

Empirical Relationship of Birth Rate, Female Literacy Rate and GDP Per Capita with Child Mortality Rate in Pakistan

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Abstract--Child mortality is considering an important indicator of quality of life and economic condition in underdeveloped countries. It is also a good indicator of female's literacy, adult health, income and birth rate. Pakistan has rapid economic growth from past few years. Despite of economic growth Pakistan has been unable to decrease child mortality rate to the target level. There are a lot of socioeconomic factors that affect child health. Due to the lake of data and many other problem this study has not include all variables. This study consider only three major factors are GDP per capita, females literacy rate and birth rate. This study result shows that increase in GDP per capita has significant affect to decrease child mortality. This study shows that females literacy play key role in decreasing child mortality because when mother is educated the chances to become a child sick is very low as compare to an uneducated woman .This study result shows that decrease in birth rate means child mortality rate will be also low. It means in Pakistan birth rate is high it is difficult for parent and government to provide efficient health facilities children as compare to developed nations. The study's result imply that females literacy ,GDP per capita and birth rate are key determinants of child mortality, among other significant indicators.

Key Words: Child mortality, female's education, GDP per capita, Birth rate, Pakistan

1. INTRODUCTION:

To measure the health status of a country infant and child mortality rate is consider as one of the best measures. The rate of child mortality is not only measure the health status of a country but according to the world development report (1993, pp.34) shows that 'an initial index of child health is infant mortality rate and is taken to be highly significant predicator of a country's economic performance". Child mortality fell everywhere in the world over the past few decades but the health result different across the boundaries and region because of increase in per capita income, increase awareness related to public health / increase in literacy rate. In most developing counties e. g Sir Lanka, China etc managed to decrease high infant mortality rate. In Pakistan the situation remains neglected.

According to the World Development Report (1990, pp.180) Pakistan experienced period of rapid economic growth but enable to improve their human health. There are many complex factors, at aggregate level, which result child mortality rate but it is not possible to include all those factors due to the lake of data availability. In this study three main factors which result child mortality are GDP per capita, female literacy rate and birth rate.

'In Pakistan , only 47% of children get immunization while 3.5m children face vitamin A deficiency , while adversely affect vision, growth and reproduction", Said Dr Syed Mujahid Hussain, immunization officer at Ministry of Health Islamabad.

UNICEF released The State of the World's Children 2014 report, ranking Pakistan at 26 in the list of countries which high infant mortality rate in the world. According to the report (in Pakistan infant mortality), an estimated 86 babies died below the age of five per every 1000 live birth in Pakistan in 2012. The figure come from 409,000 babies dying below the age of five out of 4,604,000 newborn in 2012. The 8.6% rate is an improvement since 1990, when the less than five mortality rates was measured at 13.8%. For children under the age of one, the number of the babies dying per a thousand birth was 106 in 1990 and improved 69 in 2012. Also for 2012, the average life expectancy for every new born child was 66, while one third of all children under the age of five in Pakistan were underweight 41.2% (73.8 million) of Pakistan 179.1 million population is 18 year old or younger. Using the most recent statistics available for study and defining the literacy as measured Pakistan total adult literacy rates were 79% for males and 61% for females. The number of literate adult women was 29%. The report also revealed that 7% of Pakistanis were married by the age of 15 and 24% by 18. This study relies on aggregate data and explores three major factors responsible for child health in Pakistan and across boundaries.

2. LITERATURE REVIEW:

A systematic analysis of Prof Robert E Black, MD^a, Prof Simon Cousens, MA^b, Hope L Johnson, PhD^a, Joy E Lawn, PhD^c, Prof Igor Rudan, MD^d, Diego G Bassani, PhD^e, Prof Prabhat Jha, MD^e, Prof Harry Campbell, MD^d, Christa Fischer Walker, PhD^a, Richard

Cibulskis, PhD^f, Thomas Eisele, MD^h, Li Liu, PhD^a, Colin Mathers, PhD^g; "Estimates of Global, regional, and national causes of child mortality in 2008:" for 2008 of the foremost causes of death in kids younger than five years. They used multicausal proportionate mortality models to estimate deaths in neonates aged 0–27 days and youngsters aged 1–59 months. They choose single-cause disease models and information has been collected from China and India with proportional reason for 193 countries. They calculable 8.795 million deaths in kids younger than five years worldwide in 2008, infectious diseases caused sixty eight (5.970 million), with the most important percentages as a result of respiratory disorder (18%, 1.575 million, uncertainty vary [UR] 1.046 million–1.874 million), diarrhea (15%, 1.336 million, 0.822 million–2.004 million), and protozoal infection (8%, 0.732 million, 0.601 million–0.851 million). forty first (3.575 million) of deaths occurred in neonates, and also the most vital single causes were preterm birth complications (12%, 1.033 million, urban center 0.717 million–1.216 million), birth physiological condition (9%, 0.814 million, 0.563 million–0.997 million), sepsis (6%, 0.521 million, 0.356 million–0.735 million), and respiratory disorder (4%, 0.386 million, 0.264 million–0.545 million). forty nine (4.294 million) of kid deaths occurred in 5 countries: India, Nigeria, Democratic Republic of the Congo, Pakistan, and China. Finally, they prompt that these country-specific estimates of the foremost causes of kid deaths ought to facilitate to focus national computer.

Case study of: Julie Hillock Rajaratnam, PhDa, Jake R Marcus, BAa, patriarch D Flaxman, PhDa, Haidong Wang, PhDa, Alison Levin-Rector, BSPHa, Laura Dwyer, BAa, Megan Costa, BAa, academic Alan D Lopez, PhDb, Prof Christopher JL Murray, MDa: ***“Neonatal, postneonatal, childhood, and under-5 mortality for 187 countries, 1970–2010: a scientific analysis of progress towards Millennium Development Goal 4”*** They compiled a info of 16 174 measurements of mortality in kids younger than five years for 187 countries from 1970 to 2009, they used very important registration systems, This was the primary study that used mathematician method regression to estimate kid mortality. Worldwide mortality in kids younger than five years has fallen from 11.9 million deaths in 1990 to 7.7 million deaths in 2010, consisting of 3.1 million babe deaths, 2.3 million postneonatal deaths, and 2.3 million childhood deaths (deaths in kids aged 1–4 years). 33.0% of deaths in kids younger than five years occur in south Asia and 49.6% occur in geographical area, with but a hundred and twenty fifth of deaths occurring in high-income countries. They calculable twenty one regions .The global decline from 1990 to 2010 is 2.1% per annum for mortality rate, 2.3% for postneonatal mortality, and 2.2% for childhood mortality. In thirteen regions of the planet, together with all regions in geographical area, there's proof of fast declines from 2000 to 2010 compared with 1990 to 2000. at intervals geographical area, rates of decline have magnified by quite a hundred and twenty fifth in Angola, Botswana,

Cameroon, Congo, Democratic Republic of the Congo, Kenya, Lesotho, Liberia, Rwanda, Senegal, African nation, Swaziland, and also the Gambia. They additionally followed strong mensuration of mortality in kids younger than five years shows that fast declines are occurring in many low-income countries. These positive developments merit attention and may would like increased policy attention and resources

Study of Linda G. Martin^{ab}, J. Trussell^c, Florentina Reyes Salvail^a & Nasra M. Shah^a (2011): ***“Co-variates of child mortality in the Philippines, Indonesia, and Pakistan: An analysis based on hazard models.”*** 2011. In this paper they used covariates of kid mortality within the Philippines, Indonesia, and Islamic Republic of Pakistan square measure compared victimization knowledge from the globe Fertility Survey. Hazard models square measure accustomed estimate the consequences of demographic and socio-economic variables on the chance of death in childhood. The importance of statistical method is verified by the finding that the impact of most factors on mortality is modified significantly once different influences square measure at the same time controlled.

A Comparative Analysis by J.N. Hobcraft^a, J.W. McDonald^b & S.O. Rutstein Published online: 04 Jun 2010. ***“Demographic Determinants of Infant and Early Child Mortality:”*** In this paper they examined the importance of a number of demographic determinants of infant and

early child mortality using information from 39 World Fertility Survey countries. They included sex of the child, age of the mother at the time of the birth, birth order, mother's educational level and a number of indicators of spacing of adjacent births among the correlates of chances of survival for children below the age of five years.. The findings are generally remarkably consistent in a wide range of countries and associated mortality conditions; although attention is drawn to a few interesting geographically clustered exceptions which deserve further investigation. The study leaves little room for doubt that poor child-spacing is clearly linked to decreased survival chances.

In the report study of Zeba A. Sathar: of Pakistan Institute of Development Economics, Islamabad suggested in her paper: *"Infant and child mortality in Pakistan—some trends and differentials."* Data from generative histories collected within the Population, Labour Force and Migration Survey of 1979 are accustomed analyze trends and differentials in infants and kid mortality in Asian country. Comparisons with the Asian country Fertility Survey findings also are given. Whereas levels take issue considerably across the 2 surveys, trends and differentials square measure usually similar. Infant-child mortality looks to own declined till the mid-1960s, stable for a few years and even upsightly within the latest amount of the 2 surveys.

A case study of S.M. Mostafa Kamal, Professor, Department of Mathematics, Islamic University, Bangladesh: *"Maternal Education as a Determinant of Neonatal Mortality in Bangladesh"*: investigated the effect of maternal education on neonatal mortality in Bangladesh using data from the nationally representative 2007 Bangladesh Demographic and Health Survey. Both bivariate and multivariate statistical analyses were used to assess the relationship between neonatal mortality and contextual factors focusing on maternal education. The prevalence of neonatal mortality was 37/1,000.

A worldwide study of 152 low-, middle-, and high-income countries of: Carl Otto Schell Department of Public Health Sciences, Division of International Health (IHCAR) Karolinska Institutet, Stockholm, Sweden; *"Socioeconomic determinants of infant mortality"*

They found that the Millennium Development Goals for health, potent international bodies advocated for a lot of resources to be directed to the health sector, particularly medical treatment. Yet, health has several determinants on the far side the health sector that are less evident than proximate predictors. They collected National-level information's from 152 countries supported World Development Indicators 2003 were used for variable rectilinear regression analyses of 5 socioeconomic predictors of IMR: public expenditure on health, GNI/capita, impoverishment rate, financial gain equality (Gini index), and

young feminine illiteracy rate. Analyses were performed on a world level and stratified for low-, middle-, and high-income countries. They complete that so as of importance, GNI/capita, youngfeminine illiteracy, and financial gain equality foreseen ninety two of the variation in national IMR whereas public disbursal on health and impoverishment rate were non-significant determinants onceadjusted for unsupportive. In low-income countries, feminine illiteracy was a lot of necessary than GNI/capita. Financial gain equality (Gini index) was associate freelance predictor of IMR in middle-income countries solely. Since the scale, per se, of public health disbursal doesn't severally predict health outcomes, functioning health systems square measure necessary to form health investmentseconomical. Potential health gains from improved feminine education and economic process ought to be thought-about in low- and middle-income countries.

3. DATA AND METHODOLOGY:

3.1 Sample Design and Data Description

The analysis is carried out using time series data of child mortality, birth rate, GDP Per Capita and Female literacy rate for the period of 34 years from 1980 to 2013. The data is secondary and collected from World Data Bank and Index mundi.

3.2 Model Specification

Multi Linear Regression Model (MLR) is used on time series data to estimate the

model and find out the relationship between dependent variable and independent variables. The dependent variable is child mortality rate of Pakistan and independent variables are birth rate, GDP Per Capita and Female literacy rate. A unit root test is used for stationarity of the data and Co-integration test for long-run association.

The general equation of the model is

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

Y = child mortality rate

X₁ = birth rate

X₂ = GDP Per Capita

X₃ = Female literacy rate

4. DATA ANALYSIS AND RESULT INTERPRETATION;

4.1 Dicky Fuller Unit Root Test for Data Stationarity

4.1.1 Child Mortality Rate

Dickey-Fuller test for unit root Number of obs = 33

Test Statistic	Interpolated Dickey-Fuller			
	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-3.427	-3.696	-2.978	-2.620

MacKinnon approximate p-value for Z(t) = 0.0101

The series of child mortality rate is not stationary at the level, that's why we take the first difference of the series and tested it again using Dickey-Fuller test for unit root.

The test statistic of (-3.427) of the test in absolute sense is greater than the critical values -2.978 and -2.620 at 5% and 10% confidence levels respectively, and the p-value is less than 0.05, which conclude that there is no unit root or the data is stationary at 1st difference.

4.1.2 Birth Rate

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. dfuller brD1

Dickey-Fuller test for unit root

              _____ Interpolated Dickey-Fuller _____
              Test      1% Critical   5% Critical   10% Criti
              Statistic  Value         Value         Value
-----
Z(t)          -5.326         -3.702
-----
MacKinnon approximate p-value for Z(t) = 0.0000
```

The test statistic value of -5.326 is greater than the critical values at 1%, 5% and 10% with p-value of 0.0000, which concluded that the series of birth rate is stationary at all significance level.

4.1.3 GDP Per Capita

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. dfuller gdpccD1

Dickey-Fuller test for unit root              Number of obs   =

              _____ Interpolated Dickey-Fuller _____
              Test      1% Critical   5% Critical   10% Criti
              Statistic  Value         Value         Value
-----
Z(t)          -4.168         -3.702         -2.980         -2.
-----
MacKinnon approximate p-value for Z(t) = 0.0007
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The series of GDP Per Capita is stationary at first difference as the test statistic value of -4.168 is greater than all the critical values at 1%, 5% and 10% significance level with p-value is less than .01 significance level.

4.1.4 Female Literacy Rate:

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. dfuller flrD1

Dickey-Fuller test for unit root              Number of obs   =   32

              _____ Interpolated Dickey-Fuller _____
              Test      1% Critical   5% Critical   10% Critical
              Statistic  Value         Value         Value
-----
Z(t)          -7.104         -3.702         -2.980         -2.622
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MacKinnon approximate p-value for Z(t) = 0.0000
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The series of female literacy rate is also stationary at first difference as the test statistic value of -7.104 in absolute term is greater than all the critical values at 1%, 5% and 10% significance level with p-value is less than .01 significance level.

4.2 Regression Analysis:

Source	SS	df	MS	Number of obs
Model	12758.6737	3	4252.89123	F(3, 30)
Residual	298.885128	30	9.96283759	Prob > F = 0.0000
Total	13057.5588	33	395.683601	R-squared = 0.9923
				Adj R-squared = 0.9897
				Root MSE = 3.1564

cmrpk	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
br	1.712518	.2893271	5.92	0.000	1.1210 2.3040
gdppc	.0292951	.0052038	5.63	0.000	.01868 0.04000
flr	-1.787024	.2983339	-5.99	0.000	-2.3960 -1.1780
_cons	86.39777	16.679	5.18	0.000	52.980 120.81

The regression analysis test shows the empirical relationship of the independent variables with the dependent variable. All the coefficients are highly significant as p-values are less than .01 level of significance and t-statistic values are greater than 2. The birth rate and GDP Per Capita have highly significant positive impact on child mortality. A one unit increase in birth rate will increase the rate of child mortality by equal rate of 1.712518. The GDP Per Capita has significant positive relationship but with a very little coefficient of .0292951 which shows a very little effect on child mortality. The relationship of female literacy rate with child mortality is negative with -1.787924 coefficient. The increase in female literacy rate decreases the child mortality. The intercept coefficient is also significant. F-statistic shows that the model is overall significant with high F value and p-value less than significance level. R2 value shows that 97.7% variation in child mortality rate has been explained by the variations in independent variables included in the model. The high R2 value will be tested for possible Multicollinearity in the model through auxiliary regression analysis.

4.3 Spearman Correlation Test

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. spearman cmrpk br gdppc flr, stats(rho)
(obs=34)
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	cmrpk	br	gdppc	flr
cmrpk	1.0000			
br	0.9923	1.0000		
gdppc	-0.9773	-0.9766	1.0000	
flr	-0.9986	-0.9908	0.9761	1.0000

The Spearman test shows the bivariate correlation between every two random variables. The coefficient of correlation between child mortality rate birth rate is positive with .9923 value but has negative coefficients with GDP Per Capita and female literacy rate. The negative coefficient of female literacy rate is plausible but of the GDP Per Capita negative coefficient shows that number of other factors might have a role to play in developing countries like Pakistan. The correlation between birth rate and GDP Per Capita and between female literacy rate is negative, which shows that if one variable increases, the other variable decreases. The correlation between GDP Per Capita and female literacy rate is positive, which shows that increase in female literacy rate increases the per capita income.

4.4 Auxiliary Regression Analysis:

significantly. Results shows that a one unit increase in female literacy rate decrease the child mortality rate by more than one unit. The female education and child mortality relationship is significant with one year increase in mother's education decreases the child mortality by 7-7% (Jhon G. Cleland, Jerome K. vann Ginneken 1988)

The GDP Per Capita marginally increases the child mortality with increase in income in Pakistan. Such results may be accompanied by other various factors such as higher population growth, lack of access to proper healthcare, poverty, social and cultural dogmas and so on, which reduces the influence of increase in income on reducing child mortality in Pakistan.

RECOMMENDATION:

The child mortality is among the most debatable and serious issues confronting the world especially in low-income countries with higher rate. The goal of MDGs is to reduce child mortality by two-third by 2015 put emphasis on this issue which results in fall of child mortality from 8.7% to 5.1% over the past 2 decades (UNICEF 2012). But despite this, about 80% of children deaths occurs in Sub-Saharan countries and South Asia and half of which in Pakistan, India, China, Congo and Nigeria (Black et al. 2010)

Pakistan need to revive its policies to focus on preventable measures such as vaccination, removing health barriers to accessing the proper health care at low cost by increasing health expenditures and increase the supply of better sanitation, health care improvements, clean water

supply treated with antimicrobials, provision of hygiene education etc which can reduce the incidence of Pneumonia and diarrheal diseases which alone causes 2.9 million young children deaths per year (WHO 2003) March

More specialization in female and neonatal health care should be done to improve neonatal health and healthy child birth. The higher birth rate should be addressed to increase awareness about the consequences of the problem and to change the cultural and social ideologies of the people which can results in reducing child mortality. Gender discrimination in healthcare and education is another prevailing issue in Pakistan which should be eradicate by providing equal opportunities which can greatly improve women health, education level and empowerment and may consequently results in lower and healthy child birth.

Pakistan has a dualistic economy which results in income and resource distributional inequalities. Government need to revise policies decrease sectorial differences which can lead to reduction in poverty and enable masses in acquiring better health facilities, improve living standards with ultimate positive effect on reducing child mortality.

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