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Consequences of Uncertain Food Prices on Household Health and Education Living in Urban Areas of Pakistan

Nigar Zehra[1]

[1]Assistant Professor/ Research Economist, Applied Economics Research Centre, University of Karachi.
Correspondence: nigarzehra17@gmail.com[1]

ABSTRACT

Aim of the Study: The aim of this research paper was to develop the household deprived health and education index for thirteen cities of Pakistan. The paper also identifies the impact of uncertain food prices (volatility in food prices) on household health and education deprivation.

Methodology: The study conducted using the methodology of pseudo panel fixed effect for four waves of PSLM data.

Findings: The results also explained that the volatility in food prices increase the deprivation in both dimensions i.e., health and education.

Conclusion: It is concluded that in terms of education deprivation Quetta is the most deprived large city and stand at the 1st rank while, Bahawalpur is the most deprived city in terms of household health in 2014-15. The study recommended that government should build more schools and health care centers to provide free quality education and medical treatment.

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Introduction

Healthy and educated population play a significant role for the economy of any country as it leads to productive labour and encourage economic growth. However, inflated food prices are the biggest hurdle for the household health and education attainment. International food prices are persistently high and volatile since the international food predicament of 2008, provoking hunger and undernourishment all over the world. High and growing food prices can not only be a direct threat to food security of households but it also deprived population health, discouraging human development, and depressing labor productivity for the country in the long run [Park (2013)]. Volatility in food prices is an additional issue, that is much severe than inflated food prices. According to Zehra and Fatima (2022), high food prices affect consumers while volatility harms both the consumers and producers. Heightened uncertainty is the biggest reason of household to compromise their sustainable and long-term consumption decisions that lengthening the condition of insufficient food-intake. Similarly uncertainty in food prices is a risk associated with producer's profit that limits the producer to invest in the crop with volatile prices.

Health and Education attainment is very much dependent on food inflation [Afzal etal (2013)]. Pakistan is a developing country and according to Asian Development Bank in 2018 about 21.9% people live below the poverty line. Poor households devote large portion of their income on food consumption. In times of high food prices household heads are more concerned to accomplish their basic food requirements rather to invest in education of their children. They send their children to labor market to make money rather to send school [Afzal etal (2013)]. Likewise it is difficult for poor households to spend on health. To save high doctor fee they treat themselves at home by self-medication, which sometimes make the situation worse and life-threatening. Households do not provide pregnant women proper prenatal care; similarly they do not get services of trained staff at times of their delivery. Furthermore, households do not spend on immunization due to high volatility in food prices [Zehra (2020)]. There are several studies that highlighted the impact of food inflation on household education. To the best of author's information there is no empirical study that relates food price volatility with health using deprived health index as proxy in Pakistan. Though, a research by Brinkman, et al; (2009) reflected negative influence of food prices on child health in developing economies, where Pakistan was among them. Furthermore, in World Health Organization report (2008); it was descriptively explained that the swift increase in food prices, deteriorated malnutrition rates, that further increase health care cost, low productive efficiency and wasting in children. To avoid the problem most of the people have changed their dietary pattern towards cheaper foods. Furthermore, the poor people of urban areas were unable to consume nourished food due to high cost. Another study of Zehra (2020) highlighted that volatility in food prices affect the child health by reducing the child immunization. Similarly the research of Hou, et al. (2016) is the only study that explains the link between food prices and child education attainment in Pakistan. Furthermore Zehra in 2020 explain the adverse impact of food price volatility on child education attainment. The author found no study that explains the impact of volatile food prices on deprived household education index. To fill the given gaps the aims of the research is to explain the impact of food price volatility on household deprived health and education index. The study will help the policy makers to develop such policies which maintain high and quality education and health standards even in times of uncertain food prices.

After introduction in Section 1, the paper is structured as in Section 2 detailed literature is given, Section 3 explains the methodology and model specification, Section 4 discusses the empirical results and Section 5 provides the conclusion and policy implication.

Literature Review

This section presents the review of those studies which identify the impact of high food prices on household's health and education attainment. In this regard Torlesse, et al. (2003) used yearly data of rate of underweight[1] children for the period of 1992 to 2002, for rural Bangladesh. The authors examined the impact of rice price on child health and concluded that high rice price reduced the household expenditure on rice and increased non-rice expenditures that ultimately decreased the rate of underweight children due to an increase in the quality of food. Hence, high price of rice reduced the rate of underweight children in Bangladesh.

Hartwig (2008) assessed the causal effect of high food prices on child mortality and acute under nutrition in Malawi, by employing the pooled cross-sectional data for the period of 2000 and 2004. On the basis of difference-in-difference estimation (DID) technique, it was concluded that food price distress did not affect child mortality and acute under nutrition significantly in areas which were affected. In 2009, Sulaiman, et al, identified the implications of high food prices on the health of child (weight for height) and mother (weight) by assessing the two periods before (2006) and after food price crises (2008) in

[1] When, the values of weight for age z-score are more than two standard deviations, lower than the internationally recognized reference value.

Bangladesh. The paired t-tests were used by the authors for investigating variation in children's and mothers' health. For panel data of rural part of Bangladesh the multivariate regression model was used with household fixed effects. However, for urban Bangladesh, on the basis of cross-sectional data, it was concluded that children's heath was deteriorated, both in rural and urban parts; while mothers' health improved in rural Bangladesh and did not affect in urban areas.

Raihan (2009) collected the three rounds of data based on 2006, 2007 and 2008 and analyzed the impact of high food prices on child education in Bangladesh. It was concluded that due to rise in prices of rice, edible oil and pulses; poor households of Bangladesh reduced their spending on child schooling which increased drop out percentage of the school going children. Majority of these children were engaged in work to contribute in their household income.

Brauw (2011) used individual panel data and repeated the cross sectional data of 2008 for El Salvador. The study identified that in 2008, food price inflation was 15 per cent that negatively affected the height for age Z scores in children below 3 years age and on an average, it was reduced by 0.2 standard deviations. It was also found that decline in height for age Z score was lower for those children who belonged to families with access to international migrants.

Another study of Lee, et al. (2013), based on 63 developing countries, concluded that during 2001 to 2010 the elevated food prices were adversely affect the different health variables like infant and child mortality and under nourishment rate. In addition, it was also established that volatile food prices, elevated child and infant mortality, however had no influence on rate of undernourishment.

Hoda Abd El Hamid (2013) observed the effect of food prices on different factors of child education for instance; enrolment in primary, completion of primary school, and female to male ratio of primary enrolment rates. Region wise cross sectional data for the period of 2006 to 2009 of all sub-Saharan African states was used. Ordinary least squares (OLS) model, was used to inspect the effect of per capita income, life expectancy, student's expenditure in primary schooling, percentage of government expenditure on education to GDP on each educational outcomes and urban population. It was established that high food prices reduced the percentage of primary school completion while, food prices had no substantial influence on rate of primary enrollment and female to male ratio. It was also analyzed that increase in government expenditure increase the female to male ratio and rate of primary enrolment. Similarly, there was a positive and significant links between per capita income and primary school completion. Moreover, life expectancy also increased the primary enrolment rates and female to male ratio. Furthermore, increase in expenditure on primary schooling reduced the rate of primary enrolment. While found no significant link among outcome of child education and urban population.

Chibuye (2014) assessed the impact of price increase in different food products on the health of children, less than five years in Zambia. For this purpose the household level data was analyzed for the periods of 2006 and 2010. On the basis of district fixed effect, it was found that high prices of energy and protein rich food items like cereal beans, chicken and eggs; adversely affect the children's health.

Vellakkal, et al. (2015) investigated the relationship between spikes in food prices and child malnutrition in Andhra Pradesh state, India. They studied the two periods: the pre- and post-food price spikes; i.e., before 2006 and after 2009, respectively. For child malnutrition they used wasting in children, as a proxy. On the basis of 'two-stage least squares instrumental variable models' it was found that growing prices of eggs, legumes, rice and further staples which were included in Indian diets had positive and significant impact on wasting in children.

Fledderjohhan et al. (2016) analyzed the influence of food prices on child mortality for 364 Indian districts for the period 2002 to 2008. First differenced linear regression model was applied and determined that in highly deprived districts, child mortality has risen due to the high food prices of meat and dairy products.

Hou, et al. (2016) concluded that used two years panel survey data from PSLM 2008 and 2010 and determined that high wheat prices decrease the children's enrolment rate that further increase the child labour. Furthermore, high wheat prices have little effect on girls' enrolment that is because low girl's enrolment rate before crises. Moreover high wheat prices did not affect the enrolment of children who belong to households having agricultural land.

The consequences of food price inflation on children's health in Ethiopia, was investigated by Woldemichael, et al. (2017), using stunting, wasting and underweight, as proxies of child health for children below the age of five years. They analyzed 15 years data from 1996 to 2015, on the basis of OLS results found negative impact of high food prices on child health. In 2020 Zehra found negative impact of food price volatility on child health and education attainment using Propensity Score Matching technique.

Methodology and Model Specification

To develop deprived health index (DHI) and deprived education index (DEI), the study uses Pakistan Social and Living Standard Measurement Survey (PSLM), and the Household Integrated Economic Survey (HIES) data for the years 2007-08, 2011-12, 2013-14 and 2014-15. Furthermore, the study gathered the data of food price volatility from the research of Zehra and Fatima 2022[2]. This research used the methodology given by Alkire and Foster (2007), and Alkire and Santos (2010) to construct Household Deprived Health Index (DHI) and Household Deprived Education Index (DEI) for thirteen big cities of Pakistan. The list of indicators and their weights used to construct deprived health and education index are given in Table 1.

Table 1: *Indicators and Weights used to Develop DEI and DHI*

Dimension	Indicator	Weights
Education	Years of Schooling	(1/6)
	Attendance of Child in School	(1/8)
	Quality of Education	(1/24)
Health	Access to Health	(1/6)
	Immunization	(1/18)
	Prenatal care	(1/18)
	Trained Delivery	(1/18)

Source: UNDP and OPHI's Human Development Report (2017).

Deprivation in Education

The deprived education index includes three variables. Firstly, the years of schooling where a household should have at least one male and one female member (exceeding ten years of age) with at least five years of education in a school. This variable is deprived if a household fails to meet this requirement. Secondly, attendance of a child in school: a household should have all school age children (between the age of six to eleven) studying in a school. This variable is deprived if a household fails to meet this requirement. Thirdly, the quality of education; i.e., if there is no problem in quality of school or a child is satisfied with the facilities in school. This variable is deprived if a child is not attending school because of the reason of shortage of teachers, if a school is far away, or non-availability of male and female teachers and finally if the standard of school is not good. Further, this category also includes, if child is attending school but remains unsatisfied of the facilities available in school.

All the three sub-indicators are dichotomous i.e. in 0 and 1, 1 means that a household is deprived and 0 means that it is not-deprived. After multiplying the variables with their weights mentioned in Table 1, the

[2] "Food price volatility and household welfare: A case study of major cities of Pakistan" by Nigar Zehra and Ambreen Fatima (iba.edu.pk)

linear addition of these three variables forms the deprived education index and a cut-off value that is around 0.3 is applied. It enables to explain that if the DEI values for the households are 0.3 or more than 0.3, they are considered deprived or facing the problem of education.

Deprivation in Health

The deprived health index includes four different variables. First is the Access to Health: Household feels that basic health units, clinics or health facilities are adequate. This variable is deprived if these health facilities are not used by household (at all or only once) due to its access problem, for example, if they are too far away; government facilities are not available, doctors are not available or they cannot treat complications, staff is untrained or not helpful, female staff is not available, medicines are ineffective or insufficient, etc. Second is the Immunization: All children in the household (below five years of age) are fully immunized. This variable is deprived if any child below five years of age is not fully immunized (as given in the vaccinations chart), for, example BCG, DPT, measles, hepatitis, polio, etc., (those households which do not have any child below five years of age are assumed non-deprived). Third, is the Prenatal Care; this variable includes mothers in a household who have received prenatal care that has given birth to a child during past three years. The variable is deprived if any mother in a household has undergone a delivery in the past three years but did not get any prenatal examination; a household where no woman has undergone a delivery is assumed as non-deprived. Fourth is the Trained Delivery: If a female in a household has undergone a delivery case (in the past three years) by trained staff (like, doctor, trained *dais*, lady health visitor or a nurse or was given birth to a suitable maternity place (government or private hospital, or clinic). This variable is considered to be deprived if in a household (in the past three years) a delivery case was assisted by an untrained staff (family member, relative, neighbor, friend, etc), or the case was dealt in an unsuitable place (home, other place). The household which had no woman who underwent a delivery (case in the past three years) would be assumed as non-deprived.

The above four sub-categories are also dichotomous where, 1 means that a household is deprived and 0 means non-deprived. After multiplying the variables with their weights, mentioned in Table 1 the linear addition of these variables forms a deprived health index and a cut-off value that is around 0.3 is applied. It enables to explain that if the DHI values for the households are 0.3 or more than 0.3, they are considered deprived or facing the problem of health.

Moreover, pseudo panel fixed effect method is used to identify the link between food price volatility and deprived health and education index [see Zehra and Fatima (2022) for details].

Model of the Study

To describe the influence of food price volatility on household health and education, the research uses Deprived Health Index as a proxy of household health and Deprive Education Index as a proxy of household education. The purpose for choosing DHI and DEI (as a proxy) is that these indices are based on different variables that completely explain household's health and education. The following models are used to explain the empirical link of food price volatility between household education and health.

Model 1

$$DEI_{it} = \alpha_0 + \alpha_1 FV_{it} + \alpha_2 lnHHI_{it} + \alpha_3 NE_{it} + \alpha_4 HHMEEMP_{it} + \alpha_5 HNEMP_{it} + \alpha_i + \varepsilon_{it} \quad (1)$$

DEI represents Deprived Education Index,

FV represents Weighted Food Price Volatility,

lnHHI represents log of Household Income,

NE represents Number of Earners,

HHMEEMP represents Household Maximum Education of Employed

HNEMP represents Head's Non-agricultural Employment, and

i represents Household Surveyed, t represents time period.

In Model 1, the research is carried out to identify the impact of food price volatility on household education using education deprivation index as a principal proxy. Together with food price volatility, other socioeconomic variables are also included in the model to identify role of these factors on household education. It is assumed that during the period of high food price volatility, income of household provides initial support to overcome critical effects of food price volatility; whereas the households might reduce education deprivation. Similarly, the variable, 'number of earners' is also assumed to increase the income of households and play a positive role in reducing education deprivation. Similarly, maximum education of individuals who are employed also reduces education deprivation due to two reasons. First, if a person is highly educated, he/she can earn more; second, such a person can better understand the importance of education and would desire to see the children of his house to be educated and encourage the other members to send their children to school. However, the association of head's employment with non-agricultural sector can increase the education deprivation [see Aksoy and Isik-Dikmelik (2008)]. According to the author the variable shows that earnings of household comes from a non-agricultural sector showing that the household is a net buyer of food where due to high and volatile food prices the household may reduce its expenditures on education.

Model 2

$$DHI_{it} = \alpha_0 + \alpha_1 FV_{it} + \alpha_2 lnHNEMP_{it} + \alpha_3 HHMEEMP_{it} + \alpha_4 AI_{it} + \alpha_5 T_{it} + \alpha_i + \varepsilon_{it} \qquad (2)$$

where,

DHI represents Deprived Health Index,

AI represents Asset Index,

T represents Toilet facility according to MDGs, and

i represents Household Surveyed.

In Model 2, deprived health index is used as a proxy of household health. To identify the impact of food price volatility on health deprivation, in this Model, apart from the weighted food price volatility, different other socio economic variables are used as exogenous variables which are: head of the household's non-agricultural employment, household maximum education of employed persons, assets index and toilet facilities. Again, the head's non-agricultural employment plays a vital role to raise the households health deprivation because it shows that he/she is a net buyer of food and due to volatile food prices, would spend less on health care; while, maximum education of an individual who is employed is useful in reducing health deprivation because such a member has better knowledge regarding immunization, prenatal care, etc. The variable, asset index is used, as it shows the wealth of household and to manage the out of pocket expenditures on health care, the households may sell their assets, as in times of health shocks when income of households reduced [Alam and Mahal (2014)]. Similarly, adequate toilets and sanitation facilities can protect the household from the most infectious diseases [WHO (2015)]. Therefore, toilets and sanitation facilities are helpful to reduce health deprivation.

Empirical Results

This section details the empirical results of deprived education and deprived health index in thirteen cities of Pakistan. Furthermore the impact of food price volatility on DEI and DHI are also discussed in this section[3].

[3] The results of weighted food price volatility are explained in the research work of [Zehra and Fatima (2022)].

Figure 1: *Deprived Education Index in Thirteen Cities*

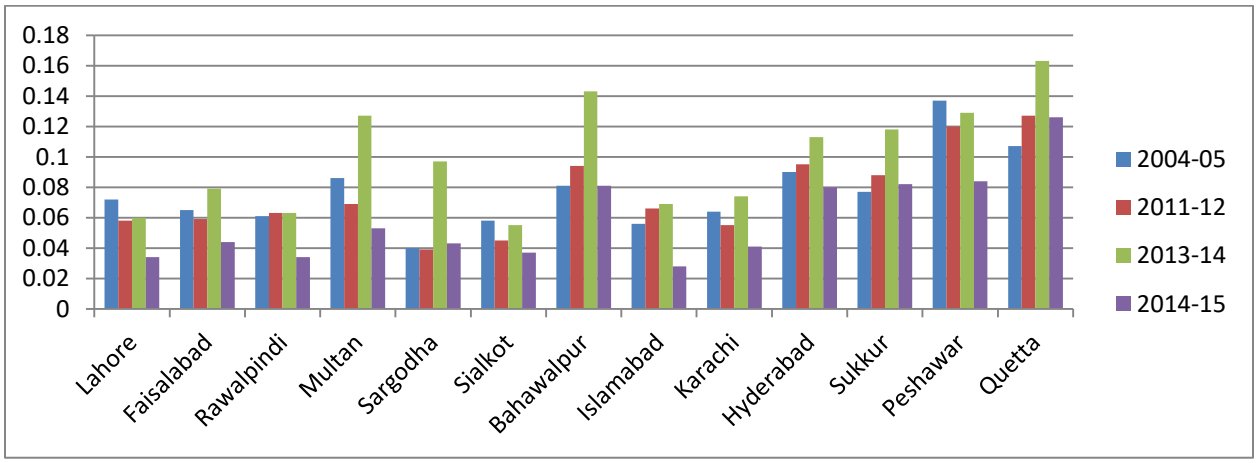
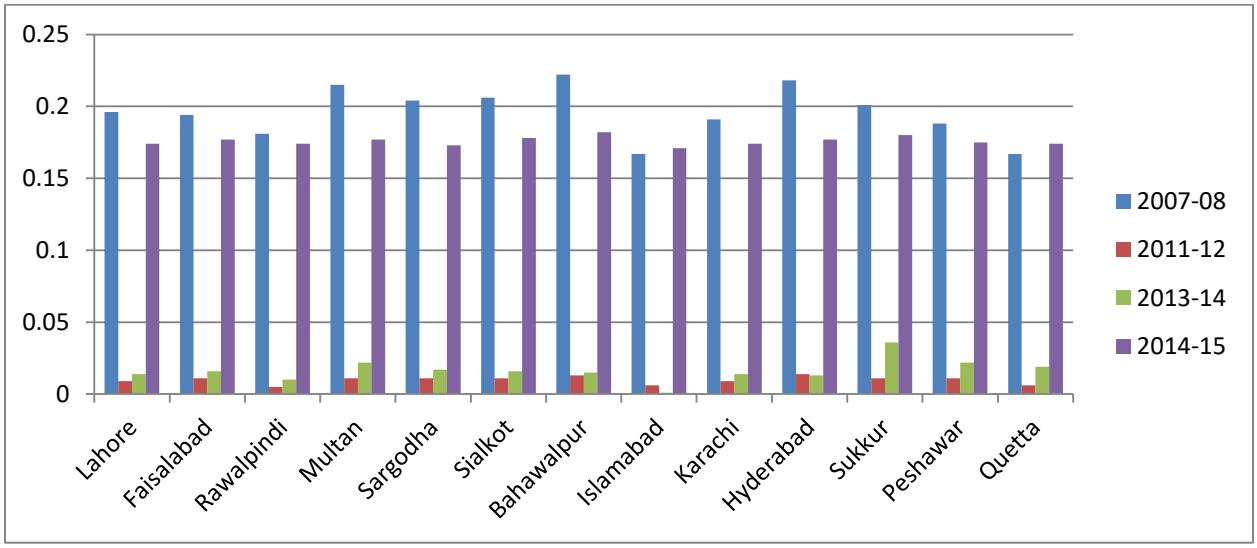


Figure 1 illuminates the trend of DEI in thirteen cities for four periods of PSLM/HIES data (2007-08, 2011-12, 2013-14 and 2014-15). The above graph shows that most of the cities have downward trend of deprived education index, if only two periods 2007-08 and 2014- 15 are considered. While, there is an increasing trend in Sargodha, Sukkur and Quetta. Furthermore, the situation of education remains same in Bahawalpur for the period 2007-08 and 2014-15. On the bases of cities ranking[4] considering 2007-08 and 2014-15 in Table A-1 (Appendix), Lahore city was at 11th position in 2014-15 whereas in 2007-08 it was at rank 7 amongst the thirteen cities. It shows Lahore city improved the level of education among these two years. While Faisalabad stood at rank 7th in 2014-15, whereas, it was at 8th rank in 2007-08; viewing the city get more deprived in education. Rawalpindi city upgraded its education position and reached to 11th position in 2014-15 from 10th in 2007-08. Similarly Multan, Islamabad, Hyderabad and Peshawar have improved in terms of education from 4th to 6th, 12th to 13th, 3rd to 5th, and 1st to second position respectively. Karachi retained its rank and remains at 9th position. Furthermore, Sargodha, Sialkot, Bahawalpur, Sukkur and Quetta decreased their education position from 13th to 8th, 11th to 10th, 5th to 4th, 6th to 3rd and 2nd to 1st position respectively.

Figure 2: *Deprived Health Index in Thirteen Cities*



[4] The High rank, (1) shows highly deprived city in terms of education as compared to other cities.

Figure 2 illuminates the trend of DHI in thirteen cities for four periods of PSLM/HIES data (2007-08, 2011-12, 2013-14 and 2014-15). The cities have mixed upward and downward trend of deprived health index, if only two periods 2007-08 and 2014- 15 are considered. The graph shows that during the periods 2011-12 and 2013-14 the deprived health index was low as compare to 2007-08 and 2014-15. On the bases of cities ranking[5] considering 2007-08 and 2014-15, in Table A-2 (Appendix), Lahore city was at 6th position in 2014-15 whereas in 2007-08 it was at rank 7 amongst the thirteen cities. It shows in Lahore city the level of health is deteriorated among these two years. Similarly Faisalabad, Rawalpindi Sialkot, Karachi, Sukkur, Peshawar, and Quetta also become worse in terms of health during these two periods from 8^{th} to 4^{th}, 11^{th} to 6^{th} ,4^{th} to 3^{rd}, 9^{th} to 6^{th}, 6^{th} to 2^{nd} and 12^{th} to 6^{th} respectively. While Multan, Sargodha, Islamabad and Hyderabad cities have improved their health situation by reaching to rank 4^{th}, 7^{th}, 8^{th} and 4^{th} in 2014-15 from 3^{rd}, 5^{th}, 5^{th} and 2^{nd} in 2007-08. It is noticed that Bahawalpur remains the most deprived city in both years and stood at 1^{st} position of deprivation.

Table 2: *Results of Model 1*

Dependent Variable : Deprived Education Index (DEI)	**Coefficients**	**t-value**
Weighted Food Price Volatility	0.162	2.17**
Log of Household Income	-0.007	-0.36
Household max education of employed person	-0.195	-7.74*
Number of earners	0.011	1.11
Head Employment in Non agricultural Sector	0.241	2.56**
Constant	0.065	0.20
R Square: Within	0.85	
Between	0.54	
Overall	0.66	
Number of Obs	52	
Number of Groups	13	
F-test(Prob. F-test)	40.67 (0.00)	

Source: Author's estimation based on four waves of PSLM data

*shows significant at 1%, **shows significant at 5%.

Table 2 explores the impact of food price volatility on deprivation in education. It can be easily shown from Table 2, that there is a positive and significant relationship between food price volatility and deprivation in education index. In view of this study, 1 point increase in food price volatility increases the deprivation in education by 0.16 point. Due to volatile pattern of food prices, people are forced to cut-off their spending on education of their children to maintain their food requirement [Raihan (2009)].

In addition to food price volatility the study found a negative and significant relationship between maximum education of a person who is employed with deprivation in education. Increase in variable by one level, reduces deprivation in education by 0.19 point. As evident from the theory, highly educated employed persons have better understanding regarding the value of education and have better earning opportunities which is helpful in reducing deprivation in education. Moreover, the relationship between head's non-agricultural employment and deprivation in education is positive and significant; suggesting that 1 person increase in employment of head in non-agricultural sector, on an average, increase deprivation in education index by about 0.24 point. As stated earlier this is due to the fact that employed individuals in non-agricultural sector are net consumers of food; hence they spend large amount of their spending on food [Deaton (1989), Cranfield, et al. (2007)]. Therefore, they are at risk to the volatile food prices [Ziegelhöfer (2014)]. As a result they reduce their expenditure on education. The Model 1 (Table 2) shows the variables: log of household income and number of earners are insignificant.

[5] The High rank, (1) shows highly deprived city in terms of health as compared to other cities.

Table 3: *Results of Model 2*

Dependent Variable : Deprived Health Index (DHI)	**Coefficients**	**t-value**
Weighted Food Price Volatility	0.765	2.00*
Log of head non-agricultural employment	0.101	2.67**
Household max education of employed person	-0.002	-1.64
Asset Index	0.274	0.52
Toilet	-0.0133	-0.27
Constant	-0.048	-0.09
R Square: Within	0.993	
Between	0.102	
Overall	0.983	
Number of Obs	52	
Number of Groups	13	
F-test(Prob. F-test)	11121.1(0.00)	

Source: Author's estimation based on four waves of PSLM data

*shows significant at 1%, **shows significant at 5%.

In Model 2, deprived health index is used as dependent variable to identify the consequences of weighted food price volatility on it. It is revealed that weighted food price volatility also has significant and positive impact on deprived health index; which means that 1 point increase in weighted food price volatility increases the deprivation in health by 0.76 point. As the food price volatility increases, households use several food and non-food managing strategies, like they reduce their calorie consumption and start consuming low quality food which adversely affect health of households especially the health of children. Ziegelhöfer (2014) also found that food shocks adversely affect child health.

In addition to food volatility, the study also found that head's employment in non-agricultural sector also becomes the cause of health deprivation. An increase of 1 person in head's employment in non-agricultural sector increases the deprivation in health index by 0.10 point. However, other exogenous variables in this Model are insignificant.

Conclusion and Policy Implication

This research has constructed household deprived education and health index to identify the household health and education status for thirteen large cities of Pakistan; using four waves of PSLM/ HIES data, i.e., 2007-08, 2011-12, 2013-14 and 2014-15. The paper inter-links the deprived health and education index with food price volatility of sixteen staple food commodities by means of pseudo panel technique. On the basis of household deprived education, and health deprived indices, intercity disparities are found. It is observed that comparing 2007-08 and 2014-15, in most of the cities education deprivation has decreased while in few cities the index become worse showing that Quetta is the most deprived large city and stand at the 1st rank since 2011-12. Furthermore in most of the cities there were mixed upward and downward trend of health deprivation and Bahawalpur is the most deprived city in terms of health. Pseudo panel results portrays that volatility in food prices has significant and negative impact on household deprived health and education indices. It is also concluded that the employment of highly educated individual from household plays a vital role in reducing education deprivation. While the employment in non-agricultural sector increases the education as well as health deprivation as they spend more on purchasing food rather to spend on health and education. It is recommended that government should build more schools and health care centers to provide free quality education and medical treatment.

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Conflict of Interest

Author declared no conflict of interest.

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ORCID iDs

Nigar Zehra [1] https://orcid.org/0000-0001-6077-3273

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Appendix

Table A1: *Deprived Education Index in Thirteen Large Cities of Pakistan*

Cities	Year	Rank	DEI	Years of Schooling	Child School Attendance	Quality of Education
Lahore	200708	7	0.072	0.056	0.011	0.005
Lahore	201112	10	0.058	0.048	0.007	0.004
Lahore	201314	6	0.093	0.077	0.011	0.004
Lahore	201415	11	0.034	0.028	0.004	0.002
Faisalabad	200708	8	0.065	0.055	0.006	0.004
Faisalabad	201112	9	0.059	0.048	0.009	0.003
Faisalabad	201314	11	0.062	0.044	0.013	0.005
Faisalabad	201415	7	0.044	0.034	0.006	0.003
Rawalpindi	200708	10	0.061	0.050	0.011	0.001
Rawalpindi	201112	8	0.063	0.053	0.007	0.002
Rawalpindi	201314	8	0.081	0.064	0.014	0.003
Rawalpindi	201415	11	0.034	0.028	0.006	0.000
Multan	200708	4	0.086	0.066	0.018	0.002
Multan	201112	6	0.069	0.055	0.011	0.003
Multan	201314	7	0.082	0.075	0.000	0.006
Multan	201415	6	0.053	0.041	0.010	0.002
Sargodha	200708	13	0.040	0.032	0.006	0.001
Sargodha	201112	13	0.039	0.035	0.003	0.001
Sargodha	201314	9	0.075	0.066	0.009	0.000
Sargodha	201415	8	0.043	0.036	0.006	0.000
Sialkot	200708	11	0.058	0.053	0.004	0.001
Sialkot	201112	12	0.045	0.044	0.000	0.001
Sialkot	201314	12	0.053	0.053	0.000	0.000
Sialkot	201415	10	0.037	0.024	0.012	0.001
Bahawalpur	200708	5	0.081	0.067	0.011	0.003
Bahawalpur	201112	4	0.094	0.072	0.018	0.005
Bahawalpur	201314	3	0.133	0.120	0.007	0.006
Bahawalpur	201415	4	0.081	0.066	0.013	0.002
Islamabad	200708	12	0.056	0.050	0.005	0.001
Islamabad	201112	7	0.066	0.051	0.012	0.003
Islamabad	201314	12	0.035	0.035	0.000	0.000
Islamabad	201415	13	0.028	0.024	0.003	0.001
Karachi	200708	9	0.064	0.048	0.013	0.003
Karachi	201112	11	0.055	0.042	0.010	0.003

Karachi	201314	10	0.066	0.052	0.011	0.003
Karachi	201415	9	0.041	0.031	0.009	0.001
Hyderabad	200708	3	0.090	0.066	0.019	0.005
Hyderabad	201112	3	0.095	0.070	0.024	0.001
Hyderabad	201314	5	0.097	0.080	0.017	0.000
Hyderabad	201415	5	0.080	0.058	0.020	0.002
Sukkur	200708	6	0.077	0.057	0.018	0.002
Sukkur	201112	5	0.088	0.065	0.020	0.002
Sukkur	201314	2	0.199	0.132	0.066	0.002
Sukkur	201415	3	0.082	0.063	0.016	0.002
Peshawar	200708	1	0.137	0.097	0.033	0.006
Peshawar	201112	2	0.120	0.096	0.022	0.002
Peshawar	201314	4	0.128	0.110	0.012	0.006
Peshawar	201415	2	0.084	0.071	0.012	0.001
Quetta	200708	2	0.107	0.080	0.024	0.004
Quetta	201112	1	0.127	0.099	0.025	0.003
Quetta	201314	1	0.281	0.163	0.095	0.024
Quetta	201415	1	0.126	0.085	0.037	0.005

Source: Author's calculation using PSLM/HIES 2007-08, 2011-12, 2013-14 and 2014-15.

Table A2: *Deprived Health Index in Thirteen Large Cities of Pakistan*

Cities	**Year**	**Rank**	**DHI**	**Access to health**	**Immunization**	**Prenatal care**	**Trained Delivery**
Lahore	200708	7	0.196	0.153	0.005	0.006	0.001
Lahore	201112	4	0.009	0.002	0.001	0.006	0.000
Lahore	201314	3	0.019	0.003	0.004	0.013	0.000
Lahore	201415	6	0.174	0.165	0.003	0.008	0.000
Faisalabad	200708	8	0.194	0.167	0.005	0.008	0.003
Faisalabad	201112	3	0.011	0.001	0.002	0.007	0.002
Faisalabad	201314	6	0.014	0.001	0.007	0.008	0.002
Faisalabad	201415	4	0.177	0.166	0.002	0.009	0.001
Rawalpindi	200708	11	0.181	0.167	0.002	0.003	0.002
Rawalpindi	201112	6	0.005	0.000	0.001	0.004	0.001
Rawalpindi	201314	10	0.002	0.000	0.001	0.001	0.000
Rawalpindi	201415	6	0.174	0.165	0.002	0.006	0.002
Multan	200708	3	0.215	0.152	0.004	0.007	0.004
Multan	201112	3	0.011	0.001	0.001	0.010	0.000
Multan	201314	7	0.013	0.002	0.003	0.010	0.000
Multan	201415	4	0.177	0.164	0.001	0.011	0.001
Sargodha	200708	5	0.204	0.167	0.004	0.010	0.001

Sargodha	201112	3	0.011	0.003	0.002	0.007	0.001
Sargodha	201314	5	0.015	0.000	0.003	0.012	0.000
Sargodha	201415	7	0.173	0.166	0.002	0.007	0.001
Sialkot	200708	4	0.206	0.167	0.002	0.008	0.001
Sialkot	201112	3	0.011	0.001	0.001	0.008	0.001
Sialkot	201314	8	0.011	0.001	0.004	0.008	0.002
Sialkot	201415	3	0.178	0.166	0.003	0.010	0.000
Bahawalpur	200708	1	0.222	0.167	0.006	0.005	0.006
Bahawalpur	201112	2	0.013	0.002	0.002	0.009	0.000
Bahawalpur	201314	4	0.016	0.005	0.005	0.007	0.000
Bahawalpur	201415	1	0.182	0.164	0.003	0.013	0.003
Islamabad	200708	12	0.167	0.167	0.001	0.005	0.001
Islamabad	201112	5	0.006	0.001	0.002	0.004	0.002
Islamabad	201314	11	0.000	0.000	0.000	0.000	0.000
Islamabad	201415	8	0.171	0.164	0.002	0.006	0.001
Karachi	200708	9	0.191	0.167	0.003	0.004	0.000
Karachi	201112	4	0.009	0.001	0.001	0.007	0.001
Karachi	201314	7	0.013	0.001	0.005	0.007	0.001
Karachi	201415	6	0.174	0.165	0.001	0.008	0.001
Hyderabad	200708	2	0.218	0.167	0.006	0.010	0.002
Hyderabad	201112	1	0.014	0.002	0.002	0.010	0.001
Hyderabad	201314	9	0.010	0.001	0.000	0.008	0.000
Hyderabad	201415	4	0.177	0.165	0.002	0.009	0.002
Sukkur	200708	6	0.201	0.167	0.006	0.011	0.006
Sukkur	201112	3	0.011	0.001	0.003	0.007	0.003
Sukkur	201314	1	0.044	0.006	0.026	0.010	0.005
Sukkur	201415	2	0.180	0.166	0.003	0.011	0.002
Peshawar	200708	10	0.188	0.167	0.005	0.006	0.005
Peshawar	201112	3	0.011	0.002	0.002	0.008	0.003
Peshawar	201314	2	0.027	0.002	0.017	0.009	0.003
Peshawar	201415	5	0.175	0.164	0.001	0.009	0.002
Quetta	200708	12	0.167	0.153	0.006	0.005	0.006
Quetta	201112	5	0.006	0.003	0.002	0.004	0.002
Quetta	201314	9	0.010	0.005	0.014	0.000	0.000
Quetta	201415	6	0.174	0.165	0.007	0.006	0.003

Source: Author's calculation using PSLM/HIES 2007-08, 2011-12, 2013-14 and 2014-15.