

# Towards Improved Food and Nutrition Security in Sindh Province, Pakistan

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**Abstract** The 2011 National Nutrition Survey (NNS) in Pakistan showed that Sindh province continues to have some of the worst undernutrition rates in South Asia. For determinants of acute and chronic malnutrition to be better understood, Action Against Hunger (ACF) conducted a Nutrition Causal Analysis (NCA) in two districts of Sindh province, where persistently critical prevalences of wasting were recorded, for example, Dadu district with GAM and SAM rates at 19.5 per cent and 5.3 per cent respectively (October 2011). ACF findings confirmed that Infant and Young Child Feeding (IYCF) practices do not receive the attention required to prevent the irreversible damages caused by undernutrition when occurring during the critical 1,000 days window. The study also showed a high occurrence of illnesses related to poor access to water and sanitation infrastructures, as well as a high level of poverty paired with the lack of alternative income sources.

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## 1 Introduction

For decades, Pakistani women and children have suffered from some of the highest rates of undernutrition in the world, with a national prevalence of stunting of 43.7 per cent (NNS 2011). In 2011, Sindh province had an even more critical rate of stunting (49.8 per cent), while the prevalence of underweight was 40.5 per cent, and wasting prevalence was 17.5 per cent. As shown by the 2011 National Nutrition Survey (NNS 2011), these alarming figures have not significantly changed in the past decade.

Although Community-Based Management of Acute Malnutrition (CMAM) interventions have been implemented by nutrition cluster partners in collaboration with the Department of Health (DoH) in some districts in northern and southern Sindh, there is still a considerable gap to be filled. The DoH has developed a strategic framework of action for curbing the high prevalence of undernutrition in Sindh, revamping the programme quality currently delivered, and exploring the potential linkages with complementary interventions, that is, food assistance and related dietary diversity improvements, water and sanitation and health. The 2011 NNS findings also showed that those critical high levels of undernutrition were consistent with high rates of infant and maternal mortality.

In 2010, the infant mortality rate in Sindh was 87 deaths per 1,000 live births,<sup>1</sup> and maternal mortality in the province was reported at 314 maternal deaths per 100,000 live births in 2008.<sup>2</sup> A large proportion of these deaths (more than one third among children under five years of age, Black *et al.* 2008) are associated with undernutrition and its vicious cycle perpetuated across generations. In 2011, only 52.5 per cent of women in Sindh had a normal body mass index, while 23.7 per cent were underweight. When undernutrition occurs during the first 1,000 days of a child's life (from conception through to the second birthday), the consequences are particularly severe, often irreversible, and have profound effects throughout their lifetime.

Undernutrition in Sindh places constraints on economic and social development through three primary pathways associated with overall loss to the economy: (a) direct losses in productivity from impaired physical status; (b) indirect losses from poor cognitive function; and (c) losses emanating from increased health costs.

As per the conceptual framework of undernutrition,<sup>3</sup> households without regular access to health services may experience higher rates of morbidity and increased undernutrition,

**Table 1 Prevalence of undernutrition in Sindh province, results from selected ACF surveys (%)**

Year	Survey areas	Prevalence of undernutrition (based on WHO 2006 standards) <sup>5</sup>			
		Wasting			
		GAM WHZ < -2 z and/or oedema	SAM WHZ < -3 z and/or oedema	Stunting HAZ < -2 z	Underweight WAZ < -2 z-
2012 Oct	T.M. Khan district	24.1	6.9	53.6	49.9
2011 Nov	Mirpur Bathoro (Thatta district)	12	1.9	41.5	32.9
2011 Oct	Dadu district	19.5	5.3	52.7	49.6
2010 Dec	Mirpur Bathoro (Thatta district)	19.6	2.4		
2008 Jun	Dadu district	22.7	3.7	-	-
2007 Nov	Dadu district	17.8	3.2	-	-

Source Authors' own.

than those with access. Indicators for evaluating such access may be attendance to antenatal care and immunisation rates. According to the 2011 NNS, coverage of health services in Sindh was relatively low, with 38 per cent of women having received no antenatal care (ANC) during their last pregnancy. Moreover, of women receiving ANC, only 10 per cent received information on the importance of exclusive breastfeeding, which contributes to the low rate of early initiation of breastfeeding, and of inappropriate infant and child-feeding practices.<sup>4</sup> In Pakistan, the consequences of such inadequate Maternal and Child Health (MCH) services, inadequate food consumption, and early age of marriage result in the highest recorded prevalence of low birth weight in Asia (32 per cent) (UNICEF 2012).

In addition, the 2011 NNS results showed that Sindh appeared to be the most vulnerable province with 72 per cent of households reported as food insecure compared to 58 per cent at country level. The Pakistan Social and Living Standards Measurement Survey of 2011 (Pakistan Bureau of Statistics 2011) found that 39 per cent of households surveyed in Sindh believed their economic situation to be 'much worse' or 'worse' than the year before, while just over 2 per cent believed it to be 'better' or 'much better'. Systemic poverty in Pakistan is associated with the underlying causes of undernutrition, with the main contributing

factors including low consumption and low nutritional value of food. This critical situation exacerbated by natural disasters and conflicts is often described as the cause of the deterioration of the nutritional status of the population. Action Against Hunger (ACF) has been operating in Sindh since 2007, with emergency and development interventions, and has conducted district-wide nutrition surveys in different areas of Sindh province from 2007 to 2012; results are summarised in Table 1.

As shown in Table 1, even before the catastrophic 2010 flood, undernutrition rates in Sindh province remained persistently high. A survey conducted by ACF in Dadu district in November 2007 indicated very high levels of wasting, that is, prevalence of Global Acute Malnutrition (GAM) was 17.8 per cent while the prevalence of Severe Acute Malnutrition (SAM) was 3.2 per cent. A follow-up survey in June 2008 revealed that the prevalence of GAM was 22.7 per cent and SAM 3.7 per cent. ACF carried out another nutrition survey in Dadu in November 2011 and results showed persistently high prevalence of acute malnutrition with prevalence of GAM and SAM of 19.5 per cent and 5.3 per cent respectively. In addition, underweight and stunting prevalence were recorded as being critically high, respectively 49.6 per cent and 52.7 per cent in the same district. In other districts of Sindh, survey results also showed similar critical prevalence of undernutrition in

Thatta district in December 2010 and in T.M. Khan district in October 2012 (see Table 1). Due to these critical results, ACF decided to conduct a Nutrition Causal Analysis (NCA) in the most affected union councils of these districts.

## 2 The Nutrition Causal Analysis (NCA)

In order to better understand the determinants of acute and chronic undernutrition in Sindh, to further break down pathways leading to these high rates of undernutrition, and to design appropriate and relevant nutrition-sensitive interventions and advocacy strategies, ACF conducted a NCA in Thatta and Dadu districts<sup>6</sup> in 2012, based on a methodology developed by ACF International and Tufts University.

While the NCA in Pakistan focused specifically on causal pathways to acute malnutrition, wasting is an established risk factor for stunting.

The specific objectives of the NCA are:

- to analyse secondary data and develop a hypothetical causal model to inform a preliminary understanding of causality, and underlying causes and long-term trends;
- to identify any associations between the nutritional status of children (proxy measure of the overall community nutritional status) and a set of risk factors (or variables listed below) of undernutrition to test the previous formulated hypothesis; and to determine the causal pathways and review each hypothesised causal pathway using process tracing, to prove or disprove the hypothesis.

By identifying the underlying and interrelated causes of undernutrition in a specific geographic area, the NCA is a step towards the design of a context-specific, comprehensive approach to tackling undernutrition, for which responsibility rests upon national governments, with the support of humanitarian agencies in some cases. The NCA aims to provide action-oriented research for government and humanitarian agencies to improve maternal, newborn and child health, improve women's and children's nutritional status and prevent undernutrition. NCA results can also be used as an advocacy tool to engage government ministries, donors and health representatives to enhance their focus on nutrition and its underlying causes in order to scale up their response to undernutrition.

**Table 2 Parameters taken into account for sample size calculation (%)**

Parameters for sample size calculation	
Estimated prevalence	175
Precision	5
Design effect	2.0
Under five	13.4
Non-response	5
Source Authors' own.	

## 2.1 Methodology

### Hypothesis development

The first phase of the NCA developed a hypothesis of preliminary causal pathways, in close consultation with humanitarian and government stakeholders<sup>7</sup> in Sindh with different specialisations in the sectors of nutrition, water, sanitation and hygiene (WASH), and food security and livelihoods (FSL). During this first round of consultation, 13 variables relating to income, diet, WASH, and health were identified as having a high likelihood of contributing to undernutrition in Sindh:

- Limited household income;
- Limited access to food;
- Inadequate food intake within children;
- Poor dietary diversity;
- Poor handwashing;
- Inadequate health services (availability and access);
- Prevalence of open defecation;
- Insufficient potable water;
- Poor immunisation coverage;
- Cultural traditions;
- Lack of awareness of appropriate childcare and feeding practices;
- Lack of exclusive breastfeeding.

### Cross-sectional survey

These variables served as the basis for the development of a household questionnaire used for a cross-sectional survey to collect anthropometric indicators, health, childcare and feeding practices, knowledge about undernutrition, WASH, FSL, and market prices that provided data for econometric analysis. These were complemented by focus group discussions to better understand the qualitative relationship between the explanatory variables and the prevalence of wasting, and the prioritisation and finalisation of causal pathways.

**Table 3 Bivariate analysis of related factors with acute malnutrition in children**

Variables			Proportion of wasted children (%)	X <sup>2</sup> -value and level of significance
Selected demographic variables	Sex of the child	Male	57.3	(0.341, 0.559)
		Female	42.7	
	Child's age in months	6–11	19.8	(14.100, 0.007)**
		12–23	45.8	
		24–35	16.7	
		36–47	10.4	
48–59	7.3			
Selected socioeconomic and food security variables	Source of income	One income source	83.3	(10.669, 0.001)**
		Two or more income sources	16.7	
	Do you store harvest for own consumption?	Yes	49.0	(0.264, 0.607)
		No	51.0	
	Family own livestock	Own production	27.1	(0.367, 0.832)
		Purchase	71.9	
Selected health-related variables	Quantity of water collected per day	Up 20 litres	55.2	(64.118, 0.000)***
		20–40 litres	26.0	
		40–60 litres	14.6	
		60–80 litres	3.1	
	Water treatment for drinking	Yes, always	5.2	(10.961, 0.004)**
		Yes, sometimes	6.2	
		No	88.5	
	Child faeces disposal	Pour flush toilet	5.2	(4.475, 0.215)
		Pit latrine	7.3	
		Open field	78.1	
		Others	9.4	
	Handwashing with soap	Yes, always	17.7	(27.914, 0.000)***
Yes, sometimes		43.8		
No		38.5		
Illness in the 2 weeks before the survey	Yes	70.8	(77.141, 0.005)**	
	No	29.2		

The survey methodology was designed based on the Standardised Monitoring and Assessment of Relief and Transition (SMART) methodology, following a two stage cluster sampling to randomly select clusters (or villages) and randomly select households. The ENA (Emergency Nutrition Assessment) for SMART software was used to calculate the sample size based on parameters listed in Table 2 (total number of households to be surveyed was 787) and clusters (villages) were randomly selected, employing probability proportional to population size (PPS) method. In the second stage of sampling, ballot and systematic random sampling methods were used to select households. In all selected households

anthropometric measurements were taken for 6–59 month-old children, and the household questionnaire was administered in all households including those without children.

#### Data analysis

Stepwise univariate, bivariate and multivariate analyses were done to link explanatory variables with acute malnutrition (based on anthropometry analysis). Firstly, standard tabulation and exploratory tests were done to analyse the general characteristics of the surveyed population and households. Then bivariate and multivariate analyses were subsequently performed on the household data to gauge the association between

**Table 3 Bivariate analysis of related factors with acute malnutrition in children (cont.)**

Variables			Proportion of wasted children (%)	X <sup>2</sup> -value and level of significance
Selected diet and care practices related variables	<b>Child currently breastfed</b>	Yes	58.3	<b>(5.497, 0.019)*</b>
		No	41.7	
	Received colostrum	Yes	46.9	(1.366, 0.505)
		No	53.1	
	<b>Age complementary food started</b>	< 4 months	17.7	<b>(17.001, 0.001)**</b>
		4–6 months	15.6	
		7–11 months	64.6	
		> =12 months	2.1	
	<b>Child dietary diversity</b>	Received 4 or more food groups	86.5	<b>(6.831, 0.009)**</b>
		Received less than 4 food groups	13.5	
	<b>Child illness and breastfeeding</b>	Less than usual	94.5	<b>(17.519, 0.004)**</b>
		About the same	3.6	
		More than usual	1.8	
	<b>Knowledge on duration of exclusive breastfeeding</b>	< 4 months	28.1	<b>(22.870, 0.000)***</b>
		4–6 months	39.6	
		> 6 months	32.3	
	<b>Knowledge on importance of colostrum</b>	First immunisation	2.2	<b>(48.841, 0.000)***</b>
		Child growth	40.0	
		Don't know	57.8	
	<b>Knowledge on signs of malnutrition</b>	1 score	51.0	<b>(7.254, 0.027)*</b>
		2–3 scores	49.0	
	<b>Knowledge on the prevention of diarrhoea</b>	1 score	56.2	<b>(4.779, 0.029)*</b>
		2–3 scores	43.8	

Associations are \*significant at 5% (p value < 0.05%), \*\*significant at 1% (p value < 0.01%), \*\*\*significant at 0.1% (p value < 0.001%), unmarked = not significant. Note that only selected variables are presented here (see full NCA report<sup>9</sup> for exhaustive variable list).

Source Authors' own.

each of the independent variables and the nutritional status of children (as measured by wasting). The bivariate analysis was performed using a chi-square (X<sup>2</sup>) test. Multivariate analysis of logistic regression was performed to examine the net effect of each independent/explanatory variable on the nutritional status of children as measured by wasting (more details about the analysis approach can be found in Annex 1).

## 2.2 Results

The present article focuses on findings from bivariate and multivariate analysis emphasising the variables for which significant association with acute malnutrition was found. A detailed

description of the results obtained from the anthropometric survey and from the explanatory and univariate analysis can be found in the NCA report.<sup>8</sup>

The bivariate analysis of the data from the household questionnaire indicated the following independent variables as highly correlated with wasting/acute malnutrition (significant associations see also Table 3).

- *Demographic variable:* Age of the child. The result of the analysis showed that the highest proportion of wasted children observed were in the age group 12–23 months (45.8 per cent)

**Table 4 Logistic regression estimates of the effect of the explanatory variables on wasting**

Explanatory variables	β	Sig.	Exp (β)	95% CI for Exp (β)	
				Lower	Upper
Child's age in months	-0.548	0.076	0.578	0.316	1.058
Source of income	-1.719	0.116	0.179	0.021	1.532
<b>Quantity of water collected per day</b>	<b>-0.829</b>	<b>0.029*</b>	<b>0.437</b>	<b>0.207</b>	<b>0.919</b>
Water treatment for drinking	0.472	0.288	1.604	0.671	3.832
Handwashing with soap	0.723	0.112	2.060	0.845	5.020
Illness in the 2 weeks before the survey	-18.169	0.999	0.000	0.000	
Child still breastfed	0.524	0.385	1.689	0.517	5.520
Age complementary food started	0.952	0.067	2.591	0.934	7.189
Child dietary diversity	0.376	0.646	1.456	0.293	7.230
<b>Child illness and breastfeeding</b>	<b>-0.853</b>	<b>0.049*</b>	<b>0.426</b>	<b>0.181</b>	<b>1.007</b>
Knowledge on duration of exclusive breastfeeding	-0.274	0.623	0.760	0.255	2.268
<b>Knowledge on the importance of colostrum</b>	<b>1.331</b>	<b>0.023*</b>	<b>3.786</b>	<b>1.205</b>	<b>11.899</b>
Knowledge on the signs of malnutrition	-0.759	0.273	0.468	0.120	1.819
Knowledge on the prevention of diarrhoea	-0.152	0.828	0.859	0.217	3.391

\*Significant at 5%, unmarked = not significant. β – regression coefficient; Sig. = level of significance; Exp (β) = odds ratio; CI = confidence interval.

Source Authors' own.

followed by the age group 6–11 months (19.8 per cent), while wasting was lowest among older children in the age group of 48–59 months (7.3 per cent).

- *Socioeconomic variable:* Number of sources of income within the household. A significantly higher level of wasting was observed among households with one income source (83.3 per cent) compared to households with two or more sources of income (16.7 per cent).

- *Health:*

- Quantity of water collected per day and water treatment;
- Handwashing with soap or ash;
- Incidence of illnesses within the two weeks prior to the survey.

The bivariate analysis showed that quantity of water collected by the household/day, treatment of water before household consumption, handwashing with soap or ash and incidence of illness two weeks prior to the study, were significantly associated with

wasting (associations significant at 1 per cent or 0.1 per cent; see Table 3).

- *Care practices:*

- Child being breastfed;
- Age at introduction of complementary feeding;
- Child's dietary diversity;
- Breastfeeding during illness;
- Knowledge of duration of exclusive breastfeeding;
- Knowledge of importance of early initiation of breastfeeding (and of colostrum);
- Knowledge of the signs of acute malnutrition;
- Knowledge of the prevention of diarrhoea.

The result of the analysis showed that child currently breastfed (at time of the survey), the age at which complementary food is introduced, child dietary diversity, breastfeeding practices during illness, knowledge on duration of exclusive breastfeeding, knowledge on importance of

colostrum, knowledge on the signs of malnutrition and knowledge on the prevention of diarrhoea are significantly associated with acute malnutrition (see Table 3).

The *multivariate analysis* of the logistic regression identified the following main determinants of the prevalence of wasting in children under five years of age (significant association with  $p < 0.05$ ; see Table 4):

- The risk of being malnourished for children from households that collect more than 20 litres of water per day was 56 per cent lower than for those whose households collect less than 20 litres of water per day.
- The likelihood of being malnourished for those children who were breastfed more than usual when they were sick decreased by 82 per cent compared to children who were breastfed less than usual when they were sick.
- Children whose mothers do not know the importance of colostrum were 1.2 times more likely to be wasted compared to children whose mothers know the importance of colostrum.
- The proportion of wasted children was significantly higher among mothers who knew the duration of exclusive breastfeeding (4–6 months) than among those who did not.

The linkage of the results of the bivariate and multivariate analysis with qualitative outputs of the focus group discussions and the causal pathway led to the prioritisation of the following explanatory causes for wasting.

The following variables emerged from both quantitative and qualitative data:

#### *Limited household income sources*

Level of income has a strong impact on the food that caregivers purchase and prepare for their children. Although participants of focus group discussions showed some understanding of the importance of a diversified diet, they indicated that they could not (economically) access a more diversified food basket. The vast majority (69 per cent) of households surveyed depend on a single source of income, particularly unskilled wage labour (35 per cent) and skilled wage labour (32 per cent). Single income sources also signify vulnerability to external shocks, with a tendency to reduce the quantity and quality of food consumption during and after shocks.

Inequitable distribution of land and other resources, the prevalence of sharecropping and bonded labour, high soil salinity and recurrent natural disasters contribute to a lack of economic resilience for the poorest.

#### *Insufficient potable water*

Households have difficulties accessing the approximately 105 litres of water per household per day needed for consumption and hygiene for a family of seven: only 43 per cent of households collected 20–40 litres of water per day.<sup>10</sup> An overwhelming majority of households (75 per cent) do not treat drinking water. Improving water quality can reduce the risk of contracting gastrointestinal infection and diarrhoea. Diarrhoea and other infectious diseases affect both dietary intake and utilisation, which may have a negative effect on children's nutritional status. The high prevalence of diarrhoea as found in this survey could be associated with inadequate quantity of potable water. The prevalence of wasting among children of households who do not treat water before drinking was significantly higher as compared with those who do.

#### *Poor handwashing*

Less than 10 per cent of the people reported washing their hands before feeding a baby, 13 per cent after disposing of children's faeces, and more than 75.2 per cent of the households surveyed disposed child faeces in open fields. Soap represents an expenditure for the household, therefore the availability of soap depends on purchasing power or aid distributions. While populations are aware of the necessity of using soap, many families expressed that they only use soap in the most important moments, such as after adult or children's defecation, while during the rest of the day they only use water.

#### *Care practices and lack of awareness of caregivers*

The lack of caregivers' awareness about complementary and supplementary feeding, feeding during illness and food requirements for pregnant and lactating mothers is significantly associated with wasting. The risk of being malnourished for those children who were breastfed more than usual when they were sick decreased significantly when compared to children whose breastfeeding was reduced when they were sick. The practice of breastfeeding was limited by factors such as the milk production of the mother, women becoming pregnant within a

short period after birth, and women's seasonal agriculture work. Colostrum was withheld mainly due to cultural beliefs that it is not appropriate or good for the child.

Following the collection and analysis of quantitative and qualitative information and initial draft of the report, ACF consulted again with the same initial multi-stakeholder group in Sindh (DoH, Govt. of Sindh 2010) to review findings and triangulate quantitative and qualitative data. Based on the group's contextual knowledge and previous research regarding the underlying causes of malnutrition, and ACF's qualitative analysis, certain explanatory variables were considered to be the most relevant and realistic.

#### *Limited access to food*

Purchasing power is a major factor in ensuring access to food, as markets constitute the main food source for nearly 70 per cent of households across Sindh, with less than 30 per cent of households relying on their own production (*ibid.*). Lack of appropriate storage infrastructure for sharecroppers leads to high post-harvest losses, and frequent natural disasters from cyclical droughts to floods (such as those of 2010–11) reduce the capital of the poorest, with negative effects on their already poor production and income-generation opportunities.

#### *Poor dietary diversity*

The diet of the population is mainly comprised of locally produced cereals such as wheat and rice, often combined with potatoes and chilli peppers purchased cheaply on the local market. Sources of nutrients such as vitamin A and iron are rarely consumed in the area. The consumption of animal products and fruit was found to be generally low and diets monotonous, although some households access milk through their livestock, and fish if they live in coastal areas.

#### *Children's inadequate food intake*

The study showed limited access to and consumption of adequate food and a low level of appropriate child-feeding practices by caregivers. Findings also suggest that children are largely fed on starch-rich diets with few complementary micronutrients. While 87 per cent of children under two years who are still breastfeeding had consumed the minimum number of food groups [four] in the previous 24 hours, only 20 per cent

had eaten the minimum number of required meals [between two and four depending on the child's age in months].<sup>11</sup> Only 30 per cent of 6–11 month-old children had eaten the minimum number of meals appropriate to their age. Overall, only 3 per cent of non-breastfed children received the minimum number of meals for their age in the previous day.

### **2.3 The NCA: a tool for practitioners and policymakers**

The NCA tool aims to identify potential pathways to undernutrition, but complementary social, political, and institutional analysis is necessary to unpack and address the identified causal variables. Issues of access to water, health, food, income, and women's education underlie the results of this study, from lack of diversity of income sources and children's diets to influencing cultural taboos on early breastfeeding and women's lack of access to accurate maternal health care and health education. ACF and other humanitarian agencies can address proximate causes of undernutrition by providing or subsidising access to water, food and maternal and child health information. The causal pathways confirmed by the NCA and the structural issues they highlight, however, will only tackle undernutrition at its roots if those deeper causes are taken up by the Pakistani government and its partners. The NCA can alert practitioners to 'quick wins' in terms of raising awareness of IYCF and honing in on specific activities related to dietary diversity and hygiene, and point policymakers and health workers in the right direction.

The NCA points to specific areas for response that could have a significant impact on the prevalence of undernutrition, appropriate and relevant to the local context. In the case of Pakistan, the NCA shows that a comprehensive focus on infant and young child-feeding practices, support for income generation and resilient livelihoods, increased access to potable water, and tackling cross-cutting issues such as care practices and social taboos are the relevant steps towards decreasing the prevalence of undernutrition.

### **Annex 1**

The data analysis was done in three steps:

- 1 Firstly, standard tabulation and exploratory tests were done to obtain probability plots and descriptive statistics and used to describe the

general characteristics of the surveyed population and households.

- 2 In the bivariate analysis, the chi-square test was employed to see the association between each of the independent variables under study and the nutritional status of children as measured by wasting, and p-values less than 0.05 are considered as significant. The chi-square bivariate analysis does not consider confounding effects; therefore, the net effects of each independent variable were estimated controlling other factors using the logistic regression multivariate analysis.
- 3 Finally, the multivariate analysis was employed to identify the determinants of wasting in children. This analysis focused on

two outcomes of nutritional status for children: whether they are undernourished or not. Since the interest was in identifying children at risk of malnutrition, the dependent variables were coded as 1 if the child was undernourished and coded as 0 if not. The odds ratio, which is determined from the logistic regression coefficients, revealed information about the increased or decreased risk of malnutrition given a set level of the independent variable while controlling for the effects of the other variables in the model. Estimates of odds greater than 1.0 indicate that the risk of malnutrition is greater than that for the reference category. Estimates less than 1.0 indicate that the risk of malnutrition is less than that for the reference category of each variable.

### Notes

- 1 Sindh Multiple Indicator Cluster Survey (MICS) 2009–10, Federal Bureau of Pakistan, Government of Pakistan.
- 2 Pakistan Demographic and Health Survey (PDHS) 2006–07, National Institute of Population Studies and Macro International Inc.
- 3 The conceptual framework of malnutrition originally developed by UNICEF identifies three levels of causes of, and pathways leading to, undernutrition.
- 4 Early initiation of breastfeeding was 51 per cent and minimum dietary diversity for 6–23 month-old children was 4.1 per cent in Sindh (NNS 2011).
- 5 WHO Multicenter Growth Reference Study Group, WHO Child Growth Standards: Methods and development: Length/height-for-age, weight-for-age, weight-for-height and body mass index-for-age, WHO, 2006.
- 6 The NCA was conducted with the financial assistance of the Humanitarian Aid and Civil Protection department of the European Commission (ECHO) and the Canadian International Agency Development (CIDA).

The views expressed herein should not be taken, in any way, to reflect the official opinion of ECHO and CIDA.

- 7 Stakeholders who participated in the consultations included the PDMA, Nutrition Manager of the Government of Sindh, district health and agriculture officers from Dadu and Thatta, representatives of Aga Khan University, WHO, FAO, Save the Children, Oxfam, ACTED, and the Nutrition, WASH, and Food Security Clusters.
- 8 The Pakistan ACF Nutrition Causal Analysis 2012 report can be found on the ACF-USA website at: [www.actionagainsthunger.org/media/technical-surveys](http://www.actionagainsthunger.org/media/technical-surveys).
- 9 *Ibid.*
- 10 Sphere standards recommend 15 litres of water per person per day, [www.spherehandbook.org/en/water-supply-standard-1-access-and-water-quantity/](http://www.spherehandbook.org/en/water-supply-standard-1-access-and-water-quantity/). Sindh household data: Dept of Health, Govt. of Sindh 2010.
- 11 According to WHO, eating at least four food groups is associated with a better quality diet (WHO 2008).

### References

- Black, R.E; Allen, L.H.; Bhutta, Z.A. *et al.* (2008) 'Maternal and Child Undernutrition: Global and Regional Exposures and Health Consequences', *The Lancet* 371.9608: 243–60
- Department of Health, Government of Sindh (2010) *Flood Affected Nutrition Survey (FANS) Sindh, Pakistan, November 2010*, supported by UNICEF and ACF-Canada

- Government of Pakistan, *Sindh Multiple Indicator Cluster Survey (MICS) 2009–10*, Federal Bureau of Pakistan, Government of Pakistan
- NNS (2011) National Nutrition Survey of Pakistan, Islamabad: Aga Khan University, Government of Pakistan and UNICEF Pakistan, <http://pakresponse.info/LinkClick.aspx?fileticket=BY8AFPcHZQo%3D&tabid> (accessed 22 February 2013)

Pakistan Bureau of Statistics (2011) (PBS)  
*Pakistan Social and Living Standards Measurement Survey*, [www.pbs.gov.pk/content/pakistan-social-and-living-standards-measurement-survey-pslm-2010-11-provincial-district-0](http://www.pbs.gov.pk/content/pakistan-social-and-living-standards-measurement-survey-pslm-2010-11-provincial-district-0)  
(accessed 22 February 2013)

UNICEF (2012) *The State of the World's Children: Children in an Urban World*, New York: UNICEF

WHO (2008) 'Indicators for Assessing Infant and Young Child Feeding Practices', Conclusions of a consensus meeting held 6–8 November 2007', Washington DC, World Health Organization