# Investments in Health and Education Help Save Lives

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# Investments in Health and Education Help Save Lives

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**K E Y W O R D S**

Child Health, Remittances, Lady Health Workers, GMM model

**A B S T R A C T**

Economies with large labor population and labor oriented production face problems of quality of labor provided. This quality can be divided into two components; one the skill component and other the health component. The purpose of the paper is to identify the root causes of low health standards in the working population. The district wise data of Punjab (Pakistan), revealed that fertility rate, number of hospitals, literacy rate, and proxy income are the major determinants that can reduce Infant Mortality Rate, and the time as dummy varaible in GMM model indicated the health standard to be depreciated in 2011 as compared to 2004

## Introduction

Among all the developing countries, Pakistan has a large population contributing to the total output of the country. With a high population engaged in goods and services production, the health of the workers is important matter for better and consistently growing production. On one hand, it is essential to have a healthy labor class for the aforementioned reason; on the other, it is equally important, if not more so, to have a healthy dependent population because it becomes difficult for people to go to work if their dependents are unwell.

Out of all health related indicators Infant Mortality Rate is considered to be the most precise and quantifiable indicator of family health (Reidpath & Allotey, 2003). It shows how income, education and other factors can influence the health of a population and become principal focus of the health policies in a country (Reidpath & Allotey, 2003). According to the world's Infant Mortality Rate ranking, Pakistan was ranked 25th. Infant Mortality does not only indicate that the number of children that die in first year of their birth, it also indicates the number of females that have insufficient level of nutrition or health status. It means that a family with a still born child or the death of an infant might have sub sufficient income, education or resources to properly manage the birth of the child.

Health of the labor is very important for the country with labor oriented goods and service production; the weight of ill population is borne by the healthy population. With per capita real annual income of $628 in 2009, managing an ill worker becomes very hard for the family. According to the WDI the annual per capita health expenditures were $29 for the year 2011, with expenditures that low, it is very crucial that they are spent properly providing the right services at the right time. From the chart (figure 2) it can be seen that the infant mortality rate is very different from the average in last decade of Pakistan in several districts like Bahawalpur, Rajanpur, Lodhran and Pakpatan where first of all it is considerably higher and secondly shows an increase in year 2007-08 as compared to 2003-04 whereas the other districts shows improvement as the health expenditures per capita rose in history of Pakistan Figure 1.

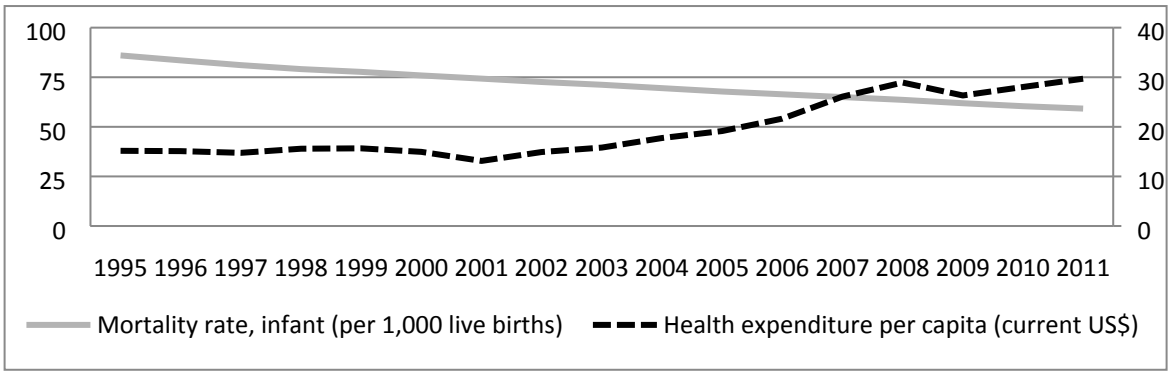


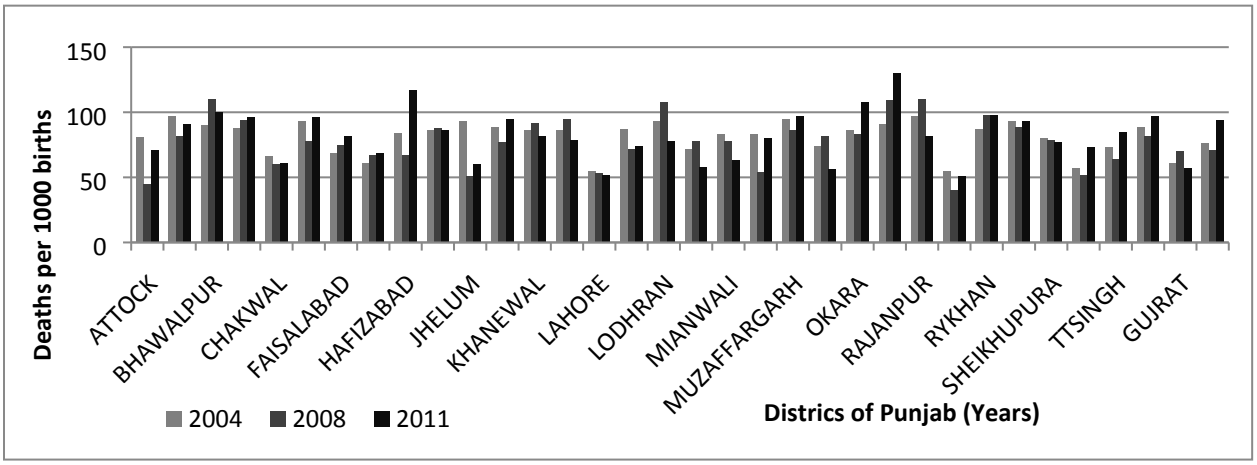

**FIGURE. 1** Health Expenditures and Infant Mortality Rate – Pakistan

For every government the efficient use of the resources is important to stabilize the economy, where expenditures like health and education do not seem to provide instant results but their effectiveness is visible in other ventures, looking at the trend of mortality rate district wise, it can be seen that the health funds are not sufficiently distributed to gain maximum per capita returns with lowest dispersion possible.

Hence the purpose of this paper is to evaluate the role of health and education sector in the Infant Mortality Rate in a three time period data work frame with the districts of Pakistan as the entities Figure

2. It highlights how government policies are working in each district and addresses the cause of a very high mortality rate. In the following chapter the overview of previous studies is presented while analyzing how infant mortality can be minimized.

**FIGURE. 2** District-Wise Profile of Infant Mortality Rate In Punjab (Source: MICS)




This paper explored the determinants of Infant Mortality Rate at a deeper level in the districts of Punjab. Empirically there are very few studies that try to explore the regional health scenario. This paper is unique in the context that it focuses on how government allocation of resources to health and education sector can affect the health of individuals.

With Infant Mortality Rate being discussed as an important indicator for health, this paper is designed to fulfill following objectives:

- Testing social indicators which are responsible in controlling the Infant Mortality Rate.
- Analyzing government policy options and their marginal impact on Infant Mortality Rate
- Evaluating the district specific and time specific effects of policies.

This study is organized in the following manner. Section II has, a review of Literature on empirical determinants of Infant Mortality Rate, Section III presents the statistical model for estimation, Section IV conducts a thorough analysis of inter district deviations of all the variables done to find statistical linkages with Infant Mortality Rate, Section V entails the results and interpretations of the estimated model and Section VI concludes the discussion and makes recommendations.

**Government Expenditure Allocation**

For Pakistan current MDG target for Infant Mortality Rate is 40 deaths per 1000 births by 2015. Till 2013, Infant Mortality Rate is 59 deaths per 1000 births; in order ensure this number keeps decreasing the government has to spend accordingly. The major chunk of the expenditures are taken away by the current / non developmental expenditures such as Defense Expenditure and Debt Repayments. Thus, Government of Pakistan is only left with a small part of its expenditures (22.6% in 2004-05, 19.2% in 2008-09 and 18.9% in 2011-12) which can be used in achieving the MDG target. Therefore, how and where it is spent is crucial for achieving the target. While analyzing the developmental expenditures Pakistan only spends 0.04% of it on health expenditures (Economic Survey of Pakistan, 2012-2013).

Hence these resource allocation shows the financial limitations which Government of Pakistan is facing in improving the health of labor and general population. This paper will analyze the components of health expenditures of the Government of Punjab and determine which of these components are more beneficial to provide guidance in efficiently allocating funds to reduce Infant Mortality Rate.

As it can be said that targets of social sectors in the economy are not substitutable, hence improvisation in health by reallocating funds from other sectors might not be a suitable solution. Hence this paper has evaluated the marginal impacts of expenditures which improve Infant Mortality Rate in order to rank them on the basis of their effectiveness. So out of all 18.9% (of GDP) development expenditures, only 0.9% (of development expenditures) Education and 0.04% (of development expenditures) Health are considered as Government policy spending in order to improve health conditions. These figures are lot more promising in the case of Punjab province where 2011-12 education expenditures were 13% and Health expenditures were 9% of total developmental expenditures. It is confirmed that Government has to face tradeoffs in social welfare spending [1]. This paper will be analyzing the marginal benefits of few of the development expenditure options in order to see which one should be prioritized.

[1] Economic Survey of Pakistan 2012-13

## Literature Review

There are several studies which were based on the pattern of Infant Mortality Rate. This paper discusses major studies and helps create basic foundation of empirical knowledge regarding Infant Mortality Rate.

Zakir & Wunnuva, (2010) highlighted the two way relationship between the infant mortality and the fertility rate. The countries with high population growth rates and where a single mother goes through multiple child births has poor health which increases chances of infant mortality. Agha (2000) used primary data for Pakistan from PIHS and concluded that social indicators like family poverty, parents education and sanitation facilities were significant in explaining the odds of infant mortality in Pakistan. Bhalotra (2007) used data from National Family Health Survey of India with data split into rural and urban areas. The results showed that income is a major determinant in reducing the mortality rate for both regions but the health expenditures were not significant, Bhalotra, (2007) confirming Shandra, Nobles, London & Williamson, (2004) reasoned that these expenditures are politically prioritized. Income was a significant factor because people having higher income were generally able to access or avail better health services causing lower infant mortality. Bokhari, Gai, & Gottret, (2007) discussed how government can reduce the under-five mortality rate by targeting the causal diseases in order to make the government expenditures effective. Bokhari, Gai, & Gottret, (2007) also highlighted that access to the health facilities also plays a role in better health, using roads as significant indicator of access to facilities. Bokhari, Gai, & Gottret, (2007) proved that higher income and health expenditures are beneficial in controlling infant mortality rate.

Juhee (2001) mentioned infant mortality has reached a low stable rate in developed countries while it is still high and on a slow decline in developing countries. There are many factors that contribute to low infant mortality such as health programs by public health personnels and improvement in socio-economic status by social scientists. Data on infant mortality obtained by the 1991 Demographic Health Survey of Nepal is analyzed in this logistic regression study. Presenting the reasons for high Infant Mortality Rate, this study stated that place of residence (sanitation), immunization, and ethnicity influence infant mortality the most.

Luis Rosero-Bixby (2013) conducted a research on Costa Rica showing a dramatic reduction in its infant mortality rate from 68 per 1,000 live births in 1970 to 20 per 1,000 in 1980. In the present study, changes during this century, mortality differentials, and causes of death are analyzed, and multiple regression techniques are used to identify the determinants of the decline in Costa Rica's 79 cantons. Although socioeconomic development and greatly reduced fertility contributed to the infant mortality decline, as

much as three-fourths of the decline is attributable to public health programs implemented during the 1970s. The extension of primary health-care, especially rural and community programs seems to be responsible for 40 percent of the reduction. In addition, health services produced a notable decrease in the socioeconomic differentials related to children's risk of death. The unique achievements of this developing country offer a new strategy for public health.

Bhargava (2003) explored the impact of family planning, health care and gender differences on infant mortality rate of Uttar Pradesh for the time period 1982- 1992. The study concluded that family planning and better health care reduce the infant mortality rate.

Cundiff (2012) compared the infant mortality rate of US with OECD countries on the basis of several social and economic indicators and concluded that the US has fewer medical facilities than other OECD countries and ranks fifth in infant mortality rate.

Millard (1994) highlighted the fact that people have different perception about distribution of child mortality. In developing countries child mortality has been accredited to neglect, cultural traditions of child care, population pressure, low maternal educational levels, lack of medical care, and insufficient basic resources. Research projected three factors; biomedical conditions, interactions of malnutrition and infection leading to high rate of child mortality. Research using child mortality, maternal education, and primary health care, concluded that child neglect and economic scarcity are main reasons of child mortality.

Hassan and Jokhio (2011) examined occurrence of specific intra partum practices in Sindh province to find out the measures of safe delivery practices. For this purpose they collected data from 225 participants and 82 health workers by using questionnaires. Researchers applied cross–sectional technique on the study and concluded that safe delivery practices and care for new borns need improvement especially in the rural areas, by providing training to health workers and TBAs (Traditional Birth Attendants).

An article is written by Stoeckel (1970) analyzed the infant mortality trends in a rural area of East Pakistan, Comilla- Kotwali Thana, utilizing the Bogue pregnancy history technique and indicated that infant mortality has declined by slightly over 20 percent between 1958 and 1967. The major contribution to this decline occurred in the women of ages 15-19 years and 35 years and older. This decline may have resulted from the development programs carried on in the area between 1961 and 1967, specifically the Women's Education and Home Development and Family Planning programs. A convergence in infant mortality rates to mothers in the age range 15-39 years was found in the final year under analysis. One possible explanation for the convergence is that the development programs are reaching women within

this age range more equally than in the past. An alternative explanation relating to the problems of recall of mortality events was discussed.

Holian John (1989) used 1976-77 Mexican Fertility survey to find out that infant health care and proximity to medical personnels and facilities to enhance infant's ability to survive his early years. He considered health utilization and access to medical facilities for the determination of infant mortality, where both were highly correlated with lowering mortality rate.

Using 1964-65 cross sectional data of USA Grothmaker (1979) estimated the effects of poverty on Infant Mortality Rate. Grothmaker (1979) divided the mortality rate into neo-natal mortality (death within 28 days of birth) and post neo-natal mortality (death after 28 days of birth), the results showed that being poor increases the mortality rate by about 20% percent (neonatal 20% and post neonatal 19%), this is because poverty imposes several constraints on the family to improve the health of their offspring.

Pena, Wall, & Persson (2000) attributed fast decline in the mortality rate of Nicaragua to the availability of health care, education and focus on the most poor segment to the society. According to this study the areas where there are lowest level of unsatisfied basic needs and high level of education, are mostly recognized as lowest incidence of Infant Mortality Rate.

Jain (1985) presented that social resources lead to betterment of household environment which allows the members to have better infant health care and minimizing the infant mortality. According to Jain (1985) the social resources include access to education and medical facilities for chances of reducing infant mortality. Here the role of birth attendants and vaccinations play a vital role in reducing the neo-natal and post neo-natal infant mortality which are being incorporated using the services of lady health workers.

Adams & Page (2005), Javid, Arif & Qayyum (2008) and Viet (2008) analyzed the effects of international remittances on income and poverty and show significant evidence of poverty alleviation. Adams & Sherraden (1996) highlighted the positive impact of increasing household assets in reducing poverty.

Most of the empirical studies have used the time series data for the Infant Mortality Rate, but district wise data of Punjab is analyzed there are many outliers, districts where there is a high Infant Mortality Rate than the average, hence mixing cross section with the time series can bring better results. Literature has also discussed the role of health expenditures, which are just the means of the better health but for the case of developing countries, most of the funds just evaporate, hence instead of using funds allocated this study has used the outcome relevant for better health. This also shows how realized policy affects the

health outcomes. Similarly poverty and income indicator is incorporated using percentage of households that receive remittances and own their house.

## Data and Methodology

### A. Indicators

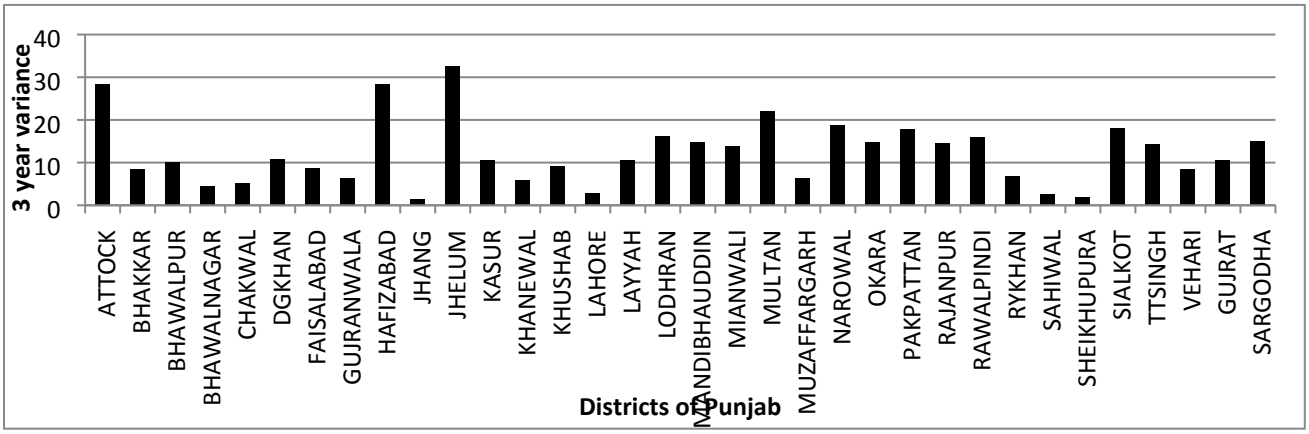
To estimate the determinants of primary health for districts in Punjab, following are the indicators that are collected from Punjab Development Statistics and Multi Income Cluster Survey Punjab for the year 2004, 2008 and 2011.

| | |
|---|---|
| Infant Mortality rate | Roads in District |
| Fertility Rate | Households owning a house |
| Government Hospitals | Foreign Remittances |
| Lady Health Workers | Dummies (Time) |
| Literacy Rate | |

### B. Infant Mortality Rate

Infant Mortality Rate is defined as the number of children that die before the age of 1year per 1000 births. Soon after the birth newborn is faced with malnutrition, diseases, and lack of hygienic environments, hence this indicator can be used as an indicator for the basic health level of the household. This data is comprised of 36 districts of Punjab for the years 2004, 2008 and 2011. In the following graphs the bars show the coefficient of variance Infant Mortality Rate for districts of Punjab. This shows that the district like Attock (81, 45 & 71), Hafizabad (84, 67 & 117) and Jhelum (93, 51 & 60) had high variability in the health levels (figure 3) and did not show any decrease for 2004, 2008 and 2011 respectively.

**FIGURE 3** VARIABILITY OF INFANT MORTALITY RATE WITHIN SAMPLE TIME PERIOD



C. **Fertility rate**

Health of a woman in the family is easily considered as the root of health of the family, number of children born to a woman is inversely proportional to the infant's health. Hence while estimating the primary health level of the individuals, the fertility rate can be recognized as an important indicator. Fertility Rate is described as number of children that would be born to a woman in her childbearing years (15-49) conforming to age specific fertility rate for that year. The three time period district wise comparison (figure 4) shows that fertility rate did not change considerably from year 2004, 2008 and 2011.

**D. Government Hospitals**

Number of hospitals in a district can improve the health level of its residents as proximity to hospitals increases the number of lives saved for every life threatening situation. As per the Punjab Development Statistics, hospital is an institution having ten or more than ten beds. This definition will however, not be applicable where an institution has specifically been named by the Government e.g. Rural Health Centre, Mustafabad, Tehsil and District Kasur having eighteen (18) beds. None of the districts showed decrease in the hospitals for the utilized time frame.

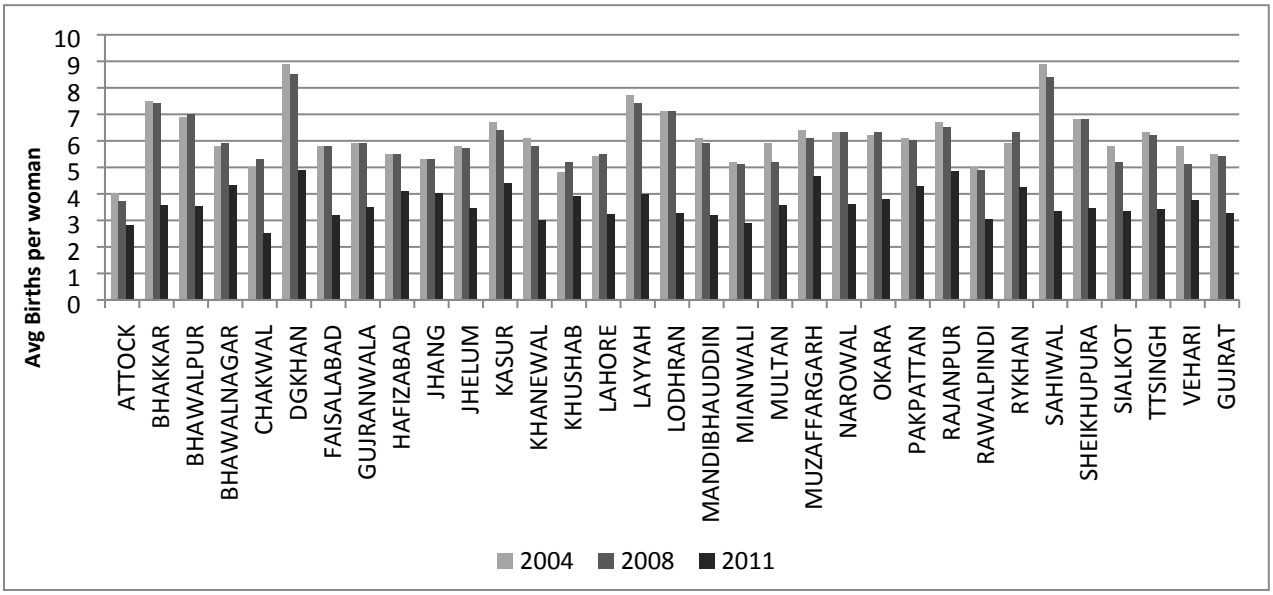



**FIGURE. 4** DISTRICT WISE TOTAL FERTILITY RATE

### E. Lady Health Workers

Lady health worker is based on a concept of providing mobile basic health services and education. In Pakistan with majority of rural population, every town is built with a structure that it should have a hospital hence services provided by lady health worker can be an important indicator for basic health level of individuals. This indicator is defined as the ratio between number of women of age 15-49 years who were visited by the lady health worker within a month to number of women of ages 15-49 years surveyed. This health facility showed a rise in most of the districts, the rise is lower in major cities as they have greater access to hospitals etc.

### F. Literacy Rate

Ability to read can help individuals understand health hazards and follow the precautionary measures, hence it can be used as an indicator for better health, this asserting the role of education in higher health standards. Literacy rate is defined as the ratio of number of household members age 10 years or older who are able to read and write with understanding in any language (excluding Quranic reading, if this was the only response) to total household members age 10 years or older surveyed. The district of Mianwali and Okara had shown major improvements in literacy rate.

### G. Roads in District

More interconnected roads ease the people access to hospitals and better food and facilities. Hence districts that have longer lengths of roads are expected to have lower infant mortality rate. According to the Punjab Development Reports districts with major cities have better road coverage.

### H. Households owning a house

As there is not any sort of data for the economic wellbeing of the residents of the districts, this study will use percentage of households who own the house as a proxy. For the big cities there are lower ratios of people who own a house as they are expensive to own. Hence families who own their house are more expected to provide better facilities to their children.

### I. Foreign Remittances

To incorporate the income level of each district, percentage of households who receive foreign remittances are used as a proxy. Industrial cities like Sialkot and Gujrat have shown significantly higher rates of foreign remittances received. The households that receive remittances are expected to have access to better facilities and hence lower infant mortality rate.

## J. Reverse Causality and Variable Constancy

This study has tested the direction of causal relationship between Infant Mortality Rate and Fertility Rate using Granger causality test, where it can be said that in the case of Punjab District there is no hint of reverse causality of infant mortality rate effecting fertility rate causing inconsistency of estimators.

Out of all the indicators in Table 3 in appendix, Fertility Rate and lady health workers show significant difference between three time periods, whereas indicators like mortality rate, government hospitals and also fertility rate show prominent difference across the districts. This significant difference highlights the fact that these cross sections or time periods should not be merged in Pooled OLS.

**Model**

This paper will use the following model to estimate the determinants of district wise Infant Mortality Rate for Punjab in year 2004, 2008 and 2011 separately. There will be 33 districts included in the sample.

$$IMR_{it} = \beta_1 + \beta_2 FER_{it} + \beta_3 GH_{it} + \beta_4 LHW_{it} + \beta_5 LITERACY_{it} + \beta_6 ROADS_{it} + \beta_7 OWNHOUSE_{it} + \beta_8 REMITANCE_{it} + \beta_9 DUMY08_{it} + \beta 10 DUMY11_{it} + \mu_{it} \quad \text{------ (1)}$$

Where IMR (Infant Mortality Rate), FER (Fertility Rate), GH (Government Hospitals), LHW (Care provided by Lady Health Worker), LITERACY (Literacy Rate), ROAD (Roads in district proxy for access to hospital), OWNHOUSE (Percentage of households who own a house), REMITTANCE (Percentage households who receive foreign remittances), DUMY08 (Dummy for year 2008) and DUMY11 (Dummy for year 2011). This paper has used Stata to estimate the above models, the definitions and linkages between the variables are discussed in next chapter.

**Econometric Model:**

This paper will be using Panel GMM model to determine determinants of the Infant Mortality Rate because of its following merit. (Wooldridge, 2002 ; Baum et al., 2003) provided evidence that GMM estimates are more consistent as compared to Pooled OLS model and they will be efficient too if there is not hetroscedasticity in the model. Secondly this model can solve the problem of reverse causality by using instruments if it is present in the results. Hence in the tables below the GMM model will show the results (table 2) same as the LSDV model allowing for fixed effects only difference is that the standard errors are smaller.

**Results and Interpretations**

This chapter begins with the econometric analysis of the equation number (1) using the information which will be generated from this analysis, policy route map will be devised to control Infant Mortality Rate for the case of Districts of Punjab.

The results of pooled model (table 1) show that irrespective of effect of time or cross section, literacy rate, number of government hospitals and percentage of households that own a house are arranged in decreasing order of their significant negative impact on Infant Mortality Rate. This model does not have any kind of hetroscedasticity, specification, multicollinearity and normality issues. The joint test on government policy related variables shows that government can help the mortality rate to decrease. However the information from the time and cross section constancy test reveals that OLS might not be efficient enough, also very high intercept shows that there is some information missing which should be included in the model. Following are some model specification tests to identify which model should be applied.

**TABLE 1.** INFANT MORTALITY RATE ESTIMATES

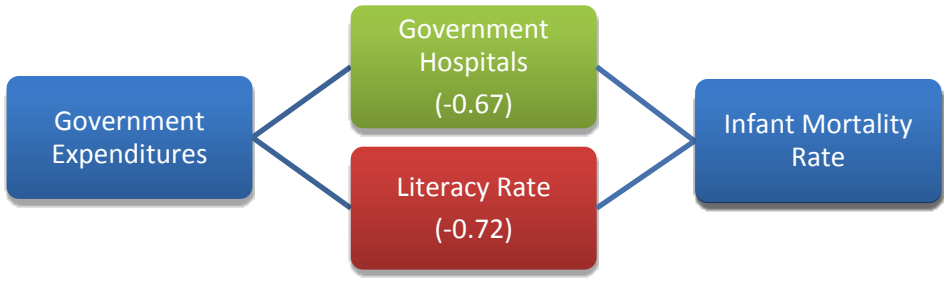
| **INFANT MORTALITY RATE ESTIMATES** | | | |
|---|---|---|---|
| | **POOLED OLS** | **LSDV** | **GMM** |
| **SAMPLE = 36 DISTRICTS** | COEFFICIENT (PROB.) | COEFFICIENT (PROB.) | COEFFICIENT (PROB.) |
| **INTERCEPT** | 183.21 (0.00) | 147.50 (0.00) | 147.50 (0.00) |
| **FERTILITY RATE** | -1.43 (0.15) | 3.12 (0.06) | 3.12 (0.05) |
| **GOVERNMENT HOSPITALS** | -0.59 (0.01) | -0.67 (0.00) | -0.67 (0.00) |
| **LADY HEALTH WORKERS** | -0.02 (0.69) | 0.01 (0.90) | 0.01 (0.90) |
| **LITERACY RATE** | -0.88 (0.00) | -0.72 (0.00) | -0.72 (0.00) |
| **LOG (ROAD)** | 0.40 (0.91) | 1.36 (0.69) | 1.36 (0.68) |
| **OWN HOUSE** | -0.51 (0.04) | -0.62 (0.01) | -0.62 (0.00) |
| **REMIT** | -0.35 (0.22) | -0.33 (0.22) | -0.33 (0.19) |
| **Y2008 DUMMY** | - | -0.89 (0.79) | -0.89 (0.78) |
| **Y2011 DUMMY** | - | 14.78 (0.00) | 14.78 (0.00) |
| **POST REGRESSION DIAGNOSTICS** | | | |
| **R-SQUARED** | 0.52 | 0.57 | 0.57 |
| **RMSE** | 12.14 | 11.56 | 10.99 |
| **B-P HETROSKEDASTICITY TEST (PROB.)** | $CHI^2 = 0.28$ (0.59) | $CHI^2 = 0.04$ (0.84) | $CHI^2 = 9.54$ (0.39) |
| **RAMSEY RESET TEST (PROB.)** | F-STATISTIC = 1.90 (0.13) | F-STATISTIC = 1.66 (0.18) | $CHI^2 = 0.07$ (0.78) |
| **CAMERON & TRIVEDI SKEWNESS TEST (PROB.)** | $CHI^2 = 7.03$ (0.43) | $CHI^2 = 9.32$ (0.41) | - |
| **CAMERON & TRIVEDI KURTOSIS TEST (PROB.)** | $CHI^2 = 2.08$ (0.15) | $CHI^2 = 1.91$ (0.17) | - |
| **POLICY IMPACT** | | | |
| **NULL HYPOTHESIS: B (GOVT HOSPITALS) = B (LADY HEALTH WORKERS) = B (LITERACY RATE) = 0** | | | |
| **WALD TEST (PROB.)** | F STATISTIC = 18.36 (0.00) | F STATISTIC = 14.85 (0.00) | F STATISTIC = 49.41 (0.00) |
| ***SIGNIFICANT AT 5%** | | | |
| **DATA TAKEN FROM PUNJAB DEVELOPMENT STATISTICS AND MICS PUNJAB** | | | |

**TABLE 2. PANEL MODEL SELECTION**

| | |
|---|---|
| **TEST FOR CROSS SECTION FIXED PANELS** | |
| **F TEST = 1.442** | PROB. = 0.109 |
| **TEST FOR TIME FIXED PANELS** | |
| **F TEST = 5.803** | PROB. = 0.004* |
| **BREUSCH PAGAN LANGRANGIAN MULTIPLIER TEST FOR RANDOM EFFECTS** | |
| **CHI-BAR[2] = 0.08** | PROB. = 0.390 |
| ***SIGNIFICANT AT 5%** | |

In table 2, first two tests are for using fixed effect model with cross section fixed effects and time fixed effects respectively, from which only time fixed came out to be appropriate model. This shows that the Infant Mortality Rate is not an area specific issue, it is not only the responsibility of specific district institutes to control it, and it is actually national issue. And as the districts are same in terms of Infant Mortality Rate, hence the random effects model also came out to be inappropriate.

**FIGURE 5** GOVERNMENT EXPENDITURE CHANNELS




[2] Joint Wald test on all the cross sectional dummies

[3] Joint Wald test on all the time dummies

Constructing the time fixed effect model Table 1, has improved the results. According to these results fertility rate, literacy rate, government hospitals and percent of households with their own house arranged in decreasing order of their magnitude has significant effect on Infant Mortality Rate. In this model, fertility rate and the dummy of year 2001 has shown significant positive impact on the Infant Mortality rate, which implies that the health levels estimated from mortality rates are declining with time too. Here impact of policy has also became significant hinting that government can control the Infant Mortality Rate if policy indicators are utilized properly. Here the post regression diagnostics specifies that there are no issues with the regression result which can be misleading.

GMM (table 2) is more efficient version to OLS fixed effect; it can be seen by comparing the standard errors, which are lower for the case of GMM, while coefficients are same. With no hetroskedasticity found in GMM, it implies that GMM is more consistent and efficient as compared to OLS. Hence GMM estimated are considered as most appropriate to determine the district level infant mortality rate. The coefficient results of this model is same as the time fixed effect, it has only reduced the standard errors to make it more efficient.

Graphical illustration in Figure 5 showed that there are two approaches which can be taken to achieve lower Infant Mortality Rate, since variables used are in logarithmic form, the coefficients are now representing as elasticities, so they are comparable with each other. These results show the marginal impact on spending on government hospitals and literacy rate are pretty close, still literacy rate supersede government hospitals by 0.05% for 1% increase in Government expenditure.

**Conclusions and Recommendations**

Infant Mortality Rate is defined as the number of newborns dying under a certain age; this indicator tells the health prosperity of the individuals especially workers in the economy. Better health outcome shows that the income or resources that individuals are receiving are converted into the right type of utility that is required by them, whenever they need a medicine they can buy one, whenever they need to get a medical check-up they can afford it etc.

If the Infant Mortality Rate is high in any country this means that the infant population is dying due to factors that could have been controlled. The leading causes of death among children under five are pneumonia and diarrhea followed by birth trauma, measles, malaria, hemolytic diseases, maternal infections and malnutrition. All of these diseases can be prevented through proper medical care, vaccinations, hygiene, nutrition and medical care. The low health conditions are also magnified because

of poverty. Poor families have minimal level of savings which they can utilize to sustain better health and living standards.

In this analysis, six main social determinants of infant mortality were used. These were average fertility rate of a woman, number of hospital, care provided by lady health workers, the average literacy rate, roads, percentage of households that own a house and percentage of households that receive foreign remittances for each district. It is shown that literacy of the family, good health facilities through hospitals and households that own a house are inversely related to the Infant Mortality Rate. The social indicator of percentage of families that own a house show that these families are expected to have enough income to facilitate healthy development of infants.

This is in line with the analysis, since it proves the point that literacy is important for the parents, for the better health outcomes of their children. Well-educated parent will take better care of their child, will also know the benefits of vaccinations, and keep an eye on health depreciating symptoms hence lowering the chances of infant mortality; whereas increasing number of hospitals are beneficial for post illness recovery. So Government of Pakistan especially Punjab Province should prioritize education expenditure over health expenditure while distributing surplus funds after allocating minimum required expenditures.

Hence it can be seen that if these factors are taken into account while making policies for Punjab province of Pakistan, there will be lower infant mortality. Consequently the work force will increase by a substantial amount which can lead to better national income.

For future policies, the following recommendations should be kept into account:

- The health expenditure should be maintained, in terms of hospitals in each district. Main focus should be the districts which already have high Infant Mortality Rate.
- Steps should be taken to improve literacy in rural areas, for both men and women, by increasing the intake of students in universities who belong from the rural areas of the country.
- Household income, using house ownership proxy showed significant effect on reducing Infant Mortality Rate; hence government should focus on increasing income of households or subsidize cost of living of the poor households to allow them to maintain better health standard

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## Appendix

**TABLE 3.** TEST FOR CONSTANCY IN TIME AND WITHIN CROSS-SECTION

| Indicator | Test [4,5] | Statistic | Prob. |
|---|---|---|---|
| **Infant Mortality rate** | Welch F Test for Homogeneity in time | 0.543 | 0.584 |
| | Bartlett Test for Homogeneity in cross section | 6.389 | 0.041* |
| **Fertility Rate** | Welch F Test for Homogeneity in time | 114.254 | 0.000* |
| | Bartlett Test for Homogeneity in cross section | 11.281 | 0.004* |
| **Government Hospitals** | Welch F Test for Homogeneity in time | 1.853 | 0.165 |
| | Bartlett Test for Homogeneity in cross section | 5.983 | 0.050* |
| **Lady Health Workers** | Welch F Test for Homogeneity in time | 9.208 | 0.000* |
| | Bartlett Test for Homogeneity in cross section | 0.293 | 0.864 |
| **Literacy Rate** | Welch F Test for Homogeneity in time | 1.793 | 0.174 |
| | Bartlett Test for Homogeneity in cross section | 0.846 | 0.655 |
| **Roads in District** | Welch F Test for Homogeneity in time | 1.022 | 0.365 |
| | Bartlett Test for Homogeneity in cross section | 0.956 | 0.620 |
| **Households own a house** | Welch F Test for Homogeneity in time | 2.148 | 0.125 |
| | Bartlett Test for Homogeneity in cross section | 1.328 | 0.515 |
| **Foreign Remittances** | Welch F Test for Homogeneity in time | 0.150 | 0.861 |

[4] Welch test is F test generated from Anova Table which allows the unequal variances. It checks the equality of mean for all the time periods utilized.

[5] Bartlett is test to check equality of variances. Variable having equal variances will identify that the individual districts are evolving differently with time

| | | | |
|---|---|---|---|
| | BARTLETT TEST FOR HOMOGENEITY IN CROSS SECTION | 0.000 | 0.999 |