The Intertemporal Analysis for the Determinants of Women and Child Health Deprivations in Pakistan

Aysha Iftikhar*, Abdul Jalil**

Abstract

This study analyses the intertemporal health deprivations of women and children using three rounds of Pakistan Demographic and Health Surveys (1990, 2006 and 2012-13). Focusing, on the demand side of health, the determinants of health deprivations of women and children are computed using Alkire-Foster methodology. The women health deprivation index shows that the incidence of women health deprivations has decreased, however, the intensity has increased from 2006 to 2012-13. Moreover, the child health deprivations have increased from 2006 to 2012-13. The results for determinants from logistic regression suggest that women health deprivations are mainly determined from her education, partner's education and the number of births. The health deprivations faced by children are higher than that of women. The determinants for the child health deprivations are mother's education, region, household size and the number of births in the last five years.

Key words: women deprivation health index, child deprivation health index, intensity, incidence

JEL Classification: I14, I15

Introduction

Population health contributes significantly to the development of the country as revealed by the health-human capital theory (Becker 1960, Schultz 1962, Romer 1989). Countries cannot attain unrelenting development without investing in human capital, specifically on their children. According to UNICEF, "*Well accomplished and unrelenting investments in people, especially in children and the most disadvantaged, accrued returns for poverty reduction. Countries cannot achieve sustained growth and shared prosperity without investing effectively in their people, above all their children. Inclusive economic growth and the development of human capacities depend upon each other*" (UNICEF 2012).

In 2000, the eight Millennium Development Goals are defined to combat poverty, hunger, disease, illiteracy, environmental degradation, and discrimination against women by the end of 2015. There exists causal relationship among all the MDGs. There exist mutual causality between MDGs and health, both cause each other. Better health, for instance, empowers children to enhance their learnings abilities and enable adults to increase their earnings. Similarly, reduction in gender inequality is crucial for the attainment of improved health. Reduction in poverty, starvation and environmental degradation had positive impact on better health but all these factors also depend on health (WHO 2000). However, MDGs could not be achieved, and in 2015 another set of goals appeared, known as Sustainable development goals (SDGs) for subsequent 15 years. SDGs aimed for no poverty, zero hunger, good health and well-being, clean water and sanitation and reduction of inequality (UNDP 2015).

By looking at these objectives, one can understand the importance and role of health and nutrition in individual's life. In this regard, early childhood development plays an important role, in which conditions a child would be living e.g. pre-birth nutrition level, immunization, food consumption, sanitation facilities, educational level of parents, environmental factors etc. (Linnemayr et al, 2008). Lack of standard facilities produces unhealthy children with infection diseases and other health issues that render their physical (Christian, 2009) as well as psychological health (Currie and Stabile, 2006).

---

*Ph.D Scholar, School of Economics, Quaid-i-Azam University Islamabad
** Professor of Economics, Pakistan Institute of Development Economics, Islamabad

There is the possibility that under-nourished children have low performance in school, reduced productivity in labour force, greater risk for illness and premature death (Lanigan and Singhal, 2009, Victora et al 2008). The situation become more severe when those children raise in poverty and in future they are more likely to be poor as well. The health poverty often establishes itself as a malicious circle that children are traped in from their birth onwards (Roelen and Gassman 2008, Minujin 2012). Similarly, health status of mothers and her education had significantly great impact on initial childhood health through pre-natal and post-natal period. Children under the age of 24 months depend mostly on their mothers regarding their feed, nutrition and health care. Therefore, mothers with access to better food, knowledge of health care and access to health facilities are able to fed and feed their children in a better way as compare to those mothers with no health knowledge and approach to health facilitation centers (Haines et al, 2007, Adm et al, 2005).

Most of the studies had linked child growth and child survival to maternal health. They observed the role of parental and new-born care, breastfeeding, complementary feeding, access to health care facilities and sanitation in child growth and child survival (Isaia et al 2017, kuruvilla et al 2014, Bhutta et al 2008, Bhutta et al 2008b, Jones et al. 2003). Breastfeeding initiation is an important determinant of child health at early life stages (Dad and Habib 2017 and Wachs 2008). World Health Organization (WHO) and UNICEF (2003) have developed strategies and issued practice guidelines to promote and support breastfeeding. The advantages of breastfeeding are twofold that this not only protects child from illness and infection but also good for women health as well (Skafida 2012, Whalen and Cramton 2010, Scott and Binns 1999).

Parental education is also the crucial factor for the development of child health and play an important role in the progress and development of children's cerebral (Aslam and Kingdon 2012, Ali and Zeb 2017). Other studies also report that in developing countries higher educational level of mothers linked with improved physical progress of child in infancy and early childhood (Wachs 2008). Socioeconomic status has also important implications for adverse health outcomes. The surrounding environment is persuasive to establish health outcomes, and there is an increasing effort to promote healthy communities to reduce inequalities especially in health at a geographical level. Individuals living in deprived areas also report poor and worse mental health (Das et al 2007). Several studies explore the association of social and demographic factors with child and women health (Spencer 2000, Prescott 1998). Focusing on the importance of health of women and children, this study uses Pakistan as a case study for the analysis of intertemporal health deprivations.

This study contributes in literature in three ways. Firstly, the study focuses on the demand side of health rather than supply side of health which have been focused earlier in literature. Moreover, this study estimate health deprivation indices and their determinants to understand the health issues in Pakistan specifically for children and women. To our best knowledge there is no empirical study that attempt to estimate health deprivation indices and its determinants in Pakistan. Secondly, this study presents broader picture of composite indicators of health that posit more enhance view to assess the health deprivation rather than to focus on single indicator and its determinants. This study develops composite indices of health deprivation of women and children by including maximum health variables on which data is available. Whereas, several studies incorporate health as one of the dimension like Human Development Index, Physical Quality of Life Index (at macro level), and Poverty Indices (at micro level) etc. Whereas more focused health studies analyze health specific variables and their determinants e.g. malnutrition and its determinants, child immunization and its determinants so on. Thirdly, this study uses individuals as a unit of analysis rather than household to analyse determinants of women and child health deprivation. These health deprivation indices will also help to analyze the reductions in the intensity and incidence of women and child health deprivations by using Alkire-Foster (2007, 2011) methodology with an intention to motivate policy makers to form structural policy responses to resolve health deprivations. Further, on the basis of these indices, the determinants of weighted health deprivation status score are obtained for mothers and children as well. The study also performs intertemporal analysis to reveal the overtime detoriation or improvement in these indices and their determinants. The decomposition of health indices further have importance from policy perspective that which dimension of health should be focused on priority basis.

The study used three rounds (1990, 2006 and 2012-13) of Pakistan Demographic and Health Survey (PDHS). The findings of the study show that the women health deprivations are mainly determined from her schooling, companion's schooling and the number of births. The health deprivations faced by children are higher than that of women. The determinants for the child health deprivations are mother's education, region, household size and the number of births in the last five years. The inaccessibility of water and sanitation facilities are significantly contributing towards the child health deprivations. The women health deprivation index shows that the incidence of women deprivations has decreased, however, the intensity has increased from 2006 to 2012-13. Moreover, the child health deprivations have increased from 2006 to 2012-13. The women health deprivations are mainly coming

from inaccessibility of health facilities, however, immunization and child height for age (malnutrition) have higher contributions in children health deprivations. Determinants of women health deprivation includes female education, husband education, husband employment, number of total children ever born, number of births in last five years and region.

The rest of the paper is organized as follows. Section 2 outlines the Methodology. Section 3 describe data and construction of variables. The estimation results are explained and discussed in Section 4. Section 5 provide conclusion and discussion. Finally, section 6 provides the recommendations for the reduction of health deprivations in Pakistan.

Methodology

The logistic regression is applied to find the determinants of women and child health deprivations. The dependent variable is the binary variable that is formed through the health deprivation scores of individuals. The econometric model to analyse the determinants of women health deprivation and child health deprivation in equation form can be written as

$$Y_i = \alpha + x_i\beta + \varepsilon_i \qquad (1)$$

Where Y_i the binary variable and its probability π_i is conditional upon explanatory variables. For individual *i* identified as deprived, we can define probability as

$$\pi_i \equiv Prob(y_i = 1) \equiv P(y_i \setminus x_i) \qquad (2)$$

The conditional mean equals the probability as follows:

$$\varepsilon_{y_i \setminus x_i} = \pi_i \times 1 + (1 - \pi_i) \times 0 = \pi_i \qquad (3)$$

Whereas the probability function of Y_i is

$$p_y(y_i) = {\pi_i}^{y_i}(1 - \pi_i)^{1-y_i} \qquad (4)$$

To verify that the conditional mean given by the conditional probability stays between zero and one, a Generalize Linear Models (GLM) commonly consider two link functions (g) known as probit link function and logit link function. The probit link function is not directly interpretable whereas logit link function can be directly interpretable. The logit of π is the natural logarithm of the odds that the binary variable Y takes a value of one rather than zero. If the odds are 'even' i.e. equivalent to one then corresponding probability (π) of falling into either category i.e. deprive or non-deprive, is 0.5 and the logit is zero. In this case, the logit model can be described as

$$ln\frac{\pi_i}{1-\pi_i} = \eta_i = \beta_0 + \sum_{j=1}^{k}\beta_j\, x_{ij} \qquad (5)$$

Alternatively,

$$\frac{\pi_i}{1-\pi_i} = e^{\eta_i} = exp\sum_{j=0}^{k}\beta_j\, x_{ij} \qquad (6)$$

The left-hand side of this equation is called the log-odds ratio which is the linear function of the explanatory variables. However, right-hand side, partial regression coefficients β_j are

interpreted as marginal changes of the logit, or as multiplicative effects on the odds. If β_j is negative, the change in x_j denotes a decrease in the odds.

The Formation of Dependent Variable (Y_i)

As we are interested in assessing the probability of individual being deprived, we choose censored deprivation score c_i that reflect deprivation characteristics of individuals in our analysis. To determine deprive individuals, we compare censored deprivation score of individual (c_i) with deprivation cut-off (k=33%). If c_i is above the deprivation cut-off, the individual is identified as deprived. We then define binary random variable (Y_i) that takes the value of one if the individual is identified as deprived and zero otherwise. The dependent variable is given by:

$$Y_i = \begin{cases} 1 & \text{if and only if } c_i \geq k \\ 0 & \text{otherwise} \end{cases}$$

An overall deprivation score $ci \in [0, 1]$ is computed for each person. It is computed by:

$$c_i = \sum_{k=1}^{K} w_k I_{ki} \qquad (7)$$

Where I_{ki} is the value of component k of individual i and w_k is the weight of I_{ki}. I_{ki} is the binary indicator which equals to 1 when it denotes deprivation and 0 otherwise. An individual i is identified as 'health deprived' if $c_i \geq k$, where k ∈ (0, 1]; and non-deprived otherwise. Then vector c summarizes the deprivation scores of all individuals.

The Formation of Women Health Deprivation Index (WHDI) and Child Health Deprivation Index (CHDI)

The deprivation status score is then used to determine the women and child health derivation indices to analyse the intertemporal change in intensity and the incidence of health deprivations for women and children in Pakistan.

The generalized form for the well-being indices is given by:

$$I(x) = [w_1 I_1(x_1)^{\beta} + \cdots + w_m I_m(x_m)^{\beta}]^{1/\beta} \qquad (8)$$

Where $\beta \neq 0$

The wellbeing index $I(x)$ is defined as a weighted mean of order β of the transformed achievements $I_j(x_j)$. The dimension weights $w_1, w_2, \ldots . w_m$ are all non-negative and their sum are assumed to be equals to one i.e. $w_j > 0$ and $\sum_j w_j = 1$. Following Alkire and Foster (2007, 2011) methodology where β is assumed equals to 1, equation (1) becomes;

$$I(x) = w_1 I_1 x_1 + \cdots + w_m I_m x_m \qquad (9)$$

Which is standard weighted arithmetic mean of the wellbeing index.

Next, we apply dual cut-off approach to this index in two steps. Firstly, a deprivation cut-off for each indicator is applied to identify 'health deprived' persons. Vector z is used to summarize the deprivation cut-off for indicator j, and it is denoted by zj. If $xij < zj$ then a person is deprived in an indicator j and non-deprived, otherwise. A deprivation status score gij is assigned to each person in each dimension based on the deprivation status. If person i is deprived in indicator j, then $gij = 1$; and $gij = 0$ otherwise.

Secondly, the weighted deprivation status score of each person is obtained to identify 'health deprived' people. An overall deprivation score ci is computed using equation (7).

After the identification of 'health deprived' individuals we calculate the percentage of the population who are 'health deprived' known as the **headcount ratio** (H).

$$H = \frac{q}{n} \qquad (10)$$

Where q and n denote number of 'health deprived' individuals and total number of individuals respectively. However, this headcount rate of 'health deprived' provide only the number of deprived and do not account for the intensity or severity of deprivation. The headcount ratio remains unchanged when individuals who are already 'health deprived' become more deprived in an additional dimension, or when their level of deprivation in a dimension deteriorates (Alkire et al 2011).

Therefore, this method not only estimate the number of the deprived individuals but also the **intensity** of their deprivation is included in the measurement. Intensity can be defined as; "The percentage of weighted dimensions in which the average 'health deprived' individuals are disadvantaged is called intensity of 'health deprivation' It can be obtained by:

$$A = \frac{\sum_{i=1}^{n} c_i(L)}{n} \qquad (11)$$

Where $c_i(L)$ is censored deprivation score.

Adjusted headcount ratio is computed as the Health Deprivation Index. This measure reflects both the incidence of health deprivation (the percentage of the population who are health deprived) and the intensity of health deprivation (the percentage of deprivations suffered by each individual or household on average). The CHDI and WHDI are calculated by multiplying the incidence (H) to the intensity (A). Therefore,

$$CHDI\ or\ WHDI = H \times A \qquad (12)$$

Weighing Scheme for WHDI and CHDI

In literature, there are different schemes for assigning weights to the indicators of the welfare indices, e.g. frequency based weights, expert opinion weights, statistical weights etc. (See e.g. Decanq and Lugo 2013, Belhadj 2012). However, there is no single widely accepted approach due to the lack of theoretical guidance (Alkire, 2011). Most of the studies use equal weights for the welfare indices. However, equal weighting scheme is criticized by researchers as well (Ravallion, 2011).

The Child Health Deprivation Index (CHDI) has two dimensions, namely, nutrition and wellbeing. We assigned equal weights to the dimensions of Child Health Deprivation Index (CHDI) and unequal weights to the indicators of both dimensions on the basis of relevant importance of the health indicator. In nutrition dimension, we assign higher weights (as compared to other indicators) to heights for age (stunting), weight for height (wasting) and breastfeeding on the basis of their long run impact on child's health. Similarly, in wellbeing dimension, we assign higher weights to immunization and diarrhoea as compared to fever and chest & nose infection.

The Women Health Deprivation Index (WHDI) has also two dimensions, namely, health and living standard. We assigned unequal weights to the dimensions of Women Health Deprivation Index (WHDI) and equal weights to the indicators of both dimensions. In WHDI, 60% weight are assign to health dimension and 40% given to the dimension of living standard. However, we also report results by applying equal weighting scheme for the purpose of comparison in appendix.

Data and Variable Construction

This study uses Pakistan Demographic and Health Surveys (PDHS) 1990-91, 2006-07 and 2012-13. The PDHS is representative at the national (urban and rural) and regional levels. The total household sample size is 13000 for 2012-13, 10,000 for 2006-07 and 9000 for 1990-91. The three surveys have been carried out using similar survey instruments, methodology and questions that are comparable across the time periods, allowing for inter-temporal analysis.

This analysis focused on the children and ever-married women sample as the unit of analysis to make the children-specific and women-specific needs visible. The Table-1(a) and Table-1(b) present the dimensions and indicators of Women and Child Health Deprivations along with their weights and deprivation cut-off. Whereas, the Table-2(a) and Table-2(b) present the determinants of Women and Child Health Deprivations Indices.

Table 1(a): Dimensions, Indicators and Deprivation Thresholds WHDI

Dimension	Weights	Indicators	Deprivation cut-off
Health (60%)	6.25%	Age at first birth	=1 if responded age is less than and equal to 18 year; =0 otherwise
	6.25%	Ante-natal care	=1 if responded never visit, 1 visit and 2 visit during pregnancy period; =0 otherwise
	6.25%	Getting medical help for self; permission to go	=1 if responded had big problem in permission; =0 otherwise
	6.25%	Getting medical help for self; money needed for treatment	=1 if responded had big problem in money needed for treatment; =0 otherwise

	6.25%	Getting medical help for self; distance to health facility	=1 if responded had big problem in distance to health facility; =0 otherwise
	6.25%	Getting medical help for self; having to take transport	=1 if responded had big problem in having transport; =0 otherwise
	6.25%	Getting medical help for self; cannot go alone	=1 if responded had big problem that she cannot go alone; =0 otherwise
	6.25%	Health check-up after discharge from delivery	=1 if no check-up; =0 otherwise
Living standard (40%)	16.7%	Sanitation Facilities*	=1 for unimproved Sanitation facilities; =0 otherwise
	16.7%	Source of drinking water**	Water = 1 for unprotected source of water; =0 otherwise
	16.7%	Wealth index	=1 for poorer or poorest; =0 otherwise (middle, richer and richest)

* Unimproved Sanitation facilities includes flush to somewhere else, flush don't know where, open pit, open field/bush and others.

** Unprotected source of water includes unprotected well, unprotected spring, tanker truck, cart with small tank, surface water and others

Table 1(b): Dimensions, Indicators and Deprivation Thresholds for CHDS

Dimension	**Weights**	**Indicators**	**Deprivation cut-off**
Nutrition (50%)	6%	Weight at birth	=1 if size of child is smaller than average or very small; =0 otherwise
	18%	Height for age (stunting)	children whose height-for-age Z-score is <−2.0 standard deviations (SD) below than mean on the WHO Growth Standards (2006) considered stunted
	14%	Weight of child (wasting)	children whose weight-for-age Z-score is less than−2.0 standard deviations (SD) below than mean on the WHO Growth Standards (2006) considered underweight

	12%	Breastfeeding	=1 if child is never breastfed or not currently breastfed; =0 otherwise
Health/wellbeing (50%)	18%	Diarrhoea	=1 if child had diarrhoea in the last two weeks; =0 otherwise
	20%	Immunization	=1 if child is never vaccinated; =0 otherwise
	8%	Chest and nose infection	=1 if child had problem in the Chest and blocked or running nose (1=chest only, 2=nose only, 3=both); =0 otherwise
	4%	Fever	=1 if child had fever in the last two weeks; =0 otherwise

Table 2(a): Determinants of Women Health Deprivation

	Variable	**Description**
Women Health Deprivation	Female Education	Dummy equals 1 if the women in the household has primary and 0 for uneducated women
	Husband Education	Dummy equals 1 if the husband has primary and 0 for uneducated
	Region	Dummy equals 1 if women is a residential of urban and 0 for rural
	Household size	Number of household members
	5-year birth interval	Number of births in the last five years
	Total child ever born	Total Number of children
	Women Empowerment	Dummy equals 1 if mother is empowered in deciding to visit relatives or family
	Husband Employment	Dummy equals 1 if the husband is employed and 0 otherwise
	Female Employment	Dummy equals 1 if the women is employed and 0 otherwise

Table 2(b): Determinants of Child Health Deprivation

	Variable	Description
Child Health Deprivation	Mother Education	Dummy equals 1 if the women in the household has primary and 0 for uneducated women
	Region	Dummy equals 1 if women is a residential of urban and 0 for rural
	Water	Water = 1 for unprotected source of water; =0 otherwise
	Household size	Number of household members
	5-year birth interval	Number of births in the last five years
	Father Employment	Dummy equals 1 if the husband is employed and 0 otherwise
	Mother Employment	Dummy equals 1 if the women is employed and 0 otherwise
	Sanitation	=1 for unimproved Sanitation facilities; =0 otherwise
	Wealth Index	=1 for poorer or poorest; =0 otherwise (middle, richer and richest)

Estimation Results

The Intertemporal Analysis of Women Health Deprivation Index

The results for WHDI are given in table 3(a). The WHDI is calculated as the product of intensity and the incidence of health deprivations for the three years 1990-91, 2006-07 and 2012-13 respectively. In 2012-13, 16.46% of women are found to experience health deprivations as compared to 52% in 1990-91. Women's are deprived from at least half of the weighted indicators of health in 2012-13. The WHDI is significantly lower in urban areas (3.36%) as compared to rural areas (23.05%). The intertemporal analysis of health deprivations of women in Pakistan, reveal that the intensity of health deprivation experienced by women decline from 63.12% in 1990-91 to 46.87% in 2006-07 and increased to 49.72% in 2012-13. The 2% increase in WHDI in 2012-13 as compared to 2006-07 is attributed to the intensity of health deprivations, however the incidence have reduced from 39% to 33%. It shows that the average number of women deprived from the weighed set of indicators is increasing in Pakistan. Although the incidence of health deprivations has reduced. We can say that health deprivations are being reduced by reducing the deprivations of people only who are marginally poor, not by reducing the deprivations of the poorest of the poor.

Table 3(a): Women Health Deprivation Index (WHDI)

	1990-91			2006-07			2012-13		
	Pak	**Rural**	**Urban**	**Pak**	**Rural**	**Urban**	**Pak**	**Rural**	**Urban**
A (Intensity)	63.12	65.42	53.67	46.87	47.16	43.75	49.72	50.04	45.68
H (Incidence)	82.41	95.43	52.79	39.21	53.84	10.08	33.12	46.07	7.35
WHDI	52.02	62.43	28.33	18.38	25.39	4.41	16.46	23.05	3.36

The Intertemporal Analysis of Child Health Deprivation Index

The results for CHDI are reported in table 3(b). The CHDI is also calculated as the product of intensity and the incidence of health deprivations for all periods. In 1990-01 children were deprived form 50.69% of the weighted indicators of health, which declined in 2006-07 (37%). However, the intensity of health deprivations increased from 37% in 2006-07 to 49% in 2012-13. The incidence of health deprivations increased from 35.92% in 2006-07 to 40.85% in 2012-13. There are no significant differences experienced for intensity of health deprivations in 2012-13 and 2006-07 in urban and rural areas. However, the comparison of women and children health deprivations show that the deprivations faced by children are higher than that of women. The one possible reason could be the transmission of women deprivation into child deprivation as being deprived mother.

Table 3(b): Child Health Deprivation Index (CHDI)

	1990-91			2006-07			2012-13		
	Pak	**Rural**	**Urban**	**Pak**	**Rural**	**Urban**	**Pak**	**Rural**	**Urban**
A (Intensity)	50.69	59.79	50.44	37.50	37.78	37.00	49.44	49.62	48.91
H (Incidence)	43.30	45.80	37.89	35.92	34.56	38.63	40.85	44.22	33.22
CHDI	21.95	23.26	19.11	13.47	13.06	14.29	20.19	21.94	16.25

Determinants of Women Health Deprivations

Table 4(a) reports the results of logistic regression for the determinants of women health deprivation in 1990-91, 2006-07 and 2012-13. Apart from three variables, other variables are significant at 5% level of significance in 1990-91. The variables which are found to have negative and significant impact on health deprivation for women in 1990-91 are also negatively associated in 2006-07 and 2012-13. These variables are education of women and

being resident of urban areas. The odds for being deprived from health decrease by 76% for educated women as compared with uneducated in 1990-91 and 2012-13. Similarly, for husband's education the odds are 62% (2006-07) and 55% (2012-13) are in the favour of decline in the health deprivation score. Women with large number of children are expected to be more deprived from health. The increase in the number of children born the last five years increase the chances for women for being deprived from health by 58% (2012-13), *ceteris paribus.* The increase in the children born increase the odds for being deprived from healthy life by 4% in 1990-91 and 2% in 2012-13, *ceteris paribus.* The employed husband has high influence on women's health in 2012-13 (odds are 45%) as compared to 1990-90 (odds are 12%).

Table 4(a): Logistic Regression Estimates for Determinants of Women Health Deprivation

	1990-91		**2006-07**		**2012-13**	
Variable	**Co-eff**	**Odds Ratio**	**Co-eff**	**Odds Ratio**	**Co-eff**	**Odds Ratio**
Female Education	-1.42*	0.24	-1.46*	0.23	-1.41*	0.24
Husband Education	-0.48*	0.62	-0.98*	0.38	-0.79*	0.45
Region	-2.19*	0.11	-1.98*	0.14	-1.39*	0.25
Household size	0.02*	1.02	-0.03*	0.97	-0.01	0.99
No. of births in last 5-years	0.90*	2.46	0.47*	1.60	0.46*	1.58
Total child ever born	0.04*	1.04	-0.04*	0.96	0.02*	1.02
Women Empowerment	-	-	-	-	-0.66*	0.52
Husband Employment	-0.13*	0.88	0.01	1.01	-0.61*	0.55
Female Employment	0.00	1.00	0.55*	1.74	0.07	1.07
Gender of household head	-0.09	0.91	0.40*	1.49	-	-
Constant	2.50	12.19	-0.82*	0.44	1.36	3.90

*****Significance at 5%

Determinants of Child Health Deprivations

We report results of child health deprivation in table 4(b). According to results educated mothers are expected to have more healthy children, the odds to have unhealthy children are expected to be less by 40%, 41% and 38% for 1990-91, 2006-07 and 2012-13 respectively. The residence in the urban area also reduces the chances for children to be deprived from health by 11% and 2% for 1990 and 2012-13 respectively. The households with large number of individuals have higher chances to have unhealthy children. As the odds of increase in health deprivation score of children are expected to increase by 2% with an increase in household size for both 1990-91 and 2012-13.

Similarly, the increase in number of births increase the chances to have health deprived children. The increase in number of births negatively effects the health of mother that in turn negatively effects the health of her children. As the odds to have unhealthy children due to increase in births are 6% for 1990 and 8% for 2012-13. The mother's employment also appeared to have significant and positive impact on the health deprivation score of children for the three years. The improved sanitation and water facilities are the prerequisites for healthy environment, and they directly affect the individual's health. Therefore, the unimproved sanitation system also increases the health deprivations of children, the odds are calculated as 29% for 1990-90 and 10% for 2006-07. However, sanitation found to be insignificant in 2012-13. The living standard of households significantly affects the health status of children. The children residing in poor households have high chances to have unhealthy life as the odds are 79%, 26% and 95% for 1990-91, 2006-07 and 2012-13 respectively.

Table 4(b): Logistic Regression Estimates for Determinants of Child Health Deprivation

	1990-91		**2006-07**		**2012-13**	
Variable	**Co-eff**	**Odds Ratio**	**Co-eff**	**Odds Ratio**	**Co-eff**	**Odds Ratio**
Mother Education	-0.51*	0.60	-0.52*	0.59	-0.47*	0.62
Region	-0.11*	0.89	0.16*	1.17	-0.02	0.98
Water	-0.07	0.93	-0.35*	0.70	0.50*	1.66
Household size	0.02*	1.02	0.00	1.00	0.02*	1.02
5-year birth interval	0.06	1.06	-	-	-0.09*	0.92
Father Employment	0.40*	1.50	0.01	1.01	-0.18	0.84
Mother Employment	0.25*	1.28	0.18*	1.20	0.30*	1.35
Sanitation	0.25*	1.29	-0.11*	0.90	-0.13	0.87
Wealth Index[1]	0.58*	1.79	-0.30*	0.74	0.67*	1.95
Constant	-1.36	0.26	-0.34	0.71	-0.38	0.68

*****Significance at 5%

[1] In 1990-90 wealth index is replaced by asset variable, a household is said to be deprived if do not possess the three small assets.

Decomposition of Health Deprivation Indices

The results for the decomposition of women and child health deprivation indices are given in table 5(a) and 5(b) respectively. The contribution of each variable indicates relative importance of that variable in the respective index. In case of WHDI, wealth index has high share among all variables in three years (1990, 2006 and 2012). Whereas distance to health facility, need transport to health facility and cannot go alone each contribute 10% in overall index in 2012. However in 1990, sanitation, cannot go alone, health check-up after delivery and antenatal care contribute 21%, 15%, 11%, and 10.68% respectively.

However, in case of CHDI, immunization has highest contribution in child deprivation, followed by height for age (stunting) and weight for age (wasting). In both years, 1990 and 2012, contribution of immunization, height for age and weight for age is around 33%, 28% and 12% respectively. Incidence of diarrhoea contributes around 15% in overall index of 2012.

Table 5(a): Decomposition of Women Health Deprivation Index

Variable	**Contribution of each variable (%)**		
	1990	**2006**	**2012**
Age at first birth	7.36	5.29	4.91
Antenatal care	10.68	7.76	6.48
Health check-up after delivery	11.27	6.67	5.10
Need permission to go hospital	-	3.93	4.62
Need money for medical help	-	1.69	7.73
Distance to health facility	-	0.42	9.56
Need transport to go to health facility	-	-	10.10
Can't go alone	15.44	0.47	10.75
Wealth Index	28.09	34.02	30.15
Water	6.38	5.62	4.99
Sanitation	20.78	34.12	5.60
Total	100.00	100.00	100.00

Table 5(b): Decomposition of Child Health Deprivation Index

Variables	Contribution of each variable (%)		
	1990	**2006**	**2012**
Diarrhoea	9.76	2.41	15.42
Fever	3.18	0.53	3.75
Breastfeeding	2.48	92.77	3.85
Immunization	33.05	3.68	32.60
Chest and nose infection	6.98	0.61	3.93
Weight at birth	4.21	1.91	2.89
Height for age	28.05	-	28.05
Weight of child	12.30	-	12.40
Total	100.00	100.00	100.00

Conclusion and Discussion

This study try to analyse health deprivation in women and child to understand the health issues of two important member of society. Consequently, investment in women and child health could be the possible tool that can trigger the pace of economic development and growth.

The health deprivations are found to be higher for poorer women as compared to richest. Mamun and Finley (2015) using Demographic and Health Surveys for 36 low to middle income countries also found that the risk of being deprived from healthy life style is low for wealthy, highly educated and urban women. However, none of the study computed the determinants of weighted health deprivation score of women, as in our case. The findings of this study also suggest that the health deprivations of women are being declined in Pakistan in terms of magnitude rather than intensity. On average, women are deprived from at least half of the weighted indicators. Vriendt et. al (2009) also highlighted that the most important determinants of women's maternal health and nutrition are education, age, and occupation of women. Adjiwanou et al (2018), for 37 developing Asian and African countries using DHS surveys showed that the partner's education has a strong effect on mother's health. Women whose husbands are above secondary level of education are more likely (43%) to visit ante-natal care as compared to women with partner having no education. The female education, her husband's education, household size and number of births are the main determinants of health deprivations of women in Pakistan. The findings of Dar and Afzal (2015) also support these results that women's education, husband's level of education, type of occupation and child birth order are the main determinants of maternal health care of women in Pakistan. Other studies for the determinants of maternal health also support these results that women's health is significantly affected by her education (Ross and Wu 1996).

Apart from women, children also face severe deprivations of health in Pakistan. Earlier studies focused on the determinants of single indicator of health for children e.g. immunization, malnutrition etc. However, this study focused on the determinants of the weighted deprivation score of health computed for each child. The main

determinants of child health are mother's education, region, household size, number of births in the last five years, water and sanitation facilities and financial status (proxies by wealth index). Educated mothers are more likely to have healthy children. Moreover, being resident of urban area reduces health deprivations of children. Aslam and kingdom (2012) report that parental education is positively associated with immunization decisions of their children while empowerment of mother and her education impact her child's height and weight in long-term.

Policy Recommendations

The child health deprivations can be reduced by improving the improved sources of water as the water and sanitation facilities are significantly contributing towards the health deprivations of children. The intensity of health deprivations should be focused rather than the incidence. It implies that people facing severe health deprivations should be focused separately to reduce the intensity. The accessibility of health facilities should be increased on priority basis as the women health deprivations are mainly coming from inaccessibility of health facilities.

REFRENCES

Adjiwanou, V., Bougma, M., & LeGrand, T. (2018). The effect of partners' education on women's reproductive and maternal health in developing countries. Social Science & Medicine, 197, 104-115.

Adm, T., Lim, S. S., Mehta, S., Bhutta, Z. A., Fogstad, H., Mathai, M., Zupan, J., Darmstadt, G. L. (2005) Cost effectiveness analysis of strategies for maternal and neonatal health in developing countries. BMJ, 331, 1107-1110.

Ali, M., & Zeb, F. (2017). Maternal Formal Education in Association with Nutritional Status of Children (Less-than Two Years).

Alkire, S. (2007). The missing dimensions of poverty data: Introduction to the special issue. *Oxford development studies*, *35*(4), 347-359.

Alkire, S., & Foster, J. (2011). Counting and multidimensional poverty measurement. Journal of public economics, 95(7), 476-487.

Alkire, S., Roche, J. M., Santos, M. E., & Seth, S. (2011). India country briefing. In Oxford Poverty & Human Development Index (OPHI) Multidimensional Poverty Index Country Briefing Series.

Aslam, M., & Kingdon, G. G. (2012). Parental education and child health—understanding the pathways of impact in Pakistan. *World Development*, *40*(10), 2014-2032.

Becker, G. S. (1960). An Economic Analysis of Fertility, Demographic and economic change in developed countries: a conference of the Universities. *National Bureau Commitee for Economic Research*, *209*.

Belhadj, B. (2012). New weighting scheme for the dimensions in multidimensional poverty indices. *Economics Letters*, *116*(3), 304-307.

Bhutta, Z. A., Ali, S., Cousens, S., Ali, T. M., Haider, B. A., Rizvi, A., Okong, P., Bhutta, S. Z., Black, R. E. (2008b) Alma-Ata: Rebirth and Revision 6: Interventions to address maternal, newborn, and child survival: what difference can integrated primary health care strategies make? *Lancet,* 372**,** 972-989.

Bhutta, Z. A., Memon, Z. A., Soofi, S., Salat, M. S., Cousens, S., & Martines, J. (2008). Implementing community-based perinatal care: results from a pilot study in rural Pakistan. *Bulletin of the World Health Organization*, *86*, 452-459.

Christian, P. (2009) Prenatal origins of undernutrition. *Nestle Nutr Workshop Ser Pediatr Program,* 63**,** 59-73; discussion 74-7, 259-68.

Currie, J., & Stabile, M. (2006). Child mental health and human capital accumulation: the case of ADHD. Journal of health economics, 25(6), 1094-1118.

Dad, F., & Habib, I. (2017). Mother's knowledge, attitude and practices (KAP) regarding complementary feeding for children age 06-24 months in Kurrum Agency of FATA Pakistan. *J Prev Med Public Health*, *3*, 33-42.

Dar, S., & Afzal, U. (2015). Education and Maternal health in Pakistan: The pathways of influence. The Lahore Journal of Economics, 20(2), 1.

Das, J., Do, Q. T., Friedman, J., McKenzie, D., & Scott, K. (2007). Mental health and poverty in developing countries: Revisiting the relationship. Social Science & Medicine, 65(3), 467-480.

De Vriendt, T., Matthys, C., Verbeke, W., Pynaert, I., & De Henauw, S. (2009). Determinants of nutrition knowledge in young and middle-aged Belgian women and the association with their dietary behaviour. Appetite, 52(3), 788-792.

Decancq, K., & Lugo, M. A. (2013). Weights in multidimensional indices of wellbeing: An overview. Econometric Reviews, 32(1), 7-34.

Haines, A., Sanders, D., Lehmann, U., Rowe, A. K., Lawn, J. E., Jan, S., ... & Bhutta, Z. (2007). Achieving child survival goals: potential contribution of community health workers. *The Lancet*, *369*(9579), 2121-2131.

Isaia, M., Theodorou, M., Galanis, P., Nikolentzos, A., & Polyzos, N. (2017). Breastfeeding determinants in Cyprus: A cross-sectional study. *Journal of Neonatal Nursing*, *23*(6), 267-274.

Jones, G., Steketee, R. W., Black, R. E., Bhutta, Z. A., Morris, S. S., & Bellagio Child Survival Study Group. (2003). How many child deaths can we prevent this year?. The lancet, 362(9377), 65-71.

Kuruvilla, S., Schweitzer, J., Bishai, D., Chowdhury, S., Caramani, D., Frost, L. & Cohen, R. (2014). Success factors for reducing maternal and child mortality. *Bulletin of the World Health Organization*, *92*, 533-544.

Lanigan, J., & Singhal, A. (2009). Early nutrition and long-term health: a practical approach: Symposium on 'Early nutrition and later disease: current concepts, research and implications'. *Proceedings of the Nutrition Society*, *68*(4), 422-429.

Linnemayr, S., Alderman, H., & Ka, A. (2008). Determinants of malnutrition in Senegal: Individual, household, community variables, and their interaction. *Economics & Human Biology*, *6*(2), 252-263.

Mamun, A. A., & Finlay, J. E. (2015). Shifting of undernutrition to overnutrition and its determinants among women of reproductive ages in the 36 low to medium income countries. Obesity research & clinical practice, 9(1), 75-86.

Minujin, A. (2012). Making the case for measuring child poverty. *Child Poverty and Inequality*, 14.

Prescott-Clarke, P. (1998). *Health Survey for England: The Health of Young People'95-97*. HM Stationery Office.

Ravallion, M. (2011). On multidimensional indices of poverty. The Journal of Economic Inequality, 9(2), 235-248.

Roelen, K., & Gassmann, F. (2008). Measuring child poverty and well-being: A literature review. Working paper, Maastricht Graduate School of Governance.

Romer, P. M. (1989). *Human capital and growth: theory and evidence* (No. w3173). National Bureau of Economic Research.

Ross, C. E., & Wu, C. L. (1996). Education, age, and the cumulative advantage in health. Journal of health and social behavior, 104-120.

Schultz, T. W. (1962). Reflections on investment in man. *Journal of political economy*, *70*(5, Part 2), 1-8.

Scott, J. A., & Binns, C. W. (1999). Factors associated with the initiation and duration of breastfeeding: a review of the literature. *Breastfeeding review: professional publication of the Nursing Mothers' Association of Australia*, *7*(1), 5-16.

Skafida, V. (2012). Juggling work and motherhood: the impact of employment and maternity leave on breastfeeding duration: a survival analysis on Growing Up in Scotland data. *Maternal and child health journal*, *16*(2), 519-527.

Spencer, N. (2000). *Poverty and child health* (No. Ed. 2). Radcliffe Medical Press Ltd.

UNDP, U. (2015). Human development report 2015: Work for human development. United Nations Development Programme.

Unicef. (2012). The state of the world's children 2012: children in an urban world. eSocialSciences.

Victora, C. G., Adair, L., Fall, C., Hallal, P. C., Martorell, R., Richter, L. & Maternal and Child Undernutrition Study Group. (2008). Maternal and child undernutrition: consequences for adult health and human capital. *The lancet*, *371*(9609), 340-357.

Wachs, T. D. (2008). Multiple influences on children's nutritional deficiencies: a systems perspective. *Physiology & Behavior*, *94*(1), 48-60.

Whalen, B., & Cramton, R. (2010). Overcoming barriers to breastfeeding continuation and exclusivity. *Current opinion in pediatrics*, *22*(5), 655-663.

Appendix

Result's Comparison of Child Health Deprivation with Equal Weights to All Indicators

Table 3(b'): Child Health Deprivation Index (CHDI)

	1990-91			**2006-07**			**2012-13**		
	Pak	**Rural**	**Urban**	**Pak**	**Rural**	**Urban**	**Pak**	**Rural**	**Urban**
A (Intensity)	48.58	48.53	48.72	46.49	46.92	45.45	46.84	47.08	46.13
H (Incidence)	42.50	44.39	38.40	8.12	8.62	7.14	41.88	44.80	35.30
CHDI	20.65	21.54	18.71	3.78	4.04	3.24	19.62	21.09	16.28

Table 4(b'): Logistic Regression Estimates for Determinants of CHDI

	1990-91		**2006-07**		**2012-13**	
Variable	**Co-eff**	**Odds Ratio**	**Co-eff**	**Odds Ratio**	**Co-eff**	**Odds Ratio**
Mother Education	-0.30*	0.74	0.05	1.05	-0.26*	0.77
Region	-0.15*	0.86	-0.03	0.97	-0.17*	0.85
Water	-0.18*	0.83	0.14*	1.15	0.36*	1.43
Household size	0.02*	1.02	0.03*	1.03	0.01	1.01
5-year birth interval	0.08*	1.08	-	-	-0.22*	0.81
Father Employment	0.56*	1.75	0.18	1.20	0.02	1.02
Mother Employment	0.31*	1.36	-0.04	0.96	0.30*	1.35
Sanitation	0.19*	1.20	0.08*	1.09	-0.01	0.99
Wealth Index	0.58*	1.78	0.28*	1.32	0.41*	1.50
Constant	-1.51	0.22	-3.00	0.05	-0.11	0.89

Table 5(b'): Decomposition of Child Health Deprivation Index

Variables	Contribution of each variable (%)		
	1990	**2006**	**2012**
Diarrhoea	6.96	11.72	10.69
Fever	15.19	16.63	16.91
Breastfeeding	3.08	19.60	4.82
Immunization	20.12	25.09	18.68
Chest and nose infection	16.01	9.80	10.47
Weight at birth	9.52	17.16	8.35
Height for age	17.19	-	18.01
Weight of child	11.92	-	12.06
Total	100.00	100.00	100.00