QUALITY ASSURANCE PROCEDURES IN MEASUREMENT SURVEYS: EXPERIENCE FROM CAB COMPONENT OF AHS

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PARAMETERS TO BE ASSESSED IN CAB COMPONENT OF AHS

- Height (length in infants and young children who cannot stand) and weight measurement in all persons; BMI will be computed from height/length and weight
- Hb estimation in all persons aged 6 months and above
- Blood pressure in all persons aged 18 years or above
- Fasting blood sugar in all persons aged 18 years or above
- Iodisation levels to be measured in household salt

SPECIFICATIONS FOR THE EQUIPMENT

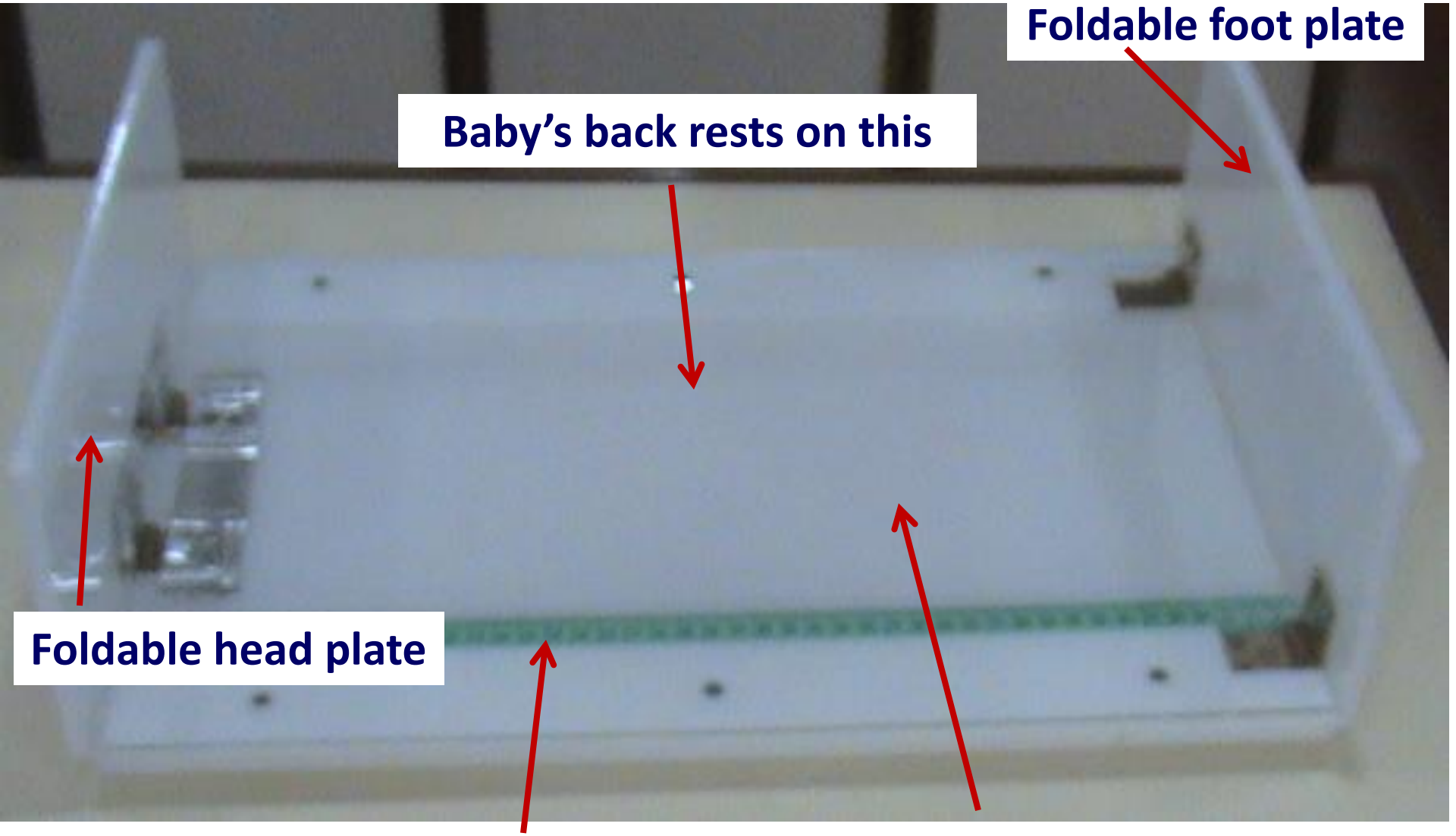
INFANTOMETER

Made of plastic so that there is no risk of warping during monsoon
Length : 45 cm base and 45 cm sliding central panel
Breadth : 30 cm
Foldable foot and head plates so that it can be carried easily
Instrument Accuracy 0.1 cm
Measurable length 45 - 90cm

Accuracy to be tested against standard infantometer

Bid evaluation by NFI, New Delhi
Accuracy testing of individual pieces of equipment: NFI, NIHFW, New Delhi, DMRC Jodhpur, RMRC Bhubaneswar, RMRC Dibrugarh and RMRCT Jabalpur.

INFANTOMETER



STATURE METER FOR HEIGHT MEASUREMENT

Wall mounted stature meters are used for measuring height.

Tape length: 2 meters.

Instrument accuracy: 0.1 cm.

Accuracy of the tape to be assessed by comparing with the standard steel tapes certified by Deptt of Weights and Measures.

Accuracy of stature meter in measuring height of individuals to be tested against a standard stature meter.

Bid evaluation by NFI, New Delhi

Accuracy testing of individual pieces of equipment: NFI, NIHFW New Delhi DMRC Jodhpur, RMRC Bhubaneswar, RMRC Dibrugarh, and RMRCT Jabalpur

DIGITAL WEIGHING MACHINE

Digital weighing machine
Lithium battery operated
Can weigh 5 - 150 kg
Accuracy ± 100g

Accuracy and sensitivity to be tested against a standard digital weighing machine.

Bid Evaluation by NFI New Delhi

Accuracy testing of individual pieces of equipment: NFI, NIHFW New Delhi, DMRC Jodhpur, RMRC Bhubaneswar, RMRC Dibrugarh, and RMRCT Jabalpur

AUTOMATED DIGITAL BLOOD PRESSURE MONITOR

Specifications

Measuring method: Oscillometric system

Indication: Digital display

Range: Blood Pressure: 40- 240mm Hg,

Pulse: 40-199beat/min

Measure twice with 5 min interval and record both measurements

Instrument Accuracy: Pressure: ±3mmHg,

Pulse: ±5%

Bid evaluation: Automated digital blood pressure monitor approved by European Society of Hypertension (EHS) and/or British Hypertension Society (BHS)

Accuracy checking: Instruments certified by manufacturer as EHS /BHS compliant.

HB ESTIMATION

5ml dispenser

Colorimeter

Voltage stabiliser

Drabkin's solution

Accuracy of 5ml dispenser to be tested against a standard dispenser: expected accuracy volume of ± 0.1 ml or colorimetric reading ± 0.01 OD.

Accuracy of colorimeter to be tested against a standard colorimeter: expected accuracy colorimetric reading ± 0.01 OD.

Bid evaluation of Colorimeter, fixed volume dispenser and Drabkin's solution by NIN, Hyderabad

Accuracy testing of individual pieces of equipment: NFI, NIHFW New Delhi, DMRC Jodhpur, RMRC Bhubaneswar, RMRC Dibrugarh and RMRCT Jabalpur

HB ESTIMATION

20 µl pipette and lancet

Accuracy of pipette to be tested against a standard pipette: expected accuracy colorimetric reading ± 0.01 OD.

Bid evaluation of pipettes and lancets NIHFW, New Delhi

Accuracy testing of individual pipettes for all FSAs: NIHFW New Delhi

GLUCOMETER

Specifications

Method: Glucose Oxidase SA Method

Results in terms of Plasma glucose equivalent units

Blood Sample: 1 microlitre

Range: 20-600 mg/dl

Battery operated , LCD Digital Display

Accuracy tested against the colorimetric/ spectrophotometric plasma glucose estimation in "apparently normal" persons - difference should be less than ± 20 mg/dl.

Bid evaluation: Dr Mohan Chennai

Accuracy testing of individual pieces of equipment: NFI , NIHFW New Delhi, DMRC Jodhpur, RMRC Bhubaneswar, RMRC Dibrugarh and RMRCT Jabalpur

KIT FOR TESTING IODISATION OF SALT

Salt testing kit provided by the National Institute of Nutrition was used.

BACK PACK FOR CARRYING EQUIPMENT AND CONSUMABLES FOR CAB SURVEY

A back pack has been custom designed keeping in mind the two requirements of safety of equipment and comfort of the team members carrying the back pack.

The part of the backpack in contact with the back of the person carrying it is well padded to ensure comfort

Broad, padded, thick straps of the back pack to ensure that they rest on the shoulders without causing any discomfort.

TESTING ACCURACY OF EQUIPMENTS DURING THE SURVEY

TESTING ACCURACY OF DIGITAL BALANCES

Weight and BMI are two important parameters used for assessment of nutritional status. Accuracy of balances is an essential prerequisite for accurate measurement of weight

In AHS CAB battery operated digital balances were used for weighing.

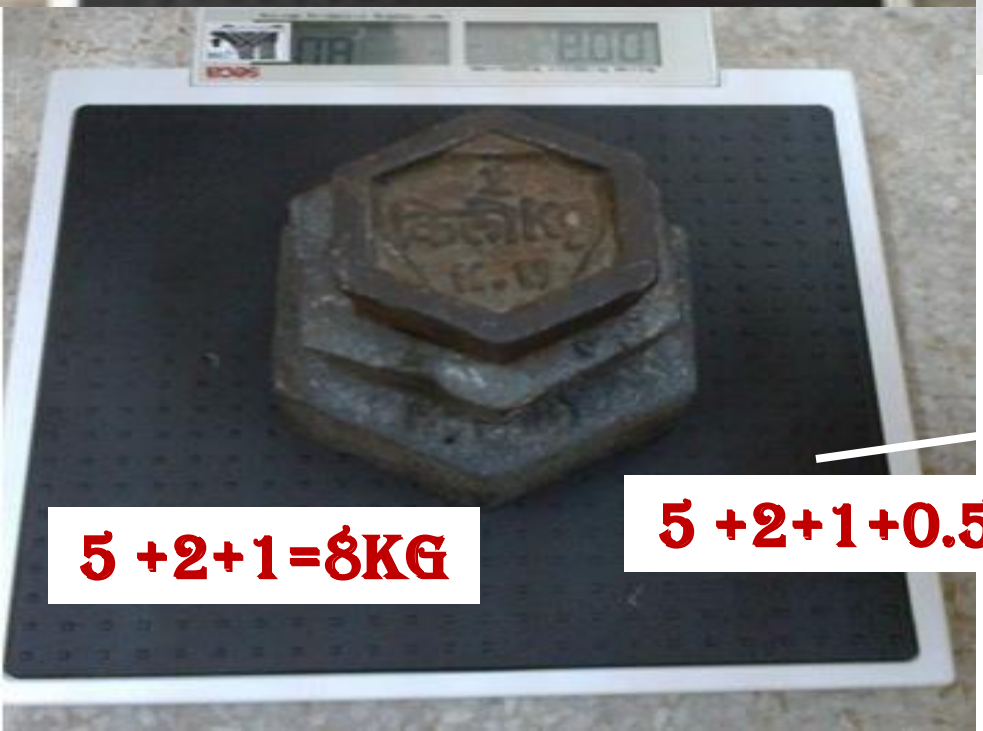
Accuracy of balances was tested during the survey by:

- using standard weights certified by the Deptt of Weights and Measures and checking the weight recorded by the balance.

- by weighing two persons of varying weights five times in the balances.

If the recorded weight was within 100 grams of the actual weight the balance was accurate and could be used in the survey.

TESTING ACCURACY OF BALANCE USING STANDARD WEIGHTS



Weigh two adults five times in the balance

If the weight recorded during the five measurements was within 100 grams the balance is accurate and could be used in the survey

QUALITY ASSURANCE PROCEDURES USED DURING THE SURVEY

QUALITY ASSURANCE PROCEDURES DURING SURVEY

Checking equipments

Every day the accuracy of the balances were checked using standard weights and weighing two adults five times in the balance being used

In every house correctness of fixing stature meter was checked by checking height of one of the survey personnel.

Duplicate measurements

Every day the team was expected to visit 14 households and take measurements in about 70 persons.

After measuring the parameter in all the household members and recording the data, one person is selected and the measurements were repeated

For each parameter, duplicate measurement was done in randomly chosen 10% of the subjects

For height, weight, BP, blood glucose and Hb duplicate measurements were collected in 7 persons every day. For height and weight the 7 persons should include one preschool child, one adolescent, one elderly person

In one in ten infants length measurement was repeated

After checking household salt in all houses one house was selected every day and the household salt is tested again

TRAINING OF FIELD INVESTIGATORS IN CAB COMPONENT OF THE AHS

Objective

To train field investigators so that they acquire the skills to

- **ascertain and record age and infant feeding practices in all children below 3 years of age and**
- **ascertain acute morbidity in under 5 children**
- **ascertain physiological status of women in reproductive age group**

They will be taught and practise

- **procedures by which the measurements are to be taken**
- **quality control procedures that they should follow to ensure accuracy in measurements and**
- **infection control and waste disposal practices that they have to use in the field**

During the training the trainees will practise performing all the procedures using instruments/equipments to be used in the survey.

Batch Size for the training

Since the training is totally focused on skill up-gradation hence batch size will be only 10-15 persons.

Duration of Training

This skill development training is critical for ensuring good quality data from the survey

The training aims to make trainees proficient in taking these measurements accurately and performing the quality control checks.

NFI and NIHFW have developed a 3-4 day training programme assuming that:

- all the institutions have the community and hospital attachments where they could take the trainees
- trainees and faculty work from 9 AM - 6PM daily.

NFI and NIHFW completed 3 training courses in 2 weeks; the other 4 institutions undertook one training course of 4 days and completed one course.

Training was be skill based with 5 out of six sessions planned focussing on practising the skills

There was one session each in practising the skills in clinic/ hospital and community setting

The minimum number of times of practising each measurement/ estimation for each trainee was as follows:

- ✓Measure Height and weight 30 times - 4 in children
- ✓BP 30 times in adults
- ✓Pipette out 20 µl from anti-coagulated blood 45 times
- ✓Collect blood by finger prick and pipette out accurately 8 times each as duplicate samples
- ✓Check blood sugar 10 times each as duplicate samples
- ✓Check iodine content in salt 10 times

Criteria used to assess skills of the trainees

Accurate recording of the age, infant feeding practices and morbidity in preschool children as compared to the faculty.

Accurate recording of other measurements (as compared to the faculty).

Allowable margin of difference is shown below:

Height/length	**± 0.1 cm**
Weight	**± 100 grams**
Blood pressure	**± 1 mm of Hg**
Blood sugar	**± 5 mg/dl**
Haemoglobin	**± 0.01 OD**

Only those trainees who could measure the parameters accurately (as indicated above) were given a certificate indicating satisfactory completion of the training course and taken by FSA for the survey .

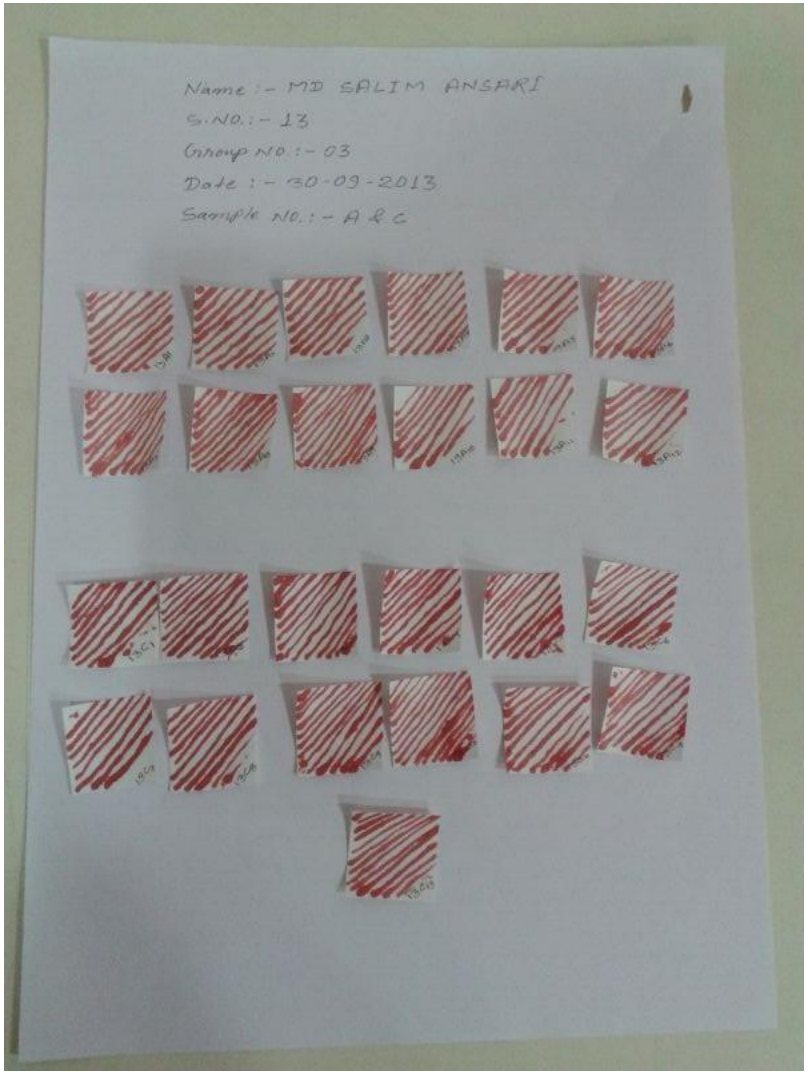
Performance appraisal of each trainee as per a standardized format was kept in the training institutions.

IS IT POSSIBLE TO TRAIN THE PERSONS TO PIPETTE 20 µL OF BLOOD ACCURATELY ?

wrong hb.mpg

right hb.mpg

Video0004.3gp



The agencies were requested to send the three members of the team together, so that they could be taught how to work as a team and collect accurate information without the family feeling that they are spending lot of time.

Incidentally if the team was sent as an unit, it might be possible to assess whether the team can cope even if one member performed sub-optimally in one test.

QUALITY ASSURANCE IN HB ESTIMATION IN CAB COMPONENT OF THE AHS

NFI 26.12.13 COLORIMETER NO-5109			
S.NO	SAMPLE NO	OD	HB
1	N1	0.24	14.4
2	N2	0.23	13.8
3	N3	0.17	10.0
4	N4	0.20	12.0
5	N5	0.23	13.8
6	N6	0.22	13.2
7	N7	0.18	10.6
8	N8	0.17	10.0
9	N9	0.24	14.4
10	N10	0.22	13.2

Interlab QA

Each lab sent 10 samples every month as dried blood spot to all other labs and the concordance tested

All labs performed very well in interlab QA

Daily standards and 10 of the previous day samples in which Hb was estimated were run in each of the colorimeters in use.

If the difference is more than 0.01 OD the colorimeter was not used for Hb estimation

NFI 21.1.14 COLORIMETER NO-5133			
S.NO	SAMPLE NO	OD	HB
1	N1	0.29	15.0
2	N2	0.20	10.0
3	N3	0.28	14.5
4	N4	0.18	9.0
5	N5	0.18	9.0
6	N6	0.18	9.0
7	N7	0.17	8.5
8	N8	0.19	9.5
9	N9	0.19	8.5
10	N10	0.29	15.0

Hb estimation was done in duplicates in 10% of the surveyed persons.

The dried blood spots collected by all FSA were sent to NFI and NIHFW for Hb estimation

All the FSAs fared well in this QA, less than 10% of the duplicates showed difference of more than 0.01 OD

Problems in blood sample elution or other errors were sent to the FSAs regularly. This tended to help in minimising the errors.

USE RELATED WEAR AND TEAR

After completion of the survey all the FSAs were requested to bring back the equipment to Delhi. All the equipments were tested for wear and tear and assessment whether they were accurate and could be used further.

All equipments from all zones showed evidence of use related wear and tear.

ETHICAL CONSIDERATIONS IN MEASUREMENT SURVEYS

SURVEY INFORMATION SHEET

Title: Clinical, Anthropometric and Biochemical Component of the Annual Health Survey

INVESTIGATOR: Registrar General, India

What is the purpose of this study?

In India, under-nutrition and anaemia have been major public health problems in all segments of population. DLHS 2 provided district wise information on prevalence of under-nutrition in pre-school children and anaemia in preschool children, adolescent girls and pregnant women. However, data on prevalence of anaemia and under-nutrition in other age and physiological groups are not available. It is essential to have district specific information so that appropriate district specific interventions can be planned, implemented and impact monitored.

India is currently undergoing nutrition and health transition. Over-nutrition, hypertension and diabetes are emerging as public health problems in both urban and rural areas. There has not been any nation wide survey to provide district level data on prevalence of over-nutrition, diabetes and hypertension. The present survey will provide such information and enable district specific interventions to be planned, implemented and impact monitored.

What does this study involve?

All members of the household will have their height and weight measured (aged 1 month & above) and Hb estimated (aged 6 months & above). All persons over 18 years of age will have their BP recorded and fasting blood glucose estimated.

Possible benefits

To the individual:

All eligible persons of the household will have their height, weight BP & blood fasting glucose levels recorded and given to them. Those who are under- or over-nourished or have high BP or fasting glucose will be advised to access the nearest health facility for care and advice. As soon as Hb data becomes available, they will be sent to the agencies and the village wise list of persons with moderate and severe anaemia will be provided to the district officials for necessary interventions. Preschool children and pregnant and lactating women who are undernourished can access ICDS food supplements regularly and benefit from them.

Survey Information Sheet contd...

Benefits to the national programmes:

The district wise data will enable the districts to incorporate priority interventions in their PIP for management of under and over-nutrition, anaemia, hypertension and diabetes. The present survey will also provide baseline data against which future data can be compared to assess the impact of interventions.

Possible risks to your family

There are no risks to the study subjects.

Cost to the participant

There is no cost to the participant. The investigators will go to the households and conduct the survey.

Compensation

No compensation will be given to the members of the household as the survey will be done at home and the study population will not incur any expenses for participating in the survey. The families may have health and nutrition benefits in terms of knowing their current status and advise on where to access necessary services if any problem was detected.

Confidentiality of the information

Confidentiality of individual's data will be maintained.

How will decision not participate in the study affect the care received?

Decision not to participate in this survey will not affect the relationship between the householders and the health and nutrition services. The householders can continue to have access to all the services provided by the health and ICDS services.

Contact persons

For further information/questions, you can contact any one of us at the following address

Consent Form

Title: Clinical, Anthropometric and Biochemical Component of the Annual Health Survey

INVESTIGATOR: Registrar General, India

Name of the participant:

Address:

Contact No. (if available):

Documentation of the informed consent

I, … … … … (in case of children, father/mother/guardian) …… have read the information in the study information sheet/it has been read to me. I was free to ask questions and they have been answered. I am over 18 years of age and, exercising my free power of choice, hereby willingly give my consent (consent to include my ward/child) as a participant in the above survey and clarify that

(1) I have fully understood the information provided about the study.

(2) I have been informed that there are no known risks associated with this study.

(3) I am aware of the fact that I can opt out of the study and this will not affect my child's access to health or ICDS services.

(4) I have been provided information about individuals whom I can contact to seek clarifications.

(5) I have been told that my (my child's) identity will be kept confidential if the data are presented or published.

Name and signature / thumb impression

_____ (Name) _____ (Signature)

Date: _____ Time: _____

Witness

I certify that the nature, purpose and potential benefits of the above study have been read out and explained to participant and all his/her queries have been satisfactorily answered.

Name and signature of witness:

_____ (Name) _____ (Signature)

Date: _____ Time: _____

Address of the witness: _____

HOUSEHOLD CARD

Annual Health Survey: Clinical, Anthropometric and Biochemical (CAB) Tests

State: **District:** **Rural / Urban:** **AHS Sample Unit:**
AHS House No.: **AHS Household No.:** **Date of survey:**

Iodisation of salt: No iodine – 1; Less than 15 PPM – 2; More than 15 PPM – 3
If code '1' or '2', please change the type of salt used; use only adequately iodised salt.

Sl. No.	Name	Sex	Age (in completed years)	Height (Cm)	Weight (kg)	BP systolic (mm of Hg)	BP diastolic (mm of Hg)	Fasting blood glucose (mg/dL)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

Please show this card to the ANM/AWW and get their advice. If they advise you to consult the physician please do so. If Fasting Blood sugar is over 110mg/dL, or if systolic Blood Pressure is over 130mm Hg and/or Diastolic Blood Pressure is over 90mm of Hg please consult the PHC Doctor or Family Physician.

RESPONDENT'S' PARTICIPATION

- Every household was given the household card in which actual measurements done in each individual and result of household salt testing was entered
- Mother Child Protection Card issued by Ministry of WCD were provided to all households where pregnant woman or, under-three child was present
- Card household card gave generic instructions on what is to be done if the measurements for any individual was out side normal range; those with undernutrition were requested to contact AWW; those with hypertension or abnormal blood sugar levels were requested to visit nearest PHC, or medical practitioners
- FSA were requested to provide Hb results to the household or to the ANMs for downward transmission to the village
- District health services were sensitised to increase in referrals because of survey & were requested to provide appropriate care

SUMMING UP

WHY UNDERTAKE CAB COMPONENT OF AHS

- India is undergoing socioeconomic, demographic, nutrition and health transitions.
- Pace of these interrelated transitions has been steady but slow and uneven across decades, districts, states and segments of population.
- Twelfth Plan and National Health Mission emphasise the need for district specific planning of interventions based on magnitude of the problems in different districts to reduce the gap between districts/states and accelerate the pace of improvement in health and nutritional status.
- Current district level data on health and nutritional status is essential to operationalise this.

EQUIPMENT & METHODS TO BE USED FOR MEASUREMENTS

Length: Infantometer

Height: Wall mounted height measuring tape

Weight: Digital weighing scale

Blood Pressure: Digital BP measuring instrument

Hb estimation: finger prick collection of 20µl of blood on to filter paper; estimation of Hb from the dried blood spot using cyanmethaemoglobin method

Blood sugar: estimation from finger prick blood using glucometer

Testing of household salt for iodine content: iodine testing kits.

All these equipments are simple and methods for measurement are used in primary health care institutions.

OPPORTUNITIES AND CHALLENGES

- **CAB survey covered all districts in nine states with poor nutrition and health indices**
- **These states have about 45% of India's population; they contribute to 55% of population growth, 60% of under-nutrition, and mortality;**
- **But they also represent an opportunity: Rapid improvement in health & nutritional indices in these states are possible through district specific planning of interventions and by improving access to good quality of essential health & nutrition care.**

CAB COMPONENT OF AHS

- CAB component of AHS is designed to provide district specific information on magnitude of under- and over-nutrition, micronutrient deficiencies, hypertension and diabetes in all the districts in 9 states with poor nutrition and health indices.
- Based on these data district specific Programme implementation plans can be drawn up, funded and implemented.
- Progress in implementation and impact of these interventions can be assessed by using the AHS CAB data as the base line.
- Successful models can be replicated.
- If performance is suboptimal, factors responsible for the poor performance can be identified and midcourse corrections can be made.

NEW DATA EXPECTED FROM CAB COMPONENT

Currently there is very little data on nutritional status of people other than pregnant women and under-five children.

We do not have ready answers to the questions:

- how do the other vulnerable groups like school children and elderly fare?
- What is the extent and dimensions of intra-family differences in nutritional status?
- What is the extent of under- and over-nutrition and micronutrient deficiencies in different segments of population in the same district?
- Are there some well-defined groups at higher risk of nutritional problems who require focussed interventions?

Based on data on these, districts can draw up specific interventions plans and request for resource allocations in DHAP.

OTHER BENEFITS FROM CAB

AHS CAB training module describes quality control measures to be undertaken during the survey to ensure accuracy of measurements eg how to test for accuracy and sensitivity of weighing machines;

All the survey personnel - mostly ANMS and lab technicians would receive rigorous training in these;

They will follow the procedures during the survey;

The health workers in sub centres and PHCs will see that it is possible ensure accuracy in all these measurements if simple precautions are followed;

This knowledge if backed by emphasis through the in-service training programmes could result in their optimally utilising the equipment provided and identifying those who require care.

CAB AHS SURVEY BENEFITS

To the individual

- Information on nutritional status, Hb levels, blood pressure and fasting glucose will be provided to every member of the household who participated in the survey;
- Infants and children will get the MCPC with their weight marked
- Preschool children and pregnant and lactating women who are under-nourished will be advised to access ICDS food supplements regularly and benefit from them;
- Persons with over-nutrition, hypertension and high fasting blood sugar will be advised to access health care professionals for investigations and management of the problem.

To the district programmes

- District specific interventions can be drawn up, implemented and progress monitored.

THANK YOU!

SKB