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Child Malnutrition and Poverty: The Case of Pakistan

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1. INTRODUCTION

The role of economic factors—particularly income and consumption—in the wellbeing of a population is well documented. However, wellbeing does not depend solely on these factors; social indicators such as life expectancy, health, education, and nutrition serve an important complementary function [Linnemayr, *et al.* (2008)]. The most significant social problems in many developing countries, including Pakistan, include widespread child malnutrition, high infant mortality, and low literacy. Child malnutrition is considered the key risk factor for illness and death, contributing to more than half the deaths of children globally [Cheah, *et al.* (2010)]. It also affects the child morbidity rate and poses a threat to children's physical and mental development, in turn lowering their educational attainment [Chirwa and Ngalawa (2008)]. The recent literature, therefore, considers nutrition an important dimension of individual wellbeing [Babatunde, Olagunju, and Fakayode (2011)].

Although the causes of child malnutrition are interrelated and multi-sectoral [Cheah, *et al.* (2010)], food insecurity, poor maternal nutrition, frequent infections, underutilisation of health services, and poor-quality care provided to children are considered the most important correlates of malnourishment [Linnemayr, *et al.* (2008)]. However, there is no consensus in the literature regarding the role of poverty in child malnutrition. Several studies show malnutrition as a reflection of poverty, with people not having enough income to buy food, while many other empirical studies have found no association between poverty and child malnutrition [Chirwa and Ngalawa (2008)].

The performance of Pakistan in social indicators, including the nutrition status of children, is far from satisfactory. Although the proportion of underweight children has declined in the last 15 years, approximately a third of young children are still counted as underweight according to the 2011 National Nutrition Survey (NNS). Stunting and wasting, the other two measures of children's nutrition status, have even deteriorated. Child malnutrition in Pakistan is, therefore, widespread.

How do we account for this phenomenon? Is child malnutrition related to the poverty status of their households or to other factors such as child illness, maternal health, or access to healthcare? Investigating this is vital both in the context of poor health indicators—particularly high infant and child mortality—and instability in poverty reduction in the past. The findings of earlier studies are

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inconclusive. Alderman and Garcia (1993) have found that illness and diarrhoea are strongly correlated with poor nutrition among young children in Pakistan. Arif (2004) finds a significant relationship between poverty and weight-for-age, but no association with stunting or wasting. His study does not, however, take into account the endogeneity problem, because poverty is likely to be determined by child nutrition through its effect on the health status of adults and their earnings [Chirwa and Ngalawa (2008)].

The major objectives of this paper are twofold: (i) to examine the trends in child malnutrition during the last decade (2000–2010) using two-round data from a longitudinal household survey, and (ii) to find its correlates, focusing on poverty and the health status of children and their mothers. We use individual (child), household, and community-level variables to understand the differentials involved in child malnutrition, as well as key factors such as child illness, maternal health, and households' poverty status.

The rest of the paper is organised as follows. Section 2 describes the study's conceptual framework, data sources, and methodology. Section 3 indicates the trends in child malnutrition and poverty. Section 4 presents the socio-demographic differentials of child malnutrition, which include gender and age of children and their mothers' body mass index (BMI) and education. Section 5 examines the determinants of child nutrition using a multivariate method. Section 6 discusses the poverty and child malnutrition nexus in Pakistan. Section 7 concludes the study.

2. CONCEPTUAL FRAMEWORK, DATA SOURCES, AND METHODOLOGY

Children's nutrition status is determined by three types of factors: (i) immediate, (ii) underlying, and (iii) basic (UNICEF, 1990). Immediate causes are linked to dietary intake and the occurrence of disease in children while underlying causes encompass access to food and healthcare among children and their mothers, and the environmental conditions in which they live. Basic causes include a country's economic, political, and institutional structure and availability of resources. Poverty can affect child nutrition through dietary intake or a household's inability to buy sufficient food. Inadequate food increases children's risk of infections, and frequent infections cause nutrition deficiencies. Although many studies have explored the poverty and child malnutrition nexus, its robustness is indistinct (Pal, 1999). As Sununtar (2005) shows:

> Malnutrition is the result of marginal dietary intake compounded by infection. In turn, marginal dietary intake is caused by household food insecurity, lack of clean water, lack of knowledge on good sanitation, and lack of alternative sources of income. It is also compounded by, inadequate care, gender inequality, poor health services, and poor environment. While income is not the sum of total of people's lives, health status as reflects by level of malnutrition is.

The conceptual framework we use to examine the determinants of children's nutrition status is based on the household utility maximising model, specifying a household production function [Becker (1965); Behrman and Deolalikar (1988); Strauss and Thomas (1995)]. The model assumes that the household's preferences can be characterised by the utility function, U, which depends on the consumption of a vector of commodities, *X*, leisure, *L*, and quality of children represented by their nutrition status, *N*:

$$U = u(X, L, N) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Household utility is maximised subject to several constraints, including a time-specific nutrition production function and income constraints. Children's nutrition status is determined by food availability, morbidity, access to health services, and the quality of care at home. The nutrition outcome of each child, measured by standard anthropometric measures, can be derived as:

$$Ni = n(C, W, H, Z, e) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where *C* is consumption, *W* is a vector of child-specific characteristics, *H* is a vector of household-specific characteristics, Z is a vector of health variables, and *e* is a child-specific disturbance term. In Equation 2, *N* is measured by the standardised anthropometric measures, height-for-age z-score (HAZ), weight-for-age z-score (WAZ), and weight-for-height z-score (WHZ). The z-scores are computed using the World Health Organisation (WHO)-recommended reference population [WHO (2006)]. The *WAZ* of a child, for example, is the difference between his/her weight and the median weight of the reference population of the same age and sex, divided by the standard deviation (SD) of the weight of the same group of children:

$$WAZ = \frac{Wi - Wr}{SD} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

The three anthropometric measures, *WAZ*, *HAZ*, and *WHZ*, provide different information about children's nutrition status. *HAZ* indicates stunting, a condition that reflects chronic malnutrition. *WHZ* measures the current nutrition status of a child, while *WAZ* captures aspects covered by *HAZ* and *WHZ* [Chirwa and Ngalawa (2008)].

The Pakistan Institute of Development Economics (PIDE) carried out three rounds of a longitudinal (panel) survey in 2001, 2004, and 2010. The first (2001) and third (2010) rounds of the survey collected data on children's age, weight, and height, necessary for anthropometric measurement. We use these two rounds of data to examine changes in children's nutrition status over the last decade, and the third round of data (collected in 2010) to investigate the determinants of child nutrition. The sample used in the first two rounds of the panel survey consisted of rural areas in 16 districts located in the four provinces of Pakistan; these rounds were accordingly named the Pakistan Rural Household Survey (PRHS). The third round

was named the Pakistan Panel Household Survey (PPHS) since it included rural and urban areas in the 16 districts [for more detail, see Nayab and Arif (2012)]. The total rural sample of the 2010 PPHS consisted of 2,800 households while the urban sample comprised 1,342 households, yielding a total survey sample of 4,142 households. The PPHS 2010 obtained data on the weight and height of all children younger than 6 years. Our analysis encompasses 3,218 children aged 6–59 months, about half of whom (48.2 percent) are female (Table 1). Data on weight and height is not available for all children.

Table 1

Sampled Children by Region and Gender, PPHS 2010

Region	Both Sexes	Male	Female
Total	3218	1666	1552
Urban	844	440	404
Rural	2374	1226	1148

Following the WHO recommendations for WAZ analysis, we include those children with z-scores ranging from –6 to 5. For HAZ and WHZ, we include children with z-scores from –6 to 6 and from –5 to 5, respectively [WHO (2008); World Food Programme and Centre for Disease Control and Prevention (2005)]. The HAZ scores are found to contain more outliers than the WAZ and WHZ scores. A child is characterized as malnourished if his or her z-score is more than two SDs below the standard reference population.

Equation 2, which examines the determinants of child nutrition status, incorporates individual (child)-level characteristics, household-level characteristics, and community variables. Child characteristics include age and gender; maternal characteristics include level of education and BMI. We use per capita consumption expenditure to represent the poverty status of the sampled households. Health variables represent sanitation and the incidence of morbidity among children. Household structure (*pucca* or *kachha*) and the type of toilet represent environmental factors at the household level. The availability of lady health workers (LHWs) represents healthcare services, while the region of residence (urban or rural) signifies the community variable.

Per capita expenditure, a household-level variable, is likely to be determined by the anthropometric outcomes through its effect on the health status of adults and their earnings [Chirwa and Ngalawa (2008)]. The use of ordinary least squares (OLS) could yield biased estimates given the endogeneity of per capita expenditure in Equation 2. In order to account for the endogeneity problem, following Chirwa and Ngalawa (2008), we use the two-stage least squares (2SLS) method where per capita expenditure is instrumented by household variables including landholdings, ownership of livestock, the household head’s work status, and household size.

The use of per capita expenditure represents the poverty status of the sampled households well. However, a change in poverty status could also be an important factor when investigating the determinants of child nutrition status. As mentioned earlier, the PPHS 2010 was the third round of the panel survey, the earlier two rounds having been carried out in 2001 and 2004. The period 2001–04 was when most of the sampled children were born. In the second stage of our analysis, we compute a variable that indicates changes in the poverty status of households between 2004 and 2010 and use it to replace per capita expenditure. The change in poverty status has four categories: (i) poor in two periods (2004 and 2010), (ii) non-poor in two periods, (iii) moved out of poverty, and (iv) moved into poverty. The last two categories are combined to represent transitory poverty. The PPHS 2010 also includes a module on households' perceptions of food shortage—the question asked in the survey was whether the household had faced a food shortage in the last 12 months. In the final stage, per capita expenditure is replaced by household-perceived food security. The OLS technique is applied in the second and third stage of the analysis, where poverty dynamics and perceived food security are used as independent variables instead of per capita expenditure.

3. TRENDS IN CHILD NUTRITION AND POVERTY

Pakistan's long history of data collection on socioeconomic and demographic issues through household surveys tends to lack information on child nutrition, making it difficult to analyse trends in children's nutrition status over long periods of time. The NNS carried out in 1985–87, 2001, and 2011 has, however, filled the gap to some extent. Other surveys, though smaller in sample size—such as the Pakistan Socioeconomic Survey (PSES) 2001, Pakistan Demographic and Health Survey (PDHS) 1990, PRHS 2001, and PPHS 2010—have also gathered data on children's height and weight to determine their nutrition status. Table 2 presents information from these data sources on three well known anthropometric measures: underweight, stunting, and wasting in rural and urban areas. According to the NNS series, the incidence of underweight among children gradually decreased from around 48 percent in 1985–87 to about 32 percent in 2011. This decline has occurred both in rural and urban areas. The two rounds of the panel dataset, PRHS 2001 and PPHS 2010, also support the NNS data and show a fall in the underweight over the last decade although the magnitude differs. Despite the decline in proportion of underweight children over time, at present more than a third of children (32 percent in NNS 2011 and 39 percent in PPHS 2010) are underweight.

Table 2

Trends in Child Nutrition in Pakistan

	% Underweight			% Stunted			% Wasted		
Data Source	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
NNS 1985–87	47.9	–	–	41.8	–	–	10.8	–	–
NNS 2001	41.5	42.3	38.7	31	32.5	24.5	11.6	11.2	12.1
NNS 2011	31.5	33.3	26.6	43.7	46.3	36.9	15.1	12.7	16.1
PDHS 1990	40.4	–	–	50	–	–	9.2	–	–
PSES 2001	48.2	51.4	41.7	49.7	52.7	43.5	–	–	–
PRHS 2001	–	56.6	–	–	64.4	–	–	18.4	–
PPHS 2010	39.4	39.8	38.1	63.9	64.5	62.1	17.9	17.2	19.9

Note: The differences between figures may be due to methodological variations among these surveys. The PDHS 1990/91 uses the NCHS standard with a reference population of children aged 0–59 months. The figures reported for the NNS 2001 are a percentage median with a reference population aged 6–59 months. The PRHS, PSES, PPHS 2010, and NNS 2011 use reference populations aged 6–59, 0–59, 6–59, and 0–59 months, respectively.

The situation of the other two anthropometric measures, stunting and wasting, is different and alarming. Stunting, which reflects chronic malnutrition, has increased between 2001 and 2011. According to the NNS 2011 data, around 44 percent of children are stunted, which is about 2 percentage points higher than the proportion in 1985–87 (Table 2). The panel data, however, shows no major change in stunting between 2001 and 2010. Overall, the magnitude of stunting is much higher in the panel datasets (PRHS 2001 and PPHS 2010) than in the NNS dataset. According to the NNS series, the incidence of wasting has also increased from 11 percent in 1985–87 to 15 percent in 2011. The panel series, however, shows a mild decline in wasting, from 18 percent in 2011 to 17 percent in 2010. The deterioration in stunting over time and high prevalence of underweight children (more than one third) reflects Pakistan's weak performance in improving the nutrition status of its children.

Table 2 also gives children's nutrition status by rural and urban area. The data sources all indicate that rural areas have a higher prevalence of underweight and stunted children, but the case is the opposite for wasting, which appears to be moderately higher in urban areas. Most malnourished children in urban and rural areas fall in the "severe" category (Table 3). The proportion of children in this category is very high in the case of stunting. Not only is the overall prevalence of stunting high, children are also severely malnourished.

Table 3

Children's Nutrition Status (Moderate/Severe) by Region, 2010

Nutrition Status of Children	% Underweight			% Stunted			% Wasted		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Normal	56.9	57.7	56.7	31.2	32.6	30.7	61.8	61.9	61.8
Moderate	15.7	15.0	15.9	20.2	23.2	19.2	8.9	9.4	8.7
Severe	23.7	23.1	23.9	43.7	38.9	45.4	9.0	10.5	8.5
Overweight/height	3.7	4.2	3.5	4.9	5.3	4.8	20.3	18.2	21.0
Total	100	100	100	100	100	100	100	100	100

Source: Authors' computations based on micro-data from PPHS 2010.

Note: Normal children are healthy children with z-scores between –2 and +2 SD, while those for moderately malnourished child are below –2 SD and those for severely malnourished child are below –3 SD.

The available data on poverty levels and trends in Pakistan for the last five decades show that poverty reduction has not been sustainable, rather than it has fluctuated remarkably. In the late 1980s, when approximately half the country's children were reportedly malnourished (underweight), the poverty level was very low—only 17 percent. There is consensus in the poverty literature concerning the sharp rise in poverty in the 1990s. The incidence of poverty, estimated by the three rounds of the panel survey (2001, 2004, and 2010), also illustrates that poverty fluctuated during 2001–2010 (Table 4). It declined from 31.3 percent in 2001 to 24.1 percent in 2004 and then increased to 27 percent in 2010 in Punjab and Sindh. In rural Pakistan, poverty declined by 5 percentage points—from 27.5 percent in 2001 to 22.4 percent in 2010. In 2010, the poverty estimates are 20.7 percent with a greater incidence of rural poverty (22.4 percent) than urban (16.6 percent).

Table 4

Incidence of Poverty: Cross-Sectional Analysis of Panel Survey (2001, 2004, 2010)

Survey Year	All Provinces	Punjab and Sindh
2001 (Rural only)	27.5	31.3
2004 (Rural only)	–	24.1
2010 (Rural)	22.4	27.0
Urban	16.6	18.5
All	20.7	24.4

Source: Arif and Farooq (2012).

Poverty estimates based on the three rounds of data show that, during the last decade, more than half the rural population (51 percent) in two largest provinces, Punjab and Sindh, remained in poverty for at least one period. Within this group, the major share is accounted for those categorised as one-period poor (31 percent), although a considerable proportion—around 17 percent—was found to be poor in two periods. The chronic poor, i.e., those who remained poor in all three rounds, was only 4 percent, which is less than half the population who remained poor in two rounds. The three-wave data is spread over a 10-year period: 2001 to 2010. So, during this decade, only a small proportion of households remained continuously poor. Movement into and out of poverty is a common phenomenon in Pakistan, particularly in its rural areas.

Table 5

Poverty Dynamics by Rural Region using Three Waves of Data (2001, 2004, 2010)

Change in Poverty Status	Total Sample (Sindh and Punjab)	Punjab			Sindh
		Total	Central to North (Excluding South)	South	
3-period poor (chronic)	4.01	3.71	1.06	6.46	4.32
2-period poor	16.60	10.34	6.17	14.65	23.12
1-period poor	30.90	23.97	17.41	30.76	38.12
Never poor	48.48	61.98	75.36	48.14	34.44
All	100.0	100.0	100.0	100.0	100.0
N	(1395)	(792)	(417)	(375)	(603)

Source: Arif and Farooq (2012).

4. SOCIO-DEMOGRAPHIC DIFFERENTIALS OF CHILD MALNUTRITION

Figures 1–3 present data on the three anthropometric measures by gender for the total sample as well as rural and urban areas, while Figure 4 presents data on children's nutrition status by age. Overall, there is no major gender difference in the three measures, but gender differences are more profound within rural and urban areas. In rural areas, for example, more males are underweight and wasted than females, while in urban areas the prevalence of malnutrition is higher among females than among males. It is not easy to explain these differences, but nutrition habits, morbidity, and health-seeking behaviour, which are likely to affect child nutrition status, may differ for girls and boys in rural and urban areas.

Fig. 1. Child Nutrition Status by Gender, 2010

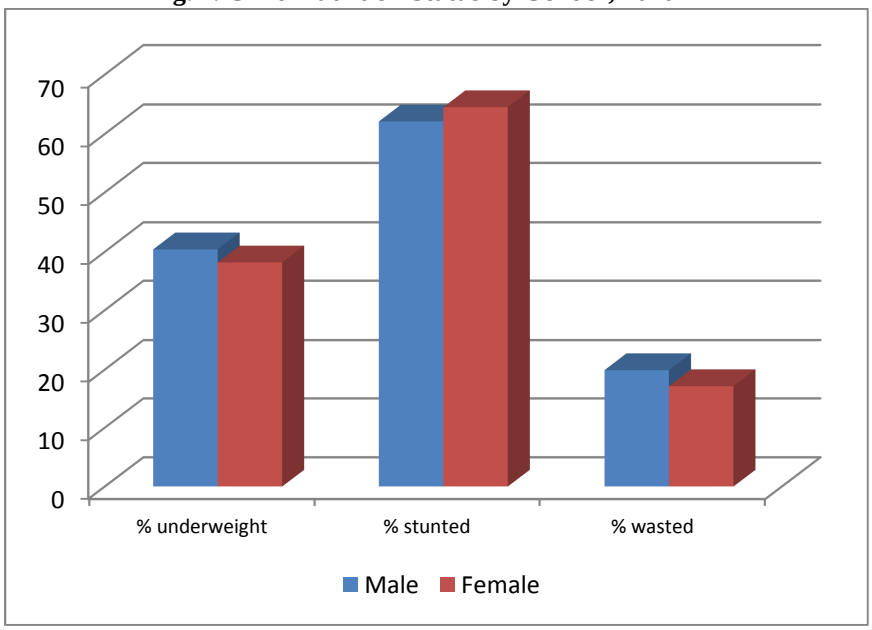
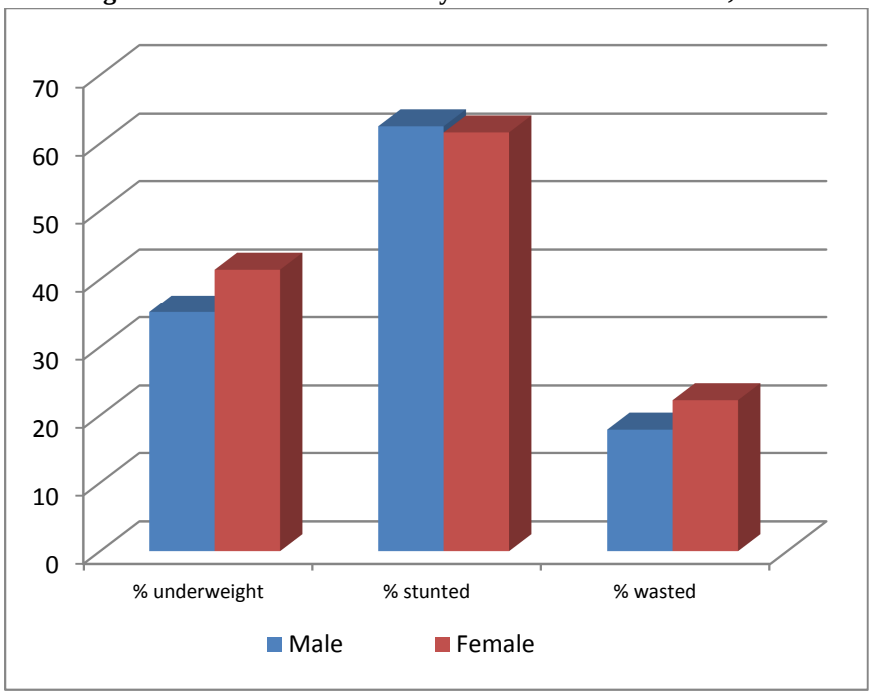
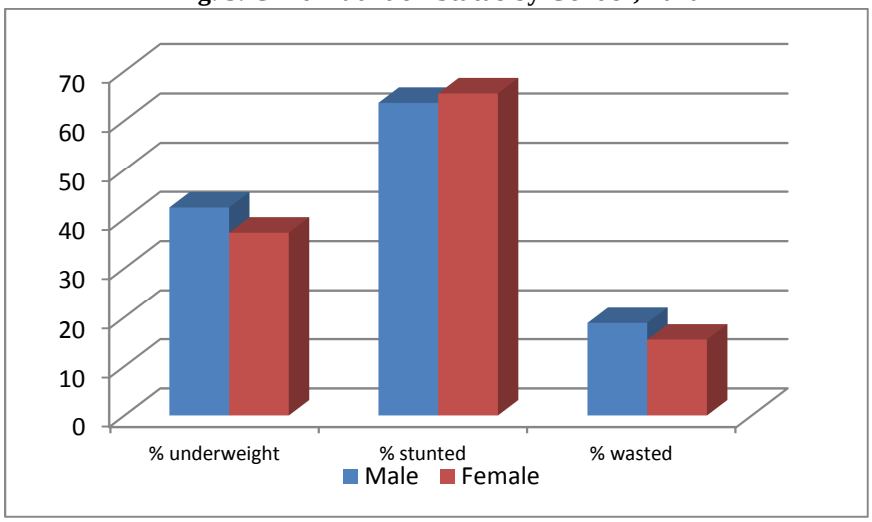


Fig. 2. Child Nutrition Status by Gender in Urban Areas, 2010



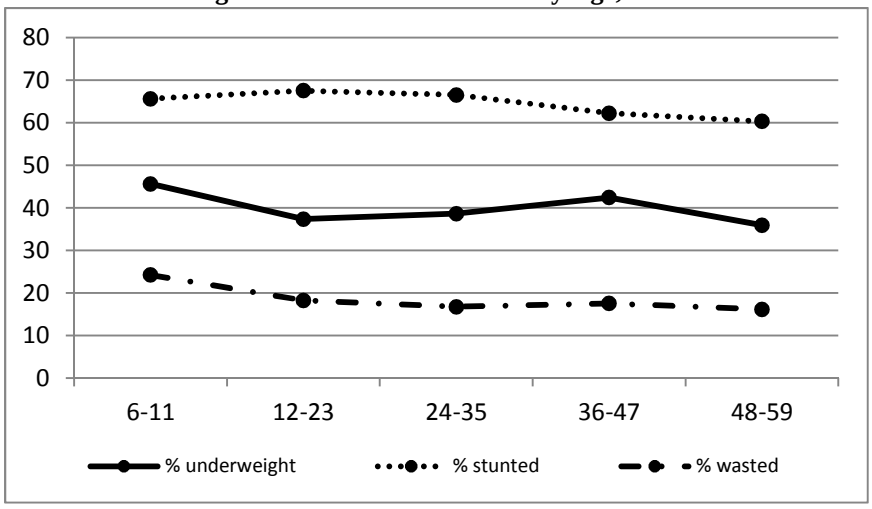
Source: Authors' computations based on micro-data from PPHS 2010.

Fig. 3. Child Nutrition Status by Gender, 2010



There appears to be a nonlinear relationship between children's age and the three measures of their nutrition status (Figure 4). In the case of underweight, it is highest for children aged 6–11 months. The relationship decreases for the next age group (12–21 months), but increases for those aged 2–3 years. The lowest prevalence occurs among children aged 48–59 months. Despite these variations across age groups, the minimum prevalence of underweight stands at 36 percent, suggesting widespread malnutrition in all age groups of the sampled children. The situation is similar for stunting and wasting (Figure 4).

Fig. 4. Child Nutrition Status by Age, 2010



Source: Authors' computations based on micro-data from PPHS 2010.

Table 6 presents the relationship between children's nutrition status and their mothers' BMI and educational attainment. Neither characteristic appears to be correlated with stunting (chronic malnutrition), but both underweight and wasting are—the higher the mothers' BMI, the higher their children's nutrition status. Education also has a similar relationship with child nutrition. Compared to 40 percent, the prevalence of underweight is about 30 percent among children of mothers with a college or higher level of education. Both mothers' BMI and education are also related to wasting, a measure of children's current nutrition status. Wasting is higher among children whose mothers are underweight and less educated than among those whose mothers have a higher BMI and are better educated.

Table 6

Child Nutrition Status by Mother's BMI and Education

Mothers' Characteristics	% Underweight	% Stunted	% Wasted
BMI			
Underweight	52.8	66.4	26.8
Normal	40.7	65.5	18.9
Overweight	32.6	61.0	12.4
Obesity	27.8	63.4	12.3
Education			
No education	40.2	64.0	18.5
Primary	41.1	64.5	20.7
Secondary and Matriculation	33.3	63.4	11.1
College and Higher	29.7	61.7	12.0
Total	39.4	63.9	17.9
(N)	2568	1937	1949

Source: Authors' computations based on micro-data from PPHS 2010.

5. DETERMINANTS OF CHILD NUTRITION

As mentioned earlier, we examine the determinants of child nutrition status by estimating Equation 2, where WAZ scores, WHZ scores, and HAZ scores are used as dependent variables. Our independent variables include: child characteristics (gender and age), child illness (incidence of diarrhoea and other illness), maternal characteristics (BMI and education), per capita expenditure as an indicator of household poverty, number of siblings, environmental factors (structure of dwelling unit and access to a toilet with flush), availability of LHWs, one-community variables, and region of residence (rural or urban). As noted in Section 2, given the endogeneity problem, we instrument per capita expenditures by household ownership of land and livestock, work status of the household head, and household size. The model is regressed using the 2SLS method. Table 7 provides the summary statistics of the dependent and independent variables used.

Table 7

Summary Statistics for Dependent and Independent Variables

Determinants	Mean	Minimum	Maximum	SD	N
WAZ	-1.55	-5.98	4.94	1.96	3540
HAZ	-2.38	-6.01	6.00	2.20	2742
WHZ	0.12	-4.99	5.00	2.22	2280
Per capita expenditure (Rs)	2718.75	55.91	35901.27	1978.43	6409
Child characteristics					
Sex (male = 1)	0.53	0	1	0.50	4604
Age (months)	31.36	6	59	14.97	3218
Number of siblings (< 2)	0.21	0	1	0.415	6509
2–3	0.35	0	1	0.489	4214
4–6	0.26	0	1	0.449	4214
7+	0.06	0	1	0.24	4214
Incidence of diarrhoea in last 30 days (yes = 1)	0.09	0	1	0.295	4635
Incidence of other illnesses in last 30 days (yes = 1)	0.14	0	1	0.35	4635
Maternal characteristics					
BMI	22.98	13.11	56.70	4.79	3623
Mother's education (none)	0.81	0	1	0.49	4635
Primary (yes = 1)	0.08	0	1	0.27	4635
Secondary (yes = 1)	0.07	0	1	0.25	4635
College (yes = 1)	0.04	0	1	0.19	4635
Housing and hygiene					
Housing type (pucca = 1)	0.33	0	1	0.47	4616
Toilet (flush = 1)	0.55	0	1	0.50	4609
Community factor					
LHW presence (visit in last 3 months)	0.56	0	1	0.50	6480
Region (urban = 1)	0.26	0	1	0.44	4635

The mean values for the z-scores of WAZ, HAZ, and WHZ are –1.50, –2.44, and 0.15, respectively. Per capita expenditure is computed to be Rs 2,707 per month. About half the sampled children are female with a mean age of about 31 months (Table 7). About 11 percent of the children sampled reported having suffered diarrhoea in the month preceding the survey while another 15 percent had been prone to other illnesses during this period, mainly respiratory tract infections. The mean value of mothers' BMI is calculated at 22.93. More than half the housing units sampled were *pucca* (cemented) and about two thirds had a toilet with a flush. LHWs were reported to have visited 63 percent of the households sampled. The mean value of the regional dummy (urban) is 0.26.

Table 8 presents the results of the 2SLS regression for the three equations (WAZ, HAZ, and WHZ). Let us first consider the child characteristics gender and age. The gender variable has a significant and negative relationship with only the WAZ scores, showing that boys are more likely than girls to be underweight. The age-squared term, however, has a significant and positive association with only the HAZ scores, suggesting a non-linear relationship where boys gradually improve their height/age score.

The number of siblings has a negative relationship with WAZ (underweight) and WHZ (wasting) but a positive association with HAZ (stunting). This means that, while the number of siblings negatively affects children's current nutrition status, it contributes positively to their growth in the long term. The other important finding is the statistically significant negative association of the incidence of diarrhoea and other illnesses, particularly the former, with the three anthropometric measures. Morbidity appears to adversely affect the growth of children—episodes of illness reduce the body's ability to convert food into energy. Surprisingly, mothers' education does not emerge as statistically significant, but their BMI has a strong association with children's nutrition status, suggesting a strong correlation between the former's health and the latter's nutrition status.

The environmental factor represented by the availability of a flush toilet at home has a statistically significant relationship with WAZ and WHZ scores, but the relationship is insignificant for HAZ scores. The lack of association implies that household-level environmental factors such as toilets with flush systems affect current health rather than chronic malnutrition (HAZ).

The impact of LHWs in improving children's nutrition status is positive and statistically significant as far as WAZ and HAZ scores are concerned, implying that their visits help improve not only current nutrition status but also children's growth in the long term by improving HAZ. The regional dummy (rural/urban) was incorporated in the models to examine the effect of community factors on children's nutrition, and its negative sign indicates that the nutrition status of urban children is lower than that of rural children. Finally, per capita expenditure, which represents the poverty status of the sampled households, is not statistically significant, i.e., poverty has no direct impact on children's nutrition status (Table 8).

To further explore the relationship between poverty and child nutrition, we replace per capita expenditure—which represents a household's current poverty status—with its poverty status in 2004 and poverty dynamics in equation 2. The hypothesis is that the poverty of a household in the recent past and its movement in or out of poverty can affect a child's nutrition status. As noted earlier, the sampled children included in the nutrition status equation were 6–59 months old. The PPHS was carried out in the last quarter of 2010. As part of a panel survey, an earlier round was carried out in 2004 but only in rural Punjab and Sindh. Poverty in 2004 or a change in households' poverty status between 2004 and 2010,[1] when the sampled children were born, may have had an impact on their nutrition status. Table 9 gives the results of OLS estimates for

[1]Based on this panel data, Arif and Farooq (2012) have estimated that, between 2004 and 2010, 15 percent of the sampled households moved out of poverty while 18 percent fell into poverty. Another 9 percent of households identified as chronically poor, remained poor in two rounds, i.e., 2004 and 2010.

Table 8

Determinants of Child Malnutrition
(2SLS Regression with Per Capita Expenditure Instrumented)

Determinants	WAZ Coefficients	HAZ Coefficients	WHZ Coefficients
Per capita expenditure (Rs)	0.00002	0.00003	0.00011
Per capita expenditure (sq)	–1.50000	–2.07001	–5.97001
Sex (male = 1)	–0.21390***	–0.07455	–0.01812
Child age (months)	0.02034	–0.03274	–0.02541
Child age-squared	–0.00027	0.00058*	0.00376
Number of siblings (< 2 as reference)			
2–3	–1.11921	0.18445	–1.11462
4–6	–0.30096*	0.33559*	–0.41678**
7+	–0.16573	0.32119	–0.59825*
Diarrhoea (yes = 1)	–0.60165***	–0.42692**	–0.35303*
Other illnesses (yes = 1)	–0.11436	–0.39066***	0.05315
Mother's BMI	0.06953***	–0.01682	0.07844***
Mother's education (no education as reference)			
Primary	–0.05852	0.06455	–0.03131
Secondary	–0.12829	–0.05722	–0.06474
College	–0.00571	0.02637	0.01382
Housing type (pucca = 1)	–0.05529	0.1041	–0.16252
Toilet facility (yes = 1)	0.33656***	–0.20369	0.05983***
LHW visited (yes = 1)	0.37323***	0.29574**	0.17524
Region (urban = 1)	–0.31404***	0.16582	–0.06081***
Constant	–4.04473***	–2.69587***	–1.59778**

Note: *denotes significance at 1 percent, **denotes significance at 5 percent, ***denotes significance at 10 percent.

Table 9

Impact of Poverty and Poverty Dynamics on Child Malnutrition—OLS Regression

Determinants	WAZ Coefficients	WAZ Coefficients	HAZ Coefficients	WHZ Coefficients
Poverty status in 2004 (poor = 1)	–0.21872	–	–	–
Poverty dynamics (non-poor as reference)				
Chronic (poor in 2 periods)	–	–0.14043	–0.40912	0.06713
Transitory (moved into or out of poverty	–	–0.06055	0.19287	0.17597
Sex (male = 1)	–0.22621	–0.22799	–0.04055	–0.08535
Child age (months)	0.01632	0.0178	–0.00038	–0.00943
Child age-squared	–0.00023	–0.00024	0.00013	0.000102
Number of siblings (< 2 as reference)				
2–3	–0.02767	–0.06239	–0.03609	0.03363
4–6	–0.21127	–0.22787	0.17871	–0.27058
7+	–0.27325	–0.30459	–0.08322	–0.51504
Diarrhoea (yes = 1)	–0.81456***	–0.8209***	0.10535	–0.58821**
Other illnesses (yes = 1)	–0.09647	–0.10661	–0.29124	–0.28534
Mother's BMI	0.05695***	0.05754***	0.00122	0.04407**
Mother's education (no education as reference)				
Primary	0.17595	0.16176	0.13125	0.16306
Secondary	0.3676	0.42127	0.56022	–0.13302
College	–0.75571	–0.76871	0.01646	0.29564
Housing type (*pucca* = 1)	0.13908	0.15124	–0.08093	0.08191
Toilet facility (yes = 1)	0.27132*	0.28244*	0.04988	0.48111***
LHW visited (yes = 1)	0.38765***	0.39669***	0.01534	0.41305**
Constant	–3.47382***	–3.51597***	–2.95795***	–1.42942**

Note: *denotes significance at 1 percent, **denotes significance at 5 percent, ***denotes significance at 10 percent.

four models. In the first model for WAZ (underweight), per capita household expenditure is replaced by household poverty status in 2004: "poor in 2004" is given the value 1 and 0 otherwise. In the other three models (WAZ, HAZ, and WHZ), we use three dummies for poverty dynamism: "transitory poor" ("moved out of poverty or fell into poverty)", and "chronically poor". The third category, remained non-poor in 2004 and 2010, is the reference category.

Model 1 (WAZ) examines the effect of poverty status in 2004 on child nutrition status in 2010; the remaining models concern the role of poverty dynamics in child nutrition status. None of the categories emerges as statistically significant (Table 9), implying that not only does households' current poverty status (i.e., per capita expenditure in 2010) have little impact on children's nutrition, recent poverty status and households' movement into or out of poverty is not statistically relevant either. It is noteworthy that age and number of siblings, both of which were statistically significant in the models given in Table 8, are not significant in the models in Table 9. There is no change in the significance of the other variables.

In the PPHS 2010, sampled households were asked whether they had faced food shortages in the last 12 months and if, during this period, there had been adequate food for their household members. These two questions bring up households' perceptions of their food security, although this type of perception may not reflect a true picture of the household's food security because it does not determine its duration or nature. It does, however, provide information about households that faced food shortages for some time during the 12 months preceding the survey. The PPHS 2010 shows that about a third of the households sampled reported such shortages.

In the final stage of our analysis, we re-estimate Equation 2 by replacing per capita expenditure with variables representing the household's perceived food security. If the household faced a food shortage or if there was insufficient food in the last 12 months, it takes a value of 1 and 0 otherwise. Two models (for WAZ only) are estimated. Model 1 incorporates a variable for food shortage, which in model 2, is replaced by a variable for perceived food insufficiency. Table 10 presents the results of the OLS regression. Interestingly, neither variable is statistically significant. Like poverty, perceived food shortage is not related to children's nutrition status. There is no major difference in the magnitude and significance of other variables used in the models. The results of the models for HAZ and WHZ regarding perceived food security are similar to those for the WAZ equation.

Table 10

OLS for Underweight Children (Perceived Food Security)

Determinants	WAZ	WAZ
Food shortage (yes = 1)	0.05179	–
Sufficient food (yes = 1)	–	0.04598
Sex (male = 1)	–0.21544**	–0.21352**
Child age (months)	0.01693	0.01696
Child age-squared	–0.00022	–0.00022
Number of siblings		
2–3	–0.13345	–0.13583
4–6	–0.03228**	–0.33750**
7+	–0.20781	–0.20825
Diarrhoea	–0.57140***	–0.57546***
Other illnesses	–0.10985	–0.12347
Mother's BMI	0.07200***	0.07312***
Mother's education		
Primary	–0.04041	–0.03609
Secondary	0.00777	0.02015
College	0.1148	0.13794
Housing type	–0.53747	–0.05432
Toilet facility	0.34353***	0.03618***
LHW visited	0.33706***	0.34791***
Region	–0.27220**	–0.27975**
Constant	–3.66645***	–3.71176***

Note: *denotes significance at 0.05, **denotes significance at 0.01, ***denotes significance at 0.001.

6. DISCUSSION: EXPLANATION OF POVERTY-CHILD MALNUTRITION NEXUS IN PAKISTAN

A key finding of this study is that children's nutrition status in Pakistan is predominantly related to their exposure to illness (diarrhoea), the nutrition status of their mothers, the provision of healthcare services, and environmental factors. The current poverty status of their households or changes in poverty status over time and perceived food shortages are not significantly associated with child malnutrition. The question is how to explain this lack of association between poverty and child nutrition status. As noted earlier, there is no consensus in the literature on the role of poverty in child malnutrition. Several studies have shown malnutrition as a reflection of poverty, while other empirical studies have found no association between the two [Chirwa and Ngalawa (2008)]. As NEPAD (2004) notes, "[the] *availability and access to sufficient quantity and quality of affordable food is necessary but not sufficient to ensure adequate nutrition*". Alone, food security and low poverty levels cannot make a household nutritionally secure. Beside poverty, other basic determinants of nutrition include social, economic, political, cultural, and non-food factors such as care and health [ACC/SCN-IFPRI (2000)]. A nutritionally secure society is once that achieves adequate food, adequate maternal and child care, and good health and environmental services [Gillespie and Haddad (2003)]. Unless the three underlying determinants (see Section 2 for detail) are addressed in an integrated manner, malnourishment can prevail in a rich but unhealthy family where both food and income poverty are not a problem.

In the case of Pakistan, based on the PSES 2001, Arif (2004) finds that per capita expenditure (or poverty) has a positive impact only on weight-for-age, but no association with stunting or wasting; he does not account, however, for the endogeneity problem. When we do so in this study, we find that poverty is not statistically associated with any of the three anthropometric measures (underweight, stunting, and wasting). As shown earlier, Pakistan has not experienced a sustained reduction in poverty in the last five decades; rather, it has fluctuated. Poverty increased in the 1990s, but the prevalence of underweight declined. During the first half of the last decade, poverty declined, then rising in the second half. Although the proportion of underweight children has declined in the last decade, the incidence of stunting and wasting has remained unchanged or even increased.

Poverty in Pakistan is considered largely a rural phenomenon, but there is no major difference between urban and rural areas in terms of child malnutrition (see Table 2). This is partially explained by rural economy dynamics. Despite high unequal land distribution, about two thirds of rural households are engaged in the production of agricultural food items/livestock-related activities, ensuring the necessary dietary intake of household members. Moreover, social and financial support is deeply embedded in Pakistani

culture where vulnerable households receive support from neighbours, relatives, and well-off families, and are thus able to maintain a certain subsistence level of nutritional intake. Such support may even be enhanced when some households or social groups are subjected to natural or non-natural negative shocks. The state also provides a number of direct and indirect transfers and subsides to the poor to protect them from short- and long-term social and financial insecurity. Targeted direct transfers in the public sector, such as zakat, the Bait-ul-Mal, and Benazir Income Support Programme (BISP) help with the provision of food; Nayab and Farooq (2012) find that the BISP has had a positive impact on food consumption.

Evidence from other countries such as India shows that adequate food is not the key issue, and that it is necessary to look beyond income levels, poverty, and food availability (Mendelson, 2011). Episodes of illness, particularly diarrhoea, reduce the body's ability to convert food into energy, leading to high rates of malnutrition among children. Children who suffer from constant illnesses—even if they meet their dietary requirements—cannot grow robustly since excessive nutrition losses occur during frequent episodes of disease [Rosenberg, Soloman, and Schneider (1977)]. Frequent episodes of diarrhoea account for high neonatal and infant mortality and it is the second-most fatal disease among children in the world [UNICEF (2011)]. Pneumonia is one of the leading fatal diseases in Pakistan [UNICEF (2012)].[2] There is a strong association between the incidence of diarrhoea and lack of access to safe drinking water both in urban and rural areas. In Karachi, 22 percent of water samples provided by the government were found to be either non-chlorinated or containing insufficient amount of chlorine.[3] While the reduction in poverty depends greatly on private household consumption expenditures, improvements in child malnutrition are induced by public expenditures. Improved sanitation and access to clean water, usually invested in by the government, can have a significant impact on malnutrition [IFPRI (2005)].

Similarly, the significance of mothers' nutrition status and the availability of LHWs indicate the importance of maternal health and childcare services in improving the nutrition status of children. The literature also shows that the children of malnourished mothers are more likely to be underweight and run a higher risk of prenatal mortality [Opara, Adebola, Oguzor, and Abere (2011)]. In Pakistan, where health facilities are very poor—the country has spent only 0.6 percent of its GDP on health services over the last two decades—the system's pervasive weaknesses have placed the greatest burden of mortality and disease on women and children.[4]

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[2]UNICEF (2012). *DAWN* newspaper, October 10, 2012.

[3]*DAWN* newspaper, October 10, 2012.

[4]UN Report titled "Every Women, Every Child: From Commitment to Action" *DAWN* newspaper, October 10, 2012.

7. CONCLUSIONS

The high prevalence of malnourishment among children in Pakistan remains a critical issue in policy debate. This study has examined trends in child malnutrition and developed its links with the characteristics of children and their mothers, the provision of healthcare services, and the poverty status of households. We have found that very high levels of malnutrition exist among children, but that there is no significant association between poverty and child malnourishment or between perceived food shortages and child malnutrition. Rather, our results suggest that exposure to disease is the major cause of poor child growth, and the latter cannot necessarily be solely attributed to poverty. Child malnutrition is deeply rooted in child illness, the nutrition status of their mothers, environmental factors, and a weak healthcare system.

Several policy suggestions emerge from the findings of this study.

First, Pakistan should not assume that economic growth or poverty reduction will automatically translate into improved child nutrition and health. Measures to enhance actions on the social determinants of health and specific programmes to improve early-life nutrition are needed to reduce child malnourishment.

Second, the existing child and maternal healthcare services in the country are inadequate for improving child health and nutrition status. Many developing countries, some with resources even more limited than those of Pakistan, are 'on track' in improving maternal and child health. Pakistan's key weaknesses are insufficient financing, poor governance, lack of skilled health workers, and inequalities in access to healthcare.[5] Thus, direct investments in appropriate health interventions targeting women and children are necessary to improve child health and nutrition.

Third, the high incidence of child illnesses, particularly diarrhoea, needs to be overcome by preventive measures, including dissemination of knowledge about hygienic environment and specific dietary intake during illnesses to compensate for loss of nutrients.

Finally, the positive contribution of LHWs in child nutrition and other health indicators [see Arif, *et al.* (2012)] shows the importance of door-to-door healthcare services in Pakistan. The LHW programme should be universalised, particularly in rural areas.

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[5] *DAWN* newspaper, October 10, 2012.

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