Vitamin A Supplementation & De-worming

Post Event Coverage Survey- 2010

Tanzania Mainland

Final Report on Research Findings

April 2011

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Funding Sponsors: A2Z: The USAID Micronutrient and Child Blindness Project
The Canadian International Development Agency

The authors would like to acknowledge the work of many who were involved with the implementation of this survey and include Margaret Benjamin and Temina Mkumbwa from HKI, Wessy Meghi from TFNC and Dr. Fatma Mganga from MOHSW/EPI as well as the time and efforts of the enumerators, health workers, community health workers, village leaders and child caretakers involved in this survey.

Current Version Date: April 10.2011
NIMR Approval Date: May 18, 2010

This report is made possible, in part, by the generous support of the American people through the United States Agency for International Development (USAID) under the terms of Cooperative Agreement No. GHS-A-00-05-00012-00. The contents are the responsibility of the AED and do not necessarily reflect the view of USAID or the United States Government.

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Executive Summary

Title	*Vitamin A Supplementation (VAS) Post-Event Coverage Survey for Mainland Tanzania-June/July 2010 Round*
Methodology	*Cross-sectional randomized cluster survey scheduled within one month of the latest VAS June 2010 mass distribution round in Mainland Tanzania*
Study Duration	*One month (July 2010)*
Objectives	*Primary: To obtain and validate national coverage estimates for the June 2010 mass distribution round of VAS and de-worming.* *Secondary: To characterize children missed by the VAS mass distribution round as a basis to plan better strategies to reach them in the future.*
Number of Subjects	*1,203 subjects were interviewed of which 1,192 (99.1%) completed the interview with 1,171 (97.3%) included in the analytic sample.*
Key Inclusion Criteria	*Households with children 6-59 months in June 2010 for VAS and between 12-59 months for de-worming coverage analysis*
Statistical Methodology	*All analyses were conducted using STATA and adjusted for cluster survey design. Selected characteristics of children (and households of children) reached and not reached by VAS were compared for differences using chi-squared tests and logistic regression analysis.*

Key Findings	*VAS coverage in Mainland Tanzania among children 6-59 months of age during the June 2010 VAS distribution round was 65% (95% CI: 62.7-68.1), about 30% lower than national coverage data. Approximately 90% of children had ever received a vitamin A capsule (VAC), including those that received a VAC in the June 2010 distribution round. The average age of children who had never received a VAC was 24 (±1.54 SE or 95% CI: 21.1-27.4) months.* *De-worming coverage among children 12-59 months of age during the June 2010 distribution round was 59% (95% CI: 54.0-64.1), with a significant number being de-wormed against the current policy of treating children over 1 year (24% of children <11 months surveyed were de-wormed).* *Less than one third (32%; 95% CI: 26.8-36.9) of recently delivered women (i.e. those who gave birth within one year before the survey date) had received their recommended post-partum dose of vitamin A.* *Compared to children who were reached by the June 2010 VAS round, children missed lived in urban areas [OR=3.31; p=0.01], had caretakers who did not hear about the campaign [OR=48.7; p<0.001], or were more likely to be from a Muslim household [OR<3.25; p<0.01]. Child sex, age, maternal age and maternal education had no effect on VAS coverage.*
Discussion and recommendations	The results highlighted differentials between the post-event coverage survey and national coverage estimates, indicating a lack of accurate coverage data available for mainland Tanzania. The strong and successful decentralization of the VAS program may be at the expense of national level ability to promote and socially mobilize for VAS awareness and monitor actual coverage. The role of the national government, including the Tanzania Food and Nutrition Center in the national VAS program, needs to be strengthened. Raising local awareness by better informing village leaders about VAS distribution rounds by district officials can help address coverage issues as well as capturing hard-to-reach or missed children. Refresher trainings for health workers on Tanzania's VAS and de-worming delivery protocols are also needed.

Acronyms

AED	Academy for Educational Development
CCHP	Comprehensive Council Health Plans
CHW	community health worker
DHS	Demographic and Health Survey
DMO	district medical officer
EPI	Expanded Program on Immunization
HW	health worker
IRB	Institutional Review Board
NBS	National Bureau of Statistics
MoHSW	Ministry of Health & Social Welfare
NGO	non-governmental organization
PCA	principal component analysis
PEC	post-event coverage
PEM	protein energy malnutrition
PPS	probability proportional to size
RMO	regional medical officer
SES	socioeconomic status
TBA	traditional birth attendants
TFNC	Tanzania Food and Nutrition Center
VAC	Vitamin A capsules
VAD	Vitamin A deficiency
VAS	Vitamin A supplementation
WHO	World Health Organization

1. Introduction

1.1 Background

Vitamin A deficiency (VAD) is a significant public health problem in Tanzania. A 1997 national survey revealed low serum retinol (<20ug/dL) among 24% of children aged 6-71 months and low breastmilk retinol in 69% of lactating women[1]. Diet quantity, quality, and diversity are limited in Tanzania which, along with high rates of infection in children, contributes to high rates of VAD. Both mild and severe forms of VAD are associated with increased morbidity and mortality in children[2,3].

In Tanzania, efforts to combat VAD started in 1987 when a disease-targeted approach for focusing on Vitamin A Supplementation (VAS) was used. Under this strategy, VAS was targeted to "high-risk" children with xerophthalmia, measles, protein energy malnutrition (PEM), lower respiratory tract infection and diarrhea. However, this approach failed to reach a high proportion of VAD children who did not have the "high risk" condition. Thus, beginning in 1997, VAS was integrated into the Expanded Program on Immunization (EPI) which targeted all children less than 2 years of age as well as post-partum women. The program was further modified in pilot areas from 1999-2000 when VAS distribution was added to the sub-national measles vaccine campaign that targeted all children between 6-59 months of age in selected mainland districts. Data from these pilot districts showed VAS coverage reached 94% in 1999 and 99% in 2000.[4] The high coverage achieved through using the measles campaign to distribute VAS to all Tanzanian pre-school aged children led to the start of the national bi-annual VAS distribution rounds in 2001. Since 2001, VAS coverage in Tanzania has remained ≥90% according to official estimates based on tally sheet administrative data (see Figure 1).

1.2 Statement of the Problem & Rationale for Survey

VAS coverage estimates in Table 1 are based on administrative data from "tally sheets" that record the number of 6-59 month children receiving VAS at a given health post against an estimated number living in the health post catchment area. These data are consolidated up through the health system infrastructure (i.e. health facility to district to region and finally to national level) to arrive at national VAS coverage estimates. Results from studies that compared VAS coverage estimates from administrative versus population-based post-event coverage surveys in 2004 and 2006 showed an 8-10 percent higher coverage estimate from administrative data, suggesting that this method overestimates actual VAS coverage.

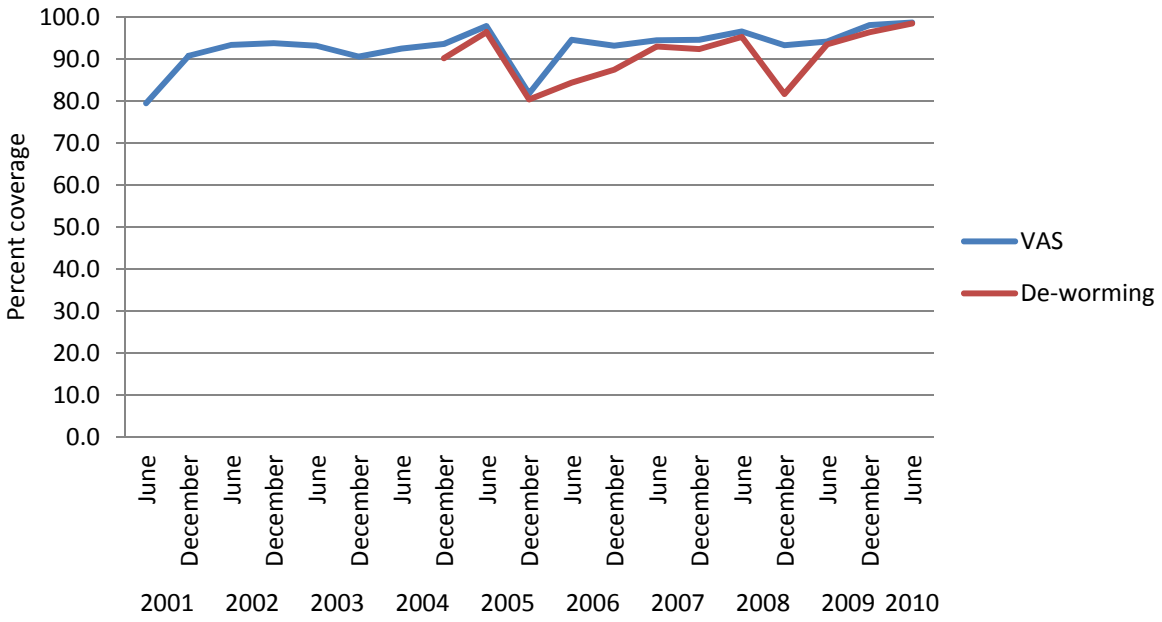
[1] TFNC 1998 Report No.1880 National Vitamin A Survey 1997.

[2] Imdad A et al. Vitamin A supplementation for preventing mortality and morbidity in children 6 months to 5 years of age. *Cochrane Database of Systematic Reviews,* 2010 (12): CD008524.

[3] Beaton GH, Martorell R, Aronson KJ, Edmonston B, Ross AC, Harvey B, McCabe G. *Effectiveness of vitamin A supplementation in the control of young child morbidity and mortality in developing countries*. Toronto, Canadian International Development Agency, 1993. Nutrition policy discussion paper 13.

[4] EPI report 2001 MOHSW Tanzania

Figure 1. Trends in coverage of Vitamin A supplementation and de-worming among children under 5 during twice yearly events, Mainland Tanzania



The accuracy of VAS coverage estimates from administrative (tally sheet-based) data are likely compromised both in the numerator (total number of children dosed) and the denominator (total number of targeted children). The numerator figure is collected from thousands of health posts and summarized at the district, regional and national levels, involving numerous people and hand calculations at most levels subjecting the tallies to human error. In addition, reports from health posts or districts are often submitted up to 3-4 months after the round takes place. Although systems have been put in place to encourage timelier reporting, there has been little improvement. The denominator figure used at all levels is provided by the National Bureau of Statistics (NBS). It is based on population projections from the last census in 2002 and is generally considered an underestimation of the true population. However, national directives from the Ministry of Health & Social Welfare (MoHSW) require that all reporting of health statistics use the population project data. Many districts report coverage rates over 100% indicating that census projections are likely underestimating the actual target population.

It is likely that children missed by bi-annual VAS massive distribution rounds are those from vulnerable and remote households. These 'hard-to-reach' children, however, have not been well characterized or identified in Tanzania. Although anecdotal evidence suggests this includes children who abstain for religious reasons or who are geographically isolated, better information is needed to understand barriers to participation in the VAS distribution rounds.

1.3 Objectives

The primary objective of the post-event coverage survey was to determine VAS coverage among children 6-59 months and de-worming coverage among children 12-59 months during the June 2010 national distribution round in order to validate administrative coverage data.

The secondary objective of the survey was to characterize the children who were missed by VAS in June 2010 and examine barriers to attendance.

2. Methodology

Ethical approval for conducting the survey was provided by the Tanzanian National Institute of Medical Research and the Institutional Review Board (IRB) of the Academy for Educational Development (AED) in Washington, DC.

2.1 General Design

The study was a cross-sectional cluster sample survey. To establish a representative sample of households, thirty clusters were randomly selected across mainland Tanzania using probability proportional to size (PPS) sampling of administrative units, the smallest unit for which there is population data (i.e., ward or village level) from the NBS data. The sampling frame was developed in one stage using a NBS-generated list of all registered villages in the country. The sampling interval and sample needed was determined based on the total population of the country. A random number between 1 and the sampling interval was then selected to determine the first cluster. This methodology was used to select thirty clusters across more than 12,000 villages.

The sample size for the survey was adapted from the WHO/EPI cluster sampling methodology[5,6] of 30 clusters by 30 individuals (n=900) for coverage rates on immunizations. A sample size of 900 allows for a coverage estimate that is within 6.5% of the 'true' coverage rate. However, in order to obtain more information about children missed by the VAS distribution, this sample was extended to include 10 additional children per cluster, or 30 clusters X 40 individuals (n=1,200), which increased the precision of the coverage estimate and allowed for more robust analysis of the children who were missed.

Six teams of six enumerators were employed for the survey work. Each team had a team leader with a supervisor for every two teams. Before arriving in the villages, the teams reported to the district medical officer (DMO) in which the cluster was located to explain the purpose of the survey and obtain official approval to carry out the survey in the district. The team was then assigned a district health officer to accompany and introduce them to the village leaders. Upon arrival in the village, the team leaders and district staff met with the village leaders to explain the purpose of the survey and obtain official approval to conduct the survey in the village. Letters were also sent ahead of time to the district medical officers where the 30 clusters were located with copies sent to the regional medical officers (RMO) for the respective districts and hand carried to the village leaders.

Using a map, each cluster was divided into 4 quadrants. In each quadrant, one of 5 starting points was chosen at random. At each starting point, a bottle was spun to determine the direction of the

[5] WHO (1991) Training for Mid-Level Managers: The EPI Coverage Survey.
[6] WHO (2005) Immunization Coverage Cluster Survey- Reference manual. Dept of Immun, Biol & Vaccines.

households for selection. Once the direction was determined, the number of households from the starting point to the end of the quadrant in the direction of the bottle was estimated and a house was selected at random as the starting household. Following the direction of the bottle spin from this first household, the next 10 eligible households were interviewed. This process was repeated in each of the 4 quadrants of the cluster.

Households were screened for eligibility based on having a child 6-59 months of age at the time of the June 2010 round of supplementation. Within each eligible household, only one eligible child was selected to be the focus of the survey. If multiple children lived in the household, the selection of the child was done at random by writing the names of all eligible children on slips of paper, placing them in a bag, and picking one out. Child ages were verified by health cards whenever possible and when unknown, were estimated using life event calendars. This method was repeated in all quadrants in each of the 30 clusters sampled across mainland Tanzania resulting in a total estimated sample size of 1,200 households.

In order to assist informants to recall vitamin A supplements, interviewers showed samples of capsules of different doses normally used during distribution rounds during visits.

In addition to caretakers/children in the sample, three other types of informants were sampled in each cluster and included 1-2 health workers (HW), 1-2 VAS community health workers (CHW) and 1 village/community leader. These interviews were conducted by team leaders and began with the village/community leader survey in each site. After this initial interview, two health workers per cluster were interviewed to collect additional data on the recent round of supplementation and assess general health worker characteristics and knowledge of VAS. As with the selection of children, names of potential informants were written on slips of paper, placed in a bag, and picked at random. The health workers interviewed were randomly selected across the facilities within the cluster but had to be involved with VAS distribution in some way. The same random selection methodology was used to select two CHWs per cluster to interview using the names of all CHWs engaged in VAS provided by the village leaders. Most interviews took between 30 - 45 minutes.

The rapid assessment of the VAS coverage was completed within 6 weeks of the June/July 2010 round of distribution. As some districts distributed VAS late in July, data collection was completed in July and August 2010.

2.2 Statistical Analysis

All data were double entered into an EPI Info software system. Data were then compared for errors and corrected by reviewing the original data form. Analysis was done using STATA statistical software[7]. Standard error calculation of coverage rates for VAS and de-worming were adjusted for survey design methodology using the STATA *svy* procedure. Chi-squared tests and logistic regression analysis were run to test differences among missed and covered children on various characteristics, including socioeconomic status (SES), maternal age and education, child age and sex, distance from health center, and religion. A p value of <0.05 was considered significant.

[7] StataCorp. 2009. *Stata Statistical Software: Release 11*. College Station, TX: StataCorp LP

2.2.1 Wealth Estimation

Since expenditures were not estimated in the survey, SES of the household was determined using a wealth index. The wealth index calculation included data on a household's ownership of assets and on available water and sanitation. Each asset and service variable was broken down into a dichotomous or categorical variable depending on whether or not the household owned that asset or used that service.[8] The variables were then processed in order to obtain their scoring factor or weight.

For the data analysis, principal component analysis (PCA)[9] was utilized to determine the important factors explaining household SES. The results obtained from the first principal component were used to develop the asset index based on the formula:

$$Aj = f1 \times (aj1-a1)/ (S1) + \ldots\ldots fN \times (fajN-aN) /(sN)$$

where,

f1 is the scoring factor or weights for the first asset,

x is the variable (asset or service),

aj is the value for the assets,

a1 and s1 are the mean and standard deviation of assets respectively.

Based on this equation, wealth indices were assigned to the residents of households. The resulting population was then divided into wealth quartiles representing proxies for SES (i.e., lowest, lowest-middle, upper-middle, and upper). Wealth quartiles are thus expressed in terms of quartiles of households of the total population at risk for all measures.

3. Study Findings

3.1 Enrollment and Final Sample

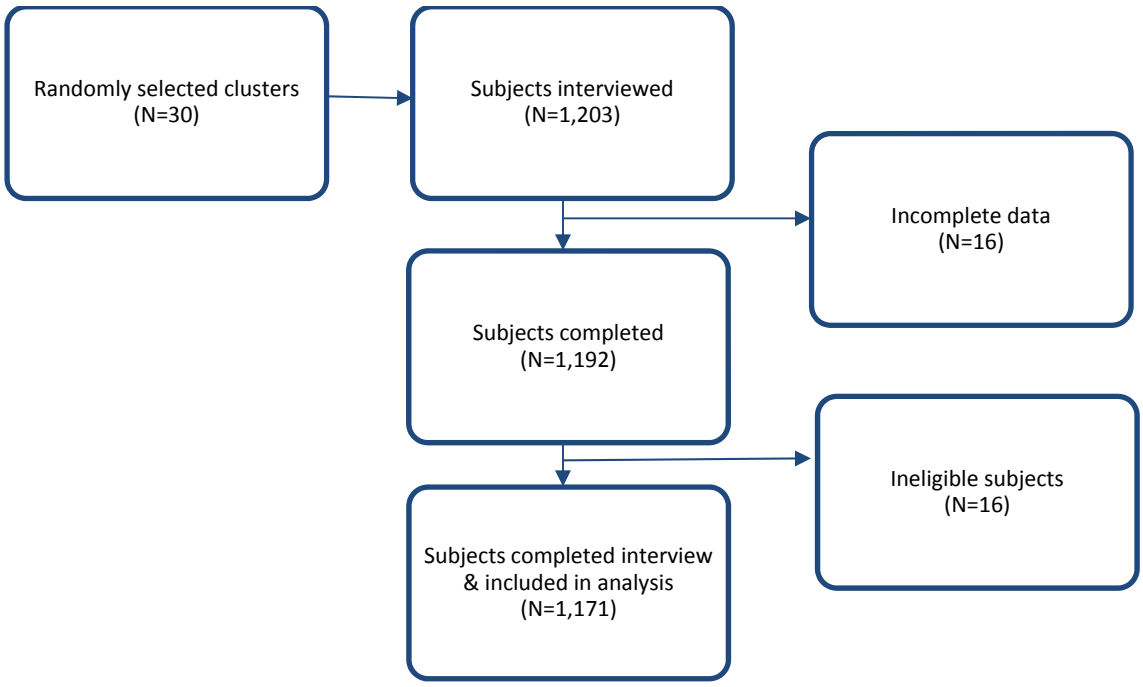
After collection of data, the final sample included 1,203 children, 58 HWs, 30 village/community leaders, and 45 CHWs. Analysis was restricted to children aged 6-59 months of age at the time of the 2010 distribution round in the district, for whom the status of VAC receipt during the last round was known. Given that all districts did not offer VAS distribution on the same date, distribution duration could vary up to one month, and the date of VAS receipt was not always recorded on any forms, age at distribution was calculated using a common distribution date of June 16, 2010 with a one-month leeway period. Final analyses therefore included all children 6-59 months of age on June 16, 2010.

[8] Shea Oscar Rutstein, Kiersten Johnson "The DHS Wealth Index" in DHS comparative reports N°6 August 2004

[9] Deon Filmer, Lant Pritchett "Estimating wealth effects without expenditure data or tears: with an application to educational enrollments in States of India" World Bank Policy Research Working Paper No. 1994 October 1998

The final analytical sample was 1,171 children, as reflected in Figure 2.

Figure 2. Flow of participants in final analytical sample



3.2 Description of Sample

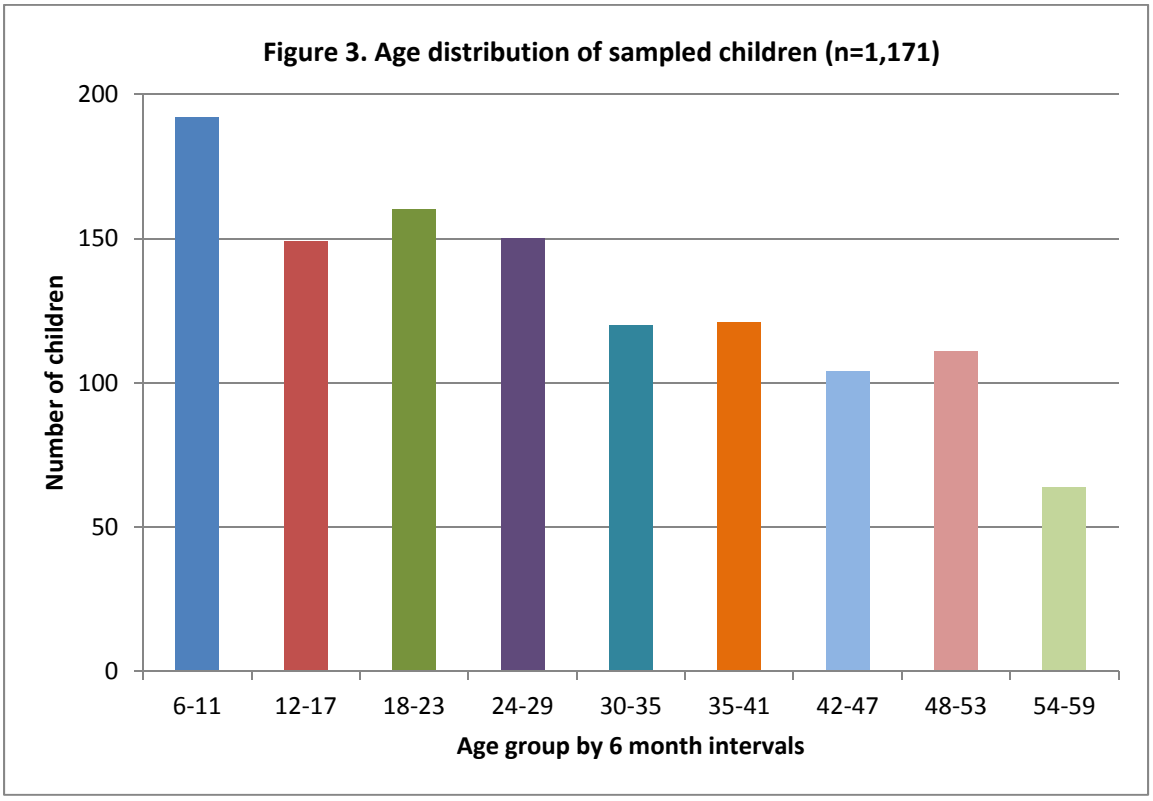
Table 1 provides an overview of the characteristics of the final sample included in the analysis. Overall, the sample of children was fairly evenly represented across 6-month age categories and gender, with slightly higher representation among younger children. Although all <5 children (present or not present) were included in the random selection, older children who were more likely to be out playing may have been missed by the mother when asking for child names and ages. On the whole, most informants/caretakers were mothers (99%); among them, 83% were married and 66% had completed their primary education.

Table 1. Descriptive Statistics

	Sample (n=1,171)	Percent (%)
Child Characteristics		
Age in months		
6-11	192	16.4
12-17	149	12.7
18-23	160	13.7
24-29	150	12.8
30-35	120	10.3
36-41	121	10.3
42-47	104	8.9
48-53	111	9.5
54-59	64	5.5
Gender		
Females	595	51.1
Males	569	48.9

Table 1. Descriptive Statistics of Sample (continued)	Sample (n=1,171)	Percent (%)
Caretaker/Informant Characteristics		
Relationship with Child		
Mother	1098	93.8
Father	8	0.7
Grandmother	43	3.7
Aunt	13	1.1
Other	9	0.8
Maternal Characteristics (N=1,098)		
Marital Status		
Married	902	83.1
Divorced/ Separated	49	2.7
Widowed	29	4.5
Single	100	9.2
Other	6	0.6
Education of caretaker		
None	212	19.3
Incomplete primary school	109	9.9
Primary Education	727	66.2
Incomplete secondary school	14	1.3
Secondary education	33	3.0
Post secondary training	3	0.3
Relationship of caretaker to head of household		
Self	98	8.9
Only wife	732	66.7
One of multiple wives	95	8.7
Child of	66	6.0
Parent of	43	3.9
Sibling of	11	1.0
Other	53	4.8
Age in years		
<20	51	4.6
20-24	270	24.6
25-29	304	27.7
30-34	251	22.9
>=35	222	20.2
Household Characteristics		
Religion		
Muslim	315	26.9
Roman Catholic	368	31.4
Non-Catholic Christian	428	36.6
Traditional	45	3.8
Other	15	1.3
Income Quartile of caretaker		
First (Lowest)	136	11.6
Second	401	34.2
Third	370	31.6
Fourth (Highest)	264	22.4
Main Source of Income		
Farming	822	70.3
Business	188	16.1
Formal employment	68	5.8
Informal employment	38	3.3
Other	54	4.6

Figure 3 below shows the distribution of children sampled by age based on 6-month age intervals. Younger children were generally better represented in the sample. This may be due to the fact that they were more likely to be in the household at the time of the survey and older children were more likely to be further from the house playing. Although all children <5 in the household were supposed to be listed for random selection, presence in the household at the time of the survey may have altered the mothers answers.



3.3 VAS Coverage among Children 6-59 Months of Age during Supplementation Round

> ***Key finding:***
>
> *65% of children aged 6-59 months received VAS during the June 2010 distribution round.*

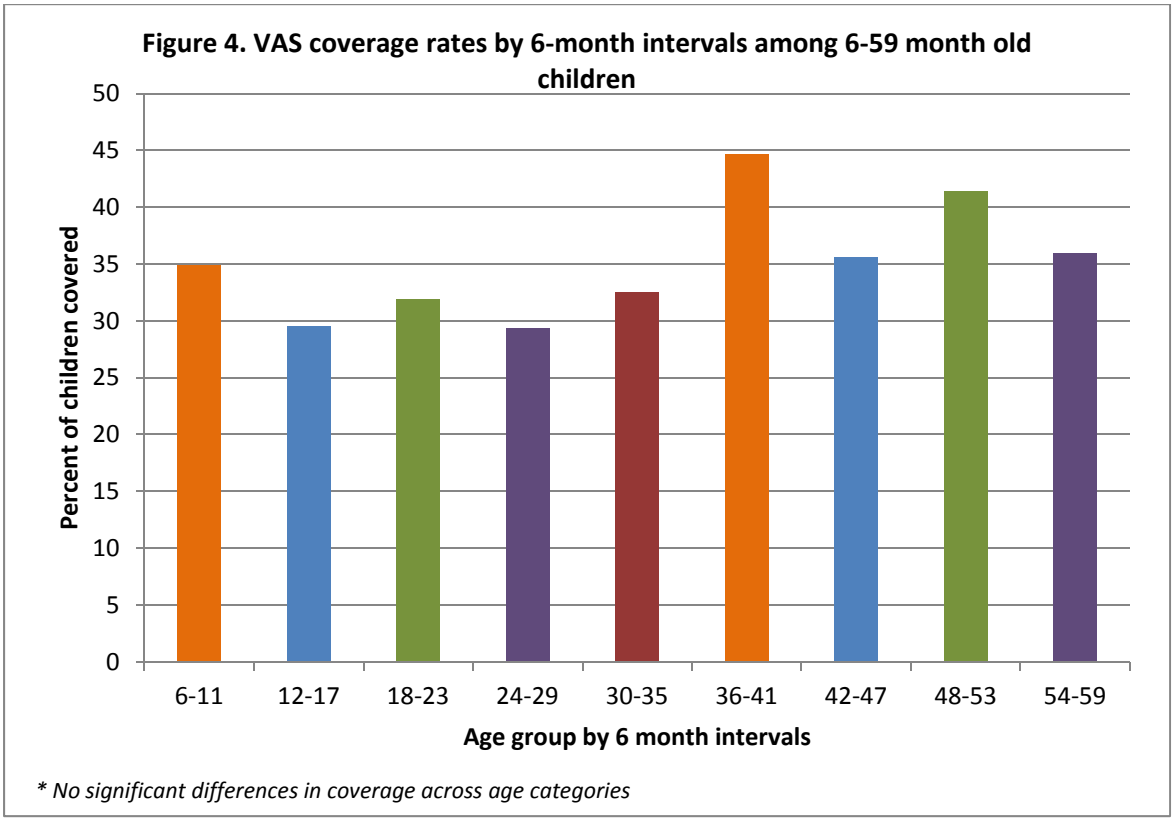
The primary outcome of the survey was to document the actual mainland coverage rate of children 6-59 months old who were supplemented with Vitamin A during June 2010 (Round 1). The key finding of 65% of children being supplemented was almost 30% lower than the estimated national coverage figure of 98%, indicating that a large number of children were missed in the 2010 VAS round.

Table 2 also shows that overall, only 91% (CI: 89.0%-92.4%) of children had ever received vitamin A in their lifetime. This is to say that 9.3% of children had never been reached with vitamin A in their lifetime. Ten children were supplemented but not eligible (i.e. less than 6 months or over 60 months).

Table 2. Coverage of VAS among children 6-59 months of age

	VAS coverage in last round of supplementation (June 2010)		VAS coverage in lifetime	
	% Received [CI]	% Did not receive [CI]	% Received at least once [CI]	% Never received [CI]
Overall	65.4 [62.7, 68.1]	34.6	90.7 [89.0, 92.4]	9.3
By Age				
6-11 months	64.9 [58.1, 71.8]	34.9	80.6[75.0, 86.3]	19.3
12-59 months	65.4 [62.3, 68.5]	34.5	94.6 [91.9, 97.3]	7.4
By Sex				
Female	66.7 [62.7, 70.6]	33.1	90.8 [88.4,93.2]	9.2
Male	63.8 [59.7, 67.9]	36.2	93.5 [89.1,97.9]	9.5

There was no statistical difference in coverage by sex or age for receipt of VAS in the last round. However, ever having received VAS was lower among children 6-11 months than 12-59 months, which is not surprising as the older children would have had more opportunities to be reached by at least one round of supplementation in their lifetime.



3.4 Caretaker Knowledge about Vitamin A and VAS Rounds

Key findings:

Village/community leaders were the main source of information about VAS campaigns.

Almost half of the caretakers knew about the benefits of Vitamin A and its importance for child health

Table 3 below shows that among caretakers interviewed, 43.6% knew that vitamin A could help protect a child from disease, and just under half (48.7%) did not know the benefits of vitamin A. Similarly, food sources of vitamin A were mostly unknown (45.3%), although 32.9% of mothers indicated that green leafy vegetables were a source of vitamin A.

More caretakers heard about the VAS campaign through their community leaders (35.2%) than through community health workers (20.8%) or health workers themselves (20.3%). Almost 15% of caretakers heard about the VAS campaign through loudspeaker announcements on roaming vehicles.

When asked which was the most important service provided during the VAS distribution, more caretakers indicated de-worming (84.2%) as a valued service than VAS (65.3%), although they were allowed to answer more than one service.

Table 3. Caretaker responses to Vitamin A knowledge questions

Response options not provided unless noted, and multiple answers allowed	Sample	Percent (%)
What are the benefits of vitamin A?	**N=900**	
Prevents Blindness	3	3.3
Protects Against Disease	392	43.6
Protects Against Death	19	2.1
Other Responses	62	7.3
Don't Know/Don't Remember	438	48.7
What foods are rich in vitamin A?	**N=903**	
Egg Yolk	113	12.3
Liver	28	3.3
Fish	107	12.5
Red Palm Oil	5	0.6
Green Leafy Vegetables	282	32.9
Orange fruits (ripe mango, papaya)	158	18.5
Orange vegetables (carrots, pumpkins, orange fleshed sweet potato)	52	6.1
Other Foods	209	23.1
Don't Know	416	45.3
How do you find out about the VAS campaigns?	**N=748**	
Poster	35	4.7
Newspaper	0	0
Television/Radio	17	2.3
Other mothers/ word of mouth	50	6.7
Community Health Worker	156	20.9

Table 3. Caretaker responses to Vitamin A knowledge questions (continued)		
Response options not provided unless noted, and multiple answers allowed	Sample	Percent (%)
Health worker at clinic	152	20.3
Traditional Birth Attendant	0	0
Religious Leaders	79	10.6
Community Leaders	263	35.2
Roaming Vehicles with loudspeakers	107	14.3
Other	125	16.7
Don't Remember	0	0
What is the most important item distributed during the campaigns? (options provided)	**N=507**	
De-worming Tablets	427	84.22
Bednets	53	10.45
Measles Vaccine	10	1.97
Other Vaccines	16	3.16
Vitamin A	331	65.29

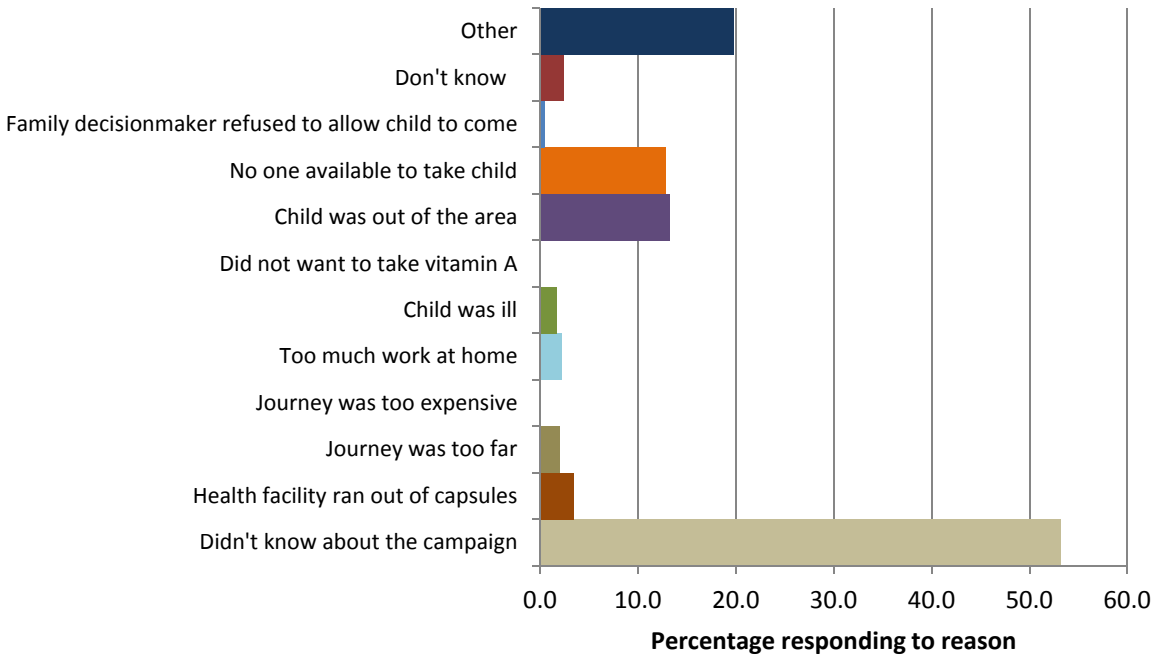
3.5 Characteristics of the Children Missed by the Last VAS Campaign

> ***Key finding:***
>
> *Caretaker's lack of awareness of the VAS round was the single greatest barrier to children receiving supplementation.*

Figure 5 provides information and insights into the reasons for children missing supplementation during the June 2010 bi-annual VAS event.

Over half (53%) of the children who missed the campaign did so because their caretaker didn't know about the campaign. Other commonly cited reasons for missing the campaign included not having a caretaker available to take the child (13%) and child not available during campaign (12%). Lack of supplies at the health facility and the journey being too far were cited by less than 5% of informants/caretakers.

Figure 5. Reasons for not being supplemented among all missed children (n=413)



Among caretakers of missed children, the distance to services (2%) or cost of reaching services (0%) were not significant reasons for non-participation (see Figure 5 above). However, data indicated that average time to travel to services were significantly different between missed and reached children: the average time to reach a VAS post was 26 minutes among children reached and 41 minutes among children missed in the last round ($p<0.001$). Additional reasons for missing campaign (though in ≤2% of the respondents) included: child was ill; don't care/not important; household head refuses; or they do not want child to receive VAS.

Among caretakers of children never having received VAS, roughly 4% said their children were not eligible until they were 9 months of age. This may indicate that mothers have a strong association of VAS with measles, which is provided at 9 months of age. This association is not surprising, as it is common among most caretakers in Tanzania to call vitamin A supplements "*chanjo ya vitamini A*" in Kiswahili language, which literally means "vitamin A vaccine".

Mothers/caretakers of missed children were asked what services, if provided, would encourage them to come to a vitamin A campaign with their child. They were read a list of services but also could come up with their own preferred service. The first choice among mothers with missed children was free bednets (38%), followed by de-worming tablets (29%), growth monitoring (8%) and other (7%). Seventeen percent of mother whose children missed the campaign responded 'nothing,' which may have indicated that VAS alone would be sufficient to come to the campaign or that there were no additional services which would have made them come.

Of the children who were missed by the campaign (n=413), 99% attended the clinic for other reasons. Therefore most of these children were receiving some type of health services. Reasons for attending the clinic among children missed by VAS included routine checkups (80%), vaccinations (28%) and sick visits (51%).

3.5.1 Risk Factors for Missing Vitamin A Supplementation

> ***Key finding:***
>
> *Children missed lived in urban areas, had caretakers who did not hear about the campaign or were more likely to be from a Muslim household*

In general, there was no difference in coverage between missed versus reached children across age groups, child gender, maternal age and education, and household income quartile. The risk factors associated with missing VAS are included in Table 4.

A child with 4 or more siblings was approximately 40% more likely to receive VAS than a child with no siblings (OR=1.62; p=0.02). This is likely in part due to the mother being more informed about child health services as well as the ability of older siblings to take younger siblings to the clinic for VAS.

A child living in a rural area was over 3 times more likely to receive VAS than a child living in an urban area (OR=3.31; p=0.01). The lower coverage rates exhibited in urban areas, including Dar es Salaam, have been consistent for many rounds. Anecdotal reasons included lack of social mobilization in urban areas, high prevalence of use of private clinics that do not practice the twice-yearly VAS distribution and the nature of urban employment that does not give time for care takers to take their children for VAS.

Perhaps reflective of this, a child living in a household where the main source of income was from the informal sector (street vendors among other professions) was 70% less likely to be supplemented than a child living in a farming household (OR=0.31; p=0.02).

Finally, a non-Muslim child was over 3 times more likely to be supplemented than a Muslim child (range of ORs= 3.25-3.91; p<0.01).

Table 4. Risk Factors for Missing Campaign

	% Did not Receive Vitamin A (n/N)	Odds Ratio (95% CI)	*p-value*
Child Characteristics			
Age (months) of child			
6-11	34.9 (67/192)	1	
12-17	29.5 (44/149)	1.28 (0.82, 1.99)	0.26
18-23	31.9 (51/160)	1.15 (0.71, 1.85)	0.57
24-29	29.3 (44.150)	1.29 (0.72, 2.31)	0.38
30-35	32.5 (39/120)	1.11 (0.65, 1.91)	0.69
36-41	44.6 (54/121)	0.67 (0.38, 1.17)	0.15
42-47	35.6 (37/104)	0.97 (0.54, 1.75)	0.92
48-53	41.4 (46/111)	0.76 (0.45, 1.27)	0.28
54-59	35.9 (23/64)	0.96 (0.49, 1.88)	0.89
Sex			
Male	36.2 (206/569)	1	
Female	33.1 (197/398)	1.14 (0.89, 1.47)	0.27

Table 4: Risk Factors for Missing Campaign (continued)	% Did not Receive Vitamin A (n/N)	Odds Ratio (95% CI)	*p-value*
Maternal Characteristics			
Maternal Age (years)			
<20	41.2 (21/51)	1	
20-24	35.9 (97/270)	1.2 (0.72, 2.16)	0.42
25-29	35.9 (109/304)	1.23 (0.74, 2.11)	0.39
30-34	31.5 (79/251)	1.52 (0.80, 2.88)	0.19
>=35	33.8 (75/222)	1.37 (0.71, 2.64)	0.33
Maternal Education			
None	31.1 (66/212)	1	
Incomplete primary school	44.0 (48/109)	0.57 (0.32, 1.03)	0.06
Primary Education	34.4 (250/727)	0.86 (0.50, 1.47)	0.58
Incomplete secondary school	28.6 (4/14)	1.13 (0.37, 3.39)	0.82
Secondary education	36.4 (12/33)	0.79 (0.34, 1.82)	0.57
Post secondary training	33.3 (1/3)	0.90 (0.07, 11.95)	0.94
Number of living children			
1	39.0 (74/190)	1	
2	40.6 (95/234)	0.93(0.65, 1.34)	0.70
3	34.5 (71/206)	1.21 (0.76, 1.92)	0.40
4	34.0 (53/156)	1.24(0.80, 1.91)	0.32
>=5	28.2 (88/312)	1.62 (1.09, 2.41)	0.02*
Received VAS info before round			
No	89.1 (197/221)	1	
Yes	14.4 (97/672)	48.7 (22.9, 103.6)	0.000**
Household Characteristics			
Urban/Rural			
Urban	56.3 (151/268)	1	
Rural	28.1 (253/902)	3.31 (1.56, 7.03)	0.01*
Religion			
Muslim	55.9 (176/315)	1	
Roman Catholic	25.8 (95/368)	3.64 (1.66, 7.97)	0.002**
Non-Catholic Christian	28.0 (120/428)	3.25 (1.43, 7.34)	0.006**
Traditional	24.4 (11/45)	3.91 (1.69, 9.05)	0.002**
Other	20.0 (3/15)	5.06 (0.78, 32.72)	0.086
Income Quartile			
First (Lowest)	30.9 (42/136)	1	
Second	35.2 (141/401)	0.82 (0.51, 1.33)	0.42
Third	27.6 (102/370)	1.17 (0.62, 2.21)	0.61
Fourth (Highest)	45.5 (120/264)	0.54 (0.23, 1.24)	0.14
Main Source of Income			
Farming	31.9 (262/822)	1	
Business	39.4 (74/188)	0.72 (0.41, 1.24)	0.23
Formal employment	38.2 (26/68)	0.76 (0.33, 1.73)	0.50
Informal employment	60.5 (23/38)	0.31 (0.11, 0.84)	0.02*
Other	35.2 (19/54)	0.86 (0.32, 2.25)	0.75

*denotes statistical significance at p<0.05; ** denotes statistical significance at p<0.01

3.5.2 Chronically Missed Children

> ***Key finding:***
>
> *Almost 10% of children in mainland Tanzania have never been reached by VAS in their lifetimes.*

As described earlier, almost 10% of children in Tanzania have never been reached by VAS in their lifetimes. The mean age of these 'chronically missed' or hardest-to-reach children was 24 months (95% CI: 21.1-27.4).

When reviewing reasons for missed coverage among children who had never received VAS, similar results were found except a higher percentage of mothers cited 'no one available to take child to campaign' (18%). Similar to those missed in the last round, distance in time to travel to the health facility was significantly greater among those never reached than those ever reached (49.5 minutes versus 29.4 minutes; $p<0.01$).

3.6 Post-Partum VAS Coverage

> ***Key finding:***
>
> *Only 32% of women who had delivered in the past year reported having received post-partum VAS.*

Among the women who had delivered in the past year (n=327) only 32% (CI: 26.7.8%-36.8%) reported having received post-partum VAS. This compares well with VAS coverage reported in the DHS which is 26%. Post-partum VACs are not available through midwives or traditional birth attendants (TBAs). Even among the 61% of women who delivered at a clinic, only 42% received VAS. Because of this policy, guidelines indicate VAS for post-partum women should be provided within 8 weeks of delivery. Of those receiving the supplement, almost 60% received it at the time of delivery, whereas the remaining women were provided the VACs sometime within 8 weeks of delivering, but not at the time of delivery.

Most received the VAS at a healthy facility during post-natal visits, while others received VAS through community health workers or outreach clinics. Unfortunately, among post-partum women supplemented with VACs, over one-third received VAC that had to be swallowed whole or chewed. In some cases, this required spitting out the plastic capsule after swallowing the oil.

There were no differences in post-partum VAS coverage across maternal age, number of living children, maternal education, income quartile or religion. However the sample size was very low among women having delivered in the last 12 months and may not have been sufficient to detect real differences among these maternal characteristics.

3.7 Coverage of De-worming

> ***Key finding:***
>
> *De-worming coverage of eligible children aged 12-59 months was only 59%.*

Mebendazole for regular de-worming is offered to children 12-59 months of age alongside VAS during the twice-yearly supplementation. Almost all sampled households that attended the supplementation round (96%) noted that de-worming was offered along with the VAS. Assuming children who did not receive VAS also did not receive mebendazole, de-worming coverage of eligible children (12-59 months of age) was only 59% (CI: 54.0-64.1). However this estimate is based on the assumption that children who did not participate to receive VAS at the last campaign were also not participating for de-worming. There may have been children who attended the campaign for only mebendazole and did not receive VAS. This is because the survey was designed to capture coverage on vitamin A supplementation.

Among 12-59 month-old children that were supplemented with VAS, 96% also received mebendazole for de-worming. The protocol for administration of mebendazole for prophylactic de-worming twice yearly is specific to children 12-59 months of age and not children under 1 year; however, 24% of 6-11 month olds reached with VAS were also reportedly de-wormed.

3.8 Health Worker, Community Health Worker, Village Leaders and VAS

> ***Key finding:***
>
> *Many health workers were not aware of the benefits of VAS and current Tanzania protocols for supplementation and de-worming of children*

Among the health workers (HWs) surveyed, 63% were females and represented a wide range of levels of training from clinical officers to medical attendants to nurse midwives, with no strong representation in any one group. On average, among the surveyed HWs, the average years of service was 11.1 years (95% CI: 8.3-13.9) and 85% were working in a government health facility.

Responses to basic knowledge questions about vitamin A among health workers, community health workers and village leaders are included in Table 5 and Figures 6 through 8. The source of information about VAS for health workers was predominantly from their formal professional training (78%) with some mentioning workshops (22%) and job aids (12%) as other sources of information about Vitamin A. No health worker received their VAS information from any official guideline or document from the government, NGOs or the Ministry of Health/Tanzania Food and Nutrition Center.

Table 5. Role, knowledge and source of VAS information among health workers, community health workers and village/community leaders

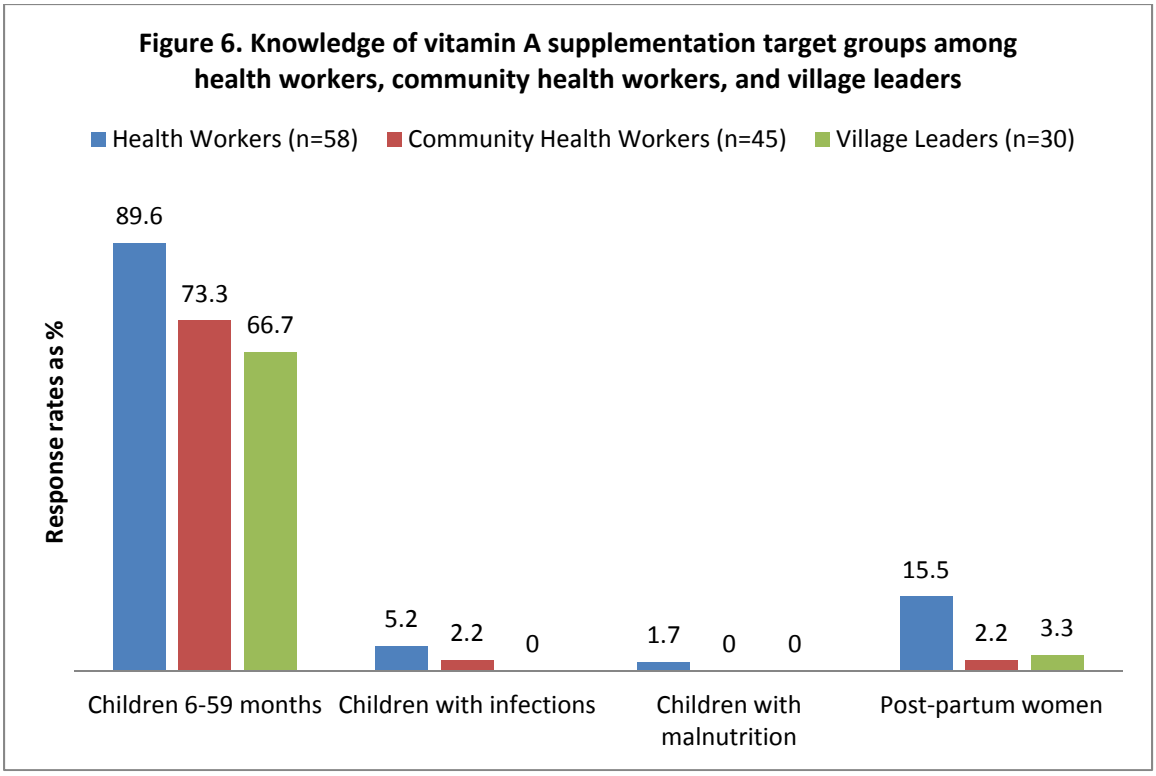
	Health Workers (n=58)	Community Health workers (n=45)	Community Leaders (n=30)
Average years of service (range)	11.1 years (<0.5 to 38)	8.8 years (<0.05 to 25)	5.2 years (<0.5 to 17)
	Percent (n/N)	**Percent (n/N)**	**Percent (n/N)**
Heard of vitamin A	not asked	58.1 (25/43)	96.6 (29/30)
Role in VAS program			
No role	not asked	8/9 (4/45)	0 (0/30)
Advise local authorities	not asked	4.4 (2/45)	0 (0/30)
Informing/mobilizing community	46.6 (27/58)	68.9 (31/45)	90.0 (27/30)
Administering VAS	75.9 (44/58)	57.8 (26/45)	0 (0/30)
Recording tally sheets	17,2 (10/58)	11.1 (5/45)	0 (0/30)
Compiling coverage data	13.8 (8/58)	0 (0/43)	3.3 (1/30)
Supervision	19.0 (11/58)	not asked	not asked
Benefits of Vitamin A			
Prevents Blindness	86.2 (50/58)	44.4 (20/45)	26.7 (8/30)
Improves Immunity	55.2 (32/58)	46.7 (21/45)	43.4 (13/30)
Allows child to grow well	50.0 (29/58)	37.8 (17/45)	40.0 (12/30)
Don't know	0 (0/58)	4.4 (2/45)	13.3 (4/30)

Table 5. Role, knowledge and source of VAS information among health workers, community health workers and village/community leaders (continued)

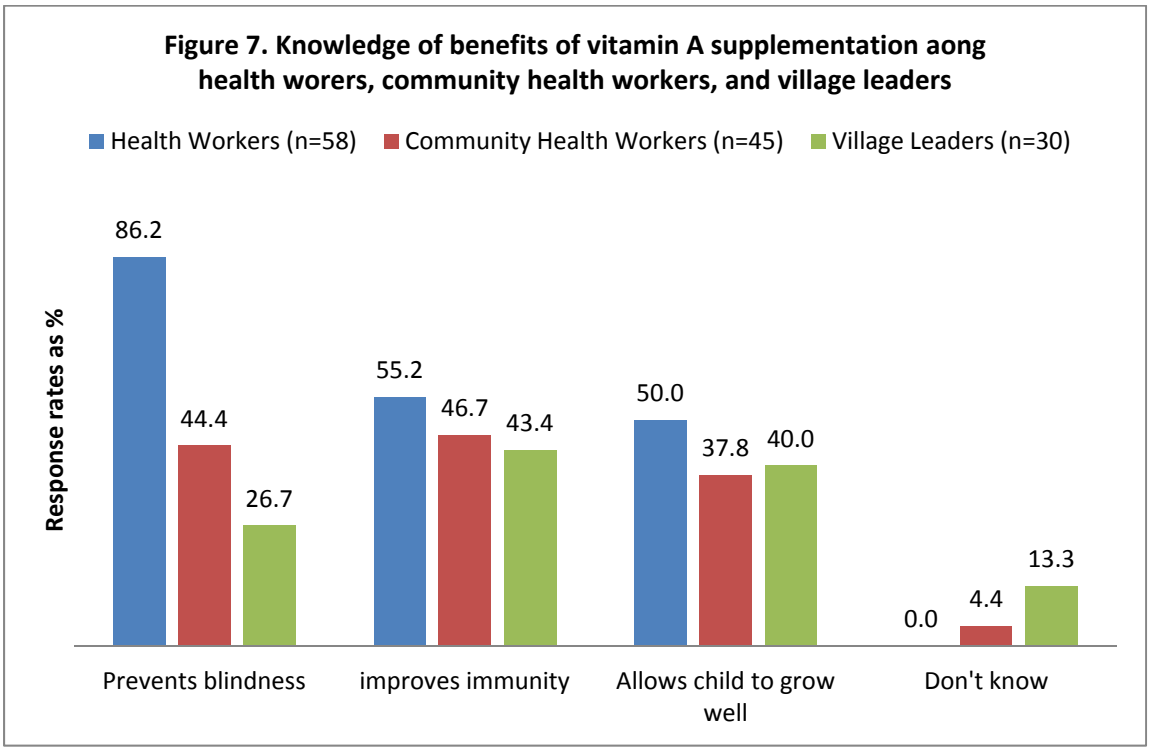
	Health Workers (n=58)	Community Health workers (n=45)	Community Leaders (n=30)
Source of information			
D/R Medical Officers	1.7 (1/58)	15.6 (7/45)	33.3 (10/30)
MOHSW/TFNC	0 (0/58)	0 (0/58)	3.3 (1/30)
NGO	0 (0/58)	2.2 (1/45)	0 (0/30)
TV/radio/loudspeakers	1.7 (1/58)	8.9 (4/45)	10.0 (3/30)
Posters or job aids	12.1 (7/58)	8.9 (4/45)	16.7 (5/30)
Policy documents	0 (0/58)	0 (0/45)	0 (0/30)
Workshops/Seminars	22.4 (13/58)	44.4 (20/45)	16.7 (5/30)
Formal professional training	77.6 (45/58)	NA	NA
Through health facilities	NA	15.6 (7/45)	13.3 (4/30)
Other	10.3 (6/58)	6.7 (3/45)	3.3 (1/30)
Strategies to combat VAD			
Promote production and consumption of Vitamin A rich foods	19.0 (11/58)	17.8 (8/45)	not asked
Vitamin A supplementation	65.5 (38/58)	53.3 (24/45)	
Nutrition/health education	50.0 (29/58)	38.8 (17/45)	
Food fortification	0 (0/58)	0 (0/45)	
Control and prevention of infectious diseases through environmental sanitation, immunization etc.	1.7 (1/58)	0 (0/45)	
Exclusive breastfeeding up to 6 months/ breastfeeding promotion	5.2 (3/58)	0 (0/45)	
IYCF/Complementary feeding	5.2 (3/58)	6.7 (3/45)	
Don't know	3.4 (2/58)	13.3 (6/45)	
Other			
Target groups for VAS			
Children 6-59 months	89.6 (51/58)	73.3 (33/45)	66.7 (20/30)
Children with infections	5.2 (3/58)	2.2 (1/45)	0 (0/30)
Children with malnutrition	1.7 (1/58)	0 (0/45)	0 (0/30)
Post partum women	15.5 (9/58)	2.2 (1/58)	3.3 (1/30)

Only 32% of health workers had received any training in vitamin A supplementation, and 37% knew that Vitamin A supplements should not be given during pregnancy. Half of the HWs knew the correct dose and timing for post-partum VAS (200,000 IU capsule within 8 weeks of delivery). Although almost 90% of HWs knew the correct target for VAS campaigns were 6-59 month old children, two HWs indicated it was 9-59 month-old children, one indicated it was 11-59 month olds, and 2 believed the target included post-partum women during the campaign.

As seen in Figure 6, the vast majority of health workers, community health workers and village leaders were aware of the target group for twice yearly VAS (children 6-59 months of age) however, there was little knowledge even among health workers that VAS should be provided to children with infections, children presenting with malnutrition, and post-partum women.

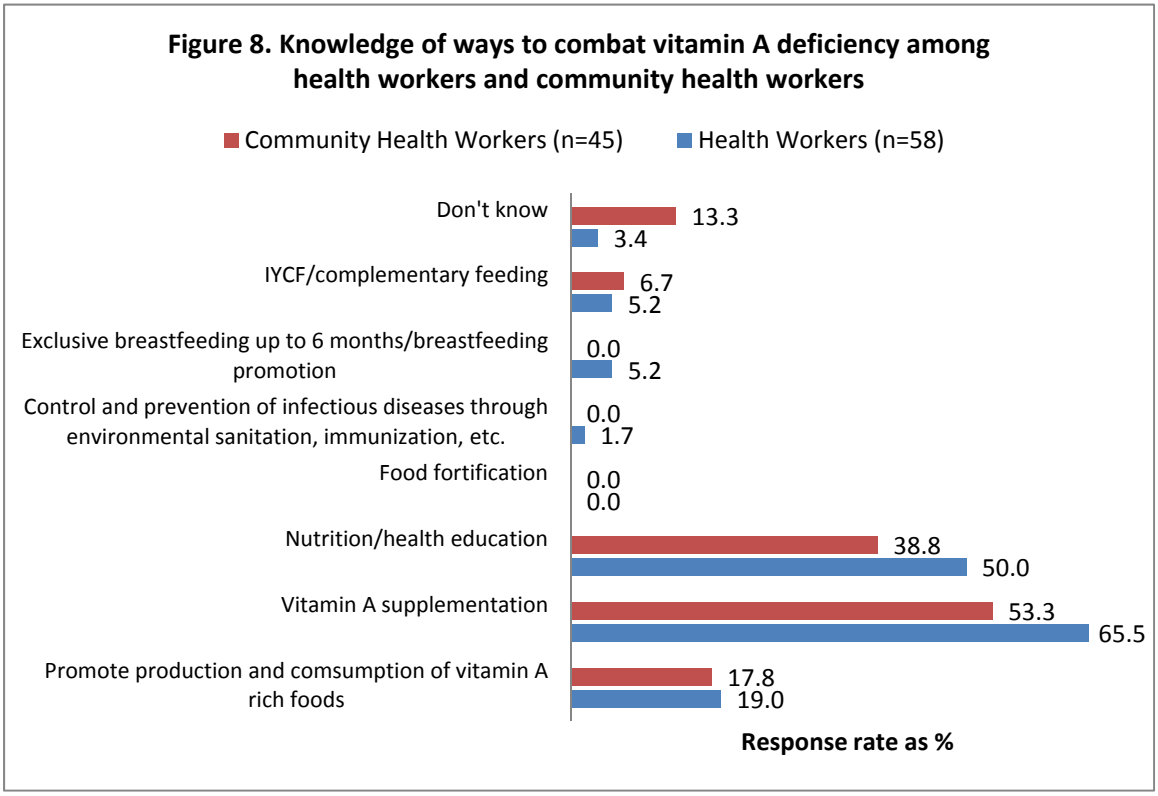


When asked about the benefits of VAS, there was a general understanding that VAS provided improved immunity and general health for the child to grow well and/or prevent blindness (see Figure 7). It is interesting to note that the most commonly cited benefit of VAS supplementation among health workers was for the prevention of blindness despite the policy evidence on reduced mortality which was, and continues to be, the main impetus for vitamin A supplementation in children <5 globally.



Nutrition knowledge in general among health workers and community health workers was poor. No informants in either group cited food fortification as a way to prevent VAD, and CHWs were unaware that breastfeeding is the main source of vitamin A for children <6 months of age (see Figure 8 below).

Figure 8. Knowledge of ways to combat vitamin A deficiency among health workers and community health workers



4. Discussion and Recommendations

This survey was conducted at an opportune time as the findings were able to be compared to data from the Demographic and Health Survey (DHS), which also collected data in 2010, though mostly on recall from the December 2009 round of supplementation. The DHS results indicated 60% coverage for mainland Tanzania, which coincides well with the findings of this survey conducted in 2010. Post-event coverage survey findings would be expected to be more accurate given the recall period is confined to 6 weeks from provision of the supplement. The DHS recall, however, can vary from individual to individual and from between 1 day to over 5 months.

Routine validation of national tally-sheet based administrative data is important given the myriad problems faced with data collection, summarization and transmission of data from the facility to the national level and the lack of reliability of the national census population projection (from 2002). The census projection is widely considered to be underestimated, thus resulting in many district coverage rates of over 100%. The June 2010 round of supplementation was reported to have a coverage rate of 98% based on tally sheet data compared to the actual figure of 65.4%.

The findings that almost 10% of Tanzanian children 6-59 months of age have never been reached by VAS is concerning. Twice yearly events have been occurring in Tanzania routinely since 2001. Therefore a large proportion of children are repeatedly being unreached despite various rounds of supplementation

offered. In fact, on average, these chronically missed children failed to be reached over at least 3 rounds of supplementation, if not all 10 for which they are eligible.

Over half of the children who missed the campaign did so because their caretaker did not know about the campaign.

The decentralization process and related advocacy work at the district level has helped with financial sustainability of programs but national coordination is still needed to promote and monitor VAS campaigns.

Although children at 6 months of age can, and should, receive their first dose of vitamin A, survey findings indicated that many mothers and health workers believe that 9 months it the appropriate first age of supplementation. The globally accepted concept that twice yearly VAS reduces under-5 child mortality by 23% is not commonly known among health workers as most cited prevention of blindness as the major benefit of VAS.

The second most widely cited reason for missing the campaign was that the child had no available caretaker to escort him/her to the clinic. Caretakers were often traveling but for many children their mothers were too busy to make it to the clinic. Survey findings also indicated that children missed by the campaign live, on average, 25 minutes further away from a VAS health post than their reached counterparts. Although not mentioned as a barrier to attendance by caretakers, distance to the health facility did seem to have a bearing on coverage.

Finally, external financial support for vitamin A supplementation programs is waning. Evidence indicates that coverage rates are not as high as assumed. Although 100% of districts are setting aside funds for VAS distribution, the cost per child allocated varies greatly, which may have an impact on the resources available to meet the needs of the "hard-to-reach" children

Given the findings from the survey outlined in the preceding discussion, the following recommendations are made:

- In order to address the lack of awareness among caretakers regarding the VAS campaigns, more community mobilization and awareness is needed in Tanzania mainland to ensure that all mothers and caretakers are aware of campaign days.
- Since most caretakers hear about the campaign through their village/community leaders, it seems that these trusted sources of information need to be informed about VAS distribution more effectively by district officials.
- Reliance on national level for communication, as was historically done via radio messages, needs to be considered again and maintained at a basic level until districts or regions have sufficient budgets for mass media.
- The role of the national level, most notably the Tanzania Food and Nutrition Center (TFNC), should be strengthened in the long term sustainability of the VAS program.
- Refresher trainings for health workers on VAS delivery protocols are needed.
- Health workers also need to be re-trained in de-worming protocols and age criteria, as it can be harmful for children <1 to receive de-worming medicine.

- Refresher training on VAS administration is also needed in the maternity wards and should be considered for traditional birth attendants.
- Community mobilization strategies developed should consider the specific risk factors for missed coverage revealed in the survey.
- Special emphasis should be placed on sensitizing the Muslim populations on the importance of Vitamin A for reducing mortality and morbidity in children under 5.
- Clinics in areas where many parents work in the informal sector and cannot bring their child in to receive VAS should consider alternative delivery options to accommodate work schedules.
- Mobile supplementation and/or door -to -door supplementation should be considered in Tanzania where distances between villages can be very far.
- Further monitoring and evaluation of the program is needed to ensure improved accuracy of tally sheet data. .

5. Limitations of the Study

The proposed study was not designed to answer all questions of interest within the vitamin A supplementation program due to limited financial resources and time. This rapid cross-sectional cluster randomized design was employed in order to conduct the survey within a month of the VA distribution for ideal maternal recall. Therefore it was not possible to ascertain, for example, regional or district level coverage. Since the current funding was allocated to gain a one- time snapshot of coverage in the June 2010 round of supplementation, it will not be possible to follow-up the same children in later VAS campaigns.

6. Conclusions

The survey demonstrated that VAS and de-worming coverage per round among children of 6 to 59 months is far below (by 30%) the national coverage data usually reported by regions from tally sheets and is yet to reach all eligible children in Tanzania.

The successes of the Tanzania national Vitamin A supplementation program have centered on the long term sustainability of the program, as 100% of districts budget for VAS activities in the Comprehensive Council Health Plans (CCHPs). However, the heavy focus on decentralization and district support has perhaps been at the cost of the national level's role in promoting and monitoring the VAS program. Future efforts in VAS should include reinforcing TFNC's critical role in supporting the program, engaging village/community leaders, and providing refresher training for health workers in VAS and de-worming protocols.