectancy and independent variables which are HE, GDP per capita, education, mortality rate. These are my research variables show effects on life expectancy with time series data. econometric technique will use to find results of this study. Regression analysis and models is to use for check the relationship of these variables and results for interpretation. Either these variables are correlated with each other to show impact of health expenditures on life expectancy.

4.2 Econometric model

Based on proposed variables:

The following form of econometric model is assumed to be estimated,:

$$LE = \alpha_0 + \beta_1 HE_t + \beta_2 GDP_t + \beta_3 Edu_t + \beta_4 MR_t + ut$$

Where :

$$ut \sim iid$$

LE = life Expectancy > is dependent variable

HE = Health Expenditure > independent variable

GDP = Gross Domestic Product > is independent variable

Edu(LR) = Education > independent variables

MR = Mortality rate > independent variable

4.3 Data Collection Instrument and Description

World development indicator (WDI) is source of data collection for analysis. This study is time series based on time series data. After collection of data regression analysis is use to gets results. Data of all research variables is available on one source which is World development indicator.

4.4 Estimation Techniques and ARDL Modelling Approach

Before presenting empirical results of ARDL model, we apply following econometric steps of stationarity test of the time series data of by augmented-dickey-fuller and we proceed to determine the F test for ARDL model. some variables are stationary and some are non-stationary. According to proceedings variables properties atuo-regressive distributed lag model is apply for results and analysis.

5. Results and Discussion

Formerly estimating the ARDL bound approach, we use the augmented dickey-fuller test for stationary and non-stationary time series. The results are presenting in table.1 showing that all variable are integrated of order one I (1) excepting the life expectancy and GDP when the variables are stationary at I(0).

Table 1. **Stationary Results of ADF Test**

Variables	Level I (0) p-value	Ist difference I(1) p-value
LE	0.003***	0.813
HE	0.314	0.000***
GDP	0.007***	0.000
LR	0.836	0.000***
MR	0.973	0.020***

*show values are significant at 10% level with Mackinnon (1996).

***show values are significant at 1% level with Mackinnon (1996).

**show values are significant at 5% level with Mackinnon (1996).

The results of ADF unit root test implies that the condition for cointegration using Johansen method was met by series. The objective of this method to analysis the long run and short run dynamics relationship between the dependent and explanatory variables of interest using ARDL procedure and as well a maximum lag of dependent variable is one and independent variables is (3,2,) consider appropriate based on the majority of the criteria including AIC as evidenced from table of results. However, the general results of econometric model of ARDL are shown in table.2 Results show the short run relationship between the variables of model.

5.1 Results of Econometric model ARDL

Dependent variable	Coefficient value	P-value
LE	0.972	0.000
Independent variables		
HE	0.002	0.000
GDP	-0.005	0.000
LR	0.007	0.029
MR	-0.039	0.007

the results show the significance and relationship of variable dependent variable life expectancy lag is significant and positive impact with health expenditures. That indicate 1% increase in health expenditures in the country will result 0.002% increase in level of life expectancy. Sunday and Adeleye, (2017) also reported the same results, There is positive and significant relationship between life expectancy and health expenditures. GDP is used to proxy factor for life expectancy has a Negative and insignificant relationship with life expectancy. For its lag one value is contrary theoretical expectation. If one 1% increase in GDP then results -0.005 percent

decrease in life expectancy. The third independent variable of model is literacy rate. there is positive and significant relationship between the life expectancy and literacy rate. Deshpande *et al.*, (2014) also reported the same results, there is still positive and significant relationship between life expectancy and literacy rate. If one percent increase in literacy rate then the result is 0.007 % increase in life expectancy. Last one independent variable is mortality rate of neonatal born (per 1000 live birth). There is negative and insignificant relationship between the life expectancy and mortality rate. If one percent increase in mortality rate then result is 0.039 decrease in life expectancy.

5.2 Long Run Estimation

Dependent variable	Coefficient value	P-value
LE		
Independent variables		
HE	0.363	0.000
GDP	-0.685	0.000
LR	0.362	0.039
MR	-0.018	0.416

A careful look at the long run results in table. 4 shows that the coefficient of life expectancy health expenditures, GDP, literacy rate, mortality rate and their lagged value of all their expected sign and significant as suggested by theory. Expected three lag value of health expenditure that carries statistical direct relationship with life expectancy. Health expenditures is indicate positive and significant relationship with life expectancy. While the lag value of health expenditures indicate and reveals a positive impact and statistically significant on the level of life expectancy-health outcomes in line with our a priori expectations. Sunday and Adeleye (2017) also Reported the same results. Health expenditures show the positive and significant relationship with life expectancy. This indicate that a 1% increase in level of health expenditure in country will result in 0.363 percent increase in level of life expectancy in long yearly. The GDP is used to proxy factors as a negative and statistically insignificant relationship on life expectancy for its lag one contrary

to theoretical expectation. If 1 % percent increase in GDP will results -0.685 percent decrease in life expectancy in long term . While two lag value of GDP is show positive and significant relationship on the life expectancy as indicate by the value of T-ratio and probability value to our priori expectations. Literacy rate and its lag value indicate a positive and statistically significant relationship with life expectancy in Pakistan. Also, a 1% increase in the literacy rate will give rise in the life expectancy (health outcome) by 0.362 percent in long run. Deshpande *et al.*, (2014) also report the same results, the relationship of literacy rate and life expectancy is positive and statistically significant. Mortality rate is also show negative and statistically insignificant relationship with life expectancy in long run. Meanwhile, the of morality rate show negative and statistically insignificant relationship with life expectancy. If 1% increase in mortality rate then result will be -0.018 reduce in life expectancy in long run.as the results of long run estimation

5.3 Bound Test Results for Co-integration

Computed wald test (F-statistic) 6271.2

K=4

Critical value	upper bound value I(1)	lower bound value I(0)
1%	4.37	3.29
5%	3.49	2.56
10%	3.09	2.2

Sources: (i) Pesaran et al. (2001), Table CI (iii), Case 111: Unrestricted intercept and no trend. K is the number of regressors in the ARDL model. Narayan and Narayan (2005), Case III, *, ** and *** denotes significance at 1%, 5% and 10% respectively. (ii) Authors' Computations using E-views 9.

5.4 Diagnostic Tests of the ARDL Model Results

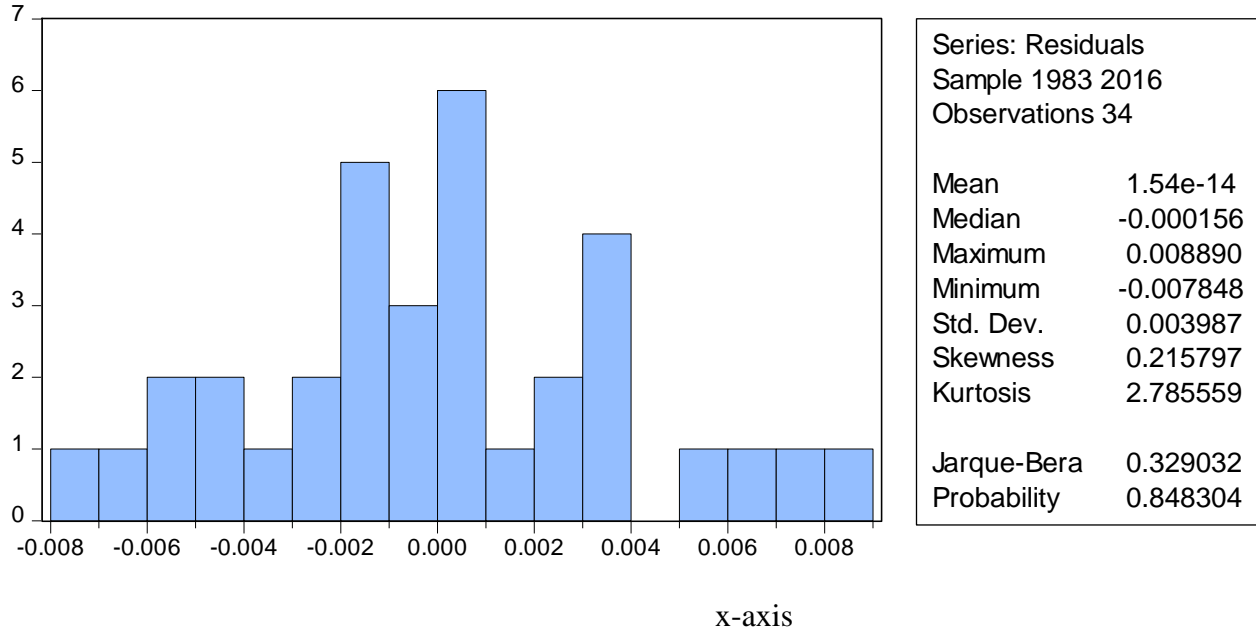
S/No.	TEST	F-statistic	P-value
i.	Serial correlation test: B-G serial correlation LM test	1.908556	0.0318
ii.	Heteroskedasticity test:	0.855371	0.9996
iii.	Normality test: jarque Bera	0.329	0.848304
iv.	Ramsey Reset test:	0.249008	0.6246

Table show the ARDL diagnostic test results, in this analysis we see the f-statistics value with probability value to check appropriate results of model.

The robustness of model has been definite by serval diagnostic tests such as serial correlation test, heteroskedasticity test, Ramsey RESET specification test and Jarque-Bera normality test. All the tests indicate that the model has a satisfactory econometric properties, with a correct functional form and as well the models residual are serially uncorrelated, normally distributed and homoscedastic. Hence, the result reported are valid for reliable interpretation and policy making. The results of residual analysis can be confirmed as shown in table.6 the results reveal that, the residual of data are normally distributed. The null hypothesis of normality of residual of data is accepted at 84.83 percent confidence level as indicated by the probability value of 0.848304 and jarque- Bera value of 0.329032 which is greater than zero.

5.4 Normality Test Diagram

y-axis



6. CONCLUSION & POLICY IMPLICATIONS

6.1 conclusion

The contributions of the life expectancy (health outcome) to economic progress of any economy has been well established in the development literature. The study examined empirically impact of public health spending on health outcomes in Pakistan. Using time series data spanning between 1980 and 2016. This study made to use of bound test cointegration approach developed within the framework of the autoregressive distributed lag ARDL econometric procedure to determine the long run relationship between health expenditure and life expectancy in Pakistan. Utilizing the ADF unit root test, the stationarity of the variables were guaranteed, depend by the choice of ideal lag and after that test for existence of co-integration. Experimental findings recommend that a long run association between health outcome (life expectancy), and public health expenditure, literacy rate at lagged two withdrawal in Pakistan. The results showed that health expenditures and literacy rate at lagged two significantly and positively partial the rate of

life expectancy in Pakistan. This was as a outcome of appropriate channel of funds to health sector in the country. Thus, imitate the effectiveness of health consequences proxied by life expectancy in the research. Moreover, observational proof likewise demonstrated that literacy rate at lagged two is conversely related yet authentic noteworthy to life expectancy in Pakistan inside this study time frame. This outcome is similarity with Neo-Classical hypothesis just as past exact studies. This likewise determines if satisfactory measures are set up against morality rate, this will expand the dimension of life expectancy in Pakistan.

Different diagnostic tests were carried out on the short and long run models, the results show the model passes all tests.

6.2 Policy Implication

Flowing naturally from this, are the policy recommendation which include:

- i. Health expenditures and life expectancy is show positive relationship in this study. So the policy should be made for increasing health expenditures of Pakistan.
- ii. On based of results of this study some changes should be taken for increase health expenditures for health sector. The policy maker should take serious action to improve the health expenditures allocation and standards.
- iii. Government of Pakistan should Increase and reorganize the public expenditure allocation to health sector in order to provide health facilities and also, adequate management of funds and development of health services should be greatly pursued.
- iv. Lastly, government should introduce programs that will give awareness concerning the effect of life expectancy and public health expenditures on individual health and should also advise people and health ministry to appropriate measure to be taken for proper public health policy, to avoid any kind of hazard about health care.

6.3 Future direction of research

After analysis of our research results and policy implications suggest that proper and additional research on following topics;

- The role of health spending as a determinants of mortality when forecasting the life expectancy.
- Additional investment in health care sector to improve health is may causes increase in life expectancy.

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