Module 7: Frequency of Consumption of Vitamin A Rich Foods

1. Justification

Micronutrient malnutrition, the lack of vitamin A in particular, is one of the major public health problems in less developed countries. It can lead to blindness and death in children under five years of age. Globally, an estimated 250 million preschool children are vitamin A deficient, of which about 250,000 children become blind every year. As a consequence, half of them die within 12 months of losing their sight. About 25% of mortality rates among young children can be reduced by correcting vitamin A deficiency at the community level (Beaton *et al.,* 1993).

There is increasing demand from researchers, donors, and governments to assess the risk vitamin A deficiency at individual, household, and community level; which is mainly driven by the importance of understanding the existing vitamin A deficiency (VAD) level an as well as plan implementation programs to reduce it. The conventional methods used to assess vitamin A deficiency include xerophthalmia (eye damage) prevalence, dietary assessment, and biochemical analyses of serum retinol or retinol binding protein. However, these techniques require specialized skills and resources.   Vitamin A intakes are best assessed through consumption studies where either all foods consumed are weighed before eating, or using recall methods of foods consumed, usually during the past 24 hours. Clearly, assessing both VAD status and vitamin A intakes is expensive and often beyond the scope of nutrition interventions that are trying to go-to-scale. Helen Keller International invested in developing a semi-quantitative, food frequency method that looked at the frequency of intake of vitamin A rich foods and validated these results against serum retinol values (Rosen *et al.,* 1993). This method is used to assess whether a given population is at risk of VAD. It can also help monitor which vitamin A foods, such as OFSP, are coming into the diet by season and over time.

Subsequently, the 24-VASQ method was developed for estimating vitamin A intake of populations in a simpler way than 24 hour recall of all foods consumed (dee Pee *et al.,* 2006). It can be used in large surveys and surveillance systems to quantify vitamin A intake of specific population groups, monitor changes in intake through time, compare intake among populations, identify the contribution of four different food groups - vegetables, fruits, animal foods and fortified foods - to vitamin A intake and identify populations at risk of vitamin A deficiency. However, it is also too time consuming to serve as a quick, low cost monitoring tool.

2. Objectives

The objectives are:
1) to learn how to design and implement the Helen Keller International (HKI) seven day recall food frequency method to assess the risk of VAD at the community level. The HKI approach can be used to assess whether or not VAD is public health problem or not as well as to monitor the changes in consumption of vitamin A rich foods due to an intervention;
2) to learn how to calculate the HKI food frequency score, understanding which are animal sources of vitamin A versus plant sources of vitamin A.

3. Tool

If the goal is to determine the whether VAD is a public health problem in an area, 15 randomly selected communities should be surveyed. In each community at least 50 female caregivers of children 12-71 months of age should be interviewed. If the goal is to use it as an evaluation tool (seeing the change in the score over time), then sample size calculations will need to be done, referring to the literature for examples of studies using this indicator.

The HKI tool basically asks one question: How many days, in the past seven days, did (child's name) eat (a specific food item). The question is asked of female caregivers of children 12-71 months of age. If more than one child is present in that age group in a household, the child to be interviewed should be randomly selected. It is important to note whether or not the child is still breastfeeding, as that influences intake of other foods (Persson *et al.*, 1998).   The questionnaire with the tool is provided in Appendix A. The ODK questions follow.

0   IS THE REFERENCE CHILD STILL BREASTFEEDING   0. No 1. Yes _____
         0A. IF CHILD STOPPED BREASTFEEDING: AGE OF CHILD IN MONTHS WHEN STOPPED BREASTFEEDING _____

FREQUENCY OF CONSUMPTION OF VITAMIN A RICH FOODS DURING PAST 7 DAYS. Now we have a few more questions regarding your child (*name*) and how often he/she has eaten certain foods during the past week. We are also interested in learning if you ate those foods as well. *If the item is in italics it cannot be substituted on the survey form. If it is not, it can be replaced with similar types of food that are locally available.* A * indicates that the food item is a plant source of vitamin A (supplying beta-carotene which the body converts into retinol or vitamin A). Two ** indicate that the food item is an animal source of vitamin A (directly supplying retinol).

	MAIN STAPLE (MAIZE, SORGHUM, RICE, CASSAVA, IRISH POTATO, SWEETPOTATO,
1	*YAM, COOKING BANANA, ETC.)?*
1A	*AND THE CHILD?*
2	*WHOLE CHILLIES OR HOT PEPPER?*
2A	*AND THE CHILD?*
3	*DARK GREEN LEAVES OF ANY KIND?**
3A	*AND THE CHILD?*
4	PUMPKIN LEAVES?*
4A	AND THE CHILD?
5	*SWEETPOTATO LEAVES?**
5A	*AND THE CHILD?*
6	AMARANTHUS LEAVES?*
6A	AND THE CHILD?
7	*RED PALM OIL?**
7A	*AND THE CHILD?*
8	*MILK OR MILK PRODUCT (CHEESE, YOGHURT)?*
8A	*AND THE CHILD?*

9   *CARROTS?**

9A   *AND THE CHILD?*

10   *RIPE MANGO, FRESH OR JUICE?**

10A   *AND THE CHILD?*

11   *PUMPKIN OR ORANGE SQUASH?**

11A   *AND THE CHILD?*

12   *RIPE PAPAYA (FRESH OR JUICE)?**

12A   *AND THE CHILD?*

13   WHEAT/BISCUITS/COOKIES/BREAD?

13A   AND THE CHILD?

14   *WHITE-FLESHED SWEETPOTATO?*

14A   *AND THE CHILD?*

15   *ORANGE-FLESHED SWEETPOTATO (OFSP)?**

15A   *AND THE CHILD?*

16   *YELLOW-FLESHED SWEETPOTATO?**

16A   *AND THE CHILD?*

17   *EGGS WITH YOLK?***

17A   *AND THE CHILD?*

18   *ANY FRESH FISH (WITH INTACT LIVER)?***

18A   *AND THE CHILD?*

19   *LIVER - FROM ANY ANIMAL OR BIRD (E.G. CHICKEN) OR FISH?***

19A   *AND THE CHILD?*

20   *MEAT FROM COW/PIG/SHEEP/RABBIT/RAT/WILD ANIMAL?*

20A   *AND THE CHILD?*

21   *BUTTER?***

21A   *AND THE CHILD?*

22   *COD LIVER OIL?***

22A   *AND THE CHILD?*

23   *FOOD FRIED IN OIL OR WITH OIL?*

23A   *AND THE CHILD?*

24   PASSION FRUIT (OR OTHER PLANT SOURCE HIGH IN VITAMIN A)*

24A   AND THE CHILD?

25   VITAMIN A FORTIFIED MARGARINE (BLUEBAND) OR OIL?**

25A   AND THE CHILD?

26   CHICKEN OR OTHER FOWL?

26A   AND THE CHILD?

27   WEANING FOOD FORTIFIED WITH VITAMIN A, LIKE CERELAC (FORTIFIED PAKAGED CEREAL)?**

27A   AND THE CHILD?

28   INFANT FORMULA (E.G. NAN, ETC) FORTIFIED WITH VITAMIN A?**

28A   AND THE CHILD?

29   COCONUT, COOKING OIL (VEGETABLE OR GHEE)?

29A   AND THE CHILD?

30   ANY SUGAR TO WHICH VITAMIN A HAS BEEN ADDED?

30A   AND THE CHILD?

31   LENTILS, BEANS OR OTHER PULSE?

31A   AND THE CHILD?

32   GROUNDNUT, CASHEW NUT OR ANY OTHER NUT?

32A   AND THE CHILD?

33. IF THE CHILD ATE ANY TYPE OF SWEETPOTATO DURING THE PAST SEVEN DAYS: ON A TYPICAL DAY, HOW MUCH SWEETPOTATO DOES THE (*NAME OF THE CHILD*) EAT DURING THE ENTIRE DAY?

        33A NUMBER OF ROOTS: _____.

        33B ROOT SIZE

                1   VERY SMALL (50 gms)

                2   SMALL (100 gms)

                3   MEDIUM (250 gms)

                4   LARGE (400 gms)

                5   VERY LARGE (600 gms)

34. IF THE CHILD CONSUMED ANY SWEETPOTATO: DOES THE CHILD NORMALLY CONSUME:

        34A   AS A SNACK   0. NO 1. YES

        34B   FOR BREAKFAST   0. NO 1. YES

        34C   FOR LUNCH   0. NO 1. YES

        34D   FOR DINNER/SUPPER 0. NO 1. YES

35. IF THE FEMALE CAREGIVER ATE ANY TYPE OF SWEETPOTATO DURING THE PAST SEVEN DAYS: ON A TYPICAL DAY, HOW MUCH SWEETPOTATO DOES THE (*NAME OF THE WOMAN*) EAT DURING THE ENTIRE DAY?

        35A NUMBER OF ROOTS: _____.

        35B ROOT SIZE

                1   VERY SMALL (50 gms)

                2   SMALL (100 gms)

                3   MEDIUM (250 gms)

                4   LARGE (400 gms)

                5   VERY LARGE (600 gms)

36. IF THE FEMALE CAREGIVER CONSUMED ANY SWEETPOTATO: DOES SHE NORMALLY CONSUME SWEETPOTATO:

        36A   AS A SNACK   0. NO 1. YES

        36B   FOR BREAKFAST   0. NO 1. YES

        36C   FOR LUNCH   0. NO 1. YES

        36D   FOR DINNER/SUPPER 0. NO 1. YES

37. IF WOMAN OR CHILD ATE ANY TYPE SWEETPOTATO: WHERE DID YOU GET THE ROOTS?
        1   YOUR FIELD
        2   FROM MARKET
        3   RELATIVE / NEIGHBOR/FRIENDS
        4   FROM CURRENT PROJECT
        5   OTHERS SOURCE (Specify)
        8   DO NOT KNOW

In collecting the data, note that sweetpotato leaves, pumpkin leaves, and amaranthus leaves are specific examples of the Dark Green Leaves category. For example, if pumpkin leaves are consumed 4 days, the number of Dark Green Leaves must be at least 4. Clearly, sweetpotato and pumpkin leaves could be consumed on the same day, so the total for Dark Green Leaves just can never be less than the number of days noted for any one of the specific type of leaves.

4. Analysis

Whether or not a community is has a vitamin A deficiency problem is determined by two threshold values:
      ≤4 days per week for mean frequency of consumption of animal sources of vitamin A
      ≤6 days per week for mean frequency of consumption of animal and plant sources of vitamin A (weight by source).

If at least 70% of the communities surveyed (11 out of 15) have a VAD problem, then the entire survey area probably has a VAD problem of public health significance. The questionnaire does not provide sufficient information to determine whether an individual child is vitamin A deficient. The HKI score should be used as a community level indicator.

Animal Score= Eggs + Fish with Liver intact + Liver + Butter + Cod Liver Oil + Fortified Weaning Foods + Fortified Margarine + Fortified Sugar + Fortified Infant Formula

Plant Score = (Dark Green Leafy Vegetables + Carrots + Ripe Mango + Pumpkin or Orange Squash + Ripe Papaya + Yellow Sweetpotato + Orange-fleshed Sweetpotato + Red Palm Oil + Passion Fruit)/6

Total Score = Animal Score + Plant Score.   10.5 is the maximum possible score.

5. References

Beaton G.H., R. Martorell, K. Aronson, B. Edmonston, G. McCabe, A. Ross, and B. Harvey, 1993. "Effectiveness of Vitamin A Supplementation in the Control of Young Child Morbidity and Mortality in Developing Countries," Toronto, Canada: University of Toronto.

De Pee, Saskia, Halati, Siti, and Bloem, Martin. 2006. 24 hour VASQ method for estimating vitamin A intakes, HKI Asia-Pacific Regional Office, Indonesia, 56 pages.

Rosen, David S., Haselow, Nancy J., Sloan, Nancy L. 1993. How to use the HKI food frequency method to assess community risk of vitamin A deficiency. Helen Keller International Technical Assistance Program, 71 pages.

Persson,V., Greiner, T., Islam, S. and Gebre-Medhin, M. 1998. "The Helen Keller International Food-Frequency Method Underestimates Vitamin A Intake Where Sustained Breastfeeding is Common," *Food Nutr. Bull.*, vol. 19, no. 4, pp. 343–346.

Appendix A. Questionnaire Available Also in Excel File for Frequency of Vitamin A Consumption

F. FREQUENCY OF CONSUMPTION OF VITAMIN A RICH FOODS AND MAJOR FOOD GROUPS DURING PAST 7 DAYS VILL: ☐☐☐ HHID: ☐☐☐ **Pg 11**

Now we have a few more questions regarding your child (*name*) and how often he/she has eaten certain foods during the past week.

We are also interested in learning if you ate those foods as well.

Num.	NAME OF THE FOOD	CHILD F03	CAREGVIER ID F04
11	*Pumpkin or orange squash*		
12	*Ripe papaya, fresh or as juice*		
13	Wheat/Biscuits/Cookies/Bread		
14	White-fleshed sweetpotato		
15	*Orange-fleshed sweetpotato (OFSP)*		
16	*Yellow-fleshed sweetpotato*		
17	**Eggs with yolk**		
18	**Any fish FRESH (with intact liver)**		
19	**Liver - from any animal or bird (e.g. chicken) or fish**		
20	Meat from cow/pig/sheep/rabbit/rat, chickens or wild game		
21	**Butter**		
22	**Cod liver oil**		
23	Food fried in oil or with oil		
24	*Passion fruit (or other fruit rich in vitamin A)*		
25	**Vitamin A fortified margarine (BLUEBAND) or oil**		
26	Chicken or other fowl		
27	**Weaning food fortified with vitamin A, like Cerelac**		
28	**Infant formula (e.g. NAN, etc) fortified with vitamin A**		
29	Coconut milk or oil, cooking oil, ghee		
30	**Any sugar to which Vitamin A has been added**		
31	Lentils, Beans (all kinds), peas, other legumes		
32	Groundnut, cashew nut or any other nut		

F01 Name of the Reference child ☐☐☐☐☐☐☐☐☐☐☐☐ Code: ☐☐

F02 Is the *reference child* still breastfeeding? 0- No 1- Yes ☐

If no: At what age (in months) did the child stop breastfeeding ☐☐

Explain to the participant that you want the number of DAYS, not the number of times.

During the past 7 days, how many days did the child eat (name of the food)?

Meaning, how many days, starting with the last day (specify the day), did the child eat (food)

remembering that if the child, for instance, ate the food at lunch and at dinner on the same day,

that counts as 1 day. Remember for the child, the food can be part of the porridge, e.g. milk added

to maize flour. *(NOTE: includes foods not prepared in the)*

NUMBER OF DAYS THE FOOD WAS CONSUMED OVER THE PAST 7 DAYS

Num.	NAME OF THE FOOD	CHILD ID F03	CAREGIVER ID F04
1	Main staple (maize, rice, cassava, etc.)		
2	Whole chillies or hot pepper		
3	*Dark green leaves (of all kinds)*		
4	*Pumpkin leaves* **#**		
5	*Sweetpotato leaves*		
6	*Amaranth leaves* **#**		
7	*Red Palm Oil*		
8	Milk or milk product (cheese, yoghurt)		
9	*Carrots*		
10	*Ripe mango, fresh or as juice*		

This food item can be replaced with similar foods that are locally available.

Plant sources of vitamin A are *in italics*. Animal or industrially fortified sources of vitamin A are **bolded.**

F05 *FOR THE* **CHILD** *IF CONSUMED* **ANY** *TYPE OF SWEETPOTATO:*

On a typical day, how much sweetpotato does (name) eat during the entire day? **F05A** Number of roots ☐☐.☐☐ **F05B** Size: 1-Very Small 2-Small 3-Medium 4- Large ☐

(Show picture of root sizes)

F06 *FOR THE* **CHILD** *IF CONSUMED SP:* On a day when [NAME] eats SP, is it for... 0- No 1- Yes 8- Don't know A- Snack ☐ B- Breakfast ☐ C- Lunch ☐ D- Supper/Dinner ☐

F07 *FOR THE* **MOTHER** *IF CONSUMED ANY TYPE OF SWEETPOTATO:*

On a day when you eat sweetpotato, how much do YOU typically eat during the entire day? **F07A** Number of roots ☐☐.☐☐ **F07B** Size: 1-Very Small 2-Small 3-Medium 4- Large ☐

(Show picture of root sizes)

F08 *FOR THE* **MOTHER** *IF CONSUMED SP:* On a day when you eat SP, is it for... 0- No 1- Yes 8- Don't know A- Snack ☐ B- Breakfast ☐ C- Lunch ☐ D- Supper/Dinner ☐

F09 *If ate SP:* Was it available from (1- Your field 2-Market 3-relative/neighbor 4-Current Project 5-Other 8-Don't know)? ☐ **F09B** Specify other ☐☐☐☐☐