VAT Reliability Assessment Results

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Background

USAID/Uganda is currently funding the Sustaining COmprehensive REsponses (SCORE) project for vulnerable children and their families (2011-2015). SCORE developed a project-specific Vulnerability Assessment Tool (VAT) to measure household vulnerability through an index child in each household (Appendix A). The VAT is divided into six sections: background and demographic information; Section A - Protection; Section B - Food Security; Section C - Economic Strengthening; Section D - Family Strengthening; and Section E - Assessor's General Impression. Sections A through E are summed to create a total child score. Based on total scores, children are assigned critically, moderately, and slightly vulnerable status to determine which children and households should be enrolled in the SCORE project (VAT1). For households enrolled, a second VAT (VAT2) was administered approximately one year later to re-assess the vulnerability status. The project is currently in the process of administering VAT3.

USAID/Uganda seeks a better understanding of the data quality of the VAT, including the reliability of the instrument to track the same child in the household for repeat VAT administration. To answer this question regarding reliability, MEASURE Evaluation proposed conducting secondary analysis of VAT1 and VAT2 data for select indicators.

Methods

To assess the reliability of the VAT, we conducted secondary data analysis from SCORE's existing database that included index children with VAT1 and VAT2 scores (for a total of 12,006 index children). The Mildmay Uganda Research and Ethics Committee and the Health Media Lab Institutional Review Board in Washington, DC both reviewed and approved the study protocol.

First, we aimed to measure the agreement between the VAT1 and VAT2 for select indicators that we did not expect to change between time periods such as sex of child, child chronic disease, child disability, guardian having a chronic disease, and guardian having a disability. To do this, we calculated Cohen's kappa (k) (Cohen, 1968) that is an appropriate measure of agreement for indicators with categorical responses (e.g., yes/no; male/female). Cohen's kappa is referred to as a chance corrected measure of agreement.

The equation for κ is:

$$\kappa = \frac{\Pr(a) - \Pr(e)}{1 - \Pr(e)},$$

Table 1 was used to interpret the kappa values, or strength of agreement, between the assessments for each indicator (Altman, 1991). Low kappa values indicate the agreement is weak, higher kappa values indicate the agreement is strong.

Table 1. Interpretation of kappa values

Value of *K*	Strength of agreement
< 0.20	Poor
0.21 - 0.40	Fair
0.41 - 0.60	Moderate
0.61 - 0.80	Good
0.81 - 1.00	Very good

For the indicator date of birth, we were unable to calculate the reliability coefficient since this continuous variable included many unknown responses and outliers. However, we examined the extent to which responses were the same at VAT1 and VAT2.

In the protocol we had initially proposed examining the extent to which positive responses in VAT1 were also positive in VAT2 for the questions related to child protection (i.e., Has the child been involved in the following: Child Labor /Street child /Child Mother; Has the child been involved in the following forms of child abuse or neglect? Psychological abuse / Physical abuse / Sexual abuse / Child Neglect; and Has the child ever been involved in alcohol/ Substance consumption/use? Drinking Alcohol/Local Brew / Smoking / Petroleum sniffing / Drugs?). At VAT1, the reference period for these questions was whether a child had ever been exposed to these items. However, we subsequently learned that at VAT2, the reference period changed to assess exposure to these items between VAT1 and VAT2. As such, comparing responses at VAT1 and VAT2 would not be a valid indicator of reliability.

In addition, we examined the correlation between the vulnerability score minus interviewer's perceptions of vulnerability and the interviewer's perceptions of vulnerability. Also, we assessed the contribution of the interviewer's perceptions of vulnerability to the total VAT score.

Findings

Sections are organized around the statistical analyses conducted. The first section presents the findings for Cohen's kappa and the rater agreement for sex of child, child chronic disease, child disability, guardian having a chronic disease, and guardian having a disability. We end this section presenting the findings on the extent to which responses on the indicator date of birth were the same at VAT1 and VAT2. In the second section, we present the correlation between interviewer perceptions of vulnerability and total VAT scores without interviewer perceptions of vulnerability.

I. Rater Agreement

Below we present the main findings by variable. For each variable, there is a table that shows: the number and percent that were the same at VAT1, VAT2 and the number and percent that were different at VAT1, VAT2. Cohen's kappa is also presented for each variable.

Sex

Table 2 presents the findings for sex. At VAT1 and VAT2 there were the same number of males (6,526) and females (5,480) assessed, yielding a Kappa value of 1 (very good agreement).

Table 2. Responses for child's sex at VAT1 and VAT2, n=12,006

Difference in child sex between assessments	Frequency	Percent
Male VAT1 Male VAT2	6,526	54
Female VAT1 Female VAT2	5,480	46
Male VAT1 Female VAT2	0	0
Female VAT1 FemaleVAT2	0	0

Child has chronic disease

The majority of children (95%) had the same chronic disease status (Yes/No) between VAT 1 and VAT2 (Table 3). For five percent of the children (n=610) the status changed. More than half of these children (n=343) acquired the disease by the second assessment and 267 had a chronic disease at VAT1 but not at VAT2. Please see the table below. The kappa value was .68 indicating "good" agreement.

Table 3. Responses for child's chronic diseases at VAT1 and VAT2, n=12,006

Difference in child chronic disease	Frequency	Percent
Yes VAT1 Yes VAT2	753	6
No VAT1 No VAT2	10,643	89
Yes VAT1 No VAT2	267	2
No VAT1 Yes VAT2	343	3

Child has disability

The majority of children (97%) had the same disability status (Yes/No) between VAT1 and VAT2 (Table 4). For three percent of the children (n=350) the status changed. Some of these children acquired a disability by the second assessment (n=32). However, 318 children (2.6%) had a disability at VAT1 but did not have it at VAT2. Please see the table below. The Kappa value was .88 indicating "good" agreement.

Table 4. Responses for child disability at VAT1 and VAT2, n=12,006

Difference in child having a disability	Frequency	Percent
Yes VAT1 YesVAT2	1,600	13
No VAT1 No VAT2	10,056	84
Yes VAT1 No VAT2	318	3
No VAT1 YesVAT2	32	0.3

Guardian has a chronic disease

For 25% of the guardians (n=3,025) the chronic disease status (Yes/No) changed between VAT1 and VAT2 (Table 5). While 1,064 (9%) guardians acquired a chronic disease by VAT2, 1,961 (16%) guardians reported a chronic disease in VAT1 but did not in VAT2. The kappa value is .40 indicating fair agreement.

Table 5. Responses for guardian chronic disease at VAT1 and VAT2, n=12,004

Difference in Guardian Chronic Disease	Frequency	Percent
Yes VAT1 YesVAT2	2,023	17
No VAT1 No VAT2	6,956	58
Yes VAT1 No VAT2	1,961	16
No VAT1 YesVAT2	1,064	9

Guardian has disability

For fifteen percent of the guardians (n=1,741) the disability status (Yes/No) changed between VAT1 and VAT2. While 573 guardians (5%) became disabled by VAT2, 1,168 guardians (10%) reported a disability in VAT1 but did not in VAT2. The kappa value was .37 indicating fair agreement.

Table 6. Responses for guardian disability at VAT1 and VAT2, (n=12,001)

Difference in Guardian Disability	Frequency	Percent
Yes VAT1 YesVAT2	698	6
No VAT1 No VAT2	9,562	80
Yes VAT1 No VAT2	1,168	10
No VAT1 YesVAT2	573	5

Date of Birth

For date of birth, 12% of children (n=1,456 of 12,006) had a different date of birth between the two assessments (Table 7). The differences in date of birth may be explained partially by the presence of a high number of unknown date of birth responses and other invalid values for the DOB variable. Because of these issues with data quality, we did not calculate the inter-rater reliability coefficient for this variable.

Table 7. Responses for date of birth at VAT1 and VAT2, (n=12,006)

DOB is different	Frequency	Percent
No	10,550	88
Yes	1,456	12

II. Correlation between interviewer's perceptions of vulnerability and the VAT score.

The results suggest that the relationship between these scores is positive which means that as the interviewer's perception score increases so does the VAT score (equal total score minus interviewer's perceptions of vulnerability). The Spearman correlation coefficient is 0.19 in VAT1 and 0.3 in VAT2. Correlation between scores is statistically significant at both VAT1 ($p<.0001$) and VAT2 ($p<.0001$).

We noticed that the interviewer could assign four scores: scores of 0, 2, 8 or 10 (0 for good situation, 2 for fair situation, 8 for bad situation and 10 for critical situation). This assigned score contributed to the total VAT score. The interviewers' perceptions of vulnerability contributed on average about 12% in the VAT1 score and 11% in the VAT2 score.

Conclusion

Most of the variables (sex, child chronic disease, child disability) that were not expected to change from VAT1 to VAT2 had kappa values in the good range, indicating high reliability of the instrument in measuring these variables. The kappa values for guardian chronic disease and disability were less reliable; however, this could be due to a different guardian answering questions at the time of VAT2. Overall we learned that data collectors are contributing between 11 and 12% to the total VAT score and may influence the placement of a child into one of the three categories. The upcoming VAT3 test and re-test when the instrument will be administered to the same household within a short period of time by two independent raters will help further determine the reliability of other items in the instrument.

References

Cohen, J. (1968). "Weighted kappa: Nominal scale agreement with provision for scaled disagreement or partial credit". *Psychological Bulletin* **70** (4): 213–220.

Altman DG (1991) Practical statistics for medical research. London: Chapman and Hall

Appendix A. Vulnerability Assessment Tool

SCORE Vulnerability Assessment Form ID No

No.	QUESTIONS AND FILTERS	
1.	Interviewer Name and ID	
2.	Date of Interview (day /month/year)	d d m m y y y y
3.	District Code	
4.	Sub – County/ Division Name	
5.	Parish Name	6. Village Name
7.	Name of the Household Head	
8.	Name of Index Child	
9.	Date of Birth of the Index Child (day /month/ year)	d d m m y y y y **DON'T KNOW..... 2020**
10.	Sex of the Index Child	1. Female 2. Male
Did the Agency/CBO/NGO receive funding from USAID ***(Track 1 Project)?*** ***YES*** ***NO***		Is the index child/household a former ***Track 1*** beneficiary? ***YES*** ***NO***

Section A: Protection		CODING CATEGORIES: ***(If yes to any of the category in the question, score 5, if no score 0)***	Score
11.	Has the child been involved in the following: ***(Ask the child/parent/guardian)***	Child Labor /Street child /Child Mother	
12.	Has the child been involved in the following forms of child abuse or neglect? ***(Ask and observe the child)***	Psychological abuse / Physical abuse / Sexual abuse / Child Neglect	
13.	Has the child ever been involved in alcohol/ Substance consumption/use? ***(Ask the child)***	Drinking Alcohol/Local Brew / Smoking / Petroleum sniffing / Drugs	
14.	Child has a chronic disease ***(Ask the child/parent/guardian)***	HIV/AIDS / Sickle Cells / Epilepsy	
15.	Child has a Disability ***(if the disability is physical/observable please don't ask)***	Deaf / Blind / Physical / Mental	
16.	Do you know anyone who can help you in case you need legal assistance for the following? If Yes, then ask them to list the places and tick the one where they go among the answers:	Child Neglect / Sexual Abuse / Property grabbing ***(If yes score 0 and if No score 5)*** ***Police__ , LC__, Probation and welfare office/CDO__, Human rights agencies__***	
Section A: Total Score			

Section B: Food Security		CODING CATEGORIES	Score
17.	What does the child <u>usually</u> eat? ***Usually means at least 3 times a week (Ask the parent/guardian and then a child to double check)*** ***Applicable to children of all age bracket (Breast feeding children takes all the food values)***	***Energy foods:*** (potatoes, banana, oils, posho, millet, rice, maize, bread, cassava)**(If Yes, score 0 & if No score 4)**	
		Body building foods: (beans, meat, soya, peas, milk, eggs, chicken, fish)**(If Yes, score 0 & if No score 4)**	
		Protective and regulative foods: (tomatoes, oranges, pawpaw,mangoes, pineapple) **(If Yes, score 0 & if No score 4)**	
18.	How many times does the child have meals in a day? ***(Ask the parent/guardian and then a child to double check)***	3 times a day ***(if yes, score 0),*** Twice a day ***(if yes, score 3),*** *Once* a day ***(if yes, score 8),*** Not every day ***(if yes, score 10)***	
19.	Are there times when your household/child goes without meals due to failure to get food?	Yes ***(Score 5)*** No (***Score 0)***	
20.	If Yes, how often does the household/child go without meals?	At all times ***(if yes, score 3)*** Irregularly ***(if yes, score 2)*** Very rarely ***(if yes, score 0)***	

Section B- Total Score			
Section C: Economic Strengthening			
21.	What is your household's main source of income?	1. Formal employment ***(If Yes, score 0)*** 2. Informal employment (truck driving, boda-boda, rental units, askari/guards, subsistence farming, petty trading)***(If Yes, score 6),*** 3. Casual Labor(porter, builder) ***(If Yes, score 8),*** 4. Remittances ***(If Yes, score 8),*** 5. Unemployed ***(If Yes, score 10)***	
22.	How many people live in your household? What is the current total monthly household income?	Number_____Total Income_____ ***(Divide total income by total number of people in HH, if < 30 US dollars (UGX 75000) per person/per month then score the HH 15 & if it's > 30US dollars (UGX 75000) score 0)***	
23.	Who is the main contributor to household income?	- Children ***(if yes, score 5)*** - Grand Parents ***(if yes score 4,)*** - Relative(s) ***(if yes, score 3,)*** - Mother ***(if yes, score 2,)*** - Father ***(if yes, score 1,)*** - ***Others (if yes, score 5)***	
Section C- Total Score			
Section D: Family Strengthening- Critical Services			
24.	Parenthood Status for the index child	- Double orphan ***(if yes, score 6)*** - Maternal Orphan ***(if yes, score 5)*** - Paternal Orphan ***(if yes, score 4)*** - Both Parents Absent ***(if yes, score 3)*** - Mother Absent ***(if yes, score 2)*** - Father Absent ***(if yes, score 1)*** - Both Parents Alive ***(if yes, score 0)***	
25.	Guardian age/Parent age	Below 18 yrs***(if yes, score 5),*** Above 65 yrs***(if yes, score 3),*** Between 18-65 yrs***(if yes, score 0)***	
26.	Guardians Health/Parents age	Has a disability (***If Yes score 2, if No 0),***	
		Has a chronic disease [e.g. HIV and AIDS, Diabetes, cancer etc that affects working capacity] (***If Yes to score 2, if No 0)***	
27.	What is the main source of drinking water for members of your household?	Piped/borehole/harvesting (***If yes, score 0),*** Surface water (***If Yes score 5)***	
28.	Do you have Latrine facilities	Yes own ***(Score0 for Yes),*** Shared ***(Score 3 for shared),*** No ***(Score 4 for No)***	
29.	Does the index child go to school?	Yes ***(if Yes, score 0)*** No ***(if No, score 3)***	
30.	If Yes, does the child absent him/herself from school for at least 1 month in a term	Yes ***(if Yes, score 2)*** No ***(if No, score 0)***	
31.	When the index child is sick, what do you do?	1. Seek medical care/go to the Health Facility ***(score 0)*** 2. Others (***If doesn't seek health care, score 3)***	
Section D: Total Score			
Section E: Assessors General Impression			***Score***
32.	- Good Situation [can manage without support]***(If Yes score 0)*** - Fair Situation [could be considered for support] ***(If Yes score 2*** - Bad Situation [should be considered for support] ***(If Yes score 8)*** - Critical Situation [eligible for support] ***(If Yes score 10)***		
Total Child Score for sections A, B, C, D & E			