Socio-Economic Determinants of Child Health: A South Asian Perspective

Nishat Fatima[1]

Abstract

The main objective of this study is to investigate the socio-economic determinants of under-five child mortality for the South Asian countries especially within the specified time period of MDG4 from 2000 to 2015. Results of random effect model demonstrate that immunization and female education have significant proportion in reducing under-five child mortality during the period of 2000-2015. Comparatively female labor force participation and remittances have less contribution in reducing child mortality. In this regard, there should be some incentives in the job market to increase female labor force participation for further reduction in child mortality. Also, significant proportion of child mortality can be reduced by awareness campaigns regarding the use of remittance income for better child health care. Urbanization and adolescent fertility caused to increase the under-five child mortality rate in South Asia. So, there should be better health care facilities in slum areas and strict laws should be made against the early age marriages. There is dire need to focus on awareness campaigns, especially to literate females regarding the health aspects of the family members for sustainable development of the household and the economy also.

Introduction

Child health is one of the most important indicators of social development and quality of life in a country and shows the level of education, nutrition and access to health care services. Child health is itself a development indicator and linked with other economic and development indicators such as growth of the economy, educational attainment, income and efficiency in productivity (Persico et al., 2004; Chen & Li, 2006; Currie and Hyson, 1999; Amiri and Gerdtham, 2013). As improved health in childhood leads to enhancement in physical, technical and intellectual capacity of the population which is the indication of increase in human capital.

Under-five child mortality rate is one the key indicator of child health, as poor child health leads to high rate of child mortality. Under-five child mortality rate can be defined as the number of children who die before approaching to the age of five and expressed in terms of per 1000 live births (Unicef)[2]. It is not only the agenda of public health organizations but also received a great deal of attention of international health agencies. In 2000, along with the regional agreements of reducing under-five child mortality rate, 189 countries of the globe signed on international agenda, named MDG 4 target[3], for the eradication of under-five child mortality rate by two third in 2015.

Following MDG 4 the global under-five mortality rate has showed a remarkable decline which is more than half i.e. dropping from 12.7 million to 6 million under-5 child

[1] *M.Phil Economics Scholar, Department of Economics, University of Gujrat, Pakistan*

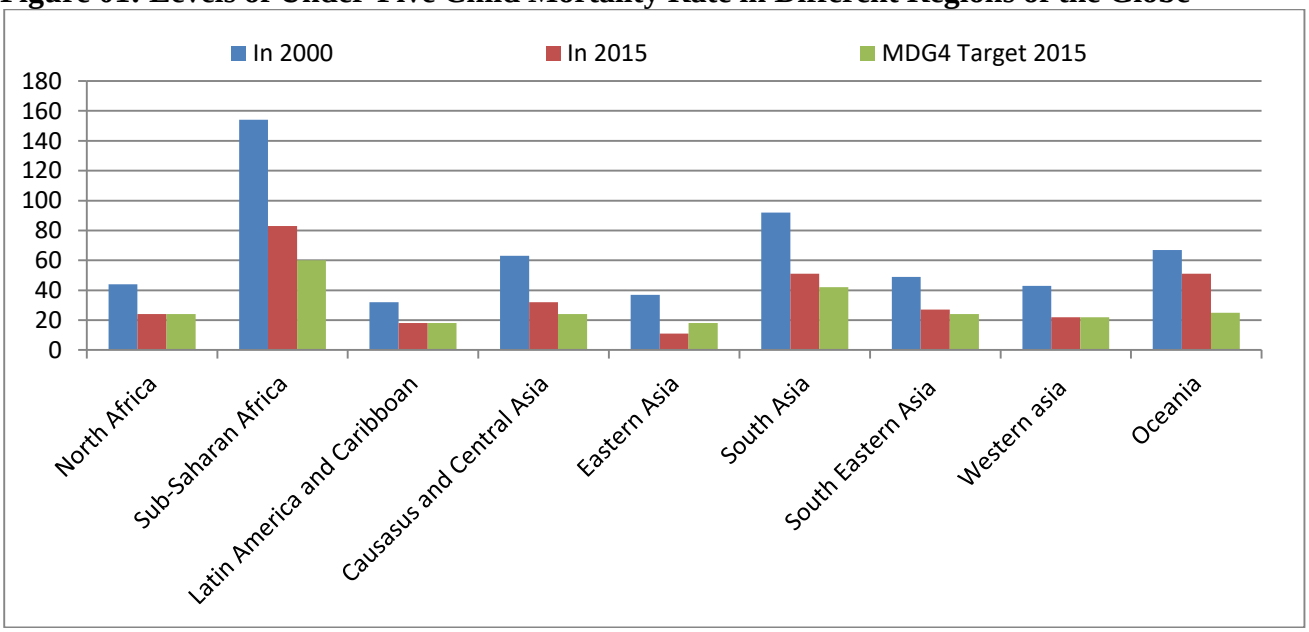
For detail see http://www.unicef.org/infobycountry/stats_popup1.html

[3]In 2000, the consensus was emerged among the world leaders for the global partnership in achieving eight Millennium Development goals. The time bound measurable targets were set for achieving each goal with the deadline of 2015. To meet these goals, 189 countries had signed the millennium declaration at the United Nations Millennium Summit in 2000. MDG 4 is one of the Millinium Development goal, aimed at reducing under-five child mortality rate by two third between 1990 and 2015 (For detail see http://www.unmillenniumproject.org/goals/gti.htm).

deaths between the time periods of 1990-2015. It is also reported that Measles vaccination has been increased from the 2000 to 2013 which prevent 67 percent deaths (MDGs, 2015).

At the regional level the under-5 child mortality rate had been declined more than halved in all regions other than Oceania. Figure: 01 shows the presence of disparities among countries in achieving MDG4 target. Regions in terms of high under-5 child mortality are Sub-Sharan Africa and Southern Asia respectively as compare to rest of the regions. As in 2015 it is reported that 83 per thousand deaths are in Sub-Saharan Africa with the target of 60 and 51 per thousand deaths in South Asia with the given target of 42.

Figure 01: Levels of Under-Five Child Mortality Rate in Different Regions of the Globe



Source: Inter-agency Group for Child Mortality Estimation Report 2015

At country level, 62 countries meet the target of MDG4 which involve not only low middle income countries but also low income countries. In high income countries one child die in every 147 in high income countries as compare to Sub-Sharan Africa where one child die in every 12. After Sub-Saharan Africa, one child dies in every 19 in South Asia before celebrating the fifth birthday. Most of the infectious diseases that caused the death rate in under-five child are curable with the quality based interventions (You et al., 2015). According to UNICEF report, 5.9 million under-five child deaths caused by malnutrition, poor economic condition of the family, sepsis, malaria, mothers less schooling years, adolescent fertility, limited access to water, less sanitation, pneumonia and diarrhea (APR,2015).

Table 1 shows that although most of South Asian countries show a progress in reducing more than half of child mortality rate to attain MDG 4. But still there are risks of high child mortality rate as it is second highest under-five child mortality rate among all regions. In South Asian counties Maldives has a remarkable progress in reducing child mortality. But worse condition can be seen in Pakistan and Afghanistan. From 2000, Pakistan is experiencing least progress in South Asian countries in reducing child mortality.

Table 01: Under-Five Child Mortality Rate per 1000 in South Asian Countries

Countries	In 2000	In 2015
Pakistan	112	81
India	91	48
Afghanistan	137	91
Bhutan	80	33
Maldives	44	9
Nepal	81	36
Sri Lanka	16	10
Bangladesh	88	38

Source: World Development Indicators Database

Despite of this global achievement, South Asia is still lagged behind to achieve the target of MDG4. The most miserable condition is that three under-five child deaths are reported in South Asia in every 10 global deaths. And after Sub-Saharan Africa this region has second highest under-five child mortality rate. One of reason of this highest child mortality rate is adolescent fertility. As according to Unicef (2007) more than one third of women in rural regions of South Asia and Sub-Saharan are married before the age of eighteen. Female empowerment is one of the important indicators of affecting child health. More the empowered females in terms of education and decision making, more will be aware to seek out the health services and to utilize the resources optimally for the child health, which reduces the child mortality.

With this regard the motivation of the study is that, there is need to find out the determinants of high under-five child mortality rate in South Asia. To the best of my knowledge no one study use under-five child mortality as dependent variable for South Asian countries. Still by using infant mortality as dependent variable there are some important variables in the literature on which the panel analysis is missing i.e. female education, female labor force participation rate, adolescent fertility etc. There is need to quantify their impact on child mortality so that it can be further reduced to desire level. Our study fills this gap in empirical research by employing panel analysis on determinants of under-five child mortality.

On the basis of above discussion, the first and prime objective is to identify the driving forces of under-five child mortality in South Asian region on which empirical work has been missing. Second is to empirically investigate their impacts on under-five child mortality because South Asian countries experience decline in under-five child mortality but still did not catch up MDG4 i.e. reducing child mortality by two-third for the period of 1990-2015. Therefore, our third objective is to identify the most important variables those are contributing in reducing under-five child mortality.

Literature Review

By reviewing literature, we have to justify our study purpose in a comprehensive way, improve theoretical understanding among the variables and to select the econometric approach regarding the nature of data and sample selection. The widespread debate on the determinants of child mortality over the globe has been summarized in the literature. The following studies incorporate empirical work on surveyed, time series and panel analysis on determinants of child mortality.

Husnain et al., (2016) used secondary data from 1978 to 2010 and empirically investigate the effect of CO2 emission on child mortality for South Asian countries i.e.

Pakistan, India, Sri Lanka, Bangladesh. The study found that there is positive association between child mortality and carbon emission by assuming inflation, trade, remittances and rural population growth as control variables. Results of this study showed that trade and remittances are caused to reduce the child mortality with the channel of increase in income. On the other hand, rural population growth is positively associated with child mortality but inflation has negative but insignificant estimate.

Harttgen et al., (2015) used 1984 demographic and health survey data for 324 regions of 25 sub Saharan countries to empirically estimate determinants of child mortality. For getting predicted estimates of child mortality the study employed new multilevel approach within the Bayesian. Study results demonstrated that mother education, high nutritional level of mother, child birth in urban area and household economic well being are important factors in reducing child mortality. Results indicated that male children have more probability to die relative to female child. And undernourished children are associated with less survival probability.

Choudhury (2015) employed binary logistic regression models to National Family Health Survey data (2005-06) to estimate the determinants of child mortality in India. More precisely the study predicted the effect of mother socio economic empowerment, her education level and exposure to mass media on child mortality at regional level. The study showed that parents' education and their exposure to mass media have a significant effect in declining child mortality. Effect of exposure to mass media on child mortality is more robust in rural areas. The study measured the women empowerment in terms of their decision power in health care, purchasing of daily household needs and visiting to relatives. The results of this study suggested that child mortality is low relatively in those regions where woman are more empowered.

Karmaker et al., (2014) employed Cox proportional hazard model analysis on Demographic and Health Survey data 2007 to investigate the crucial factors of child mortality in Bangladesh. The study found that early age marriages of girls have more probability of child mortality due of lack of awareness about child bearing activities. Moreover, breastfeeding, improved sanitation facility, birth intervals and safe drinking water are negatively associated with child mortality. Radio and television creates more awareness among people through commercials about child care and leads to less child mortality.

Zafar and Asghar (2014) employed structural equation model on Pakistan Demographic and Health Survey (PDHS) data, conducted for the year 2006-07 to measure the latent child health and identify major determinants of child health in case of Pakistan. Child transitory health improves with less frequency of diarrhea, fever and cough. The study investigated that family size has a negative impact on child health because of low per head income distribution. Parents' awareness about nutritional requirements of the child has a significant impact on child health. This study showed that parents' education has a positive and significant effect on child health. Child age is also a significant contributor to child health and in this study it has a positive relationship with child health, implying that child resistance gets stronger as get older. Empirics showed that Male child are more sensitive and their health is more deteriorated as compare to female health. And improved Housing facilities like electricity, water pump and sanitation leads to better child's Transitory Health. However, results for sanitation facilities and drinking water not found to be statistically significant.

Onanuga and Onanuga (2014) used secondary data from 1990 to 2012 to investigate the determinants of child mortality in sub-Sahara Africa. For the estimation of variables panel FGLS and GMM is used. Results demonstrated that high growth in carbon emission cause to increase child mortality in Sub Saharan Africa. This implies that more carbon omission might be experienced through the achievement of economic growth, and it is associated with deterioration in child health. Sanitation facilities are poor in Sub Saharan Africa so it has

positive association with child mortality. Further, GDP per capita, food production index and access to safe water has a negative association with child mortality. Predicted value of child mortality in terms of urban population is positive. This estimate is supported by the study of Asun (1992) which argued that in developing country the urban society have severe effects on health because it is characterized by overcrowding, poor health facilities, more probability of communicable diseases and over polluted area. More else more fertility rate caused to increase child mortality.

Ude and Ekesiobi (2014) used secondary data from 1980 to 2012 and employed multiple regression analysis to empirically estimate the effect of health and education expenditures on child mortality for Nigerian economy. The study found that per capita health and education expenditures are going to reduce child mortality in Nigeria. But health expenditures are not enough and sustained to reduce a considerable level of child mortality rate.

Dejene (2013) employed Cox proportional hazards regression analysis for Ethiopian Demographic and Health Survey 2011 data to highlight the more effective determinants of child mortality. The hazard ratio is experienced to be higher for under-5 child mortality among teenage motherhood relative to more matured age, twin baby than single, boys than girls, shorter birth intervals than longer birth intervals, uneducated mothers than educated and economically weak family background relatively rich families. The study estimated that more empowered woman, in terms of education are more active to do something that raise their income, has been associated with significant decline in child mortality.

Fink and Hill (2013) used 74 demographic and health surveys data for 37 low and middle income countries (Sub-Sharan Africa, Latin America, Asia) to estimate mortality for the period of 1990-2010. Results indicated that under-5 child mortality is relatively high in rural areas as compare to urban areas and region wise in Sub-Saharan Africa as compare to Middle East and North Africa, which is experienced lowest under-5 child mortality. Developing countries experienced high child mortality rate in rural areas but over the time urbanization is contributing in reducing child mortality.

Arceo et al., (2012) applied secondary data of 1997-2006 to investigate the relationship between air pollution and infant mortality rate in Mexico by employing fixed effect model. The study found that there is significant relationship between child mortality and air pollution. Estimation implied that 1 percent increase in particulate matter and carbon monoxide leads to 0.42 percent and 0.23 percent increase in child mortality respectively. Moreover, by employing VAR analysis it is found that there is significant and positive association in growth in CO2 omission and child mortality for the case of India.

Naveed et al., (2011) applied Cointegration and VECM model on secondary data from 1978 to 2008 to check out the relationship between infant mortality rate and socioeconomic variables. The study investigated that more GDP per capita and more women empowerment lesson child mortality in case of Pakistan. But population is going to increase child mortality. Empirics of this study showed that female labor force participation and female education are contributing to decrease infant mortality rate. And female labor force participation and female education are important variables in affecting child mortality.

Kembo and Ginneken (2009) used Zimbabwe Demographic and Health Survey 2005-06 to empirically investigate the impact of social and maternal characteristics on child mortality by employing hazard model. Multivariate analysis estimated that long birth intervals caused to reduce child mortality but risk of child mortality increases by 26 percent when the birth is taken place in rural area relative to urban area. Mother education has insignificant but has negative association with child mortality. On the other side, improved sanitation facilities like improved quality of toilet and safe drinking water have a larger impact on reducing child mortality. Mothers with the age of 40-49 and 20 have more

probability of child mortality as compare to the maternal age of 30-39. Urban population is more familiar to birth spacing methods because of more education so family planning programs should be directed to the rural areas to aware the parents about the positive impacts of birth spacing.

Mahfouz (2009) used both questionnaire and interviewed based primary data on determinants of child mortality, collected from Malakal town of Southern Sudan for the year of 2007. The study found that large birth intervals and immunization has negative association with child mortality but large family size has positive effect. Moreover, Mother education and high income of the household are negatively and significantly associated with child mortality, in which priori is the more important factor for this study.

Iram and Butt (2008) conducted an empirical study to check the impact of major socioeconomic factors and maternal health care practices on under-five child mortality for the case of Pakistan. For this purpose, the study estimated sequential probit models by using surveyed data of FBS i.e., Pakistan Integrated Household Survey (PIHS) 2001. Main categories of independent variables are individual characteristics, maternal or housing characteristics, health inputs and environmental characteristics. It is estimated that mother education and income are negatively related to child mortality. As more educated mothers will be more aware about the child health needs and use health resources more optimally and more income increases the affordability for cost of health problems. Empirics of this study demonstrated that mother employment status is positively related to child mortality because less time is devoted for child care. And late marriages lead to more complications at child birth and more will be the probability of child death. Opposed to other empirical study, this study indicated that female child have relatively more probability of dying at neonatal stage as compare to male child. Child mortality is positively but insignificantly related to absence of postnatal care, and significantly to child birth at home. Mothers who don't receive tetanus vaccination during pregnancy and don't feed child at proper time experience more child mortality. And No sanitation facility is positively but insignificantly related to neonatal mortality and negatively associated with the presence of electricity connection in the home.

Issa and Ouattara (2005) used pooled data of 160 low and high developing countries for the period of 1980-2000 to empirically investigate relationship between public and private expenditures on health and child mortality by employing OLS and fixed and random effects. The study clearly demonstrated that expenditures on health will be one of influential determinant of child mortality if it is decomposed into public and private expenditures and separate effects are measured on child mortality. At low and high development stage of economy, public health expenditures and private health expenditures will be more effective respectively to development stage. As development emerge, the public health expenditures loss their worth. Therefore, public health expenditures are more effective in developing countries and private health expenditures are more effective in developed countries in declining child mortality. One percent increase in public expenditures reduces child mortality by 0.16 percent in developing countries but in developed countries one percent increase in private expenditures reduces child mortality between the range of 0.36 to 0.86 percent. Income per capita and female education has negative association with child mortality but carbon emission is weakly associated with infant mortality.

By reviewing an extensive literature about determinants of child mortality, we found that a great deal of work has been done on child mortality over the globe. Most of the studies used surveyed based data to estimate the determinants of child mortality. To the best of my knowledge, there is a literature gap, particularly in secondary data analysis for South Asian countries. Panel analysis for four South Asian countries has been done by Husnain et al., (2016) to empirically investigate the impact of CO2 emission, inflation, trade, remittances and rural population growth on infant child mortality. But this study doesn't empirically

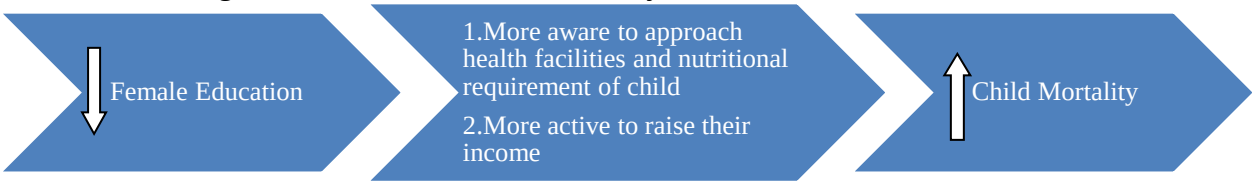
investigate the impact of other important socio-economic variables on child mortality. So, our study fills the literature gap in panel analysis in three perspectives: First to incorporate under-five child mortality as dependent variable, second to analyze the impact of other missing variables on child mortality in the context of South Asia and third to include remaining four cross sections. Now the objective of the study is to empirically investigate the impact of following variables on under-five child mortality in case of South Asian countries: Adolescent fertility, female education, female enrollment, immunization, remittances and urban population.

Theoretical link

Before going to estimating the proportion of each variable in defining the variation in under-five child mortality, the study needs a theoretical understanding between child mortality and independent variables. By reviewing the literature, we found following theoretical linkages between the child mortality and other variables selected in this study.

Female education and child mortality

Mostly educated women are less fatalistic about child illness and use uses alternative therapeutics for child care, also will be more aware to approach the health facilities (Caldwell, 1979). They have less probability of their child mortality. As they are more aware about the nutritional requirements of child, also use health resources more optimally (Iram and Butt, 2008). Dejene (2013) argued and empirically test that more empowered woman, in terms of education are more active to do something that raise their income which is associated with significant decline in child mortality.

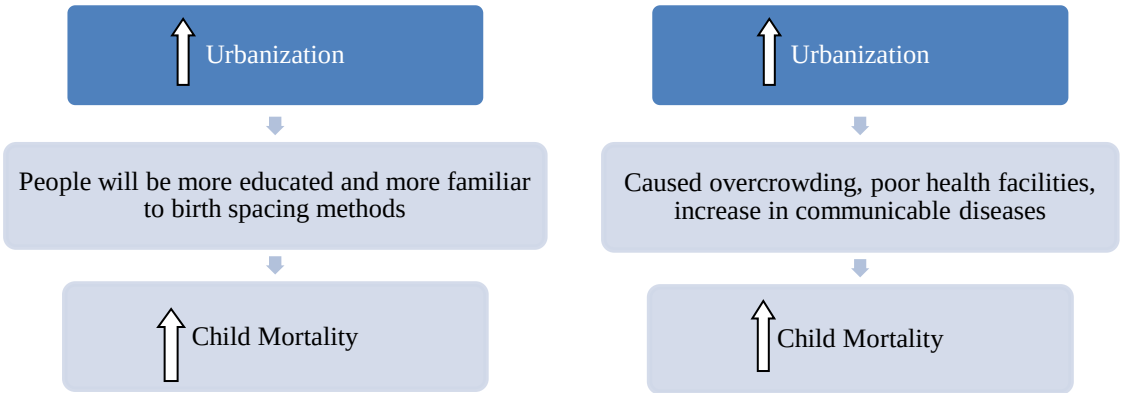


Adolescent fertility rate and child mortality

Teenage mothers have more probability of child mortality due of lack of awareness about child bearing activities (Karmaker et al., 2014).

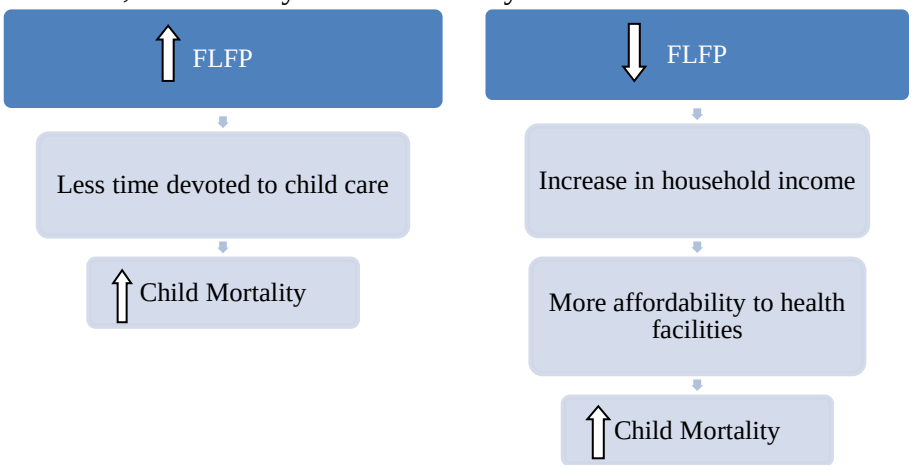
Urbanization and child mortality

Urban population is considered to be more educated and more familiar to birth spacing methods which have negative association with child mortality (Kembo and Ginneken, 2009). But there might be positive association between urbanization and child mortality. As in developing countries the urban society have severe effects on health because it is characterized by overcrowding, poor health facilities, more probability of communicable diseases and over polluted area (Asun, 1992).



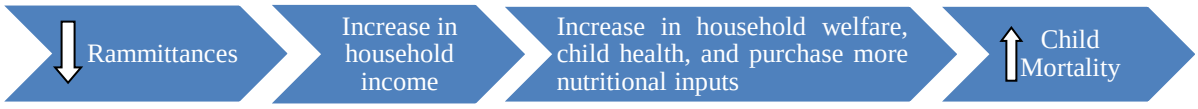
Female labor force participation rate (FLFP) and child mortality

Working woman has less time for their family so less time is devoted for child care which leads to child mortality (Iram and Butt, 2008). But on the other hand Tanveer et al. (2011) showed that increase in FLFP reduces child mortality through the channel of more household income and, accessibility and affordability to more health facilities.



Remittances and child mortality

Remittances are positively associated with households welfare, child health, and nutritional status, health care services and consequently reduce child mortality (Anton , 2010; Dorantes and Pozo 2009; Daniel and Lopez, 2012). Remittances are positively related to household income. More precisely relaxation in income allows them to purchase medical and nutritional inputs which are essential for child survival (Hildebrandt and McKenzie, 2005).



Immunization/vaccination and child mortality

Vaccination is considered to be very necessary against bioterrorism. It is influential in strengthening the immune system by combating against pathogens, increase the life expectancy and lower the child mortality (Andre et al., 2008).

Data and Methodology

To carry out panel analysis on determinants of child mortality for the South Asian countries, we compiled our dataset for the following cross sections for the period 2000-2015: Pakistan, India, Bhutan, Maldives, Sri Lanka, Bangladesh, Afghanistan and Nepal. Variables are selected on the basis of literature gap. Our dependent variable is Under-Five child mortality rate and independent variables are Remittances, Female labor force participation rate, Female education, Urbanization, Adolescent fertility, and Immunization Rate.

Description of variables and data sources

As before mentioned, the objective of this study is to conduct panel analysis of determinants of child mortality for the South Asian countries, we take the data from 2000-2015. For the accomplishment of the objective of the study world development indicators are used for all the variables. Data for this study is collected for the specified time period because we want to investigate the impact of important factors on child mortality under the time specified agenda of MDG4. In this study, we take child mortality as dependent variable and measured in as per 1000 under five child mortality rates. It can be defined as the children who die before approaching to their fifth birthday. Description of independent variables is as follows:

- Adolescent fertility rate is per thousand numbers of children that would be born teenage mothers, age of 15 to19.
- We take the urban population as percentage of the total population. It can be defined as the percentage of population living in urban areas.
- Personal Remittances are taken as percentage of GDP. These are the combination of two gears. One is current personal transfers in the form or kind from non residence to residence household. Second is the compensation of employees who are not the residence of the economy where they work.
- Immunization can be defined as the percentage of children of the age of 12 to 23 months who have been vaccine within 12 months. In our study we take the average of measles and DPT (diphtheria, pertussis and tetanus) vaccine.
- Female education is measured with secondary school enrollment of females. It can be defined as the ratio of total enrollment in secondary level to total population at secondary level, regardless of the age group.
- Female participation rate is the percentage of female of the age 15 to 64 who is economically active to participate in producing goods and services for a specific period of time.

Main model of our study is as follows:

$$MORT_{it} = f(\alpha_0 + \beta_1 ADOFER_{it} + \beta_2 FLFP_{it} + \beta_3 IMM_{it} + \beta_4 REMIT_{it} + \beta_5 URBPOP_{it} + \beta_6 FEDU_{it} + \gamma_1 Z_i + \gamma_2 X_t + \mu_{it})$$

Where,
MORT = Under-five child mortality rate
ADOFER = Adolescent fertility rate
FLFP = Female labor force participation rate
IMM = Immunization
REMIT = Remittances
URBPOP = Urban population
FEDU=female education

On the basis of above mentioned model, we apply random effect model to empirically investigate the impact of socio economic variables on under-five child mortality especially in

the context of MDG4. As random effect model is selected on the basis of Hausman specification test.

Results and Discussion

Table 2: Results of Hausman Specification Test

Correlated Random Effects - Hausman Test Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random		1.022300	6	0.9848
Variable	Fixed	Random	Var (Diff.)	Prob.
ADOFER	0.240732	0.241973	0.000148	0.9187
FLFP	-0.248336	-0.255694	0.000440	0.7257
IMM	-0.718057	-0.721560	0.001350	0.9240
REMIT	-0.304054	-0.253698	0.011166	0.6337
URBPOP	0.449887	0.491044	0.008809	0.6610
FEDU	-0.544067	-0.530402	0.002568	0.7874

Hausman specification test showed that the random effect model is appropriate for investigating the effect of regressor on child mortality. As in table:02 the probability value is above 5% level.

Table 03: Results of Random Effect Model

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
ADOFER	0.241973	0.039973	6.053364	0.0000*
FLFP	-0.255694	0.048775	-5.242338	0.0000*
IMM	-0.721560	0.099023	-7.286798	0.0000*
REMIT	-0.253698	0.130498	-1.944085	0.0560**
URBPOP	0.491044	0.158337	3.101260	0.0028*
FEDU	-0.530402	0.078950	-6.718220	0.0000*
C	134.7930	8.169485	16.49957	0.0000*

Note: * and ** shows 1% and 5% level of significance respectively

Table 03 demonstrates the impact of socio-economic variables on under-five child mortality rate by employing random effect model for the case of South Asian Countries. All the coefficients are significant, showing contribution in affecting child mortality. The detailed discussion on the coefficient of random effect model is as follows.

The relationship between adolescent fertility and under-five child mortality is positive. The coefficient on adolescent fertility is 0.24 and highly significant at 1% level of significance. One unit increase in adolescent fertility in South Asia increases the under-five child mortality by 0.24 units. As, Teenage mothers have more probability of child mortality due of lack of awareness about child bearing activities (Karmaker et al., 2014). According to UNICEF (2007) more than one third of women in rural regions of South Asia are married before the

age of eighteen. Our results are supported by empirical studies (Dejene 2013; Karmaker et al., 2014).

Literature showed that there is mix association between FLFP and child mortality. Some studies empirically justified negative and some investigate the positive association between FLFP and child mortality. But in our study there is negative association between these two variables and the coefficient is significant at 1% level. One unit increase in female labor force participation reduces the under-five child mortality by 0.26 units in South Asia. This relationship is supported theoretically and empirically by the literature. Theoretically, increase in the female labor hours reduces the child mortality with the channel of increase in household income. As more income will increase the affordability of health care services. This coefficient is consistent with the study of Naveed et al., (2011).

Immunization against diseases is an important variable in reducing under-five child mortality. Results demonstrate that in case of South Asia immunization has remarkable effects in reducing child mortality. As immunization rate has been increased during the time period of MDGs which caused reduction the child mortality. Theoretically it is argued that more the immunization rate leads to increase the strength of child immune system and more strength to fight within the major infected diseases. The coefficient is highly significant at 1% level. One unit increase in immunization against measles and DPT reduces the child mortality in South Asia with 0.72 units. The predicted value of child mortality is consistent with Mahfouz (2009).

South Asia is remittance rich region in the globe. Personal remittances are caused to increase the household income and raise their standard of living. With high budget people will afford not only the nutritional inputs for the child but also the health care service which caused to improve child health and reduce child mortality. Our study empirically investigate that in South Asia, remittances affect the developmental indicator of child health. The coefficient is negative and significant at 5% level. One unit increase in remittances reduces the under-five child mortality by 0.25 units in South Asia. This predicted value is supported by the study of Husnain et al., (2016).

In our random effect model the urban population is positively associated with under-five child mortality. It shows that one unit increase in urban population reduces child mortality by 0.49 units. This coefficient is highly significant at 1 percent level. In literature review we have been studying the mix results of association between child mortality and urban population. Positive association shows that in South Asian countries the most of urban area comprises on slum areas or they have poor health facilities or more communicable diseases.

Female education is going to reduce the under-five child mortality rate in South Asia. In our study the coefficient is highly significant at 1% level. One unit increase in female education leads to reduce child mortality by 0.53 units in South Asian countries. More female schooling years not only aware them about the child nutritional requirements but also about the best health care facilities. Educated females have the ability to raise the family income at the time of need, which raise the standard of living consequently reduce the child mortality. Our estimated coefficient is consistent with following studies (Iram and Butt, 2008; Naveed et al., 2011)

Conclusion

The objective of the study was to investigate the socio-economic determinants of under-five child mortality for the South Asian countries especially within the specified time period of MDG4 from 2000 to 2015. Our study is a value addition into the literature by employing random effect model for all South Asian countries. We have to estimate the effect

of following variables on under-five child mortality rate: Remittances, Female labor force participation rate, Female education, Urbanization, Adolescent fertility, and Immunization Rate.

Results of random effect model shows that Remittances, Female labor force participation rate, Female education, Immunization Rate have negative association with under-five child mortality. All of the variables are contributing to reduce under-five child mortality rate in South Asia. Both female education and immunization have a significant contribution in reducing child mortality. But immunization has more contribution in reducing child mortality rate. FLFP and remittances have same contribution in reducing under-five child mortality with the channel of increase in income. In contrast, Urbanization and adolescent fertility are going to increase child mortality in South Asia. Results demonstrate that urbanization is an important factor in increasing child mortality due to slum areas.

Improvements in reducing under-five child mortality have been seen in South Asian region but these were not enough. As, South Asian region did not catch up MDG4. It did not achieve the target of lowering under-five child mortality rate by two-third till 2015 and having second highest under-five child mortality rate among all regions of the globe in 2015. As, immunization and female education have significant proportion in reducing under-five child mortality during the period of 2000-2015. Comparatively FLFP and remittances have less contribution in reducing child mortality. With this regard, three should be some incentives in the job market to increase female labor force participation for the further reduction in child mortality. Also, significant proportion of child mortality can be reduced by awareness campaigns regarding the use of remittance income for better child health care. Urbanization and adolescent fertility caused to increase the under-five child mortality. So, there should be better health care facilities in slum areas and strict laws should be made against the early age marriages.

References

1. Amiri, A., & Gerdtham, U. G. (2013). Impact of Maternal and Child Health on Economic Growth: New Evidence Based Granger Causality and DEA Analysis. *Newborn and Child Health, Study Commissioned by the Partnership for Maternal, Lund University, Sweden*.
2. Andre, F. E., Booy, R., Bock, H. L., Clemens, J., Datta, S. K., John, T. J., & Santosham, M. (2008). Vaccination greatly reduces disease, disability, death and inequity worldwide. *Bulletin of the World Health Organization*,*86*(2), 140-146.
3. Antón, J. I. (2010). The Impact of Remittances on Nutritional Status of Children in Ecuador1. *International migration review*, *44*(2), 269-299.
4. Arceo, E., Hanna, R., & Oliva, P. (2016). Does the effect of pollution on infant mortality differ between developing and developed countries? Evidence from Mexico City. *The Economic Journal*.
5. Asun, C.F., 1992. Family health in sub-Sahara Africa: Morbidity and mortality in mothers and children. Paper presented at the National Conference on Africa and the New World Order, Jos Plateau state, Nigeria.
6. Bourne, P. A., Sharpe-Pryce, C., Francis, C., Solan, I., Hudson-Davis, A., Campbell-Smith, J., & Watson-Coleman, O. (2014). Mortality and Inflation: A 21-Year Analysis of Data on Jamaica. *Journal of General Practice*, *2014*.
7. Caldwell, J. C. (1979). Education as a factor in mortality decline an examination of Nigerian data. *Population studies*, 395-413.
8. Chen, Y., & Li, H. (2006). Mother's education and child health: Is there a nurturing effect? *Journal of Health Economics*, *28*(2), 413–426. doi:10.1016/j.jhealeco.2008.10.005

9. Choudhury, P. K. (2015). Explaining the Role of Parental Education in the Regional Variations in Infant Mortality in India. *Asia & the Pacific Policy Studies*, *2*(3), 544-572.
10. Currie, J., Hyson, R., 1999. Is the impact of health shocks cushioned by socioeconomic status? The case of low birthweight. American Economic Review Papers and Proceedings 89 (2), 245–250.
11. Daniel F. and López-Cevallosi (2012) Migration, Remittances, and Health Care Utilization in Ecuador. Rev Panam Salud Publica 31:1.
12. Daniel F. and López-Cevallosi (2012) Migration, Remittances, and Health Care Utilization in Ecuador. Rev Panam Salud Publica 31:1.
13. Dejene, T., & Girma, E. (2013). Social determinants of under-five mortality in Ethiopia: Event history analysis using evidence from Ethiopian Demographic and Health Survey (EDHS).
14. Dorantes C. A. and Susan Pozo (2009) New Evidence on the Role of Remittances on Health Care Expenditures by Mexican Households. (IZA Discussion Paper No. 4617)
15. Fink, G., & Hill, K. (2013). Urbanization and Child Mortality—Evidence from Demographic and Health Surveys". *Background paper prepared for Commission on Investing in Health*.
16. Harttgen, K., Lang, S., & Santer, J. Multilevel modelling of child mortality in Africa.
17. Hildebrandt, N., McKenzie, D. J., Esquivel, G., & Schargrodsky, E. (2005). The effects of migration on child health in Mexico [with comments].*Economia*, *6*(1), 257-289.
18. Husnain, M. I. U., Haider, A., Salman, A., Zahid, H. M., Khan, M., & Shaheen, F. An Econometric Analysis of the Statistical Relationship between Carbon Dioxide Emissions and Infant Mortality in South Asia.
19. Iram, U., & Butt, M. S. (2008). Socioeconomic determinants of child mortality in Pakistan: Evidence from sequential probit model. *International Journal of Social Economics*, *35*(1/2), 63-76.
20. Issa, H., & Ouattara, B. (2005). The effect of private and public health expenditure on infant mortality rates: does the level of development matters. *Damascus Univ. J*, *28*(1), 21-37.
21. Karmaker, S. C., Lahiry, S., Roy, D. C., & Singha, B. (2014). Determinants of Infant and Child Mortality in Bangladesh: Time Trends and Comparisons across South Asia. *Bangladesh Journal of Medical Science*, *13*(4), 431.
22. Kembo, J., & Van Ginneken, J. K. (2009). Determinants of infant and child mortality in Zimbabwe: Results of multivariate hazard analysis. *Demographic Research*, *21*, 367-384.
23. Mahfouz, M. S., Surur, A. A., Ajak, D. A. A., & Eldawi, E. A. (2009). Level and determinants of infant and child mortality in Malakal Town–Southern Sudan. *Sudanese Journal of Public Health*, *4*(2), 250-255.
24. Naveed, T. A., Ullah, S., Jabeen, T., & Sabir, S. (2011). Socioeconomic Determinants of Infant Mortality in Pakistan. *Interdisciplinary Journal of Contemporary Research in Business*, *8*, 728-40.
25. Onanuga, O. T., & Onanuga. T. (2014). Economics of the Environment and Infant Mortality in Sub-Saharan Africa. *African Journal of Scientific Research Vol*, *12*(1).
26. Persico, N., Postlewaite, A., Silverman, D., 2004. The effect of adolescent experience on labor market outcomes: the case of height. Journal of Political Economy 112 (5), 1019–1053.
27. Ude, D. K., & Ekesiobi, C. S. (2014). Effect of Per Capita Health Spending on Child Mortality in Nigeria. *International Journal of Innovative Research and Development*, *3*(9).
28. Unicef. (2007). *The state of the world's children 2008: Child survival* (Vol. 8). Unicef.

29. Unicef. (2015). *Committing to child survival: a promise renewed*. eSocialSciences.
30. You, D., Hug, L., Ejdemyr, S., Idele, P., Hogan, D., Mathers, C., ... & Alkema, L. (2015). Global, regional, and national levels and trends in under-5 mortality between 1990 and 2015, with scenario-based projections to 2030: a systematic analysis by the UN Inter-agency Group for Child Mortality Estimation. *The Lancet*, *386*(10010), 2275-2286.
31. Zafar, S., & Asghar, Z. (2014). Determinants of Child Health in Pakistan through Latent Variable Model Approach. *International Journal of Economics and Empirical Research (IJEER)*, *2*(4), 135-149.

Appendix

Table of Summary Statistics

	ADOFER	FLFP	IMM	REMIT	URBPOP	FEDU
Mean	60.36104	45.98333	81.23333	6.098262	27.77075	48.75400
Median	48.94360	40.50000	84.50000	3.981244	28.63000	48.11158
Maximum	153.8456	84.60000	99.00000	32.23065	45.53600	101.9733
Minimum	7.276000	13.80000	25.50000	0.113255	13.43100	0.000000
Std. Dev.	37.22501	21.92477	16.61552	6.696691	7.814847	20.59777

Wald Test

Test Statistic	Value	df	Probability
F-statistic	211.3075	(6, 69)	0.0000
Chi-square	1267.845	6	0.0000
Null Hypothesis Summary:			
Normalized Restriction (=0)		Value	Std. Err.
C(1)		0.241973	0.039973
C(2)		-0.25569	0.048775
C(3)		-0.72156	0.099023
C(4)		-0.2537	0.130498
C(5)		0.491044	0.158337
C(6)		-0.5304	0.07895

Restrictions are linear in coefficients.