Pakistan Journal of Applied Economics, Vol.28 No.2, (189-211), Winter 2018

EXPLORING THE RELATIONSHIP BETWEEN MOTHER'S EMPOWERMENT AND CHILD NUTRITIONAL STATUS: An Evidence from Pakistan[1]

Haroon JAMAL*

Abstract

The objective of this paper is to explore linkages between mothers' socioeconomic empowerment and the nutritional status of children under age five in the context of Pakistan. Empowerment is represented through a composite index which is developed for this study by incorporating various empowerment dimensions; such as educational attainment, labor force participation, involvement in household decisions, asset ownership, freedom of movement and perceptions regarding domestic violence. Nationally representative rich data of Pakistan Demographic and Health Survey 2012-13 is used to quantify the nature and direction of relationship between empowerment and child malnutrition in terms of stunting, wasting and under weights in a multivariate logistic regression framework. The estimated results highlight the importance of empowerment dimensions, considered in this analysis for improvement of nutritional status of children. Thus to empower women, eradication of gender discrimination and public interventions that aims to empower women directly through conditional cash transfer programs, microfinance, agriculture and livestock projects are recommended.

Key Words: Mothers' Empowerment Index, Principal Component Analysis, Child Malnutrition, Logistic Regression, Pakistan.
JEL Classification: I12, C25, J16.

I. Preamble

Malnutrition is an umbrella term for poor nutrition which, according to the WHO addresses three broad groups of conditions:[2]

- under nutrition, which includes wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age);
- micronutrient-related malnutrition, which includes micronutrient deficiencies (a lack of important vitamins and minerals); and
- overweight, obesity and diet-related non-communicable diseases.

* Visiting Research Fellow, Institute of Business Administration, Karachi, Pakistan.

[1] An earlier version of this paper has been annexed in the working paper series of the Centre for Business and Economic Research (CBER), IBA, Karachi.

[2] Retrieved on September 27, 2018 from http://www.who.int/news-room/fact-sheets/detail/malnutrition.

In the form of stunting, wasting and underweight, child malnutrition remains one of the most important health concerns of the governments of developing countries, due to its significant position for healthy human development. Pakistan also has an extraordinarily high and persistent level of child under nutrition.[3] The data of Pakistan Demographic and Health Survey (PDHS) 2012-13 reveals that about 45 per cent of Pakistani children under the age of five years are stunted, 11 per cent are wasted and 30 per cent are underweight. In light of the alarming fact that in developing countries, one out of every three children is malnourished; thus, the research on causes of child malnutrition is constantly expanding worldwide; specially, in developing countries. A considerable part of empirical research is devoted for exploring relationship between women's empowerment and child nutritional status. Moreover, as part of the quest to achieve gender equality, women's empowerment has increasingly been the focus of many development interventions by development partners and the international agencies.

The empirical research confirms a positive association between increase in women's empowerment and improved nutrition outcomes and conversely action leading to women's disempowerment can result in adverse nutritional impacts for women themselves as well as for their children [Bhagowalia, et al. (2012), Quisumbing (2003), Smith and Haddad (2000)]. Based on review of numerous empirical evidences from developing countries, Bold, et al. (2013) summarized that, 'studies have shown the important linkages between the dimensions of women's empowerment and nutritional outcomes.' They further argued that in addition to being an end-goal in itself, women's empowerment is also considered a mean by which other important development outcomes can be achieved, such as poverty reduction and investment in human capital (nutrition, health and education). Smith, et al. (2003) observed that improvement in women's power is relative to men's, both within the household and in the community, and it strongly influence children's nutritional status. In South Asia, where status of women's is particularly low, they conclude 'if women and men had equal status in South Asia, with all other factors held as they are the percentage of underweight children would decline from 46 to 33 per cent - a reduction of 13.4 million malnourished children.'

In the context of Pakistan, no evidence of any systematic effort is available to quantify the relationship between women's empowerment and child nutritional status. Empowerment indicators the education and employment are used independently in the regression framework to explore the impact on child nutrition. However, these studies, often infer conflicting results on the nature of relationship. Arif, et al. (2012), while examining determinants of child malnutrition in Pakistan, found that mothers' education did not turn out to be statistically significant, as a determining factor of child nutritional status in their estimated multivariate regression model. In contrast, other studies using Pakistan data found a positive and significant relationship between child nutrition and

[3] The terms 'malnutrition' and 'undernutrition' are often used loosely and interchangeably. Malnutrition refers to all deviations from adequate and optimal nutritional status; including energy undernutrition and over-nutrition.

mothers' educational attainment.[4] This leads to inconclusive discourse regarding the impact of women's empowerment on child nutritional status. Similarly, Fikree, et al. (2000) and Rahman, et al. (2004) did not find mother's employment status and the financial decision-making authority, respectively, to be associated with child nutritional status. Following in this direction, the study provides empirical evidence with reference to Pakistan on relationship between mothers' empowerment and child nutritional outcomes through a composite Empowerment Index (EI) which incorporates various aspects of women's empowerment including education, labor-force participation, and involvement in household decision making, mobility, asset ownership and access to information. The analysis uses the micro data of PDHS 2012-13.

The paper proceeds as follows. Dimensions and methodology for measuring empowerment is presented in Section II. Data and specification of malnutrition model are described in Section III, while discussions on empirical results including quantitative scales of women's empowerment across regions, provinces and household poverty status are furnished in Section IV. Section V, conclude the paper with some suggestions and remarks.

II. Measuring Women's Empowerment

A number of studies on conceptualizing empowerment have been produced for the purpose of getting consensus on the definition of women's empowerment.[5] Most often, these studies refer to women's ability to make decision and affect the outcome of importance to themselves and their families. Further, the control over one's own life and over resources is often stressed in these studies. According to Malhotra, et al. (2002), the key underlying concepts which define women's empowerment relates to choices, control, and power. For instance, Eyben, et al. (2008) defines that 'empowerment is a process which relate to power of an individual to redefine women possibilities and options, and to have ability to act upon them' while, Kabeer (2001) defines 'empowerment as an expansion in people's ability to make strategic life choices in a context where this ability was previously denied to them.'

The nature of diversity and multiplicity in defining women's empowerment leads to the fact that it is characterized as a complex, multifaceted, context dependent notion and thus its measurement is challenging. Moreover, the empowerment process cannot be measured but can only be approximated because it is not directly observable. In relevant literature, it is also highlighted that women's empowerment cannot be quantified absolutely but only in relative terms and has to be assessed through proxies or indicators.

[4] See for instance, Headey, et al. (2016), Di Cesare, et al. (2015), Mahmood (2001), Fikree, et. al. (2000), Alderman and Garcia (1994), Hazarika (2000).

[5] References of various studies are available in Malhotra, et al. (2002).

1. Indicators of Women's Empowerment

The aspects of women empowerment which are considered in this study include; women participation in household decisions, women's freedom of movement, women's acceptance of unequal gender roles and women's access to sources of empowerment (education, exposure of mass media, employment and property rights). Thus, the composite Empowerment Index (EI), developed for this study comprises of these dimensions which are based on empirical literature that indicated or confirmed their possible association with women's autonomy and empowerment. A schematic view of empowerment model for this study is furnished in Figure 1, while definitions of specific indicators for each empowerment aspect are described in Table 1. Brief remarks on the selected indicators are in order.

a) Educational Attainment

Education has the potential of empowering women in several ways; it equips them with awareness and knowledge required to make beneficial life choices; and it also increases their ability to access resources and services. In addition, it enables them to become informed consumers and citizens [Kishor and Gupta (2004)]. Education is also likely to enhance women's economic independence by equipping them with skills necessary to avail the paid employment opportunities, thereby also, making their economic contributions more visible. Women's educational attainment is represented in six categories; no education=0, incomplete primary=1, complete primary=2, incomplete secondary=3, complete secondary=4 and higher=5. Besides, the women's own educational attainment, her level of education relative to those of husband is also included in the composite EI. If women has less education relative to husband, her score is 0, otherwise 1.

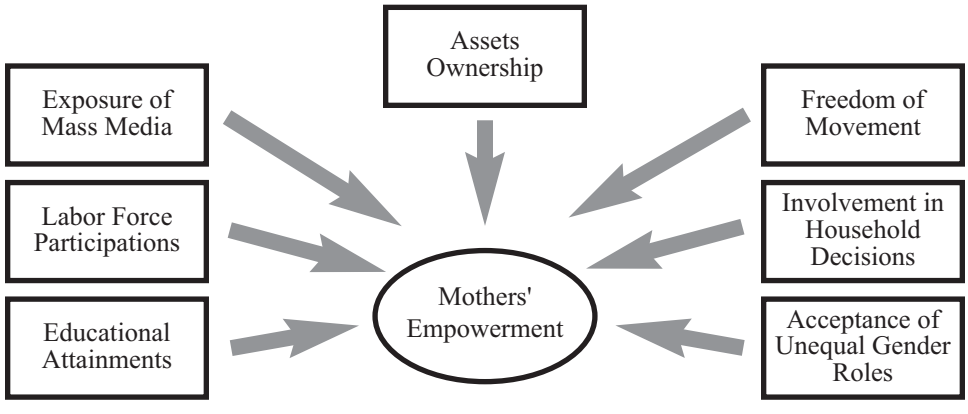


FIGURE 1

Dimensions of Empowerment

Source: Author's own presentation.

TABLE 1

Components of Mothers' Empowerment Index

Dimensions – Variables	Definitions
Educational Attainment:	
Educational attainment of mothers	No education=0, Incomplete primary=1, Complete primary=2, Incomplete secondary=3, Complete secondary=4, Higher=5
Mother education compared with Father	Women less educated=0, More or Same Level of education=1
Labor Force Participation:	
Nature of Participation	Not Working=0, Occasional=1, Seasonal=2, All years=3
Exposure to Mass Media:	
Reading newspaper or magazine	Not at all =0, Occasionally=1, At least once a week=2, Daily=3
Watching television	Not at all =0, Occasionally=1, At least once a week=2, Daily=3
Asset Ownership:	
Owns a house alone or jointly	Does not own=0, Jointly own=1, Alone own=2
Owns land alone or jointly	Does not own=0, Jointly own=1, Alone own=2
Involvement in Household Decisions:	
Mothers health care	Not Involved=0, With Husband=1, Alone=2
Large household purchases	Not Involved=0, With Husband=1, Alone=2
Visits to family or relatives	Not Involved=0, With Husband=1, Alone=2
Money husband earns	Not Involved=0, With Husband=1, Alone=2
Women's Freedom of Movement – Getting Medical Help for self:	
Getting permission to go	Big problem=0, Not a big problem=1
Getting money needed for treatment	Big problem=0, Not a big problem=1
Not wanting to go alone	Big problem=0, Not a big problem=1
Women's Acceptance of Unequal Gender Roles – Beating of Wives by Husband Justified if:	
Wife goes out without telling husband	Justified=0, Not Justified=1
Wife neglects the children	Justified=0, Not Justified=1
Wife argues with husband	Justified=0, Not Justified=1
Wife refuses to have sex with husband	Justified=0, Not Justified=1
Wife burns the food	Justified=0, Not Justified=1

Source: Author's own presentation.

b) Labor Force Participation

An important enabling factor for economic and social empowerment of women is her participation in economic activities, particularly outside the home. It is argued that not only can employment be a source of economic independence, but it can help to give women a sense of self-worth. The indicator which represents the nature of labor force participation in the EI is an ordinal variable. Scores are assigned as; 0 for not working women, 1 for women who reported occasional work outside home, 2 for seasonal working and 3 for women who reported working the whole year.

c) Exposure to Mass Media

Due to higher level of illiteracy and low level of educational attainment of women, mass media is an important source for enhancing women awareness to the outside world, while especially TV is undoubtedly an important source of entertainment, it has tremendous educational value. Regular exposure to different mass media, particularly the visual media, is likely to play a significant role in building women's information base. Frequency of reading newspapers or magazines and watching television is included to assess the media exposure with the following categories; 0=not at all, 1=occasionally, 2=at least once a week and 3=daily.

d) Property Rights

Control over resources is an important aspect of women empowerment. For the EI, patterns of land and house ownership are included. Value zero is assigned to ordinal variables in case of no ownership, while values 1 and 2 are assigned for joint and single ownership, respectively.

e) Women's Freedom of Movement

In the PDHS women's freedom of movement was not asked directly. Instead they were asked whether; they need permission to go out of the house? do they face any problem in getting the needed money? or do the face any difficulty in going out of the house alone? These questions were asked with reference to get the medical help for self-care. Answers for these questions were recorded in two categories; 'big problem' and 'not a big problem'. It can be safely argued that women, who reported problems in getting permission or face difficulty in going out alone, were more limited in their freedom than women who answered 'not a big problem'. For estimation of Empowerment Index, 0 is assigned to those women who responded 'big problem'; otherwise 1 is assigned.

f) Woman's Involvement in Household Decision-Making

In various household and personal level decisions, women's extent of participation reflects the degree of empowerment. PDHS asked each ever-married woman age 15-49, who makes decisions in her household regarding women's health care, large household purchases, visits to family or relatives and the money earned by her husband.[6] Three choices were given to answer these questions; not involved (someone else decide), decide with husband or alone. Four ordinal variables are created for WEI by assigning values 0, 1 and 2, accordingly.

g) Women's Acceptance of Unequal Gender Roles

A fundamental element of empowerment is the rejection of ascription of seemingly immutable and essentially unequal rights and privileges on the basis of sex of an individual. One such 'right' often normatively ascribed to men is the right of husbands to regulate and control behavior of their women's [Kishor and Gupta (2004)]. Acceptance of this normatively prescribed the power of men over women which reflect an acceptance of unequal gender role. Women who accept that beating of wife by husbands are justified; is less empowered than a woman who thinks otherwise [Sen and Batliwala 1997)]. According to (Kishorand Gupta, 2004), overall it can be safely said that in societies where beating of wives by husbands is widely accepted IT is indicative of a lower status of women, both absolutely and relative to men.

To measure this aspect of women's empowerment, PDHS asked all respondents (ever married women aged 15-49) whether they thought that a husband is justified in beating his wife for each of the following reasons: wife goes out without telling husband, wife neglects the children, wife argues with husband, wife refuses to have sex with husband, and wife burns the food. Five variables were developed for the composite EI with binary values: 0 if a women justifies beating by her husband and, value 1 if she categorically argues 'not justified'.

2. Methodology for Combining Empowerment Indicators

Instead of exploring relationship between the above empowerment indicators and the child nutritional status discretely, a composite index is preferred. It represents the aggregate measure of a combination of complex phenomena and summarizes multidimensional issues to support the policy decisions. Two issues however are encountered while developing composite indices; the substitutability among components and how to weight constituent variables. Various efforts are being made to represent women

[6] Women who worked for cash were also asked 'who mainly decides how the money they earned would be used'? However, this variable is dropped due to very low labor force participation rate and large refusal to answer.

empowerment through composite indices. Women empowerment in Agriculture Index (WEAI) is the first standard measure to capture women's empowerment, directly in the agricultural sector. The WEAI was launched by the International Food Policy Research Institute (IFPRI), Oxford Poverty and Human Development Initiative (OPHI), and USAID's 'Feed the Future' program in 2012. The WEAI is comprised of two sub-indices: one to measure empowerment of women along five domains/dimensions and, second, to measure the gender parity of empowerment within the household [Alkire, et al. (2013)]. Another notable composite index was developed by Tuladhar, et al. (2013) while assessing the relationship between women's empowerment and spousal violence for Nepal.[7]

However, these studies either used the additive methods assuming full substitutability among components of the index which is not a desirable property - a deficit in one dimension can be compensated by a surplus in another - or subjective weights be applied before aggregating the component indicators. Application of subjective cut-offs (thresholds) for categorizing the level of empowerment is also common in most of these studies. The technique of Principal Component Analysis (PCA) can be used to resolve issues of substitutability and assignment of weights to constituents of the composite indices.[8] PCA provides weighing scheme derived from the given data instead of weighting recommended by experts, policy makers or through public opinion polls. Thus, application of statistical weights for construction of composite indices is a better option as these remove the subjectivity and personal biases.

Smith et al. (2003) explored the relationship between women's status and children's nutrition in various countries which belongs to three geographical regions: South Asia, Sub-Saharan Africa, and Latin America and the Caribbean with the help of a composite index. They preferred PCA technique for combining indicators after experimenting the two alternative methods.[9] They observed the index, based on principal component analysis performed far better than those based on the other alternative methods, when subjected to validation analysis. Phan (2016) also developed a composite index for women empowerment following the PCA technique for Southeast Asian countries, including Cambodia, Indonesia, Philippines and Timor-Leste. This study, also apply the PCA technique to the above-mentioned empowerment indicators for developing the composite EI. The index assigns empowerment score to each ever married woman aged 15-49 years in the dataset.

[7] Mehwish, et al. (2017) also developed an empowerment index for Pakistan using PDHS 2013 data. Their study uses same methodology as developed by Tuladhar, et al. (2013) for combining empowerment indicators.

[8] Very brief description of Principal Components is provided in Appendix–B. For conceptual clarity and computational details, see Adelman and Morris (1972).

[9] Two alternative methods include; first is an index based on absolute cutoffs in which women are assigned points for achieving specified levels of each indicator and then summing the points to construct the index. This method has the advantage of being straightforward in the exact way it combines the indicators. Its disadvantages are that it assigns equal weight to each indicator, does not take into account their interrelations, and is based on cutoffs that may not be widely agreed upon as meaningful. Second is a method in which the women are divided into equal-sized groups along each indicator and then assigned points. Based on population proportions, this method relies on the variation in the sample, rather than cutoffs, to separate women into distinct groups. It has the same advantages and disadvantages as the cutoffs method.

III. Data and Estimation Framework for Determinants of Child Malnutrition

This study uses the Pakistan Demographic and Health Survey (PDHS) 2012-13 data, conducted under the aegis of the Ministry of National Health Services, Regulations and Coordination; implemented by the National Institute of Population Studies (NIPS). A nationally representative sample of 14,000 from 500 primary sampling units (PSUs) was selected for 2012-13 PDHS. Details regarding sampling framework and sample allocation across various strata are furnished in the Appendix-A. Household production framework suggested by Becker (1965) and Strauss and Thomas (1995) was referred in most studies that explore determinants of children's nutritional status. This framework assumes that a household has preference which can be characterized by utility function U, which depends on consumption of a vector of commodities (X), leisure (L), and the quality of children represented by their nutritional status (N).

$$U = u\,(X,L,N)$$

The assumption in such a model is that good nutrition, as estimated through standardized anthropometric measures, is desirable in its own right, and it is likewise assumed that households make consumption decisions on the basis of reasons other than nutrition [Pitt and Rozenzweig, (1995)]. Household utility is maximized, subject to several constraints, including a time specific nutrition, the production function and the income constraints [Strauss and Thomas (1995)]. Guided by the underlying determinants the reduced form of nutritional function for each child can be derived as:

$$N_i = f(C_i, M_i, F_i, H_i)$$

where N_i, C_i, M_i, F_i, and H_i denotes, child nutritional status (under-nourished or well-nourished), child characteristics, empowerment and health status of mothers, father characteristics and characteristics of household, respectively. Brief definitions of dependent and explanatory variables are furnished below.

1. Defining Child Nutritional Status

The 2012-13 PDHS collected data on the nutritional status of children by measuring the height and weight of all children under age 5 in the selected households. These data allowed the calculation of three indices: height-for-age, weight-for-height, and weight-for-age. According to the PDHS report [NIPS, ICF (2013)] indicators of nutritional status of children was calculated using growth standards published by the World Health Organization (WHO) in 2006. The three nutritional status indices are expressed in standard deviation units (Z-Score).

The height-for-age index is an indicator of linear growth retardation and cumulative growth deficits in children. Children whose height-for-age Z-score is below minus two standard deviations (-2 SD) from the median of WHO reference population are considered short for their age (stunted), or chronically malnourished. Children who are below minus three standard deviations (-3 SD) from the reference median are considered severely stunted. Stunting reflects failure to receive adequate nutrition over a long period of time and is affected by recurrent and chronic illness. Height-for-age; therefore, represents the long-term effects of malnutrition in population and is not sensitive to recent, short-term changes in dietary intake. The weight-for-height index measures body mass in relation to height or length and describes current nutritional status. Children with Z-scores below minus two standard deviations (-2 SD) from the reference population median are considered thin (wasted) or acutely malnourished. Wasting represents the failure to receive adequate nutrition in the period immediately preceding the survey and may be the result of inadequate food intake or a recent episode of illness causing loss of weight and the onset of malnutrition. Children with a weight-for-height index below minus three standard deviations (-3 SD) from the reference median are considered severely wasted. The weight-for-height index also provides data on overweight and obesity. Children above two standard deviations (+2 SD) from the reference median are considered overweight or obese. Weight-for-age is a composite index of height-for-age and weight-for-height. It takes into account, both the acute malnutrition (wasting) and the chronic malnutrition (stunting); but it does not distinguish between the two. Children whose weight-for-age is below minus two standard deviations (-2 SD) from the reference population median are classified as underweight. Children whose weight-for-age is below minus three standard deviations (-3 SD) from the reference median are considered severely underweight.

For this analysis, children under age 5 whose Z-scores is associated with height-for-age, weight-for-height, and weight-for-age are below minus two standard deviations (-2 SD), from the median of the WHO reference population are considered malnourished. Thus, a value of 1 is assigned to the variable N_i, which covers children who are either stunted or wasted or underweight, while the value 0 is assigned to the well-nourished children.

Since the dependent variable N_i is dichotomous, a binary logistic regression model is fitted to ascertain the determinants of malnutrition among children under five years. The Logit model estimates the probability of falling into either of the dichotomous value of the dependent variables given the effect of the explanatory variables. Thus, the estimated parameters represent the probability that a child will be malnourished. A positive sign of the estimated coefficient implies that variable will lead to increased malnutrition, while a negative sign indicates that the variable will reduce malnutrition.

2. Determinants Related to Child Characteristics

Child characteristics were included in the final specification of multivariate analysis which are age and sex of child and the place of child delivery. Empirical literature on de-

terminants of child malnutrition suggests that in developing countries elder children are likely to suffer more from malnutrition, than the younger children. Thus, a positive relationship between age and malnutrition is assumed. An important aspect of child healthcare is empirically tested by incorporating the place of child delivery in the malnourishment model. With respect to maternal and child health service used, the past studies found that formal antenatal care and delivery at a health facility are positively associated with nutrition status [Headey, et al. (2016), Mahmood (2001), Alderman and Garcia (1994)].

The variable 'Child Delivery at Home is assigned value 1 for those children whose mother reported delivery at home, while delivery at public or private hospitals/nursing homes is assigned value zero. Thus the variable which reflects the absence of much health related facilities is assumed to have a positive relationship with malnourishment. Child relative size and weight at birth are also important in determining probability of malnourishment. Unfortunately, majority of sampled women (80 per cent) either didn't weight their child at birth or don't remember, while data on child's relative size at birth is available in categories (small, average and large) and not in kilograms/ponds. Nonetheless, these two variables are tried in preliminary specifications of malnutrition model but appear statistically insignificant with wrong signs and thus, it is dropped.

3. Empowerment and Health Status of Mothers

Two maternal characteristics: mother's empowerment and mother's own health status are included in the analysis. Mother's empowerment is represented through empowerment score (described in the previous section) while mother's nutritional status is considered through the Body Mass Index (BMI) which is a well-recognized indicator of energy reserves in adults.[10] An inverse relationship between these two variables and malnourishment of children is assumed. Thus the negative signs of regression coefficients are expected.

4. Determinants Related to Characteristics of Fathers

Father's age and education are important characteristics which may affect the nutritional status of children. Based on earlier empirical research, inverse relationship between age and education of fathers, the malnutrition is assumed [Headey, et al. (2016) and Mahmood (2001). Due to collinearity problems, instead of using level or years of education, a binary (1, 0) variable is created to reflect father with no education. Thus, the positive sign of regression coefficient is expected for illiterate father.

[10] BMI is calculated as weight in kilograms divided by the square of height in meters. The estimated values of BMI for relevant sampled women are provided in the PDHS dataset. A category variable which assigns value 1 for those mothers whose BMI is in the range of 18.5 to 24.9 is used for this analysis. This BMI range reflects a healthy status (green) according to the WHO standard.

5. Background Characteristics of Household

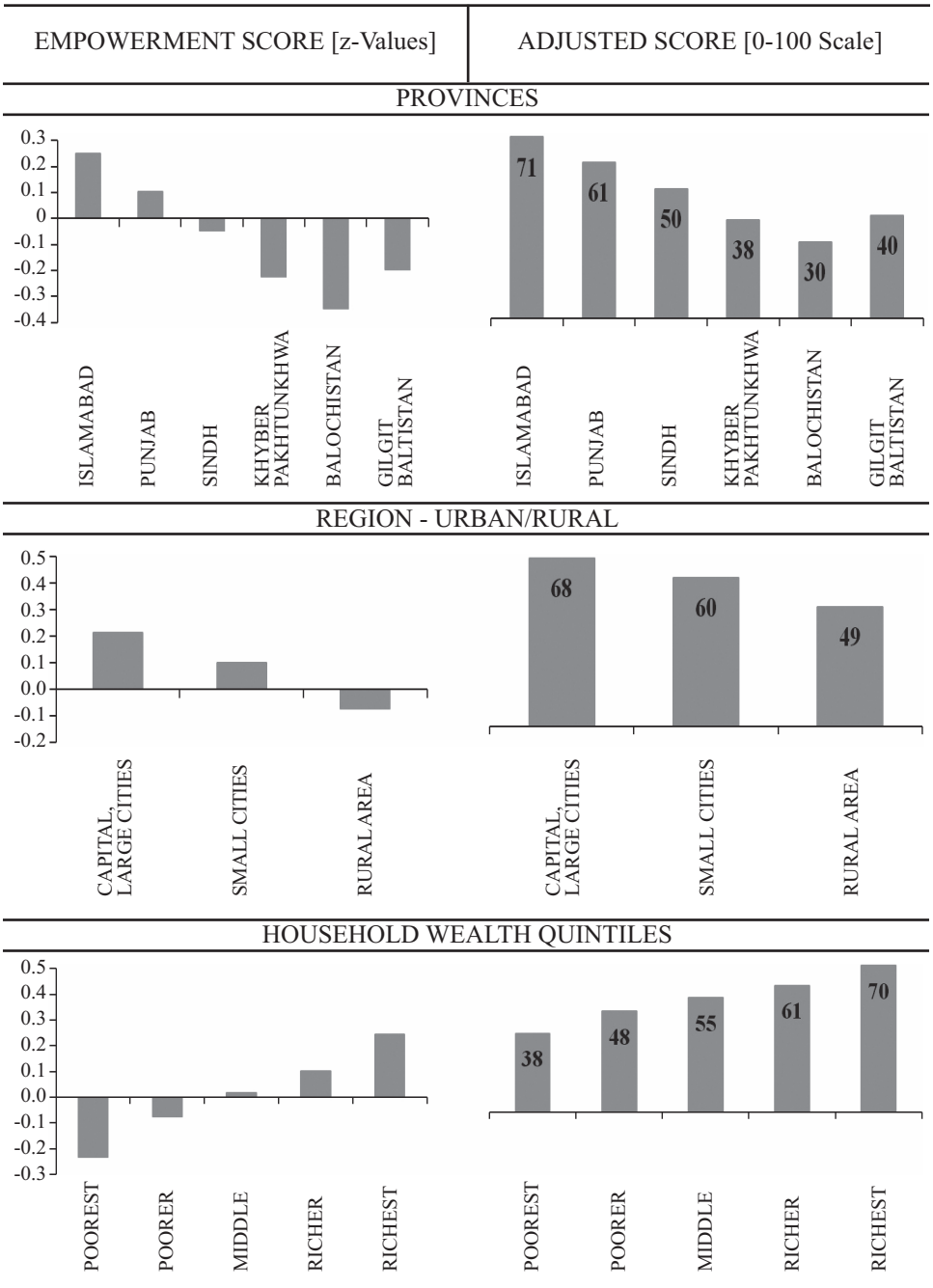
An important determinant of child malnutrition is the household status, in terms of income, consumption or poverty [Headey, et al. (2016), Di Cesare, et al. (2015), Mahmood (200), Hazarika (2000)]. In almost all studies which are based on Demographic and Health Surveys (DHS), a wealth index is used to reflect the socioeconomic status of household. It is constructed as an indicator of the level of wealth that is consistent to expenditure and income measures; and thus, it is a proxy indicator for long-term standard of living. According to PDHS report (NIPS, ICF International 2013), the index is based on data of household ownership of assets and the consumer goods such as the source of drinking water, type of toilet facilities, type of fuel, ownership of various durable goods and other characteristics relating socio-economic status of the household. The household wealth index and wealth quintile data used in this study is directly taken from the PHDS dataset.

Education level of family members also influences the behavior of mothers with respect to health of children. Thus the highest level (years) of schooling completed by any member of household, including the household head is empirically tested through multivariate malnutrition model. An inverse relationship between the level of highest education in household and malnutrition is predicted a priori. Regional (urban/rural) and provincial binary variables are also incorporated in the logit models, to control the spatial heterogeneity among the households regarding the culture, social norms and the level of development. Six binary variables (Punjab urban, Punjab rural, Sindh Urban, Sindh rural, KPK urban and KPK rural) which represent sample strata are included, while Balochistan province is used as a reference category.

IV. Results and Discussions

Average values of empowerment score obtained by ever married women in the age cohort 15-49 in the PDHS 2013 data is furnished in Figure 2. These scores are derived by combining various dimensions of women's empowerment considered in this analysis and by applying PCA technique for aggregating empowerment variables. The exhibit portrays this information across provinces, region and household poverty status.

Provincial ranking in terms of average women empowerment score is according to a priori expectation. Islamabad ranks the highest, while the lowest average values of empowerment score appear for the Baluchistan province. Again, as expected, Gilgit/Baltistan is better off than Baluchistan and KPK provinces, mainly due to relatively high female literacy and educational attainment. Regional average in terms of large cities, small cities (towns) and rural areas are also in accordance to the general perception regarding women empowerment. The average score of rural women is 49, while in large cities women obtained an average acore of 69. The exhibit also confirms a str ong positive relationship between women's empowerment and household poverty



Source: Estimated from DHS 2012-13, Pakistan data.

FIGURE 2

Women Empowerment Score – Average Values

status, reflected through household wealth quintiles. Average empowerment score of women residing in poorest (lowest wealth quintile) households is almost half than women residing in richest (highest quintile) households.

Table–2 reports the estimates of logistic regression function[11] for child malnourished mode l. The correlates or determinants of malnutrition, described above are included in the logistic function to assess the probability that a child will be malnourished. It is implied that a variable will lead to increased malnutrition if the estimated coefficient associated with variable possesses a positive sign, while a negative sign indicates that variable will reduce malnutrition. Estimated coefficients, level of significance and marginal effects with respect to probability of malnourishment and model summary statistics are displayed in the table. Summary statistics of the logistic regression indicate a good-fit of the model with 66 per cent of correct predictions. Pseudo R-Squares[12] are low (13 and 17 per cent), however, it is common in the studies based on cross-section data.[13] Sign of all estimated coefficients associated with variables are as hypothesized (in accordance to a priori expectation). Barring two coefficients associated with 'Father having no education' and 'Sindh Rural', all estimated coefficients are statistically significant, at least at 5 per cent level of significance. The result regarding child age indicate that elder children are more likely to suffer from malnutrition, than the younger children. Studies in the context of Pakistan find that age is positively associated with child malnutrition [Raju and D'Souza (2017)]. With respect to the effect of gender on nutrition, negative sign associated with girls indicate that likelihood of malnourishment is lower among girl child. The phenomenon is however, consistent with general findings in the other developing countries which shows that boys naturally have poor health than girls [IFPRI (2016)]. An important finding of this research in terms of policy is the positive and highly statistically significant coefficient associated with the variable 'Child Delivery at Home'. High marginal effect of this variable on child malnutrition is also evident in Table–2. The findings support earlier studies that child delivery at a health facility has an impact on nutritional status [Headey, et al. (2016), Alderman and Garcia (1994)].

As expected, age of father which is also a proxy of experience, is statistically significant with negative sign; indicating an inverse impact on child malnutrition. In contrast, education which is represented as a binary variable (with no education) is not statistically significant, perhaps due to collinearity. Nonetheless, the positive sign indicates that likelihood of child malnutrition is higher in case of illiterate father. The household poverty status is represented through wealth index, which is a composite

[11] Malnourishment model is also estimated though Probit regression specification. The results are provided in Appendix–C. The summary statistics reveal that Pseudo R^2 is relatively low in the Probit regression.

[12] As the binary dependent variable is used in the Logit regression function, traditional R-Square is not computed.

[13] See Smith et al. (2003). Their estimation results show the Pseudo R-Squares in the range of 6 to 15 percent in various specifications and for various regions.

TABLE 2

Determinants of Child Malnutrition – Age Group 0-59 Months
[Binomial Logit Model: Dependent Variable, Malnourished=1, Well-Nourished=0]

	Estimated Coefficients	p-Value	Marginal Effect (%)
Child Characteristics			
Child Age	0.015	0.000	0.37
Girl Child	-0.164	0.041	-4.07
Child Delivery at Home	0.468	0.000	11.08
Characteristics of Mother			
Mother's Empowerment Score	-0.248	0.080	-6.11
Mother BMI - Green (18.5 to 24.9)	-0.161	0.052	-4
Characteristics of Father			
Age of Father	-0.011	0.054	-0.27
Father with no Education	0.158	0.109	3.93
Household Characteristics			
Household Wealth Quintile	-0.172	0.000	-4.27
Highest Education – Completed Years	-0.055	0.000	-1.37
Locations:[Sample Strata]			
Punjab Urban	-0.371	0.014	-8.96
Punjab Rural	-0.365	0.002	-8.83
Sindh Urban	0.398	0.009	9.57
Sindh Rural	0.154	0.305	3.83
KPK Urban	-0.497	0.009	-11.69
KPK Rural	-0.35	0.017	-8.49
Intercept	0.643	0.015	-
Model Summary:			
Chi-Square	379.45		
Pseudo R-Squares:			
Cox & Snell R-Square	0.125		
Nagelkerke R-Square	0.167		

Notes: Marginal effects (%) are computed at mean value of variables. Zero or less than 0.01 p-value indicates that the coefficient (β) is statistically significant at least at 90 percent confidence level and strongly rejects the null hypothesis that $\beta = 0$.

The chi-square statistic is the difference between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0. The value of Chi-Square strongly rejects the null hypothesis.

Source: Estimated from DHS, 2012-13, Pakistan Data.

index of various socioeconomic characteristics and ownership of household assets. The estimated results of Table-2 suggest that poverty has strong linkages with food inadequacy or child nutritional status. The marginal effect of wealth on likelihood of malnutrition is estimated at -4.3 per cent.

Mother's status is represented through empowerment score and a variable reflecting mother's own health status through green BMI. These variables are highly statistically significant, and as expected, have an inverse relation with likelihood of child malnutrition. However, the noteworthy finding of this research is that marginal effect associated with the empowerment index (EI) is higher as compared with mother's own nutritional status (BMI) and household poverty status. Estimated from the logit regression coefficient, marginal effect of women empowerment on the likelihood of malnutrition is estimated at -5.7 per cent, while estimated marginal effects are -4.0 and -4.3 per cents for mother's BMI and household wealth status, respectively.

V. Concluding Remarks

This research investigates and quantifies the relationship between child malnutrition and mother's empowerment using data of Pakistan Demographic and Health Survey 2013. It is a first attempt in the context of Pakistan to model composite mother's empowerment score as one of the determinants of child malnutrition. The composite index is developed by combining maternal characteristics including education, labor force participation, access to information, property rights, involvement in household decisions and perception regarding the domestic violence. Based on the logistic regression analysis, while the results are broadly consistent with what has previously been reported in studies on malnutrition, they do yield one interesting finding that mother's empowerment has an edge over their health status and the household poverty. Its marginal effect in reducing child malnutrition is larger than estimated for mother's BMI, and the household wealth quintiles.

The study reiterates that women's empowerment is crucial for improving child nutritional outcomes. Thus, in the interest of bringing about sustainable improvements in child nutritional status, empowering women in terms of dimensions included in the composite empowerment model should be considered in all interventions by governments. The relevant literature suggest various interventions that aims to empower women. Smith et al. (2003) conceptualize improving women's status in two ways; structural interventions and interventions that aims to empower women directly. In terms of structural interventions, policies and development approaches may be designed in national and provincial context to eradicate gender discrimination and to ensure that women have equal economic, social, cultural, political, and civil rights. Reducing gender gaps in access to public services, productive assets, and resources form an important foundation for empowering women. In contrast, interventions or programs that specifically and directly aim to empower women promote catch-up in women status. Evi-

dence on the impact of conditional cash transfer (CCT) programs on women's empowerment, generally indicate a positive effect on various indicators of women's empowerment. Similarly, studies on microfinance programs points to their success when targeted to women. Various studies conclude that female borrowers who made active use of their loans had a higher chance of playing a role in household decision making, than those who did not. In the rural context, agriculture and livestock interventions can impact on women's status through a variety of pathways. For instance, specifically designed animal production and dairy projects may impact on women's income, control over resources, and participation in household decision making.

Bibliography

Adelman, Irma and C.T. Morris, 1972, The measurement of institutional characteristics of nations: Methodological considerations, The Journal of Development Studies, 8(3): 111-135.

Alkire, S., R. Meinzen-Dick, A. Peterman, A. Quisumbing, G. Seymour and A. Vaz, 2013, The women's empowerment in agriculture index, World Development, 52: 71-91.

Alderman, Harold, and Marito Garcia, 1994, Food security and health security: Explaining the levels of nutritional status in Pakistan, Economic Development and Cultural Change, 42(3): 485-507.

Arif, G.M., Saman Nazir, Maryam Naeem Satti and ShujaatFarooq, 2012, Child malnutrition in Pakistan: Trends and determinants, Pakistan Institute of Development Economics, Islamabad, Retrieved on July 31, 2017 from
http://www.pide.org.pk/pdf/Working%20Paper/Child%20Malnutrition%20.pdf

Becker, G., 1965, A model of the allocation of time, Economic Journal, 75: 493-517.

Bhagowalia, P., A.R. Quisumbing, P. Menon and V. Soundararajan, 2012, What dimensions of women's empowerment matter most for child nutrition? Evidence using nationally representative data from Bangladesh, IFPRI Discussion paper, 01192, Washington, DC: International Food Policy Research Institute.

Bold, Mara van den, Agnes R. Quisumbing, and Stuart Gillespie, 2013, Women's empowerment and nutrition: An evidence review, IFPRI Discussion paper, 01294, International Food policy Research Institute.

Di Cesare, Mariachiara, ZaidBhatti, Sajid B. Soofi, Lea Fortunato, MajidEzzati, and Zulfiqar A. Bhutta, 2015, Geographical and socioeconomic inequalities in women and children's nutritional status in Pakistan in 2011: An analysis of data from a nationally representative survey, Lancet Global Health, 3(4): 229-239.

Eyben, Rosalind, Andrea Cornwall and Naila Kabeer, 2008, Conceptualising empowerment and the implications for pro-poor growth, A paper for the DAC poverty network, Institute of Development Studies.

Fazal, Shahid, Paola Maria Valdettaro, Joanna Friedman, Cecile Baquin and Silke Pietzsch, 2013, Towards improved food and nutrition security in Sindh province, Pakistan, IDS Bulletin, 44(3): 21-30.

Fikree, Fariyal F., Mohammad H. Rahbar and Heinz W. Berendes, 2000, Risk Factors for stunting and wasting at age six, twelve and twenty-four months for squaller children of Karachi, Pakistan, Journal of Pakistan Medical Association, 50(10): 341-348.

International Food Policy Research Institute, 2016, Global nutrition report, 2016: From promise to impact: Ending malnutrition by 2030. Washington, DC.

Hazarika, Gautam, 2000, Gender differences in children's nutrition and access to health care in Pakistan, Journal of Development Studies, 37(1): 73-92.

Headey, Derek, John Hoddinott, and Seollee Park, 2016, Drivers of nutritional change in four South Asian countries: A dynamic observational analysis, Maternal and Child Nutrition, 12(1): 210-218.

Kabeer, Naila, 2001, Resources, agency achievements, reflections on the measurement of women's empowerment, in discussing women's empowerment - Theory and practice, SIDA Studies, 3: 17-57.

Kishor, Sunita, and Kamla Gupta, 2004, Women's empowerment in India and its States: Evidence form NFHS, Economic and Political Weekly, 39(7): 694-712.

Mahmood, Arshad M., 2001, Determinants of growth retardation in Pakistani children under five years of age, Pakistan Development Review, 40(4): 1009-1031.

Malhotra, A., S. Schuler and C. Boender, 2002, Measuring women's empowerment as a variable in international development, Background paper prepared for the World Bank workshop on Poverty and Gender.

Mehwish, Ghulam Ali, Anil Saleem and Siddiqa Ali Bhai, 2017, Impact of women empowerment on attitude towards domestic violence, RMIT University, Melbourne: Australia. Retrieved from https://www.youtube.com/watch?v= fzbcMlA1oWQ on July 21, 2017.

National Institute of Population Studies (NIPS) and ICF International, 2013, Pakistan demographic and health survey 2012-13, Islamabad: Pakistan, and Calverton, Maryland: USA, NIPS and ICF International.

Phan, Ly, 2016, Measuring women's empowerment at household level using DHS data of four Southeast Asian countries, Social Indicator Research: 359-378.

Pitt, M., and M. Rosenzweig, 1995, Estimating the intra household incidence of illness: Child health and gender inequality in the allocation of time, International Economic Review, 31: 1139-1156.

Quisumbing, A.R., 2003, Household decisions, gender, and development, A synthesis of recent research, International Food Policy Research Institute, Retrieved from www.ifpri.org/sites/default/files/ publications/genderbook.pdf

Rahman, Atif, Zafar Iqbal, James Bunn, Hermione Lovel and Richard Harrington, 2004, Impact of maternal depression on infant nutritional status and illness: A cohort study, Archives of General Psychiatry, 61(9): 946-952.

Raju, Dhushyanth, and Ritika D'Souza, 2017, Child undernutrition in Pakistan: What do we know, Policy Research working paper, 8049, World Bank,

Sen, Gita, and Srilatha Batliwala, 1997, Empowering women for reproductive rights in Harriet B and Gita Sen Presser, (eds.), Women's empowerment and demographic processes, New York: Oxford University Press.

Smith, L.C., and L. Haddad, 2000, Explaining child malnutrition in developing countries, A cross-country analysis, Washington, DC: International Food Policy Research Institute, Retrieved from http://www.ifpri.org/publication/ explaining-child-malnutrition-developing-countries-0

Smith, L.C.,U., A. Ramakrishnan, L. Ndiaye, Haddad and R. Martorell, 2003, The importance of women's status for child nutrition in developing countries, Research report, 131, International Food Policy Research Institute, Washington, DC: Retrieved on July 27, 2017 from www.ifpri.org/sites/default/ files/publications/rr131.pdf.

Strauss, J., and D. Thomas, 1995, Human resources: Empirical modeling of household and family decisions, in: J. Behrman and T.N. Srinivasan, (eds.), Handbook of development economics, 3: Amsterdam: North-Holland.

Tuladhar S., K.R. Khanal, Ghimire P.K. Lila, and K. Onta, 2013, Women's empowerment and spousal violence in relation to health outcomes in Nepal: Further analysis of the 2011 Nepal demographic and health Survey, Calverton, Maryland, USA: Nepal Ministry of Health and Population, New ERA International, Retrieved on August 8, 2017 from https://dhsprogram.com/pubs/pdf/FA77/FA77.pdf.

World Health Organization, 2006, Child growth standards: Length/height-for-age, weight-for-length, weight-for-height and body mass index-forage: Methods and development, Multicenter Growth Reference Study Group, World Health Organization, Geneva: Switzerland.

APPENDIX - A

About the Sample

Pakistan Demographic and Health Survey (PDHS) was conducted under aegis of the Ministry of National Health Services, Regulations and Coordination; and implemented by National Institute of Population Studies (NIPS). ICF International provided financial and technical assistance for the survey through USAID/Pakistan. The PDHS is part of the worldwide Demographic and Health Survey program.

The main objective of the 2012-13 PDHS was to provide reliable information on fertility and its preferences; awareness, approval, and use of family planning methods; maternal and child health; childhood mortality levels; knowledge and attitudes toward HIV/AIDS, other sexually transmitted infections (STIs); and knowledge about other illnesses, such as tuberculosis, hepatitis B, and C.

A nationally representative sample of 14,000 households from 500 primary sampling units (PSUs) was selected for 2012-13 PDHS. All ever-married women age 15-49 years in the selected households were eligible for individual interviews. In the selected households, 14,569 eligible women were identified for individual interviews and 13,558 were successfully interviewed. The survey was designed to produce reliable estimates for key indicators at the national and provincial levels, including urban-rural breakdowns, as well as for Gilgit-Baltistan and Islamabad. The detail description of sample frame, design, weights, estimation of errors and data quality is provided in various appendices of 2012-13 PDHS report (NIPS, ICF 2013), while a schematic view of sample distributions across regions and provinces are reproduces below:

Sample Allocation of Clusters and Households by Regions and According to Residence Pakistan – 2012-13

	Allocation of Clusters			Allocation of Households		
	Urban	Rural	Total	Urban	Rural	Total
Punjab	58	85	143	1624	2380	4004
Sindh	64	42	106	1792	1176	2968
Khyber Pakhtunkhwa	35	56	91	980	1568	2548
Balochistan	33	34	67	924	952	1876
Islamabad	35	13	48	980	364	1344
Gilgit-Baltistan	23	22	45	644	616	1260
Pakistan	248	252	500	6944	7056	14000

Source: Source: NIPS and ICF International (2013),
http://www.nips.org.pk/abstract_files/PDHS%20Final%20Report%20as%20of%20Jan%2022-2014.pdf

APPENDIX - B

Brief Introduction of Principal Component Analysis

Use of Factor Analysis (FA) technique[14] for indexing multidimensional phenomena has been well-established. FA essentially consists of consolidating the data so as to arrange it around the covariance structures of the variables. This technique reduces the number of relationships by grouping or clustering together all those variables which are highly correlated with each other into one factor or component. The FA model can be described as follows:

$$X_i = a_{i1}F_1 + a_{i2}F_2 + a_{i3}F_3 + \ldots\ldots a_{ij}F_j$$

where; X_i = Attribute or Dimension,
a_{ij} = Proportion of the variation in X_i which is accounted for by the *jth* factor,
F_j = j_{th} factor or component.

The Principal Component Analysis (PCA) procedure in the FA method produces components in descending order of importance, that is, the first component explains the maximum amount of variation in the data, and the last component is minimum. Thus, the first few components[15] (Principal Components) account for a sizeable part of the variation in the data and subsequent components contribute very little. This traditional PCA is best for continuous and normally distributed data as the technique assumes linear relationship between numeric variables.

For category indicator or variables, a team of Leiden University has developed Categorical Principal Components Analysis (CATPCA).[16] The technique is now available in SPSS and may be applied for data reduction when variables are categorical (e.g. ordinal) and the researcher is concerned with identifying the underlying components of a set of variables (or items) while maximizing the amount of variance accounted by the principal components. The primary benefit of using CATPCA rather than traditional PCA is the lack of assumptions associated with CATPCA. CATPCA does not assume linear relationships among numeric data nor does it require assuming multivariate normal data. Furthermore, optimal scaling is used in SPSS during the CATPCA analysis and allows the researcher to specify which level of measurement (nominal, ordinal, interval/ratio, spline-nominal, and spline-ordinal etc.) in the optimally scaled variables is required.

[14] For detailed discussion, see Adelman and Morris (1972).

[15] A threshold of Eigen-Value (greater than one) is used to determine the number of Principal Components.

[16] Data Theory Scaling System Group (DTSS), Faculty of Social and Behavioral Sciences, Leiden University, The Netherlands.

Having a representation of the data in the component form, every household is ascribed a 'score' on each derived principal component using factor loading (variance in the individual attribute) as a weight and then multiplying this score with the standardized value of variables or dimensions. An overall score (OS) usingscores of all principal components for an individual or household is obtained as follows:

$$(OS)_i = \sum_n \left[\sum (a_{ij} * Z_j) \right]$$

where; $\sum_n$ = Summation over *n* principal components,
a_{ij} = Factor Loading of *ith* Factor and *jth* indicator (weights),
Z_j = Standardized value of *jth* variable or dimension.

APPENDIX - C

Estimated Coefficients Derived from Probit Regression

Determinants of Child Malnutrition – Age Group 0-59 Months [Binomial Probit Model: Dependent Variable, Malnourished=1, Well-Nourished=0]		
	Estimated Coefficients	z-Value
Child Characteristics		
Child Age	0.009	0.000
Girl Child	-0.099	0.043
Child Delivery at Home	0.287	0.000
Characteristics of Mother		
Mother Empowerment Index	-0.140	0.099
Mother BMI - Green (18.5 to 24.9)	-0.100	0.046
Characteristics of Father		
Age of Father	-0.006	0.057
Father with no Education	0.094	0.117
Household Characteristics		
Wealth Quintile	-0.106	0.000
Highest Education – Completed Years	-0.034	0.000
Locations:[Sample Strata]		
Punjab Urban	-0.226	0.014
Punjab Rural	-0.222	0.003
Sindh Urban	0.246	0.008
Sindh Rural	0.089	0.323
KPK Urban	-0.301	0.009
KPK Rural	-0.212	0.018
Intercept	0.396	0.013
Model Summary:		
Chi-Square	379.8	
Log-Likelihood	-1779.83	
Pseudo R-Square	0.096	

Notes: Zero or less than 0.01 z-value indicates that the coefficient (β) is statistically significant at least at 90 percent confidence level and strongly rejects the null hypothesis that $\beta = 0$.

The chi-square statistic is the difference between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0. The value of Chi-Square strongly rejects the null hypothesis.