FACTS Reports

**Field Actions Science Reports**
The journal of field actions

**Vol. 4 | 2010**
**Vol. 4**

# Using data from a nationally representative nutrition surveillance system to assess trends and influence nutrition programs and policy

**Nasima Akhter and Nancy Haselow**

OpenEdition Journals

**Electronic version**
URL: http://journals.openedition.org/factsreports/395
ISSN: 1867-8521

**Publisher**
Institut Veolia

**Electronic reference**
Nasima Akhter and Nancy Haselow, « Using data from a nationally representative nutrition surveillance system to assess trends and influence nutrition programs and policy », *Field Actions Science Reports* [Online], Vol. 4 | 2010, Online since 15 February 2010, connection on 01 May 2019.
URL : http://journals.openedition.org/factsreports/395

Field Actions Science Report
www.factsreports.org


FACTS Reports

# Using data from a nationally representative nutrition surveillance system to assess trends and influence nutrition programs and policy

**N. Akhter[1,2], N. Haselow[3]**

[1]Helen Keller International, Bangladesh, Gulshan, Dhaka, Bangladesh
[2]Centre for International Health and Development, Institute of Child Health, University College London, UK
[3]Helen Keller International/Asia-Pacific Regional Office, Phnom Penh, Cambodia

* The NSP was funded by the United States Agency for International Development (USAID) from 1990 until 2002, and thereafter by the Embassy of the Royal Netherlands from 2003 to 2006. A revised NSP, funded by the European Commission began in 2009.

**Abstract.** The Nutritional Surveillance Project (NSP*) of Helen Keller International (HKI), Bangladesh, implemented in partnership with the Government of Bangladesh's (GOB) Institute of Public Health Nutrition (IPHN) from 1990 until 2006, is among the longest running surveillance systems; and was implemented with an overall goal to monitor nutrition and health status of children and mothers in Bangladesh. From 1990-1997, NSP data collection included rural and urban poor populations of disaster prone areas of Bangladesh. Since 1998, it evolved into a nationally representative nutrition surveillance system in rural Bangladesh and also continued assessing trends of malnutrition in urban poor areas. Over the 16 year period, the NSP produced plethora of information that was packaged and shared as bulletins, in peer reviewed journal articles, as presentations at conferences, seminars, workshops. The NSP had a flexible framework that allowed it to assess trends and underlying factors of malnutrition, monitor and evaluate selected programs and conduct special studies related to current and emerging issues. NSP findings were available to contribute to program development and supported policy discussions in-country and internationally. The NSP continuously highlighted the importance of monitoring, which is not only an indispensible element for a successful program, but also helps prioritization and decision making to maximize utilization of limited resources for developing countries burdened with numerous problems to address. The NSP provides an example of a technically sound surveillance system with rapid turnover of data and findings, which is imperative to successful program planning, policy formulation and tracking progress toward developmental goals.

**Keywords.** Surveillance, Malnutrition, Nutrition, Policy Development, Bangladesh, Monitoring, Millennium Development Goals.

## 1 Introduction

Malnutrition limits the development potential of a country, and is strongly associated with increased mortality, morbidity, reduced cognitive performance and compromised productivity among its population. In 2000, world leaders were gathered in commitment to set the Millennium Development Goals (MDG) including the targets of halving the level of hunger, poverty, and child and maternal mortality by 2015 from the 1990 levels (United Nations Development Programme 2009). These targets were set at the international level; and each country would need reliable data to assess current status, trends and evaluate program performance to accelerate progress in achieving MDGs.

While South Asia has the highest proportion and numbers of malnourished children, Bangladesh is one of the three countries in this region that accounts for half the world's malnourished children (United Nations Children's Fund 2006). The Nutritional Surveillance Project (NSP) of Helen Keller International (HKI), Bangladesh, implemented in partnership with the Government of Bangladesh's (GOB) Institute of Public Health Nutrition (IPHN) from 1990 until 2006, is among the longest running surveillance system that assessed country nutritional and food security status over time and made the findings available at local and international levels. The NSP data showed that Bangladesh made tremendous progress in reducing

*Correspondence to:* Nasima Akhter
(n.akhter@ich.ucl.ac.uk)

malnutrition (measured by proportion of underweight children, <-2SD Weight for Age NCHS[1] Reference) which went from 71% in 1990 to 46% in 2005 (HKI/IPHN 2006a). However, it was noted that 46% of children <5 years of age being underweight is still very high (World Health Organization 1995), and would require a more intensive and persistent effort to reduce malnutrition so that it is no longer a public health problem and to achieve MDG Goal 1 by 2015. Over the period, besides assessing trends in malnutrition and food security in Bangladesh (Bloem 2003, Bloem 2004, HKI/IPHN 2001a,b), HKI's NSP was used to investigate the underlying factors of malnutrition (HKI/IPHN 2006b) (HKI/Save the Children UK, 2005) and to monitor national and local program coverage and intensity. These types of data are critical for effective policy formulation and shaping programs to reduce poverty, and to improve health and nutrition.

The NSP was initiated in 1990 by HKI after the devastating floods of 1988 highlighted the lack of reliable population-based data to target assistance to the affected areas. It was determined that there was a need to be able to assess the impact of the many natural disasters in Bangladesh on nutritional status of children and women through an established system to measure current, pre and post disaster situations, in comparison to non-affected areas. After its establishment, NSP measured the severity and magnitude of disaster impacts (HKI 1991) (HKI 1995) (HKI 1994a) and guided relief and rehabilitation efforts (HKI 1994b) (HKI 1998). From 1990-1997, NSP continued bi-monthly data collection rounds among rural and urban poor populations of disaster prone areas of Bangladesh. Since 1998, it evolved into a nationally representative nutrition surveillance system in rural Bangladesh and continued assessing trends of malnutrition among mothers and children in urban poor areas until 2006 (HKI 1999). The former NSP data set now acts as a warehouse of health and nutrition information in Bangladesh, with access to almost 945,000 representative household's data over 16 years. Because of the importance and utility of the system, in 2008, the NSP was revised based on the current and future data needs in Bangladesh and has been re-implemented by HKI in 2009 to institutionalize the system within a new local partner, BRAC University, to sustain it for another extended period.

## 2 Methods

Nationally and divisionally representative data were collected by the NSP using a stratified multistage cluster sampling in rural areas, and using a probability-proportional to size sampling in urban poor areas of Bangladesh. Data on a broad range of indicators based on the UNICEF conceptual framework of malnutrition (UNICEF 1998) were collected including anthropometry (height, weight, mid-upper-arm-circumference or MUAC) of children and their mothers, socio-economic, food consumption, morbidity, and access to health care data, as well as cluster level information (such as price of major food items and distance to amenities) to assess and analyze the nutritional status in relation to the underlying factors that enhance or aggravate the situation. Each NSP data collection round, a two month cycle, coincided with one of the

[1]United States National Centre for Health Statistics.

**Figure 1.** NSP data collectors interviewing a woman and measuring a child in a rural community in Bangladesh.

Bengali weather seasons to capture the seasonal variation that might influence prevalence of malnutrition.

Households with at least one child under-five years of age were eligible to participate in the survey in each round. Data were collected from 28 rural sites, four sub-districts from each of the six divisions in Bangladesh and an additional four sub-districts in the Chittagong Hill Tracts (CHT), which is a marginalized minority area. Households were predominately Muslim with exception to the CHT, and cultural norms and the level of conservativeness were more or less consistent across the country. The NSP data collection teams, one in each of the sites, were comprised of two people with at least one being female. Anthropometric measurement required two people (*Figure 1*), and having a woman in the team built rapport with the mother and facilitated posing sensitive questions regarding pregnancy and maternal health. The basic equipment needed for each team were clip board, pencil, questionnaires, height-board, Secca scale with bag, battery, umbrella, life-jacket/rain coat, and a calculator. Height was measured using a locally made stadiometer, weight was measured using a digital Secca scale, and a TALC tape was used to measure MUAC. Precision measurement of the height board was accurate to 0.1 centimeter and the Secca scale was precise to 100 grams.

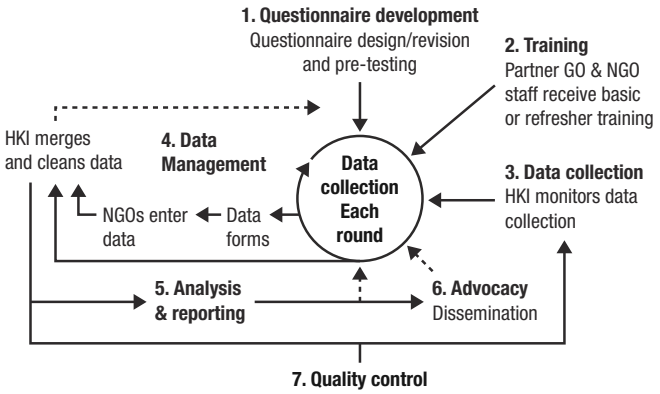


**Figure 2.** Overview of operational cycle of NSP round.

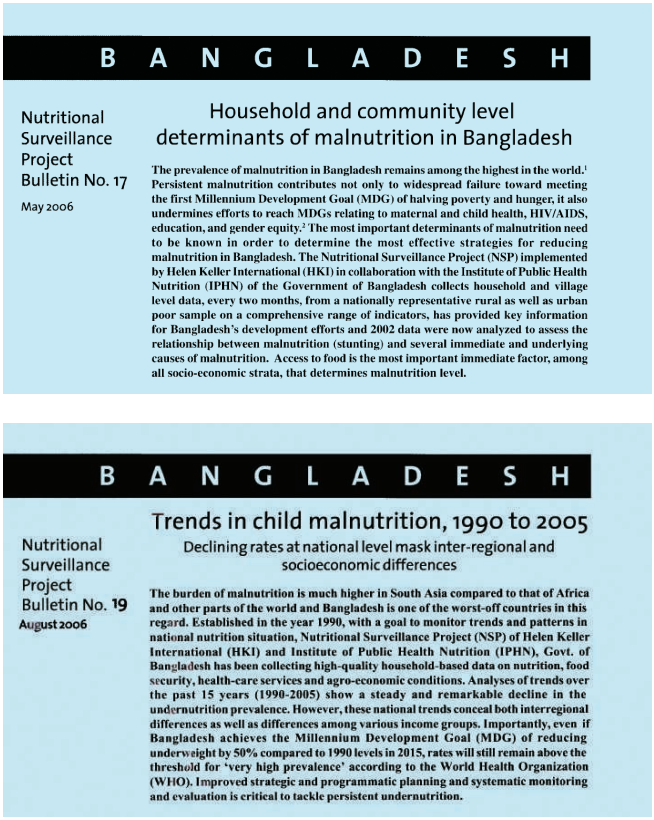


**Figure 3.** Cover page of NSP bulletins on determinants of malnutrition in Bangladesh (NSP Bulletin no.17), and on trends in child malnutrition, 1990-2005 (NSP Bulletin 19).

NSP sub-contracted with partner governmental and non-governmental organizations (NGOs) for the field level implementation (data collection and data entry), with administrative, logical support, survey design, monitoring and quality control and data analysis and interpretation done by HKI staff. For each round the questionnaire was reviewed and may have been revised slightly based on the need for new indicators because of an additional interest or special study by HKI or IPHN, other government agency or stakeholder request. After pre-testing, the data collectors (Data Collection Officers of partner NGOs or government personnel) would be trained or retrained on the method and questionnaire. Experienced data collectors received a two-three day refresher training on changes to the survey tool and any new data collectors received an extended basic training of about two weeks (*Figure 2*). Each round of data collection lasted around 6-7 weeks and was undertaken with an intensive quality control system in place including random re-administration of 10% of the questionnaires by HKI Quality Control Officers. HKI Monitoring Officers visited teams on-site and provide support as needed. Data entry staff of partner NGOs received training to enter data using a standard entry package developed by the experienced HKI data management team. Data were sent to HKI in batches, which were then merged and cleaned and then reviewed and analyzed by the Analysis and Reporting Unit team. Key indicators were analyzed and compared during each round and special analyses were done as well. A Round Report was produced and disseminated soon after each data collection round. Starting in 2000, data were combined on an annual basis and findings shared related to the whole year. In addition, special bulletins were regularly produced to highlight interesting findings. The NSP operated with a high level of cooperation between the units of the NSP system and with implementing partner NGOs, which ensured rapid turn-over of high quality data and timely findings shared with stakeholders regularly, making the system extremely responsive and essential (Chopra et al., 2004).

## 3 Role of NSP

### 3.1 NSP in assessing trends and underlying factors

Over the 16 year period, NSP produced plethora of information that was packaged and shared as reports, bulletins, in peer reviewed journal articles, and as presentations at conferences, seminars and workshops. The findings of NSP were shared for policy discussions at the national level and in response to queries for external information on a range of different topics. The NSP bulletins presented findings drawn from technically sound statistical analysis, presented in a format simple to understand and use, and distributed on a regular basis to public and private sector national and international organizations and non-government partner organizations. They drew attention to issues of concern and informed and updated readers on current nutritional status of women and children and trends over the period (*Figure 3*). NSP bulletins covered a range of interesting topics such as the likelihood of children in female headed households to be better nourished compared to male headed households due to a significantly higher expenditure on food and medical care in female headed households (HKI/IPHN 2006c). Responding to request from the World Health Organization, NSP also provided data on the prevalence of malnutrition at both regional and divisional levels between 1990 and 2006, which were analyzed using both NCHS reference, and the new WHO Growth Standards (WHO 2009).

These bulletins, produced over the 16 year period, are available on the HKI website (www.hki.org). HKI also regularly produced a yearly data set on CD and freely distributed it with the annual report, welcoming others to utilize this resource to understand how malnutrition prevails in developing countries, its nature and determinants. More recently, the raw data sets from NSP have been made available through public access for any further analysis by outside parties.

The NSP data, collected every two months, and cross-sectional in nature generated a large dataset that allow investigation of trends of slowly rising problems that would have otherwise remained un-noticed, and could have become alarming without proper identification and attention leading to program and policy directives. For instance, the co-existence of the dual burden of malnutrition, overweight and under-nutrition among mothers in Bangladesh was observed while analyzing NSP data, and published in 2007 (Shafique et al., 2007a). The findings were also shared in national and international conferences, such as at the 8th Commonwealth Congress on Diarrhea and Malnutrition in 2006, stimulating discussions to tackle the dual burden of malnutrition in Bangladesh (Shafique et al., 2006).

The NSP, being a system that measures current, pre and post crisis situations with a built-in mechanism to measure impact of crisis at the household level was exploited by the Department for International Development (DFID) to get insight on the impact of shocks and disasters in Bangladesh. The findings of the special study showed that disasters increase the adverse impact of concurrent and subsequent non-disaster shocks and negatively affect household asset ownership, livelihood, food security, health and nutrition. The study published as an HKI disaster report (HKI 2001) also reflected that the impact was different for landowners and landless households, and that the recovery time for households was proportional to the severity of the impact of the disaster. In addition, NSP data was used to identify the potential of macroeconomic food policies in reducing malnutrition when data analysis showed the association of increased rice prices and higher malnut rition rates in 2003 (Torlesse, Kiess, and Bloem, 2003). The paper argued that because rice is the main staple of the Bangladeshi population, the consu mption per capita tends to remain stable and therefore an increase in the price of rice would result in less money available for households to buy other quality, micronutrient rich foods. This lack of purchasing power would result in children from more households becoming underweight. This paper stressed the importance of macroeconomic policies to keep the price of staple foods affordable so poor and marginal households would not experience increased hunger and malnutrition.

After the recent global price rise of foods, attempts are ongoing to assess impacts of food price rise on malnutrition. An NSP system such as HKI implemented in Bangladesh is ideal to follow such change and its impact on the food and nutrition security among the most vulnerable. However, this type of system is not present in most countries (Swan, Hadley, and Cichon, 2009).

### 3.2 NSP as a flexible tool monitoring programs on health and nutrition

Backed up by long-experience, analytical understanding of associations of indicators (Hall and Bloem, 1993) related to nutritional status of mothers and children in Bangladesh (Semba et al., 2008) and by observing the trends in socio-economic advancements, NSP used this expertise to design tools to monitor program performance and evaluate impact on nutrition or other indicators. The NSP questionnaire included tools to monitor coverage of GOB's programs, such as child immunization, vitamin A supplementation (VAS) among children and post-partum mothers, or utilization of heath service facilities. For instance, NSP assessed VAS coverage (HKI/IPHN 2004) among different target groups (children aged 6-12 months and children aged 12-59 months) who are supplemented through two different channels. HKI findings on characteristics of non-recipients among children aged 12-59 months guided the GOB and partners to develop and incorporate additional strategies to include those children who were not being reached by the program (HKI/IPHN 2006d). Earlier findings of NSP were used to emphasize the role of and need for universal VAS coverage among children to prevent night blindness (Bloem 1995). To make data and findings available to its users, NSP has shared such findings in open access journals, such as the FACTS Report (Akhter et al., 2008) and contributed to discussions at the International Vitamin A consultative Group meetings (Torlesse et al., 2003) and the Micronutrient Forum meetings (Shafique et al., 2007b). Presentations of NSP data on factors associated with non-receipt of vitamin A capsules among Bangladeshi 12-59 months old children encouraged participants of other countries in the region with poor VAS coverage (Akhter et al., 2007) to further explore and address the underlying cause of the low coverage. Coverage of micronutrient supplementation during pregnancy and post-pregnancy period was also assessed by NSP, and disseminated at other forums (Akhter et al., 2006a).

### 3.3 NSP monitoring the National Nutrition Program (performance and impact)

NSP extended its data collection sites to assess the performance and impact of the National Nutrition Program (NNP), the largest nutritional intervention program implemented by GOB to reduce malnutrition. NSP findings on malnutrition at national level allowed for assessment of the impact of the program against secular trends in malnutrition. NSP data (national level) was also used by others (World Bank 2005) as an external control to assess impact of the NNP. NSP shared data analysis and feedback with the NNP review mission commissioned by the Canadian International Development Agency (CIDA) (Upadhyay, Deoki, and Azad, 2005) reflecting that Bangladesh's large scale malnutrition reduction program had failed to reach its objective on reduction of malnutrition. Further in-depth analysis done using NSP data in NNP areas found that the program performance varied widely by area, by implementing agency (HKI 2006); and that coverage of the intervention and targeting was inadequate. In most cases, evaluations assessing NNP did not measure program performance, but assessed the impact on reduction of malnutrition only. A lesson learned was that when assessing impact of programs, an assessment of the quality of program service delivery (such as targeting and coverage) should also be included in order to use the data to improve strategies to meet program objectives.

### 3.4 Special studies through the NSP system

The NSP was a flexible surveillance system, and had been adapted several times to implement special studies within

country and at the national level. The system allowed for addition of modules to the routine questionnaire to collect data from regular data collection sites of NSP or for extending the system to new sites, as well as adapting the system to implement special studies at national level. For instance, a special module was added within the NSP questionnaire to investigate strategies that were effective in increasing vitamin A capsule coverage among children. These findings were then shared with GOB to help improve coverage in low performing areas. The NSP system also allowed for expansion of its data collection area to accommodate special interests, such as was done after the 1998 flood to include flood affected areas outside the regular NSP sites in order to assess impact of the severe flood in different parts of the country (HKI 1999). Some examples of special studies that were undertaken within the NSP include: using the NSP to undertake a follow-up National Vitamin A Deficiency survey in 1997 (HKI/IPHN 1999) to compare it to the Bangladesh National Blindness Study of 1982-83 (HKI/IPHN 1985); conducting a national anemia survey in 2001 (HKI/IPHN 2006e), conducting a food consumption survey in 2001-2; and conducting a Rickets study (HKI/IPHN 2006f) in 2007.

### 3.5 NSP as an integral part of policy formulation

Being recognized in-country and abroad for its high quality data gathered over more than a decade and a half in Bangladesh, and for the in-depth observations that the data analysis allowed, NSP findings have been an integral part of policy documents. For instance, findings have been used to develop and support the Poverty Reduction Strategy Paper and the Health Nutrition Population Sector Program. The NSP findings on the alarmingly high level of anemia in Bangladesh raised much debate, and the national policy on prevention and reduction of anemia was developed following these discussions. The NSP findings showed that infants in Bangladesh are given other foods at ages below six months and the complementary diet is not adequately diverse. The ensuing discussion at the national conference on breastfeeding and complementary feeding also raised the issue of the need for comparable indicators within the country (Akhter et al., 2006b), such as for exclusive breastfeeding. The concerns motivated active participation of different stakeholders, including WHO, to formulate the GOB's Infant and Young Children feeding strategy.

## 4 Discussion

The NSP system assessed prevalence of malnutrition in Bangladesh in relation to in-depth investigations of underlying factors and allowed targeting of assistance to be undertaken to address these factors. The NSP also assisted the GOB to evaluate health and nutrition programs including the NNP, which was a very large investment aimed at reducing malnutrition in country. The NSP was also used to conduct many special studies of national importance and shared findings with the GOB, donor agencies, NGOs and other stakeholders. Because of the independence of the system, the high quality of the data, and the timely analysis and reporting, NSP findings guided evidence based policy formulation and program development in the country. The NSP acted as a technically sound surveillance system built on strengths of local and international staff that operated smoothly over 16 years. NSP results were packaged and disseminated to a wide audience in-country and abroad.

Unfortunately, over the long phase of implementation, the NSP faced several difficulties, including funding gaps that resulted in discontinued rounds in 2001 and again between 2007 and 2008. Although a good number of donors were convinced of the need for this system in Bangladesh, it became large and too costly to be easily funded by a single donor. In addition, because of these discontinued rounds, and also because changes to the questionnaire were frequently made, some indicators were changed that make it difficult to do certain trend analysis for the whole 16 year period, and therefore selected analysis had to be limited to those rounds when data was collected using the same indicators among comparable target groups. Reviewing this experience has helped NSP to structure the questionnaire and to choose variables carefully so as to ensure that future trends analysis will be possible from the NSP dataset for many years to come.

Funding is now secured through the European Commission as HKI and BRAC University work to re-establish the NSP system in a revised and simplified form specifically aimed to institutionalize NSP within a local organization (BRAC University) to better ensure a sustained surveillance system in Bangladesh.

## 5 Conclusions

The NSP system is an example of a technically sound surveillance system with rapid turnover of data and findings, imperative to successful program planning, policy formulation and tracking progress in reaching developmental goals. Careful analysis of changes in nutrition status of the target population over time and its relationship to underlying factors can highlight past and emerging trends and can shed light on gaps in both policy and programs to retarget assistance where it is needed most. NSP continuously highlighted the importance of program monitoring as well, which is not only an indispensible element for a successful program, but also helps decision making to maximize utilization of limited resources particularly important for developing countries burdened with numerous health, nutrition and economic problems to address.

## References


Akhter N, Stallkamp G, Chowdhury T, Panagides D, de Pee S (2006a). Poor coverage of micronutrient supplementation among pregnant and postpartum women in Bangladesh. In: 8th Commonwealth Congress on Diarrhea and Malnutrition, 6-8 February 2006. Dhaka, Bangladesh

Akhter N, Witten C, Shafique S, Stallkamp G, de Pee S (2006b). Varying definitions of exclusive breastfeeding result in different estimates: need for a national consensus. In: 2nd National Conference on Breastfeeding and Complementary feeding, 19-20 August, 2006, ICMH, Dhaka, Bangladesh.

Akhter N, Stallkamp G, Witten C, Anderson V, de Pee S (2007). Vitamin A Capsule Distribution among children aged 12-59 months in Bangladesh: Who are missed? In: Micronutrient Forum Meeting 2007, 16-18 April, 2007, Istanbul, Turkey.

Akhter N, Wittern C, Stallkamp G, Andreson V, de Pee S, Haselow N (2008). Children aged 12–59 months missed through the National Vitamin A Capsule Distribution Program in Bangladesh: findings of the Nutritional Surveillance Project. FACTS report 2008. Vol 1, issue 1. Available at: http://factsreports.revues.org/index114.html

Bloem MW (1995). The role of universal distribution of Vitamin A Capsule in combating vitamin A deficiency in Bangladesh. American Journal of Epidemiology 1995; 142:843-55.

Bloem MW, Moench-Pfanner R, Panagides D (2003). Health & Nutritional Surveillance for Development. Singapore: Helen Keller International.

Bloem MW, Moench-Pfanner R, Graciano F, Stalkamp G, de Pee S (2004). Trends in health and nutrition indicators in the urban slums of three cities in Bangaldesh, compared to its rural areas. In: Globalization of Food Systems in Developing Countries: Impact on Food Security and Nutrition FAO Food and Nutrition paper 83, FAO, Rome.

Chopra M, Hassan N, Klaver W, Rahman A, de Pee S (2004): External Review of the Nutritional Surveillance Project in Bangladesh, Commissioned by The Royal Government of the Kingdom of the Netherlands.

Hall G, Chowdhurry S, Bloem MW. Use of mid-upper arm circumference Z-scores in nutritional Assessment. Lancet 1993;341:1481 (letter)

Helen Keller International (1991). An Expansion of Distress and Relief Monitoring to the Cyclone-Affected Areas. Monthly reports 1-6. Helen Keller International, Bangladesh.

Helen Keller International (1994a). Special Report: May 2, 1994 Cyclone. Helen Keller International, Bangladesh.

Helen Keller International (1994b). How Ready Were We? Results from the HKI/UNDP Post-Cyclone Study. Helen Keller International, Bangladesh.

Helen Keller International (1995). Nutritional and Socioeconomic Implications of Low Rainfall in the Northwest Region: Pirganj and Chilmari. Helen Keller International, Bangladesh.

Helen Keller International (1998). Preparedness, Damage and Management of the May 1997 Cyclone. Helen Keller International, Bangladesh.

Helen Keller International (1999). Impact of the 1998 Floods on Rural Households inBangladesh. Helen Keller International, Bangladesh.

Helen Keller International (2001). An analysis of disasters and livelihoods in rural Bangladesh 1991-2001. A report for Department for International Development of the British Government (DFID). Helen Keller International, Bangladesh.

Helen Keller International (2006). Monitoring the National Nutrition Program (former BINP) to accelerate change: summary findings from the Nutritional Surveillance Project: February 2006. Briefing sheet, prepared by Helen Keller International.

Helen Keller International / Institute of Public Health Nutrition (1985). Bangladesh nutritional blindness study, 1982-1983. New York: Helen Keller International, 1985.

Helen Keller International / Institute of Public Health Nutrition (1999). Vitamin A status throughout the lifecycle in rural Bangladesh. HKI Nutritional Surveillance Project, Vitamin A Deficiency survey report.

Helen Keller International / Institute of Public Health Nutrition (2001a). The Nutritional Surveillance Project in Bangladesh in 1999. Towards the Goals of the 1990 World Summit for Children. Helen Keller International, Bangladesh (2001).

Helen Keller International / Institute of Public Health Nutrition (2001b). Progress in Bangladesh towards the goals of the 1990 World Summit for Children. Nutritional Surveillance Bulletin 3. Helen Keller International, Bangladesh.

Helen Keller International / Institute of Public Health Nutrition (2004). Vitamin A capsule distribution among 6-11 month old infants: more than 25% not covered. Nutrition Surveillance Project Bulletin No. 15. Dhaka: Helen Keller International / Bangladesh.

Helen Keller International / Institute of Public Health Nutrition (2006a). Trends in child malnutrition, 1990 to 2005: Declining rates at national level mask inter-regional and socioeconomic differences. Nutrition Surveillance Project Bulletin No. 19. Dhaka: Helen Keller International/Bangladesh.

Helen Keller International / Institute of Public Health Nutrition (2006b). Household and community level determinants of malnutrition in Bangladesh. Nutrition Surveillance Project Bulletin No. 17. Dhaka: Helen Keller International/Bangladesh.

Helen Keller International / Institute of Public Health Nutrition (2006c). Female decision-making power and nutritional status within Bangladesh's socio-economic context. Nutrition Surveillance Project Bulletin No. 20. Dhaka: Helen Keller International/Bangladesh.

Helen Keller International / Institute of Public Health Nutrition (2006d). National vitamin A supplementation coverage. Nutrition Surveillance Project Bulletin No. 18. Dhaka: Helen Keller International/Bangladesh.

Helen Keller International / Institute of Public Health Nutrition (2006e). The Burden of Anemia in Rural Bangladesh: The Need for Urgent Action. Nutrition Surveillance Project Bulletin No. 16. Dhaka: Helen Keller International/Bangladesh.

Helen Keller International / Institute of Public Health Nutrition (2006f), Prevalence of lower limb rickets in Bangladeshi children in 2004: a follow-up to the 2001 survey. Dhaka : Helen Keller International/Bangladesh.

Helen Keller International / Save the Children UK (2005). Household and community level determinants of malnutrition in Bangladesh, findings from the Nutritional Surveillance Project. Report prepared for The Department for International Development, Government of the United Kingdom, as part of the Integration of Nutrition Intervention into the Health, Nutrition and Population Sector Program. March 2005.

Semba RD, de Pee S, Sun K, Sari M, Akhter N, Bloem MW (2008). Effect of parental formal education on risk of child stunting in Indonesia and Bangladesh: a cross-sectional study. Lancet 2008; 371: 322–28.

Shafique S, Akhter N, Stallkamp G, de Pee S, Panagides D, and Bloem MW 2006. Double Burden of Malnutrition in Bangladesh: Trends of Under- and Over-weight among Women, 2000-2004. In: 8th Commonwealth Congress on Diarrhea and Malnutrition. 6-8 February 2006. Dhaka, Bangladesh.

Shafique S, Akhter N, Stallkamp G, de Pee S, Panagides D, and Bloem M (2007a). Trends of under-and overweight among rural and urban poor women indicate double burden of malnutrition in Bangladesh. International Journal of Epidemiology. 2007 Apr; 36(2):449. Accessed at http://ije.oxfordjournals.org/cgi/reprint/dyl306v1

Shafique S, Akhter N, Stallkamp G, Anderson V, Witten C, de Pee S. (2007b). Risk Factors For Anemia Among Adolescent Girls In Rural Bangladesh: Conclusions From National Anemia Survey, 2004. In: Micronutrient Forum Meeting 2007, 16-18 April, 2007, Istanbul, Turkey.

Swan SH, Hadley S, Cichon B. 2009. Feeding Hunger and Insecurity. Field analysis of volatile global food commodity prices, food security and child malnutrition. ACF International network 2009.

Torlssse H, Kiess L, Bloem MW (2003a). Association of Household Rice Expenditure with Child Nutrtional Status Indicators a Role for Macroeconomic Food Policy in Combating Malnutrition. Journal of Nutrition. 133: 1320-1325, 2003.

Torlesse, H., Moestue, H., Kiess, L., et al (2003b).: Night blindness among women is a good indicator of vitamin A deficiency in a population experiencing crisis, presented at XXI IVACG Meeting, Marakech, Morocco, February 2003

UNDP. Millennium Development Goals (MDGs). [Online] Available at http://www.undp.org/mdg/ Accessed 10 Septemer 2009.

UNICEF 1998. The state of the world's children 1998. Page-24.

UNICEF(2006). Progress for Children, A report card on Nutrition, number 4, New York: UNICEF

Upadhyay J, Deoki Nandan D, Azad TMA (2005). Review of Organizational Options for Delivery of Nutrition Services through the Health, Nutrition and Population Sector Program. Report prepared for Canadian International Development Agency.

World Health Organization (1995). Report of a WHO Expert Committee. Physical status: The Use and Interpretation of Anthropometry. Geneva: World Health Organization.

World Health Organization (2009). Global database on Child Growth and Malnutrition. [Online] Available at http://www.who.int/nutgrowthdb/database/countries/bgd/en/. Accessed at 10 Novemer 2009.

World Bank (2005). Maintaining Momentum Towards the MDGs: An Impact Evaluation of Interventions to Improve Maternal and Child Health and Nutrition Outcomes in Bangladesh. 29 March 2005. Operations Evaluation Department, World Bank.