World Vision

GUIDANCE FOR MEASURING ANAEMIA AMONG ADOLESCENTS

ACKNOWLEDGEMENTS

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Programming Guidance: Document Status	World Vision
Title	Guidance for Measuring Anaemia Among Adolescents
Date	January 28, 2021
Purpose	Provide guidance on addressing adolescent anaemia
When Used	
Primary User/s	FO Sector or Technical Programme Lead, Area Programme Manager, Technical Specialists, for anyone providing training or being trained on how to measure anaemia
Translations Available	No

WHAT IS ANAEMIA AND ITS IMPACT ON ADOLESCENTS?

- Anaemia is a condition of the blood that occurs when the number and size of red blood cells are insufficient.
- Red blood cells contain iron-rich protein haemoglobin that is needed for transporting oxygen from the lungs to the cells and tissues.
- The most common cause of anaemia is iron deficiency. Iron is essential for **immune response, cognitive development, temperature regulation, and work performance.**
- Iron is needed for red blood cell synthesis (***haemoglobin*** is a major component of red blood cells). If haemoglobin concentration falls, then the oxygen capacity of the blood also decreases. This can lead to:
    - **Fatigue**
    - **Reduced work capacity and productivity**
    - **Shortness of breath**
    - **Increase risk for disease and disability**
    - **Poor reproductive outcomes** (i.e., preterm birth, low birth weight, postpartum haemorrhaging, and fistulas)

Did you know?

Anaemia is the number one global cause of lost Disability Adjusted Life Years (DALYs, or # of years lost due to ill-health or disability) for boys and girls 10 to 14 years of age and girls 15 to 19 years of age.

WHAT IS THE CORE IMPACT/OUTCOME INDICATOR TO MEASURE ADOLESCENT ANAEMIA?

Indicator Code	Indicator	Questions	Mandatory or Optional	Indicator Modification
C1A.25743	Prevalence of anaemia among adolescents (12 to 18 years)	YHBS Survey **(See Annexes C, D, and E)**	Mandatory	This is a new Core Impact Indicator

WHAT CAN WORLD VISION (WV) DO TO ADDRESS ADOLESCENT ANAEMIA?

- Consider implementing WV's Core Project Model (CPM) IMPACT+, which includes a module and lesson plans around adolescent anaemia.
- Consider implementing WV's CPM Nurturing Care Groups (NCGs), which also includes messages around anaemia in the NCG Nutrition Module.
- Support developing enabling policies for adolescent nutrition, such as maternity leave policies that allow mothers to practice exclusive breastfeeding, policies to promote healthy food environments and systems for children and adolescents (e.g., in schools, against unethical marketing of unhealthy foods and drinks, adequate physical activity, food, and nutrition security).
- Design your Technical Programme (TP) strategies and nutrition programmes to include nutrition advocacy for adolescent nutrition.
- Build community awareness around gender-sensitive behaviour change intervention strategies that target adolescents.
- Train teachers and health workers to provide weekly iron and folic acid supplementation or multiple micronutrient supplements to adolescent girls.
- Integrate adolescent nutrition education into the school curriculum, linking in critical themes of menstrual hygiene management; physical activity; water, sanitation and hygiene; puberty; adolescent pregnancy; sexual and reproductive health; and social media.

HOW DO WE MEASURE ADOLESCENT ANAEMIA?

Anaemia can be measured by counting the number of red blood cells (hematocrit) and the haemoglobin in your blood. A standard method to measure haemoglobin is using a Hemocue, which requires a health worker to collect a small drop of blood from the middle finger.

Another approach to measuring anaemia is using a pulse oximeter, which measures the oxygen saturation of the arteries. This approach is considered non-invasive, as it does not require any blood to be collected.

Always obtain permission from the Ministry of Health (MoH) before conducting an adolescent anaemia survey and use a MoH-approved method to measure adolescent anaemia (i.e. Hemocue or pulse oximeter). Do not use the Rad-67 if it has not been approved by the MoH.

Please see Annex E for the WHO table with cut-offs for haemoglobin for mild, moderate and severe anaemia.

WHAT ARE THE STEPS FOR MEASURING ANAEMIA USING A HEMOCUE?

How to Perform Capillary Sampling

Make sure the patient/donor is seated comfortably. The hand should be warm and relaxed. Heating the hand with warm water or by some other means is a good idea to increase blood circulation. The hand should be straight but not tense, to avoid stasis.

It is best to use the middle or ring finger for sampling, but fingers with rings should be avoided due to the risk for decreased circulation. Clean the finger with alcohol or a suitable disinfectant then wipe dry with a clean, dry wipe or allow to air dry completely.

Using gentle pressure, rock your thumb from the top of the knuckle towards the fingertip. This stimulates the blood flow towards the sampling point.

While maintaining gentle pressure with your thumb positioned towards the tip of the finger, firmly place the lancet at the side of the fingertip. Not only is the blood flow at its best at this point, it also causes the least pain. Lancets that produce a puncture depth of at least 2.0 mm will produce better blood flow.

Wipe away the first two or three "good sized" drops of blood. This stimulates the blood flow. If necessary, apply light pressure again, until another drop of blood appears. Avoid "milking."

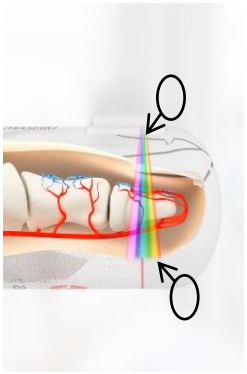
Make sure that the drop of blood is big enough to fill the cuvette completely. Introduce the cuvette tip into the middle of the drop.

Fill the cuvette in one continuous process. A partially filled cuvette must never be re-filled.

Wipe off any excess blood from the outer surfaces of the cuvette, being careful not to draw any blood out of the cuvette in the process.

hemocue.com

WHAT ARE THE STEPS FOR MEASURING ANAEMIA USING THE RAD-67 PULSE OXIMETER?



Community Health Worker using Rad-67 in ENRICH programme, Tanzania

- **Although there are other kinds of oximeters, the Rad-67 has been field-tested and validated by WV.**
- The basic method entails placing a digit – a finger for an adult or a toe for an infant – inside a sensor with an emitter and detector. The difference in the light absorption is then used to calculate haemoglobin and other constituents simultaneously with one measurement.
- The CE- and FDA-approved Rad-67 provides portable spot-check monitoring measurements of both oxygen saturation and non-invasive haemoglobin.
- Rad-67 features a rechargeable battery with a six-hour run time and a high-resolution color display with a touchscreen.
- Rad-67 is not intended to replace laboratory blood testing. Blood samples should be analysed by laboratory instruments prior to clinical decision making.
- By using a multi-wavelength sensor that measures 7+ wavelengths, we can distinguish among the various blood constituents to measure haemoglobin.

Helpful Hints for using the Rad-67

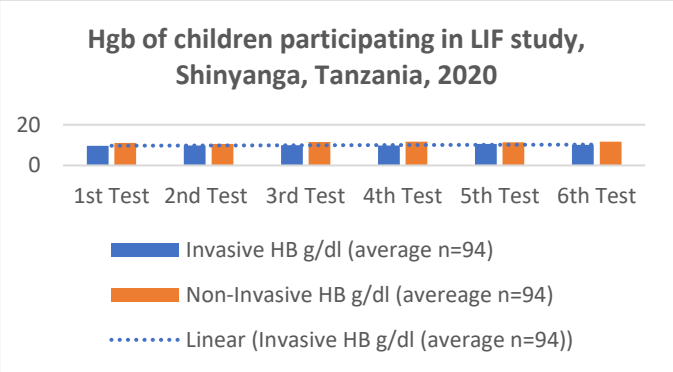
- Ask the adolescent to drink a large glass of water before using the Rad-67.
- The adolescent must be in the seated position; if possible, have the adolescent sit for 15 minutes before administering the test.
- The adolescent should not move or talk.
- Always use a sensor guide on adolescents to determine appropriate sensor size.
- Select ring or middle finger (not dominant) for adolescents.
- Utilise finger silhouette on the top of the sensor for nail bed alignment.
- Gently squeeze the sensor to help seat the emitter on the nail bed.
- Place the arm on a flat surface, such as a desk or table.
- Keep sensor cable as straight as possible, running it up the back of the hand and lower arm.
- Pick a finger with a perfusion index (PI) of 1.0 or greater. If not, warm the site by gently rubbing for 30 seconds.

Rad-67 Demo Recording

To learn more about how to use the Rad-67, please visit the link below:

https://vimeo.com/458241252/0e0ab299a4

Research findings around acceptability, feasibility and usability of the Rad-67

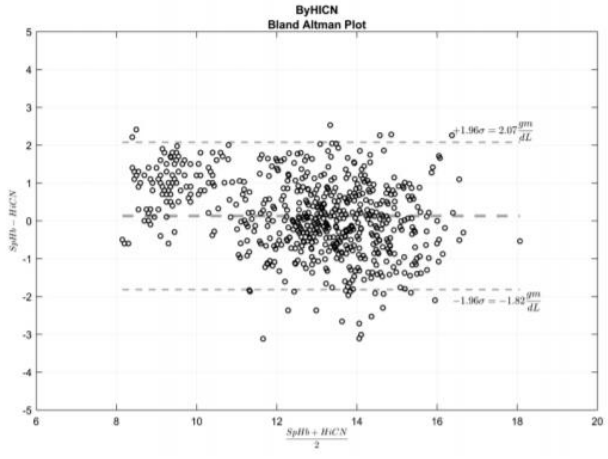


Please visit https://www.ennonline.net/fex/61/haemoglobinmonitortanzania to learn more about WV's research around the acceptability and perceived usability of the Rad-67 – a non-invasive haemoglobin monitor – among community members and health workers in Tanzania.

Additional Rad-67 Research Findings

Accuracy of non-invasive haemoglobin (SpHb) measurements obtained using Rad-67 spot-check monitoring and total haemoglobin (tHb) measurements using an invasive point-of-care device, each compared to a laboratory reference device

Device	Subjects	Samples	Limits of Agreement
SpHb vs. Laboratory Haematology Analyser	319	660	-1.82 to 2.07
Invasive Point-of-care device (capillary blood draw) vs. Laboratory Haematology Analyser	283	283	-2.5 to 1.98



Masimo study conducted in California, USA. Data collected at five different centres on healthy and sick subjects using Rad-67 with Masimo's next generation SpHb technology.

HOW BIG SHOULD MY SAMPLE SIZE BE FOR DETERMINING THE PREVALENCE OF ADOLESCENT ANAEMIA?

Formula

$$\text{Sample size}(n) = \frac{(z_{1-\alpha/2})^{2*}(p)(q)}{(d)^2}$$

n = Desired sample size
$Z_{1-\alpha/2}$ = Critical value and a standard value for the corresponding level of confidence.
(At 95% CI or 5% level of significance (type-I error) it is 1.96 and at 99% CI it is 2.58)
P = Expected prevalence or based on previous research
q = 1-p
d = Margin of error or precision

Sample size example

An Area Programme (AP) manager wants to conduct a survey to understand the prevalence of anaemia among adolescent girls in the AP catchment area. A previous study stated that anaemia among adolescent girls was 40% (if unknown, take 50%). At 95% CI and 5% margin of error, the sample required to conduct the survey is:

$$n = \frac{(1.96)^2\ (0.6)\ (0.4)}{(0.05)^2} \qquad n=368$$

(n) = 369+18 (considering 5% non-response) =386

Hence, for conducting a new cross-sectional study to determine the prevalence of anaemia among adolescent girls, 386 subjects will be required.

HOW CAN I LEARN MORE ABOUT ADOLESCENT NUTRITION?

A great place to learn more about adolescent nutrition and anaemia is through a free course offered by Nutrition International. You can find that course here: https://www.nutritionintl.org/ado-course/

ANNEX A. GUIDANCE ON HOW TO PROCURE A RAD-67

PRICING FROM MASIMO INTERNATIONAL (Shipping – Irvine, CA)

Whom should I contact to procure a Rad-67(s) pulse oximeter?

From Masimo, please contact:

Franck Berthon, Global Health Specialist @ Masimo
To: Franck Berthon franck.berthon@masimo.com
CC: Grant Aaron gjaaron@masimo.com

If you would like to purchase several Rad-67s, please contact:

World Vision Global Procurement Coordinator, Bob Wilson
Bob_wilson@wvi.org

How do I determine how many Rad-67s I should purchase?

The Rad-67 is free, but the "Rainbow DC Mini SC" sensor is not. This is the real cost of measuring anaemia using the Rad-67. **A sensor is only good for 1,000 tests. After you have conducted 1,000 tests, you will need to use a new sensor.** However, the sample size required to determine the prevalence of adolescent anaemia during a baseline survey should only be around 200. Please see the section on how to calculate sample size for more information.

RAD-67 ACQUISITION (prices listed in USD currency and subject to change)

Product	No Spot Check Sensor Purchased with Each Rad-67	1 Spot Check Sensor Purchase with Each Rad-67	2 Spot Check Sensor Purchase with Each Rad-67
Rad-67 Bonus	NA	Buy 4 get 5th free	Buy 1 get 2nd free
Rad-67 Device with bonus applied (PN #9794)	$ 795.00	$ 636.00	$ 397.50
Protection+ / Device (PN #8010)	$ 100.00	$ 100.00	$ 100.00
Mini-DCI sensor with 1,000 tests (PN #3799)	NA	$ 500.00	$ 1,000.00
Total Per Rad-67 with optional Protection+ and bonus applied	$ 895.00	$ 1,236.00	$ 1,497.50

- Protection+ is an optional additional full year of service coverage for Rad-67 device after the initial first year of product warranty and includes one time replacement of lost, damage, stolen devices, subject to various exclusions and limitations under Masimo's standard terms for these services.
- **Remote training and education will be provided at no charge as part of the pricing.**
- Prices do not include costs of shipping, duties, and fees and do not apply if a distributor is used.
- Additional mini-DCI sensors (PN #3799) may be purchased without purchasing devices

ANNEX B. HEMOCUE ESTIMATED COSTS

Item	Manufacturer	Price/Unit (approximate)
Haemoglobin photometer	HemoCue AB Box 1204 S-262 23 Angelholm, Sweden	$311.15 ea
Carrying Case	HemoCue AB, etc.	$17.10 ea
Haemoglobin cleaning device	HemoCue AB, etc.	$6.10/5 pack
AA batteries for photometer		$14.48/12 pack
Microcuvettes	HemoCue AB, etc.	$62.25/box (200)
Safety lancets	HemoCue AB, etc.	$19.60/box (200)
Sterile sponge gauzes	Medical Connection 9689 Gerwig Lane Columbia, MD 21046	$3.05/box (100)
Adhesive bandage, sheer (small)	Medical Connection	$2.63/box (100)
Exam Gloves (latex-free (medium)	Medical Connection	$11.11/box (100)
Alcohol preps	Medical Connection	$2.37/box (200)
Biohazard-waste bags (large)	Medical Connection	$48.85/case (500) 7–10 gallons

ANNEX C. CONSENT FORM FOR ANAEMIA TESTING WITH HEMOCUE

Consent/Assent for my adolescent child to participate

I give my consent for my child (full name) _____ (Age: ____ years) to be screened for anaemia (the strength of my child's blood) by measuring a very small sample of my child's blood. I understand that the people who are conducting this screening are part of [name of project and/or organisation] and [name of health partner]. This testing aims to prevent and address anaemia among adolescents. Anaemia is a serious public health problem affecting adolescents' learning, well-being, and future opportunities.

Procedures for the Collection of Blood Samples: I understand that my child's finger will be pricked with a small needle to collect small drops of my child's blood. I understand that the needle used to prick my child's finger is a new one that has never been used and will only be used once for my child. It will be opened in front of my child. I understand that the needle will be disposed of immediately after it is used. I understand that my child's skin will be disinfected with alcohol and disposable materials to prevent any infection before the finger is pricked.

I understand that this is the same procedure routinely used to collect blood in laboratories and presents minimal risk to my child. The amount of blood collected is equal to about 3 drops of water and will not worsen any disease like anaemia that my child may already have.

Risks: I understand that this procedure may cause any of these side effects: small temporary pain, minor bruises, tiny amounts of re-bleeding, and/or rash at the site on my child's finger where it is pricked. Some people may get upset, get dizzy, or faint at the sight of blood.

I understand that the procedure does not replace regular testing available at the health centre to diagnose anaemia. The result of the screening will be communicated to my child immediately after the blood sample is taken. Information on foods that can prevent anaemia will be shared with my child. I will share my child's test result with my healthcare provider. If my child has anaemia, my child and I will be notified after the screening and referred to go immediately to a health centre for follow-up. I understand that my child can seek further follow-up, even if no anaemia is detected. I have been informed that in the case of any discomfort, I can contact [name of health partner at telephone number +XXXXXXXX].

Withdrawal from screening: I understand that my child or I can refuse to participate in this screening at any time, and it will not affect their participation with the rest of the programme.

Confidentiality: I understand that my child's identity and the test result will not be given to anyone except my child and myself.

Adolescent's Name	Signature	Date (Day/Month/Year)
Parent/Guardian Name	Signature	Date (Day/Month/Year)
Tester's Name	Signature	Date (Day/Month/Year)

ANNEX D. CONSENT FORM FOR ANAEMIA TESTING WITH RAD-67

Consent/Assent for my adolescent child to participate

I give my consent for my child (full name) _____ (Age: _____ years) to be screened for anaemia (the strength of my child's blood) using a non-invasive procedure (RAD-67 machine). No needle will be used, and no blood will be taken. I understand that the people conducting this screening are part of [name of project and/or organisation] and [name of health partner]. This testing aims to prevent and address anaemia among adolescents. Anaemia is a serious public health problem affecting adolescents' learning, well-being, and future opportunities.

Procedures for the RAD-67 machine: I understand that my child's finger will be placed inside a small device that will surround the finger and shine a light through the finger. I understand that the procedure does not require a blood sample and will not cause discomfort or pain by placing the finger in the device. The light and device present minimal risks to my child. This machine is safe and has been approved for use by the health authorities, and will not cause any diseases or side effects to your child.

Risks: I understand that this procedure may cause any of these side effects: in very rare cases, people may have fear/anxiety of the machine on their finger.

The readings may sometimes be inaccurate because of other conditions, like severe anaemia, red blood cell genetic disorders (e.g., sick cell anaemia), pregnancy, nail polish, movement, heat, etc. I understand that the procedure does not replace regular testing available at the health centre to diagnose anaemia.

I understand that the procedure will not worsen any anaemia that my child may already have. The result of the screening will be communicated to my child immediately after the device calculates the measurement. Information on foods that can prevent anaemia will be shared with my child. I will share my child's test result with my healthcare provider. If my child has anaemia, my child and I will be notified after the screening and referred to go immediately to a health centre for follow-up. I understand that my child can seek further follow-up, even if no anaemia is detected.

I have been informed that in the case of any further questions that I can contact the [name of health partner telephone number +XXXXXXXXXXX].

Withdrawal from screening: I understand that my child or I can refuse to participate in this screening at any time, and it will have no effect in their participation with the rest of the programme.

Confidentiality: I understand that my child's identity and the test result will not be given to anyone except my child and myself.

Adolescent's Name	Signature	Date (Day/Month/Year)
Parent/Guardian Name	Signature	Date (Day/Month/Year)
Tester's Name	Signature	Date (Day/Month/Year)

ANNEX E. SURVEY QUESTIONS & WHO CUT-OFFS FOR HAEMOGLOBIN

This Adolescent Anaemia Module in the Youth Health and Behavior Survey (YHBS) is for adolescent girls who are between the ages of 12 to 18 years. **This is a mandatory module, but adolescent anaemia should ONLY be included in your baseline survey if you are currently implementing or plan to implement interventions to address anaemia in adolescents through a health or nutrition Core Project Model or Enabling Project Model.** The adolescent anaemia indicator is a new core impact indicator.

NAN02.	Are you currently pregnant? 1 = Yes 0 = No 88 = Unsure or don't know	
NAN03.	Record test results gD/l *Record result to 1 decimal place (xx.x). If test is inconclusive, write 00.*	

WHO Cut-offs for Haemoglobin

Age (years)	Haemoglobin level (g/dl)			
	Mild	Moderate	Severe	Non-Anaemic
11 y	11–11.4			11.5 or above
12–14 y	11–11.9	8–10.9	<8	12 or above
15 y and above				
Female	11–11.9			12 or above
Male	11–12.9			13 or above