NUTRITION CENTRE OF EXPERTISE

World Vision

Using Rapid Test Kits to Measure Salt Iodisation at the Household Level

WV Guidance Document

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GLOBAL HEALTH & WASH

BACKGROUND

What is iodine deficiency and what are its effects?

Iodine deficiency (ID) is not having enough iodine to sustain the body's need. ID in pregnancy and early childhood can cause a spectrum of problems. Women who are iodine deficient during pregnancy are more likely to miscarry (spontaneous abortion) or have still births. As well ID during pregnancy increases the risk of neonatal and infant mortality, birth defects and cretinism. Deficiency during infancy and early childhood can substantially impair physical and mental development and reduce IQ. These impairments profoundly impact on the ability of a child to succeed in school and later in economically productive work. The most critical period for intervention is between the second trimester of pregnancy to the third year after birth.

What has be done to address iodine deficiency?

Salt iodisation has been the preferred strategy to control and eliminate iodine deficiency disorders (IDD). Over the last decade, intensive efforts have been made by the governments of IDD-affected countries to implement salt iodisation programmes. To be fully effective in correcting iodine deficiency, salt must: 1) reach the entire affected population, especially groups that are the most susceptible like pregnant women and young children; and 2) be iodised to the right levels. The World Health Organization (WHO) and the Micronutrient Initiative state that in order to achieve sustainable elimination of iodine deficiency at least 90% of households must be using salt and that the salt must have an iodine content of 15 parts per million (ppm) or more. Therefore, World Vision recommends the testing of household salt to ensure: 1) the most vulnerable are utlising salt and 2) the salt is iodised to appropriate levels.

What are Rapid Test Kits?

RTK are small 10–50 ml bottles containing a stabilised starch-based solution. Add one drop of the solution to a teaspoon of salt. Salt that contains iodine will turn deep blue/purple. Some kits provide color charts so that you can match the color of the tested salt with the color chart to obtain an approximation of the amount of iodine in the salt. Rapid Test Kits (RTKs) are simple and safe to use by field staff. Individuals without chemistry training can easily verify whether a salt sample has been iodised.

Rapid Test Kits, taken from Alibaba.com

Because of their ease of use and low cost, UNICEF recommends them for qualitative and semi-quantitative assessment of salt iodisation in household surveys or for spot checks of food quality.

CORE INDICATOR: Presence of Iodised Salt in Households

The presence of iodine in household salt, as measured using RTKs, is a process indicator that answers the question: "What percentage of households use salt iodised at any iodine concentration?" In some cases, depending on the type of kit and the prevalence of salt iodisation in an area it may be possible to answer the question: "What percentage of households use salt that is within an acceptable range of iodine concentration (> 15ppm)?" It is important to note that RTKs give a qualitative to semiquantitative estimate of whether iodine is present in salt, but not the exact iodine concentration. RTKs are useful in the field for assessing whether salt is iodised, for example during household surveys. This information shows what is actually used in households, including information on whether iodised salt has been succesfully delivered to the consumer as well as whether there is use of non-iodised salt obtained from unconventional marketing sources.

Other Indicators: Urinary Iodine

The presence of iodine in salt as measured by RTKs is not an indicator of iodine deficiency. The appropriate indicator for iodine deficiency is urinary iodine which requires well trained field technicians and laboratory capacity that is often not available to ADP staff. Assessing goiter prevalence may be useful for establishing a baseline level of iodine deficiency however, it is not a useful impact indicator because changes in goiter prevalence lag behind changes in actual iodine status and may not reflect actual trends in iodine deficiency. This indicator also requires skilled / trained field researchers or medical personnel.

WHEN SHOULD I USE THESE INDICATORS?

The core indicator should be used when programmes target salt iodisation as a key strategy to improve iodine status of a population. Such programmes may include social marketing to increase the acceptability, purchasing and consumption of iodised salt. This indicator may also be useful if programmes are initiating or supporting salt iodisation programmes (i.e. small scale or medium scale) in target communities. Lastly this indicator is useful in countries where salt iodisation is occurring in the country but iodine deficiency disorders are still prevalent.

Iodine deficiency disorders are measured by 1) urinary iodine and 2) total goiter prevalence. The WHO Global Database on Iodine Deficiency compiles country and in some cases regional data on urinary iodine and total goiter prevalence and presents them in a standardised format (http://www.who.int/vmnis/iodine/data/database/countries/en/index.html). Data from these sources may be used to determine if iodine deficiency is a problem in your country. **Iodine deficiency is a problem when the median urinary iodine concentration is less than 100 mg/dL or the total goiter rate is greater than 10 percent.**

Contexts where RTKs are not useful

In situations where iodine is not being provided through salt then testing salt with rapid test kits is not an appropriate process indicator. In some regions, iodisation of salt may not be a practical option for the sustainable elimination of IDD, at least in the short term. This is particularly likely to be the case in remote areas where communications and access are poor or where there are numerous very small-scale salt producers. In such areas, other options for correction of IDD may have to be considered, such as: 1) administration of iodised oil capsules every 6-18 months; 2) direct administration of iodine solutions, such as Lugol's iodine, at regular intervals (once a month is sufficient); or 3) iodisation of water supplies by direct addition of iodine via a special delivery mechanism

WHO ARE MY POPULATIONS OF INTEREST?

All households in a programme area where iodine deficiency disorders are prevalent as determined through existing data and/or where programmes include increasing the use of iodised salt to improve iodine status as a primary goal or objective.

HOW MUCH DOES IT COST?

A single 10 mL bottle of stabilised starch solution will allow for 80-100 tests. A box of three bottles costs approximately $0.50 USD. However, managers should contact the UNICEF field office in their country or the main procurement office (see appendix for contact information) for current prices as prices may change.

WHAT SUPPLIES DO I NEED?

The type of RTK needed depends on:

1. **The type of iodine used to fortify salt (iodate or iodide or both);**

There are two types of kits available corresponding to salt fortified with 1) potassium iodate or 2) potassium iodide. The type of salt fortication must be specified when ordering. Find out from the Ministry of Health which type of iodine is used to fortify salt. In cases where both types of iodine are used it may be necessary to have both kits. If both types are present, test the salt first by using the iodate kit. If the test is negative, use the iodide kit.

2. **If iodate is used to fortify salt, the level of fortification should be known.**

Several commercially available kits are available provide semi-quantitative estimates of iodate in salt as that is the most common form of iodine used in salt iodisation. The standard kit is designed to check the presence of iodine in salt (fortified with potassium iodate) over the range of 0-50 ppm and consists of two bottles of the test solution (10 ml in each bottle, sufficient for 80-100 tests), packed in a cloth pouch along with a stainless steel spoon and plate, color chart and instruction notes. For countries setting iodine dosage in salt at 100 ppm, MBI (the RTK manufacturer) offers an alternate test kit. The test solutions show color contrast for iodine content up to 100 ppm.

What does the RTK include? How much do I need?

Most commercial kits come complete with the solution and dropper, measuring spoon, dish or plate for holding the salt and color comparison charts. Usually a box of ten bottles (each with 10 ml of test solution) will be enough for one user for a whole year during which he/she can conduct around 400 spot tests. Hence a box of bottles for each user is needed. MBI may offer the test solution in bulk packs of one litre (sufficient to fill 10 boxes or 100 bottles), each with bottles. When refilling the bottles, remember to clean the bottles with boiled double distilled water so that the solution is not contaminated with the earlier solution. The bulk packing may be reordered as needed.

Quantitative Indicator for Determining the Level of Salt Iodisation

It is recommended that a subsample of household salt be quantitatively analysed to determine the actual concentration of iodine in the salt. Documenting the actual concentration of iodine in salt (a quantitative measure) requires a laboratory analysis of salt using the idiometric titration method. This is a technically complicated and somewhat expensive analysis that is outside the scope of the World Vision's general programme monitoring and evaluation.

While studies have shown that RTKs are suitable and appropriate to accurately distinguish between iodised and non-iodised salt, in some contexts, they can distinguish between adequately iodised and not adequately iodised salt. Recent surveys using RTKs and verifying their results with titration find that they can distinguish adequately iodised salt (>=15ppm) from slightly iodised (<15ppm) in areas with a high prevalence of salt iodisation. However, **in areas where prevalence of salt iodisation is low** RTKs should only be used to distinguish any salt iodisation from no salt iodisation due to low specificity. Therefore *this indicator and how it is interpreted is context dependent. Check with the ministry of health or other relevant government agency or NGO (i.e. Micronutrient Initiative) to determine the salt iodisation status of the country/region and the type of iodine used to iodise salt.*

OTHER NOTES

- The RTK's solutions have a shelf life of more than eighteen months if unopened and six months after opening the bottle.
- Refill bottles (10) are available in cardboard boxes along with a colour chart and manual.
- **Alkaline Salt**: Some salts are alkaline due to the presence of carbonates, or certain free flow agents in the salt. In such circumstances the test solution may not give a blue colour indicating the presence of iodine in the salt. To avoid this problem a recheck solution has been developed. In cases where there is suspicion of salt alkalinity, or where the normal test solution changes to a different colour than blue or a different blue, placing a drop of the recheck solution on the salt before adding a drop of the normal test solution will help to detect the presence of iodine. Using the recheck solution with a non-alkaline salt sample followed by addition of the normal solution will still give the correct iodine level. The recheck solution comes separately, but will be provided in the test kit if the buyer indicates this need. Two recheck solution bottles can also be provided in the refill bottle carton if requested. The recheck solution bottles can be recognised by the red cap and the label on the bottles.

ADDITIONAL RESOURCES

1. WHO Database on micronutrient deficiencies provides global and in some cases regional estimates of iodine, iron and vitamin A deficiency as well as anemia prevalence. http://www.who.int/vmnis/database/en/

2. Assessment of iodine deficiency disorders and monitoring their evaluation. WHO, UNICEF, and the International Council for the Control of Iodine Deficiencies. 2007, 3rd edition. http://whqlibdoc.who.int/publications/2007/9789241595827_eng.pdf

3. Sullivan K, Houston R, Cervinskas J, Gorstein J. 1995 Monitoring Universal Salt Iodization Programs. http://www.ceecis.org/iodine/10_monitoring/00_mp/10_mon_manual.pdf

4. Mannar V, Dunn JT. 1995 Salt iodization for the elimination of iodine deficiency. International Council for the Control of Iodine Deficiencies. http://www.micronutrient.org/resources/Salt_CD/4.0_useful/4.1_fulltext/pdfs/4.1.1.pdf

APPENDIX1: RAPID TEST KIT PROCUREMENT

Commercial field spot test kits can be obtained from UNICEF field offices. They are also available for procurement through UNICEF head office:

UNICEF Supply Division
UNICEF Plads, Freeport
DK-2100, Copenhagen, Denmark
Phone - (45) 3 527 3527
Fax - (45) 3 526 9421

Ordering Information

Field Test Kits for the determination of potassium IODATE in iodised salt samples:
UNICEF STOCK No.: 05-860-00 (NOTE: For range 0-50 ppm)
UNICEF STOCK No.: 05-860-01 (NOTE: For range 0-100 ppm)

Field Test Kit for the determination of potassium IODIDE in iodised salt samples:
UNICEF STOCK No.: 05-860-02

< 20	Insufficient Severe iodine deficiency
20–49	Insufficient Moderate iodine deficiency
50–99	Insufficient Mild iodine deficiency
100–199	Adequate Optimal