

Researching livelihoods and
services affected by conflict

Blockages to preventing malnutrition in Kambia, Sierra Leone: a semi- quantitative causal analysis



Working Paper 19

Paul Binns, Ernest Guevarra, Mohamed Jalloh and Melrose Tucker

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- State capacity: building effective states that deliver services and social protection in conflict-affected situations
- Livelihood trajectories and economic activity in conflict-affected situations

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Secure Livelihoods Research Consortium
Overseas Development Institute
203 Blackfriars Road
London SE1 8NJ, UK

T +44 (0)20 7922 8221
F +44 (0)20 7922 0399
E slrc@odi.org.uk
W www.securelivelihoods.org

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Contents

About us	i
Tables, figures and boxes	iii
Acknowledgements	iv
Abbreviations and acronyms	vi
Executive summary	vii
1 Introduction and background	1
1.1 Overview of report structure	1
1.2 Overview of study design	2
1.3 Study constraints	2
2 SQUEAC investigation process	4
2.1 Stage 1 – Key informant interviews & data review	4
3 Barriers and boosters to the prevention of stunting	8
3.1 Questions arising from stage 1 investigation	8
3.2 Stage 2 Lot Quality Assurance Sampling (LQAS)	10
3.3 Concept map	13
3.4 Anthropometric measurement standardisation	13
3.5 Stage 3 – Matched Case-Control Study	16
4 Discussion	18
4.1 Household Factors	18
4.2 Infection	28
4.3 Breastfeeding	33
4.4 Adequate complementary feeding	33
5 Conclusions	37
6 Annexes	40
Annex 1: Consent form	40
Annex 1: Stage 1 Key informant interview questionnaire - Community Leaders	41
7 References	57

Tables, figures and boxes

Tables

Table 1: Summary of locations purposively sampled for SQUEAC - stage 1	5
Table 2: Summary of key informant and focus group discussions for stage 1	6
Table 3: List of boosters & barriers to the prevention of stunting in Kambia District	9
Table 4: Communities selected for Stage 2 LQAS sampling	11
Table 5: Hypothesis 1	12
Table 6: Hypothesis 2	12
Table 7: Hypothesis 3	12
Table 8: LQAS summary results for Kambia District	13

Figures

Figure 1: SQUEAC Mind Map image for the prevention of stunting in Kambia District	7
Figure 2: Image of concept map for prevention of stunting in Kambia District	15
Figure 3: Awareness and participation in community groups for stage 3 cases & controls	20
Figure 4: Box plot & stacked bar plot for ANC visits vs. stage 3 Cases and Controls	21
Figure 5: Scatter Plot of mothers' age against child's height for age Z score	22
Figure 6: Cases vs. Controls relative to household economy factors	22
Figure 7: Reports of moderate to severe hunger for stage 3 cases & controls	24
Figure 8: Maternal Dietary Diversity and MUAC vs. Controls & Cases of stunting	24
Figure 9: Maternal consumption of vitamin A rich and iron rich foods vs. stage 3 cases & controls	26
Figure 10: Access to an improved water source, clean drinking water and improved sanitation facilities vs. stage 3 cases & controls	27
Figure 11: Sanitary disposal of faeces and use of unimproved water for other household uses vs. stage 3 cases & controls	27
Figure 12: Stage 3 cases & controls vs episodes of childhood illnesses	28
Figure 13: Scatter plot for reported severity of diarrhoea against Height for Age Z score	29
Figure 14: Stage 3 Cases & Controls vs. recall of danger signs in childhood illnesses	29
Figure 15: Under-5 Card retention & BCG immunisation for cases & controls	31
Figure 16: Immunisation default and full immunisation for Cases & Controls	31
Figure 17: Child vitamin A supplementation for stage 3 cases & controls	32
Figure 18: Bar plot of cases & controls vs. delivery by a health professional	33
Figure 19: Age appropriate breastfeeding vs. stage 3 cases & controls	34
Figure 20: Bar plot of dietary diversity for stage 3 cases & controls	34
Figure 21: Box plot and bar plot of Infant and Young Child Feeding Index score for cases and controls	35
Figure 22: Age appropriate meal frequency for stage 3 cases and controls	36

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Abbreviations and acronyms

ANC	Ante Natal Clinic
BCG	Bacillus Calmette-Guérin (Tuberculosis Vaccine)
CDC	Centre for Disease Control
CHW	Community Health Worker
CMAM	Community-based Management of Malnutrition
CSAS	Centric Systematic Area Sampling
EBF	Exclusive Breast Feeding
EIB	Early Initiation of Breastfeeding
EPI	Expanded Programme on Immunisation
FANTA	Food and Nutrition Technical Assistance
FCHI	Free Health Care Initiative
HTML	Hypertext Mark-up Language
ICFI	Infant and Young Child Feeding Index
IEC	Information, Education and Communication
IYCF	Infant and Young Child Feeding
LQAS	Lot Quality assurance Sampling
MUAC	Mid Upper Arm Circumference
M2M Group	Mother to Mother Support Group
NGO	Non-Governmental Organisation
ODI	Overseas Development Institute
OTP	Outpatient Therapeutic Programme
PHU	Peripheral Health Unit
SLRC	Secure Livelihoods Research Consortium
SQUEAC	Semi Quantitative Evaluation of Access and Coverage
TBA	Traditional Birth Attendant
UNICEF	United Nations Children's Fund
WHO	World Health Organisation

Executive summary

The first report of the Secure Livelihoods Research Consortium (SLRC) Sierra Leone country programme identified a number of challenges and capacity restraints to the prevention of malnutrition in Sierra Leone (Denney *et al.* 2014). Building on this first report, a Semi-Quantitative Evaluation of Access and Coverage (SQUEAC) methodology was used to identify boosters and barriers to the prevention of malnutrition at the community level in Kambia District. The contributory factors identified in the SQUEAC investigation were then compiled into a conceptual framework for malnutrition. A caveat of the study findings is that the associations identified in some instances are not significant at the 95% confidence level, however the triangulation offered by the SQUEAC methodology suggests that this does not undermine the findings.

Baseline health and nutrition reports for Kambia District from several sources were inconsistent and suggestive of problems with accuracy and consistency. This finding was also borne out by contradictory evidence that emerged in this study. In particular, reports of high service coverage and appropriate Infant and Young Child Feeding (IYCF) practices are potentially misleading and may be a barrier to improved nutrition.

The field study was stratified by chiefdom at each stage of the investigation with a remarkable homogeneity in findings across the district. Overall, the prevention of malnutrition was affected by multiple factors and will require a range of interventions in order to reduce its prevalence:

- 1 A primary strategy for addressing IYCF practices in Sierra Leone appears to be through **Mother-to-Mother Support Groups** (M2M Groups). This study found these groups to be largely ineffective due to the low service coverage provided, compounded by a lack of properly trained members and the absence of relevant teaching aides. In communities with M2M Groups, the challenges of service quality were exacerbated by low levels of awareness of their activities. A radical overhaul of this approach and improved linkages between the M2M Groups and Peripheral Health Units is required for these preventative services to have an impact at the public health level.
- 2 Similar issues were identified at **Peripheral Health Unit** (PHU) level. Here IYCF training took place either in-service or informally on-the-job yet staff still did not provide the correct age appropriate messages. PHU staff thus require a formal update to their IYCF training and the relevant materials to assist in disseminating appropriate messages to the community. Training given in 2010 for WHO growth standards and the Community Based Management of Acute Malnutrition (CMAM) appears to have led to widespread implementation of the CMAM approach through PHU and community health services. However, despite the training, a low awareness of the symptoms of stunting and a lack of the appropriate tools to aid its identification remains a significant barrier to the prevention of malnutrition.
- 3 There is also a strong focus on detecting and referring cases of acute malnutrition through the use of **Community Health Workers** (CHWs). In theory, this can help to address lack of coverage and knowledge gaps faced by PHUs and M2M Groups. However, coordination of activities and external support and supervision will also require strengthening if the CHWs are to effectively perform their function.
- 4 **Traditional Birth Attendants** (TBAs) are a significant feature of community health services, particularly in relation to antenatal care. Efforts to change the behaviour of mothers, whether for IYCF practices or health seeking, will likely require the involvement of this influential cadre of workers, along with other providers of health services, such as **traditional healers**.
- 5 The uptake of services at village level through **vitamin A and deworming campaigns** appears to be high. Child vitamin A supplementation appears to be associated with a

reduced likelihood of malnutrition. In contrast, despite reported high immunisation coverage, the study found significant levels of default on the full child immunisation schedule. The follow-up of children defaulting on immunisation and of mothers defaulting on antenatal visits could be integrated into the role of the CHW. This would expand their current role in relation to monitoring immunisations which only takes place during maternal and child health week.

- 6 The majority of mothers perceive themselves to engage in **exclusive breastfeeding** although most of those mothers also give herbal medicines to infants from birth to six months. Men appear to play a major role in decision-making in the home in respect to exclusive breastfeeding and continued breastfeeding.
- 7 **Inadequate feeding frequency and low dietary diversity** was identified for children aged less than two years. This is compounded by **food taboos**, which can restrict dietary protein to children. In addition, **household food allocation** practices further limit the food quality and quantity allocated to mothers and children in favour of men and elders. Reduced maternal dietary diversity appeared to be linked to a greater likelihood of child stunting. A direct relationship also appears to exist between the mothers middle upper arm circumference (MUAC) and the child's length for age.
- 8 Reports of **episodes of diarrhoea, respiratory illness and fever** for the child appear to carry an increased likelihood of stunting. The same association was found with a lack of access to clean drinking water. These factors may be related and are consistent with reports from several communities of problems with the function of water pumps and limited access to clean water. The ability of mothers to recall danger signs associated with child illnesses appeared to be linked to a reduced likelihood of stunting. Improving access to clean drinking water and timely health-seeking behaviours, along with better access to medicines at community level, would likely contribute to a reduction of malnutrition.
- 9 Mothers reported their first pregnancy from 15-17 years of age, with a median age of 15, which correlated with the **early cessation of schooling** at the junior secondary school level. Strategies to prevent malnutrition should also incorporate efforts to retain girls in education until the age of eighteen. This would not only improve educational status but reduce the risks of maternal and child mortality and malnutrition associated with early teenage pregnancy.
- 10 While the awareness of community groups was generally low, the study found that the participation of husbands in community groups – such as M2M Groups – appeared to be associated with a lower risk of stunting. In aspects of child feeding, such as exclusive breastfeeding, continued breastfeeding, and household food allocation, men play a major role in decision-making. Given this, **involvement of men in community groups and as targets for behavioural change** would likely benefit strategies to reduce malnutrition.
- 11 Children whose **mothers earn an income** appear to have an increased likelihood of stunting. While counterintuitive, this suggests that women who work may not be able to devote as much time to breastfeeding and food preparation. This finding is interpreted with a high degree of caution as questions of income were not explored in the early stages of the investigation and had not been field tested. However, further investigation is warranted to determine how a mother's income can influence household nutrition.

The contributors to malnutrition are multifactorial and complex and so too must be the range of initiatives to prevent it. Many of the initiatives already existing at community level require strengthening and expansion to address the factors identified here. In addition, there is a need to target key decision-makers within households and traditional practices in order to achieve sustained behaviour change.

This SQUEAC study will be followed up by an additional stage of qualitative research carried out by the SLRC in Sierra Leone, to further examine the socio-cultural dynamics underlying the headline findings of this study

1 Introduction and background

A recent report of the Secure Livelihoods Research Consortium (SLRC), the first of a two-year project in Sierra Leone, identified a number of challenges and capacity restraints to the prevention of malnutrition in Sierra Leone (Denney, Jalloh, Mallett, Pratt, & Tucker, 2014). These need to be addressed if the state's capacity to prevent malnutrition is to be improved.

This report follows up on the original report by seeking to answer the following research question: **What are the blockages to preventing malnutrition at the district and community levels?**. This was underpinned by two research objectives, as follows:

- 1 Assess barriers and boosters to behaviour change in relation to maternal, infant and young child feeding practices in Kambia district.
- 2 Conduct a causal analysis of stunting in Kambia district.

In order to answer this question, a Semi Quantitative Evaluation of Access and Coverage (SQUEAC) methodology (detailed below) was adapted to undertake a causal analysis relating to the prevention of malnutrition in Kambia District, Sierra Leone. This will be followed up by an additional stage of qualitative research by the SLRC to further examine the socio-cultural dynamics underlying the SQUEAC findings.

Malnutrition arises from a deficiency in 'type 1' and 'type 2' nutrients¹. In particular 'type 2' nutrient deficiencies in children result in growth retardation which may be identified through a low height for age compared with normal growth patterns for well-nourished children.

Michael Golden states that:

The response to a prolonged mild deficiency of any of the type II nutrients is stunting, the extent of which is determined by the degree and duration of the deficiency. Acute deficiency leads to tissue loss and wasting in both children and adults. Mild chronic deficiencies are more common than severe acute deficiencies, so that stunting is more common than wasting. (Golden, 1996)

Stunting was thus used as a marker for malnutrition for the purposes of the SQUEAC. Stunting in this case was defined as being lower than 2 standard deviations below the median height for age according to the World Health Organisation's growth standards (World Health Organisation, 2006).

Susceptibility to nutritional deficiencies is greater among younger children and the capacity to reverse stunting diminishes after the age of two years (Gillespie & Flores, 2000). The SQUEAC examining the prevention of malnutrition in Kambia District therefore focused primarily on pregnant women, mothers and their children from birth to two years.

1.1 Overview of report structure

The report is structured according to the iterative nature of the SQUEAC methodology. In this methodology, the 'methods' and 'results' build on each other and are thus presented as relevant to each stage of the study described below and not in separate sections as would be expected for a normal reporting format.

¹ Nutrients of all types (macronutrients and micronutrients) are classified by Golden as type 1 or type 2 nutrients depending on their effect on growth. Signs and symptoms of type 1 nutrient deficiencies are specific and may be corrected by supplementation of the deficient nutrient. Type 1 deficiencies do not have an effect on growth. Signs and symptoms of type 2 nutrient deficiencies are non-specific and impact growth. All of the deficient type 2 nutrients must be present in the proper ratios for catch up growth to occur.

1.2 Overview of study design

Semi-quantitative Evaluation of Access and Coverage (SQUEAC) is a method developed by Valid International to evaluate access and coverage and has been tested across many different geographic contexts and programmes. It combines quantitative and qualitative data to provide in-depth analysis of the causes of under-nutrition, coverage of specific behaviours and/or interventions, and details of barriers and boosters to service uptake. The SQUEAC approach is well suited for application to the core research question stated above.

SQUEAC identifies the barriers and boosters that act to determine whether these initiatives ultimately impact the outcomes expected, i.e. maternal, infant and young child feeding practices. Interviews and focus group discussions with a range of key stakeholders and institutions at community level will collect qualitative data, the validity of which is ensured by triangulation by source and method. This data will be used to develop hypotheses on the level of uptake of various services, and on barriers and boosters to the adoption of critical maternal, infant and young child feeding practices. To test these hypotheses small studies are performed at community level that either randomly sample households or carers for interview, or that purposively select cases and controls for interview.

The collected data and information from the semi-quantitative investigation is used to generate hypotheses relating to chronic malnutrition causality to be tested using a matched case-control study. A matched case-control design is adopted, as this requires a smaller sample size than an unmatched design for the same statistical power. Matching is done on location, sex and age (in months). The causal analysis will identify risk factors and risk markers associated with stunting, e.g. poor maternal diet diversity, infection and the early introduction of fluids other than breast milk – a marker for poor IYCF practices.

The SQUEAC process is iterative and developed in 3 stages;

- Stage 1 – Examination of existing data
 - Key Informant Interviews
 - Focus Group Discussions
- Stage 2 – Lot Quality Assurance Sampling (LQAS)
 - Case Histories
- Stage 3 – Matched Case – Control Study

Information gathered during Stage 1 was managed through ‘mind-mapping’. Key components of the information were gathered and compared across the sampled areas for their homo/heterogeneity. Through the process of triangulation a list of potential barriers and boosters to the prevention of stunting were identified. From the mind map in stage 1 a concept map was developed. This provides a framework for understanding how each of the identified factors can contribute to the prevention of malnutrition.

Stage 2 used a LQAS methodology to test hypotheses developed from the stage 1 investigation and further clarify uncertainty of the nature of the barriers or boosters identified in stage 1.

Stage 3 used a matched case-control methodology to compare ‘cases’ (stunted children) with ‘controls’ (non-stunted children). This compares household factors, dietary diversity, IYCF practices, and health seeking behaviours to identify factors that contribute to stunting.

Specific methodologies and sampling frameworks for each stage of the investigation are identified under the relevant section of the SQUEAC process reported below.

1.3 Study constraints

A number of constraints were noted during the SQUEAC investigation, which potentially impacted on the findings of this research.

Household Food Insecurity: Extensive information relating to the sources of earned family income or subsistence agricultural activities was not collected. Household food security was assessed by proxy through the direct maternal food intake frequency and diversity and reference to periods of hunger. This is consistent with other described methods (Coates, Swindale, & Bilinsky, 2007).

Standardisation: It was not possible to standardise the anthropometric measurements of team leaders to a defined reference for accuracy. However, precision was good and the accuracy errors involved in MUAC and length measurement were considered within acceptable limits (<2mm & < 5mm respectively).

Growth chart errors: The Stage 3 matched case-control study incorrectly matched 3 pairs for stunting and non-stunting. It is presumed that the error is most likely due to errors in reading the height for age growth charts.

Reporting of food group diversity: In some cases children were reported as eating food groups normally unavailable to them due to food taboo or food allocation factors. This may overestimate child and mother dietary diversity through, for example, the inclusion of fish, which is frequently not consumed as flesh but is commonly present as fish grounds in soup with significantly less protein content.

While important, these constraints were not considered to be significant enough to undermine the value of the findings.

2 SQUEAC investigation process

The SQUEAC investigative method is iterative in nature. To reflect this process each stage of the investigation is reported in sequence below.

2.1 Stage 1 – Key informant interviews & data review

2.1.1 Existing data review

Data was gathered from several sources and included:

- Kambia PHU catchment village list (Excel file)
- Village List – Excel file – District Health Office
- Tools & Indicators for monitoring & evaluation of CMAM/IYCF programmes: Level 3 core indicators handbook 2013 – Sierra Leone MoHS
- Core Indicators Set: Kambia (baseline 2012 and end line 2013)
- Kambia District EPI report 2013 (Excel file)
- Kambia District Health Profile 2013 (Excel file)
- Kambia Nutrition Surveillance Report 2013 (Excel file)
- OTP database (Excel file)

Review of the data indicated high levels of immunisation coverage in Kambia district and nearly twice the national average exclusive breastfeeding rate. All IYCF indicators showed improvement over the 10 months of the reported period although the mean coverage of M2M Groups was 7.8% of communities/chiefdoms.

It was particularly noted by the study team that some of the data from the reports was inconsistent (e.g. district wide exclusive breastfeeding rates varied from 60% to 90%) while the majority of immunisation coverage reports suggested greater than 100% coverage despite other reports of default on immunisation.

The presence of M2M Groups reported not to be trained in IYCF practices was selected as the key factor for purposive sampling in stage 1 as described below.

2.1.2 Sampling framework

Locations for the stage 1 investigation were purposively sampled following a review of the existing data noted above and SQUEAC team background knowledge. It was determined that coverage of PHU services, reported service coverage for immunisation services and the presence of Community Health Workers (CHWs) was relatively uniform in Kambia district.

All chiefdoms were reported to have M2M Groups, which are promoted as a principal way to disseminate nutritional information to the community. Not all M2M Groups, however, had members who had been trained in IYCF. For the purposes of examining whether there was a difference in the IYCF practices of mothers in locations where the M2M Group had been trained compared with mothers not being exposed to these M2M Group messages, the purposive sample for stage 1 identified two locations within each chiefdom (see table 1);

- One location with a M2M Group reported to be trained in IYCF
- One location with a M2M Group reported to be untrained in IYCF or M2M Group was non-existent

One location in Magemba Chiefdom was used as a single location for field training for the SQUEAC team in the use of the questionnaires.

Table 1: Summary of locations purposively sampled for SQUEAC - stage 1

<u>Chiefdom</u>	<u>Village 1</u>	<u>TRAINED M2M Group</u>	<u>Village 2</u>	<u>TRAINED M2M Group</u>
Magemba	Sindougo	Yes		
Samu	Kasiere	Yes	Bapuya	No
Tonka Limba	Bubuya	No	Forekaia	Yes
Bramaia	Sulamaniya	No	Kukuna	Yes
Mambolo	Mayakie	Yes	Kobia	No

In each location the village chief or local community elder was consulted, the purpose of the study described and consent to interview members of the local community obtained. Subsequently, the purpose of the study was described to all interviewees, including the right to refuse participation, refuse information, or to terminate the interview at any time (see Annex 1). Consent was obtained and signed (signature or thumbprint) by the individual or designated group spokesperson.

2.1.3 Key informant interviews and focus group discussions

In the next stage, key informant interviews and focus group discussions were conducted at the purposively sampled locations. Questionnaires were administered at each location. The questionnaires were arranged thematically so as to triangulate information between respondents where possible. Responses were triangulated within locations and across locations to look for homogeneity / heterogeneity. The themes included:

- Health
- Nutrition
- Water and sanitation
- Household factors / food allocation / food security / education
- Maternal / Child nutrition
- Child care practices / immunisation services / health seeking behaviours
- Access to community meetings / barriers to attendance
- Support provided by programme partners
- Role of the clinic staff / CHWs / nutrition education
- Perception of malnutrition (and specifically stunting)

A separate questionnaire was prepared for each type of interview and used as guides to conduct the conversations but the iterative nature of the SQUEAC process allowed for the order of questions to be changed or for additional investigative questions to be asked. The questionnaires' frameworks for each interview type are presented in annexes 2 - 6. Table 2 below summarises the interviews conducted.

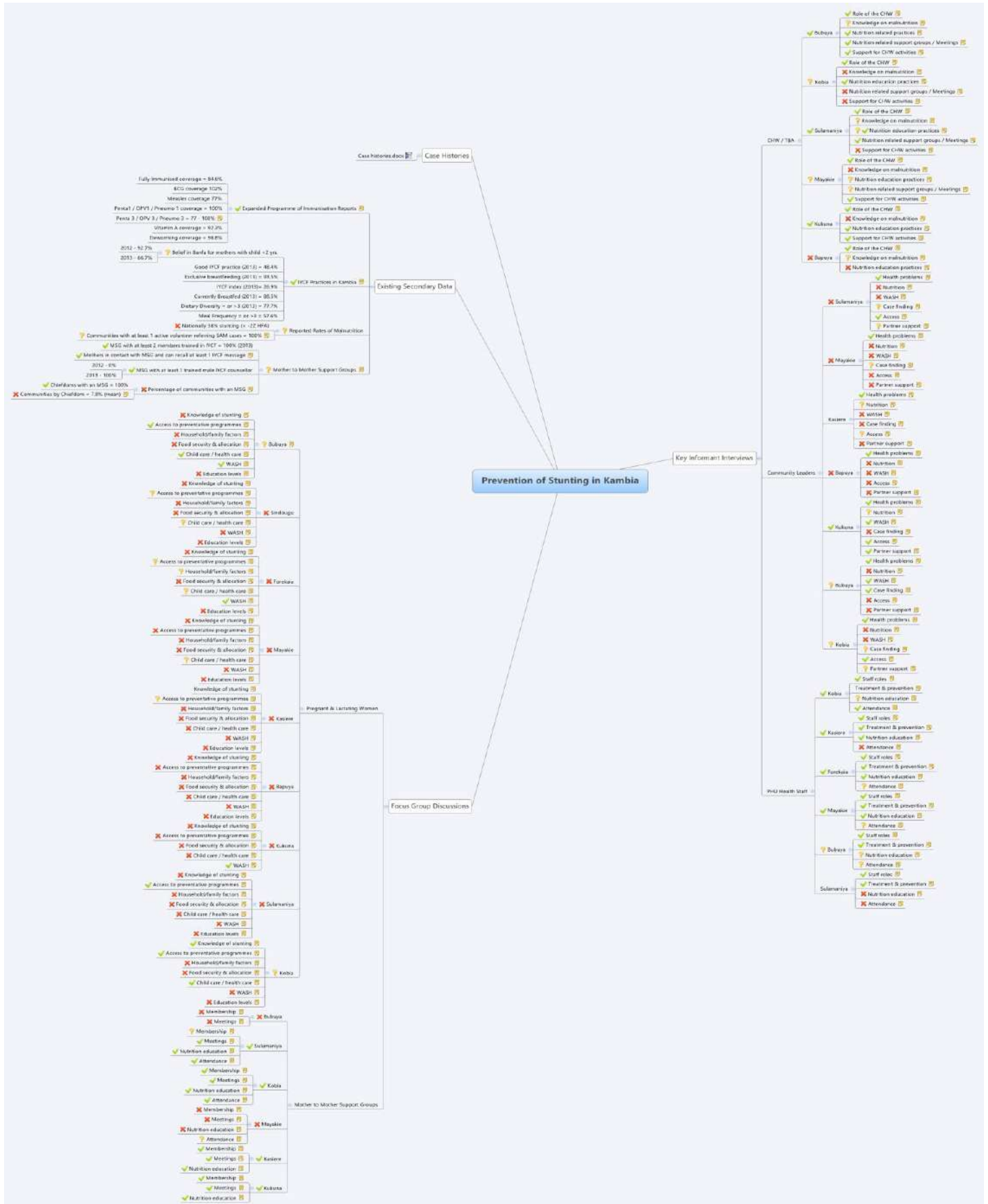
Table 2: Summary of key informant and focus group discussions for stage 1

Chiefdom	Village	Key Informant Interviews			Focus Group Discussions	
		Community leader(s)	Clinic staff	CHW / TBA	Mothers (pregnant or child <2yrs)	M2M Group members
Magemba	Sindougo	Yes	Yes	Yes	Yes	Yes
Samu	Kasiere	Yes	Yes	Yes	Yes	Yes
	Bapuya	Yes	Yes	Yes	Yes	No
Tonka Limba	Bubuya	Yes	Yes	Yes	Yes	No
	Forekaia	Yes	Yes	Yes	Yes	Yes
Bramaia	Sulamaniya	Yes	Yes	Yes	Yes	No
	Kukuna	Yes	Yes	Yes	Yes	Yes
Mambolo	Mayakie	Yes	Yes	Yes	Yes	Yes
	Kobia	Yes	Yes	Yes	Yes	No

2.1.4 Data organisation – mind mapping

Data collected during stage 1 of the investigation was organised using ‘mind-mapping’. The prevention of stunting was set as the central theme for the mind map and the value of the data judged in relation to whether it was considered to have a positive effect (✓) or negative effect (X) on the prevention of malnutrition. An image of the mind map is illustrated in figure 1 below. The mind map is provided as a supplement to this report and may be read using mind mapping software (available free of charge at www.xmind.net). For readers without the XMind software a HTML file is provided with an expanded view of the mind map.

Figure 1: SQUEAC Mind Map image for the prevention of stunting in Kambia District



3 Barriers and boosters to the prevention of stunting

The SQUEAC investigation team identified a number of ‘boosters’ and ‘barriers’ to the prevention of malnutrition in Kambia district during stage 1 (see table 3 below). For some of these factors it was not clear how they contributed to the prevention of malnutrition.

Examples:

- 1 The officially reported high rate (greater than 60%) of exclusive breastfeeding (EBF) was contradicted by the stage 1 investigation which appeared to indicate that the majority of children aged less than 6 months were given water and/or herbal medications.
- 2 ‘*Banfa*’ is a traditional belief that infants become malnourished as a result of the mother having sexual intercourse while breastfeeding. Official reports indicate the belief in *banfa* to be falling and less than 70% among women, however the stage 1 investigation suggested that this might be higher. A belief in *banfa* may possibly result in early cessation of breastfeeding if sexual relations are started soon after birth, affecting the nutritional status of the child and mitigating a natural method of birth spacing. How often is the decision to stop breastfeeding related to belief in *banfa*?
- 3 Exploratory questions in stage 1 suggested there might be a tendency to reduce the frequency of infant feeding during illness. Further clarification was needed on how widespread this practice was.

3.1 Questions arising from stage 1 investigation

The factors chosen for investigation in stage 2 were as follows:

- Is the rate of EBF as high as reported in Kambia district?
- Are herbal medicines given to children aged less than 6 months?
- Do mothers who claim to use EBF also use herbal medicines?
- At what age is breastfeeding generally discontinued?
- Who makes the decision to discontinue breastfeeding?
- How widespread is the belief in *banfa*?
- What does *banfa* mean to mothers in Kambia?
- Does *banfa* play a role in the decision to stop breastfeeding?
- Does the frequency of children’s meals change during illness?

Table 3: List of boosters & barriers to the prevention of stunting in Kambia District

BOOSTERS	BARRIERS
<ul style="list-style-type: none"> ▪ Good utilisation of vaccination services. ▪ Utilisation of vitamin A and de-worming services during child health campaigns. ▪ Early initiation of breastfeeding. ▪ On-demand breastfeeding practices. ▪ Continued breastfeeding after 6 months. ▪ Birth spacing of 2 – 3 years. ▪ Meetings on nutrition issues at community and PHU level. ▪ Links between Community Health Workers and PHU staff. 	<ul style="list-style-type: none"> ▪ Low diversity of complementary feeding in infants aged 6-12 months. ▪ Low frequency of complementary feeding in infants aged 6-12 months. ▪ Low rate of exclusive breastfeeding for infants aged less than 6 months. ▪ Low frequency of maternal dietary intake. ▪ Poor diversity of maternal dietary intake. ▪ Not having 15 trained M2M Group members (this may predispose M2M Groups to less activity and lower service coverage). ▪ Food insecurity (particularly June to August). ▪ Male adult biased intra-household food allocation leading to poor maternal & child dietary intake. ▪ Poor sanitation. ▪ Polluted drinking water source. ▪ Low awareness of M2M Groups. ▪ Low level of education. ▪ High level of early teenage pregnancy. ▪ Lack of awareness of stunting as a malnutrition issue. ▪ Late health-seeking behaviour for common illnesses (malaria, diarrhoea and acute respiratory illnesses). ▪ No links between M2M Group and PHU health staff. ▪ Women do not attend community meetings during rainy season.

3.2 Stage 2 Lot Quality Assurance Sampling (LQAS)

3.2.1 Study Description

Hypotheses about various factors identified in stage 1 were subjected to a Lot Quality Assurance Sampling (LQAS) methodology. This classified whether a selected indicator was above or below an expected standard, and thus whether the hypothesis could be confirmed or rejected. The sample size for LQAS is not predetermined, however a sample size of greater than 19 allows a statistically reliable result with a high precision to be obtained (Linkages, 2006).

For each indicator under consideration a 'standard' was developed either from existing, reported or expected standards from the stage 1 investigation. For example, the officially reported rate of exclusive breastfeeding was 93.5% for Kambia District. The standard chosen in this case was 70% (or 0.7 as a proportion). If this marker were exceeded, it would indicate that a 'high' proportion (as a classification) of mothers exhibited this child-care practice in the chosen sampling location. Conversely a proportion of equal to or less than 0.7 would indicate a 'low' classification. The results obtained from various sampling points across the district could then be compared for homogeneity or heterogeneity of (in this example) child-care practices.

Where homogeneity in classifications is found across sampling points, totals may be compiled and an estimate with 95% confidence intervals for various factors can be made with a high degree of reliability.

For the purpose of the LQAS study, a 'case definition' was identified and a sampling framework drawn up. To answer the questions indicated in stage 1 in the form of hypotheses developed for stage 2, a questionnaire was developed (see annex 7).

3.2.2 Case definition for LQAS

The target group for the LQAS investigation was mothers in selected communities in Kambia district with a child aged two years or less.

3.2.3 Study methodology

In each community households were selected according to the sampling framework noted below. A target sample size of 20 mothers in each location was selected (a total of 97 from 5 locations). Mothers were interviewed separately to ensure privacy and confidentiality.

In addition to the questionnaire, each research team was requested to identify interesting discussion points during interviews and develop a case history for 2 mothers at each location (time permitting).

3.2.4 Sampling Framework

Five locations were selected semi-purposively based on visiting chiefdoms not visited during stage 1 and ensuring inclusion of an urban location (Kambia Town). Houses within communities were selected by using a 'house to house' methodology (or every 3rd house depending on the size of the community). In 'clustered' communities, where houses were arranged in clusters rather than in straight lines ('ribbons') along a road, houses were sampled by walking in a random direction from the starting point, usually the house of the village elder. The research team would split into pairs and each pair walked in a different direction from the starting point. For 'ribbon' communities each pair walked along opposite sides of the road in both directions from the starting point. Sampling continued until the target of 20 mothers had been interviewed or the village had been sampled exhaustively. If a group of mothers had gathered at one house, interviews were conducted with all of the eligible mothers (usually two-three maximum) at that location.

Table 4: Communities selected for Stage 2 LQAS sampling

Chiefdom	Village
Magemba	Rokupr
Magemba	Kambia Town
Masungbala	Kawula
G. Dixon	Mafaray
Tonka Limba	Kabaya

In order to test a hypothesis against a standard (as described earlier) a decision rule is set. A decision rule is usually the threshold above (or below) which a classification is assigned to an indicator. This is described by the formula:

$$d = \lfloor n * p \rfloor$$

n = number of subjects in the sample

p = proportion (set by the standard)

$\lfloor \rfloor$ = Indicates the sum in the brackets is rounded down (or up) as appropriate

Example:

The officially reported rate for exclusive breastfeeding (which is considered to be a 'good' child care practice) in Kambia is 93.3% (according to the Core CMAM/IYCF Indicators Set). This indicates that child-care practices in Kambia can be considered 'good' compared with the national average of 30%. The hypothesis is that greater than 70% (to give a reasonable margin of error to the reported figure) of mothers in each location in Kambia practice exclusive breastfeeding. Twenty mothers are interviewed for exclusive breastfeeding practice at each location. The proportion for the standard is 0.7 (70%).

$$0.7 * 20 = 14$$

In this case the decision rule = 14. In other words, if more than 14 mothers in that location exhibit exclusive breastfeeding then it can be ascertained that the care practices are 'good' and conversely less than 14 implies 'poor' practices.

3.2.5 Qualitative / Quantitative results of Stage 2 analysis

The results of the stage 2 investigation obtained from the questionnaires were entered into an excel file and compared with the decision rule established for each factor. Results were also aggregated across all villages and estimates for various factors were made with 95% confidence intervals (see tables 5 to 8 below).

Table 5: Hypothesis 1

The rate of exclusive breastfeeding to 6 months in Kambia District is $> 70\%^2$ ($p = 0.5$)

Village	Standard	Sample size	Number with EBF	d	Hypothesis confirmed?
Rokupr	0.7	22	6	15	No
Kambia town	0.7	20	10	14	No
Kawula	0.7	18	8	12	No
Mafaray	0.7	22	2	15	No
Kabaya	0.7	16	4	11	No
Total		96	30		

Rate of exclusive breastfeeding = 30.6% (95% C.I = 11.0%)

Table 6: Hypothesis 2

Belief in *banfa* in Kambia District is less than 70%³ ($p = 0.7$)

Village	Standard	Sample size	Number with <i>banfa</i> belief	d	Hypothesis confirmed?
Rokupr	0.7	22	18	15	No
Kambia town	0.7	20	14	14	No
Kawula	0.7	18	17	12	No
Mafaray	0.7	22	20	15	No
Kabaya	0.7	16	15	11	No
Total		96	84		

Belief in *banfa* = 85.7% (95% C.I. = 18.3%)

Table 7: Hypothesis 3

Herbal medicines are given when mother claims exclusive breastfeeding is practiced in less than 30%⁴ of cases ($p = 0.3$)

Village	Standard	Sample size with EBF	Number of EBF + herbs	d	Hypothesis confirmed?
Rokupr	0.3	6	3	2	No
Kambia town	0.3	10	6	3	No
Kawula	0.3	8	6	3	No
Mafaray	0.3	2	2	1	No
Kabaya	0.3	4	4	2	No
Total		30	21		

In cases where exclusive breastfeeding is reported by the mother but the child is given herbal medications = 70% (95% C.I. 16.4%)

² Reported rate of exclusive breastfeeding for Kambia District = 93.5% (UNICEF and GoSL, 2013).

³ Reported rate of *banfa* belief in Kambia district = 66.7% (UNICEF, 2013).

⁴ Reported rate of EBF recall for mothers in Kambia District = 91.5% (April 2013)

Table 8: LQAS summary results for Kambia District

	Mean	Median	Percentage	95% C I
Age of children in survey (in months)	13.1	14		
Proportion of children exclusively breastfed to the age 6 months.			30.6 %	7.7 %
Use of herbal medications in infants 0-6 months.			72.4 %	17.0 %
Mothers participation in decision to give herbal medications.			20.4%	8.9 %
Age of child (in months) at which breast feeding discontinued.	17.1*	18		
Mothers participation in decision to stop breastfeeding.			40.7 %	6.6 %
Belief in <i>banfa</i> .			87.9 %	18.3 %
Do not believe in <i>banfa</i> .			11.2 %	6.6 %
Age of child (in months) when breastfeeding stopped due to <i>banfa</i> belief.	17.8	19		
Decreased frequency of feeding if the sick child.			75.5 %	17.2 %

* Excludes an outlier value of 2 months for one child. Mean age including outlier = 16 months

As with the investigation in stage 1, there was a congruent homogeneity in the findings of stage 2 such that it could be considered relatively safe to extrapolate results to the district as a whole.

3.2.6 Case Histories

Fourteen short case histories were developed from interviews in stage 2 and are transcribed verbatim in annex 8 and attached to the mind map.

3.3 Concept map

From the mind map developed in stage 1 and the LQAS results of stage 2 a concept map was developed relating to the prevention of stunting in Kambia District. An image⁵ of the concept map is shown in figure 2 below. The full concept map is available in the XMind file “KAMBIACONCEPTMAP” which is provided as a supplement to this report.

3.4 Anthropometric measurement standardisation

Standardisation of anthropometric measurements is required during the training of enumerators to ensure accuracy and precision in measurement (Medecins Sans Frontieres, 1995). The test of standardisation was applied to team leaders for the measurements of MUAC and height for this study. The results of the standardisation test were analysed using Sigma D software (available at: www.brixtonhealth.com).

Accuracy: *The ability of an enumerator to obtain a measurement as close as possible to the reference value (the supervisors reading). It is the sum of the squares of difference between the sum of the 2 measures on the same child between the supervisor and the enumerator. The acceptable value is fixed at three times that of the supervisor.*

⁵ The image shown includes the analysis from the stage 3 matched case-control study.

Precision: *The ability to repeat the same measurement on the same subject with the minimum variation. It represents the sum of the squares of difference between 2 measures on the same child. The acceptable value for the enumerator is equal to twice the value of the supervisor.*

The results of the standardisation test are presented in annexes 9 and 10 for MUAC and height respectively. The standards for precision for all numerators were within acceptable limits. The results for accuracy were not within acceptable limits, however the errors for MUAC were less than 2mm and for height less than 5 mm. A MUAC error of 2mm represents < 1% error for the cut-off point for a pregnant or breastfeeding woman (23cm) while 5mm divisions are used on height for age charts. The errors seen in accuracy, while less than ideal, were small enough to be acceptable for the purposes of the fieldwork.

Figure 2: Image of concept map for prevention of stunting in Kambia District

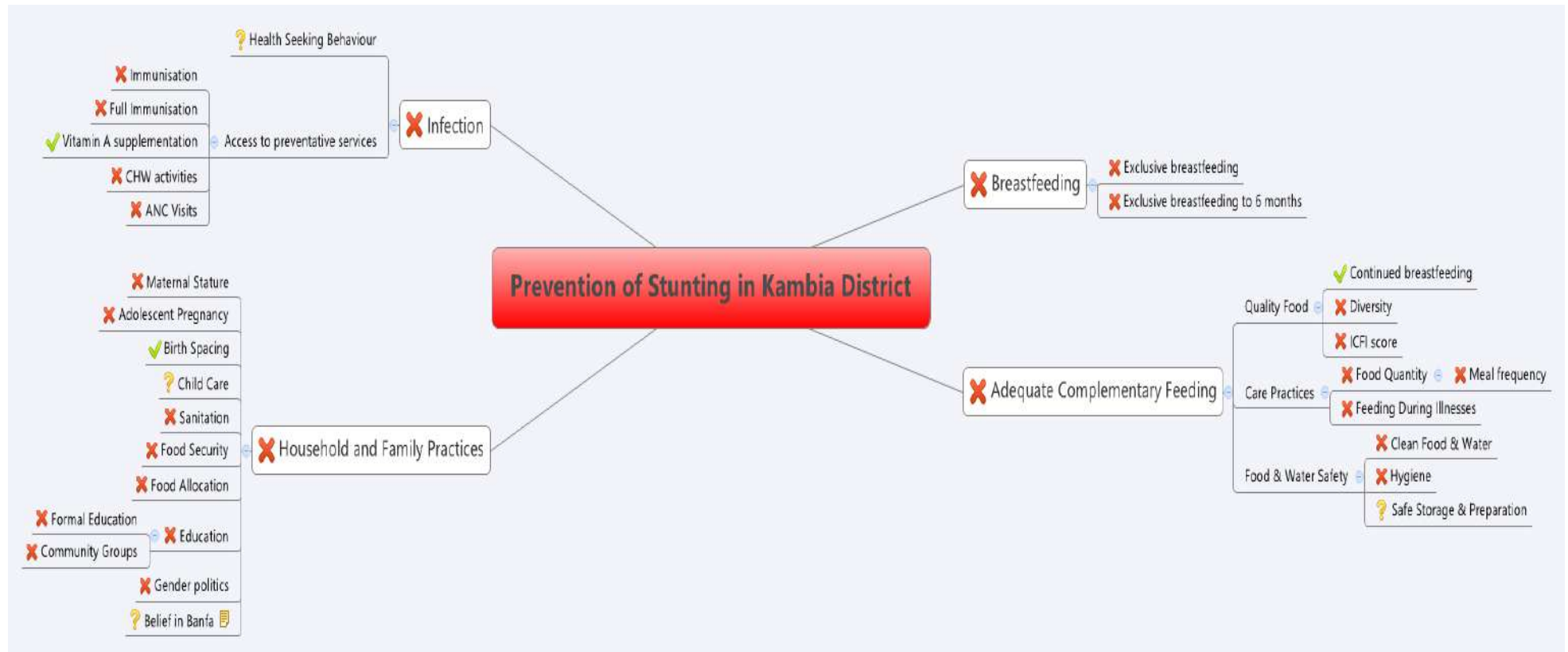


Figure 2 above represents a summary of the concept map. The concept map illustrates the factors which impact positively (✓) or negatively (✗) on the prevention of malnutrition in Kambia District. The range of negative factors and their complex relationships gives insight into the need for wide ranging and multi-sectoral approaches in order to reduce malnutrition.

3.5 Stage 3 – Matched Case-Control Study

The matched case-control study matched ‘cases’ (i.e. stunted) with ‘non-cases’ (i.e. not stunted) for the purposes of identifying risk factors associated with stunting. The use of case matching allowed regression analyses for variables with smaller sample sizes than would be possible without matching.

3.5.1 Case Definitions

Case: Child less than 2 years of age with height for age less than -2 Z scores according to WHO growth standards (World Health Organisation, 2006).

Control: Child less than 2 years of age with height for age equal or greater than -2 Z scores according to WHO growth standards.

3.5.2 Sample size

A sample size of 20 matched pairs was collected over a period of 1 week in March 2014. Two pairs (cases and non-cases), matched for age and sex were identified for each location.

3.5.3 Sampling Framework

A Centric-Systematic Area Sampling (CSAS) methodology was used to identify the sampling sites for the match study. Quadrats of equal size were marked on a map dividing the district of Kambia into ten equal areas. The village closest to the centre of the quadrat was identified as the sample point. The use of ten quadrats allowed the identification of two matched pairs in each location. If matched cases were not identified in the selected location the next nearest village (in any direction) was selected and case finding continued until two matched pairs had been identified for each quadrat (see map in Annex 11).

3.5.4 Case finding methodology

In each location a suitable starting point was selected and households with children less than two years of age identified through house to house case finding. Where children less than two years of age were identified details of name, age, sex and anthropometric status were noted. Case finding continued until a ‘case’ (a stunted child) was matched with a ‘control’ (non-stunted child) of the same age (in months) and sex.

For each child length was measured to the nearest mm, lying down using a wooden height board. Age was determined in whole months and verified by reference to the child’s health card where possible. The length for age was determined by reference to WHO (2006) growth charts for height for age for children from birth to two years.

MUAC was measured to the nearest mm using a colour-coded, flexible, non-elastic tape and weight measured to the nearest 100g using either a digital scale or hanging Salter scale. It is a constraint of this study that the scales were different in each location and could not be calibrated prior to use. MUAC and weight were collected as additional data and were not used for the evaluation of the child’s nutritional status for the purpose of this study. For each identified matched pair, a questionnaire was administered to the mother of the child.

3.5.5 Data management

Responses to the questionnaire were collected directly on the stage 3 questionnaire. The data was entered into a database using EpiData (version 3.1). Dual entry verification was used to ensure the accuracy of data entry.

Data analysis was conducted using R (version 3.03, ‘warm puppy’) and R AnalyticFlow (version 2.1.0) software. The resulting analyses were entered into the concept map developed from Stage 1 (see figure 2 above).

The mind map and concept map were compiled using XMind software and are provided as supplements to this report.

4 Discussion

The starting point for the SQUEAC investigation was a review of existing data in order to identify areas of interest for investigation. The data available was patchy and suggested inconsistency and some inaccuracy in reporting. A review of reporting methodologies and mechanisms was, however, beyond the scope of this investigation. Reports for immunisation coverage⁶ and CMAM/IYCF indicator sets (Ellie, et al., 2013) identified high immunisation coverage and higher than national averages for a range of IYCF indicators which had improved over the ten month period of the report.

Significant differences were found between reported rates of exclusive breastfeeding and immunisation and those observed during the current study. The primary reason for this was the nature of the methodology which explored and crosschecked answers given during interviews and discussions. The authors postulate that this crosschecking makes the results presented here more reliable. The example of 'exclusive breastfeeding' (EBF) illustrates this issue. Many mothers believed their children were 'exclusively breastfed' even though they also indicated that the child was given 'herbal' or 'bitter' medicines, often daily, from birth to six months. The authors assert that this accounts for the discrepancy in the reported rate of EBF (60% - 93.5% depending on source) and the SQUEAC investigation rate (30.6% [95% C.I. = +/- 7.7%]). It is noteworthy that the findings from stages 1 & 2 were relatively homogenous suggesting that the findings of the investigation at community level can be reasonably extrapolated through triangulation as representative of the district.

The issues identified with inaccurate reporting have previously been identified in other research:

While part of the problem stems from a lack of standardized monitoring procedures within the system as a whole, there are also concerns about weak reporting capacity amongst PHU staff at the community level. For example, reports from the PHUs, usually received late, often contain missing or inaccurate data... (Denney, Jalloh, Mallett, Pratt, & Tucker, 2014).

The EBF reporting discrepancy highlighted above illustrates one of the weaknesses in the reporting system, at the point of collection, which should be addressed as part of the capacity-building efforts of partner organisations.

The UNICEF conceptual framework for malnutrition identifies 'poor food intake' and 'disease' as the immediate causes of malnutrition. Stewart and colleagues re-illustrates this conceptual framework with a focus on the stunting process which occurs primarily in children less than two years of age (Stewart, Lannotti, Dewey, Michaelson, & Onyango, 2013). Based on Stewart's Conceptual Framework, the concept map for the prevention of stunting in Kambia identifies infection, household practices, breastfeeding practices and adequate complementary feeding as the prime determinants. These are discussed in more detail below.

4.1 Household Factors

The context in which feeding practices are developed and childhood illnesses are acquired, identified and treated are determined to some extent by household factors and family practices.

In terms of formal education, fewer than 25% of mothers interviewed in stage 1 in 7 out of 8 communities had received any formal education with the mode of the reported education level being Junior Secondary School (12-14 years). This was confirmed in stage 3 with 77.5% (95% C.I. = +/- 12.9%) indicating that no formal education was received. Of those receiving an education (n=9) the median length of education was 8 years.

⁶ District EPI Report January to December 2013 – Kambia District Department of Health Report.

Informal or community-based education regarding maternal and child health may compensate (inferentially) for a lack of formal education for specific topics. Access to this informal education is provided primarily by PHU staff, CHWs, TBAs, volunteers, or by M2M Groups. The first SLRC Sierra Leone report states that:

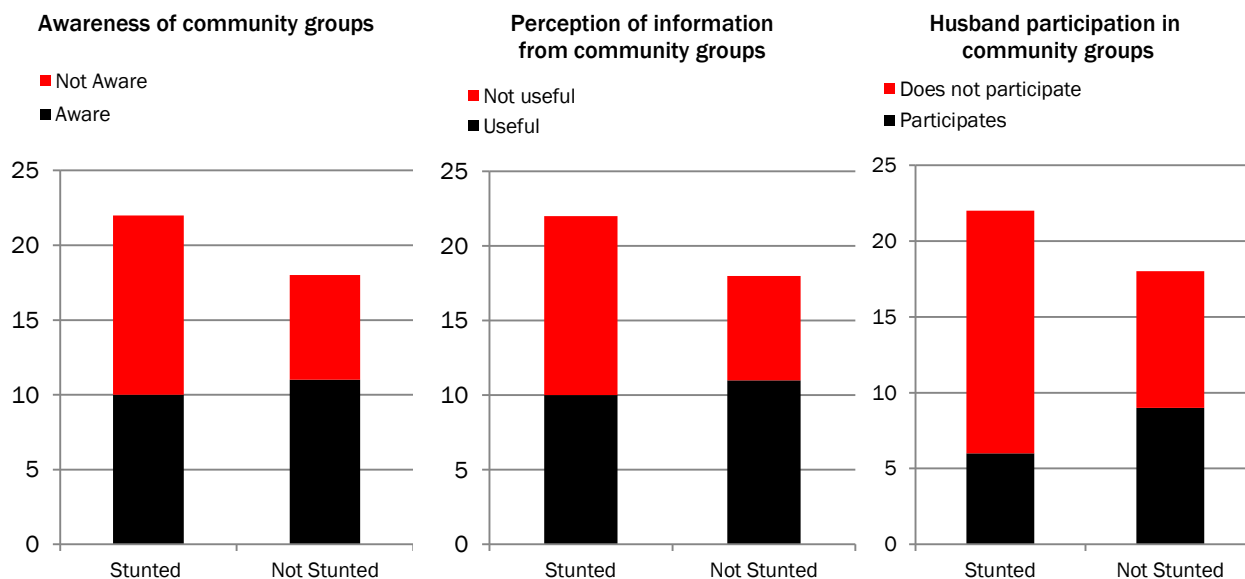
Mother-to-Mother Support Groups are relied upon by both the Government of Sierra Leone and development partners as one of the primary structures for preventing malnutrition. (Denney, Jalloh, Mallett, Pratt, & Tucker, 2014).

With PHU and immunisation coverage being reportedly high and uniform, and mean M2M Group coverage being 7.8% communities per chiefdom, the focus of the stage 1 investigation fell on the M2M Groups as the basis for purposive sampling. This compared communities with and without M2M Groups whose members were trained in IYCF. Where M2M Groups were present in the community, key informant interviews with M2M Group members, PHU staff and CHWs separately suggested positive involvement and regular meetings, although the linkages between them were not always clear and in some cases no linkage existed at all.

The standard established for judging the quality of the IYCF education being offered was the UNICEF IYCF counselling cards (UNICEF, 2012). This was reasonable given that a country assessment report for Sierra Leone in 2012 indicated that the coverage of training for CHWs was 100% (UNICEF, 2012), whilst IYCF policy had been updated and that behaviour change material and training were 'good' (the highest classification). Age-specific IYCF messages in terms of age appropriate meal frequency, diversity and consistency reported by the three key informant categories were almost universally inaccurate. In only one M2M Group interview was any IEC material observed and proper, standardised IYCF messages reported.

Evidence from interviews in stage 1 suggests that where members of a M2M Group have been trained, this training has not been cascaded to all members as is required by the M2M Group strategy. Interestingly, the IYCF messages promoted by the M2M Group leader (using the IEC materials) were contradicted by a TBA in the same village, who advised the giving of herbal medicines to infants. Furthermore, despite the M2M Group leader reciting the appropriate activities for the inclusion of mothers in the community, the vast majority of mothers interviewed in stage 1 were not aware of the M2M Group or of any of the IYCF-IEC material or messages. Awareness of community groups, a positive perception of the usefulness of information and the participation of the husbands of mothers interviewed in stage 3 suggests, without being conclusive, that these factors may contribute to a reduction in the risk of stunting. This suggests that awareness and participation in community groups may contribute reducing the risk of malnutrition, however these groups must improve on the awareness of their existence in the communities they serve.

Figure 3: Awareness and participation in community groups for stage 3 cases & controls



Tanahashi (Tanahashi, 1978) describes service coverage in terms of ‘bottlenecks’ with five levels:

- 1 Availability coverage (people for whom the service is available)
- 2 Accessibility coverage (people who can use the service)
- 3 Acceptability coverage (people who are willing to use the service)
- 4 Contact coverage (people who use the service)
- 5 Effectiveness coverage (people who receive effective care)

Sierra Leone’s National Food and Nutrition Security Implementation plan (GoSL, 2012) states:

The MOHS through the IYCF programme has established Mother support groups to promote improvement of IYCF practices. The Mother support groups are expected to grow nutritious foods and undertake food demonstrations for pregnant and lactating women to enhance the nutrition status of women and children.

The availability coverage of M2M Groups is low with a mean of 7.8% (UNICEF and GoSL, 2013) communities per chiefdom having a M2M Group. This figure, however, does not disaggregate those who are trained in IYCF and those who are not. This low coverage is further reduced where M2M Groups do exist but communities have a low awareness (accessibility coverage), as demonstrated in stage 1 of the investigation. The low accessibility coverage is exacerbated by the apparently ineffective educative role of M2M Groups trained in IYCF (effectiveness coverage). This demonstrates a need for an overhaul in the M2M Group as a primary strategy for the prevention of malnutrition.

A radical expansion of M2M Group availability coverage will be required if the approach in Kambia District is to be effective in reducing malnutrition.⁷ There will also need to be support for community sensitisation activities (to improve accessibility / acceptability / contact coverage) and the provision of IYCF specific training with relevant IEC materials (to improve effectiveness coverage). The Core Indicator reports (UNICEF and GoSL, 2013) of 100% of M2M Groups having at least two members trained in IYCF messages and facilitation is misleading.

The stage 1 investigation revealed a high level of awareness of acute malnutrition, case finding for wasted or oedematous children less than five years, and their referral to treatment programmes among PHU staff and community leaders and community workers alike. In contrast there was low awareness of the signs and symptoms of stunting, its causes and prevention. In most cases it was considered an ‘act of God’ (0/6 CHWs demonstrated appropriate knowledge). This was compounded by a lack of

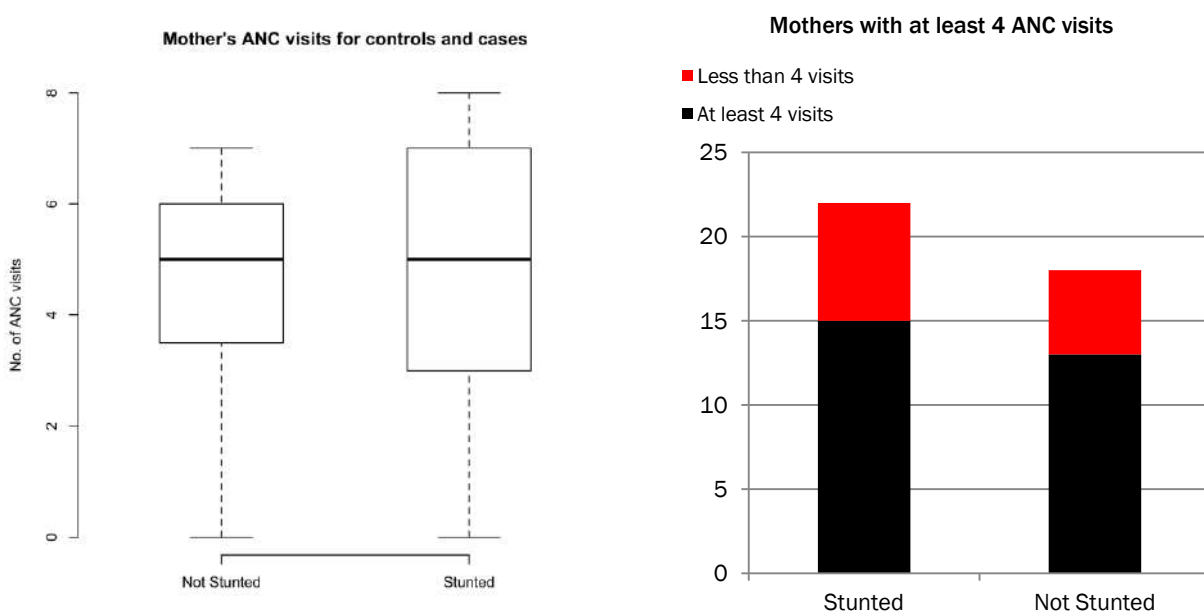
⁷ National Food and Nutrition Security Implementation Plan, 2012 – 2016.

appropriate IYCF education being given by the CHWs at the community level (0/6 CHWs correctly identified age appropriate IYCF messages).

At the PHU, none of the interviewed clinical staff had received any formal IYCF training. PHU staff reported to have received in-service training and informal on-the-job training in IYCF. In one case, a nutrition demonstration tray was available and nutrition education given to women accessing the service, however, IYCF messages in terms of age-appropriate child dietary diversity, meal frequency, and consistency were inaccurate compared with the UNICEF IYCF standard IEC materials. In addition, despite a National Training of Trainers in WHO growth standards in 2010 (Newsletter, 2010) there was little awareness among PHU staff of stunting or the means to assess stunting through the use of length/height for age charts.

Figure 4 below shows a comparison between stunted cases and non-stunted controls versus antenatal clinic visits and describes no significant differences.

Figure 4: Box plot & stacked bar plot for ANC visits vs. stage 3 Cases and Controls

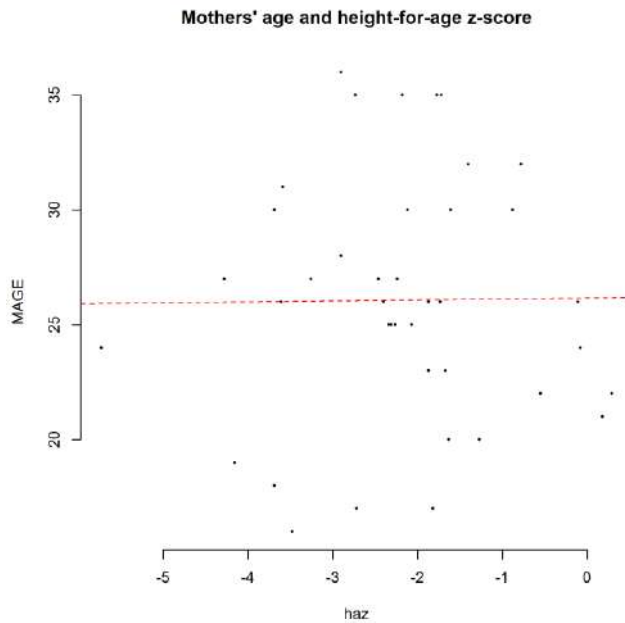


This suggests that making one or more visits to the ANC service at the PHU does not result in any significant prevention of malnutrition. From an educational perspective, it is clear that any strategy tackling the prevention of malnutrition must be aimed not only at M2M Groups as previously described, but equally at PHU staff and frontline CHWs; in particular updated IEC materials must be disseminated more widely to support efforts to educate the community.

During interviews the median reported age of the first pregnancy was 15 years (range 15-17 years) indicating a marked tendency towards adolescent pregnancy. The young age is significant not only from the educational viewpoint but serves to consolidate the position of the mother in a subordinate position with regards to participation in decision-making.

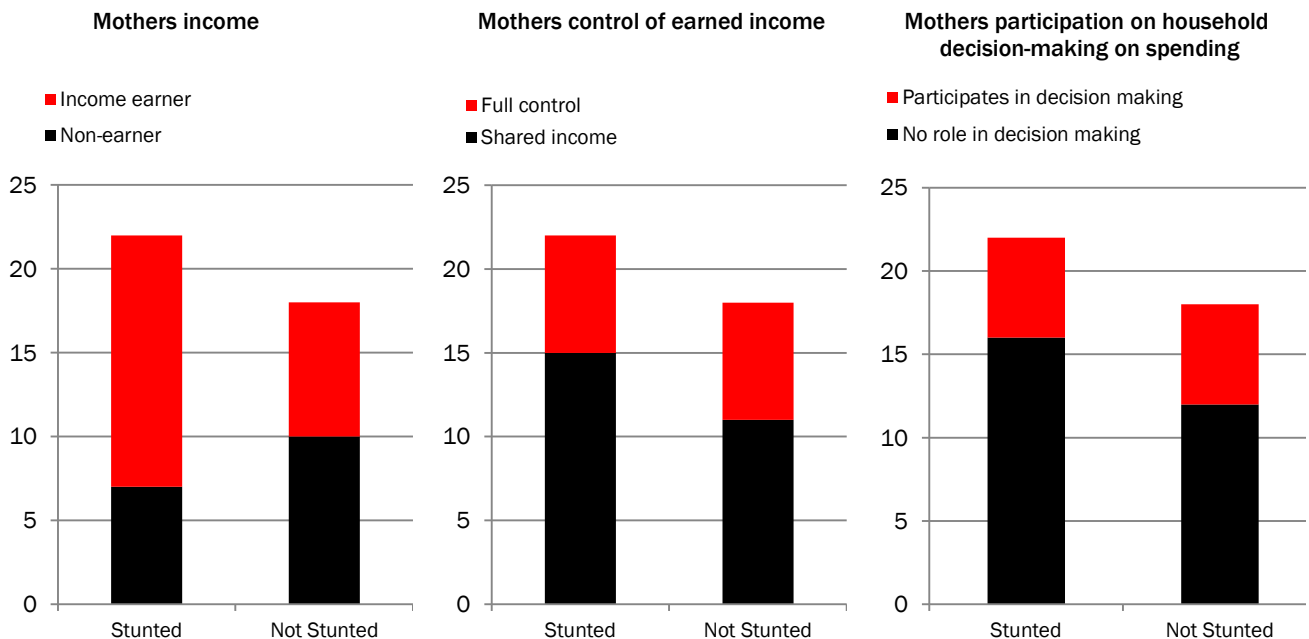
In and of itself, the age of the mother appeared to have no correlation the height for age of the child (see figure 5 below).

Figure 5: Scatter Plot of mothers' age against child's height for age Z score



During stage 2 of the investigation, it was found that where a mother reported 'exclusive breastfeeding', 72.4% (95% C.I. = +/-7.7%) of the children had in fact received additional herbal medications on a regular basis. Only 40.7% (95% C.I. = +/- 6.6%) of mothers interviewed participated in the decision to stop breastfeeding, whilst only 20.4% (95% C.I = +/- 8.9%) participated in the decision to give herbal medicines to breastfeeding children. During stage 1 of the investigation, PHU staff confirmed that the giving of herbal drinks to infants younger than six months was the biggest barrier to exclusive breastfeeding. The primary decision-makers were the husband and/or other household elders (mother or father-in-law or grandparents). During the stage 3 investigation, a minority of mothers indicated participation in household decision-making (see figure 6 below). This, however, needs to be interpreted with caution as the methodology did not allow for further exploration of the responses given, although this finding was consistent with the findings of stages 1 and 2. Mothers participating in other kinds of decision-making such as cessation of breastfeeding or giving of herbal medicines were in the minority.

Figure 6: Cases vs. Controls relative to household economy factors



The strategy of developing educational, participatory community services such as M2M Groups as the primary means of preventing malnutrition must widen the scope of its educative role so as to target influential or decision-making members of the household.

Whilst the level of control over earned income illustrated in figure 6 above does not suggest any clear differences between cases and controls, there appears to be a marked difference with respect to earned income itself. A higher proportion of mothers earning an income have stunted children.

This appears to demonstrate that in relation to the prevention of malnutrition, the absence of a maternal earned income has a more significant effect than the reported participation in the decision-making role within the household. It could be postulated that the performance of work outside of the home conflicts with time allocated to childcare practices; there were no obvious differences in ethnicity, social background or economic status of the mothers interviewed. This finding must also be interpreted with a high degree of caution as the question on income had not undergone field-testing prior to interviews and required only a binary response. A more sophisticated exploration of this issue would be required to ascertain its significance.

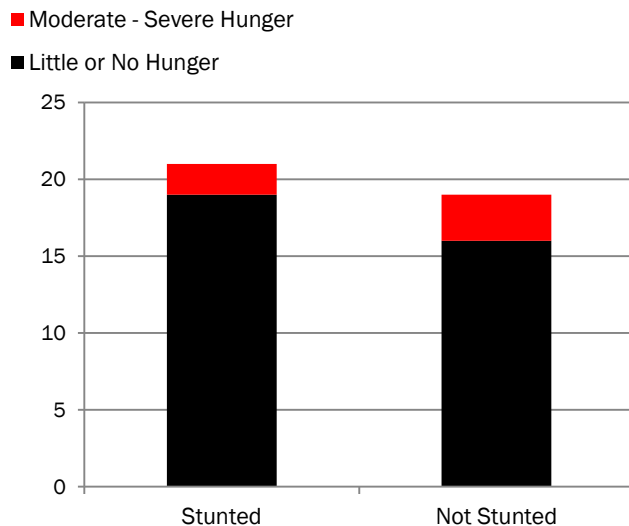
Where the mother is not involved in or shares decision-making, the decision to discontinue breastfeeding is reported to be made by the father of the child in most cases (81%). In 60% (95% C.I. = +/- 15.3%) of responses, *banfa* was described as playing a role in the decision to discontinue breastfeeding. Of mothers interviewed, 96.6% described *banfa* as having sexual intercourse with the husband (or another man), while still breastfeeding, which results in illness, malnutrition and death or as “simply killing the child slowly”, although only 87.9% (95% C.I. = +/- 18.3%) of the 96.6% indicated a belief in *banfa*.

Intuitively, a belief in *banfa*, which requires the cessation of breastfeeding when post-natal sexual relations are resumed, suggests that this may give rise to early weaning or early cessation of breastfeeding. The SQUEAC investigation indicates that the median age of cessation of breastfeeding is 18 months for all children, and where *banfa* played a role in the cessation breastfeeding, the median age was 19 months. This triangulates well with birth spacing of two to three years reported by pregnant women or mothers in the communities interviewed. While false beliefs should not be encouraged, the reported belief in *banfa* in Kambia District does not appear to have a negative effect on continued breastfeeding or on birth spacing. Efforts to eradicate traditional beliefs of this nature should be done with caution so as not to undermine these effects. A more detailed investigation into the belief and practice of *banfa* to understand the actual dynamics of behaviours and consequences would appear to be warranted.

Another aspect of control with important repercussions is that of food allocation. Interviews with mothers in all communities that responded (n = 7/8) to questions of household food allocation indicated universally that the mother and child were the lowest ranking in terms of the quantity and quality of food received. Household elders and male adults took the primary share of household food.

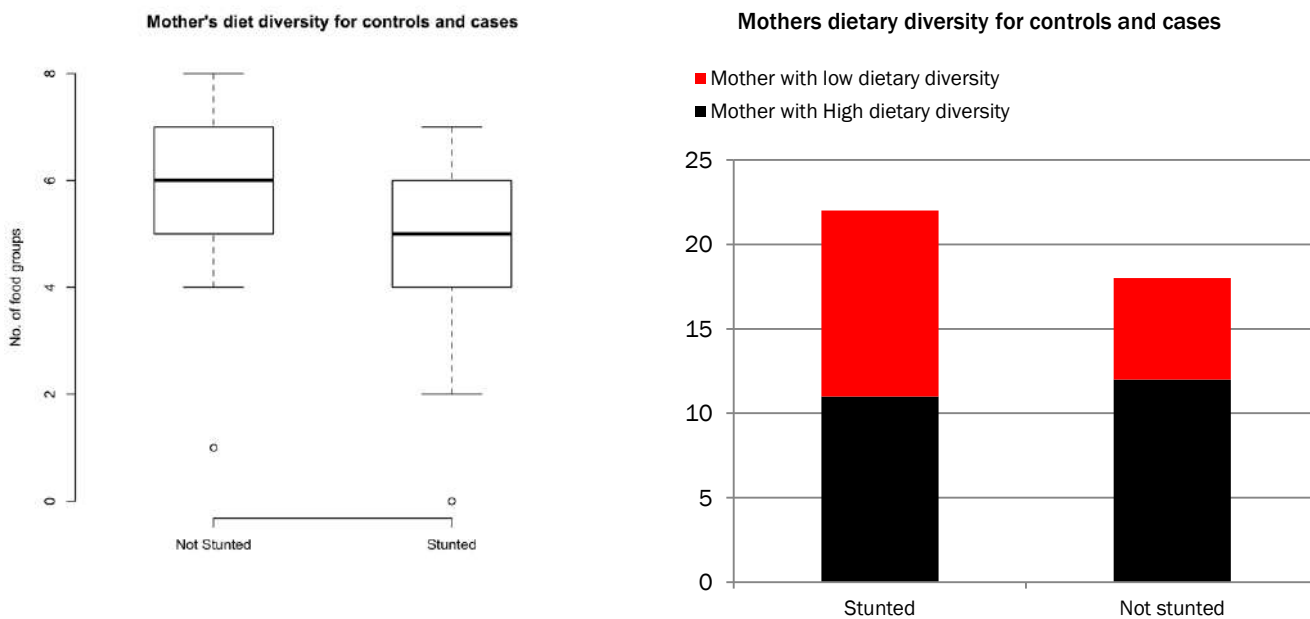
The assessment of household food insecurity was determined through the use of questions about hunger (adapted from FANTA, (Coates, Swindale, & Bilinsky, 2007)). In stage 1 of the investigation, many pregnant and lactating mothers indicated household food insecurity, particularly through the months of July to September. During stage 3, the minority of responses for both cases and controls indicated levels of moderate or severe hunger, although the related question covered only the month prior to the survey. There was only a slight difference in the levels of stunting observed relative to reports of hunger.

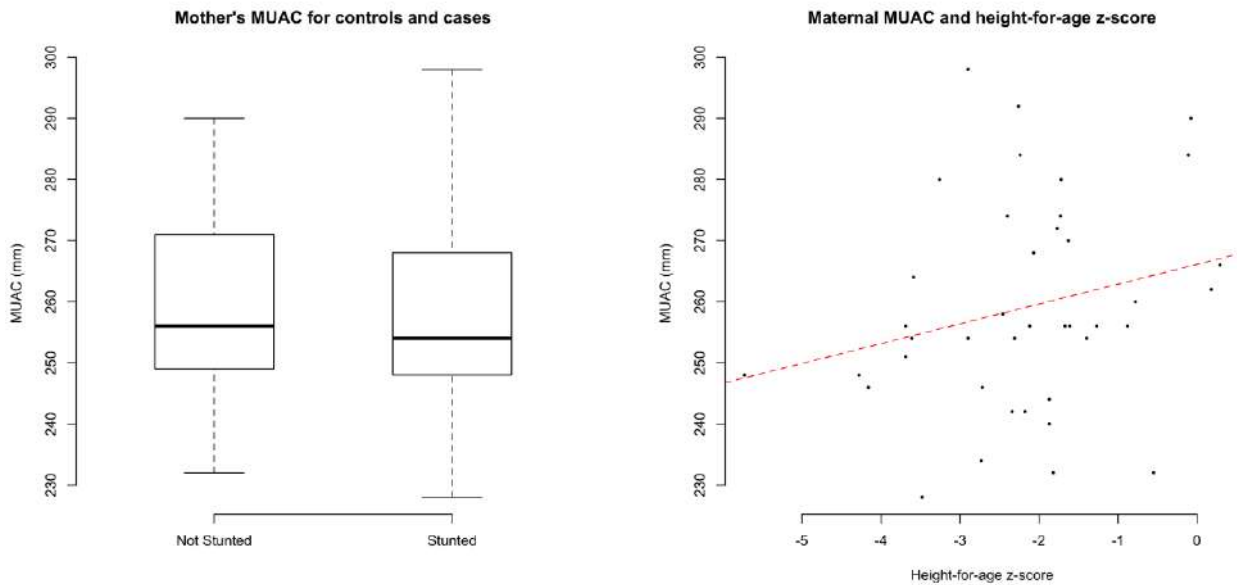
Figure 7: Reports of moderate to severe hunger for stage 3 cases & controls



Arimond (Arimond, et al., 2009) indicates maternal dietary diversity as an important indicator of the micronutrient sufficiency of the diet for pregnant and lactating mothers. Figure 8 below indicates the comparison of the maternal dietary diversity and maternal MUAC with respect to controls and cases of stunting.

Figure 8: Maternal Dietary Diversity and MUAC vs. Controls & Cases of stunting

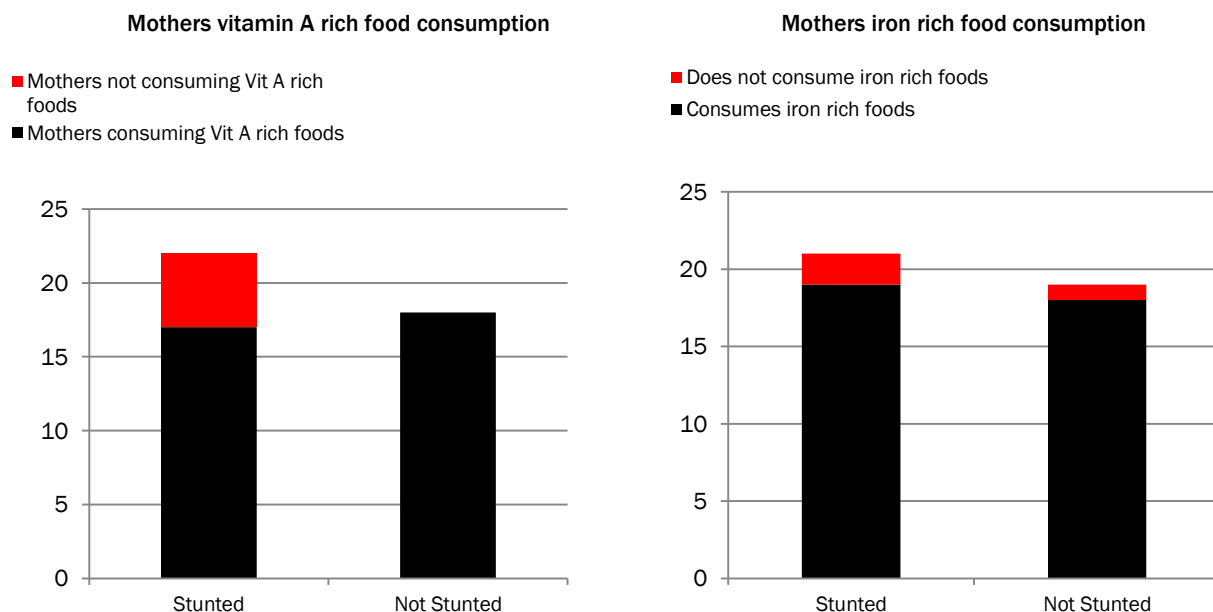




Whilst there is no significant difference in child stunting observed with respect to the mothers MUAC in the box plot, it is worth noting that only (n=1/40) mothers in the sample had a MUAC less than 23 cm which is the cut-off most commonly used to identify maternal malnutrition. It should also be noted that the cumulative effects of stunting over time may not bear any relation to a point measurement of maternal MUAC. In contrast, a scatter plot of maternal MUAC vs. the height for age of the child does reveal a trend for mothers with low MUAC to have children with lower height for age. Despite the absence of malnutrition (as defined by MUAC <23cm), there appears to be an association between an increased risk of stunting and low maternal dietary diversity [odds ratio = 0.4 CI = 0.078 - 2.062, likelihood ratio = 1.33, p = 0.44), however this is only partially explanatory as this is not statistically significant. There also appears to be a relationship between stunting and reduced maternal nutritional status as measured by MUAC.

This association with maternal dietary diversity and stunting also appears to be evident from a comparison of stage 3 cases and controls with the maternal consumption of vitamin A rich foods (see figure 9 below). The differences are less marked for the maternal consumption of iron rich foods. While vitamin A, as a type 1 nutrient, does not have a role in linear growth, it is an important requirement for immune function and is passed to the child through breast milk. While beyond the scope of this analysis, it can be postulated that an association between maternal vitamin A consumption and child stunting may be partially due to vitamin A's beneficial effect on immune systems of breastfed children.

Figure 9: Maternal consumption of vitamin A rich and iron rich foods vs. stage 3 cases & controls



In terms of preventative approaches, this would suggest that the mother's MUAC should not be used as a proxy for the adequacy of the maternal food intake. Educational approaches, whether through the PHU, M2M Groups or CHWs, for the prevention of stunting in Kambia District must include not only standard IYCF messages on child feeding, but also emphasise the importance of maternal dietary diversity.

An important source of infection in the household is contaminated water and food. The storage, handling and preparation of food was beyond the scope of this study, however access to clean water, sanitation and the disposal of child faeces was assessed.

In several communities visited in stage 1 of the investigation, improved water sources were present, but in many cases dysfunctional and unsafe sources of water were used for all household purposes. Access to clean drinking water and access to an improved sanitation facility appear to be associated with less stunting (figure 10 below).

Figure 10: Access to an improved water source, clean drinking water and improved sanitation facilities vs. stage 3 cases & controls

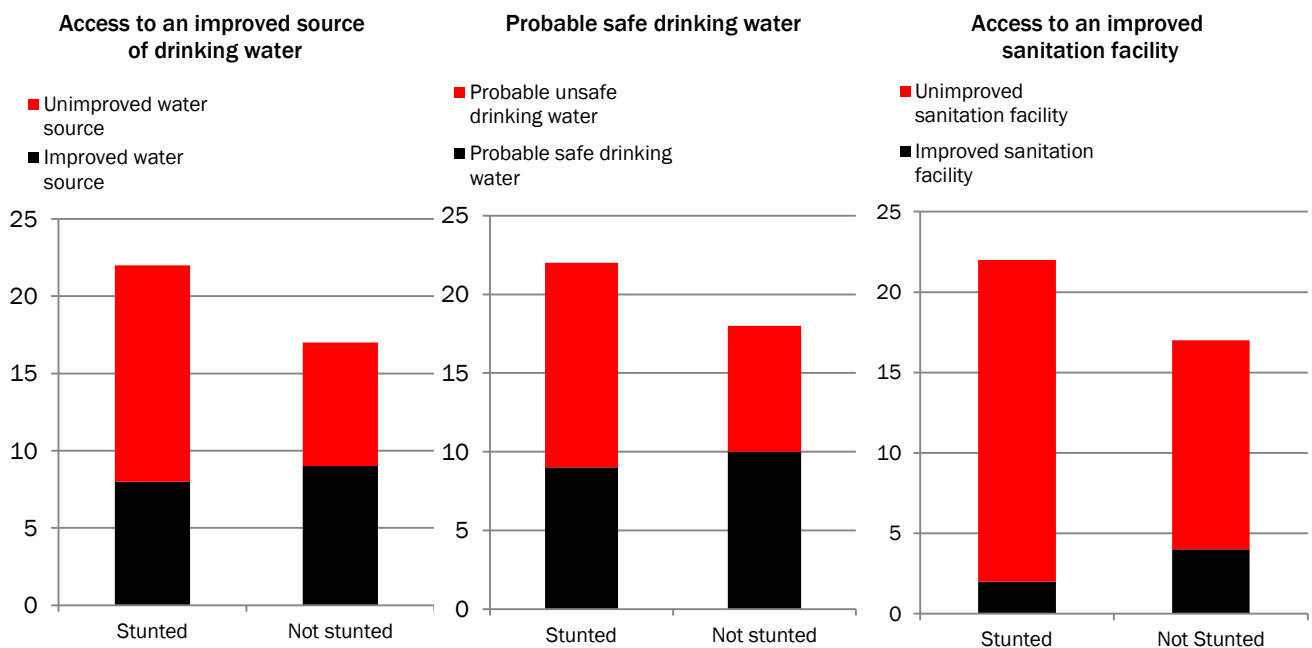
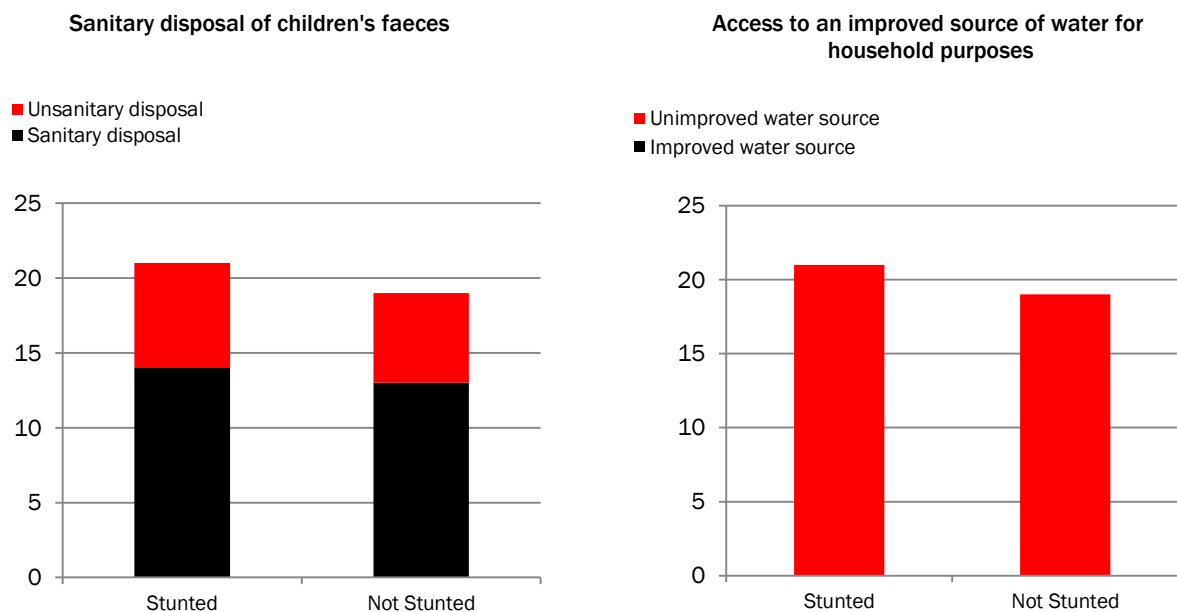


Figure 11 below suggests that the use of unimproved water for household purposes other than drinking is not associated in any way with stunting. Ideally, communities where facilities are not present or have become dysfunctional should have access to safe drinking water from improved water sources restored. In the absence of universal access to clean water at community level, there needs to be greater access and use of methods to clean the available water source and make it potable at the household level.

Figure 11: Sanitary disposal of faeces and use of unimproved water for other household uses vs. stage 3 cases & controls



There appeared to be no association between the sanitary / unsanitary disposal of the child's faeces and stunting (see figure 11 above).

4.2 Infection

The Stage 1 investigation recorded reports (from all interview / focus group discussion sources) of frequent childhood illnesses, which ranked the incidence of malaria, diarrhoea and respiratory infections highest to lowest respectively.

In stage 3 an artefact of the questionnaire design meant that when asked about danger signs related to childhood illnesses, malaria was not an option unless specifically mentioned under the “other” category. It is interesting that none of the responses (n=0/40) indicated malaria as a danger sign despite it being ubiquitous in the community and noted as a major health problem.

Figure 12: Stage 3 cases & controls vs episodes of childhood illnesses

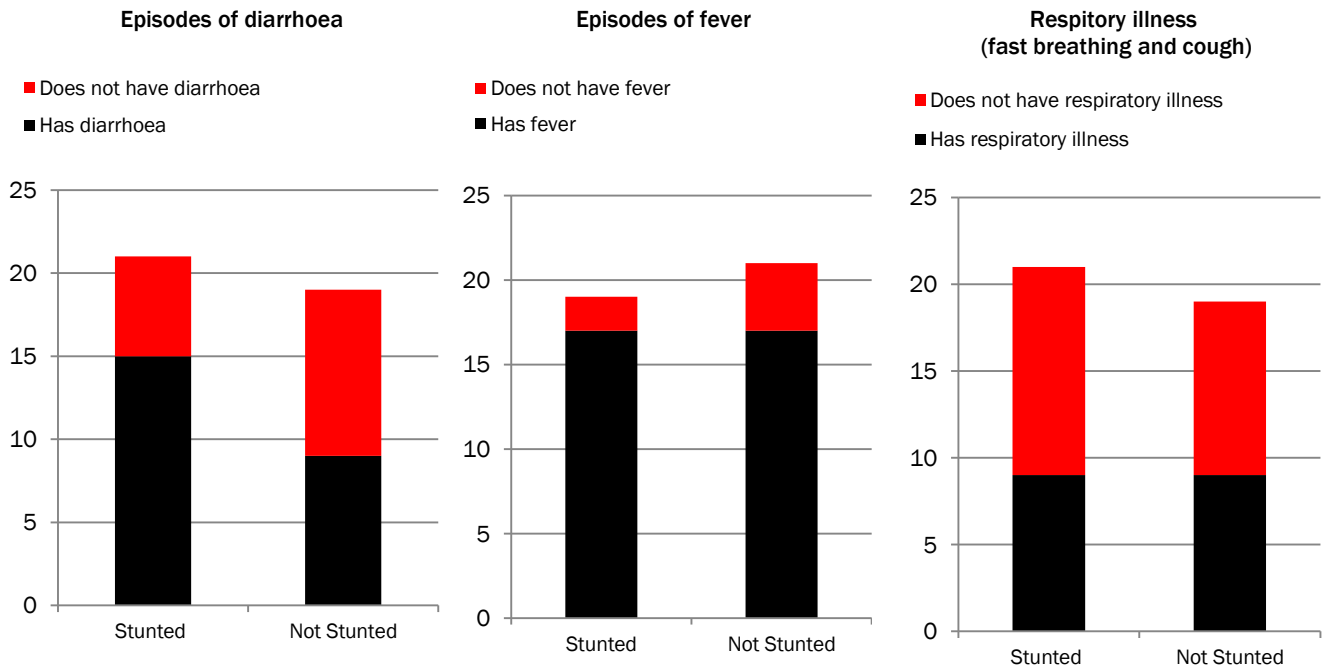
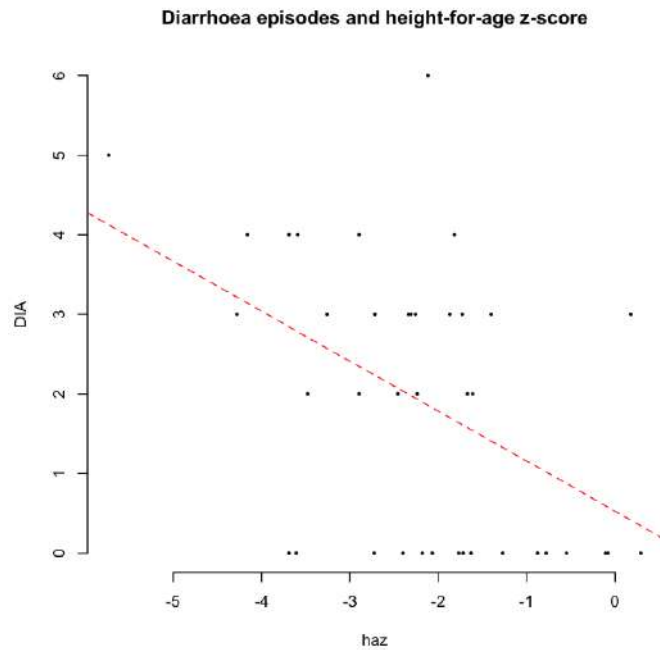


Figure 12 above indicates that a greater proportion of stunted cases are associated with reports of childhood illnesses. In stage 3, 82.5% (n=33/40) of mothers reported the child as having episodes of fever within the month prior to the study. Reports of diarrhoea appear to have a direct relationship with stunting (odds ratio 3.0 - 95% CI = 0.6 - 14.8, Likelihood ratio = 2.09, chi squared = 1.125, p= 0.288), however this is not statistically significant.

Figure 13 below further illustrates the relationship between the reported severity of diarrhoea and the HAZ score, with greater severity of diarrhoea being associated with increased severity of stunting.

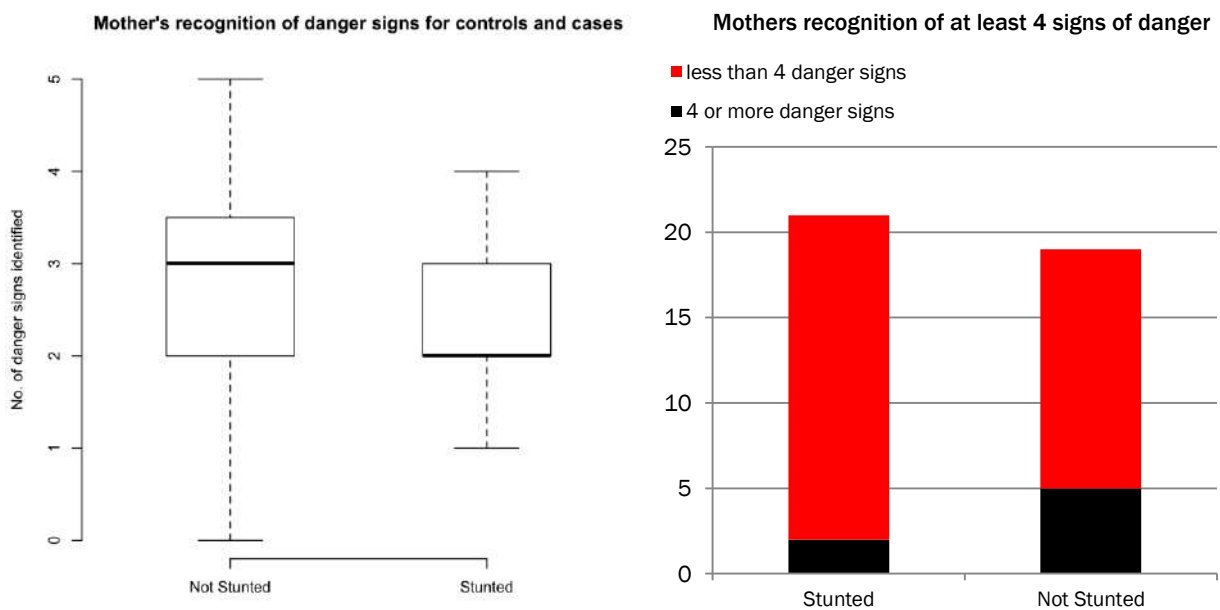
Figure 13: Scatter plot for reported severity of diarrhoea against Height for Age Z score



‘Malnutrition’ was the fourth ranked most frequently reported childhood illness, primarily from PHU staff and CHWs. This was likely due to the screening activities, referral and treatment of acute malnutrition. There was little or no recognition of stunting as an indicator of malnutrition. It should be part of the training of PHU staff, CHWs and mothers to recognise that any illness can result in poor nutrition and contribute to stunting over time. Encouraging timely health-seeking behaviour for illnesses either at PHU or community level from the CHW may contribute significantly to reducing stunting.

Recall of danger signs (along with other indicators) may act as a proxy for health-seeking behaviour as recognising symptoms of illness is the first step to obtaining treatment. Figure 14 below illustrates the relationship between the recognition of danger signs and the occurrence of stunting.

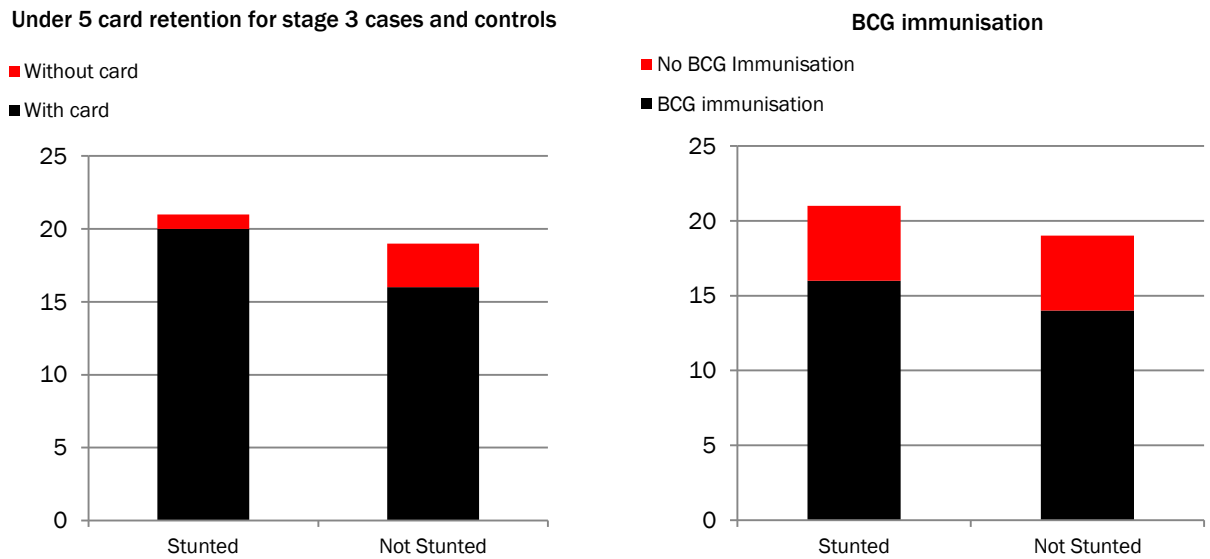
Figure 14: Stage 3 Cases & Controls vs. recall of danger signs in childhood illnesses



There appears to be a tendency for mothers of non-stunted children to recall greater numbers of danger signs. The upper quartile of the number of signs recalled by mothers of stunted children is equal to the median of those with non-stunted children; however, the difference in the number of signs recalled is too small as to be conclusive.

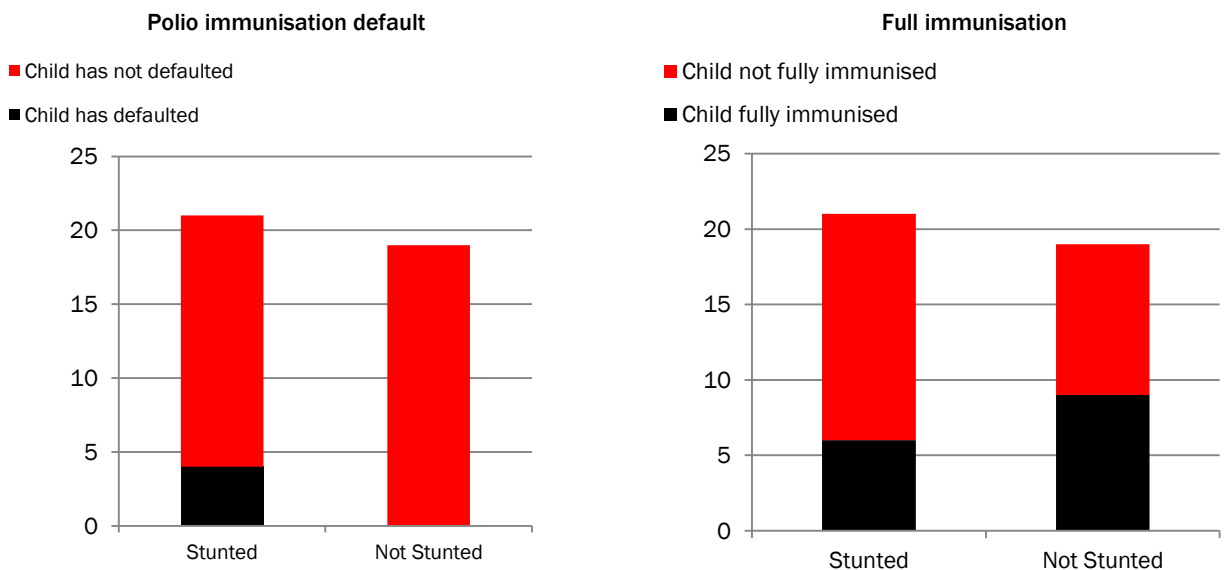
An investigation of the immunisation status indicates little difference between stunted and non-stunted cases in terms of the retention of under-5 cards and BCG vaccination (see figure 15 below). During the investigation in stage 1 it was observed (but not formally counted) that a high proportion of mothers possessed under-5 cards and this finding is confirmed in stage 3. The indicator for BCG vaccination required confirmation of either a BCG scar or an under-5 card for confirmation and showed little difference in stunting between vaccinated and unvaccinated children.

Figure 15: Under-5 Card retention & BCG immunisation for cases & controls



Recall of the number of vaccinations given as part of the stage 1 investigation was suggestive of high default on childhood immunisations and low rates of full childhood immunisation. Figure 16 derived from stage 3 data suggests low default on polio immunisation but confirms the low rate of full immunisation, and illustrates that default on immunisation and subsequent failure to fully vaccinate the child appears to be associated with a higher risk of stunting.

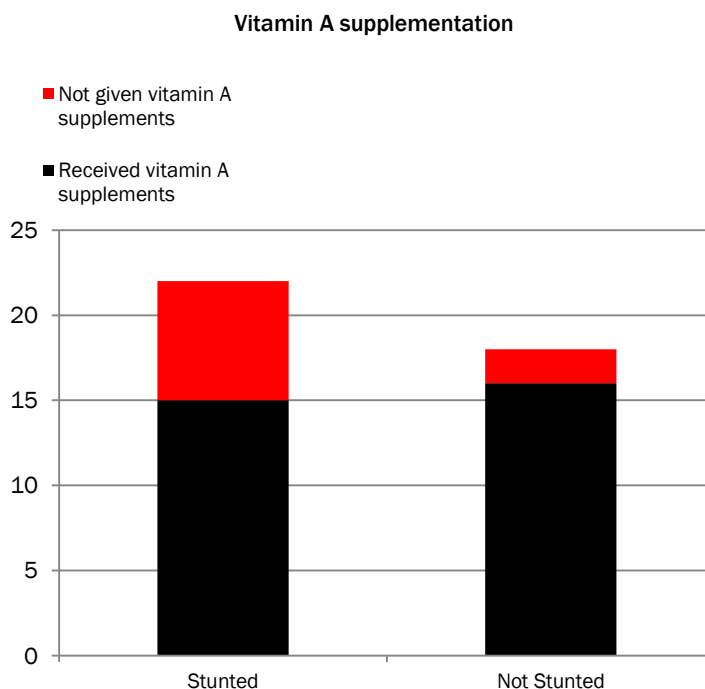
Figure 16: Immunisation default and full immunisation for Cases & Controls



The occurrence of illness is closely related to deficiencies in nutrition. In particular type 2 nutrient deficiencies retard growth and the retardation is proportional to the deficiency (Golden, 1996). Access to preventative services and timely health-seeking behaviours may reduce the occurrence, length or severity of illnesses and thus the type of deficiencies and associated growth retardation.

In contrast to default on full immunisation, there was a high stage 1 reported rate of vitamin A and deworming uptake through community level activities, such as distribution through the CHW and during child health week. This appears to be confirmed in stage 3 with an apparent association between vitamin A supplementation and reduced stunting.

Figure 17: Child vitamin A supplementation for stage 3 cases & controls



The investigation data strongly suggests that the following predispose the child to stunting: default from immunisation services, reduced uptake of child vitamin A supplementation, and poor recall of danger signs requiring treatment. These indicators likely point to a contrast in health-seeking behaviours through the difference in uptake between vaccination at PHU level and vitamin A supplementation at community level. This, however, confirms existing data which indicated that the uptake of some services, particularly vitamin A and de-worming, is greater when provided at community level through CHWs and the integrated maternal and child health week.

The activities suggested to be included in Child Health Week in Sierra Leone⁸ include defaulter tracing on immunisation services for children aged less than 1 year. It is clear from this investigation that a high proportion of children aged more than 1 year have defaulted. As a general rule of thumb there is no reason why catch up doses of childhood vaccinations cannot be given to older children and several sources including the Centre for Disease Control (CDC) and UNICEF identify suitable schedules for older children. In terms of the prevention of stunting in the most vulnerable period of childhood, the defaulter tracing activities should be extended to include children two – three years of age as a minimum.

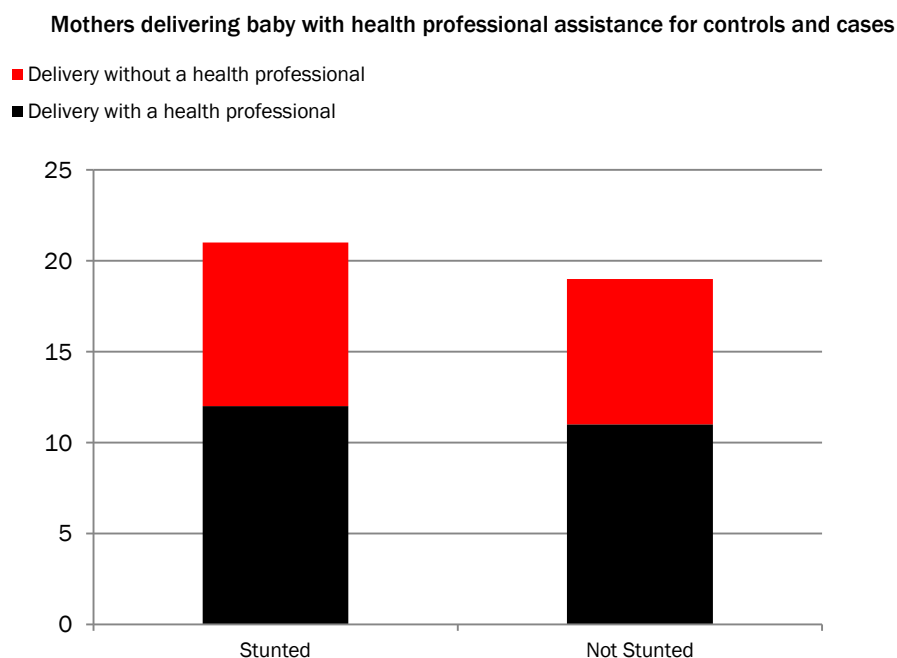
Stage 1 of the investigation indicated that there is generally non-existent or, at best, equivocal levels of partner/NGO support to community leaders and the work of CHWs. In addition to the IYCF education strategy through M2M Groups, mothers need to be educated in the early recognition of childhood illnesses and the importance of early treatment-seeking. In particular, increased support for CHWs for community-based interventions to treat malaria, diarrhoea and respiratory illnesses could minimise delay in access to treatment services. Given adequate support, CHWs are also ideally placed to play a continuing role, in tracing cases of immunisation defaulting and referral to the PHU. Increased levels of support for the work of CHWs and M2M Groups must play a central role to any strategy to reduce malnutrition.

⁸ World Health Organisation press release: “Sierra Leone Prepares for first round 2013 Maternal and Child Health Week Campaign” available at <http://www.afro.who.int/en/sierra-leone/press-materials/item/5295-sierra-leone-prepares-for-first-round-2013-maternal-and-child-health-week-campaign.html>

4.3 Breastfeeding

Early initiation of breastfeeding (EIB) within 1 hour of birth, including the giving of colostrum is a recommended health practice (World Health Organisation, 2014). The reported EIB rate for all mothers during stage 3 of the investigation was 60% (95% C.I. = +/-15.2%). Intuitively it might be expected that delivery of the child by a health professional and encouragement towards EIB may have an effect on stunting, however, as figure 18 shows, there is no discernible difference. A similar lack of impact was noted earlier in this report with respect to the number of ANC visits made by the mother coupled with a lack of age appropriate IYCF messaging given by health professionals at PHU.

Figure 18: Bar plot of cases & controls vs. delivery by a health professional



Failure to exclusively breastfeed to six months (including the giving of only water) predisposes the child to an increased risk of mortality (World Health Organisation, 2014). As noted earlier in this report, low rates of exclusive breastfeeding (30.6%), the routine administration of herbal medicines to children less than 6 months (72.4%) and the gender/control issues which allow only 20.4% of mothers to participate in the decision to administer the medicines are a barrier to efforts which aim solely to give nutrition education to mothers. It is thus important that congruent efforts are made towards educating all members of the community on the importance of exclusive breastfeeding, in particular to fathers and household elders, who appear to hold the decision-making capacity. These efforts may also be multidisciplinary; a programme implemented by Action Contre La Faim in Liberia tackling similar issues through agricultural activities and targeting men and elders suggested some successes in behavioural change (Action Contre La Faim, 2009).

4.4 Adequate complementary feeding

Adequate complementary feeding is defined by age appropriate dietary diversity, meal frequency and consistency. Integral to this is continued breastfeeding, ideally to the age of two years and beyond (World Health Organisation, n.d.). The adequacy of the child's diet for this study was assessed using the Infant and Child Feeding Index developed by Arimond and Ruel (Arimond and Ruel, 2003). One of these indicators is 'age appropriate breastfeeding', which includes exclusive breastfeeding for children to six months and continued breastfeeding, for this study, to two years.

Figure 19: Age appropriate breastfeeding vs. stage 3 cases & controls

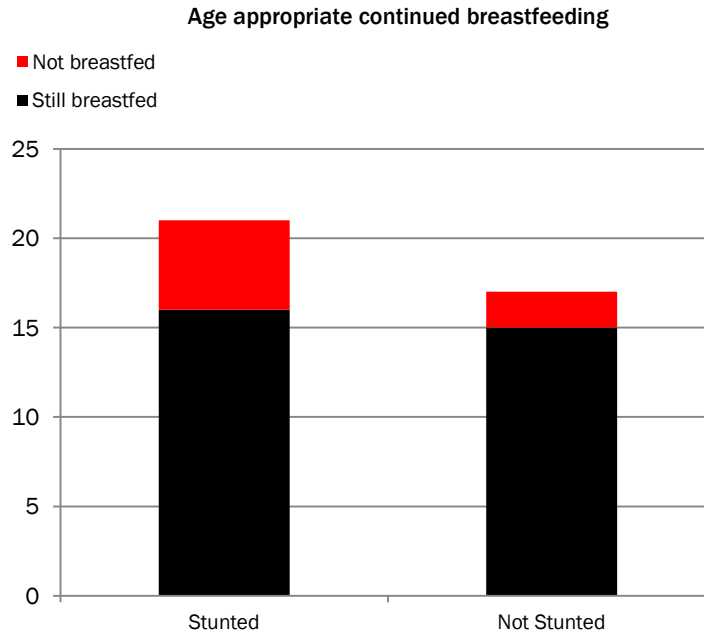
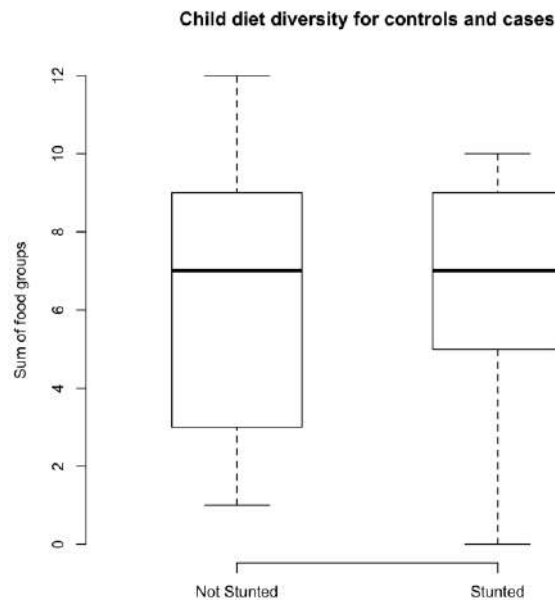


Figure 19 above indicates the relationship between continued breastfeeding and stunting, and appears to demonstrate that continued breastfeeding is associated with a reduced risk of stunting.

Beyond the age of six months dietary diversity is seen as an indicator of adequate micronutrient intake. The bar plot in figure 20 below indicates no difference in the median or 1st upper quartile for the number of food groups consumed between cases and controls in stage 3 of the investigation. This is contrary to expectation. As postulated earlier in this report this may be due to either the dietary diversity being equivocal for all children or an artefact of data collection.

Figure 20: Bar plot of dietary diversity for stage 3 cases & controls



In some cases food groups such as eggs and fish were included as being part of the child's diet, although the stage 1 investigation revealed that protein rich dietary sources such as these are commonly denied to the child due to food taboos or unequal food distribution at household level.

However, as an example, the leftovers, bones or non-flesh parts of fish are ground and used to flavour the sauces which are added to the mother and child's food.

The Infant and Young Child Feeding Index (ICFI) score provides a composite index of age appropriate breastfeeding, age appropriate dietary diversity and meal frequency. A score of greater than six indicates 'good IYCF practices'. Despite the potential constraints noted regarding the accuracy of the dietary diversity data, there appears to be a tendency towards lower ICFI scores being associated with stunting (bar plot in figure 21) and an association with reduced stunting where the ICFI score is greater than six.

Figure 21: Box plot and bar plot of Infant and Young Child Feeding Index score for cases and controls

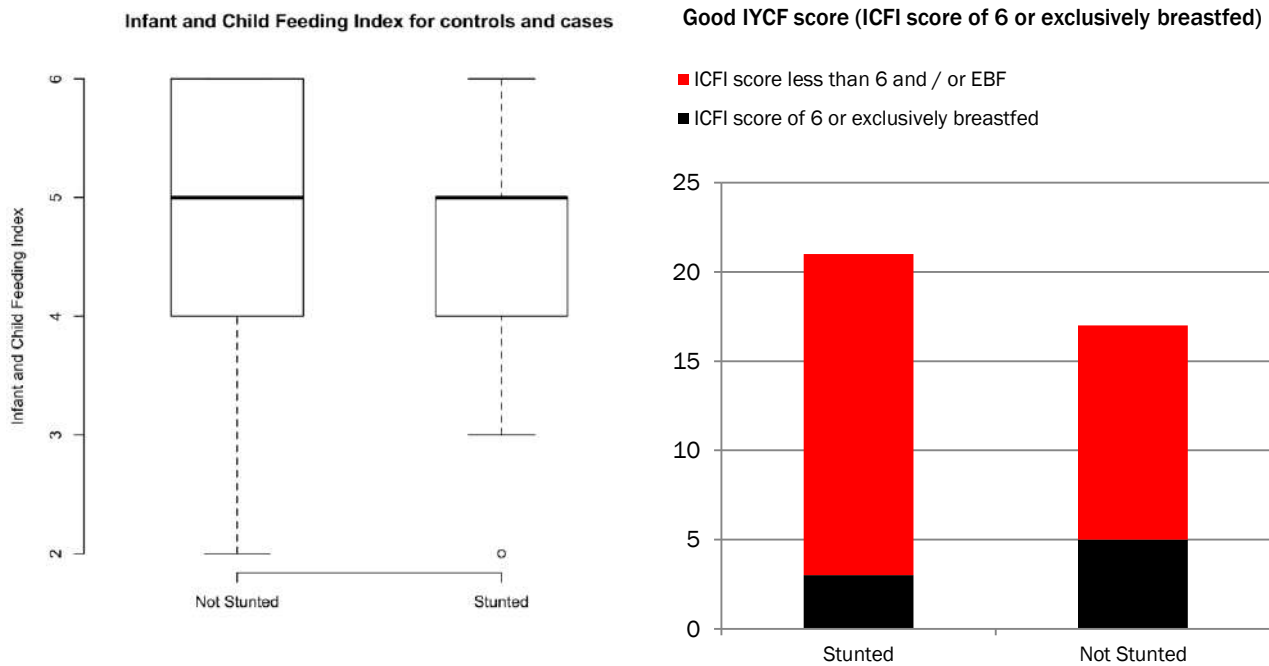
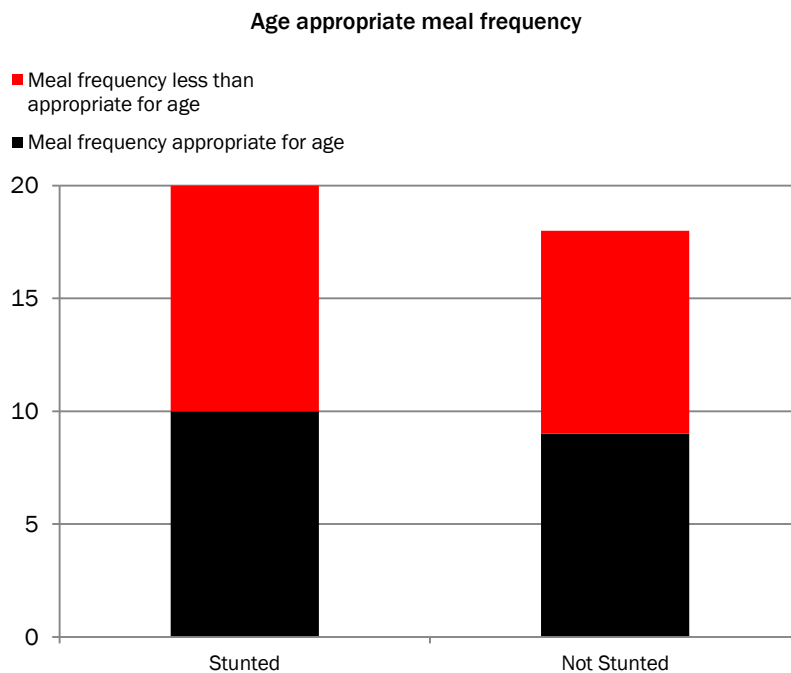


Figure 22 below disaggregates the effect of age-appropriate meal frequency from the ICFI score. There is no difference to be noted between cases or controls, primarily because the frequency of feeding was generally low. During stage 1 of the investigation, the vast majority of pregnant women or mothers with children less than two years of age indicated that both mother and child routinely ate twice per day.

Figure 22: Age appropriate meal frequency for stage 3 cases and controls



When asked about feeding practices during illness, 75.5% (95% C.I. = +/- 17.2%) of mothers in stage 2 responded that feeding frequency was reduced with only 15.3% reporting an increase. Age-appropriate meal frequency and the increase of feeding frequency during illness is an integral part of IYCF education, and further illustrates that any IYCF education currently being passed down through the PHU and/or M2M Group is currently ineffective in these respects.

As with the bar plots and box plots illustrated in this report, the likelihood and p value of most of the variables under consideration indicated tendencies, but were not significant at the statistical level. This is likely due, not only to the small sample size compared with the complexity of the relationships of the variables, but also potentially unobserved variables.

5 Conclusions

The causes of malnutrition are complex and multifactorial. The contributory factors identified in this investigation were compiled into a conceptual framework based on Stewart's conceptual model for stunting (Stewart, Lannotti, Dewey, Michaelson, & Onyango, 2013), which illustrates the contributions of each factor in Kambia District. It should be noted however that the relationships described are not statistically significant. Nevertheless the SQUEAC methodology proved useful in identifying some of the contributors towards malnutrition in Kambia District and in identifying boosters and barriers to service uptake and child care practices.

The findings were, in some cases, contrary to those expected from existing data. Immunisation coverage and rates of exclusive breastfeeding were significantly less than expected. This points to reporting issues that may mislead the efforts being made to tackle issues of under-nutrition in Kambia District.

PHUs and M2M Groups are ideally placed to provide preventative services, yet reports of coverage have focused on 'availability coverage' as defined by the Tanahashi model (Tanahashi, 1978) rather than on assessing 'effectiveness coverage'. Report of 100% of M2M Groups having trained members and over 100% immunisations at PHU do not account for the poor level of M2M Group knowledge at chiefdom level, nor for immunisation defaulting rates, and as such may be misleading if extrapolated to imply effectiveness.

The 'effectiveness coverage' of community-based approaches to preventing malnutrition is further undermined by a general lack of awareness of M2M Groups at community level and a lack of appropriate IYCF training and messaging (with relevant IEC materials) for both M2M Group members and PHU staff. There was little evidence of coordination or support between PHUs and M2M Groups, although evidence of reports from CHWs suggests that there is some coordination between CHWs and PHUs and between CHWs and M2M Groups.

There are other community-based strategies to prevent malnutrition, such as CHWs conducting routine health and nutrition activities and child health weeks, as well as TBA involvement with the mother and child. At PHU level and for CHWs, the nutrition focus is currently on treatment through screening for MUAC and the outpatient treatment of acute malnutrition. The uptake of services providing vitamin A and de-worming at community level appears to be greater than that for immunisations at PHU level. The use of these preventative services in this investigation appears to be associated with less risk of stunting, however, at community level the CHWs require a greater level of support to enhance the effectiveness of their work. One aspect of this support would be training in IYCF and the supply of IEC materials. However this must be accompanied by proper incentivisation and practical supervisory support to reinforce the theoretical training.

At each child health week there is a requirement to trace childhood immunisation defaulters aged one year or less although there are no technical barriers to catch up immunisations for children over one. With the greatest vulnerability to malnutrition and the effects of stunting being reversible up until the age of two to three years, it would be a significant enhancement of the child health week services to provide immunisation defaulter tracing up until three years of age as a minimum. The possible effect on a twice yearly spike of high workloads for PHU staff dealing with the referrals could be reduced if such defaulter tracing was included in the role of the CHW and integrated into the routine workload. Checking the child health card for immunisations and referral to PHU during the course of other routine CHW services and PHU coordination meetings would not increase the workload significantly.

As highlighted by Denney, Jalloh, Mallett, Pratt and Tucker (2014), repeated cascade trainings for staff and community workers is not likely to be effective in reducing malnutrition on its own. Issues at

household level such as access to clean drinking water and an improved latrine for proper sanitation also predispose the child to malnutrition in Kambia District. In several communities visited the water sources for drinking were not clean as several of the pumps had broken. Further to this there was also an association with not having an improved water source (i.e. the water from unsafe sources is not properly cleaned before drinking). For any educational approach to preventing malnutrition to be effective, it must be accompanied by efforts to restore a safe water supply at community level or provide the means to make the water safe at household level.

Education on appropriate feeding practices for children under two years must be extended to provide information on:

- The importance of exclusive breastfeeding to six months (including not giving water or herbal medicines).
- Continued breastfeeding to two years.
- Age appropriate dietary diversity and meal frequency for children aged greater than six months.

This would appear to be self-evident yet M2M Groups, PHU staff and CHWs (not to mention mothers) were not able to identify proper age appropriate IYCF practices. In the one community where the M2M Group members demonstrated appropriate IYCF teaching materials and messages, the TBA openly indicated that she contradicted this advice through encouraging herbal medicines for children aged under six months. Exclusive breastfeeding to six months is a universally repeated message from all key informants yet the rate of EBF continues to be approximately 30% in Kambia District. The primary reason for this is the frequent administration of herbal medicines, a practice in which mothers rarely play a role in decision-making. The lack of awareness of age-appropriate feeding practices is compounded by the existence of food taboos which restrict the dietary intake of mothers and infants.

The effect of childhood illnesses on stunting was apparent from the investigation. The effect of these illnesses was likely exacerbated by the widely reported practice of reducing meal frequency for the child during illness. IYCF messages and the mortality risks associated with giving water or herbal medicines must be aimed, not only at mothers, but at the decision-making members of the household, primarily the child's father, and grandmother.

Other widely held traditional beliefs such as *banfa* do not appear to have a negative effect on continued breastfeeding through the weaning period to 12 months and birth spacing up to 2-3 years. While addressing mistaken beliefs such as *banfa* is important, it must be done with caution so as not to undermine the beneficial aspects of current practices. Although continued breastfeeding is currently conducted to a median of 19 months, the correction of beliefs in *banfa* would allow an improvement toward the minimum of two years of breastfeeding as recommended by WHO. As with IYCF messages in general, addressing beliefs in *banfa* must be done through targeting decision-makers at household level. The participation of men in community groups appears to have a positive effect on the risk of stunting for the child, however, this inclusion should be extended to targeting males and other household elders for the messages previously described in this report.

Traditional practices including marriage before the age of 18 and associated early teenage pregnancy have long been known to have consequences for the health of the child and mother (OHCHR, 1979). Furthermore there is a subsequent effect on the level of education attained; evidence borne out by this study and identified as a barrier to the prevention of malnutrition in Kambia. Encouraging the prevention of early pregnancy before the age of 18 and continued education for females until at least the end of senior secondary school (17 – 18 years) should play a central part in strategies to prevent malnutrition.

Despite a change in the legal framework mandating delivery at PHU, with fines imposed in some communities for non-compliance, there were some anecdotal reports in stage 1 of traditional births “in

the bush” or delivery at home by the TBA. There was, however, no evidence that husbands discouraged participation in community groups or in seeking antenatal or delivery care at the PHU.

It was beyond the scope of the SQUEAC investigation to enable a formal assessment of household food security and economy. However, there was a noted difference in the risk of stunting for children whose mothers earned an income. It cannot be reliably postulated whether this is due to an overall improvement in household economy or food security; however, the effect of maternal income appeared to have a greater effect than the level of maternal control which was exerted over that income.

As clearly as the causes of malnutrition are multifactorial so must be the range of initiatives to tackle it. Such initiatives already existing at community level require strengthening and expansion to address the factors identified in this report. Enhanced supervision of such activities would potentially make more accurate information available at district level for evaluation purposes.

Annex 1: Stage 1 Key informant interview questionnaire - Community Leaders

Health Questions

- 1 What are the main health problems in the area? (list)
- 2 Which are the most frequent?
- 3 Which are the most serious (rank)?
- 4 When do you usually see these problems in the community?

Questions about nutrition

- 1 What do people here call malnutrition? (Stunting , wasting , oedema, underweight)
- 2 Who told you about malnutrition?
- 3 Who tells people about it in this village?
- 4 (Show photograph or describe stunting)
- 5 Do you know children in this village with this condition?
- 6 What do people usually do when a child has this condition?
- 7 What foods are given to young children?
 - a. 0-6m
 - b. 6-12m
 - c. 1 - 2 years

WASH

- 1 Describe where do you get your drinking water from?
- 2 (Observe water source)
- 3 Case finding
- 4 How are children identified for treatment?
- 5 Who does this in your community?
- 6 How are children referred to the health centre / MSG?

Access coverage

- 1 Do you know of programmes / meetings / groups to prevent malnutrition?
- 2 Where is (are) the programme(s) / meeting(s) located?
- 3 When does it operate?
- 4 Who attends the programme/ meetings?
- 5 Are there people who don't attend?
- 6 What are some of the reasons preventing people from attending?
- 7 What do you think of the programme / meeting / group?
- 8 (Probe answers)

Support from partners

- 1 What support if any do you receive for programmes?
 - a. Screening / referral for malnutrition
 - b. Operating support groups (e.g. MSG)
 - c. Maternal / Child health week

Annex 2: Stage 1 Key informant interviews - Community Workers

Role of the community worker

- 1 What is your role in the community?
- 2 Describe activities related to health / nutrition?
 - a. Screening and referral (to which programmes?)
 - b. Education (nutrition / health / WASH)
 - c. Attending MSG meetings
 - d. Vaccination
 - e. Child health week

Malnutrition

- 1 What types of malnutrition do you see in this community? (probe for stunting)
- 2 How do you identify those cases?
- 3 What do you do when you have identified cases of malnutrition?
 - a. Referral to treatment programme (CMAM or other)
 - b. Referral to IYCF counselling
 - c. Referral to MSG
 - d. Referral to growth monitoring

Nutrition education

- 1 What training have you had on nutrition education?
- 2 What other training have you received?
- 3 What messages do you give to:
 - a. Pregnant women
 - b. Women with children 0-6 months
 - c. Women with children 6-9 months
 - d. Women with children 9-12 months
 - e. Women with children > 12 months
- 4 How do you give these messages? (ICE / verbal / flyers etc.)
- 5 What things have changed since you gave this advice?
- 6 What things have not changed?
 - f. What are some of the reasons things do not change?

Non-attendance

- 1 What are some of the reasons mothers do not attend meetings / services?
 - a. MSG
 - b. IYCF counselling
 - c. Growth monitoring
 - d. CMAM

Community Worker Support

- 1 Who supports you in your work? (How?)
- 2 Do you attend meetings at the local health centre / MSG?

Annex 3: Stage 1 Focus Group Discussion - Pregnant & Lactating Women

- 1 Identify the ages of the participants

Nutrition

Show photograph or describe a stunted child then ask

- 1 What is this condition called? (identify local names for stunting)
- 2 What are the possible causes of this condition – local name for stunting? (check for local beliefs)
- 3 How did you hear about it? Who told you?
- 4 What are the consequences of (local name for stunting)
- 5 Can [stunting] be prevented?
 - a. If yes, how?
 - b. If no, why not?

Access to preventative programmes

- 1 Do you know of any programmes to prevent malnutrition?
- 2 Can you describe these programmes?
 - a. Who is it for?
 - b. How are these people referred to the programme?
 - c. When does it operate?
 - d. Who do you see at the programme?
- 3 Who tells people about this programme in the village?
- 4 Do you and your child attend the programme?
- 5 What messages do they tell you at the programme?
- 6 What has changed since you heard these messages?
 - e. What has not changed since hearing these messages?
 - f. What are some of the reasons things have not changed?

Non-attendance

- 7 Do you know mothers / children who don't attend the programme?
- 8 What are some of the reasons preventing people from attending the programme?

Household / Family factors

- 1 How old were you when you had your first child?
- 2 What ages are your children? (identify birth spacing or lack of)
- 3 What is your normal diet? (What did you eat yesterday?)
 - a. Preconception
 - b. Pregnancy
 - c. Lactating
- 4 How many meals did you have?
- 5 Do you think you eat a varied and nutritious diet?
 - d. How do you know this is nutritious?
 - e. Who told you?

Food security

- 1 How many times in the last year was there no food to eat in the house?
 - a. Often
 - b. Sometimes
 - c. Never
 - d. Don't know / refused to answer
- 2 How many times in the last year could you not afford to eat balanced meals?

- e. Often
 - f. Sometimes
 - g. Never
 - h. Don't know / refused
- 3 How many times in the last year did you or your child go hungry because there wasn't enough money for food?
- i. Almost every month
 - j. Some months but not every month (which months?)
 - k. Only 1 or 2 months
 - l. Never
 - m. Don't know / refused
- 4 How many times in the last year did you or your child skip meals because there was not enough food?
- n. Almost every month
 - o. Some months but not every month (which months?)
 - p. Only 1 or 2 months
 - q. Never
 - r. Don't know / refused

Household food allocation

- 1 Can you tell us about how you allocate food in your household
- a. Who in the household eats first?
 - b. How do you divide portion sizes in your household?

Child care

- 1 What do you think about vaccinations?
- 2 How many vaccinations has your child received?
- a. Visited the health facility
 - b. Visited by vaccinator at the village / household
(Check health cards at end of interview)
- 3 Does your child take medicines regularly?
- c. (describe what medicines are taken)
 - d. If not mentioned, probe for Vitamin A, De-worming
- 4 What foods do you give your child?
- a. At what age was BF started?
 - b. How often do you give breast milk?
 - c. What else is given to the child?
 - d. At what age were other foods / fluids given to the child?
 - e. At what age was breastfeeding stopped?
 - f. Child 6-9 months (How much / how often / consistency / types of food)
 - g. Child 9-12 months (How much / how often / consistency / types of food)
 - h. Child > 12 months (How much / how often / consistency / types of food)

WASH

- 1 What is the main source of drinking water?
- 2 How do you store the drinking water
- 3 What kind of toilet facility do you use?
- 4 How do you dispose of the child's stool?
- 5 How often do people normally wash their hands?
- a. Probe for when hand washing is done
 - b. Probe for what is used to wash hands

Infection

- 1 How many times in the last 3 months has your child been sick?
 - a. Diarrhoeal disease
 - b. Respiratory infections
 - c. Malaria
 - d. Worm infection
 - e. Other (describe)

- 2 What do you do when your child is sick?
 - f. probe who they visit for what conditions
 - g. Probe for when they seek treatment

Education

- 1 Until what age did you attend school?
- 2 What is your highest level of education?

Annex 4: Stage 1 Focus Group Discussion - Mother Support Groups

Membership

- 1 How many members in MSG?
- 2 Who are those members?
 - a. Females
 - b. Unmarried teenagers
 - c. Males
- 3 Number of directly trained members (crosscheck with registers)

Meetings

- 4 How often do you meet?
- 5 How do you decide who to invite to the MSG meetings?
- 6 Who supports the meetings?
 - d. Probe what support if any is given from PHU
 - e. Probe what support if any is given from CBOs / community leaders

Nutrition Education

- 7 What do you discuss at the meetings?
- 8 What messages are given?
 - f. Nutrition for pregnant women
 - g. Maternal nutrition
 - h. Birth spacing / *Banfa*
 - i. Child 0-6m (type of foods or fluids/ how often / amount)
 - j. Child 6-9 m (amount / frequency / consistency)
 - k. Child 9-12m (amount / frequency / consistency)
 - l. Child >12m (amount / frequency / consistency)
 - m. WASH (Hand washing, safe water, disposal of faeces)
 - n. Vaccinations / health care

(Probe for IEC materials / leaflets / posters etc.)

- 9 What words describe wasting / oedema / underweight / stunting?
- 10 What is the role of MSG if you find a child with stunting?
- 11 What is the role of MSG if you find children with wasting / oedema?

Non-attendance

- 12 Are there mothers who don't attend the meetings?
- 13 What prevents mothers from attending the meetings?

Annex 5: Stage 1 Key Informant Interview - Clinic Staff

Role of staff

- 1 What is your role at this PHU?
- 2 What kind of problems do you see in young children (<2yrs) at this clinic?
 - a. Rank by importance
 - b. Probe for malnutrition
 - c. Probe for stunting
- 3 What services are offered at this clinic?
 - d. Probe for services for children <2
 - e. Probe for vaccination services (check the cold chain)
 - f. Probe for services for PLW
- 4 Are there particular villages from which people do not attend PHU for any of these services?

Treatment / Prevention of malnutrition

- 1 What programmes are there at this PHU to prevent malnutrition?
- 2 Are there other programmes in the community? (list)
- 3 How do you refer children to these programmes?
- 4 What training have you received on IYCF?
(Crosscheck records at the interview)
 - a. IYCF counselling sessions
 - b. Referrals to MSG
 - c. Growth monitoring charts

Nutrition education

- 5 How do you give advice for preventing malnutrition?
 - d. Individual counselling
 - e. Group counselling
 - f. Other?
- 6 What messages do you give mothers to prevent malnutrition?
 - g. Nutrition for pregnant women
 - h. Nutrition for lactating women
 - i. Children 0-6m
 - j. Children 6-9m
 - k. Children 9-12m
 - l. Children > 12m
- 7 Do you have information booklets / flyers / posters / ICE materials?
- 8 What other types of education is included? (e.g. WASH)
- 9 What are the local beliefs about malnutrition?

Non-attendance

- 1 Are there mothers who do not attend meetings / counselling?
- 2 What are some reasons some mothers do not attend?
- 3 Are there particular villages where women do not attend PHU?

Annex 6: Stage 2 questionnaire for LQAS small study

Prevention of stunting in Kambia District – Small Study

Age of child: _____ months Sex: Male____ Female _____ (tick)

Name of village: _____

Questions:

- 1 In the first six months, how frequently did your child have any food or fluids other than breastmilk? Every day / some days / rarely / Never (circle)
- 2 In the first 6 months how frequently did you give your child any herbal drinks / medications? Every day / some days / rarely / Never (circle)
- 3 If 'NEVER' skip to question 4. If given, who advised you to give them? (tick all that apply)
 - a. You decided yourself _____
 - b. Child's father _____
 - c. Mother / Father in law _____
 - d. Grandmother / Grandfather _____
 - e. Health worker (nurse or CHW) _____
 - f. TBA _____
 - g. Other (describe) _____
- 4 At what age did you stop breastfeeding your child? _____ months
- 5 What made you decide to stop breastfeeding? (tick all that apply)
 - h. You decided to stop _____
 - i. Child's father told you to stop _____
 - j. Grandmother / grandfather decided _____
 - k. Health care worker told you to stop _____
 - l. Baby decided to stop _____
 - m. *Banfa* _____
- 6 Do you believe in '*Banfa*'? (or other equivalent local term) YES NO
- 7 Describe what *Banfa* means to you _____

- 8 What role did *Banfa* play in your decision to stop? _____

- 9 When your child is sick do you;

n. Decrease the amount or frequency of food s/he eats	YES	NO
o. Increase the amount or frequency of food s/he eats	YES	NO
p. The amount or frequency of food stays the same	YES	NO

Annex 7: Verbatim Case Histories from Stage 2

Case histories – Transcribed verbatim

1

History of *Banfa* in relation to IYCF

During pregnancy mother eats gari, banana and less rice three times a day.

Eats rice with 'proteinous' foods such as beans, fish, meat. Eats twice per day.

Starts breastfeeding immediately after delivery and exclusively on demand up to six months.

At 6-9 months put child on bulgur pap, given three times per day. 9-12 months child eats [illegible] three times per day. At 12-24 months child is put on family diet three times per day.

The breastfeeding continues up to 20 months.

The mother takes the child to clinic for immunisation. Immunisation is said to prevent diseases such as polio, measles and cough. The child is immunised five times.

2

Banfa

Banfa is when you have sex with another man besides your husband. If it's your husband nothing will happen to the child.

Believe that during sex, the male blood will enter the system of the mother and during breastfeeding that blood will enter into the child's blood which will result in the child having contaminated blood and as a result that child will die.

3

Banfa = Katape

Case history

Maternal nutrition

During pregnancy: 1 x rice/ [illegible], banana, cassava, potato leaves, orange (2 x)

After pregnancy: rice (2 x), plasas (cassava leaves, fish, maize, palm oil, pepper, onions)

0-6 months: breastmilk immediate, no water, no Gban Gban – advised in hospital (3 x), on demand (crying)

6-9 months: pap (no sugar) – given in hospital (1 x); continued breastfeeding (3 x)

9-12 months: breastfeeding 2 x; some pap, some rice, water

4

Maternal nutrition: rice, potato, cassava, gari with sauce, fruit like banana & orange, porridge. One general meal in the evening and the leftovers are heated and eaten in the morning. Also attends antenatal clinic.

0-8: E breastfeeding, bitter medicine for eight months and introduce complementary foods like glucose biscuits with sachets of milk at eight months. Watery pap was given with feeding bottle. Stopped breastfeeding at 18 months because of food insecurity and family problems.

5 Case study

Maternity nutrition: gari with sugar, raw cassava, rice and cassava leaves, fish, palm oil, pepper, onions, salt, groundnut, bean sauce, sucking limes, vegetables like potato leaves = 2-3 times a day.

0-7: EIBF, ExBF for seven, including water and bitter herbs. BF on demand.

7-10: benimix – rice, beans, bennie, palm oil, salt, maggi; watery pap with no milk (two times). Also cook rice with sauce. Water – source – drinks unprotect water.
Lactating mother: eats all kinds of food including rice and sauce.

6

When I was pregnant I do eat a lot of food like rice, foo-foo and I was advised to eat well by the nurse and also have balanced diet so that my child will grow up fine. When I gave birth my child was very big and strong and for six months I gave ExBF and after I start to give corn flour pap and milk. I don't know the amount of times I give BF per day. Now my child eats all what I eat. I gave him the pap three times daily with snacks in between.

7 Case history

When I visited the hospital when I was fine, I was told that I am pregnant and I need to take some blood medicines. In due course after the treatment, I gave birth to a healthy child. I eat different types of food and fruits. Even when I am a lactating mother, I eat the same type of food and fruits which [illegible]: rice with potato leaves and beans, bananas, pawpaw and different foodstuffs. I give breast milk to my child in the first six months and give water to the child when he is thirsty. After the first six months my child eats pap and I sometimes make Benimix when it is available. After the first yekar, the child eats the family diet with breastmilk.

8

The mother eats family diet during pregnancy and lactation 2-3 times per day, including seasonal fruits. The breastfeeding started immediately after delivery and given on demand day and night. The first six months the mother gives breast milk and water only. The child will begin eating cooked soft rice with palm oil and maggi at nine months twice per day until the child is one year. At one year the child eats family diet twice per day. The child gets his own portion. The child not be given fish or meat for fear of getting worms.

9

Maternal nutrition: rice, foo-foo, cassava, gari with sauce (including fish, beef, groundnut, palm oil, beans). Also eats fruits like banana, mango. Eat four times a day.
0-8 months: exclusive breastfeeding. Introduce CF at eight months old. But up till now the child is not eating any other food than breast milk. But eats fruits like banana with juice.
Overall the child is very okay. Still needs to encourage her eat nutritious foods.

10

When I was pregnant, I go the hospital on [shuttle?] and I eat a lot of rice, banana, mango, pawpaw, and chicken – all what is good for a pregnant woman. When I gave birth I was advised to give only BF but along the line I started giving water and native herbs. 6 months I started given bennie mix pap with no milk but now I give pap, BF and rice 2/7.

11

Pregnancy

Banana, potato, foofoo, rice/sauce – 3 x

Lactating

1 x rice/sauce

Gave birth at home – other women assisted her

Was late at night, no bike

Still hasn't gone to the hospital/PHU

0-6 months

Breast milk – on demand (6 x)

1st time breastfed child – same day (but delayed)

12

During pregnancy

Rice, plasas (fish, palm oil, salt, maggi, onions)

Banana, cassava – 1 x

Lactating

Same type of foods – 2 x

0-6 months

Delivered in hospital

Initiated breastfeeding immediately

EB – give 'Gban Gban' in the morning to [address?] stomach; 'bitter medicine'

Been to hospital 3 x – Marklate – 1 immunisation so far

ANC – 7 x visits

13

This child is 14 months old and has not eaten foods like a family diet, but just depends entirely on breast milk.

14

When I was pregnant I was advised by the nurse to eat well and have balanced diet also on personal hygiene so that my child will grow up well. I eat rice, cassava, mango, banana, etc. For the first six months I BF my child but sometimes I give native herbs and after six months I start giving pap bennie mix and milk 3/7 with some amount of snacks. At nine month I start to give rice and other food. At eighteen month I stop to BF.

Annex 8: MUAC Standardisation results for 3 team leaders

Report: C:\Users\Paul\Desktop\SLSQUEAC

Supervisor						
Subject	A	B	A-B	SQ	Sign	A+B
1	150	151	-1	1	-	301
2	156	157	-1	1	-	313
3	177	178	-1	1	-	355
4	165	166	-1	1	-	331
5	146	146	0	0		292
6	160	160	0	0		320
7	159	160	-1	1	-	319
8	155	156	-1	1	-	311
9	137	138	-1	1	-	275
10	149	149	0	0		298
			-7	7	7/7	

Report: C:\Users\Paul\Desktop\SLSQUEAC

Enumerator: 1									
Subject	A	B	A-B	SQ	Sign	A+B	D	SQ	Sign
1	150	149	1	1	+	299	-2	4	-
2	158	156	2	4	+	314	1	1	+
3	177	175	2	4	+	352	-3	9	-
4	163	163	0	0		326	-5	25	-
5	145	145	0	0		290	-2	4	-
6	160	160	0	0		320	0	0	
7	159	157	2	4	+	316	-3	9	-
8	157	157	0	0		314	3	9	+
9	139	139	0	0		278	3	9	+
10	148	147	1	1	+	295	-3	9	-
			8	14	5/5		-11	79	6/9
Precision: OK									
Accuracy: POOR									

Report: C:\Users\Paul\Desktop\SLSQUEAC

Enumerator: 2									
Subject	A	B	A-B	SQ	Sign	A+B	D	SQ	Sign
1	151	149	2	4	+	300	-1	1	-
2	157	156	1	1	+	313	0	0	
3	176	176	0	0		352	-3	9	-
4	164	166	-2	4	-	330	-1	1	-
5	146	146	0	0		292	0	0	
6	160	160	0	0		320	0	0	
7	160	161	-1	1	-	321	2	4	+
8	156	156	0	0		312	1	1	+

9	139	138	1	1	+	277	2	4	+
10	149	148	1	1	+	297	-1	1	-
			2	12	4/6		-1	21	4/7

Precision: OK
Accuracy: OK

Report: C:\Users\Paul\Desktop\SLSQUEAC

Enumerator: 3

Subject	A	B	A-B	SQ	Sign	A+B	D	SQ	Sign
1	150	151	-1	1	-	301	0	0	
2	157	157	0	0		314	1	1	+
3	175	176	-1	1	-	351	-4	16	-
4	165	165	0	0		330	-1	1	-
5	145	145	0	0		290	-2	4	-
6	159	160	-1	1	-	319	-1	1	-
7	159	159	0	0		318	-1	1	-
8	156	157	-1	1	-	313	2	4	+
9	139	139	0	0		278	3	9	+
10	139	139	0	0		278	-20	400	-
			-4	4	4/4		-23	437	6/9

Precision: OK
Accuracy: POOR

Annex 9: Height standardisation for 3 team leaders

Report: C:\Users\Paul\Desktop\Height.sgd

Supervisor						
Subject	A	B	A-B	SQ	Sign	A+B
1	88.5	88.4			+	176.9
2	99.2	99.1			+	198.3
3	101.6	101.6	0	0		203.2
4	98.9	98.9	0	0		197.8
5	95.1	95.1	0	0		190.2
6	119.3	119.4			-	238.7
7	101.6	101.5			+	203.1
8	89.1	89.1	0	0		178.2
9	93.8	93.8	0	0		187.6
10	84.5	84.5	0	0		169
.1999969				3/4		

Report : C:\Users\Paul\Desktop\Height.sgd

Enumerator: 1										
Subject	A	B	A-B	SQ	Sign	A+B	D	SQ	Sign	
1	88.7	88.6			+	177.3				+
2	99	99	0	0		198				-
3	101.4	101.3			+	202.7				-
4	98.8	98.8	0	0		197.6				-
5	95.5	95.6			-	191.1				+
6	119.2	119.2	0	0		238.4				-
7	101.5	101.5	0	0		203				-
8	89.1	89.1	0	0		178.2	0	0		
9	93.4	93.4	0	0		186.8				-
10	84.2	84.3			-	168.5	-.5	.25		-
-7.629395E-06				2/4		-1.399994		7/9		
							Precision:		OK	
							Accuracy:		POOR	

Report : C:\Users\Paul\Desktop\Height.sgd

Enumerator: 2

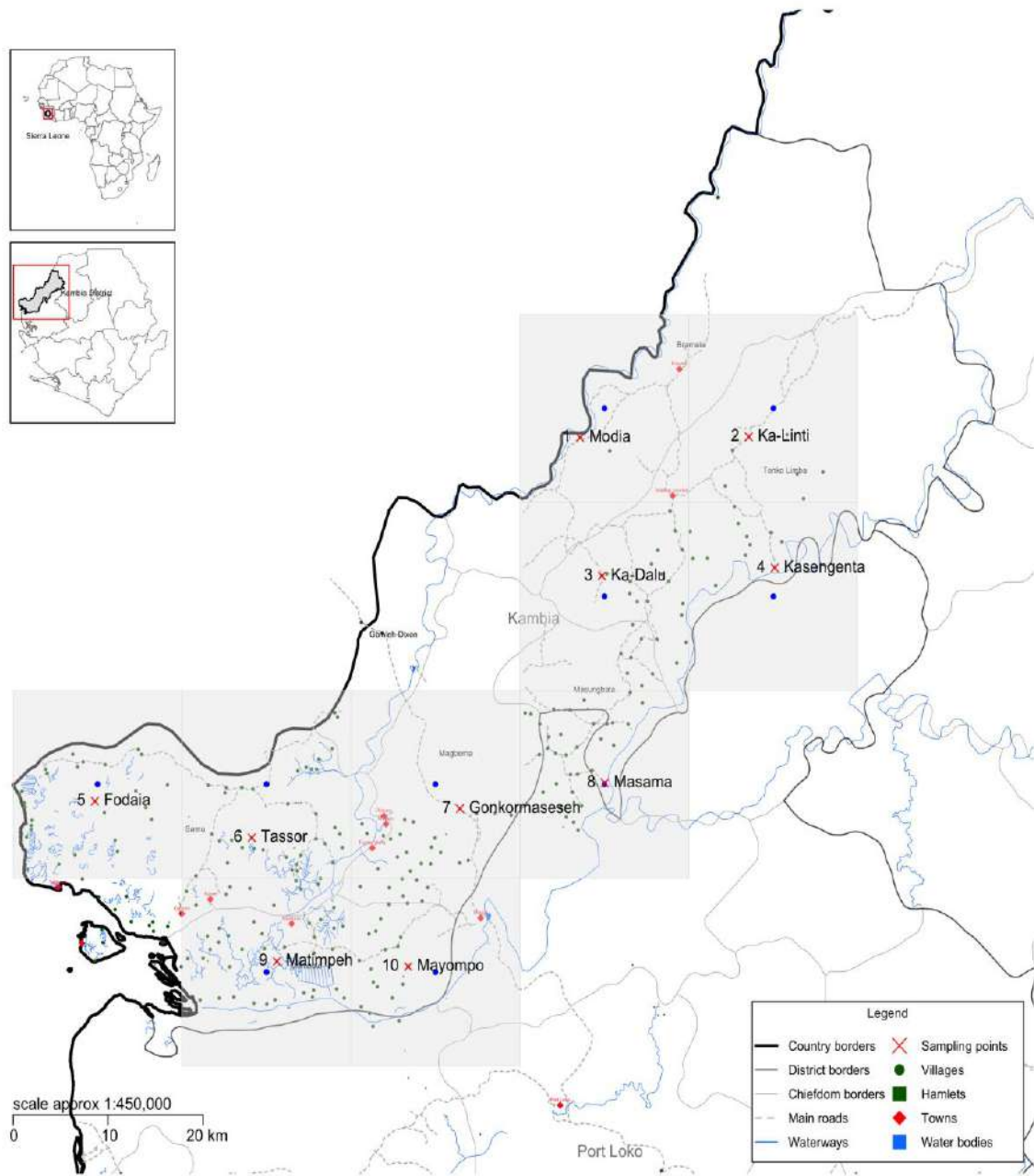
Subject	A	B	A-B	SQ	Sign	A+B	D	SQ	Sign	
1	88.2	88.3			-	176.5			-	
2	98.8	98.8	0	0		197.6			-	
3	101.4	101.4	0	0		202.8			-	
4	98.9	99			-	197.9			+	
5	94.8	94.7			+	189.5			-	
6	119.5	119.5	0	0		239			+	
7	101.6	101.7			-	203.3			+	
8	89	89	0	0		178			-	
9	93.7	93.6			+	187.3			-	
10	84.5	84.5	0	0		169	0	0		
				-9.999847E-02	3/5	-2.100021	6/9			
						Precision:	OK			
						Accuracy:	POOR			

Report : C:\Users\Paul\Desktop\Height.sgd

Enumerator: 3

Subject	A	B	A-B	SQ	Sign	A+B	D	SQ	Sign	
1	88.5	88.5	0	0		177			+	
2	99.1	99.1	0	0		198.2			-	
3	100.8	100.7			+	201.5			-	
4	98.6	98.8			-	197.4			-	
5	95.2	95.2	0	0		190.4			+	
6	119.5	119.5	0	0		239			+	
7	101.5	101.5	0	0		203			-	
8	89.1	89.1	0	0		178.2	0	0		
9	93.6	93.6	0	0		187.2			-	
10	84.5	84.5	0	0		169	0	0		
				-9.999847E-02	1/2	-2.100021	5/8			
						Precision:	OK			
						Accuracy:	POOR			

Annex 10: Map of quadrats and locations for Stage 3 sampling



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Secure Livelihoods Research Consortium (SLRC)
Overseas Development Institute (ODI)
203 Blackfriars Road
London SE1 8NJ, UK

T +44 (0)20 7922 8249
F +44 (0)20 7922 0399
E slrc@odi.org.uk
www.securelivelihoods.org

