



Nutritional Status in Northern Nigeria, Prevalence and Determinants: A Review of Evidence prepared for the ORIE Component of the WINNN Programme

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Executive Summary

This review of literature (both global and Nigerian) has been prepared to inform the ORIE project that is designed to carry out operations research and impact evaluation on child under nutrition on the DFID-funded WINNN Programme (Working to Improve Nutrition in Northern Nigeria): to assess gaps in knowledge, support WINNN programme design and implementation about what is needed, what has been done already in Northern Nigeria and what has worked in other contexts, and to inform DFID on possible pilots to tackle underlying determinants of child hood stunting.

The data show that the nutritional status of children in the northern states is among the poorest in Nigeria, with prevalence of stunting in the priority states being 52.6% compared to 41% nationally (2008 data). Time series data show that the situation is not improving over time. Key factors that have been significantly associated with child stunting include the mother's education level, household wealth and the age of the child. The status of the deficiencies of micronutrients varies between 20-40%. In terms of factors related to immediate and underlying determinants, health care coverage, the basic quality of diet and breastfeeding practices are all poor.

The logic of this review is along the following lines: a) the status data show that nutritional outcomes are very poor in northern Nigeria; b) so what do the data and research say about the context, nature and determinants of this poor nutritional status; c) what is the nature of these data, is it strong enough to say useful things about the context and outcomes and to identify the nature of risks; if not what are the gaps in data and research; d) on the basis of these informed research judgements what are likely to be the best interventions to introduce to improve nutrition in Northern Nigeria; e) what is the evidence globally and from within Nigeria to back up these recommendations as to what will work; and f) what still needs to be done in terms of research to fill these gaps and develop effective interventions.

This logic is a severe test in any part of the world, and especially in the north of Nigeria where there appear to be no longitudinal or cohort studies carried out, nor any well resourced evaluations of interventions (any that the authors could access). Therefore much of what is said here about the way forward for the WINNN programme /ORIE components is informed estimation based on a mix of research studies and surveys. This is provided in the realisation that the nutritional situation in Northern Nigeria is so serious that committed interventionists cannot wait until precisely collected data from rigorously designed studies are available. What follows is a summary of the contents and conclusions of each section.

The Introduction contains basic information about the structure and methodology of the literature review, the WINNN programme and the ORIE components.

Section 1 provides information on nutritional status and related status data. First, there is the published (and some unpublished) data on nutritional status in Nigeria and the north, in the areas of child stunting, wasting and underweight, and the trends over time. There have been regular national nutritional status surveys, with four in the last ten years. Data for the last two years are available for the five programme states through SMART surveys. All of these surveys confirm that stunting consistently exceeds 50% (with the exception of some seasonal variations in some states), well in excess of the national average. There are no clear trends that the situation is improving. In addition to the national surveys and the SMART surveys for the NW states, there have been some hospital and village based surveys. Second, there is information on maternal and girls nutritional status, drawn on using two national surveys and the recent SMART surveys. These indicate that 15-20% of the adult women are classified as thin in terms of BMI. The SMART surveys indicate that adolescent girls are particularly at risk.

Section 2 examines the determinants of under nutrition and related risk factors. This follows the well known conceptual framework of basic, underlying and immediate causes of child under nutrition. There are large data sets (especially NDHS) which show the importance of maternal education and wealth as important factors associated with nutrition status, and that rural stunting is worse than in urban areas. The analysis of determinants through regression analysis has attempted to unpack some of this further. Key factors include access to health care services and the mother's health seeking behavior. This is important in areas where women have semi-secluded status. A review of household economic status provides a strong line of reasoning that its improvement, especially for the areas where women work will have a positive impact on child nutritional status. Involvement in agriculture appears to be negative for its effect on nutritional status, so better understanding the household economy for rural women and men will be an important area to strengthen understanding. Household economic status, maternal education and women's empowerment are important predictors of maternal and child malnutrition in Northern Nigeria.

In terms of food consumption, data are sparse, given Nigeria is a large and varied nation, and there is one national survey carried out in 2002 (NFCNS). Resources required to accurately assess energy and protein intakes are considerable other than at a small village level scale. The NFCNS did assess dietary diversity and these techniques could be repeated at state level in addition to some in-depth small scale surveys to examine intra household food consumption.

Vitamin A deficiency appears to be a borderline problem in the north of Nigeria and that rates of supplementation are variable: high in Katsina but low in other states. The problem is greater for urban, compared to rural children. There appears to be (from within the last 15 years) two main sources of information on iron status in northern Nigeria (dry savanna zone), being the findings of the NFCNS and hospital research teams. Given the relatively small sample size of these studies and the general nature of the 'dry savanna' zone information, there appears to be a need for further research to assess haemoglobin and serum ferritin levels in the target populations.

Exclusive breastfeeding lasts for less than a month: the mean duration of any breast feeding is about 18 months, and complementary foods are introduced at an early stage, usually the foods already consumed by family members in the household. There are some data to suggest that breast feeding is longer in the Northern States. Seventh, MCH facilities in the northern states are poor. They point to poor health seeking behaviors. Although the averages vary by state, three quarters of all women have never sought health advice, and as few as 10% of deliveries were carried out in health facilities. Immunization rates are also very low, with less than 1 in 10 children receiving all recommended doses.

Section 3 covers direction nutrition interventions at global and Nigerian level, mostly those that will be implemented through the WINNN programme. The review of global evidence (also in Section 4) has to recognize two problems: first there were few examples of interventions that could show unambiguous links with improving nutrition (e.g. especially in agriculture and food security), and second, even fewer of these reviews relate to a context similar to the Sudano-sahelian region of the five programme states with seasonality of agricultural production, semi secluded mothers and a weak health infrastructure.

In terms of CMAM, there are not as yet widespread interventions in Nigeria, although SCF (and DFID) are in the process of implementing such approaches. The section describes the efforts to assess and implement. The review has not been able to find any widespread schemes nor any evaluations of effectiveness. Distance to community centre can still be important for many rural

households. But rural communities in the NW states have a strong social cohesion and willingness to ensure that malnourished children receive care.

For IYCF interventions, the global information shows the need for a well integrated infrastructure that supports women to adopt the care procedures that can maximise the health of their children. In the NW states this suggests a more developed form of rural health care clinic than exists so far. In areas of food insecurity and low levels of education and early marriage for women, then the fundamentals for improved IYCF are weak. In addition with women's restricted autonomy their status is diminished and their feelings of self worth are diminished. These make receptivity to educational messages more difficult. In Nigeria to date there have been some small scale, hospital and clinic based attempts to encourage IYCF, but the review has not uncovered any national or regional programmes and therefore no reviews or evaluations.

For micro nutrient supplementation interventions, Vitamin A capsule supplementation appears to be the only nationwide programme in this area. It is integrated with immunisation drives and child health weeks. There are two rounds a year, and this explains why (although with some variations) the NDHS surveys show that as many as half (in some cases) of the population of children have received vitamin A supplementation in the recent past. However the assessment provided shows that the structure's logistics need to be tightened up and that the programme could do with a thorough restructuring. Finally for deworming, the exercises appear to have little impact in the north. The research that has been done however shows that it is an effective intervention.

Section 4 covers indirect nutrition interventions, both global and Nigerian. It follows up on the need to develop pilot schemes to explore some of the basic and underlying causes which lie along various complex causal pathways: health services, access to improved water and sanitation, household income and food security, agricultural and food production, social protection, gender relations, and systems of governance. Some of the approaches can be embedded in existing programmes and policies. The Primary Health Care approach reaches less than 20% of the population and this will be accentuated for the remote rural northern States. However, there is a slow roll out of the MCH scheme although coverage of this has been poor. There are other initiatives such as the Accelerated Child Survival and Development Programme and the State Drug Revolving Fund Programme. With this weak infrastructure it is difficult to suggest any 'piggy backing' of other components to improve outreach of interventions.

The impact of agricultural interventions is also covered using research results presented from a comprehensive review on the impact of agricultural interventions on the nutritional outcomes of dietary consumption, anaemia, vitamin A status and child nutritional status. The results are ambiguous, despite the appealing prima facie case that changes in food production at the household level will have an impact on nutrition. The issue is one of the complexities of the pathways that exist, while still acknowledging that for many rural families, their farm operation is the source of the family food supply, generator of incomes and focus of much family labouring, and that family food security is regarded as one of the three underlying determinants of nutritional status. Even if an agricultural intervention is not envisaged for the WINNN programme, all other interventions must take cognisance of the nature of the household farm operation and the implications for maternal and child nutrition. There is only basic descriptive information about the food security interventions in Nigeria, and no information of their impact. These interventions include the National Special Program for Food Security (NSPFS) and subsidy programmes for fertiliser and other farm inputs. The evidence as to the impact of agricultural interventions and incomes (and therefore a possible means to improve nutrition) is ambiguous. One Nigerian intervention - Improving Agriculture and Rural Markets in Nigeria – may have potential in this regard but there is no strong evidence to prove this contention. In such a large country, the national level interventions can only have a limited impact while there is less information to hand

on state level interventions. To have an impact on child nutrition, the interventions must reflect the conditions in which under nourished children live and this must involve women as beneficiaries of these programmes either as first or second round effects

A review of global and Nigerian evidence on social protection concludes that there is emerging evidence that social protection programmes (including public works) may have a significant impact on the nutrition of households. In Nigeria there are various interventions (such as COPE), and others at the pilot stage, but there is no evidence as to their effectiveness in terms of impact on child nutritional status. Given the promising global evidence, it would be timely to use such programmes as a pilot and evaluate them rigorously. The targeting of a programme to adolescent girls may be particularly effective, helping them get an education, delaying marriage and breaking the intergenerational aspects of under nutrition.

Micro credit programmes have potential for improving nutrition on the basis of the evidence presented here. There is some global evidence to suggest that such programmes do improve household incomes and if placed in the hands of women, then this could result in improved household nutrition. There is some evidence to show that micro credit programmes have been successful in Nigeria. In the NW states and with child under nutrition as the focus, there would be a need to design innovative schemes to reach women. Women already run their own revolving credit schemes (called *adashi*) and these might be supported with extra resources.

Research evidence is strong about the importance of water and sanitation in reducing a broad range of infections and so improving nutritional status. However, Nigeria's infrastructure for providing piped water is weak and in rural areas, some alternative approaches need to be followed, such as CLTS. Finally on women's empowerment, the summary cannot do justice to the information available, because of course many interventions could be examined for their impact on women's empowerment. But in a region where much of what women (who are semi-secluded) do is achieved behind closed doors, then interventions must be dovetailed into activities where women already interact with government services, especially therefore health services.

Section 5 covers policies and governance affecting nutrition at global and Nigerian levels. A review of global evidence shows that the key aspects of effective nutrition governance are capability across sectors, accountability based in demanding that officials take action, and responsiveness, to meet the needs of the most vulnerable. As regards Nigeria, a review shows a plethora of plans and activities and motivation to take action but a lack of commitment. However, the issues involved in terms of the size and diversity of the nation must be emphasized. There are very few direct interventions in nutrition. Targets are set and plans laid out addressing underlying and basic causes but there is no strong commitment or budget lines. Nutrition planning has received a new boost with the SUN movement and there is an infrastructure to build on. However much power lies in the 36 states and the Federal level can only coordinate, promote and encourage.

Section 6 covers some key conclusions of the literature review on the role of a cohort study, a review of the nature of existing quantitative data and an assessment as to which pilot schemes might be introduced to tackle underlying determinants of child stunting. For a region of its size and severity of nutrition problems, data for the north of Nigeria are very limited. The greatest gap is for quantitative information on food consumption. There is also need for better understanding of how the underlying determinants of household food security, care of children and health services and environment have an impact on child nutrition, and the interdependencies between them. The existing research is focused on national (state) and village/clinic levels, with little in between. Representative surveys of groups of villages would be needed. In addition, a better interpretation and supplementation to qualitative information is also needed.

Some suggestions are made for pilots in the area of household food security, social protection and micro credit for women in particular and also for interventions in entry points for nutrition sensitive development in health, governance and social development.

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Acronyms

ACF	Action Contre la Faim (Action against hunger)
AEZ	Agro-Ecological Zone
AIDS	Acquired immunodeficiency syndrome
ANC	Ante Natal Care
BASICS	British Association for Immediate Care
BCG	Bacillus Calmette–Guérin (Vaccine for Tuberculosis)
BIG	Basic Income Guarantee
BMI	Body Mass Index
BRAC	Bangladesh Rural Advancement Committee
CAPA	Catchment Area Planning and Action
CCT	Conditional Cash Transfer
CDC	Community Development Committee
CEB	Children Ever Born
CGS	Conditional Grants Scheme
CI	Confidence Intervals
CIDA	Canadian International Development Agency
CLTS	Community Led Total Sanitation
CMAM	Community Management of Acute Malnutrition
COMPASS	Community Participation for Action in the Social Sector
COPE	In Care of Nigeria's Poor
DALY	Disability-Adjusted Light Years
DFID	Department for International Development
DPT	Diphtheria, Pertussis, and Tetanus
ENA	Essential Nutrition Actions
ESSPIN	Education Sector Support Programme in Nigeria
FAO	Food and Agricultural Organisation
FBFI	Food Basket Foundation International Program
FCT	Federal Capital Territories
FCT	Federal Capital Territory
FFW	Food for Work
FMOH	Federal Ministry of Health
GAM	Global Acute Malnutrition
GEP	Girls Education Project
GINA	Gender Informed Nutrition and Agriculture
HDL	High Density Lipoprotein
HERFON	Health Reform Foundation of Nigeria
HFS	Household food security
HIV	Human immunodeficiency virus
HKI	Helen Keller International
IAMiNN	Improving Agriculture and Rural Markets in Nigeria
IBSS	International Bibliography of the Social Sciences
IDS	Institute of Development Studies
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
ILO	International Labour Organization
IQ	Intelligence quotient
IYCF	Infant and Young Child Feeding Practices
JSTOR	Journal Storage
LGA	Local Government Area
MCH	Maternal and Child health
MDG	Millennium Development Goals
MFI	Micro-Finance Institution
MI	Micronutrient Initiative

MICS	Multiple Indicator Cluster survey
MNCH	Maternal New Born Child Health
MSF	Medicines sans Frontiers (doctors without borders)
NAFDAC	National Agency for Food and Drug Administration and Control
NAPEP	National Poverty Eradication Programme
NCFN	National Committee on Food and Nutrition
NDE	National Directorate of Employment
NDHS	Nigerian Demographic and Health Survey
NEEDS	National Economic Empowerment Development
NFCNS	Nigerian food Consumption and Nutrition Survey
NHIS	National Health Insurance Scheme
NID	National Immunization Day
NPAFN	National Plan of Action for Food and Nutrition
NPC	National Planning Commission
NPHCDA	National Primary Health Care Development Agency
NPI	National Programme on Immunization
NSPFS	National Special programme for Food Security
ORIE	Operations Research and Impact Evaluation
OSA	Office of the Special Advisor
OSSAP	Office of the Senior Special Assistant to the President
OTP	Outpatient Treatment Programme
PAHO	Pan American Health Organization
PATHS	Partnership for Transforming Health Systems in Nigeria
PHC	Primary Health Care
PNSP	Productive Safety Net Programme
PRAI	Poverty Reduction Accelerator Investment
PRINN	Partnership for Revival of Routine Immunisation in Northern Nigeria
RAMP	Rural Agricultural Markets Programme
RCT	Randomised Control Trials
RI	Routine Immunisation
RR	Relative Risk
RUTF	Ready to Use Therapeutic Food
SACA	State AIDS Control Agency
SAM	Severe Acute Malnutrition
SC	Stabilization Centre
SCF	Save the Children Fund
SD	Standard Deviation
SF	Serum Ferritin
SHAWN	Sanitation, Hygiene and Water in Nigeria
SMART	Standardised Monitoring and Assessment for Relief and Transitions
SMEDAN	Small and Medium Scale Enterprise Development Agency
SNID	Sub National Immunisation Day
SPARC	State Partnership for Accountability Responsiveness and Capability
STH	Soil Transmitted Helminthes
SUBEB	State Universal Basic Education Board
SUN	Scaling Up Nutrition
SUNMAP	Support to National Malaria Project
TANA	The Agriculture Nutrition Advantage
TCT	Targeted Cash Transfers
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USI	Universal Salt Iodisation
WASH	Water, Sanitation and Hygiene
WEO	World Economic Outlook
WHO	World Health Organisation
WINNN	Working to Improve Nutrition in Northern Nigeria

1 Introduction

The purpose of this paper is to review the evidence on the state and determinants of child and maternal under nutrition ¹ in Northern Nigeria. It reviews the most current evidence and also examines examples of interventions that have addressed (successful or not) under nutrition globally and in Nigeria. A review of findings on the determinants of under nutrition in northern Nigeria provides some evidence of the nature of the complex pathways between various levels of causes (immediate, underlying, basic) and interventions and policies, leading to some observations as to how far the global evidence on interventions to tackle under nutrition might be applied to the situation in northern Nigeria.

One million children under 5 die every year in Nigeria, 35% of them due to causes attributable to malnutrition, making Nigeria one of six countries that accounts for half of all child deaths from malnutrition worldwide. In the north of Nigeria, half of all the children under 5 are stunted, and 1 in 5 suffers from acute malnutrition. Basic causes for this include lack of government leadership or response to the crisis, coupled with a weak and fragmented health system, unable to provide the most basic cost effective services for the prevention and management of common health problems.

Structure and Objectives of the Literature Review ²

The structure of this paper is first to review the status of various nutrition indicators in the north of Nigeria, and second to describe the determinants and risk factors that underlie these status indicators; this allows some assessment of evidence of need. The three following sections, broadly similar in structure, review evidence of the effectiveness of interventions at global and Nigerian level, namely direct and indirect nutrition interventions, and then policies, management and governance analyses affecting nutrition.

The paper is concluded by directly addressing the specific objectives of the review, which relate to providing evidence and understanding for the DFID-funded Working to Improve Nutrition in Northern Nigeria Programme (WINNN) and its Operations Research and Impact Evaluation component (ORIE). These objectives are to inform:

- ORIE research and evaluation designs and planning by reviewing what we know about child and maternal under nutrition in Northern Nigeria and where there are gaps in knowledge that we should seek to fill
- WINNN programme design and implementation by understanding what is needed in Northern Nigeria, what has already been done in Northern Nigeria, and what has worked in other contexts
- DFID on possible pilot schemes to tackle the underlying determinants of childhood stunting in Northern Nigeria

The WINNN programme in Nigeria and the ORIE component

¹ There is a well known difficulty in terminology in this paper where, for many of the sources quoted there is interchangeable use of 'malnutrition' and 'under nutrition'. Malnutrition arises from deficiencies of specific nutrients or from diets based on the wrong kinds or proportions of foods. Under nutrition is defined as a dietary energy intake below the minimum requirement level to maintain the balance between actual energy intake and acceptable levels of energy expenditure. Many of the sources use the terms interchangeably so while preferring the term 'under nutrition', 'malnutrition' is the term used in many of the quoted sources.

² The Terms of Reference for this literature review are given in Annex 1

The WINNN Programme (Working to Improve Nutrition in Northern Nigeria) aims to tackle some of the immediate cause of under nutrition by: promoting direct interventions in community-based management of acute malnutrition, promoting healthy infant and young child feeding practices, and the distribution of micro-nutrient supplements to pregnant women and young children. WINNN also promotes more effective government planning at the national and state levels, and a component for operational research and impact evaluation (ORIE). The objectives of WINNN and ORIE are described below.

WINNN operates in the five northern states of Jigawa, Katsina, Kebbi, Yobe and Zamfara (to be called the five Programme states for short). Below is a map (Figure 1) of the 36 states of Nigeria and Federal Capital Territory (FCT) of Abuja; the country is divided into geopolitical zones and Jigawa, Katsina, Kebbi and Zamfara lie in the NW States zone; Yobe lies in the NE states zone³.

Figure 1 The States of Nigeria



The five Programme states are in the mild sub-arid Sudano-Sahelian Ecological Zone, which receives about 750-1000mm of rain a year, distributed over a period of 120-140 days from May to September. There is marked seasonality of crop production and agricultural and non agricultural rural activities and this has an impact on nutritional status and incidence of infections. The people in the area cover many different ethnic groups, although predominately they are Hausa, the settled cultivators, and the Fulani, who are cattle herders and pastoralists. The area is predominately Moslem. The internal household structure is complex, with Moslem women living in semi seclusion, with clearly defined obligations in the household as to who does what; generally women have limited control over household resources, but can maintain their own income earning work. The society is polygamous. Large areas of the five Programme states are remote, and there is a high burden of infectious disease, low rates of immunisation, and low access to health services.

The objectives of WINNN are to deliver evidence-based direct interventions to improve nutrition, shown to be cost-effective in other contexts, with five basic outputs:

- Output 1: treatment for severe acute malnutrition via **community management of acute malnutrition (CMAM)** through integrated services in primary health facilities;
- Output 2: community-based interventions to improve **infant and young child feeding (IYCF)** through exclusive breastfeeding, weaning and complementary feeding;

³ In total, the NW States zone includes Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto and Zamfara. The NE states are Adamawa, Bauchi, Borno, Gombe, Tareba and Yobe. 'NW' and 'NE' are official state designations. The NC states are Abuja (Federal Capital Territory), Benue, Kogi, Kwara, Nasarawa, Niger and Plateau.

- Output 3: the integration of **micronutrient interventions and de-worming** into routine primary health services (Vitamin A supplementation for children, iron and folic acid for pregnant women);
- Output 4: more effective **government planning and coordination** in nutrition and related sectors at the national and state levels, and a stronger health system, through the integration of direct nutrition interventions into routine health services funded by the government;
- Output 5: improved knowledge of what works to tackle child under nutrition in Northern Nigeria via **operational research and impact evaluation** (ORIE) conducted by independent researchers and evaluation experts.

ORIE is composed of 4 sub-components with the following outputs:

(1) studies in operational research: a series of operational research studies will test the efficacy of the delivery of interventions in Northern Nigeria which have been demonstrated to be cost-effective in other contexts. The knowledge generated will be used to improve programme design and implementation, and to scale-up interventions beyond their initial scope in the most cost-effective way.

(2) impact evaluation of the INNN programme: impact evaluation will assess what the programme has achieved against quantitative and qualitative indicators on the programme log frame;

(3) economic evaluation of the WINNN programme: cost-effectiveness analysis will assess the relative costs and effects of programme interventions using cost utility, benefit to cost and cost-effectiveness analyses.

(4) dissemination and the uptake of learning: substantial resources will be invested in the communication and uptake of findings within and beyond Northern Nigeria, including high quality publications in peer-reviewed journals and other media.

Methodology of the Literature Review

The research methodology involved reviewing studies cited at the global level, selected on the rigour of their methodologies (especially those that were not meta-reviews), for example, studies using scientifically rigorous methodological techniques such as randomised control trials. The literature on Nigeria was located by use of a double-pronged 'deep search' of journals and grey literature, whereby initially 'keywords' were identified to create search strings utilising Boolean operatives⁴. These search strings were then applied to a number of 'deep search' indexes, (Econlit; IBSS; Web of Knowledge; Wiley's Online Library; JSTOR; PubMed) each of which search thousands of journals. The same strings were used to search the grey literature utilising Google, and a number of multinational organisation websites (World Bank, IFPRI, UNICEF, WHO, FAO). Then backwards and forwards citation was used when relevant texts were found. In the instances where no experience to Nigeria is related, this is indicative of a paucity of quality, or in most cases any data on the topic in Northern Nigeria. Unpublished nutrition surveys carried out by WINNN team partners were also reviewed. Generally this review of evidence keeps to research carried out within the last 15-20 years.

Much of the data presented had been already categorised under varying criteria such as by agro-economic zone, geopolitical zone or individual states, and reclassification was not feasible. As far as possible the analysis has been presented in the most relevant form for understanding the situation in the five Programme (WINNN) states. In places the data between different estimates

⁴ E.g. for CMAM ("community-based management of acute malnutrition" OR "CMAM" OR "community management of malnutrition" OR RUTF OR "ready to use therapeutic food*" OR "ready to use foods") AND ("northern Nigeria" OR "Jigawa" OR "Kebbi" OR "Katsina" OR "Yobe" OR "Zamfara" OR "Fulani" OR "Hausa")

does vary considerably, and this may be for a variety of reasons that are difficult to confirm, such as data quality and issues of seasonality.

Site visits to the north of Nigeria were not possible in the circumstances and so it has not been possible to access recent material, and to follow up ambiguous issues to obtain some clarification. The authors are aware that this is a deficiency of the review. Therefore the review is largely based on the documents that are available on the internet. Feedback about documentation that has not been included and should have been is very welcome.

The paper was strengthened by comments from reviewers within the ORIE team and information received from interviews of senior Nigerian officials ⁵ who attended the IDS short course on Transforming Nutrition in July 2012.

⁵ Ibrahim Oloriegbe, Chief of Party, WINNN; Dr Chris Osa, Head, Nutrition Division, FMoH; Dr Nnenna Ihebuzor, Director, Community Health Services, National Primary Health Care Development Agency, and Dr Bamidele Omotola, Nutrition Specialist, UNICEF, Abuja

1. Nutritional Status in Nigeria and the North

Under nutrition remains one of the world's most serious but least addressed development problems (Horton et al, 2009). The number of people suffering from hunger was estimated at 925 million in 2010, with maternal and child under nutrition remaining pervasive. It has been estimated that worldwide, using data from 2004, stunting, severe wasting, and intrauterine growth restriction together were responsible for 2.2 million deaths and 21% of disability-adjusted life-years (DALYs) for children younger than 5 years old, with nearly one-third of children underweight or stunted (Black et al, 2008). Under nutrition interacts with infectious disease, causing an estimated 3.5 million preventable maternal and child deaths annually (Black et al, 2008).

Malnutrition is also responsible for the loss of billions of dollars in forgone productivity and avoidable health care spending. Under nutrition, including micronutrient deficiencies (also referred to as "hidden hunger") is caused by inadequate dietary intake and disease which in turn stems from food insecurity, poor maternal and child care practices and inadequate access to clean drinking water and safe food, sanitation and quality health services. The human costs of malnutrition fall hardest on the poorest, especially on women and children (Horton et al, 2009), while the recent food and economic crises have magnified the challenge of hunger and under nutrition (Bloem et al, 2010).

1.1 Child Nutritional status in Northern Nigeria

There have been five major national surveys from which estimations of child nutritional status could be drawn; these are NDHS, 1990, NDHS, 2003, MICS, 2007, NDHS, 2008 and MICS, 2012⁶. These surveys often use different descriptions of regions and geographical zones and as far as possible the differences are explained as they arise. The Nigeria Food Consumption and Nutrition Survey of 2001-2003 sampled data from Kebbi, only one of the five Programme states. At the time of writing this review does not have access to the MICS (2012) surveys, but it does include three Smart surveys which cover the five states, the latest of which was published in February 2012. In addition, generally there are two other sources of survey data: one of small scale research investigations which provide data at a village or multi village level, and some rapid surveys carried out, mostly by NGOs.

Summary of Child Nutritional Status (data source: NDHS, 2008)

- The average prevalence in the NW States of stunting, wasting and underweight is 52.6%, 19.9% and 35.1% respectively compared to the above national averages of 40.6%, 13.9% and 23.3% respectively.
- The NW states include 41% of all stunted children in Nigeria, 48% of all wasted children and 51% of all underweight children.
- 24% of all stunted children in Nigeria, and 32% of all wasted and 33% of all underweight children live in the five Programme states.
- The five Programme states hold 28% of all severely stunted children, 31% of all severely wasted children⁷ and 35% of all severely underweight children in Nigeria, being 1.8m, 0.6m and 0.9m respectively.
- The NDHS data shows a slow rate of progress: between 2003 and 2008, nationally, the rate of stunting fell from 42.4% to 40.6% and the underweight rate fell from 24.3% to 23.1%.

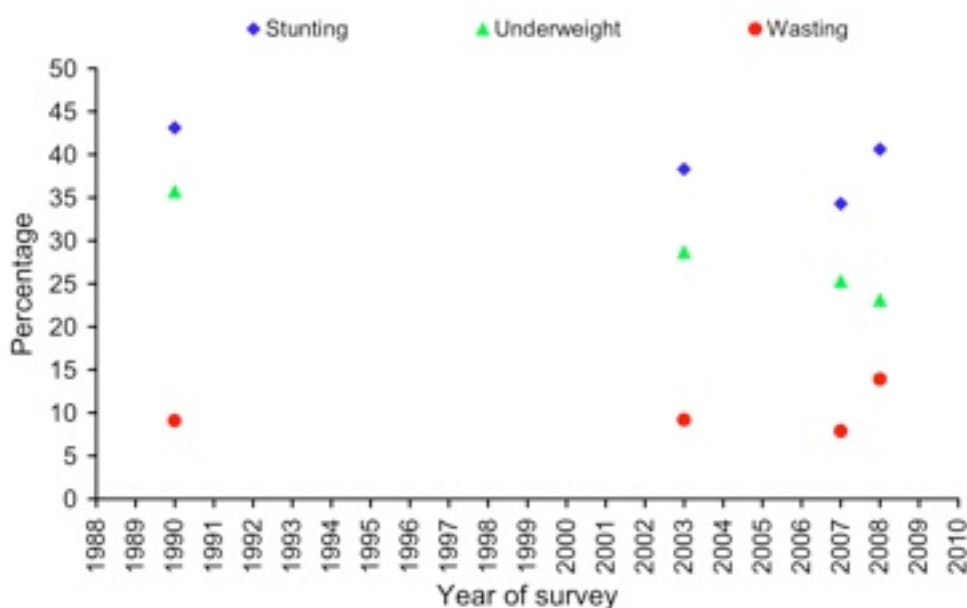
⁶ The data in these surveys have also been used to investigate further the determinants of child nutritional status and this information is described in section 3

⁷ It is assumed standard practice to consider children with nutritional oedema in the 'severely wasted' category: a review of the NDHS (2008) has shown no mention of oedema.

- There were 586,470 children with severe acute malnutrition in the five Programme states in 2008 (based on 2006 and 2008 data), so assuming a case fatality rate of 10% means that 58,000 of these children will die by their fifth birthday.

There is some of disparity between the MICS 2007 and the NDHS 2008 in terms of their malnutrition data. Many factors, such as timing of the survey, can influence the results, but there are some instances there are 10% differences between state estimates. Figure 2 below combines the recent national child nutritional status surveys in Nigeria. An important issue here because more recent studies use the new WHO standards, which could have led to different results. Given the limited resources for this review it has not been possible to recalculate NCHS referenced studies with the new WHO standards⁸. But despite these issues of classification, it is clear that malnutrition remains a serious problem in the five Programme states.

Figure 2 The prevalence of stunting, underweight and wasting recorded in the last four major national surveys: NDHS, 1990; NDHS, 2003; MICS, 2007; and NDHS 2008.



Source: Hall and Bohen (2009).

Estimations are provided in Tables 1, 2 and 3 of the proportion malnourished and number of malnourished children. Table 1 is useful as it shows the prevalence of the different forms of under nutrition in the five Programme states compared with the national figures. Generally, the averages of stunting, wasting and underweight in the northern states and in the five Programme states in particular are well above the national average. Table 1 shows that the prevalence of stunting and wasting is highest in Kebbi State and stunting lowest in Yobe and Zamfara, and wasting lowest in Zamfara State. The largest number of stunted and underweight children is in Katsina state; the largest number of wasted children is in Jigawa state (Table 2). Table 3 shows that in all of the seven NW states, out of a total population of 7.71m children under five, 4.55m were stunted and 1.82m were wasted.

⁸ Some results for nutrition status are produced later in this section which use the WHO standards.

Table 1 The proportion of malnourished children (stunted, underweight or wasted) estimated for each Programme state (DHS, 2008)

	Percentage of Children 0-5 Stunted (-2sd)	Percentage of Children Severely Stunted 0-5 (-3sd)	Percentage of Children Wasted 0-5 (-2sd)	Percentage of Children Severely Wasted 0-5 (-3sd)	Percentage of Children Underweight 0-5 (-2sd)	Percentage of Children Severely Underweight 0-5 (-3sd)
Nigeria	41.0	23.0	14.0	7.0	23.1	9.0
<i>NC Nigeria</i>	43.8	25.2	9.3	5.2	19.5	6.5
<i>NE Nigeria</i>	48.6	29.2	22.2	11.4	34.5	15.2
<i>NW Nigeria</i>	52.6	33.5	19.9	10.6	35.1	14.9
Programme States						
<i>Jigawa</i>	53.4	34.3	34.4	17.5	51.1	25.5
<i>Katsina</i>	58.4	39.2	20.3	10.2	37.7	15.1
<i>Kebbi</i>	63.5	43.6	35.1	21.0	54.2	31.1
<i>Yobe</i>	54.0	34.5	20.9	9.2	39.4	15.3
<i>Zamfara</i>	54.0	33.2	11.3	4.9	18.3	5.5

Source: NDHS 2008, pp.165 and 382

Table 2 The total number of Malnourished Children 0-5 in the Programme States of Northern Nigeria (2006, 2008)

	Total Population of Children 0-5	Number of Children 0-5 Stunted (-2sd)	Number of Children Severely Stunted 0-5 (-3sd)	Number of Children Wasted 0-5 (-2sd)	Number of Children Severely Wasted 0-5 (-3sd)	Number of Children Underweight 0-5 (-2sd)	Number of Children Severely Underweight 0-5 (-3sd)
Jigawa	1,054,687	563,203	361,758	362,812	184,570	538,945	268,945
Katsina	1,438,363	840,004	563,838	291,988	146,713	542,263	217,193
Kebbi	794,867	504,741	346,562	278,998	166,922	430,818	247,204
Yobe	531,610	287,069	183,405	111,106	48,908	209,454	81,336
Zamfara	803,194	433,725	266,660	167,868	39,357	316,458	44,176

Sources: NDHS 2008 and Nigerian Census 2006

Table 3 Total Number of Malnourished Children 0-5 in all seven NW States of Nigeria (2006, 2008)

	Total Population of Children 0-5	Number of Children 0-5 Stunted (-2sd)	Number of Children Severely Stunted 0-5 (-3sd)	Number of Children Wasted 0-5 (-2sd)	Number of Children Severely Wasted 0-5 (-3sd)	Number of Children Underweight 0-5 (-2sd)	Number of Children Severely Underweight 0-5 (-3sd)
Jigawa	1,054,687	563,203	361,758	362,812	184,570	538,945	268,945
Kaduna	1,383,955	716,889	456,705	130,092	65,046	301,702	88,573
Kano	2,187,340	1,012,738	632,141	374,035	238,420	671,513	284,354
Katsina	1,438,363	840,004	563,838	291,988	146,713	542,263	217,193
Kebbi	794,867	504,741	346,562	278,998	166,922	430,818	247,204
Sokoto	899,802	482,294	288,836	219,552	101,678	412,109	171,862
Zamfara	803,194	433,725	266,660	167,868	39,357	316,458	44,176

Sources: NDHS 2008 and Nigerian Census 2006.

Table 4 shows the numbers of stunted, underweight and wasted children in Nigeria and twelve other African countries. The prevalence data are taken for the most recent MICS data in the years shown in column 2, (www.childinfo.org) and the data for the population of children aged 0-5 years in 2007 are taken from the International Data Base of the US Census (http://www.census.gov/ipc/www/idb/). The percentage and number for each indicator have been ranked for each separate prevalence and number, out of thirteen.

Table 4 Comparison of Malnutrition in Nigeria against a selection of 12 other African Countries (2003-2007)

Country	Survey year	Population in 2007	Stunted				Underweight				Wasted			
			%	Rank	Number	Rank	%	Rank	Number	Rank	%	Rank	Number	Rank
Benin	2006	1,467,390	43.1	4	632,445	12	18.4	12	270,000	12	8.4	9	123,261	12
Burkina Faso	2003	2,733,427	38.7	7	1,057,836	7	37.7	3	1,030,502	7	18.6	1	508,417	5
Cameroon	2004	2,832,420	31.7	11	897,877	10	18.1	13	512,668	11	18.6	1	526,830	4
Chad	2004	1,805,674	40.9	5	738,521	11	36.7	4	662,682	9	13.5	4	243,766	9
Congo DR	2007	11,843,507	45.5	3	5,388,796	3	25.1	7	2,972,720	3	10.0	8	1,184,351	3
Ethiopia	2005	14,894,947	46.5	2	6,926,150	2	38.4	2	5,719,660	2	10.5	7	1,563,969	2
Ghana	2003	3,186,802	29.9	13	952,854	8	22.1	8	704,283	8	7.1	11	226,263	10
Kenya	2003	6,392,809	30.3	12	1,937,021	5	19.9	10	1,272,169	5	5.6	12	357,997	7
Liberia	2007	556,200	39.4	6	219,143	13	19.2	11	106,790	13	7.5	10	41,715	13
Mali	2006	2,406,914	37.7	9	907,407	9	26.7	6	642,646	10	15.2	3	365,851	6
Niger	2006	2,435,054	58.9	1	1,434,247	6	51.9	1	1,263,793	6	10.8	6	262,986	8
Nigeria	2007	22,997,861	34.3	10	7,888,266	1	25.3	5	5,818,459	1	10.8	5	2,483,769	1
Tanzania	2004	6,358,137	37.7	8	2,397,018	4	21.8	9	1,386,074	4	3.0	13	190,744	11

Source: Hall and Bohan (2009)

Table 4 shows that Nigeria ranks as number 1 in terms of numbers of stunted, underweight and wasted; as middle of the range in terms of underweight and wasted; and as number ten in terms of percentage stunted.

Figures 3-6 below show the prevalence and numbers of stunted and wasted children as indicated by the MICS survey of 2007.

Figure 3 Prevalence of Stunting



Figure 4 Distribution of Numbers of Stunted children by State

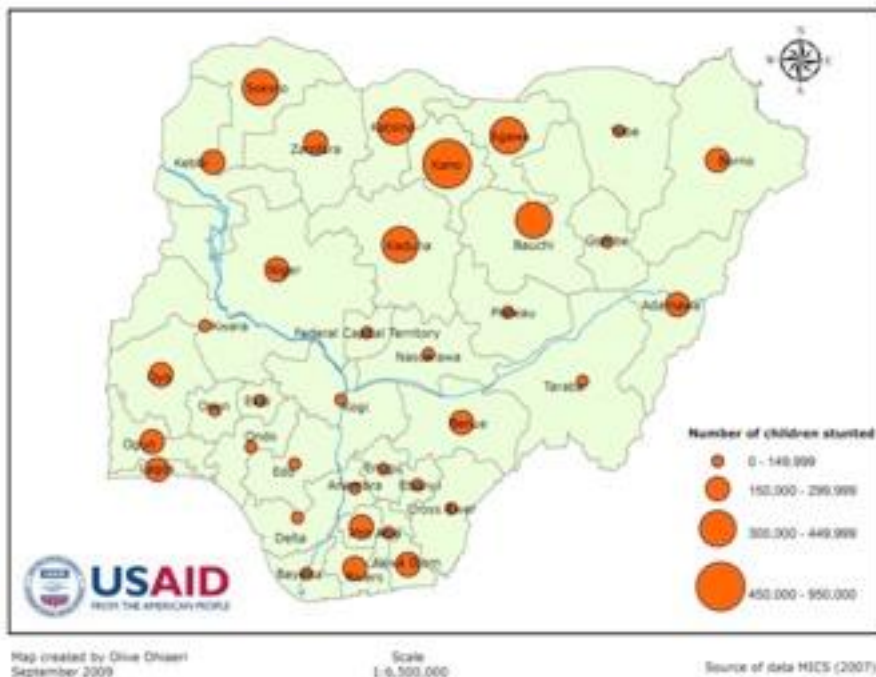


Figure 5 Distribution of Prevalence of Wasted Children by State

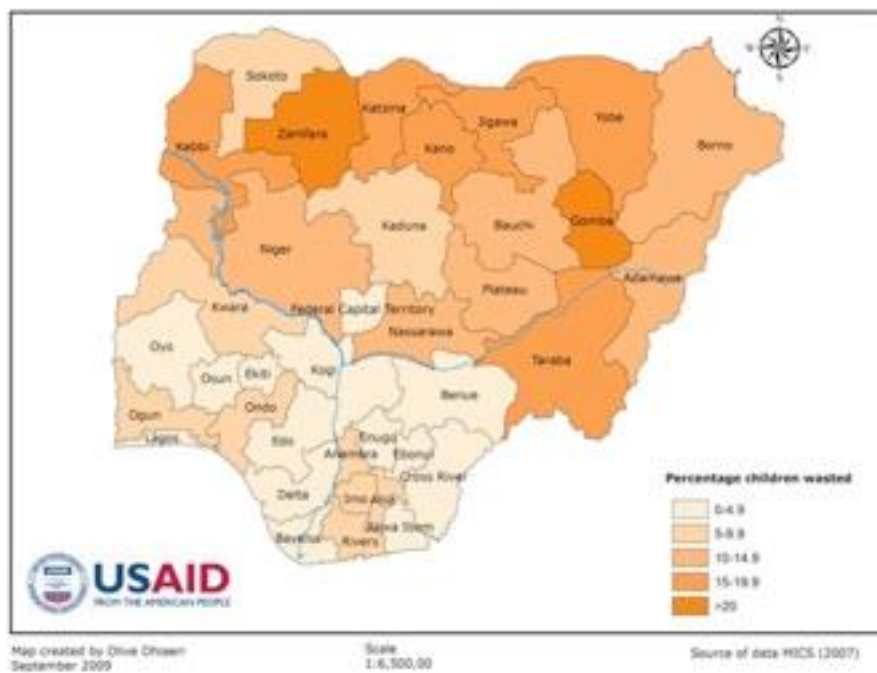
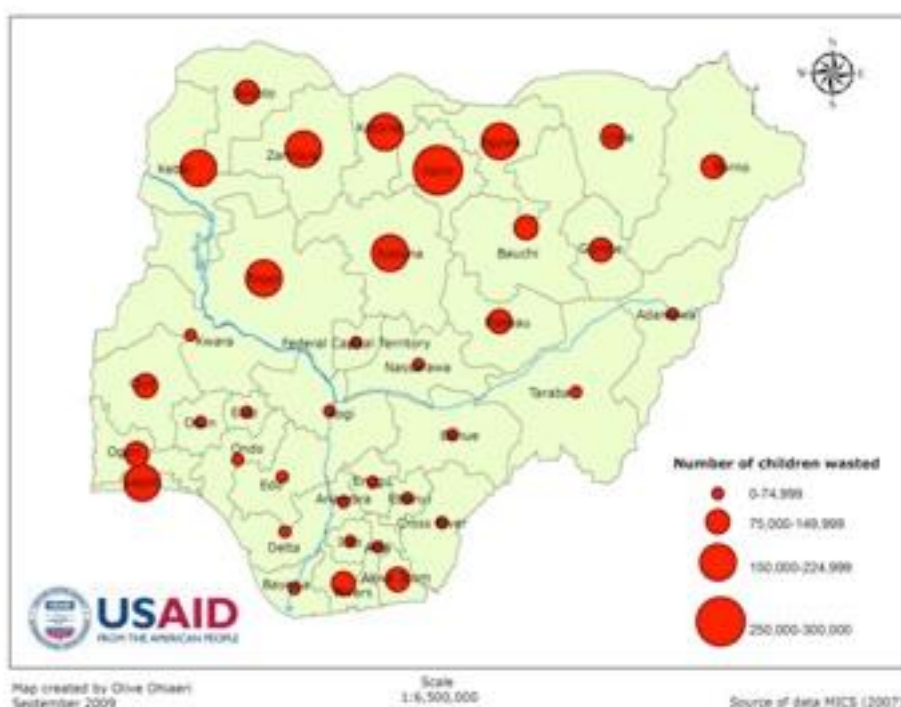


Figure 6 Distribution of Numbers of Wasted children by State



In 2001-2003, the National Survey for Food Consumption and Nutrition Status (NFCNS) covered 12 states and 72 LGAs with representative communities in each LGA (Maziya-Dixon B, et al 2003). The NFCNS also assessed the prevalence and spread of micronutrient deficiencies and determined the nutritional status and nutrient intakes (qualitative) of the rural and urban populations in Nigeria. The survey design was all-Nigeria and was stratified by major agro-ecological zone (AEZ) and predominant food crops within the zone. Twelve states were selected randomly. The AEZ that most relates to the five Programme states is 'dry savannah' and this extends as far south as Abuja. National data showed that 42% of children were stunted, 25% were underweight and 9% were wasted. The dry savannah AEZ had the highest prevalence of stunting (58%), wasting (13%) and underweight (38%)⁹. This is based on a sample of 5028 children under five. Nationally the rural sector had higher levels of malnutrition than the urban sector.

The most recent data of child nutritional status is provided by SMART Surveys (National Bureau of Statistics, 2010a, 2010b, 2011 and 2012). These surveys were carried out in the five Programme states (and others) in northern Nigeria and nutritional status of under fives' children was analysed using the WHO reference standards of 2006, and the measure of global acute malnutrition (GAM)¹⁰ and severe acute malnutrition (SAM)¹¹.

Table 5 Prevalence of Global Acute Malnutrition in the five Programme states according to the most recent SMART surveys

State/Timing of Survey	July 2010 (n=5518)	December 2010 (n=4914)	July/August 2011 (n=6069)	February 2012 (n=7186)
Jigawa	9.7	8.1	10.8	8.0
Katsina	9.0	8.8	11.3	6.8
Kebbi	15.4	10.1	8.6	7.1

⁹ Therefore to recap, these figures compare with the NHDS (2008) national figures of 41% stunted, 23% underweight and 14% wasted, and the NW States data of 53% stunting, 20% wasting and 35% underweight, but although not stated, the NCHS standards would have been used at the time of the NFCNS.

¹⁰ GAM refers to weight/height less than 80% of the median weight of children with the same height in the reference population and/or suffering from oedema; alternatively if the weight/height ratio is less than -2SDs of the Z-score.

¹¹ SAM refers to weight/height less than 70%.

Yobe	14.6	7.5	10.0	14.5
Zamfara	11.6	11.4	8.9	6.4

Table 6 Prevalence of Stunting in the five Programme states according to most recent SMART surveys

State/Timing of Survey	July 2010 (n=5518)	December 2010 (n=4914)	July/August 2011 (n=6069)	February 2012 (n=7186)
Jigawa	66.4	68.4	64.8	60.2
Katsina	62.4	66.0	54.3	41.7
Kebbi	52.8	65.4	43.4	41.5
Yobe	58.2	57.8	37.2	58.5
Zamfara	60.9	64.8	45.5	46.9

Table 7 Prevalence of Underweight in the five Programme states according to most recent SMART surveys

State/Timing of Survey	July 2010 (n=5518)	December 2010 (n=4914)	July/August 2011 (n=6069)	February 2012 (n=7186)
Jigawa	43.3	35.8	37.1	30.8
Katsina	38.3	44.9	29.7	27.1
Kebbi	38.5	40.9	22.7	25.6
Yobe	42.7	41.7	22.3	44.6
Zamfara	38.7	40.0	22.6	24.8

The conclusions that can be drawn from these data are that nutritional problems of under fives' in terms of stunting remain severe, between 42-68%, although there appears to be some improvement in the prevalence of underweight in Katsina, Kebbi and Zamfara states over the last 12 months (it is not known if these changes are significant). The December period is the post harvest season when some reduction in GAM might be expected and this is seen in the states, although it is only substantial in Kebbi and Yobe States.

There are some other smaller scale surveys that have assessed child nutrition status, with three that can be compared and these are presented in tabular form below.

Table 8 Child Nutritional Status: Summary of results from various small-scale assessments and studies.

Bibliographic Reference	Location	Sample size	Prevalence GAM(WHO ref)	Prevalence SAM (WHO ref)
SCF (A Tolla), October 2011	Daura and Zango LGAs, Katsina State	Under fives: 788; weights and heights	17.4%	4.1%
SCF (C Andert) November 2010	Daura and Zango LGAs, Katsina State	Under fives: 578	16.9%	6.1%
Ojiako et al, 2009	Kaduna and Kano states	Under fives: 511	17.1%	n/a

A further survey (van der Jagt 2009) of children from birth to 2 years found that rural babies were also more malnourished than urban babies. This is based on a sample size of 52 babies in Jos Hospital and 48 in villages about 20 miles from Jos. The mean length, weight and head circumference of the rural infants were significantly lower than those of the urban infants. Z-scores based on WHO standards showed: (i) length-for-age z-score <2 in urban (27%) and rural (33%)

children; (ii) a higher incidence of underweight and small head circumference in rural (33% and 13%) versus urban children (12% and 0%); and (iii) positive correlations between all three z-scores and maternal BMI.

Summing up the Information on Child Nutritional Status

There have been regular national nutritional status surveys, with four in the last ten years. Data for the last two years are available for the five Programme states through SMART surveys. All of these surveys confirm that stunting consistently exceeds 50% (with the exception of some seasonal variations in some states), well in excess of the national average. There are no clear trends that the situation is improving. In addition to the national surveys and the SMART surveys for the NW states, there have been some hospital and village based surveys.

1.2 Women's Nutritional Status

The NDHS 2008 surveys assessed nutritional status of adult women (15-49 years) on the basis of thin (BMI<18.5), normal (BMI 18.5-24.9) and overweight (BMI >25.0). On this basis it was found that the percentage of adult women who were thin in the NW states was 18.6 and 20.7 in the NE states compared with a national average of 12.2. (There is large variation in the other northern states, with the percentage of thin mothers being 8.5 in North Central States and 20.7 in North East states.) These data are summarized in Table 9. Maternal nutritional status was not measured in the MICs survey.

Table 9 Nutritional Status Adult Women of child bearing age

Location	Women (%) with BMI <18.5
NW States	18.6
NE States	20.7
North Central	8.5
National	12.2

Source: NDHS (2008) p. 182

The NFCNS also provided some data on nutritional status of adult women¹². This is summarized in Table 10. In the NW states just under one fifth of women were classified as thin, higher in the dry savannah region compared to the national average and slightly higher in 'rural' compared to 'urban'. Nationally, two thirds (68.5%) of women examined (number not available) fell within the normal range of BMI, with very similar proportions encountered across all of the agric-ecological zones (and 67.7% in the dry savannah).

Table 10 Nutritional Status Adult Women of child bearing age

Location	Women (%) with BMI<18.5
National	11.6
Dry Savannah	16.4
Urban	11.5
Rural	12.7

Source: NFCNS, 2003, pp. 26-27

¹² The presentation of the data is unclear: subjects being variously described as 'mothers', 'women' and 'women of child bearing age (15-49 years)'.

More recent data from the five programme states on low BMI for non pregnant women are provided by the SMART surveys (NBS 2010a, 2010b, 2011)

Table 11 Prevalence of Low BMI, non pregnant women in the five programme states according to most recent SMART surveys

State/Timing of Survey	July 2010 (n=4000)	December 2010 (n=3730)	July/August 2011 (n=4373)
Jigawa	22.3	28.2	23.4
Katsina	19.5	21.3	20.6
Kebbi	17.3	45.6	25.6
Yobe	45.2	32.6	47.3
Zamfara	12.5	10.1	22.6

These data show that the prevalence of under nutrition in non pregnant women is high relative to national averages, especially in Yobe state. The three sets of data also show that this under nutrition is highest among adolescent girls (statistically significant), indicating young mothers are at highest risk of under nutrition. In July 2010 the percent of low BMI (<18.5) was 30.2% for 15-19 year olds compared to 21.1% for 20-49 year olds: the corresponding figures for December 2010 were 35.0% and 22.1% and for July/August 2011, they were 36.5% and 18.4 respectively.

Summing up on Women's ¹³ Nutritional Status

Information is drawn on using two national surveys and the recent SMART surveys. They indicate that 8-20% of the adult women are thin in terms of BMI, depending on region, and that between 10-47% of women in the 5 Programme states are thin. The SMART surveys indicate that adolescent girls are particularly at risk of being thin.

1.3 Micronutrient Status of Children and Mothers

1.1.1 1.3.1 Vitamin A status among women and children

Data are provided in the NFCNS on vitamin A status of children under 5, mothers and pregnant women (pages 27-29). The definitions of vitamin A deficiency for under fives were given as marginal deficiency being serum retinol concentration <20 ug/dl and severe deficiency (clinical deficiency) being <10 ug/dl. On this basis, at the national level, 24.8% suffered from marginal deficiency and 4.7% suffered from severe deficiency. Therefore just under 30% were suffering from vitamin A deficiency. Deficiencies were highest in the dry savannah (31.3%). Marginal and severe deficiencies were similar in rural and urban areas. The sampling frame of the NFCNS does not provide useful data that could be applied directly to the five Programme states. Akinyele (2009) analyzed vitamin A status from the NFCNS by geopolitical zone and found that in the NW zone, 3% of under fives had clinical deficiency and 32% had marginal status.

In adults, mothers with a serum retinol concentration of <30ug/dl were considered as being at risk of vitamin A deficiency, and these were 13.1% of the national sample. At the zonal level the highest prevalence of mothers at risk was in the dry savannah at 19.5%. Mothers with serum retinol concentration of <20 ug were considered as being vitamin A deficient: nationally these were 4.1% of the population. Identical standards of deficiency were used for pregnant women: on this basis 19.2% were at risk of deficiency at the national level (being highest in the dry savannah (34.3%)) and 8.8% nationally were regarded as being vitamin A deficient.

¹³ Please see previous footnote about categorisation

Summing up on Vitamin A

The available data show that vitamin A deficiency appears to be a marginal problem among children and mothers in the dry savannah zone and the northwest of Nigeria.

1.1.2 1.3.2 Iron, Folate and Vitamin B12 status among women and children

The NFCNS also assessed the status of iron deficiency of children, pregnant women and mothers (pp. 31-35). Iron status was assessed using the serum ferritin level (SF). SF levels below 12ng/ml are highly specific for iron deficiency and indicate exhaustion of iron store in adults. In children, a cut off value of 10ng/ml was suggested ¹⁴.

For children under 5, at the national level, 27.5% were at different stages of iron deficiency: 19.4% had an SF level of less than 10ng/ml. Disaggregating by AEZ, the proportion of children with varying degrees of iron deficiency was 42.2% in the dry savannah while prevalence of iron deficiency (SF level less than 10ng/ml) was 31.5%, less than in moist savannah but higher than in humid forest). 10.7% had iron store depletion. Later analysis of data from the NFCNS by Akinyele (2009) found that in the NW zone, 21.7% of under fives were iron deficient (serum ferritin concentration < 10ug/ml) and 11.9% had iron store depletion, the differences presumably being due to the reorganization of data from AEZ to State category.

Approximately 24.3 % of mothers and 35.3% of pregnant women were at different stages of iron deficiency, with 12.7% of mothers and 19.9% of pregnant women already with iron store (SF level <12 ng/ml) indicating iron deficiency. In the dry savannah AEZ 33.2% of mothers and 43.1 of pregnant women were at different stages of iron deficiency.

A survey that tested for nutritional factors associated with anaemia in 146 pregnant women, who attended two antenatal clinics in Gombe, northern Nigeria found that based on a hemoglobin value of <105 g/L, 32% of women were classified as anaemic (Vanderjagt et al (2007)). The major contributing factor to anaemia was iron deficiency based on the SF level (<10 mg/ml) ¹⁵. Conclusions from this study were that the most common cause of anaemia in the pregnant women in northern Nigeria was iron deficiency, and the elevated concentrations of homocysteine were most likely due to both their marginal folate and vitamin B12 status, malaria was also present in fifteen (9.4%) women. This conclusion was based on the view that since the diets of the population in the northern region are heavily reliant on grains such as millet and sorghum, both of which contain large quantities of phytates, which are known to interfere with the bio utilisation of iron and other trace minerals such as Zinc and Calcium. The requirements of iron during pregnancy are high, and it was difficult to meet these requirements through diet alone.

Research on the folate and vitamin B12 status of adolescent girls age 12-16 years in Maiduguri, Nigeria found that the mean serum folate concentration for subjects was 15.3+ 5.2nmol/L (Vanderjagt et al, 2000). Only four subjects (2.4%) had serum folate concentrations lower than 6.8 nmol/l, a level indicative of negative folate balance, and 9% of the subjects had serum vitamin B12 concentrations at or below 134pmol/L, the lower limit of the reference range for their age group. Serum homocysteine was measured in 56 of the 162 subjects and the mean level was 15.9+ 5.0,

¹⁴ In the survey the following cut-off points were used for SF levels: 1) <10ng/ml (0-15 years): iron deficiency; 2) <12ng/ml (16-74 years): iron deficiency; 3) <20ng/ml: iron store depletion; 4) 20-100 ng/ml: normal range; 5) 101-300 ng/ml: slightly above normal; and 6) >300 ng/ml: iron overload.

¹⁵ The mean homocysteine concentration for all subjects was 14.1 µmol/L, and homocysteine concentrations were inversely correlated with concentrations of folate and vitamin B12. The serum homocysteine increased markedly at serum vitamin B12 levels below 250 pmol/L.

umol/L. The majority of subjects had serum homocysteine concentrations above the upper limit of the reference range for their age group. It was concluded that the adolescent girls studied were at greater risk for vitamin B12 deficiency than folate deficiency, and this is consistent with the fact that their diet included few foods that contained vitamin.

There is some further research evidence for iron and folate. (Glew et al, 2004). The dietary intakes of folate and vitamin B12 were low for rural Fulani subjects and this was reflected in their significantly lower serum concentrations of these two vitamins.

Table 12 Summary of data on Anaemia

Subject and sample size	HB values (and % of subjects)	Serum Ferritin (and % of subjects)
Pregnant Women – all (Gombe) N=146	110 g/L (100%)	Na (100%)
Pregnant women classified as anaemic (Gombe); n=44	<105 g/L (32%)	<10ng/mL (18%)
Under 5s dry savanna region (NFCNS)	Na	<10ng/mL (31.5%)
Under 5s rural all Nigeria (NFCNS)	Na	<10ng/mL (19.4%)
Mothers and pregnant women dry savanna (NFCNS)	Na	<12ng/ml 33.2% mothers; 43.1% pregnant women

Sources: VanderJagt et al (2007); NFCNS (2003)

Summing up on Iron status

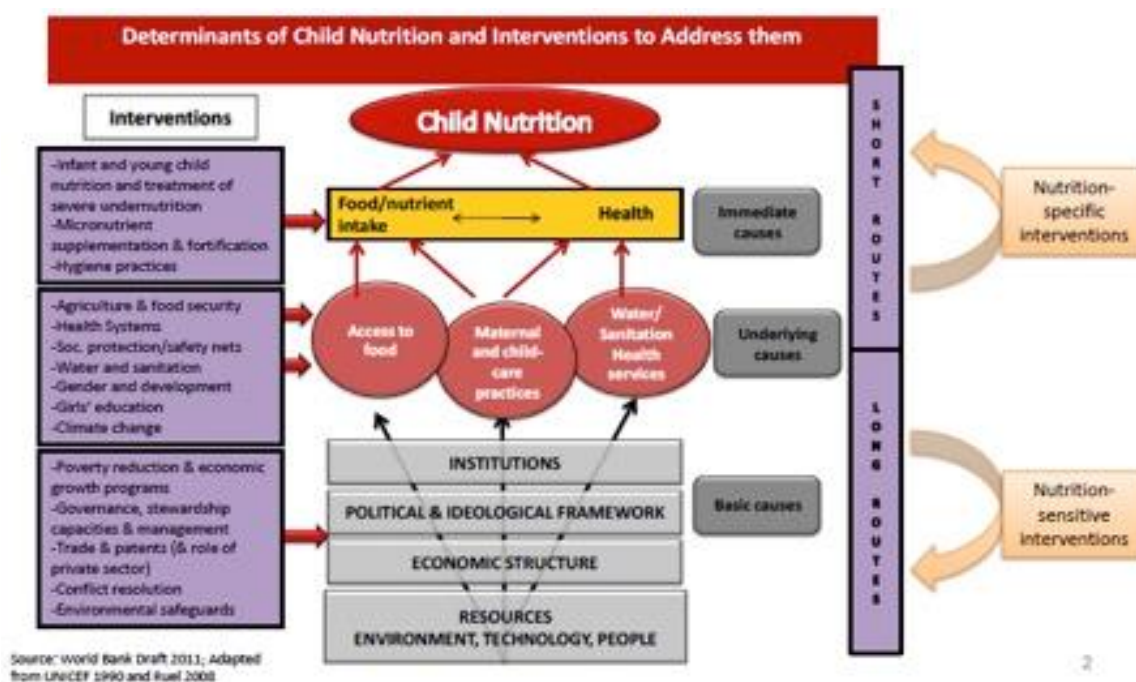
From the literature review there appears to be (from within the last 15 years) two main sources of information on iron status in northern Nigeria (dry savanna zone), being the findings of the NFCNS and the research of the team based at the Federal Medical Centre in Gombe. Given the relatively small sample size of the Gombe studies and the general nature of the 'dry savanna' zone information there appears to be a need for further research to assess haemoglobin and serum ferritin levels in the target populations. The available data show that iron deficiency anaemia affects between 19-32% of children under 5 and around a third of mothers, with a higher prevalence among pregnant women.

2. Determinants of maternal and child under nutrition

2.1 Conceptual Framework

The determinants of malnutrition are multidimensional and interrelated, ranging from factors as broad as political instability and weak economic growth, to those as specific as poor diet, respiratory infection and diarrheal disease. The well-known UNICEF conceptual framework (Figure 7) demonstrates the relationships among the determinants of under nutrition. It also shows the possible interventions to tackle child under nutrition.

Figure 7 Conceptual framework of basic, underlying and immediate causes of child under nutrition



In the top box of interventions that relate to immediate causes of child under nutrition, are the direct nutrition-specific interventions to be undertaken to tackle the immediate causes of child under nutrition: in the case of WINNN, these are CMAM, IYCF, micro-nutrient supplementation, and health interventions including deworming. In this area of tackling the immediate causes of child under nutrition, the cause-effect linkages are short and much is well known about what works. In the middle box are some of the indirect nutrition-sensitive interventions to tackle the determinants of child under nutrition: social protection programmes which aim to improve household income and reduce food insecurity; initiatives to build links and leverage synergies between nutrition and agriculture sector programmes and policies; strategies to promote gender equality and women's empowerment; programmes to improve access to improved water and sanitation; and initiatives to explore the roles of civil society and the private sector in demanding and supplying high quality scaled-up health and nutrition services. Here the cause-effect linkages are longer with a theory of change more complicated, but understanding of what works is being generated.

The bottom box relates to basic causes that relate to institutional governance, and political and social systems, as well as the natural resource base and the economic structure of the location. Programmes and policies that can have an effect at this level include poverty reduction, trade, conflict resolution, political engagement, and good governance and coordination of nutrition-related programmes and sectors. Policies and programmes that address the basic causes of child under nutrition are very important but the linkages that do so are lengthy and not well understood.

As the conceptual framework suggests, there are very many complex pathways among these variables; therefore it is important to articulate a theory of change to begin to illuminate these pathways in any given context. Interventions to reduce malnutrition must assess the underlying determinants (at immediate, underlying and basic cause levels) specific to the context, building on existing research and the knowledge of key stakeholders (government officials, research workers, nutritionists, and agriculture, social care and health professionals).

The existing studies that exist on pathways are mostly cross-section analyses of varying strength. The weaknesses of such studies are: (a) they do not show causal relationships, only associations, (b) such relationships are easily confounded as the causal pathways are rarely direct, (c) they do not include “explanatory” variables sufficiently specific to support pilot design, and (d) the studies are not sufficiently context specific. But such studies give valuable insights to be built upon for future research. In addition they were not carried out with any direct relationship to this conceptual framework.

2.2 Sources of data on determinants in Nigeria

Broadly there are three types of studies; first large data sets that have collected information on variables that are seen as determinants or important associated factors to nutritional status (e.g. NDHS), second, those studies that have re-analysed large data sets such as the NDHS (e.g. Ajieroh, 2009, Omilola (2010) Agee, 2010 (with the 2003 data set) and Adekanmbi et al 2011 (with the 2008 data set), and third, those which are self standing village- or clinic-based studies. All will have varying degrees of relevance to the five Programme states: some may provide data from those very states, others from similar agro-ecological zones.

1.1.3 2.2.1 Large data sets

There are four recent large data sets available to the review that measured child nutritional status and related characteristics: the NFCNS, 2004, MICS 2007 and the NDHS 2003 and 2008. As regards the latter, data are mostly presented on a national basis with some breakdown for the NW states. Some of the information has already been, or will be reported in this paper, in the sections that relate to a description of the state of nutrition in Nigeria. These include characteristics relating to breastfeeding, IYCF, vitamin supplementation, iron intake and deworming medication.

The NDHS 2008 shows that nationally for the indicators of wasting and stunting there is an inverse relationship between mother’s education and wealth. Male children are more likely to be stunted than female children and rural children are more likely to be stunted than urban children. MICS 2007 confirmed the high rate of undernourishment in the NW states and the rural/urban patterns. Age of child, mother’s education and wealth status were also strongly associated with malnutrition.

1.1.4 2.2.2 Analysis of large data sets

Analyses of the NDHS 2003 data set included Ajieroh’s (2010) quantitative analysis of determinants of child and maternal nutrition, Agee’s (2010) investigation of the contribution of improved maternal information about access to community services towards the reduction of child under nutrition; and Omilola’s (2010) analysis of patterns and trends of child and maternal nutrition inequalities. Adekanmbi et al (2011) used the 2008 NDHS data set to quantify predictors of child hood stunting. Akinyele, 2009 provided an overview of background information for these studies and other areas of data collection.

In trying to follow the UNICEF conceptual framework described above, the analysis focuses mostly at the level of underlying causes (food, health and care). These variables in the NDHS are captured through household wealth index (proxy for food), initiation of breast feeding, whether the child is given complementary feeding, whether delivered in a health facility and whether the mother attended antenatal care during pregnancy and mothers' occupational status (care). For the health environment and sanitation, the variables are: availability of safe water, sanitation, access to health care, environmental safety, and shelter.

2.2.3 Small Scale studies

There are several small scale studies that review child and maternal nutritional status and related characteristics focussing on the north of Nigeria (e.g. Glew et al, 2004, Ifeanyi et al, 2009, Oninla, 2007, Vanderjagt 2009, Uthman 2009). Sample sizes are small and directed towards specific research questions and some are based on extended research by a number of investigators working from a hospital base ¹⁶.

2.3 Determinants of Maternal and Child Under nutrition:

1.1.5 2.3.1 Immediate determinants (diet and disease)

This section of determinants is laid out according to the conceptual framework given in Figure 7. Its original formulation was by UNICEF, 1990 and this is still the best text on explaining this framework despite later revisions by other agencies. Therefore in introducing each level and type of determinants this source is used.

The immediate causes of under nutrition are inadequate dietary intakes and health status. They interact: disease, in particular infectious disease, affects dietary intake and nutrient utilisation. In most cases under nutrition is the combined result of inadequate dietary intake and health status. Not included in the conceptual framework 'boxes' are a range of possible demographic and community factors ¹⁷. Figure 7 proposes some of the major interventions that could have an impact on the immediate causes.

Food Consumption

The main source of data on the nature of food consumption at the national level is the NFCNS (Maziya-Dixon B, et al 2003). Information was collected using household questionnaires, 24-hour dietary recall (qualitative), and anthropometry and biochemical measurements. In the dry savannah zone, the main crops consumed were maize, rice cassava, cowpea and sorghum, although in the five Programme states, the semi arid crops of sorghum, millet and cowpeas generally form the bulk of the diet. Sorghum is confirmed as the most frequently consumed staple food crop (over four times a week) for the dry savannah, followed by maize and rice. Among the legume staple crops (the major source of plant protein) in the dry savannah, the most frequently consumed legume was cowpea. The most frequently consumed, non staples were fruit, leafy and non leafy vegetables, meat and fish, and fats and oils. Although fruit ranked second at (to non leafy vegetables) in the overall frequency of consumption percentages in the dry savannah, a majority of households consumed fruit once or twice a week. Only non leafy vegetables and fats and oils were consumed four times a week (see NFCNS pages 11-26). There is however, a considerable diversity of fried snacks. Better off families would be able to consume some meat. Breast feeding is rarely

¹⁶ The need to keep to a time horizon of studies collected over the last 15 years or so means that, for example, the comprehensive work carried out by the Department of Community Medicine of Ahmadu Bello University in the 1970s and 1980s has not been included

¹⁷ Two possibly significant maternal variables are mother's age and birth spacing. As regards the former there was no information on this and as regards the later birth interval had no effect on nutrition status nationally (NDHS, 2008)

exclusive but many children are weaned comparatively late, usually onto the household staple meals.

Otherwise there is a dearth of national surveys providing data sets that can be used for analysis of food and nutrition security in rural Nigeria. Many studies are carried out without including information on per capita consumption, food distribution and availability at the household level (Akinyele, 2009). One survey of settled communities and pastoralists among four Fulani hamlets on the Jos Plateau (Glew et al, 2004) found that urban subjects consumed more calories than rural subjects (men: 2061 vs. 1691 kcal; women: 1833 vs. 1505 kcal) and had a significantly higher mean body mass index (BMI) and percentage of body fat than rural subjects. Both urban males and females had carbohydrate intakes that were greater than those of Fulani pastoralists (men: 56% vs. 33% total calories; women: 51% vs. 38% total calories), but had a significantly lower dietary intake of total fat and saturated fat (men: 36% vs. 51% of total calories; women: 40% vs. 51% of total calories). With the exception of HDL-cholesterol levels, which were significantly lower in the rural population, the blood lipid profiles of rural subjects were more favourable compared to those of urban subjects.

Protein intake of children in the North Western zone is low because their diet is mainly cereal-based with no supplementation (Anigo et al, 2009). Ready to eat complementary food samples were collected from mothers with children older than 6 months but younger than 24 months and evaluated for its nutrient components using standard procedures. Results obtained showed that guinea corn and millet paps were the first foods introduced to children in the zone.

Summing up on Food Consumption

The data on food consumption are sparse and there is one national survey carried out in 2001-2003. Resources required to accurately assess energy and protein intakes are considerable other than at a small village level scale. The NFCNS did assess dietary diversity and these techniques could be repeated at state level. Small scale in-depth surveys to examine intra household food consumption would also be valuable.

1.1.6

1.1.7 2.3.2 Infant and Young Child Feeding Practices (Breastfeeding and Weaning)

WHO/UNICEF's global recommendations for optimal infant feeding are: exclusive breastfeeding for six months where exclusive is defined as when an infant receives only breast milk from his or her mother or a wet nurse, and no other liquids or solids, except for oral rehydration solution, drops or syrups consisting of vitamins, minerals supplements or medicines (WHO/UNICEF/USAID, 2008; Kramer, 2001). Following six months of exclusive breast feeding, WHO/UNICEF recommends adequate and safe complementary feeding until month 23, though breast feeding may continue beyond two years (PAHO/WHO, 2002).

Although breastfeeding is widely practiced across all subgroups of women, the timing of initial breastfeeding varies by background characteristics. WHO recommends early (i.e. within one hour of giving birth) initiation of breastfeeding. According to NDHS (2008), the proportion of children breastfed within one hour of delivery is slightly higher in urban areas (41 %) than in rural areas (38 %). With respect to states, North Central has the highest proportion (61 %) of children breastfed within one hour of birth, while the North East has the lowest proportion (25 %), which is surprising given that they are contiguous states. Children born to mothers with at least primary education are more likely to be breastfed within one hour of birth than those born to mothers with no education (NDHS, 2008).

Prelacteal feeding is widely practiced in Nigeria. More than half (56 %) of last-born children received a prelacteal feed. There are no marked differences in the proportions of children, who received a prelacteal feed by sex of the child. There are substantial variations by residence, assistance at delivery, and place of delivery. Prelacteal feeding is most widely practiced in North East (79 %) and North West states (68 %), and is least common in South West (31 %). Children whose mothers have more than secondary education (33 %) are less likely to receive prelacteal feeds than children whose mothers have no education (68 %). Likewise, children born to mothers in the highest wealth quintile (39 %) are less likely to receive a prelacteal feed than children born to mothers in the lowest wealth quintile (71 %) (NDHS, 2008).

According to the NDHS 2008, the median duration of any breastfeeding in Nigeria is 18.1 months with the mean duration of 17.9 months. The median duration does not vary much by sex of the child. Rural children are breastfed for a longer duration (19 months) than urban children (16.2 months). Children in households in the highest wealth quintile are breastfed for the shortest duration (14.6 months) while other children are breastfed for 17-21 months. The NW and NE states have the highest median duration of breastfeeding in the whole of Nigeria (20 months and 20.7 months respectively).

The median duration of completely exclusive breastfeeding at national level is less than one month and in the NW is less than half a month (0.4). The NW and NE states have the highest incidence of 'predominantly breastfed', which is defined as either exclusively breastfed or received breast milk and plain water, and/or non-milk liquids only, at 4.6 months. This duration is almost twice as long as other Nigerian states, and still falls some way short of both the recommended practise and duration.

The NDHS surveys of 2003 and 2008 show no change in the prevalence of exclusive breastfeeding in the NW states, being less than half a month (0.4) on both occasions. The MICS (2007) survey shows that the exclusive breast feeding rate (6 months) was 11.75% nationally, while the percentage of children 0-5 months in the five Programme states exclusively breast fed varied from 1.3% in Yobe to 4.7% in Kebbi; this is among the lowest in the country.

A study of 256 caregivers and 704 children age 6-24 months, based in the three NW states of Kaduna, Kebbi and Niger, found on average over 70% of mothers were still breastfeeding at the time of the survey (Matthew et al, 2009). The duration of breastfeeding was between 13-24 months (73.4%). Only 54.3% of mothers in NW practiced exclusive breastfeeding for the first six months but practices of exclusive breast feeding were not in compliance with international standards as over three-quarters of caregivers also gave plain water. About one fifth of caregivers (19%) reported always sterilizing bottle feeds. Complementary foods were introduced to the majority of the children much earlier than the sixth month recommended, at third month (41.2%), and for the first 1-2 months for 17.8%. This study also revealed that on the average, 31.7% of the children sampled were severely stunted which was lower than the national average.

A study in Ondo State found that a high proportion of the nursing mothers used local ingredients to formulate weaning foods for their babies (Ijarotimi et al, 2006). The nutritional composition of these foods is of high quality and they are suitable as weaning foods, particularly for infants of low-income parents who do not have access to commercial weaning foods.

Summing up on Breast Feeding

Exclusive breastfeeding lasts for less than a month in all parts of Nigeria: the mean duration of any breast feeding is about 18 months. Complementary foods - usually the foods already consumed by family members in the household - are introduced at an early stage. Some data suggest that breast feeding is longer in the northern states than in the southern states. Nigerian officials interviewed for this review pinpointed poor breastfeeding practices,

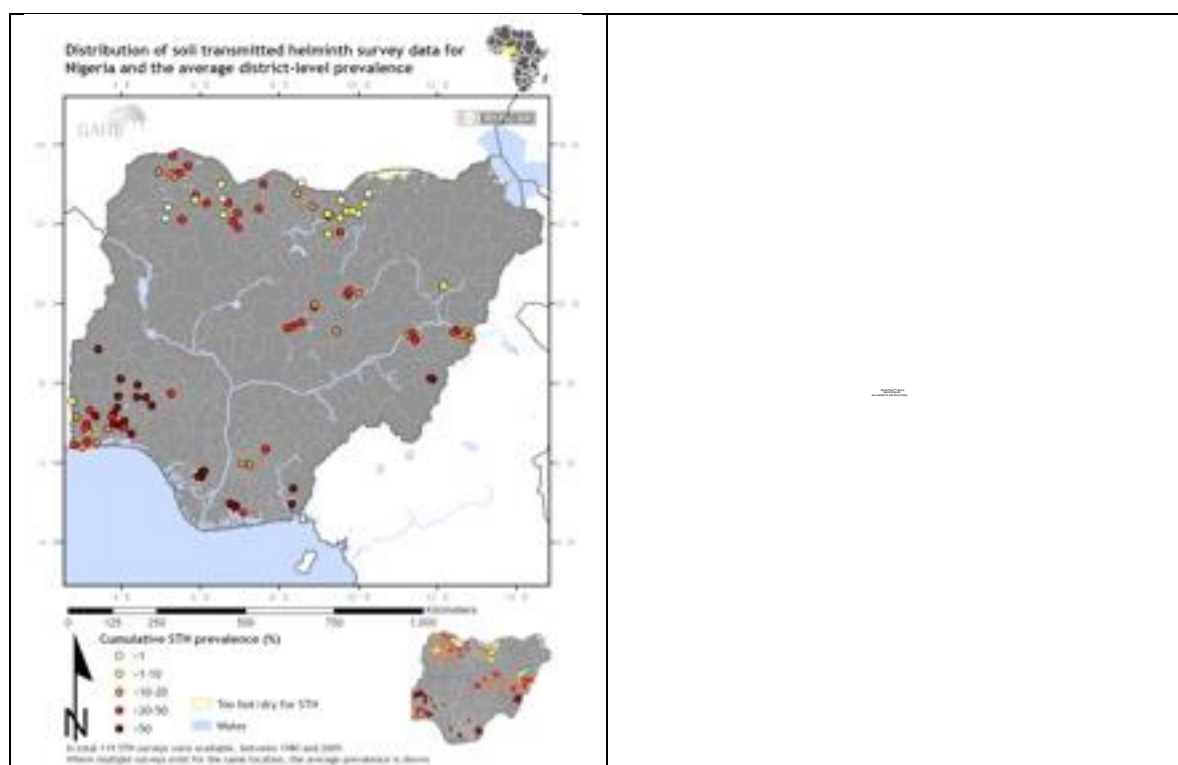
the availability of breast milk, and the support given to breast feeding mothers as key determinants of the poor nutritional status

1.1.8 2.3.3 Intestinal parasites

The presence of intestinal parasites interacts with poor nutrition through a number of mechanisms, including blood loss that triggers anaemia, and under nourished children have a greatly increased likelihood of developing parasite induced diarrhoea, which can become a chronic disorder. Dietary deficiencies can affect the immune system. The parasitic load also requires energy to survive.

The data on intestinal parasites for the NW states are rather patchy. The diagram below from Wormy world¹⁸ indicates that the cumulative STH prevalence is mostly high at >20-50, although lower in some locations of the NE states. One study has determined the prevalence of intestinal parasitism among 257 pupils in rural schools in the Konduga LGA of Borno state (rural NE Nigeria) (Damen et al, 2011). This found that the prevalence was high being 80.9%, with the 6-8 year old age group having the highest prevalence at 85.7% and the 13-16 years old group the lowest at 77.7%. The highest prevalence was *Ascaris lumbricoides* (19.1%).

Figure 8 Distribution of soil transmitted helminth survey data for Nigeria and the average district level prevalence



Source: Maps Downloaded from Wormyworld:
http://www.thiswormyworld.org/maps/search/all?country=146&infection=All&map_type=All

¹⁸ An open access information resource on the distribution of soil-transmitted helminths, schistosomiasis and lymphatic filariasis.

Summing up on Intestinal Parasites

The data on intestinal parasites for the NW states are patchy but the data indicates that it is a problem and potential interventions should be preceded by an assessment survey.

2.4 Underlying Determinants of Maternal and Child Under nutrition

The immediate causes will in turn be affected by the status of the underlying causes – being household food security; basic health services and a healthy environment; and maternal and child care (known for short as food, health and care). For example, dietary inadequacies can be caused by an inadequate supply of food or by mothers having too little time to prepare food or feed their children. Similarly severe under nutrition and child mortality may result from any one or a combination of causes, such as the lack or low utilisation of health services, inadequate food supplies and sanitary facilities, poor food hygiene or inadequate child care. It is only in a particular context that exact causes can be identified: underlying causes can be numerous and are usually interrelated. Figure 7 proposes some of the major interventions that could have an impact on the underlying causes. Most underlying causes are themselves the result of the unequal distribution of resources in society, where action is required. Causes at this level are called basic causes (see later).

1.1.9

1.1.10

1.1.11 2.4.1 Household Income/Economic Status and Food Security

Ajieroh (2009) promotes the use of the conceptual framework when assessing the analysis of NDHS as having a better fit at the underlying causal level (food, health and care) of the framework¹⁹. The results indicated that generally, across rural and urban areas, household economic status has statistically significant and positive effects on child nutrition. Household economic status had statistically significant and positive effects in rural North East and in urban areas of the North East and North West. Similarly for the mother generally in rural and urban areas, household economic status had positive and significant but weak effect on maternal nutrition and in all urban areas except the North East.

Ajieroh has directly related his analysis to the conceptual framework using the nutritional status indicators as the dependent variable and various independent variables to represent factors at the underlying level. The objectives of this analysis were to:

- Identify household and community characteristics and regional-specific risks that affect malnutrition in children 0-3 years and adult women of gestational age;
- Develop a set of typologies of vulnerability to malnutrition based on this assessment;
- Assess how current nutritional strategies and interventions do or do not address these determinants, and
- Recommend improvements in policies and programmes.

¹⁹ Ajieroh takes the NDHS data which have been collected around the six geopolitical regions (that reflect major ethnic, cultural, geographic and political blocks) and recasts them as agro-ecological zones, which link nutritional status to types of farming systems, crops grown and consumed as used in the NFCNS. Therefore in his study Ajieroh reworks the seven zones into four broad zones for analysis: Sudano sahelian, Guinea and derived savannahs and the humid forest zone. The Programme states all fall within the Sudano sahelian zone.

These regressions teased out independent correlates which showed that, nationally: (a) household economic status have statistically significant and widespread but limited overall effects, (b) households involved in agriculture have lower child nutrition status scores, even controlling for economic status, (c) when mothers work, this has a positive association with child nutrition status in rural areas, independent of household economic status, (d) maternal education has a strong association with child and maternal nutrition and (e) access to health care (e.g. antenatal visits) has less association with nutrition outcomes, perhaps signalling quality issues. Therefore household economic status, maternal education and women's empowerment are important predictors of maternal and child malnutrition in Northern Nigeria.

The socioeconomic status of a household is vital as it often determines the family's ability to procure nutritious foods for children and to care for their health. Household economic status correlates with the family's ability to seek and finance health care for their children since Nigeria lacks a publicly funded health care system that would provide access to good and basic health care services to the poor households.

Some determinants cut across many of the rural and urban regions and zones, the effects of other determinants are more localized in rural or urban settings of particular regions and zones. While maternal education and knowledge are critical for improved maternal and child nutrition, efforts to improve household economic status, increase the rural farmers' benefits from agriculture, and empower mothers to earn income and take decisions, complemented with nutritional and public health services, are more likely to improve child and maternal nutrition in the rural areas where it is most needed.

Agriculture and Food Production

Ajieroh finds that at the national level, households involved in agriculture have lower child nutrition status scores, even controlling for economic status. He suggests that any prediction of nutritional outcomes across a country as diverse as Nigeria should take into account the links between nutritional status and types of farming systems, and crops grown and consumed. Thus he finds that the agro-ecological approach is a strong predictor that can capture the range of contexts that together affect the well being of mothers and their children. Ajieroh finds that agriculture, when a primary source of income for households, was found to have a significant negative effect in child nutritional status, and was found to be significant in North Central but not in North West or North East.

1.1.12

1.1.13 2.4.2 Health Care facility usage in Northern Nigeria

Maternal and child health (MCH) outcomes in Nigeria are very poor. The NDHS 2008 found that the infant mortality rate is 75 deaths per 1000 live births; under fives mortality is 157 deaths per 1000 live births, and neonatal mortality rate is 40 per 1000 live births. The estimated maternal mortality ratio during the seven year period prior to 2008 is 545 maternal deaths per 100,000 live births. Inadequate health facilities, lack of transportation to institutional care, inability to pay for services and resistance among some populations to modern health care are key factors behind these high rates of maternal, newborn and child mortality and morbidity (Babalola, 2009, UNICEF 2008). The situation in northern Nigeria is critical where strong cultural beliefs and practices on childbirth and fertility-related behaviors partly contribute significantly to the maternal morbidity and mortality picture (Wall, 1998) compared to southern Nigeria. These beliefs and practices include: an Islamic culture that undervalues women; a perceived social need for women's reproductive capacities to be under strict male control, the practice of wife seclusion which restricts women's access to medical care, almost universal female illiteracy, marriages at an early age and pregnancy often occurring before maternal pelvic growth is complete, a high rate of obstructed

labour, directly harmful traditional medical beliefs and practices and inadequate facilities to deal with obstetric emergencies.

Reports of the NDHS 2008 show that 58% of women age 15-49 received antenatal care (ANC) from a skilled provider during their last pregnancy²⁰. Women in the urban areas and in the South were much more likely to receive ANC than their rural and northern counterparts: 51.2% and 67.1% of mothers in the North East and North West, respectively, did not receive ANC, which was a decrease on participation from the NDHS 2003 results of 47% and 59%.

A study of MCH use in the three northern states of Katsina, Yobe and Zamfara interviewed over 7,000 women (Doctor et al 2011). This study found very low utilization of ANC facilities, lowest vaccination rates of children compared to other countries in sub Saharan Africa and poor health seeking behaviours. Only 24.9% of women who gave birth in the five years preceding the survey ever received ANC from a trained health professional (i.e., a doctor, nurse/midwife), varying from a high of 32% in Katsina followed by Yobe (25.5%) to a low of 10.5% in Zamfara. This means that 75.1% of women in the three states never sought health advice. Most women receiving ANC began their visits during the second trimester. About 3% of women sought advice from their friends, with a similar proportion seeking advice from co-wives. Knowledge of complications during pregnancy can reduce the risk of death. The results show that more women in Yobe (12.7%) did not know about any complications compared with women in Zamfara (6.8%) and Katsina (1.3%).

For all live births in the past five years, only 11.2% reported that their births were delivered by a health professional, only 9.4%, delivered in a health facility. Home deliveries are nearly universal (87.2% of all women reporting home delivery). About 95% of women in Zamfara reported home deliveries, compared with 87.2% and 82.3% in Yobe and Katsina respectively: corresponding figures from the Nigeria 2008 DHS are 92.3%, 92.9%, and 93.1% respectively. For women who deliver at home, the most common reason cited was that it is more comfortable to deliver at home than at a facility (43.8%).

Agee 's (2010) analysis of the NCDS 2003 (using a sample of 1359 households) confirms many of the preceding findings: that family wealth and region specific knowledge (primarily not knowing where to go) about community health access positively affects nutritional status, and that these gains can be supported by differences in mother's education and her access to community health services.

Child Immunisation

Data from the NDHS 2008 shows the national vaccination coverage for children age 12-23 months. Overall 23% of these children are fully vaccinated, a doubling of vaccination coverage from the estimate of the NDHS in 2003 (13%). Overall 29% of children in Nigeria have not received any vaccinations. In the NC and NE States, 25.9% and 7.6% had received all basic vaccinations respectively while the figures for no vaccinations were 23.4% and 33.3% respectively.

In the three northern states of Katsina, Yobe and Zamfara, 25% of all children aged 12-23 months had received the three recommended doses of polio, but many missed the corresponding third dose of DPT3, which was received by only 5.1% of one-year olds. Only 2.2% of children 12-23 months of age received all recommended doses. More children in Yobe (3.8%) than in Katsina (2.5%) and Zamfara (0.2%) had received all recommended doses ($p=0.05$). Further analysis of the data shows that 67% of parents were unable to receive all immunizations reported lack of vaccine as a problem, and 13% had difficulties with the long wait (Doctor et al, 2011)²¹.

²⁰ Thirty percent of women received ANC services from a nurse or midwife, while 23 percent received ANC services from a doctor. Three percent of women received ANC services from a traditional birth attendant, and 36 percent did not receive ANC services at all.

²¹ Useful background data from the survey showed that the mean age at last birthday of all women was 28.7 years with 97.2% of all women being currently married at the time of the survey. The mean children ever born (CEB) was 4.3 for all women with the lowest in Yobe (3.8) compared with Katsina (4.6) and Zamfara

Children in the urban areas have consistently higher immunization rates than those in the rural areas. Overall, 4.6% of urban children 12-23 months of age had received all of the recommended doses by one year, compared to 1.1% in the rural areas. The greatest urban advantage is associated with the BCG dose, which is administered at birth and probably reflects the higher proportion of births in health care facilities in the urban areas. For DPT3 and Polio3 the urban and rural rates are much closer.

Summing up on health care facilities and immunization

MCH facilities provide protective care for mothers and children. A majority of women in the NW states did not receive antenatal care and this is expected to have an impact on health outcomes and the nutritional care of the new born, especially as in the northern states are poor. They point to poor health seeking behaviors. Although the averages vary by state, three quarters of all women have never sought health advice, and as few as 10% of deliveries were carried out in health facilities. Immunization rates are also very low, with just over 2% of children all recommended doses in three of the Programme states.

1.1.14 2.4.3 Water and Sanitation

1.1.15

In a review of the effects of water and sanitation in Nigeria, using NDHS 2008 data for the analysis, access to piped water and borehole water were found to be both positively and significantly associated with children's heights and weight Z scores (Adewara et al 2011) and the association of borehole water is stronger than that of piped water. The height of a child that has access to piped water is likely to be 0.14 Z-scores higher than a child with access to well water.

Access to pit latrines and flush toilets both appear positively associated with children's heights and are inversely related to the probability of being stunted (Adewara et al, p.11). Further, improved waste disposal and households' access to flush toilets, appear as significantly and positively associated with children's height-for-age Z-scores. The height Z-score of a child with access to a flush toilet will be about 0.56 higher than a child with no access to a flush toilet. The probability of being stunted is about 0.3 Z-scores lower for children with access to flush toilets than children with no access to flush toilets. This finding strongly supports the argument that safe disposal of human waste is essential for health and adequate growth of children. Households with access to piped or borehole water and flush toilets are all positively related to children's weight-for-age Z-scores. Access to a flush toilet is significant at the 1% level of significance, and access to piped water is positively but weakly associated with child weight Z-score.

(4.2). Women with formal schooling accounted for 18.8% with the highest in Katsina (28.9%) followed by Yobe (13.2%) and Zamfara (6.7%). Of all women with formal schooling, 53% attained primary schooling. The results show that 78.1% of women are unable to read and write in Hausa. Overall, the Hausa people are a majority at 72.6% followed by the Fulani, Kanuri, and 'other' ethnic groups at 16%, 6.2% and 5.2% respectively. With 7.9% of all women owning a mobile phone, state specific differences show that Yobe State had the highest rate of mobile phone ownership (11.0%) compared with Katsina (8.4%) and Zamfara (4.8%). The highest proportion of women living in hard- to-reach areas (i.e., with difficult terrain) was observed in Zamfara at 55.1% followed by Yobe at 49.2% and Katsina at 37.0% ($p < 0.001$) (Doctor et al, 2011).

1.1.16 2.4.4 The effect of women's work on child nutritional status

1.1.17

There is generally a positive relationship between child nutrition and women's empowerment, although the linkages between variable are not straightforward and still open to speculation. In Nigeria, there are three studies (as well as the continued findings of Ajieroh, 2009):

First, in Borno State in the North Eastern region the gender of the household showed a significant positive relationship with the household's food insecurity status. Household headed by males had a higher probability of being food insecure (Amaza, Adejobi, and Fregene 2008). The incidence of female headship is generally low in the North, with less than 7%.

Second, Adekanmbi et al (2011) using DHS 2008 data, consistently found that maternal education levels and maternal health seeking behaviours were positively significant with both stunting and wasting. The findings of this study support those of other similar studies, which indicated that maternal education has positive effect on childhood stunting. Twenty nine percent of children whose mothers had received no schooling were found to be wasted, against 25.4% of those with primary education, 18.6% of those with secondary and 12.9% of those with higher education. Mothers with formal education may be knowledgeable of what to do to prevent childhood stunting from occurring or lessen the degree if it occurs, although this may operate through other pathways such as mothers with more education have higher income, more control over income and more autonomy and decision making power. The maternal health-seeking behavior index in this study was found to have positive effect on childhood stunting, which is consistent with findings of other similar studies that examined the predictors of childhood stunting (Pongou et al. 2006; Uthman 2009). The variable for female head of household shows a lower incidence of stunting to male headed households, 22.3% against 25.9%.

Third, Ukwuani (2003) using NDHS nationwide data of 1990 showed that mother's work and other determinants of child health had different implications for the two health outcomes examined – wasting (current nutritional status) and stunting (long term nutritional status). The results showed that not all types of mother's work have a negative effect on child health during infancy and positive effects on child health during childhood. Mother's work did not have a negative effect on stunting during infancy as expected, and wasting was only higher for children of mothers who did not earn cash from work and never went to work with their children. Their children were about 1.87 times more likely to be wasted than children of non working mothers. Most of the urban women because of their education are now earning income from outside employment in government ministries or the private sector or are self employed in the informal sector. This is not possible in the rural areas as most are not educated and employment opportunities in rural areas are few.

Ajieroh suggests that allowing mothers to work to earn their own income would contribute to the reduction of child malnutrition in the regions and zones that have the highest burden of malnutrition in the country (especially North West and Sudano-Sahelian savannah). The independent effect of women's work to earn income for child nutrition was established with positive and significant effect on child growth in regions with high levels of child malnutrition, especially the North West (where the proportion of women working is lowest at 54%). Therefore allowing women to earn their own income would substantially contribute to the reduction of child malnutrition in areas where it is highest. He presents statistical evidence that these are significant variables in northern Nigeria (see his Tables 16-19) although he does not have measurement of level of women's income.

When women earn income, it increases their status, feeling of self worth and confidence, and affords them some autonomy and recognition in decision-making (Smith et al. 2003; Garrett, Bassett, and Marini 2009). Additionally, income earned by women is, to a much greater extent than men's, ploughed back into family well-being expenditures. Thus, women's modest, yet frequent income, affects income elasticities of demand for family consumables (including basic services) more directly than men's incomes (Schuffan, der Bruegge, and Chirmulay 1998).

1.1.18 2.4.5 Maternal education and maternal and child nutritional status

1.1.19

Education is one of the most important resources that enable women to provide appropriate care for their children, which is an important determinant of children's growth and development (Engle, Menon, and Haddad 1997). There is considerable global evidence that the nutritional status of children varies directly with the level of education of their parents, and in particular, their mothers (Benson 2004). Maternal education, as part of parental education, influences child nutrition outcomes through the effect of higher incomes and better use of available information about child health and nutrition (Garrett and Ruel 1999; Smith, Ruel, and Ndiaye 2004; Chamarwabagwala et al. 2005).

Ajieroh 2009 found that generally in the urban areas, a child of a woman with primary education has a height-for-age of 0.41 Z-score higher than the child of a woman with no education. The increase for a child whose mother has a secondary education is substantially higher than that for primary education at 0.54. Compared to a child whose mothers have no education, a child of a woman with primary education has higher height-for-age Z-score of 1.1 in urban North Central and 1.3 in urban North West. Where the mother has secondary education, the increases in Z-scores are 1.15 in North West. In the rural areas maternal education, including having primary and secondary education did not indicate any significant effects on child nutrition. At the regional level, no significant effect was indicated in the rural areas, and maternal reading literacy also had not significant effect in the rural areas.

By the agro ecological zone, maternal secondary school education was associated with an increase of 0.69 height-for-age Z-scores in rural Guinea Savannah, and in urban Sudano-Sahelian savannah a strong and positive effect is indicated. Being literate is associated with improved maternal nutrition in rural areas generally, and specifically in rural NW and NE. Other studies did show a significance of education to intermediary variables- antenatal usage etc which is then significantly associated to child nutritional status (see Doctor et al 2011, who worked with a different data set to Ajieroh). Being literate is associated with improved maternal nutrition in rural areas generally, and specifically in rural NW and NE.

Ajieroh's study does not indicate any significant effect of female headship on maternal and child nutrition: in all likelihood their resources may be less. However, the mother deciding alone had a positive and significant effect on child growth in the rural Sudano Sahelian zone. Ajieroh concludes that empowering mothers to earn income and take decisions, complemented with nutritional and public health services, is more likely to improve both child and maternal nutrition in the rural areas than in urban. There is clearly a difference between nutrition and its causes in rural versus urban areas, a number of studies (Ajieroh 2009; Agee 2010; Olalekan 2009; Oninla 2007; Vanderjagt 2009) finding the nutrition situation much worse in the rural settings.

1.1.20 2.4.6 Interactions between multiple variables²²

Adekanmbi et al (2011) analyzed the 2008 NDHS data set at national level, and included 28, 647 children, and applied an analysis that separated individual from community level indicators. At

²² It is common for many small surveys of child nutritional status to also collect some socio-economic data to build up associated factors for the observed status. (Agee 2010; Uthman 2009; Oninla 2007; Vanderjagt 2009, Ojiako, Ifeanyi et al, 2009). Some of these studies have been reported here because they have more intensively analysed inter-related variables.

individual level, the factors that increased the odds of childhood stunting were male gender, age 11-23 months, multiple birth, low birth weight, low maternal education and BMI, poor maternal health seeking behaviour, poor household wealth and short birth interval (being born within 24 months of the previous child). The odds of being stunted also increased with the duration of breastfeeding beyond six months of age, suggesting that the complementary foods are poor; there was no association between being stunted with sanitation or access to safe water (only weak associations were found in earlier analyses). Community level factors having significant association with child hood stunting were' child residing in community with high illiteracy rate and residence in the NW and NE regions.

Omilola (2010) also used 2003 data to assess patterns of child and maternal nutrition inequalities, and confirms some findings from other data: that this data set showed that child stunting is a NW States, rural, mother with no or little education, male child, fewer health centre visits and child aged 18-26 months and public well drinking characterized phenomenon. Maternal malnutrition is of a rural, NW states, low years of education, and (not given in other data sets) age 15-19 years character. It is logical to propose at least that child stunting is therefore strongly linked to intergenerational factors. There are considerable inequalities between levels of child nutrition: rural inequality in child nutrition is greater than urban inequality; the NW (and NE) has the highest level of inequalities.

Ojiako et al conducted a study in five villages in Kaduna and Kano states collecting household data and anthropometric measurements. There was random sampling of 511 preschool children age 0-59 months, and to determine and quantify the relationship between nutritional status of children and the explanatory variables, a two-limit tobit regression analysis was applied. The prevalence of moderate or severe nutritional problems were 61% using height for age, 40% using weight for age and 17% using weight for height z scores. In terms of determinants of nutritional status, seven of 47% of the included variables were significant in explaining children's nutritional status. Those with the expected positive signs and significance at the 1% level were soybean consumption, mother's educational level and child's height. However, the child's mother's age and child's own age were both significant at the 1% level but with a negative sign, as was mother's potion among women married to the male household head, but at the 5% level of significance. Dependency ratio showed the expected negative sign and significant at the 5% level.

Another study (Owalabi, 1996) compared nutritional status and soy bean consumption in three communities in Northern Nigeria, this time collecting data in 240 children between the ages of 2 and 15. In the village where soya beans were produced, there was a significantly higher percentage of nutritionally normal and a lower percentage of severely malnourished children than the other two villages. But the results are only indicative that cultivation of soybeans per se will reduce child malnutrition, possibly by consumption of the legumes, or their sale as cash crop and buy back of cheaper calories, or the simple fact that soybean farmers are richer than non cultivators.

Summing up the literature on determinants of nutritional status

The large data sets (especially NDHS) show the importance of maternal education and wealth as important factors associated with nutrition status, and that rural stunting is worse than in urban areas. The analysis of determinants through regression analysis has attempted to unpack some of this a bit further. Agee's analysis emphasizes access to health care services and the mother's health seeking behavior. This is important in areas where women have semi-secluded status. Ajieroh has looked more closely at household economic status with a strong line of reasoning that its improvement, especially for the areas where women work will have a positive impact on child nutritional status. Involvement in agriculture appears to be negative for its effect on nutritional status, so better understanding the household economy for rural women and men may be an important area to strengthen understanding. Adekanmbi et al's analysis points (among other things)

to the close links between maternal malnutrition and child under nutrition, that is the intergenerational effects. Household economic status, maternal education and women's empowerment are important predictors of maternal and child malnutrition in Northern Nigeria.

Final word: For the analysis generally the available research allows some preliminary conclusions about the context of the NW and NE states in terms of how the pathways that cause such a high level of childhood stunting. The areas are subject to marked seasonality in agricultural production but the location is semi arid and often badly affected by poor rainfall that reduces otherwise reasonable production of millet, sorghum and cowpeas. But mothers have poor formal education and the health care system is sparse. Women are often secluded, so limiting their mobility and opportunities to attend school and access health services. Breast feeding practices do not allow for exclusive breastfeeding. Therefore in terms of the three pillars of food, health and care, there are clear vulnerabilities that point to a better rural health care system, enhanced rural household incomes, strengthened food production systems and better support to women in child care, including education.

2.5 Basic Determinants

Those causes at below underlying causes are called basic causes. Basic causes in Figure 7 are identified as: institutions (formal and informal), political (structure, function and policies of the state) and ideological (religion, culture, tradition and beliefs) framework, economic structure and resources, environment, technology and people. Because these causes are so wide ranging and context specific, it is difficult to make any predictive statements with the strength that could be made about the immediate causes. Figure 7 proposes some of the major interventions that could have an impact on the basic causes. The basic causes of under nutrition in society also relate to both the historical background of the society and factors external to the society. The pathways between basic causes and child under nutrition are however long and difficult to detect. Yet they are very important. Section 4 describes indirect nutrition interventions and discusses where evidence is available as to the strength and nature of basic causes.

3. Direct nutrition interventions (Global and Nigerian) Introduction

A direct nutrition intervention is defined as one that has malnutrition prevention or reduction as at least one of its primary objectives. Such interventions are usually intended to impact on the main immediate and some of the underlying causes of malnutrition, such as inadequate dietary intake and disease (immediate) and care for children and women (underlying).

Studies conducted on the feasibility and cost effectiveness of direct nutritional interventions have led to the identification of a package of highly cost effective interventions, mainly concentrating on the window of opportunity for children (aged from conception to the age of 2), and for maternal under nutrition (Black et al (2008) and World Bank (2009)). These high-return interventions would improve family nutrition practices and supplement foods and micronutrients provided by families, whether through market purchases or through home production, and include:

- Promotion of good nutrition and hygiene practices, such as breastfeeding, complementary feeding for infants beyond six months of age, improved hygiene practices including hand washing, and deworming programmes;
- Micronutrient supplementation for young children and their mothers (e.g. periodic Vitamin A supplements and therapeutic zinc supplements for diarrhea management);
- Provision of micronutrients through food fortification for all (e.g. salt iodization; iron fortification), and
- Therapeutic feeding for malnourished children with special foods, including the prevention or treatment for moderate under nutrition and the treatment of severe under nutrition (or severe acute malnutrition) with ready- to-use therapeutic foods (RUTF)

This paper follows the focus of the WINNN programme, providing evidence (as far as it is available) to analyse the successes and failures of these interventions on global and Nigerian levels.

3.1 Community Management of Acute Malnutrition (CMAM)

Until recently treatment of severe acute malnutrition (SAM) has been restricted to facility-based approaches, greatly limiting its coverage and impact. Recent evidence (Emergency Nutrition Network, 2011) suggests that large numbers of children with SAM can be treated in their communities without being admitted to a health facility or a therapeutic feeding centre.

CMAM involves timely detection of SAM in the community and provision of treatment for those without medical complications with RUTF or other nutrient-dense foods at home. If properly combined with a facility-based approach for those malnourished children with medical complications and implemented on a large scale, CMAM for SAM could prevent many deaths of children.

1.1.22 3.1.1 Global Evidence

The efficacy of CMAM is “assumed to reduce deaths due to SAM by 55% compared with facility-based management of malnutrition” as reviewed by the Lancet (Bhutta et al, 2008). Of the 21 studies which had appropriate experimental designs and outcomes reviewed by the Lancet on the management of SAM, a summary risk ratio of 0.45 (95% CI 0.32–0.62; random effects) was determined when compared with the conventional treatment (Collins 2006; Nu Shwe T 2003). There are currently no randomized trials in the literature that had investigated the effect of RUTF on mortality. However, observational data from field programmes suggest that CMAM with pre-prepared balanced food can achieve high coverage and low case fatality (Bhutta et al 2008).

Among 23,511 unselected severely malnourished children treated in 21 programmes of community-based therapeutic care in Malawi, Ethiopia, and Sudan, between 2001 and 2005, the overall case-fatality rate was 4.1%, with a recovery rate of 79.4% and default of 11.0% (Ashworth, 2006; Ciliberto, 2005). This compares favourably with case-fatality rates that are typically achieved with facility-based management. However, this comparison must be interpreted cautiously since the severity of cases in the facility-based trials and the community-based observational studies might differ. In view of the association of SAM with HIV infection, infected children must also be given antiretroviral therapy. These preventive strategies for SAM ought to be formally assessed in representative groups. Observational studies show that use of pre-prepared balanced foods such as spreads and ready-to-use supplementary foods is feasible in community settings.

1.1.23 3.1.2 Nigerian Experiences²³

Nigeria has the third highest number of children suffering from SAM and stunting in the world, about 800,000 as estimated by UNICEF. To address this, UNICEF with support from Valid International, piloted CMAM in 2009. Results from the pilot demonstrated that CMAM was an appropriate approach in Nigeria and recommended expansion into other areas within the country. In response, SCF (UK) and ACF International launched pilot programmes in Katsina and Yobe states to identify how CMAM could be integrated most effectively and sustainably into health systems and communities. They implemented programmes independently but under a common, collaborative framework. Over 44,000 children were treated for SAM in these states in 2010.

Initial results in Yobe were encouraging with cure rates of around 70% and defaulter rates of 30%.

²³ This section is largely based on some unpublished reports from the agencies concerned.

The main problem areas were as service disruptions (mainly due to elections) and overcrowding in some sites where extremely high admissions led to long waiting time and poor services. Overcrowding was reduced in one site with the opening of outpatient treatment programme (OTP) sites in Potiskum LGA close by. There is also a need to strengthen the system for tracing absentees and defaulters as the approach is around sustainability. Increasing coverage by adding more OTP sites should improve the treatment of children with SAM by addressing overcrowding and this should substantially reduce defaulters and absenteeism.

Although some health staff at the two hospitals were trained on the inpatient management of SAM, Stabilization Centre (SC) services have really not been established due to lack of buy-in from the staff in the paediatric wards and from dieticians at the specialist hospital. From ACF's perspective there has been little focus on supporting this component of the programme, with all the focus on the OTP services. One reason for the relative neglect of the SC services may be that no one was claiming ownership over SC services; in the past it was the MSF who supported SC nutrition activities in these hospitals and gave incentives.

ACF International have been implementing rapid assessments in Yobe State (ACF International 2011a, 2011b), collecting information about communities covered by the CMAM programme for the development of a comprehensive community mobilisation strategy. The assessments identify main stakeholders, community organizations, health-seeking behaviours and identify contextual barriers to access, develop a mobilisation strategy and address possible solutions. Communities in the NW states will be receptive to CMAM in one major respect: there is a strong system based on village and ward heads who will encourage families to ensure children are taken to clinics. Women are allowed to leave compounds during the daytime for this purpose.

Summing up on CMAM in Nigeria

Generally (as will be seen for many other interventions) there are not as yet widespread CMAM interventions in Nigeria, although UNICEF, SCF and ACF International are in the process of implementing such approaches. The section above describes the efforts to assess and implement the effectiveness of CMAM interventions in the North; there have not yet been any evaluations of effectiveness. Distance to community centre can still be important for many rural households. But rural communities in the NW states have a strong social cohesion and willingness to ensure that malnourished children receive care.

3.2 Infant and Young Child Feeding Practices (IYCF)

1.1.24 3.2.1 Global Evidence

In terms of breast feeding, WHO recommends early (i.e. within one hour of giving birth) initiation of breastfeeding. A recent trial has shown that early initiation of breastfeeding could reduce neonatal mortality by 22% (Edmond et al, 2006). Black et al, 2008, assessed the effect of promotion strategies on exclusive breastfeeding rates for infants younger than 6 months and on continued breastfeeding up to 12 months of age. A Cochrane review (Britton et al, 2007) that analyzed 34 trials (with 29,385 mother–infant pairs from 14 countries) showed that all forms of extra support increased the duration of “any breastfeeding” (including partial and exclusive breastfeeding); the

relative risk (RR) for stopping any breastfeeding before 6 months was 0.91 (95% CI 0.86–0.96)²⁴.

In terms of complementary feeding, the global evidence on appropriate Infant and Young Child Feeding (IYCF) practices include timely initiation of feeding solid/semi-solid foods from age 6 months, feeding small amounts and increasing the amount of foods and the frequency of feeding as the child gets older, while maintaining breastfeeding²⁵. A review of complementary-feeding strategies concluded that appropriately designed interventions can have a positive effect on feeding practices (Caulfield et al, 1999). Bhutta et al 2008, reviewed the effect of complementary-feeding strategies on growth and micronutrient status and did additional meta-analyses on linear growth at various ages. With ten studies that had measured similar outcomes, data were pooled according to whether or not the target population had an average income of more than US\$1 per day per person (as a measure of food security)²⁶. The studies showed that education strategies were of most benefit in populations that had sufficient means to procure appropriate food (Gulden et al, 2000; Penny et al, 2005; Santos et al, 2001).

In populations without this security, educational interventions were of benefit when combined with food supplements (Bhutta, 2008). In food-secure populations, the strongest evidence of effect was seen from the interventions in China (Gulden et al, 2000) and Peru (Penny et al, 2005). The benefits on growth from food supplementation in food-insecure populations were consistent with those seen with large-scale conditional cash transfer (CCTs) programmes in similar populations in Mexico (Behrman et al, 2001) and Nicaragua (Maluccio et al, 2005). These programmes combined cash transfers and nutritional education, and one also included a supplementary food fortified with multiple micronutrients (Behrman et al, 2001). The effect of complementary feeding strategies was therefore estimated in various contexts and age-groups by combining the information from the pooled analysis of experimental studies and the assessment of the Progreso programme in Mexico (Behrman et al, 2001).

1.1.25 3.2.2. Nigeria Experience

In Nigeria, only 30 % of youngest children ages 6-23 months living with their mother are fed in accordance with IYCF practices. The results indicate that male and female children and children in urban and rural areas are equally likely to be fed according to IYCF practices. Among the zones,

²⁴ All forms of extra support together affected the duration of exclusive breastfeeding more strongly than the likelihood of any breastfeeding (RR 0.81, 0.74–0.89). Lay and professional support together extended the duration of any breastfeeding (RR before 4–6 weeks 0.65, 0.51–0.82; RR before 2 months 0.74, 0.66–0.83).

Specific breastfeeding promotion studies show that with individual counselling, the odds of exclusive breastfeeding were substantially increased in the neonatal period (15 studies; odds ratio [OR] 3.45, 95% CI 2.20–5.42, $p < 0.0001$; random effects) and at 6 months of age (nine studies; 1.93, 1.18–3.15, $p < 0.0001$) (Lancet, 2008, pp.35-55). Group counselling increased the odds of exclusive breastfeeding in the neonatal period, (six studies; 3.88, 2.09–7.22, $p < 0.0001$; random effects) and at 6 months of age (five studies; 5.19, 1.90–14.15, $p < 0.00001$; random effects) (Lancet, 2008, pp. 55-63) An assessment of a national mass-media campaign in Honduras reported that it increased exclusive breastfeeding from 48% to 70% at 1 month, from 24% to 31% at 4 months, and from 7% to 12% at 6 months of age (Hernandez et al, 1995)

²⁵ For the average, healthy breastfed child, solid/semi-solid foods should be provided 2-3 times per day at age 6- 8 months and 3-4 times per day from age 9 to 23 months, with an additional snack being offered 1-2 times per day, as desired. The minimum feeding frequencies are based upon the energy needs from complementary foods according to age-specific total daily energy requirements plus 2 SD (to meet the needs of almost all children), minus the average energy intake from breast milk for children in developing countries. Infants with low breast milk intake would need to be fed more frequently. However, feeding frequencies greater than necessary may lead to the displacement of breast milk (PAHO/WHO, 2003).

²⁶ In three studies, nutritional education in food-secure populations was analyzed (Gulden et al, 2000; Penny et al, 2005; Santos et al, 2001) and produced an increase in height-for-age Z score of 0.25 (95% CI 0.01–0.49), compared with the control group. Pooled analysis of seven studies in food-insecure populations showed that height-for-age Z score increased by a weighted mean difference of 0.41 (0.05–0.76) in the group given food supplements (with or without education) compared with controls (Lancet, 2008, pp.74–80). However, concerns about the overall effect size and very high energy intake in one supplementation trial have been raised (Obatolu, 2003).

the percentage of children fed according to IYCF practices ranges from 26 % in NW to 37 % in South.²⁷

There is some dated information on the 'baby friendly' initiative in Nigeria, there being 1,147 such designated hospitals in Nigeria in 2002 (Ogunlesi et al, 2005), which were limited to tertiary health facilities to which most women lack access. However, contact with a baby friendly hospital did confer an advantage in terms of appropriate breast feeding practices, being commencement of breast feeding within one hour of birth, lower rate of prelacteal feeding and higher rate of exclusive breast feeding for the first six months of life. From the literature reviewed, there have been some pilot projects in the area of IYCF. There was the pilot USAID IYCF project since 2009 for orphans and vulnerable children and HIV/AIDS; the BASICSD ii ENA CAPA project: the Baby Friendly Hospital Initiative mentioned above: and the safe motherhood projects.

Summing up on IYCF in Nigeria

The global IYCF information shows the need for a well integrated infrastructure that supports women to adopt the care procedures that can maximise the health of their children. In areas of food insecurity and low levels of maternal education and difficulties of access to health care facilities, then the fundamentals for improved IYCF are weak. Women are semi secluded which restricts their autonomy, and making receptivity to educational message more difficult. In Nigeria to date there have been some small scale, hospital and clinic based attempts to encourage IYCF, but the review has not uncovered any national or regional programmes and therefore no reviews or evaluations.

3.3 Micronutrient Supplementation

Many people suffer from 'hidden hunger' or micronutrient malnutrition, which also affects health and productivity. Micronutrient malnutrition can lower IQ, cause stunting and blindness in children, lower resistance to disease in both children and adults, and increase risks for both mothers and infants during childbirth.

1.1.26 3.3.1 Global Evidence

A systematic review of 55 studies on the effect of iron supplementation on haemoglobin concentration in children showed that iron supplementation resulted in a haemoglobin concentration that was 7.4 g/L higher than in children who had no supplementation (weighted mean difference 7.4 g/L, 95% CI 6.1–8.7; random effects) (Gera et al, 2007). Reductions in the occurrence of anaemia with iron supplementation alone ranged from 38% to 62% in non-malarial regions and 6% to 32% in malarial hyper endemic areas. The incidence of diarrhoea was increased in the iron-supplemented group (incidence rate ratio 1.11, 95% CI 1.01–1.23; random effects), and overall there was noted no benefit of iron supplementation on growth. Some studies have recommended that untargeted iron supplementation should not be given to children in malaria-endemic areas as iron supplementation can have adverse effects with regard to infectious diseases (Black et al, 2006).

²⁷ Charles-Davies, M., G. Arinola, R. Sanusi, B. Osotimehin. 2006. Immunoglobulin classes and nutritional factors in plasma and breast milk of lactating mothers in Nigeria. *Iranian Journal of Immunology*. 3 (4)]

A pooled analysis of data from eight studies of iron-folate supplementation during pregnancy suggested an increase of 12 g/L (95% CI 2.93–21.07, random effects) in hemoglobin at term and a 73% reduction in the risk of anaemia at term (relative risk 0.27, 95% CI 0.12–0.56) (Pena-Rosas JP, 2006).

Micro-nutrient supplementation via home fortification (sachets that contain iron and other micronutrients in microencapsulated form, which can be added to prepared food). has also been shown to be effective. An analysis of studies of these dispersible micronutrient preparations (Zlotkin et al, 2006; Hirve et al, 2007; Christofides et al, 2006; Menon et al, 2007; Giovannini et al, 2006; Shariieff et al, 2006) showed that, in children younger than 2 years, hemoglobin concentrations increased by 5.68 (95% CI 1.78–9.57) g/L and iron-deficiency anemia was reduced compared with controls (relative risk 0.54, 95% CI 0.42–0.70).

In a global review, Vitamin A supplementation was seen to reduce childhood mortality in children aged 6–59 months. These were testing trials from Indonesia, Ghana, India, Nepal and Sudan (Beaton et al, 1993; Grotto et al 2003). A pooled estimate showed a 24% reduction in the risk of all-cause mortality (relative risk 0.76, 95% CI 0.69–0.84). Vitamin A supplementation did not affect morbidity from infectious diseases (Barreto et al, 1997; Sempertegui et al, 1999; Villamor et al, 1992) or anthropometric measures. Also identified were three reported trials of vitamin A supplementation in the neonatal period in low-income countries, showing a 20% reduction in mortality in babies younger than 6 months (relative risk 0.80, 95% CI 0.66–0.96). (Humphrey et al, 1996; Rahmathullah et al, 2003). However, much of the evidence regarding neonatal Vitamin A supplementation comes from Asia.

1.1.27 3.3.2 Nigeria Experiences

The NDHS (2008) collected information on vitamin A supplementation. One in three urban children, compared with one in five rural children had received vitamin A supplements in six months preceding the survey. The intake of supplements was positively related to mother's education level and household wealth. Regarding the Zones, the NW and NE, represented the lowest percentages of children who had taken Vitamin A supplements in the last 6 months at 13.9% and 18.6% respectively.

The five programme states Smart Surveys found that in the four time periods of the surveys, the highest coverage of vitamin A supplementation was in Katsina state on three occasions and the lowest in Yobe on two occasions. The variations were: between 93% in Katsina and 52% in Yobe in July 2010, between 97.3% in Kebbi and 13.7% in Yobe in December 2010, between 62% in Katsina and 38% in Jigawa in July/August 2011, and between 80% in Katsina and 26% in Kebbi in February 2012.

Many HIV and AIDS-related programmes included nutritional supplements in their programming. In Benue, where HIV prevalence is very high, there are a number of programmes providing RUTF; the Ministry of Health facilitated its distribution to moderately/severely malnourished under-five children and lactating mothers, and vitamin A supplements are given to children 6-59 months every six months. Iron folate for pregnant women and de-worming of children 12-59 months are also available in the state (Holmes, 2011). In Edo, the Girls' Power Initiative offers nutritional services to infants as well as carrying out de-worming exercises every three months. Community volunteers are trained to help mobilize participants to access these services. Similarly, WEO provides nutritional support to vulnerable households, distributing food items such as rice, groundnut oil and beans (Holmes 2011).

The only supplementation programme uncovered by the literature review in Nigeria was for vitamin A supplementation. Efforts to control vitamin A deficiency started in 1996 in response to high infant and under-five mortality rates. The Nutrition Division of the Federal Ministry of Health

(FMOH), the National Primary Health Care Development Agency (NPHCDA), and UNICEF jointly developed a work plan in 1996 to eliminate vitamin A deficiency. In 1999, UNICEF, WHO, DFID, USAID, the National Programme on Immunization and the FMOH developed a broader framework to link vitamin A distribution to polio eradication. The National Program on Immunization, created by the federal government in July 1996, is responsible for formulating policy and coordinating all immunization activities in the country. Hence it was easy to integrate vitamin A supplementation into immunization activities despite the fact that such integration was not part of the National Programme on Immunization's mandate.

The National Planning Commission through the National Committee on Food and Nutrition (NCFN) coordinates all nutrition activities in the country. The NCFN addresses micronutrient deficiency through the multi-stakeholder MNDC subcommittee, which was set up by NCFN in the Nutrition Division of the FMOH. At inception, the NPHCDA was the government agency designated to coordinate and implement vitamin A and mineral supplementation in the country.

The National Immunization Days (NIDs) and its state variants, Subnational Immunization Days (SNIDs), used to eradicate polio, have been major vehicles for the distribution of vitamin A capsules to eligible children. The country first integrated large-scale vitamin A supplementation into NIDs in 2000. This integration has since been elevated to two rounds a year because it is seen as the best way to provide vitamin A to the target groups in Nigeria. UNICEF delivers the vitamin A supplements to the National Programme on Immunization for distribution during NIDs/SNIDs. These supplements come to the states along with vaccines and other supplies. The local governments then collect their supplies from the state NPI stores. The local governments bring the vitamin A capsules, which are intended for distribution through the health facilities in the UNICEF/NPHCDA-supported areas, to the Zonal NPHCDA stores²⁸.

The capsules are then delivered to the target local government areas and facilities. HKI collects vitamin A stocks from the UNICEF national stores and distributes them to all the CDTI partners in vitamin A supplementation who in turn deliver them to their states of operation, local government areas, and community health workers. The Canadian International Development Agency (CIDA)/Micronutrient Initiative (MI) programme donates the supplements through UNICEF. Government and other international agencies are only involved in the distribution/delivery of the supplements through various mechanisms.

Other agencies also assist the government in the distribution of vitamin A through Child Health Weeks in some states. Vitamin A supplementation is usually given twice a year in this way. During Child Health Week, mothers are reminded and encouraged prior to a scheduled distribution to take their children to designated centres or outreach posts to receive the supplements. Health workers routinely manage this distribution, frequently with the support of officials from other sectors, and sometimes with volunteers. The Child Health Weeks are often integrated with other interventions, such as growth promotion, deworming, ITNs, immunizations, and other micronutrient programs. This mechanism is currently in use by the Food Basket Foundation International and UNICEF with support from MI (based on information on the HKI study on Vitamin A coverage which included the Northern States).

The following strengths of vitamin A supplementation have been noted (Akinyele, 2009):

- The National Food and Nutrition Policy is in place and provides a reference point for vitamin A supplementation.
- NIDs are a low cost means of delivering vitamin A supplements at least once a year and are implemented in all 774 LGAs areas of the country through home delivery.

²⁸ This section is largely drawn from: Akinyele, I O, Ensuring Food and Nutrition Security in Rural Nigeria: An assessment of the Challenges, Information Needs and Analytical Capacity, IFPRI-Abuja, Nigeria Strategy Support Programme, Background Paper no NSSP 007, November 2009

- Trained vaccinators also visit the markets, places of worship, and day care centres for young children and each round lasts from 3-7 days.
- The health system is decentralized along the three tiers of government. Policymakers have developed an intermediate PHC structure at the ward level to serve as a bridge between the LGA and village levels. This intermediate structure replaces the district level in 200 out of the 774 LGAs nationwide.
- Human resources for vitamin A supplementation are available at all levels: (i) NPHCDA at the national level and six zonal offices; (ii) the state directorate of Primary Health Centre (PHC) at the state level; (iii) the PHC department at the LGA level; and (iv) health workers in the health facilities at the ward and community levels.
- The private sector (both profit and nonprofit) has been an important delivery channel.
- The main vitamin A supplementation partners provide a local model of partnership for improved coverage and impact.
- Frequent meetings of the nutrition partners have been beneficial.
- The use of other vehicles and avenues such as CDTI and Child Health Weeks has increased coverage.
- Guidelines are important to implementation. These include guidelines on training in vitamin A supplementation in PHC facilities (NPHCDA), training during National Immunization Days (BASICS II), and management of diseases (CDTI) (NPHCDA 2010)

Weaknesses of the vitamin A supplementation program are (Akinyele, 2009):

- The National Food and Nutrition policy proposes MNDC emphasizing food fortification and dietary diversification but makes no mention of the role of vitamin A supplementation to address vitamin A deficiency and improve child survival.
- Vitamin A supplementation has no permanent home nor effective coordination and implementing mechanisms
- There is inconsistency in the denominator population used in the estimation of vitamin A supplementation coverage.
- There is no provision for vitamin A supplementation in emergency situations.
- There is a lack of consensus in Nigeria on the best strategies for sustaining vitamin A supplementation.
- The policy leadership for vitamin A supplementation needs to be strengthened.
- There are no clear roles and accountabilities among governmental partners.
- The private sector (profit/ nonprofit), though recognized as an important delivery channel, has not being integrated into the vitamin A supplementation system.
- The system's capacity to deliver is low because financial resources (including salaries) do not reach the local levels.
- There has been inadequate attention paid to pre-service training on micronutrient deficiency control in general and vitamin A deficiency control in particular.

- There is no clear understanding of the roles and accountabilities of stakeholders, especially at the national level among NCFN, the Nutrition Division of FMOH and the NPHCDA. Hence the government provides poor technical coordination of the program.
- Poor logistics and weak supervision due to insufficient resources have led to delays in distributing capsules.
- There has been inadequate monitoring, supervision, and coordination of activities to ensure that nationally, vitamin A supplementation is administered uniformly at the same time to the target population.

Summing up on Micronutrient Supplementation in Nigeria

Vitamin A capsule supplementation appears to be the only nationwide programme in this area. It is integrated with immunisation drives and child health weeks. There are two rounds a year, and this explains why (although with some variations) the NDHS surveys show that as about one third in urban areas and one fifth in rural areas of the population of children have received vitamin A supplementation in the recent past. However the assessment provided shows that the structure's logistics need to be tightened up and that the programme could do with a thorough restructuring. Weaknesses of the system reflect weaknesses in the overall health system to reach out to rural communities in the north.

3.4 Deworming

1.1.28 3.4.1 Global Evidence

In a systematic review of 25 studies that assessed the nutritional effect of deworming in children (Dickson et al, 2000), analysis of growth outcomes in children aged 1–16 years suggested that one dose was associated with an average 0.24 (95% CI 0.15–0.32) kg increase in weight²⁹. Another systematic review of deworming assessed the effect on hemoglobin and anaemia rates (Gulani et al, 2007)³⁰. The positive effects, although small, could translate into a 5–10% reduction in rates of anaemia in populations with high rates of intestinal helminthiasis. Two studies assessed the effect of deworming interventions during pregnancy (Torlesse et al 2001; Larocque et al 2006). There was a mean fall in hemoglobin concentration between first and third trimester in women who received albendazole of 6.6 g/L less than in women who received placebo (p=0.003).

²⁹ For several doses, the increase was 0.10 (0.04–0.17) kg for up to 1 year of follow-up. The pooled estimate for increase in height was 0.14 (0.04–0.23) cm for one dose and 0.07 (0.01–0.15) cm for multiple doses up to 1 year of follow-up. Because these effects on linear growth are very small, there was no attempt to model the effects of this intervention.

³⁰ The pooled weighted mean difference (random effects model) of the change in haemoglobin was 1.71 (0.70–2.73) g/L (p<0.001) and the average estimated reduction in frequency of anaemia ranged from 1.1% to 12.4% in adults and from 4.4% to 21.0% in children.

1.1.29 3.4.2 Nigeria Experiences

1.1.30

The proportion of children given deworming tablets in the six months previous to the NDHS 2008 survey was 21%, with the NW and NE regions representing the lowest coverage of deworming at 4.0% and 5.7% respectively. This is a marked contrast between the North and South of Nigeria regarding deworming, with the mean percentage of children dewormed in the Southern states, all in excess of 42%. There is national information on deworming in most states carrying out vitamin A supplementation through child health weeks including the north as well as what obtains in schools.

Odu et al (2011) carried out three mass deworming exercises at 6-monthly intervals in Ekpeye and Ogba Kingdoms for children in public and private schools in 2007 and 2008. Over 24,000 pupils aged 2 to 12 years received oral pyrantel palmoate in three consecutive phases under the supervision of trained field staff. Pre- and post-deworming surveys were conducted to determine the effect on the prevalence of helminthiasis. This study showed that school age children (5 to 12 years) were likely to have the highest worm load and there was a significant reduction in worm infestation and worm load after the exercises.

The researchers reported that deworming of school children provided an easy and sustainable access to the high risk group for helminthic infection and the integration of deworming into the routine activities of teachers and health workers, so ensuring programme sustainability. However, it was suggested that concurrent implementation of the holistic helminthic control package is essential to achieve an overall reduction in the disease burden, as the initial control strategy of reducing the number of people infected, was found to be ineffective because of the high rates of re-infection in the presence of dismal sanitation.

Summing up on Deworming in Nigeria

The review shows that there are deworming exercises, although they appear to have little impact in the north. This also is a function of the poor health outreach infrastructure. The research that has been done shows that it is effective.

4. Indirect nutrition interventions (Global and Nigerian)

Introduction

An indirect nutrition intervention is an intervention which seeks to have an effect on the underlying cause of child under nutrition depicted on the UNICEF conceptual framework. They include the kinds of interventions listed in the middle box of the framework: interventions to improve agriculture and food production, household income and food security, social protection, gender roles and relations, health services, and access to improved water and sanitation. This section reviews the global evidence on the effectiveness of such interventions in reducing child under nutrition, and then reviews Nigeria approaches with these interventions, particularly in the North. Some of these approaches are already incorporated into other DFID-funded programmes in Nigeria, and some could be embedded into the WUINNN or other DFID programmes.

4.1 Health Services

1.1.31 4.1.1 Global experiences

1.1.32

A substantial global review has concluded that the community based primary health care can improve the nutrition status of children, and by improving the health status that interacts with nutritional status (Task Force of the Effectiveness of Community-based Primary Health Care of the International Health Section of the American Public Health Association, 2009) . It can help prevent many child illnesses, expand coverage of immunisations, promote hand washing and family planning, prevent mother-to-child transmission of HIV infections, and improve child health through non-health interventions.

1.1.33

1.1.34 4.1.2 Nigeria experiences

Primary Health Care Approach (PHC)

The PHC approach ³¹ is promoted and supported by the Federal and State Ministries of Health and implemented by the local government area: Nigeria was among 134 countries which endorsed the concept of PHC in 1978 as a tool to achieving health care for all by the year 2000 (WHO 1978). It offers the basis for successful integration of nutrition activities into the health care system. PHC was considered a vehicle for effective implementation of the health sector's nutrition policy, which fed into the development of the National Food and Nutrition Policy. This had a number of objectives related to improving nutritional status in a number of areas, objectives which have been modified and are given in Section 5 of this report.

But health care in Nigeria has been judged to be in a poor state (Akinyele 2009), especially in rural areas. Although the number of primary health centers across the country suggests reasonable

³¹ The PHC approach has been defined as essential health care based on practical scientifically sound and socially acceptable methods and technology made universally acceptable to individuals and families through their full participation and at a cost that community and country can afford at every stage of their development. It is an approach to health beyond traditional health care focusing on good health, equity and social policy.

availability, higher level primary health centers (PHC) are concentrated in the South while the North experiences lower level services. In 2005, 80% of households in urban areas were within 5 kilometers of a PHC, compared to 66% in rural areas (World Bank /FMOH 2005). The challenges of inadequate staffing and low capacity, equipment, and essential drugs, were consistent among the PHCs. In a study to determine how well six essential nutrition actions were being implemented in the PHCs, it was found that these services were haphazardly implemented and the challenges inherent in the PHC system made it impossible for these services to have any impact on nutrition (Akinyele 2009).

PHC covered less than 20% of the potential patients (Gupta et al., 2004) about ten years ago and it is unlikely that this spread has improved. Capacity building and empowerment of communities is called for through orientation, mobilization and community organization in the form of training, information sharing and continuous dialogue. Having identified the many problems against effective and efficient implementation and achievement of the objectives of primary health care services delivery at the local government, Abdulraheem et al (2011) make the following suggested recommendations as a way forward:

- Local government and other tiers of government need to increase allocations to the health sector; local governments should generate more revenue to reduce the dependence on the federal funds;
- Priority should be given to effective health education to help eliminate such diseases as malaria, typhoid and other infectious diseases;
- Poor leadership and political instability have been the basis for unsuccessful implementation of most government policies and programmes on health care delivery.
- LGAs are given unnecessary responsibilities by the state governments e.g. purchase of nonfunctioning generators and fridges and imposition of sponsored programmes;
- Priority should be given to the training of more rural health workers, to prevent the drift of health workers from rural communities to urban centres.
- Financial and other incentives should be provided to prevent the high staff turn-over of health workers.

The PHC system has been recently upgraded by the MCH Programme (MCH) which is part of the National Health Insurance Scheme (NHIS) and started in 2008 to accelerate achievement of MDGs 4 and 5. It provides free PHC for children under five and primary and secondary care (including for birth complications and caesarean sections) for pregnant women up to six weeks after childbirth.

The programme is being implemented in the country in phases. In 2006, one state from each zone and six LGAs in each of these states were chosen for Phase 1. Phase 1 started in September 2008 and included Bayelsa, Gombe, Niger, Imo, Oyo and Sokoto states. In 2008, national health data were published, disaggregated by state. Phase 2, which started in September 2009, added six states, this time on the basis of need: Bauchi, Cross River, Jigawa, Katsina, Ondo and Yobe.

Reports from the NHIS (2010) show that Phase 1 was to cover 621,400 people (100,000 enrollees per state). By December 2009, only a total of 69,000 pregnant women and 175,000 children had been provided with services – well below the targeted enrolment rate (Gavrilovic et al., 2011), but by June 2010 a total of 615,100 (98.9%) had reportedly been covered (NHIS, 2010). For Phase 2, out of 452,300 people targeted, a total of 236,100 (52%) had been covered as of June 2010. There are plans to scale the programme up to cover additional states and LGAs, and funding has been secured to cover an additional 12 states.

Only public health facilities can be accredited for the scheme (except in Oyo state, where private facilities may also be accredited but had not been by January 2010). Health management organizations enroll participants and receive fixed capitation payments of N622 per enrollee per month, of which N36 is retained as an administration fee, and a further N36 retained as a capitation payment for secondary care (whether it is a child or pregnant woman). N550 is passed on to the health provider (Gavrilovic et al., 2011). The budget for Phase 1 was N5.0 billion (as a

grant) and for Phase 2 it was N4.25 billion (NHIS, 2010). By the end of 2009, it was estimated that around N2 billion of Phase 1 funding had been disbursed (Gavrilovic et al., 2011). Each state must now provide matching funds of 50% of the amount disbursed; funding has now finished and states have not provided counterpart funding for the scheme so far, although some states have implemented their own fee waiver systems.

1.1.35 4.1.3 Other health care programmes

UNICEF's Accelerated Child Survival and Development Programme in West and Central Africa, focussing on immunization, antenatal care and malaria prevention, operates in Nigerian states where stunting rates are highest. The State Drug Revolving Fund Programme in Jigawa has a Deferral and Exemption Component, under which certain social groups, usually those living in extreme poverty, have free access to drugs and medical treatment. Katsina has targeted health services for children (measles vaccination)³². These programmes have the potential to improve child nutrition.

Summing up on Health care services in Nigeria

Nigerian health services are weak and fragmented. The PHC approach reaches less than 20 % of the population, less in remote rural areas in the northern States. However, there is a slow roll out of the MCH scheme providing access to free primary health care, although coverage of this is so far low. There are other initiatives such as the Accelerated Child Survival and Development Programme and the State Drug Revolving Fund Programme which may help to improve child nutrition.

1.2 4.2 Food Security and Nutrition

1.2.1 4.2.1 Global Evidence

Food security interventions have been difficult to measure. Although there are many reviews testing the effects of agricultural interventions with the aims of increasing food availability, diversifying diets, increasing incomes and supplementing essential vitamins and minerals, the effects on nutritional status are not well covered (see table 13 below).

Table 13 Summary of reviews of the impact of agricultural interventions on nutrition

Review	Period covered	Studies	Interventions	Nutritional Impact
Berti et al (2003)	1985-2001	30	All agriculture: home gardens, animal husbandry, cash cropping, irrigation, land reforms, credit and extension, duck-fish promotion	Mixed results

³² Programmes in non-Northern states include: In Adamawa, there is a medical fee waiver for under fives, and pregnant women can access free medical services from public health centres and hospitals. Children receive free immunization and SACA gives free medical services to people living with HIV (Holmes 2012). In Edo, WEO caters to children orphaned by HIV and AIDS and helps eradicate poverty in poor and isolated communities in Etsako West. One component of the programme involves paying hospital bills for OVC (Holmes et al 2011). In Ifedore district in Ondo state the Abiye programme provides maternal health waivers and medical support during pregnancy (World Bank, 2011b).

World Bank (2007)	1985-2007	52	All agriculture: agricultural commercialisation, horticulture, animal source food, and mixed interventions.	Mixed results
Ruel (2001)	1995-1999	14	Interventions designed to increase production and intake of micronutrient-rich food through: home gardens, animal husbandry, aquaculture and nutrition education	Some evidence of impact on vitamin A intake but evidence is scant and studies are poorly designed
Leroy and Frongillo (2007)	Not specified (but oldest study is 1987 and the most recent is 2003)	14	Animal interventions: aquaculture, dairy production and poultry production	Some evidence of impact but few studies available and often poorly conducted
Kawarazuka (2010)	Not specified (but oldest study is from 2000, most recent is 2009)	23	Aquaculture and small fisheries	Few Studies available and very little evidence of impact

Source: Masset et al (2011)

A systematic review of agricultural interventions involving over 7200 papers (Masset et al, 2011) covered bio-fortification interventions, home gardens, aquaculture and small fisheries, dairy development and animal source food promotion, that aimed to improve children's nutritional status by improving the incomes and the diet of the rural poor. The time frame was 1990 to the present. However, of these papers, only 23 were methodologically sound enough to draw concrete conclusions. Of these, 19 reported programme impact on the diet composition of the beneficiary population. The majority of studies found a positive impact of the interventions on the consumption of specific foods. As expected, home garden programmes increased the consumption of fruit and vegetables; aquaculture and small fisheries interventions increased the consumption of fish, while dairy development projects increased the consumption of milk. There are, however, a number of exceptions where no changes were observed.

The impacts of agricultural interventions on diet composition are summarized in Annex Table 15. Nineteen studies are summarized here of which 12 showed a higher consumption of vegetables (mostly) and higher dietary diversity, significant at the 5% level or better. Of these, for six studies the observed population was preschool children. Broadly speaking, this says that there are interventions in home gardens that have led to improved dietary diversity of young children. Their effectiveness in the semi arid areas of the NW states will be questionable, as they require a stable water supply. Green vegetables are abundant in the markets in these states and these crops are often grown on low lying swamp (fadama) land.

Four of the studies that were assessed investigated the impact of the interventions on iron intake (see Annex Table 16). The findings of these studies cannot be aggregated in a summary figure of impact because iron intake measurement were taken and reported in different ways. One study (Talukder et al. 2010) reported a statistically significant reduction in anaemia prevalence among non-pregnant women in project areas and no change in non-intervention areas. The other three studies found no statistically significant impact of the interventions on iron intake

With regards to Vitamin A, nine studies reported mean concentration of serum retinol in blood samples from project and control areas. Here the results are also ambiguous: only four of these studies reported means and standard deviations of children in project and control areas (see Annex Table 17)³³.

³³ Attig et al. (1993) and Vijayaraghavan et al. (1997) reported results only for programme participants and not for control groups. Low et al. (2006) reported a double difference estimate of 2.2 microgram/dl. between project and control areas (statistically significant at the 1% level), but using a regression model. de Pee et al. (1998) reported a difference of 1.7 microgram/dl. (statistically significant at the 5% level), but among women and not children. Kidala et al. (2000) found a

Finally, in assessing impact on nutritional status, anthropometric data were collected by 13 of the 23 studies included in the review. However, four of these studies had further deficiencies. The remaining studies calculated prevalence rates of under nutrition with statistical tests of significance. One study (Gunaratna et al. (2010)) employed rates of growth and found positive and statistically significant impact on nutrition by the interventions. However, only one study found a statistically significant impact on prevalence of stunting, while 3 studies (out of 8) found an impact on prevalence rates of underweight and two found an impact on wasting (see Table 14). The relatively greater success of agricultural interventions in reducing the prevalence of underweight and wasting compared to stunting can be explained at least in two ways: (i) the interventions may be better suited to addressing short-term under nutrition rather than chronic under nutrition, and (ii) the studies assessed impact shortly after the interventions had taken place and therefore could not capture longer term impact.

Table 14 Impact of Interventions on Nutritional Status of Children

Study	Stunting (height-for-age)	Underweight (weight-for-age)	Wasting (weight-for – height)
Aiga et al. (2002)	n.s	**	n.s
Faber et al (2002)	n.s	n.s	n.s
Hoorweg et. al (2000)	**		**
Makhotla and Hendriks (2004)	n.s	n.s	n.s
Low et al (2007)	n.s	**	**
Olney et al. (2009)	n.s	n.s	n.s
Schipani et al. (2002)	n.s	n.s	n.s
Shmidt and Vorster (1995)	n.s	n.s	n.s

Note: in the second column, n.s is not significantly significant, * is statistically significant at the 10% level, ** is statistically significant at the 5% level, *** is statistically; significant at the 1% level.

Source: Masset et al (2011)

Summing up on Global Evidence of the Impact of Agricultural interventions on Nutrition

Global research results have been presented from the comprehensive review by Masset et al (2011) on the impact of agricultural interventions on the nutritional outcomes of dietary consumption, anaemia, vitamin A status and child nutritional status. The results are ambiguous, despite the appealing prima facie case that changes in food production at the household level will have an impact on nutrition. In the Programme states agriculture is the major source of income and human labour. Some short term impacts were seen in a subset of the studies, but longer term impacts were not assessed. The issue is one of the complexities of the pathways that exist, while still acknowledging that for many rural families, their farm operation is the major source of the family food supply, generator of incomes and focus of much family labouring, and that family food security is regarded as one of the three underlying determinants of nutritional status.

1.2.2 4.2.2 Nigeria Experience

The National Special Programme for Food Security (NSPFS) is an initiative of the Federal Government of Nigeria and the FAO for poverty reduction in line with the National Economic Empowerment Strategy. It focuses on the transfer and application of low-cost technologies to

statistically significant lower concentration of serum retinol in project areas, but attributed this result to an extraordinary parasitic infestation in the intervention areas that compromised the validity of the experiment.

improve agricultural productivity and sustain agricultural systems, over a five- year period. The programme includes projects on: (i) food security; (ii) aquaculture and inland fisheries; (iii) animal disease and trans-boundary pests control; (iv) marketing of agricultural commodities; (v) soil fertility initiative; (vi) food stock management and (vii) South-South cooperation.

The Programme's broad objective is to contribute to sustainable improvements in national food security through a rapid increase in productivity, to reduce yearly variability and to improve the people's access to food. Its specific objectives are to:

- Assist farmers to increase output, productivity, and incomes,
- Strengthen the effectiveness of research and extension services by bringing technology and new farming practices developed by research institutes to farmers,
- Concentrate initial efforts in pilot areas for maximum effect and ease of replicability
- Educate farmers in the effective use of available land, water, and other resources to produce food and create employment, and
- Utilize international experience for integrated farming practices, to maximize use of existing facilities and knowledge and to spread benefits to wider areas.

The NSPFS has bolstered the productivity and sustainability of the small-scale agricultural systems with obvious improvements in beneficiaries' livelihoods, food security, and socioeconomic status. State governments have funded the establishment of additional NSPFS sites while the federal government increased the number of sites from 109 to 327 beginning in 2007. The direct beneficiaries of the NSPFS are farmers in all 36 States and the FCT; 70,000 households through site development and 785,000 via the outreach programme, and research institutes.

Agricultural subsidy policy in Nigeria has been subject to significant changes since the 1970s. Most recently, a federal policy provides a 25% subsidy under the Fertilizer Market Stabilization Programme, and state governments implement various fertilizer subsidies levels to augment these (Eboh et al., 2006). Adamawa, for instance, subsidizes agricultural inputs and implements, but this is not done through any coordinated government programme. Subsidized fertilizer comes through the Ministry of Agriculture and a hiring programme of agricultural implements is sometimes implemented through CSOs, e.g. the National Council of Women Societies received fertilizer for distribution at subsidized rates to female farmers (Holmes et al 2011).

In Benue, the Ministry of Agriculture, funded by the state government, provides farm inputs at a subsidized price, covering 28 LGAs state-wide. However, anecdotal evidence suggests that farming associations and poor farmers do not tend to benefit from the inputs, which go to better-off farmers or are sold. There are also problems with the timeliness of disbursement (Holmes et al 2011).

In Edo, the Ministry of Agriculture organizes fertilizer supply and distribution programmes to reach the rural poor. Between 2007 and 2011, 350,000 farm families in Edo state received fertilizers from the ministry at subsidized rates (Holmes et al 2011). Other small programmes exist at the state level: for instance, the Millennium Development Village project operates in two villages in Kaduna and Ondo state providing agricultural support (seeds/fertilizer subsidies).

Summing up on food security interventions in Nigeria for impact on nutrition

There is only basic descriptive information about the food security interventions in Nigeria, and no information of their impact. These interventions include the National Special Program for Food Security (NSPFS) and subsidy programmes for fertiliser and other farm inputs. In such a large country, the national level interventions can only have a limited impact while there is less information to hand

on state level interventions. To impact on child nutrition, the interventions must reflect the conditions in which under nourished children live, involving women as beneficiaries of these programmes either as first or second round effects. Even if an agricultural intervention is not envisaged for the WINNN programme, all other interventions must take into account the nature of the household farm operation and the implications for maternal and child nutrition. The interventions will have to be highly targeted, either in terms of location, households or household members.

1.3 4.3 Agricultural Interventions with Income Generation Goals

1.3.1 4.3.1 Global Evidence

The systemic review of Masset et al, 2011, found that only five studies reported an agricultural programme impact on total household income (see Annex Table 18). This review only looks at those interventions that have the explicit goal of improving the nutritional status of children via an increase in income and a change in diet. All studies that collected data on total household income found a large impact of the interventions, but only in one case was the statistical difference between project and control groups tested. Therefore on this basis alone, it is difficult to draw any conclusion from the results reported by these studies. Also, some studies reported project impact on incomes from a particular source, such as income from home gardening (Bushamuka et al. 2005, Olney et al. 2009, Talukder et al. 2010), or on cash income from sales of the food item promoted by the intervention, for example from market sales of home garden produce (Chakravarty 2000). This is an imprecise measure of income because substitution effects in production are possible, so the overall impact on household income, and therefore on food expenditure, remains unclear. These data may provide evidence of the programme success in promoting production of a specific good but do not represent evidence of an overall increase in household resources.

1.3.2 4.3.2 Nigeria Experiences

There were no Nigeria case studies cited in the systematic review. There was one study on the impact of off-farm income on food security and nutrition in Nigeria (Babatunde and Qaim, 2010). Using a survey of 220 farm households in Kwara State, NC region, it was found that off-farm income did have a positive effect on food security and nutrition: the prevalence of child under nutrition is lower and food production is higher in households with off-farm income.

The Improving Agriculture and Rural Markets in Nigeria (IAMiNN) Programme might offer potential for building nutrition into the value chain, through active support to enhanced participation of women, a strengthening of the value chain infrastructure that is specific to nutrient-rich foods which require cold chains, a strengthening of the demand for nutrient-rich foods in the marketplace through labelling and marketing for commercial advantage, reducing the transactions costs of food fortification and the promotion of the uptake of bio fortified staples by farmers and consumers.

Summing up on Agriculture to Improve Incomes and Nutrition

The evidence on agricultural interventions and nutrition is important because the five Programme states are predominantly rural and stunting is higher in rural areas. But the data on hand shows that the impact of agricultural interventions and incomes (and therefore a possible means to improve nutrition) is unclear. One Nigerian intervention - Improving Agriculture and Rural Markets in Nigeria – may have potential in this regard but there is no evidence to prove this contention.

1.4 4.4 Dietary diversification strategies

1.4.1 4.4.1 Global Evidence

Bivariate associations have been found between dietary diversity and height for age in 9 of the 11 countries which had held DHSs (Arimond and Ruel, 2004). Dietary diversity remained significant as a main effect in seven countries in multivariate models, and interacted significantly with other factors (e.g., child age, breast-feeding status, urban/ rural location) in 3 of the 4 remaining countries. Thus, dietary diversity was significantly associated with height for age, either as a main effect or in an interaction, in all but one of the countries analyzed. These findings suggest that there is an association between child dietary diversity and nutritional status that is independent of socioeconomic factors (Arimond and Ruel, 2004).

Interventions to diversify diets by small-animal production, home gardening, livestock rearing, and dietary modifications are potentially promising and culturally relevant, but in general, have only been implemented at a small scale, and have not been adequately assessed (Masset et al, 2011). Dietary modification techniques (e.g. germination, fermentation, and malting), have been shown in small studies to improve children's intakes of micronutrients and their micronutrient status. Although some promising multidisciplinary nutrition interventions have been implemented such as biofortification by conventional crop breeding or genetic engineering, dietary diversification strategies have not been proven to affect nutritional status or micronutrient indicators on a large scale.

1.4.2 4.4.2 Nigeria experience

No studies were found that show how dietary diversification can have an impact on child under nutrition.

4.5 Public Works Programmes

1.4.3 4.5.1 Global Evidence

Research on the developmental impact of the Food for Work (FFW) programmes in Bangladesh, an important component of the rural public works programme, providing more than 100 million days of employment in the mid-1980s, found that dietary intakes improved for all age groups in the project sites relative to control sites (IFPRI/BIDS 1989; Ahmed and Hossain 1990). Cereal consumption was slightly higher among landless and near-landless project participants in comparison to similar nonparticipants in project villages. Agricultural production increased by an average of 27 % and per capita household income by about 10%, as a result of direct and indirect effects of the project. More productive employment generated substituted for very low productivity employment with wage employment increasing by 13% and self-employment declining by about 10%.

Household-level research on labour-intensive public works programmes in Botswana and Niger confirms the income-increasing effects of participation in such programmes; in Botswana, project wage income contributed about 40% of the income of participating households, and, in Niger, it contributed about 20% of total household income of the poor (Teklu 1992; Webb 1992).

1.4.4 4.5.2 Nigeria Experience

Although social protection policy in Nigeria has been articulated to contribute to economic growth and development, and documents have identified employment and skills as priority themes, Nigeria lacks an overarching strategy for the role of public works in social protection. In December 2010, the President announced a massive job creation programme, the National Job Creation Scheme, to be kick-started with seed funding of N50 billion, to create thousands of new jobs in urban and rural communities' across the 36 states and the FCT (Akogun and Nzeshi, 2010). Some of these labour-intensive public works would be funded by conditional grants and targeted at sectors critical to achievement of the MDGs.

However, the status of the scheme is currently unclear and, overall, there is little in the way of public works programmes in Nigeria. The NDE has Special Public Works (which combine direct labour projects and education) (Lagos Indicator, 2011), but these have declined recently as a result of the general drop in social spending.

The Ministry of Works is more involved in machine-intensive and contractor-conducted works, with new contracts needing a certain percentage of labour inputs, but it is not clear that this would be a public works-type programme in the sense of social protection. However, the International Labour Organization (ILO) is encouraging the Ministry of Works and the Ministry of Labour and Productivity to conduct labour-focused public works, rather than infrastructure-focused works led by foreign contractors. Other international organizations draw on community labour to implement programmes. For example, UNDP's Local Development Programme works with LGAs in Ando and Bajesa states, with a community-driven approach to identifying needs which are then provided with the assistance of local people. However, the labour component is a secondary objective.

Reports suggest that a number of states invest in direct employment or job creation schemes, e.g. Lagos, Edo and Ekiti (World Bank, 2011a). Lagos has implemented its own public works-type programmes: recent reports suggest that over 2,000 people have been employed through the state Rice for Job Scheme, the Agric-Yes Scheme and the Lagos Ignite Enterprise Programme. It is not clear whether such programmes are poverty targeted.

Summing up on Public Works Programmes and Nutrition

Public works programmes do have a high profile in Nigeria but there lacks an overarching strategy for their role in social protection. In other countries they have been shown to improve household income and have some effect on food consumption. Evaluation of these programmes would provide some more concrete results.

4.6 Social protection (Conditional Cash Transfer)

1.4.5 4.6.1 Global Evidence

CCTs have shown some success in reducing malnutrition. Six programmes have been identified mainly from Latin American countries, that paid families in return for an action such as vaccination of children (Behrman et al, 2001; Maluccio et al 2005; Glassman et al, 2006; Mesnard et al, 2005; Lagarde et al, 2007). Overall, the programmes showed an improvement in care seeking and an associated increase in the value of total household consumption of goods and services. In Mexico, the Progresa programme, which combined conditional cash transfers with nutritional education and

m micronutrient-fortified food supplements resulted in an extra 1 cm increase in height per year, which translated into a 10% reduction in the prevalence of stunting in children aged 12–36 months (Behrman et al, 2001). The Programa Familias en Acción in Colombia Mesnard et al, (2005) reported an increase after one year of 0.44 cm in height in children aged 0–12 months, whereas Red de Protección Social in Nicaragua (Maluccio et al, 2005) recorded a small decrease in the prevalence of stunting, from 41.9% to 37.1%, and that of underweight from 15.3% to 10.4% over 2 years.

1.4.6

1.4.7 4.6.2 Nigeria Experience

There are several candidates for social protection programmes within which to embed nutrition components in Nigeria, including:

- A conditional cash transfer programme, In Care of the Poor (COPE), launched by the National Poverty Eradication Programme (NAPEP) which provides cash transfers to 22,000 extremely poor and vulnerable households on the condition that adult members attend training sessions, keep their children in school, and utilise health services;
- A conditional cash transfer for girls' education in Kano (12,000 girls) and Katsina (7,000 girls) states. If early age of pregnancy is found to be a key contributor to infant stunting then this programme is a good candidate if it can delay age at first birth;
- A pilot along the lines of the Productive Safety Net Programme (PNSP) in Ethiopia which combines public works programmes, income transfers and food security measures and support (Gilligan et. al. 2009).

COPE (In Care of Nigeria's Poor) is a Nigerian CCT which started in 2007 as a pilot in 12 states and became compulsory across all states in the second phase, and is now in its third phase with state governments required to match funding. The objective is to break the intergenerational transfer of poverty and reduce the vulnerability of the poor to existing socio-economic risks, and to improve the capacity to contribute to economic development. The programme's design draws on the Latin American model. Beneficiary households receive a monthly Basic Income Guarantee (BIG) for one year and then a lump sum Poverty Reduction Accelerator Investment (PRAI). The BIG ranges from \$10 to \$33, depending on the number of children in the household; a further \$50 per month is withheld as compulsory savings, which is provided as the PRAI (up to \$560) to the head of the household. Entrepreneurship and life skills training are provided to beneficiaries to maximize the PRAI. Payments are based on households meeting two key conditions: enrolment and retention of children of basic school age in basic education (Primary 1 to junior secondary education), where a child must maintain at least 80% school attendance, and participation in all free health care programmes.

Targeting is guided by national policy and initially included a combination of geographical, community-based and household targeting (NAPEP, 2007), and is intended for households with children of primary school age with the characteristics of headed by poor females, aged, physically challenged, VVF patients and HIV and AIDS patients. A community development committee (CDC) coordinates the identification of beneficiaries. A total of 12 states have now committed funding, which include Katsina and Kebbi (NW).

But programme coverage is very small. NAPEP's own estimates suggest that COPE has now reached approximately 22,000 households. Dijkstra (2011) found that 18,750 households have been trained by COPE. This results in coverage of less than 0.001% of the poor. Rollout has been uneven and currently, even with matched funding, resources to reach a wider population are constrained. For instance, in Jigawa, COPE reaches 50 households in 17 LGAs, covering 850 households in total, with a proposal to cover 2,800 households in all 27 LGAs (Budget and Economic Planning Directorate). The population of Jigawa is over 4 million and the poverty rate is

90%. In Adamawa, 50 households in 10 LGAs (out of 21) have been targeted, reaching 500 households in total so far.

COPE was designed at the national level by NAPEP, OSSAP-MDGs and state representatives with support from the World Bank. At the state level, COPE is implemented mainly by NAPEP in collaboration with the Small and Medium Scale Enterprise Development Agency (SMEDAN) and the National Directorate of Employment (NDE). In Phase 1, it cost N1 billion (NAPEP, 2007), with N2.4 million allocated to each of the 12 states and the FCT.²⁵ In Phase 2, funding of N2.3 million was provided to cover the remaining 24 states and FCT. In 2010, state governments would take control of the CCT³⁴ through the Conditional Grants Scheme (CGS) in order to improve sustainability: the CGS has a number of thematic areas, including education, health, water and cash transfers, and its criteria for approval for CCTs include that there must be an implementing agency and the state must have a supply side in place (tied to school enrolment, primary health care or schools) (according to a key informant at OSSAP-MDGs).

Three other CCT programmes are currently being implemented in Nigeria – in Kano, Bauchi and Katsina – to reduce girls' dropout as a result of early marriage, specifically in the transition period from primary to secondary school. The pilots are running for three years, from 2011 to 2014. The cash transfers are transferred to beneficiaries on a two months basis. In Kano, two benefit levels are being tested: N5, 000 (approximately \$32) and N2, 500 (approximately \$16). Receipt of the income transfer is conditional on girls' 80% school attendance. In Katsina, the design also focuses on creating linkages with other programmes and institutions, including a referrals' component, where beneficiaries are referred to a specialized institution when necessary.

In Kano, there are around 12,000 beneficiaries, but the aim is to extend the programme to all rural girls in the eligible catchment areas. The pilot covers one cohort moving through the schooling cycle, through Primary 5-6 and Junior Secondary 1 of selected schools. Targeting is determined primarily by the availability of schools supported by the Education Sector Support Programme in Nigeria (ESSPIN), so that the supply side is guaranteed. In rural areas, the programme management unit is selecting schools in poor areas; in urban areas, however, schools are selected using proxy means testing. In Katsina, stakeholders OSA (Office of the Special Advisor), UNICEF and the SUBEB selected nine LGAs for the pilot, with 7,000 households/9,000 girls as beneficiaries. As in Kano, there is the expectation, based on impact evaluation results that the cash transfer will be scaled up to all 36 LGAs.

Overall these CCTs appear to not have explicit nutritional goals and there have been no assessments or evaluations. They may however, have the potential to improve the nutritional status of children by improving household incomes, promoting use of free health care programmes, increasing girls' education, and delaying the age of marriage and first pregnancy.

Summing up on social protection programmes

There is emerging global evidence that social protection programmes may have a significant impact on the nutrition of households. In Nigeria there are various interventions (such as COPE), and others at the pilot stage, but there is no evidence as to their effectiveness in terms of impact on child nutritional status. Given the promising global evidence, it would be timely to use such programmes as a pilot and evaluate them rigorously. The targeting of a programme to adolescent girls may be particularly effective, helping them get an education, delaying marriage and breaking the intergenerational aspects of under nutrition.

³⁴ But we have no evidence as to whether this happened – as of 2011 COPE was in the hands of NAPEP.

4.7 Microcredit

1.4.8 4.7.1 Global evidence

Micro credit programmes, especially those provided to women do have a positive impact on child nutrition, with several relevant studies, especially from Bangladesh. A study conducted by the World Bank/ Bangladesh Institute of Development Studies showed that the Grameen Bank not only reduced poverty and improved the welfare of participating households, but also enhanced the household's capacity to sustain their gains over time. This was accompanied by an increased caloric intake and better nutritional status of children in households of Grameen Bank participants (cited by Hashemi and Morshed, 1997). It was also found that women's credit had a large and statistically significant impact on measures of the health of both boys and girls. Credit provided to men had no statistically significant impact. A 10% increase in (latent) credit provided to females increases the arm circumference of their daughters by 6.3%, twice the increase that would be expected from a similar proportionate increase in credit provided to men. Female credit also has a significant, positive but somewhat smaller effect on the arm circumference of sons. (Pitt et al, forthcoming.)

In a review of micro credit programmes provided by BRAC in Bangladesh, nutritional indicators also seemed to improve where microfinance institutions have been working. Results suggested a significant decrease in severe malnutrition closely associated with the length of BRAC membership—though disentangling the contribution of the microfinance services from the other BRAC interventions (particularly the functional education component) has not been attempted (Chowdhury and Bhuiya, 1998, Wright, 2000). Further evidence from Bangladesh showed the positive impact between children's nutritional status and women's credit and statistically significant impact on height and arm circumference, and men's credit had a positive impact on girl's body mass index, but not on boys (Khandker, 1998)

Similarly programmes were found to be successful in Indonesia. The women who received the loans increased their income substantially, improved their families' nutrition and faithfully repaid their loans. They also had higher aspirations for their children's education and were more likely to reduce fertility (Panjaitan-Drioadisuryo et al, 1999).

1.4.9 4.7.2 Nigeria Experience

In Nigeria, operations of MFIs have grown considerably in the last ten years, driven largely by expanding informal sector activities and the reluctance of banks to fund the emerging micro enterprises. The number of MFI branches increased fivefold and their asset base and clients rose six and sixty-seven times, respectively. The value of outstanding loans and savings also increased. Yet the number of beneficiaries of MFI operators is an insignificant proportion of those in need of microfinance services. The financial services provided by the MFIs have neither been given publicity nor captured explicitly in the official financial statistics.

One study addressed the challenges of MFIs (Anyanwu, 2004), which included the need to approve and implement a policy framework that would regulate and standardize their operations, accessing medium to long term sustainable commercial sources of fund, increased mobilization of savings and moving a good proportion of credit portfolio to the promotion of real sector activities, especially in agriculture and manufacturing.

Two recent pilot studies in Nigeria have shown that micro credit is effective in lifting rural households out of poverty and should be considered to be scaled up (Jegade et al, 2011, Oluwatayo, 2010). However, there was no impact assessed on nutrition.

Summing up on Micro Credit

Micro credit programme have potential for improving nutrition on the basis of the evidence presented here. There is some global evidence to suggest that such programmes do improve household incomes and child nutrition especially when credit is placed in the hands of women. There is some evidence to show that micro credit programmes have been successful in Nigeria. In the NW states and with child under nutrition as the focus, there would be a need to design innovative schemes to reach women.

4.8 Water and Sanitation

1.4.10 4.8.1 Global Evidence

Improved water and sanitation (WASH) is a key element in improved child nutritional status. Data pooled from nine longitudinal studies from Bangladesh, Brazil, Guinea-Bissau, Ghana and Peru), demonstrated that the adjusted odds of stunting at 24 months of age increased by a factor of 1.05 with each episode of diarrhoea in the first 24 months of a child's life (Black et al., 2008). Of several disease prevention strategies that reduce the burden of infections (and hence affect nutritional status), hygiene interventions (hand washing, water quality treatment, sanitation and hygiene) are regarded as core to affect nutritional status (Bhutta et al., 2008). Gunther and Fink (2010) used 172 datasets from 70 countries to analyze the effects of access to water and sanitation on infant mortality and morbidity. Their cross-country analysis showed that access to improved water and sanitation reduced the incidence of diarrhea in children less than five years by 5–17 percent and showed a 5–20 percent reduction in infant mortality.

Further, where it has been carefully evaluated (e.g. Pattanayak, 2009), Community Led Total Sanitation (CLTS) has been shown to create defecation-free open spaces and rapidly increase latrine construction. It is not known whether this reduces diarrhoea rates, and the evidence so far is thin (Fewtrell et. al. 2005; Cairncross et. al. 2003).

Other studies have provided evidence of sanitation as a preventive intervention for stunting, such as in Peru (Checkley et al., 2004). Data collected in the late 1980's from eight DHS datasets in Sub-Saharan Africa, Asia, North Africa, and the Americas were combined and analyzed (sample size almost 17,000). Improvements in sanitation were associated with increases in height ranging from 0.8cm to 1.9cm but differences of such magnitude are not always found following nutritional interventions.

Esrey (1996) also established a 13–44 % reduction in diarrhea with access to flush toilets and an 8.5 % reduction with latrines, concluding that access to good sanitation has greater effects on health than access to good water. However, Gunther and Fink (2010) faulted this study because it included only 8 countries of the 63 countries with available DHS datasets in 1995. Waddington et al. (2009), on the other hand, in a global review showed that improved sanitation led to a reduction of 37 percent in the incidence of diarrhea, but saw no significant effect from improved water accessibility.

Improved sanitation also has an important role to play in reducing the transmission of soil-transmitted helminthes (STH). STH are one of the world's most important causes of physical and intellectual growth retardation. It is estimated that 47% of children in the developing world between the ages 5-9 are infected with any of the three main types of STH: hookworm, or roundworm, or whipworm (Maternal and Child Nutrition 2008). It has been reported that *Ascaris* diverts about one

third of the nutritional intake of a child with a typical worm burden. Hookworm is a major cause of anaemia. Trichuris is a serious cause of stunting in children.

A meta-analysis of the effects of de-worming studies on nutrition status of children showed the potential of administering anthelmintic drugs to reduce the burden of worms. (Hall et al, 2008). It was not possible to be conclusive about the absolute magnitude of any effects of giving treatment. Nevertheless, it was indicated that if the prevalence of intestinal nematodes is 50% or more, then giving anthelmintic drugs leads to significant extra gains in weight, height, mid-upper arm circumference and skinfold thickness in comparison with untreated controls. As this is a meta review, the information varies case by case, all of the children range in age between 1-15, usually either primary school or secondary school focussed, however with some overlap. The study was global with studies from 23 countries (although Nigeria was not one of them). The participating children showed an average weight gain of 210gm in children (a considerable average impact in terms of nutritional status). Yet, de-worming is essentially an end-of-pipe solution (WHO, 2007): reinfection rates are relatively high after treatment. For example, in a study of over 1800 children in Brazil, Moraes and Cairncross (2004) found that sewerage and drainage infrastructure could significantly reduce transmission (and reinfection). This suggests that long-term strategies incorporating education on personal hygiene, provision of toilets and of access to safe water are important elements in strategies to sustainably reduce the disease (WHO 2007) and thereby improve child nutrition.

1.4.11 4.8.2 Nigeria Experience

1.4.12

Lack of accurate data makes it impossible to determine whether Nigeria is making progress to meet its MDGs targets in the WASH sector. In May 2005, the Nigerian Minister of Water Resources said that increased spending on water programmes resulted in a huge increase in the access to safe water supply, from 35% in 1999 to 68% in 2005. WHO, however, estimates that the figures are closer to 48% for improved drinking water and 44% for improved sanitation.

Nigeria's water infrastructure has suffered from years of poor operation and maintenance, and the very low access to improved sanitation constitutes a serious public-health problem. Weak and inefficient institutions, unsustainable public sector spending, and persistent implementation failures have also contributed to poor access rates and sustainability. Most houses are built without toilet facilities: it is rare to find rural houses with personal toilets, and urban houses with 50 or more tenants may share one toilet. In 2008, the government promised to construct 1 million public latrines across Nigeria to serve more than 150 million people, but these needed facilities have not yet materialized (Adewara et al, 2011). As an indication of this poor situation, eleven states in Nigeria battled an extended cholera epidemic; of nearly 40,000 cases reported from January–October 2010, some 1,500 were confirmed dead (NigerianBulletin.com 2010; UN News Centre 2010).

Local governments are responsible for rural water service and share the costs of service with SWAs and the federal government. This is the case for both capital improvements and recurring operation and maintenance since water is often supplied free of charge. Most rural areas depend upon boreholes or hand-dug wells for water supply. At best, Village Level Operation and Maintenance hand pumps are available. Sanitation facilities continue to be inadequate as sector disorganization, institutional conflicts, and the lack of defined responsibilities prevail.

Community-Led Total Sanitation (CLTS) is a grass roots approach to open sanitation to get communities to completely eradicate open defecation. It has spread widely in Nigeria: the DFID-assisted SHAWN project National Assessment of CLTS showed that in October 2010 over 2,875 communities in 268 LGAs in 30 States were implementing CLTS and 659 communities had

attained open defecation free (ODF) status. CLTS may provide an effective alternative to the public provision of services in rural areas.

Summing up on Water and sanitation in Nigeria

Research evidence is strong about the importance of water and sanitation reducing a broad range of infections and so improving nutritional status. However, Nigeria's infrastructure for providing improved sanitation and water is slow, particularly in rural areas. CLTS may provide an effective alternative to the public provision of services in rural areas.

4.9 Women's Empowerment

1.4.13 4.9.2 Global Evidence.

In many global surveys as also shown in Nigeria, the status of women is strongly associated with child nutritional status. Key characteristics are educational status and incomes and the extent to which women can access modern services such as health care clinics.

1.4.14 4.9.2 Nigeria Experience

Gender Informed Nutrition and Agriculture II (GINA II) is a multisectoral USAID approach to combating hunger in Sub-Saharan Africa built on the USAID-supported Agriculture Nutrition Advantage (TANA)³⁵. GINA II's overall goal was to improve the nutritional status of women and children. It aimed to reduce the number of underweight children in GINA communities by 10%, seeking to do this in several ways, including by improving agricultural practices, enhancing the care-giving capacity of mothers with children, building the nutrition-related capacity of local service providers, and sensitizing key local government officials about the importance of nutrition. It is also a health and agriculture project but is one example of action focused on women. The extent to which it empowers women has not been assessed.

The Food Basket Foundation International Program (FBFI) implemented the GINA II with support from USAID in three communities. The communities were Gunki, Ungwa Mallam/Powa, Wache of Nasarawa State; Afaha Ediene, Itak Ikot, Akpandem of Akwa Ibom State; and Hagagawa/Zango, Hagawa, Tinki of Kano State. The strategies involved: advocacy and mobilization; development review of relevant operational documents; re-ranking of community needs; training in project planning and implementation; finance and accounting; proposal appraisals; and project interventions.

The programme's strengths and weaknesses included the following (Akinyele, 2009):

Strengths:

- Involvement of multiple partners—such as FBFI, COMPASS, BASICS III, and USAID—working together
- Existence of pre-existing structures and trained personnel

³⁵ Arising from the prevalence of a high rate of malnutrition across Nigeria and concern about the alarming increase of micronutrient deficiencies, the "The Initiative to End Hunger in Africa" led to the formation of TANA. The International Institute of Tropical Agriculture (IITA) implemented TANA in partnership with other agencies. TANA was operational at the national level and used conceptual approaches to get policymakers to recognize that food and nutrition issues need to be prioritized in Nigeria's development efforts.

- Provision of logistics and good working environment because of supportive relationship with state and local government area officials
- Willingness of people to participate and donate properties
- Presence of facilities for dry season farming and suitable crops
- Readiness of people to adopt new farming techniques (irrigation farming)
- Positive returns on child malnutrition reduction through Positive Deviance
- Health sessions and community-based growth monitoring

Weaknesses:

- Inadequate facility for dry season farming (Bichi in Kano)
- Inadequate understanding of aims, roles, and responsibilities of stakeholders
- Illiteracy and lack of basic numeric skills
- Inadequate linkage and communication between implementing partners
- Inadequate linkage and communication between stakeholders, for example, beneficiaries not knowing that loans should be refunded
- Socio-cultural barriers among the poor

However, the impact of the growth monitoring and promotion interventions was significant, as noted in detail in Annex Table 19. However, the project locations are not in the Northern States. The impact of these interventions was that in both Nassarawa and Akwa-Ibom States, nutrition surveillance was associated with mildly improved child growth and reductions in underweight among the children monitored.

Summing up Women's Empowerment Interventions in Nigeria

There appears to be no dedicated intervention on women's empowerment in Nigeria and these are not to be expected in the culturally conservative northern states. Enhancing the access of girls to secondary education would be a significant means of empowerment, delaying marriage and the birth of the first child, and enabling them to obtain employment in urban areas.

5. Policies and Governance affecting Nutrition (Global and Nigerian)

5.1 Policies and Governance at the Global Level

There are examples of nations that have made steady, even rapid gains in reducing under nutrition³⁶. As noted earlier in this paper, the scientific evidence is clear as to what works especially at the immediate levels and there is a great deal of world-wide technical information on how interventions can be structured to best effect, although context still remains vitally important. The challenge from global experience is making sure interventions are delivered through governance systems that work, and are cost effective and sustainable. There will be different pathways to maintaining political will and choices for nutrition improvement, but nutrition must receive funding and some priority if success is to be achieved. Nutrition security will require a broad range of efforts (as identified by the conceptual framework in Section 2 of this review), and above all countries need to address the most vulnerable populations in society with an equitable, human rights based approach (IDS, 2012).

There are four key factors that all nations to some extent must develop in a framework to drive nutrition governance. These are: i) intersector communication between government sectors and non government agencies; ii) vertical coordination between different levels of government: national and local governments need legal frameworks, technical capacities and incentives to transfer resources, share information and remain accountable to each other; iii) sustainable funding to encourage policy coordination and implementation, particularly if national governments mobilize their own resources, and iv) maintaining political commitment through monitoring and advocacy, with accurate indicators and timely reporting.

Experience from six countries (Bangladesh, Brazil, Ethiopia, India, Peru and Zambia) points to ten key findings and policy recommendations as being important ingredients:

- The executive branch of government should be directly involved in the under nutrition reduction policy at the most senior level; this helps raise public awareness, coordinates the efforts of different line ministries and protects funding.
- Establish effective bodies to coordinate nutrition actions across government ministries, with strong political support;
- Frame nutrition as an integral part of the national development agenda, to generate public awareness so building in accountability;
- Develop a single narrative about the severity of under nutrition, so contributing to clear policy goals, and targets as part of national campaigns;
- Ensure that local governments have the capacity to deliver nutrition services; using decentralized services, and accompanied by active political parties and technical support from government ministries and donors. Training and capacity building will also be required.
- Encourage local ownership of nutrition programmes and their outcomes; this will enhance accountability for politicians;
- Support civil society groups to develop social accountability mechanisms; this enables groups to make under nutrition problems more visible and improve the scope and quality of service delivery;
- Collect nutrition outcome data at regular intervals; this supports monitoring of progress and development of indicators; collecting data in a frequent and reliable manner is key to expanding political commitment, tracking progress and allocating the required funding.
- Use centralized funding mechanisms to generate greater incentives to cooperate in the design, implementation and monitoring of nutrition interventions; this enhances accountability to internal sources of funding; and

³⁶ This section is largely based on: IDS in Focus Policy Briefing, accelerating reductions in under nutrition: what can nutrition governance tell us? [Issue 22](#), April 2012

- Governments should create financial mechanisms to protect nutrition funding and use it in a transparent way. This could be, for example in the form of a levy.

5.2 Nigeria experiences

A review of the nutrition governance in Nigeria shows several plans and activities and motivation to take action but a lack of commitment. The most recent is the Scaling up Nutrition (SUN) movement. There are very few direct interventions in nutrition.

The landscape analysis carried out under the umbrella of the Un Standing Committee on Nutrition (SCN) on national readiness to take action to tackle under nutrition (Nishida et al 2009) indicates Nigeria as having a strong nutrition governance at federal and state level but a lack of political will, poor funding and a lack of effective planning and coordination for success.

1.4.15 5.2.1 Food and Nutrition Policy for Nigeria

The Food and Nutrition Policy for Nigeria articulates the fact that food and nutrition are an integral part of the overall national objective of improving the socioeconomic well-being of the people. The Policy was based on the premise that poverty would be reduced by 10% which was 35% at the time in 1994.

1.4.16 5.2.2 National Plan of Action for Food and Nutrition (NPAFN)

The National Plan of Action for Food and Nutrition launched in 2004 was based on the Policy with the overall goal of improving the nutritional status of all Nigerians, particularly of the most vulnerable groups, by promoting the following specific goals ³⁷:

1. Establishing a viable system for guiding and coordinating food and nutrition activities undertaken in the various sectors and at various levels of the society, from the community to the national levels,
2. Incorporating food and nutrition considerations in development plans and allocating adequate resources toward solving the problems pertaining to food and nutrition at all levels,
3. Promoting habits and activities that will reduce the level of malnutrition and improve the nutritional status of the population,
4. Identifying sectoral roles and assigning responsibilities for the alleviation of malnutrition,
5. Ensuring that nutrition is recognized and used as an important indicator to monitor and evaluate development policies and programs, and
6. Promoting the good indigenous food cultures and dietary habits of Nigerian peoples for healthy living and development.

To achieve the overall goal to improve the nutrition status of the vulnerable groups, a number of specific objectives were formulated:

1. Improve food security at the household and the aggregate level to guarantee that families have access to adequate and safe food in both quantity and quality to meet nutritional requirements for a healthy and active life,
2. Enhance care-giving capacity within households regarding child feeding and childcare practices, as well as addressing the care and well-being of mothers,

³⁷ This and following sections are based in large part on Akinyele (2009)

3. Improve the provision of human services such as health care, environmental sanitation, education, and community development,
4. Improve the capacity within the country to address food and nutrition problems, and
5. Raise the understanding of the problems of malnutrition in Nigeria at all levels of the society, especially with respect to its causes and possible solutions.

The following targets were set to address the food and nutrition problems in the country:

1. Reduction in the level of poverty to 10% by 2010
2. Reduction in starvation and chronic hunger to the barest minimum through increased food intake
3. Reduction in under nutrition especially among children, women and the aged, and in particular severe and moderate malnutrition among under-fives by 30% by 2010
4. Reduction in micronutrient deficiencies particularly iodine deficiency disorders, vitamin A Deficiency, and iron deficiency anaemia by 50% of the current levels by 2010
5. Reduction in the rate of low birth weight (2.5kg or less) to less than 10% of the current levels by 2010
6. Reduction in diet-related noncommunicable diseases by 25% of current levels by 2010
7. Improvement in general sanitation and hygiene including availability of safe drinking water
8. Reduction in the prevalence of infectious and parasitic diseases that aggravate the poor nutritional status of infants and children by 25% current levels

The NPAFN is the flagship infrastructure for realizing the rights of the Nigerian population to adequate nutrition and achieving the MDGs. The plan details various activities which are not specified from the sources accessed³⁸, and based on the five specific objectives (see above). Though the NPAFN was launched in 2004, it is yet to be fully implemented in a systematic and coherent manner, constituting a big barrier to achieving the rights of Nigerians to adequate nutrition. There is therefore an urgent need for a fully coordinated implementation of the food and nutrition plan of action.

The draft National Economic Empowerment Development (NEEDS) includes nutrition in Chapter 23 as a cross-cutting issue. As the poverty reduction strategy of the government, NEEDS informs development partners' acceptance of nutrition as a cross-cutting issue for child survival and development women's wellbeing, leading to the reduction of infant, child, and maternal mortality, and to the achievement of the eight MDGs in Nigeria.

1.4.17 5.2.3 Institutional Framework for Implementing Food and Nutrition Policy and Plan of Action

The Food and Nutrition Policy document mandated the National Planning Commission (NPC) to establish a National Committee on Food and Nutrition (NCFN) comprising sectoral ministries and representatives from academia (one from each geopolitical zone) and NGOs to provide the institutional framework to coordinate and implement policy guidelines by the Committee. The Committee provided for a secretariat to lead its activities, located at the NPC in the Presidency because of the multisectoral and multidisciplinary nature of solving the multifactorial causes of malnutrition. Provisions were also made to have the Committee replicated at the state and local government area levels. The intention is that the functions of NPC, NCFN and the secretariats will be coordinated at the national level and in the same way at the state and LGA levels.

The committees at the federal, state, and local government areas are not functional at an equal

³⁸ Original document currently not on the National Planning Commission website (<http://www.npc.gov.ng/home/doc.aspx?mCatID=68249>), and activities not described at all in any of the texts that refer to it.

level, due to the continued lack of understanding and poor resource allocation by the government and its agencies. The committee's location at the federal level within the Agriculture and Industries Department of the National Planning Commission instead of the Department for International Cooperation has made it difficult to get development partners buy into the nutrition agenda to foster an integration of the various approaches for resolving child survival and development problems. This institutional framework needs to be recognized and supported by government and the development partners in the bid to deliver adequate nutrition services for the Nigerian people to meet their right to adequate nutrition for survival.

There is critical need to deploy nutritionists at various levels of the committee to implement food and nutrition programmes, with improved sector-wide coordination of food and nutrition programs, technical capacity, and budgetary allocations also required. Gaps in the availability of technical staff capable of skillful and effective service delivery in food and nutrition, and poor use of staff capacity and skills also need be addressed.

1.4.18

1.4.19 5.2.4 Government Policies for Food and Nutrition Security

1.4.20

There have been initiatives aimed at providing the necessary policy environment for addressing food insecurity in Nigeria, but they have been accompanied by inconsistency, poor targeting, a lack of commitment, and improper coordination. Therefore, the various policies need to be re-energized. Some policies, such as export trade policies (e.g. encouragement of processed cassava export) and import trade policies (e.g. the recent reduction in tariffs and the lifting of import bans and the temporary abolition of duties on some agricultural products) are even leading to food insecurity.

1.4.21

Nigeria's federal government has several policies and programmes in place to address agricultural production and food security. These programmes and projects as well as various Presidential Initiatives are summarized in the Annex Tables 21 and 22 (Akinyele 2009). Table 21 lists 12 programmes and generally the weaknesses revolve around instability in approach and lack of long term political commitment. Therefore programmes are not sustainable. The Presidential initiative appears to have achieved more, prompted by directive from the top of Government.

5.2.5 Strengths and Weaknesses of Policies and Programmes to address Food Insecurity and Malnutrition

While most of the programmes initiated by the government addressing food and nutrition security appear to have made progress, they have not lead to self-sufficiency or reduce malnutrition. Some of the salient reasons for the ineffectiveness of the various efforts aimed at achieving food security in Nigeria include (Mohammed, 2006):

- Policy inconsistency and administrative dislocations of the federal departments in charge of the various programmes.
- Inability to sustain funding of the programmes.
- Instability of the research institutes due to their constant movement among ministries and poor funding.
- Unnecessary political interference and managerial problems, resulting from socioeconomic cleavages, which permeated the nation's sociopolitical, economic, and cultural institutions.

- Lack of qualified manpower to provide effective leadership for the various programs.
- Lack of continuity and shifts in approach by successive governments.
- Poor funding and lack of institutional arrangements for implementation.
- Lack of funds and commitment limiting the extent of infrastructural provision in the rural areas.
- Government infrastructural programmes embarked upon without effective planning or institutional arrangements for their execution and continuity.

Annex Table 20 (Akinyele, 2009) provides a summary of the weaknesses of each of the programmes and policies related to agricultural production and food security. This shows that, generally, structures are in place set up in a manner to get results, but that implementation is slow and lacks a focus to drive it along.

1.4.22 5.2.6 The Scaling Up Nutrition Movement

As noted above, Nigeria launched a National Plan of Action for Food and Nutrition in 2004. However it is attempting to accelerate this Plan of Action by signing up to the Global Scaling up Nutrition (SUN) Movement. A national summit was convened in February 2012 with the aim of expanding the dialogue on national nutrition. It was concluded that the National Plan on Food and Nutrition (2002) has largely remained unimplemented due to lack of budgetary allocation, and that it does not address the emerging nutrition issues. The National Nutrition Council has yet to be inaugurated.

The objectives of this Summit were to:

- Identify, prioritise and discuss major challenges with nutrition in Nigeria and recommend necessary policy and programme action to address them;
- Advocate for increased resource allocations for nutrition interventions by all stakeholders in Nigeria, and
- Deliberate and develop a road map for scaling up nutrition in Nigeria

Observations from the Summit concluded that (inter alia):

- There is a policy and plan of action in place
- Evidence based interventions are being implemented but coverage is low
- There are a large number of development partners providing technical and financial support to nutrition
- The National Plan of Action has remained unimplemented because of a lack of adequate budget and the existing national policy does not address some emerging issues
- The National Nutrition Council is yet to be inaugurated
- The National Committee on Food and Nutrition is not functional
- There is a lack of technical capacity both in the National planning Commission and across all sectors generally,
- Community involvement in nutrition activities has been weak.

The Summit concluded that there is a need to provide adequate public funding, to revise national plans, senior nutritionists be appointed to remedy lack of capacity, nutrition concerns should be mainstreamed into agriculture and other relevant sector plans and develop a team of champions to push advocacy.

A major roadblock is the lack of a dedicated budget to nutrition. However funding is available if it was channelled in the right direction, and this could be supplemented by donors. At the Federal level nutrition has to be funded at present from the primary health care line. In addition the Federal and States governance system represents both constraints and opportunities. The Federal level

has the role of advising and coordinating making while implementation and sustainability takes place at the state level. If a small number of State Governors became nutrition 'champions', then they might be able to have a real impact at that level and inspire others to do the same, and build in a commitment that is demanded from communities in other states.

1.4.23 5.2.7 Nutrition Commitment Audit

ORIE has prepared a separate nutrition commitment audit which assesses the government's commitment to improve nutrition in terms of government policies and programmes, legal frameworks, and public expenditure. The information in the audit complements the information provided in this section of the literature review

Summing up on Interventions on Nutrition Governance in Nigeria

A review of the nutrition governance in Nigeria shows a plethora of plans and activities and motivation to take action but a lack of commitment. However the issues involved in terms of the size and diversity of the nation must be emphasized. There are very few direct interventions in nutrition. Targets are set and plans laid out addressing underlying and basic causes but there is no strong commitment or budget lines. There is no dedicated budget line for nutrition. The nutrition planning has received a new boost with the SUN movement and there is an infrastructure to build on. However much power lies in the 36 states and the Federal level can only coordinate, promote and encourage.

6. Summing up on Objectives

These objectives of this review of research and information are:

- To inform ORIE research and evaluation designs and planning by reviewing what we know about child and maternal under nutrition in Northern Nigeria and where there are gaps in knowledge that we should seek to fill
- To inform WINNN programme design and implementation by understanding what is needed in Northern Nigeria, what has already been done in Northern Nigeria, and what has worked in other contexts
- To inform DFID on possible pilot schemes to tackle the underlying determinants of childhood stunting in Northern Nigeria

6.1 Gaps in data, data quality and the role of a cohort study

There are serious gaps in the availability of data on nutrition in Nigeria, and the North, and concerns about the quality of some of the available data. As noted in Section 1, there are four sets of data from national surveys: DHS 1990, DHS 2003, MICS 2007 and DHS 2008 (the MICS 2012 results are still to come). There are discrepancies between some of the data sets: calculations for this paper have shown that there are some quite extreme instances where there are 10% differences between state estimates in the MICS 2007 and the NDHS 2008. These differences may be due to methodology, timing and context. Regardless of these differences, the surveys have showed is that the problem of child nutrition is serious. There may be scope for analysis of anthropometric data in the NFCNS data³⁹ which has so far received little attention, and when MICS 2012 becomes available, there will be further opportunities to assess trends in nutritional status.

There is an important gap in the availability of data on food consumption nationally and in the five Programme states. There has been one national food consumption survey – the NFCNS (2003) based on a one visit ‘food groups in the last week’ enquiry and a few micro studies based on more intensive questioning. No surveys using more precise methods such as quantitative 24 hour recall and or even seven day weighing have been undertaken. This leaves a major gap in our understanding of one of the immediate cause of under nutrition. A reviewer of this paper pointed out that an expanded follow-up survey of food consumption was planned as part of the National Plan of Action on Food and Nutrition but funds have not been allocated to the study.

This review uncovered some small scale surveys studies at village, hospital or clinic level, including the Northern states. These studies have generally been limited to small sample sizes and are often based on one- time interview. There is a need for studies of varying sample sizes and several rounds of data that can gain some insight into context-specific factors such as seasonality and the multiple livelihoods and sources of income in which people are engaged, even if they are not designed to give representative results. More qualitative approaches using techniques such as nutrition diagnostic tools and the Delphi studies to collect data from all kinds of respondents – from villagers through to professionals – could also be employed to elicit knowledge on the underlying causes of under nutrition.

As noted in Section 2 the existing large data sets allow the analysis of some of the determinants of child under nutrition in the context of northern Nigeria, but to achieve sustained improvements in child nutrition it is important to understand more about the complex pathways underlying child under nutrition with the help of longitudinal data. The ORIE programme expects to undertake a

³⁹ Little analysis of this data has been done: the main report is available from IITA or USAID as well as the entire database at IITA.

study to follow a cohort of children from birth or 1-2 months of age prospectively for 18 months, using a baseline and a follow-up survey to examine factors associated with a failure to show adequate linear growth over the first 24 months of life in the context of the WINNN programme. This review of literature did not uncover an existing longitudinal cohort study. The study will collect and analyze quantitative and qualitative data on the child, mother, father, household and community. It will examine context-specific factors which influence child nutrition such as the semi-secluded status of women and the effect on their autonomy, decision-making power and health-seeking behavior, the economic behavior of households including the multiple sources of income and the separate economic spheres of husbands and wives, the polygamous nature of households, and the seasonality of agricultural activity and incomes.

Lastly, there is a dearth of evaluation studies assessing the impact of existing direct and indirect nutrition interventions; there is a need for programmes to routinely collect and analyse monitoring and evaluation data and, where appropriate, to set up systems for impact evaluation at the outset. ORIE will contribute in this regard, by conducting operations research and impact evaluation on the interventions implemented by WINNN.

6.2 Information to Inform WINNN Programmes

This review of literature shows that the WINNN programme is on course has effective components to build on existing programme experience in northern Nigeria. Generally, the available evidence shows that national programmes have less reach and impact in the rural northern states because: remoteness, cultural conservatism and the minimal participation of women and their children in state institutions such as health clinics and schools, among other reasons.

All the three outputs of CMAM, IYCF and micronutrient and deworming interventions can build on effective interventions by other organisations (including the state governments) that have had an impact. But WINNN must be prepared for slower uptake of the interventions than would be the case in southern states (for the reasons mentioned above). Although there will be no opposition for mothers and children to use the interventions, the infrastructure will be new to many conservative rural communities and full engagement with the local community structures must be developed.

As regards the fourth output of WINNN – more effective government planning and coordination – the review shows no shortage of good intentions but implementation has been weak. Power resides at the state level and WINNN must be prepared to advocate vigorously with State governors and give the required support to the implementing agencies (expected to be the PHC system).

6.3 Pilot Schemes which could tackle underlying determinants of child under nutrition

As noted above the evidence base on which to suggest pilot schemes to understand and tackle child under nutrition is weak. In carrying out the review of global evidence, there were two constraints in particular. First of all there were few examples of interventions that could show unambiguous links with improving nutrition (e.g. especially in agriculture and food security), and second very few studies were undertaken in contexts similar to the Sudano-sahelian region of the five programme states (e.g. other parts of West Africa, semi arid parts of India, Eastern and Southern Africa), with similar seasonal patterns of agricultural production and income, semi secluded mothers, and a weak health infrastructure. Some suggestions follow below.

Social protection: Some of the poorest families are the landless, those with very little land and the indigent. Many survive at a minimum level because of the Hausa gift giving tradition. A social protection scheme, and or a public works or food for work programme could help to improve the magnitude and regularity of household incomes and therefore child nutrition. The background

information in this review might be used to make DFID's Targeted Cash Transfers (TCT) more nutrition-sensitive.

Household food security (HFS): the evidence on the links between agriculture, food security and nutrition is tenuous, but there is a case for designing programmes to try to improve food security and nutrition based on very context-specific knowledge of the nature of household economies in the North, such as the complex mix of individual and joint economic activities, the nature of gender roles and relations, and the secluded nature of women's activities. Such programmes would help us to understand how interventions to improve household food security need to be designed and implemented in Northern Nigeria in order to have an impact on child nutrition. .

Micro credit for women: there is evidence pointing to the effectiveness of micro-credit targeted at women in enhancing women's incomes and spending power and improving their children's nutritional status. There are a large number of microcredit programmes in Nigeria, in addition to which many women run their own informal schemes. A pilot scheme could explore how to most effectively target credit at women, examining whether they have the power to allocate extra income generated and to what degree it is channeled to spending which helps to improve child nutrition. The DFID funded

Rural Agricultural Markets Programme (RAMP) could be used to target women traders and farmers, including those whose activities are 'managed' by their husbands).

There is scope for DFID to enhance the nutrition-sensitivity of some of its existing programmes in Northern Nigeria. These include for example:

- The Partnership for Transforming Health Systems in Nigeria (PATHS): Objective: To improve the planning, financing and delivery of sustainable and replicable pro-poor services for common health problems in 5 States. The programme might examine how nutrition can be better integrated into health care services of all types.
- Partnership for Revival of Routine Immunisation in Northern Nigeria (PRINN) and Maternal New Born Child Health (MNCH): Objective: To improve effective access to maternal, neo-natal and child health, including routine immunisation (RI) services in four states by improving delivery of RI for children and women of reproductive age via the primary health care system. This might examine how nutrition can be part of the immunisation infrastructure.
- Support to National Malaria Project (SUNMAP): Objective: To strengthen delivery of Nigeria's National Malaria Control Effort. There is scope to examine the interaction between malaria and child and maternal nutrition.
- Health Reform Foundation of Nigeria (HERFON); Objective: To start or strengthen broad based reforms in Nigeria's health sector in up to 12 States. Again, nutrition can be integrated.
- Sanitation, Hygiene and Water in Nigeria (SHAWN). Objective: To accelerate and sustain progress in safe excreta disposal, adoption of basic hygiene practices and consumption of safe water in rural areas of Nigeria. SHAWN is extremely important to improving nutrition.
- Health Financing: Objective: To improve the equity and effectiveness of health financing in Nigeria to enable poor women and children to secure access to life-saving basic maternal and child health services free at the point of use. Again, nutrition services should be integrated into maternal and child health services.
- Girls Education Project (GEP): Objective: To improve girls' access, attendance, retention and relevant learning outcomes at primary and junior secondary level. Extending girl's education is a crucial step to delaying marriage and age of first pregnancy, thereby improving child nutritional outcomes. It is also key to increasing women's power in their marriages and households and their control over their children's health and nutrition.

- Women 4 Women: Objective: To train 7000 female health workers in Northern Nigeria. Female health workers can be key providers of health and nutrition information and services to semi-secluded women.

DFID also has programmes in Governance and Social Development where the importance of nutrition as a governance issue could be mainstreamed as well as the demand for nutrition services enhanced:

- State Partnership for Accountability Responsiveness and Capability (SPARC). Objective: To increase efficiency and effectiveness of selected state level governments' use of public resources/public financial management.
- Mobilisation for MDGs (M4M) Objective: To increase progress towards achievement of the MDGs in Nigeria to increase accountability and responsiveness of policy makers and service providers to citizens.

Annex 1: Terms of Reference for this Literature review

1. Review and summarise existing data on maternal and child nutritional status in Northern Nigeria
2. Review the evidence on direct nutrition interventions in Nigeria and globally which have (and have not) helped to reduce maternal and child under nutrition, focusing on the interventions and outputs proposed in the Northern Nigeria WINNN programme (CMAM, IYCF practices, micro-nutrient supplementation and deworming etc)
3. Review the evidence on indirect 'nutrition-sensitive' policies and programmes in Nigeria and globally (income generation/social protection; food security; water and sanitation; women's empowerment etc) which have (and have not) helped to reduce maternal and child under nutrition,
4. Review the evidence on strategies to increase the effectiveness of government coordination and planning in nutrition and related sectors at national and state levels, and the integration of nutrition interventions into government-funded routine health services, in Nigeria and globally
5. Make recommendations on possible pilot schemes which can tackle the underlying determinants of child stunting in Northern Nigeria
6. Establish if a cohort study in Years 1-2 can provide useful new information on the underlying determinants of child stunting in Northern Nigeria which can be used to design pilot schemes to tackle stunting
7. Review existing sources of quantitative data on nutritional status, assess their reliability, and consider if they can be used as sources of information for the WINNN programme, thereby making use of existing data and avoiding duplication in data collection and analysis
8. Provide information for, and dovetail with, the nutrition commitment audit to be undertaken by IDS
9. Make note of potential stakeholders as they emerge in the review and provide information for the stakeholder mapping and consultation to be undertaken by IDS

Annex Tables

Table 15 Impact of the Interventions on diet composition (global review)

Study	Statistical significance of the difference observed	Food Items	Observed Population
Bushamuka et al. (2005)	**	Higher consumption of vegetables, rice, fish, oils; stable consumption of meat; reduction in consumption of pulses.	Households
De Pee et al. (1998)	**	Higher consumption of plant food but lower consumption of animal food	Women
Faber et al. (2002)	**	Higher consumption of carrots, butternut squash and spinach	Children 2-5 years
Greiner and Mitra (1995)	**	Higher consumption of oil rich foods, green leafy vegetables but not of yellow fruit	Children 1-6 years
Hoorweg et al. (2000)	***	40% higher milk intake	Households
Jones et al (2005)	***	Higher consumption of green leafy vegetables and orange-fleshed potatoes and fruit but no difference in the consumption of animal source food.	Households
Kidala et al. (2000)	***	Higher consumption of vitamin A rich food	Children 6-71 months
Laurie and Faber (2008)	**	Higher consumption of butternut, sweet potato, but not of carrot and pumpkin	Children 1-5 years
Low et al. (2007)	***	Higher dietary diversity and higher consumption of papaya, orange-fleshed potato and dark green leaves	Children 6-59 months
Marsh (1998)	(no statistical test)	Higher consumption of vegetables	Children under five
Murshree-e-Jahan et al. (2010)	(no statistical test)	Higher consumption of fish but lower consumption of staple cereals	Households
Nielsen et al. (2003)	n.s.	No difference found in any element of the diet composition	Women and 6-12 year old daughters
Olney et al. (2009)	**	Higher dietary diversity and higher consumption of liver, meat and eggs among children but not mothers	Women and children under five
Roos et al. (2003)	n.s.	No differences in fish intake	Households
Schipani et al. (2002)	n.s.	No difference in any component of the diet	Household and children under five
Shmidt and Vorster (1995)	n.s	No difference in the consumption of vegetables	Children 6-13 years
Smitasiri et al. (1999)	***	Increase in the consumption of vitamin A rich food and fats	Preschool girls, school girls 10-13 years, lactating and pregnant women.
Talukder et al. (2010)	*	Higher consumption of chicken liver and animal food but not of vegetables	Household and children 6-59 months
Vijayaraghaven et al. (1997)	**	Higher consumption of Vitamin A rich food	Preschool children

Note: in the second column, n.s. is not statistically significant, * is statistically significant at the 10% level, ** is significant at the 5% level, *** is significant at the 1% level.

Source: Masset et al, 2011

Table 16 Impact of the Interventions on Iron intake (global review)

Study	Iron Measurement	Statistical significance of the difference	Impact
Olney et al. (2009)	Haemoglobin	n.s.	No differences in levels among women and children under five
Schipani et al. (2002)	Serum ferritin and haemoglobin	n.s.	No differences in levels among women and children under five
Roos et al. (2003)	Food consumption	n.s.	No difference in household iron intake
Talukder et al. (2010)	Anaemia prevalence	** (in Nepal) * (Bangladesh)	Difference found among non-pregnant women in Bangladesh and Nepal but not in Cambodia

Note: in the second column, n.s. is not statistically significant, * is statistically significant at the 10% level, ** is significant at the 5% level, *** is significant at the 1% level.

Source: Masset et al, 2011

Table 17 Forest Plot of differences between project and control areas in serum retinol concentrations (micrograms/dl.) among children under five (global review)

Country	Survey year	Population in 2007	Stunted				Underweight				Wasted			
			%	Rank	Number	Rank	%	Rank	Number	Rank	%	Rank	Number	Rank
Benin	2006	1,467,390	43.1	4	632,445	12	18.4	12	270,000	12	8.4	9	123,261	12
Burkina Faso	2003	2,733,427	38.7	7	1,057,836	7	37.7	3	1,030,502	7	18.6	1	508,417	5
Cameroon	2004	2,832,420	31.7	11	897,877	10	18.1	13	512,668	11	18.6	1	526,830	4
Chad	2004	1,805,674	40.9	5	738,521	11	36.7	4	662,682	9	13.5	4	243,766	9
Congo DR	2007	11,843,507	45.5	3	5,388,796	3	25.1	7	2,972,720	3	10.0	8	1,184,351	3
Ethiopia	2005	14,894,947	46.5	2	6,926,150	2	38.4	2	5,719,660	2	10.5	7	1,563,969	2
Ghana	2003	3,186,802	29.9	13	952,854	8	22.1	8	704,283	8	7.1	11	226,263	10
Kenya	2003	6,392,809	30.3	12	1,937,021	5	19.9	10	1,272,169	5	5.6	12	357,997	7
Liberia	2007	556,200	39.4	6	219,143	13	19.2	11	106,790	13	7.5	10	41,715	13
Mali	2006	2,406,914	37.7	9	907,407	9	26.7	6	642,646	10	15.2	3	365,851	6
Niger	2006	2,435,054	58.9	1	1,434,247	6	51.9	1	1,263,793	6	10.8	6	262,986	8
Nigeria	2007	22,997,861	34.3	10	7,888,266	1	25.3	5	5,818,459	1	10.8	5	2,483,769	1
Tanzania	2004	6,358,137	37.7	8	2,397,018	4	21.8	9	1,386,074	4	3.0	13	190,744	11

Source: Masset et al 2011

Table 18 Impact of the interventions on total household income (global review)

Study	Impact	Description
Hoorweg et al. (2000), Kenya	Positive (statistically significant at 000.1)	Income among dairy farmers is 40% higher than among non dairy farmers
Marsh et al ((1998), Bangladesh	Positive (no statistical test)	Households with home garden have slightly higher incomes
Murshed-e-Jahan (2010), Bangladesh	Positive (no statistical test)	Income increases more rapidly among farmers in aquaculture programme and at the end line is 40% higher in the project group
Nielsen et al. (2003), Bangladesh	Positive (no statistical test)	Income is 15% higher among households in a poultry promotion programme
Schipani et al. (2002) Thailand	Positive (no statistical test)	Income is 60% higher among families with home gardens

Source: Masset et al 2011

Table 18 Impact of Growth monitoring and Promotion in two States of Nigeria (GINA II)

	Nassarawa State	Akwa-Ibom State
Nutritional Surveillance	In June, 11.1% of children were moderately/severely underweight, an increase of 2% over May. Severe underweight prevalence increased from 0% in May to 1.7% in June. In July, overall underweight prevalence fell to 7.4% reflecting a drop of nearly 4% in moderate underweight with essentially no change in the prevalence of severe underweight. In August only 2.4% of the children weighed were underweight.	In June, 19% of children weighed were moderately/severely underweight, a 4% increase over the previous month, with nearly all the increase seen in the % of moderately malnourished children. In July moderate/severe underweight increased 10% over the June figures. Due to implementation difficulties, GMP was conducted in only one of the 3 communities during August.
Growth Promotion	Of those children for whom a growth trend could be measured in June (those with 2 consecutive weightings) only 7% had a positive slope in their growth curve. The % with a positive slope increased to 13.5% in July and to 30% in August. Most of the increase in the % with a positive growth trend was seen from a decrease in children with flat growth curves, with the % losing weight (negative slope growth curve) constant except for a small reduction in August.	In June, 11.4% of children for whom a growth trend was available showed a positive growth curve, and 25% showed negative growth. While the % of children with positive growth was roughly the same in July, the % with negative growth fell by 11%.

Table 20 Agricultural Production and Food Security Programme Implementation in Nigeria

Programme	Strengths	Weaknesses
Primary Health Care Approach	Seeks to promote the integration of nutrition activities into the health care system	Weak health system and poor implementation of PHC as vertical programme
Accelerated Child Survival and Development	Seeks to integrate the components of child survival and development	Too early to evaluate effectiveness; implementation progress is slow now that it is merged with IMNCH
Catchments Area Planning and Action	Approach is community driven and interactive, offering greater flexibility and innovation	Health system support is weak, no strong sustainability since donor support ended
Gender Informed Nutrition and Agriculture	Existence of multiple partners working together, including FBF1, COMPASS, BASICS III and USAID	Inadequate stakeholders' understanding of aims, roles and responsibilities; socio cultural barriers among the poor; and illiteracy and lack of basic numeric skills.
Home Grown School Feeding and Health programme	Increase enrolment in schools and improved performance of children	Design not adequate, state government buy-in is slow and no impact assessment indicators exist.
Vitamin A Supplementation	The National Food and Nutrition Policy is in place and provides a reference point for vitamin A supplementation; trained vaccinators also visit the markets, places of worship, and day care centres for young children; each round is over a period of 3-7 days	The National Food and Nutrition Policy talks about MNDC emphasising food fortification and dietary diversification but makes no mention of the role of vitamin A supplementation to control vitamin A Deficiency and improve child survival
Food Fortification and Bio fortification	Increasing population coverage for vitamin and mineral consumption	Acceptability of products in rural areas not ascertained.
Salt Iodisation	Coverage of all households (97%)	Inability to determine the amount of iodine consumed at the household level

Vitamin A food fortification	Makes Vitamin A available to all members of the population	No guaranteed protection for consumers from over-consumption of vitamin A from the many products fortified.
National Special programme on Food Security	Activities in many communities to assure food security	Difficult to document the level of production and impact

Source: Akinyele 2009

Table 191 Nigeria Government agricultural initiatives: (1930s-1970s)

Programme/project	Description	Weakness
Cooperatives (1935 – date)	The Nigerian cooperative Ordinance was promulgated in 1935 to regulate cooperative activities in the country. In 1974 a law was enacted establishing the Dept. Of Cooperatives	Policy inconsistency and administrative dislocations of the federal departments in charge of cooperatives.
Commodity Boards 1947-1986	Commodity marketing Boards started during the colonial era with the establishment of the first marketing Board in 1947: palm produce, Groundnut and Cotton marketing Boards were formed in 1949. The second generation, established in 1954, were the regional marketing boards which served as buyers of last resort at fixed prices and held buffer stock.	Inability to pay farmers the subsistence market price then. Scrapped in 1986 under the Structural Adjustment Programme.
Agricultural Research Institutes (1964 – date)	Five research institutes, namely: Cocoa, Oil, Palm, Rubber and Trypanosomiasis were established by the Nigeria Research institute Act in 1964. In 1975 the Agricultural Research Institute decree came into effect, establishing additional research institutes.	Inability of the research institutes as a result of their constants movement from one ministry to another. There was also a major funding problem.
National Accelerated Food Production (NAFPP) (1970s)	Objectives were to increase the yield of seed varieties, enhance fertiliser use and promote extension and credit services as well as adaptive research and staff training. A number of national crop centres were introduced at different locations: Ibadan (rice and maize); Zaria (sorghum, millet and wheat) and Umudike (cassava)	Started very well but the wheat programme was affected by a basic withdrawal of political support and the lifting of the ban on wheat imports.
Nigerian Agricultural cooperative bank (NACB) 1973- date	The main specialised institution for agricultural credit delivery in the country	Directed to provide subsidised credit at single digit interest rate without the corresponding government subsidy. Needs to be reformed for greater efficiency and effectiveness in resource mobilisation and credit delivery.
Agricultural Development Projects (ADPs) (1975-present)	World Bank funded at inception; ADP revolution started in 1974 with the Gusau, Funtua and Gombe ADPs. They were set up to provide extension services, technical input support and rural infrastructure services. They are now recognised as the major	The decline in oil prices that started in 1982 had a substantial fiscal effect in Nigeria and led to shortages of counterpart funds for these projects. The emphasis on modern technology in the ADPs led their agricultural research and extension services to focus on relatively high input

	agricultural development institutions in the country.	technology for sole cropping systems. These systems were not used by the majority of small holders who used mixed/relay cropping systems as a rational strategy to reduce risks. With extension methods, the change from training and demonstration to the TV system was slow, resulting in top down, rather than responsive recommendations to farmers.
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1970s-present

Programme/project	Description	Weakness
River Basin Development Authorities (RBDAs) 1977-present	The major instrument of the water Resources and Irrigation Policy was the establishment of 11 RBDAs in 1977 to develop and take advantage of available water bodies in the country for agriculture, fishing and other purposes.	The failure of the RBDAs was due to unnecessary political interference and managerial problems resulting from socio economic cleavages which permeated the nation's socio-political, economic and cultural institutions. A lack of qualified manpower to provide effective leadership at the departmental levels also played a role.
Operation Feed the Nation (1976-1979)	This was mass mobilisation and mass awareness programme created in 1976 through 1979 in reaction to the first real food crisis in the country.	The lack of continuity and shifts in approach by successive governments were the reasons for the failure of the programme.
Green Revolution (1979-1883)	The programme focussed on food production, input supply and subsidy, special commodity development, review of agricultural credit guarantee schemes, and increased resource allocation to RBDAs.	The lack of continuity and shifts in approach by successive governments were the reasons for the failure of the programme.
Directorate of Food and Roads and Rural Infrastructure (DFRRI) (1986-1993)	DFRRI was established in late 1986 to accelerate the rate of infrastructure development in the rural areas. It was originally designed as a supra-ministerial body for channelling the proceeds of the liberalised foreign exchange market for rural development	The lack of funds and commitment limited the extent of infrastructural provision in the rural areas. The government infrastructural programme was embarked upon without effective planning and without institutional arrangements for their execution.
National Agricultural Land Development Authority (NALDA) (1991-1999)	The authority's objectives include providing strategic public support for land development, promoting and supporting optimum used of Nigeria's rural land resources, providing gainful employment for rural people and raising incomes, and improving general living standards in rural areas.	The NALDA approach increased rather than reduced the direct public provision of goods and services which could be provided by the private sector instead. Many of the NALDA's services were duplications, albeit on a more intensive basis than services provided by the ADPs.
Presidential Incentives on Cocoa, Cassava, Rice, Livestock, Fisheries, vegetables (1999-2007)	These were initiated by the last administration in an effort to improve Nigeria's food production in line with Vision 2020. The strategy is to attract the attention of the highest level of political authority for special interventions in the commodity sector.	Weaknesses were poor funding and lack of institutional arrangements for implementation.

Source: Report of the National Programme for Food Security, Federal Ministry of Agriculture and Water Resources, May 2008

Table 202 Nigerian Presidential Development Initiatives (2008)

Presidential Initiative	Target	Achievement to date
Increased Rice production	Increased rice production and export so as to produce 6m mt of rice by 2005 and surplus for export by 2007.	Through R-Box technology, increased yield of 3.5-7.5 tons has been recorded Training of 370 extension agents Training of 1,250 farmers in 25 states and FCT on R-Box technology Training of engineers and technicians in handling of rice-processing equipment Attainment of national output of 0.8m mt , causing a reduction in imports(3m mt to 1.3m mt) in 2004
Cassava production and processing	Increased cassava production and export with target earning of US 5.0b from cassava export in 3 years. The specific target is to produce 150m mt of cassava per year by the end of 2006.	Expansion of export trade on cassava Development of processing equipment Local processing centres established in each Local Government Area Production of 18,000 bundles of breeder stock at National Root and Cash Crop Research Institute at Umudike Production of 12,000 bundles of foundation stock by Root and Tuber Expansion Programme Development of new varieties with a yield of 30-80 t/ha against 12-15 t/ha of local varieties
Vegetable Oil production	Bridge the supply and demand shortfall of about 300,000 tons/litres and attain self sufficiency within 5 years Fabricate processing machines	Production of 102,000 sprouted nuts Production of 29.27 mt of foundation seeds Production of 40.04 mt of groundnut seed Procurement and distribution of 175.11 mt of seed cotton Training of 100 oil palm nursery operators and equipment fabricators at national institute for Oil Palm Research Training of 100 extension staff Promotion of radio jingles on Federal Radio Corporation Procurement of 70,000 jute bags Fabrication of two soya bean layers Privatisation of Federal Oil palm estate at Ore-Irele (Ondo state)
Livestock Production	Improve animal protein intake by 50% within 3 years. Produce for export within the next 5 years and expand diary production. Develop small holder poultry scheme and rehabilitate existing infrastructure	Procurement of 300 million doses of contagious bovine pleuropneumonia from National Veterinary Research institute Procurement of 200,000 disposable syringes Procurement of 200,000 day old chicks from national Animal Production Research Institute Development of three earth dams at Adamawa, Borno and Kwara states Rehabilitation of infrastructure at cattle multiplication centres Procurement of 25 tons of cattle premix, 70 t of cotton seeds, cake and 5,000 blocks of mineral salt licks.

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