LIFE STUDY | Understanding lives – now and for the future

Standard Operating Procedures: Infant Anthropometry

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[1] See http://www.healthforallchildren.com/shop-base/shop/software/lmsgrowth/

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1   Background

Initial discussions regarding infant anthropometry measurements took place in 2012, in the Life Study Scientific Protocol Development Group and Scientific Working Groups. Consideration was given to potential research questions that could be answered by Life Study, and also the anthropometry measurements included in other cohort studies.

The Life Study Scientific Steering Committee was responsible for overall decision making and for approval of the final Life Study scientific protocol. This included making decisions as to which assessments, measurements and observations were included for participants attending the Life Study Centres.

The Life Study Standard Operating Procedures (SOPs) for Infant Anthropometry are based on the "Childhood Nutrition Research Centre, Standard Operating Procedure for adult / child anthropometry, March 2013." The Life Study team was in addition given access to anthropometry SOPs from the Millennium Cohort Study, the Avon Longitudinal Study of Parents and Children, Children of the Children of the 90's Study, and from NatCen Social Research.

Work to develop the Life Study SOPs commenced in 2013, prior to the initial Life Study pilot for the pregnancy component. NatCen Social Research conducted this pilot and their staff were involved in the initial development of the SOPs.

Members of the Life Study team based at UCL Institute of Child Health gave feedback on draft documents, sourced equipment, tested data capture mechanisms and liaised with external suppliers regarding the specification and development of data capture systems.

The Life Study SOPs for Infant Anthropometry were not implemented, as funding for Life Study was withdrawn by the funders in October 2015 before the infant visits had commenced.

2 Summary of measurements

	6 month visit	12 month visit
Baby	Weight Head circumference Mid-upper arm circumference Subscapular skinfolds Length	Weight Head circumference Mid-upper arm circumference Subscapular skinfolds Length

3 Before mother and baby arrive

Table 1 summarises issues to be checked before the mother[2] and baby arrive.

Table 1 Checklist: before mother and baby arrive

1.	Is the room warm enough for a naked baby?
2.	Do you have the necessary wipes, tissues and paper with which to line the weighing scales?
3.	Is all the equipment easily at hand, working properly, undamaged and cleaned with antibacterial wipes?
a.	Are the weighing scales on a level surface? Check the air bubble is in the centre of the circle and if necessary adjust the foot screws.
b.	Are the weighing scales away from the edge of the counter (safety of baby)?
c.	Is the head circumference tape threaded correctly, i.e. **up through the first slot, down the second and up the third**, and not damaged or creased?
d.	Are the skinfold calipers at hand and is the dial at zero?
e.	Is the length equipment placed away from the counter edge (safety of baby)?
f.	Is there a chair for the mother to sit on?
4.	Do you have distraction toys available and cleaned with antibacterial wipes?
5.	Is the computer switched on and working?

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[2] We assume throughout that the baby is accompanied by his/her mother

4 Once mother and baby have arrived

Table 2 summarises issues to be checked once the mother or carer and baby have arrived.

Table 2 Checklist: once mother and baby have arrived

1. Check when the baby is likely to be hungry. It is much easier to measure a baby that has recently been fed. If the baby is hungry whilst you are trying to do the measurements it is likely that all three of you will find the situation difficult.
2. **NEVER LEAVE THE BABY UNATTENDED** Be aware and make sure the baby is **never** placed in a position where they might fall.
3. It takes much longer to measure anthropometry in an infant than an adult.
4. Explain each measurement first. Confirm the mother is happy for that measurement to be done and that she knows what you want her to do.
5. Be sensitive to how the mother and baby are reacting. If necessary stop the measurements to allow the mother to pacify the baby or for her to take a break.
6. Allow the mother to do most of the handling of the baby (undressing, placing on equipment and holding still) as the baby is likely to respond better to the mother.
7. Encourage the mother to distract the baby whilst you are doing the measurements.

5 Order of measurements

Table 3 summarises the order of measurements.

For ease and because babies rarely like to have their legs straightened this is the best order in which to perform the measurements.

Table 3 Order of Measurements

1. Mother undresses baby completely to be weighed.
2. Mother replaces nappy and sits on chair holding the baby seated on her left thigh with baby's right arm closest to her body (all measurements are done on the baby's left side).
3. Proceed to measure head circumference, mid-upper arm circumference and subscapular skinfold.
4. Measure the baby's length with help of the mother but you may need the help of another assistant. Detailed instructions are in the section 11.
5. Dress baby.

6 Inclusion Criteria

Unless there are any specific exclusion criteria (see the separate sections), all measurements are made on all infants at the six month and the twelve month visits.

7 Weight

7.1 Introduction

This measure is intended to establish weight and to check weight gain in the growth process.

7.2 Exclusion Criteria

None

7.3 Equipment

- Seca 376 scales[3]
- Antibacterial surface wipes e.g. Milton wipes
- Clinical paper roll

7.4 Calibrating the equipment

The scales have been calibrated by the manufacturer and should be serviced and recalibrated according to the manufacturer's guidelines. The instructions for this are in the Seca 376 instruction manual.

The Life Study Centre managers are responsible for ensuring that servicing is carried out as recommended.

If staff using the equipment have any concerns about the accuracy of the equipment, they should report this to the Life Study Centre Manager.

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[3] Image taken from: http://www.seca.com

7.5 Procedure

1 **Make sure you have read and complied with the sections 2 to 5.**

2 Explain to the mother how you will take the infant's weight measurement and how you would like their assistance.

3 Ask the mother to remove all clothing from the baby (including their nappy). To avoid the baby moving too much ask the mother to help distract the baby while you take the weight measurement; for example, jangling keys lightly can be quite effective.

4 Check there is nothing on the scales. Press the Start key to switch on the scales. The display will read SECA and then quickly run through all elements of the display. The scales are ready for operation when the display reads 0.000.

5 Place a double layer of clinical paper on the tray of the scales and if the mother has a suitable blanket with her that can be placed in the tray over the clinical roll then do this, as this is more comfortable for the baby and may help to keep them still. It is important that the blanket / clinical roll does not hang over the edge of the tray.

6 Hold down the arrow key (hold/tare) until "NET" appears in the display. Wait until the display stops flashing and is replaced by 0.000.

7 Lay the baby naked on the scales. The preference is for babies to be lying on the scales but if older babies are too long or will not stay in this position and they can sit unsupported, then they can be sat on the scales. The mother should stay immediately beside the baby whilst they are on the scales; they **should not be left unattended at any time** to avoid them falling off or out of the scales. Ideally, the baby should be as still as possible.

8 Read off the measured weight.

9 If the infant moves excessively while the scales are stabilising you may get a false reading. If you think this is the case, reweigh the infant.

10 Write down the weight or enter it directly into the Infant Anthropometry Survey before asking the mother to lift the infant off the scales.

11 Ask the mother to place the infant back on the scales. Repeat the steps to take a second measurement and record that too.

12 If the two weights differ by more than 0.01kg, then a third measurement should be obtained. If you are unsure if the difference between the two measurements is greater than 0.01kg, the Infant anthropometry Survey will automatically calculate the difference and prompt you to take a third measurement if necessary.

13 Ensure all the weight measurements are entered in the Infant Anthropometry Survey.

14 If you have any comments you wish to record in relation to the baby's weight measurements, you will be able to record these in the Infant Anthropometry Survey. For example, if you believe the measurements are not accurate, you should make a note of this when prompted.

15 Throw away the clinical paper and wipe down the scales with an antibacterial surface wipe after each use.

16 If the baby passes urine whilst their weight is being measured:

   a. If you do not have any weight measurements, dispose of wet clinical roll in the clinical waste bins, clean the scales and start again from the beginning of the weight protocol.

   b. If you already have one weight measurement and all the urine is inside the tray, then you can take a second weight reading before cleaning up (assuming the mother is happy with that).

   c. If you already have one weight measurement and some of the urine goes outside of the tray, clean up and start the weight protocol from the beginning.

7.6 Feedback

See section 12.

The child's weight measurement and the centile will appear on the feedback sheet for the mother to take away. This should be given to her at the end of the visit.

If the baby's weight is less than the 0.4th centile or more than the 99.6th centile, the feedback sheet suggests that the mother discuss this with her health visitor or GP.

The feedback sheet also says "Life Study staff are not permitted to give advice about your baby's height, weight and head circumference."

8 Head Circumference

8.1 Introduction

Measurement of head circumference is a routine part of the infant's growth assessment, it tells us about growth and development.

8.2 Exclusion Criteria

None

8.3 Equipment

- SECA 212 measuring tape[4]
- Antibacterial surface wipes e.g. Milton wipes
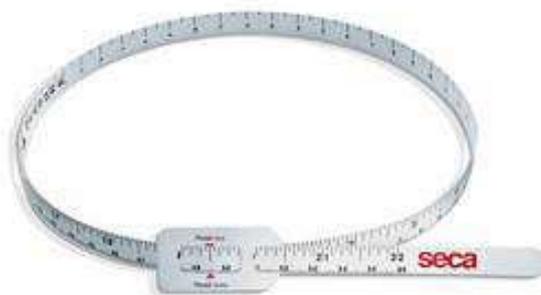
8.4 Procedure

1 **Make sure you have read and complied with sections 2 to 5.**

2 Explain the procedure to the mother.

3 Position the baby on the mother's lap as described in Table 3 Order of Measurements.

4 Ask the mother to remove any hair clips, bobbles, hair bands or hats from the child's hair/head.

5 Place the measuring tape around the child's head at its largest diameter midway between the eyebrows and the hairline at the front of the head, above the ears

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[4] Image taken from: http://www.seca.com

and around the occipital prominence at the back of the head. Your aim is to always measure the largest circumference possible.

6   Ask the mother to distract the infant with toys as they may try to pull the tape off.

7   Pull the tape snugly to compress the hair. Make sure that the tape passes the occipito-frontal plane (as described above) and does not slip when getting the reading. It may be helpful to ask the mother to hold the tape in place on the back of the head with a finger.

8   Read the measurement to the nearest 0.1 cm.

9   Write down the measurement or enter it directly into the Infant Anthropometry Survey.

10 Repeat the measurement to obtain a second reading and record this. If the two measurements differ by more than 0.2cm, then take a third reading. If you are unsure if the difference between the two measurements is greater than 0.2cm, the Infant Anthropometry Survey will automatically calculate the difference and prompt you to take a third measurement if necessary.

11 If you have any comments you wish to record in relation to the baby's head circumference measurements, you will be able to in the Infant Anthropometry Survey. For example, if you believe the measurements are not accurate, you should make a note of this when prompted.

12 Wipe the measuring tape with the antibacterial surface wipes after each baby and store to avoid damage and creasing.

13 Ensure all the measurements are entered into the Infant Anthropometry Survey.

8.5   Feedback

See section 12.

The child's head circumference measurement and the centile will appear on the feedback sheet for the mother to take away. This should be given to her at the end of the visit.

If the baby's head circumference is less than the 0.4th centile or more than the 99.6th centile, the feedback sheet suggests that the mother discuss this with her health visitor or GP.

The feedback sheet also says "Life Study staff are not permitted to give advice about your baby's height, weight and head circumference."

# 9   Mid-Upper Arm Circumference

9.1   Introduction

Mid-upper arm circumference is an anthropometric measure providing information on muscle mass and subcutaneous fat. Changes in arm circumference are relatively easy to detect and as such the mid-upper arm circumference is a key indicator of the nutritional status of children and adults. The measure is reduced substantially in the undernourished and substantially increased in people who are overweight. Like other anthropometric measures it can be used as a tool to examine the effectiveness of public health policies, particularly with regards to child nourishment.

9.2   Exclusion Criteria

None

9.3   Equipment

- Seca 212 measuring tape[5]
- White eyeliner pencil (to mark the measuring position on the infant's arm)
- Antibacterial surface wipes e.g. Milton wipes (to clean the tape)
- Non-alcohol wipes (to remove white eyeliner marks on infant's arm)
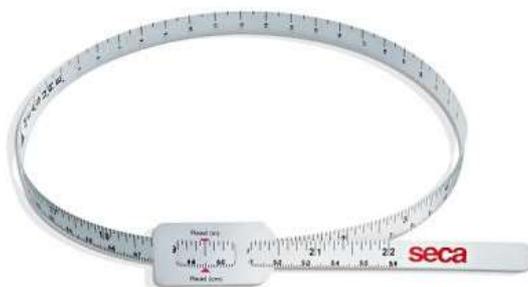
9.4   Procedure

1   **Make sure you have read and complied with sections 2 to 5.**

2   Explain the procedure to the mother.

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[5] Image taken from: http://www.seca.com

3   The baby must have a bare arm and shoulder for this measurement. Position the baby in a sitting position on the mother's lap so that you can easily access the left arm. The baby will need to have their elbow bent at a right angle. The mother should hold the left hand to prevent the baby from pulling their arm away.

4   Using the white eyeliner pen, mark the process of the Acromion (this is the end of the shoulder bone which is next to the top of the upper arm bone).

5   Using the measuring tape, measure the distance between the top point marked and the tip of the elbow (olecranon process). Divide this measurement in half, this is the mid-point of the upper arm; mark this mid-point with the white eyeliner pen.

6   Pass the tape over the baby's hand and slip it up the baby's arm, to the mid-point that you have marked. The mother should hold the baby's arm loosely.

7   The tape should lie on top of the mark, covering it. Ensure the tape is passing horizontally around the arm, not sloping, and is in contact with the skin but does not compress tissue underneath. It should not be loose but neither should it be puckering the skin. It may help to hold the wider end of the tape with your left hand and the loose narrow end with your right hand, as that way it can be repositioned and tightened easily.

8   Read the measurement to the nearest 0.1cm. If the arrow falls between millimetres always read to the nearest whole millimetre. Write this down or enter directly into the Infant Anthropometry Survey.

9   Loosen and then reposition the tape, and repeat the measurement so that a second reading is made to improve accuracy. If the two measurements differ by more than 0.2cm, take a third measurement. If you are unsure if the difference between the two measurements is greater than 0.2cm, the Infant Anthropometry Survey will automatically calculate the difference and prompt you to take a third measurement if necessary.

10 Ensure all the measurements are entered into the Infant Anthropometry Survey.

11 If you have any comments you wish to record in relation to the baby's Mid-Upper Arm Circumference measurements, you will be able to in the Infant Anthropometry Survey. For example, if you believe the measurements are not accurate, you should make a note of this when prompted.

12 Offer a non-alcohol wipe to the mother so that they can wipe off the white eyeliner marks on the baby's arm, if they wish to.

13 Clean the Seca tape after use with the antibacterial surface wipe.

9.5 Feedback

No feedback will be given.

10 Skinfolds

10.1 Introduction

Around half the fat in the body is located directly beneath the skin (subcutaneous fat), and its thickness provides some indication of total body fat.

10.2 Exclusion Criteria

Do not measure skinfolds over skin which is broken, swollen, inflamed / infected or sore / sensitive – if appropriate measure on the other side of the body, otherwise exclude altogether.

10.3 Equipment

- Holtain Skin-fold Caliper[6]
- White Eyeliner pencil
- Antibacterial surface wipes e.g. Milton wipes (to clean the calipers)
- Non-alcohol wipes (to remove the eyeliner marks from the skin)

10.4 Calibrating the equipment

Ensure the caliper is calibrated and measuring zero prior to each clinic. If staff are concerned the calipers are inaccurate, they should report this to the Life Study Centre manager.

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[6] Image taken from: http://www.holtain.com

10.5 General Procedures

1. **Make sure you have read and complied with sections 2 to 5.**

2. Use a white eyeliner pencil to mark the points to measure.

3. Once the site has been located and marked, the thumb and forefinger of the left hand are used to elevate a fold of skin and subcutaneous fat about 1cm away from the measurement point. If necessary, the skin can be lifted using both hands and then held by the left hand whilst measuring with the right.

4. The thumb and finger must be far enough away from the point of measurement so that the fingers are not compressing the point of measurement and the skinfold is pulled away from the underlying muscles in order to form a fold with almost parallel skin surfaces. It may not be possible to achieve parallel sides when the skinfold is large. Care must be taken to only grasp skin and subcutaneous fat. The right hand is used to open the calipers and place them over the skinfold perpendicular (at right angles) to the long axis (length) of the fold, approximately half way between the top of the fold and the body surface.

5. A reading is taken once the dial first slows to almost a stop. The time taken varies depending on the thickness of the skinfold. The caliper should not be left in position too long, as they will start to compress the skinfold and give an inaccurate measurement.

6. Once a reading is taken **release the calipers FIRST** before releasing the fold held by the left hand.

7. When taking a reading the operator's head should be positioned so as to avoid errors due to parallax. (This means that the operator's head should be in a direct line with the dial on the caliper so that they can clearly see the exact position of the needle on the dial, to avoid inaccurate readings).

8. A measurement is recorded to the nearest 0.2mm.

9. The measurement is repeated, so that three comparable readings are obtained.

10. Record all measurements in the Infant Anthropometry Survey.

11. Offer a non-alcohol wipe to the mother so that they can wipe off the white eyeliner marks on the baby's back.

12. Wipe the calipers with an antibacterial surface wipe after use.

10.6 Subscapular Skinfolds

1. Explain the procedure to the mother. Mothers are likely to have had their own skinfolds measured during their first visit to a Life Study Center. If they did not, demonstrate the procedure on their forearm.

2. Explain that when measuring skinfolds in babies, the pressure of the caliper itself can barely be felt; but if the baby moves suddenly, the calipers can pull sharply on the skin and this may cause discomfort. It is therefore essential that the baby is held firmly so that this does not happen. Do not assume the baby will keep still.

3. The baby should already be in the position described in Table 3 and the mother should hold the baby's shoulders/arms to prevent movement. Avoid having the baby seated facing the mother and held by both arms such that the skin of the back is taut as it will be difficult and uncomfortable to raise a skinfold. Locate the left scapula (left shoulder blade) and move your fingers down until you reach the angular aspect of the lower margin of the shoulder blade. Mark a point slightly away from the bone just below this angle.

4. At this point, pick up a skinfold gently but firmly between finger(s) and thumb(s) with the fold angled at 45° to the horizontal with the top end pointing towards the spine and the lower end to the left side.

5. Apply the calipers slightly away from the fingers and perpendicular to the long axis of the skinfold. Once the calipers are in place release the calipers slowly and gently whilst **STILL HOLDING** the skinfold between finger and thumb. Wait until the dial slows to almost a stop before reading.

6. Record the measurement to the nearest 0.2mm. Write this down or enter directly into the Infant Anthropometry Survey.

7. Repeat the measurement so that three comparable readings are obtained. Ensure that all measurements are entered into the Infant Anthropometry Survey.

8. If you have any comments you wish to record in relation to the baby's skinfold measurements, you will be able to in the Infant Anthropometry Survey. For example, if you believe the measurements are not accurate, you should make a note of this when prompted.

9. Offer a non-alcohol wipe to the mother so that she can wipe off the white eyeliner marks on the baby's back.

10. Clean the calipers after each baby with the antibacterial surface wipes.

10.7 Feedback

No feedback will be given.

11 Length

11.1 Introduction

The infant length measurement, when taken in conjunction with other growth parameters, can be used as an indicator of an infant's nutritional status.

11.2 Exclusion Criteria

Infants whose legs cannot be straightened.

11.3 Equipment

- Seca 416 Infantometer[7]
- Antibacterial surface wipes e.g. Milton wipes

11.4 Procedure

1 **Make sure you have read and complied with sections 2 to 5.**

2 Explain to the mother the reason for taking the length measurement. Explain that you will need their assistance in taking this measure and how they can help. The infant needs to be undressed apart from a nappy, no foot or headwear should be worn.

3 An adult must stay immediately beside the infant at all times, even if the baby has never previously rolled over.

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[7] Image taken from: http://www.seca.com

4   Place the infant on the bed of the Infantometer with his/her crown touching the headpiece and the mother standing at the head.

5   Make sure the infant's trunk and pelvis are straight and properly aligned with the measuring device.

6   Move the infant's head into the Frankfurt Plane position. The Frankfurt Plane should be at right angles to the surface of the table. The Frankfurt Plane is an imaginary line passing through the external ear canal and across the top of the lower bone of the eye socket, immediately under the eye (see Figure 1). This position is important if an accurate reading is to be obtained. Ask the mother to hold the infant's head in this position and make sure their head is in contact with the headpiece. Encourage the mother to keep her baby distracted by talking and keeping eye contact.

Figure 1 Frankfurt Plane Position
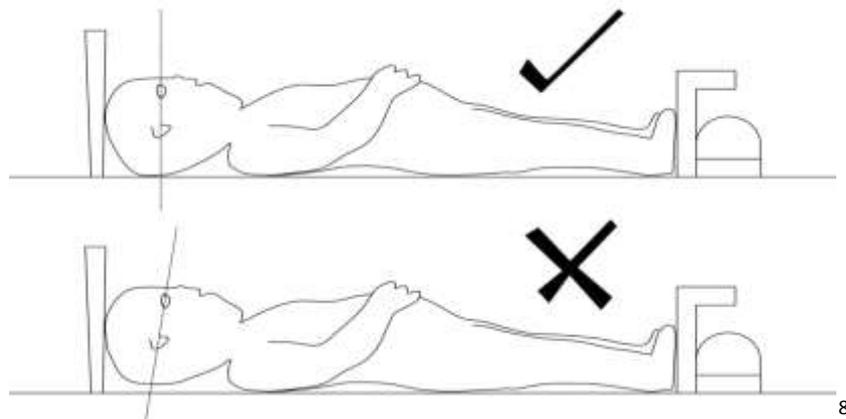
7   Straighten the infant's legs by holding the legs by the ankles with one hand and applying a **gentle downward pressure** over the legs with the other hand**.** It is very important that this pressure should be **GENTLE.** Young infants cannot fully straighten their legs in the way that older age groups can, and damage and pain could result if this is done too rigorously. Make sure the infant's hips are not twisted.

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[8] Image taken from: https://images.google.com/

8 Check with the mother that the infant's head is still in position and touching the headpiece.

9 Releasing your hand from the baby's ankles, move the footrest on which the measurement reader is mounted to touch the soles of the child's feet, toes should be pointing directly upwards. If the baby is pointing the toes downward you will need help to get the feet straight. Once the footrest has been brought up it locks in position so the infant can move their legs again whilst you note the reading.

10 The measurement is read from the red arrow in the reader window. The measurement is recorded in centimetres and millimetres to the nearest millimetre. If the measurement lies between two millimetres then you should round to the nearest millimetre. Either write this down or enter it directly into the Infant Anthropometry Survey.

11 Press the black button on the footrest to release the brake and move the footrest down again. The infant can remain on the infantometer and the steps repeated to obtain a further measurement of length.

12 Ensure both measurements are entered into the Infant Anthropometry Survey.

13 If you have any comments you wish to record in relation to the baby's length measurements, you will be able to in the Infant Anthropometry Survey. For example, if you believe the measurements are not accurate, you should make a note of this when prompted.

14 Wipe the Infantometer with an antibacterial surface wipe after taking the measurements. The footrest should be slid back by depressing the black press button.

11.5 Feedback

The infant's length measurement and the centile will appear on the feedback sheet for the mother to take away. This should be given to her at the end of the visit.

If the infant's head circumference is less than the 0.4th centile or more than the 99.6th centile, the feedback sheet suggests that the mother discuss this with her health visitor or GP.

The feedback sheet also says "Life Study staff are not permitted to give advice about your baby's height, weight and head circumference."

12 Feedback Sheets

1   Open the Desktop Device Application. To do this click on the shortcut as shown below:

2   Enter the participant's ID and select the visit type using the dropdown box, then press "search".

3   The participant's details (name, date of birth, gender, and visit type) should appear on the screen. Check this is the correct participant. If not, use the arrow in the top left corner to take you back to the participant identification screen to re-enter the correct participant ID.
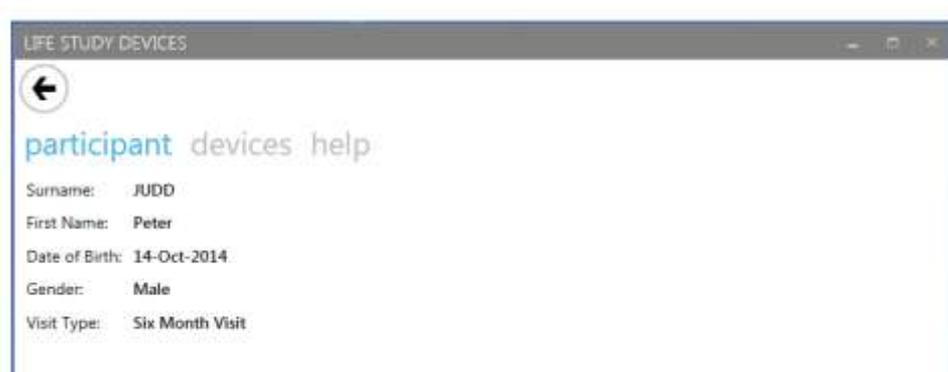
9

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[9] Note – all names and dates of birth, relate to fictitious participants

4   Select "devices" which appears above the participant details.

5   Select "Child Anthropometry".
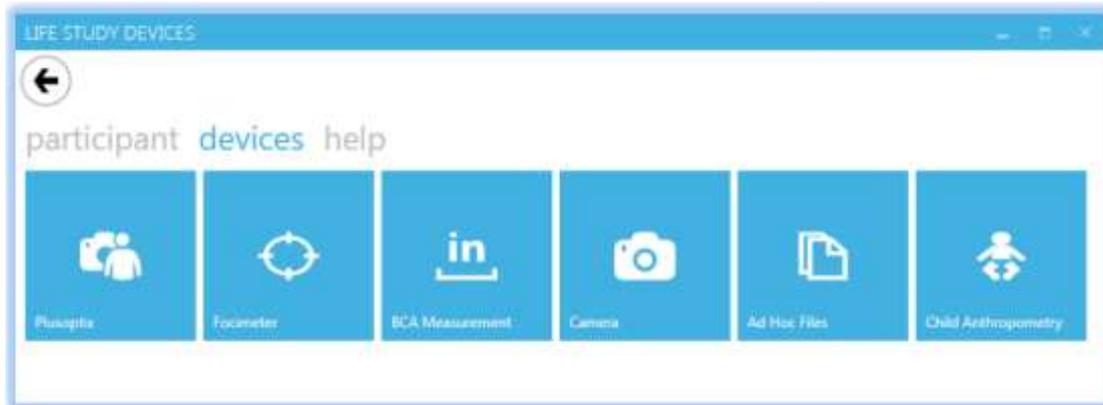
6   The following will open for recording the participant's anthropometry measurements for transfer to the participant feedback sheets.

7   Click in the box "Adjust for gestation", then check with the mother as to how many weeks pregnant she was, when the baby was born, and enter the value in the box marked "Weeks".

8 Enter the values for the baby's length, weight and head circumference.

9 The centile values will then automatically populate and will take account of the baby's gestational age.[10]

10 Check that all values are entered correctly and then press "SUBMIT". Then press "yes" to confirm.

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[10] LMSgrowth software (http://www.healthforallchildren.com/shop-base/shop/software/lmsgrowth/) was used to calculate the centiles. Cole TJ, Green PJ. Smoothing reference centile curves: the LMS method and penalized likelihood. Stat Med 1992;11:1305-19.

11 Then press "ok".
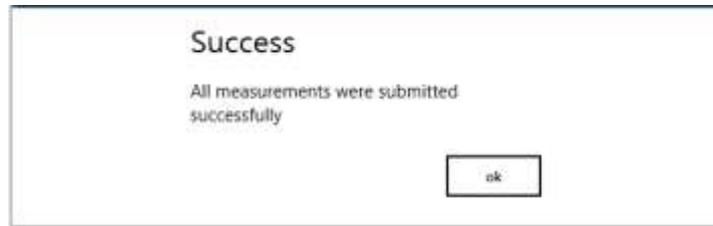
12 Press the arrow in the top left corner to exit that participant's session, then close the Desktop Device Coordinator.

13 At the end of the participant's visit, give the mother a copy of her baby's feedback sheet which is located on the Life Study document store.

13   Appendix 1 Participant Feedback Form

Barking, Havering and Redbridge **NHS**
University Hospitals
NHS Trust

Infant feedback at the 6 month visit

Name:	James Gregg	Participant ID:	MAT-109034-XF0D
Date of visit:	30 April 2015		

Thank you for taking part in Life Study.

As part of Life Study, today your baby may have:

- had some measurements taken, including length, weight, head size, skinfold thickness and arm size
- given small samples of urine, saliva and poo
- taken part in some child development tests with you, including tracing your baby's eye movements whilst they watched a video and watching you and your baby doing activities together.

Here are your baby's results for some of the measurements we took today:

Measurement	Result	Centile
Weight (kg)	7.5	47
Length (cm)	65.8	44
Head Circumference (cm)	43.2	67

If any of your baby's measurements are less than the 0.4th centile or more than the 99.6th centile, you may like to discuss these with your health visitor or GP. Life Study staff are not permitted to give advice about your baby's height, weight and head circumference.

v3.0 (dated 01/12/2014)

See footnote[11]

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[11] Note – all names and dates of birth, relate to fictitious participants

14 Appendix 2 Results Template

This Appendix provides two templates.

The first is provided to allow measurements and observations to be noted for ease of transfer into the Infant Anthropometry Survey or feedback sheets.

The second is provided for use should there for any reason be a computer failure rendering the Infant Anthropometry Survey unavailable. Results recorded on paper should be securely stored and then entered into the Infant Anthropometry Survey as soon as possible.

If either of these templates are used, care must be taken to make sure results are recorded legibly and that these are transferred into the Infant Anthropometry Survey and feedback sheets as soon as possible.

These paper records should not be left lying around, and once they are no longer needed, they should be shredded to maintain confidentiality.

INFANT ANTHROPOMETRY

Mother ID: **Date:**

Infant ID:

For all measurements:
- **CODE -2 IF INFANT MET THE EXCLUSION CRITERIA**
- **CODE -3 IF TECHNICAL PROBLEMS WITH THE EQUIPMENT**
- **CODE -4 IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE INFANT**

Weight – recorded to the nearest 0.01Kg

Weight 1	Weight 2	Weight 3 (If 1 and 2 differ by > 0.01kg)

Head circumference - recorded to the nearest 0.1cm

Head circumference 1	Head circumference 2	Head circumference 3 (If 1 and 2 differ by >0.2cm)

Mid-upper arm circumference (MUAC) - recorded to the nearest 0.1cm

MUAC 1	MUAC 2	MUAC 3 (If 1 and 2 differ by >0.2cm)

Subscapular skinfold thickness – recorded to the nearest 0.2mm

Subscapular skinfold 1	Subscapular skinfold 2	Subscapular skinfold 3

Length – recorded to the nearest 0.1cm

Length 1	Length 2

INFANT ANTHROPOMETRY

Mother ID: **Date:**

Infant ID:

Is the mother happy for you to take the following measurements?

	Yes	No	If no, why?
Weight	☐	☐	
Head circumference	☐	☐	
Mid-upper arm circumference	☐	☐	
Skinfold	☐	☐	
Length	☐	☐	

For all measurements:
- **CODE -2 IF INFANT MET THE EXCLUSION CRITERIA**
- **CODE -3 IF TECHNICAL PROBLEMS WITH THE EQUIPMENT**
- **CODE -4 IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE INFANT**

Weight – recorded to the nearest 0.01Kg

Weight 1	Weight 2	Weight 3 (If 1 and 2 differ by > 0.01kg)

Any comments:	

Head circumference - recorded to the nearest 0.1cm

Head circumference 1	Head circumference 2	Head circumference 3 (If 1 and 2 differ by >0.2cm)

Any comments:	

Mid-upper arm circumference (MUAC) - recorded to the nearest 0.1cm

MUAC 1	MUAC 2	MUAC 3 (If 1 and 2 differ by >0.2cm)

Any comments:	

Subscapular skinfold thickness – recorded to the nearest 0.2mm

Subscapular skinfold 1	Subscapular skinfold 2	Subscapular skinfold 3

Any comments:	

Length – recorded to the nearest 0.1cm

Length 1	Length 2

Any comments:	

Number of station where measurements taken: ………..

15 Appendix 3 Infant Anthropometry Survey

Variable	Question	Responses	Universe

WghtIntI	I would like to measure ^[Cohort baby name]'s weight.
	
	Are you happy for me to take this measurement?
	
	EXPLAIN THE MEASUREMENT TO THE MOTHER.
		Choice: single
		
		1 Mother agreed to weight
		2 Mother refused weight
			If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI[12]
			And (Sweep = 2 or 3) // 6 months and 12 months

WghtWyNI	Why don't you want to have your child's weight measured?
	
	ENQUIRE SENSITIVELY BUT DO NOT PUSH FOR AN ANSWER
		Open: 150	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (WghtIntI = 2) // Refused measurement

HdCiInt	I would like to measure ^[Cohort baby name]'s head circumference.
	
	Are you happy for me to take this measurement?
	
	EXPLAIN THE MEASUREMENT TO THE MOTHER.
		Choice: single
		
		1 Mother agreed to head circumference
		2 Mother refused head circumference
			If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months

HdCiWyNo	Why don't you want to have your child's head circumference measured?
	
	ENQUIRE SENSITIVELY BUT DO NOT PUSH FOR AN ANSWER
		Open: 150	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (HdCiInt = 2) // refused head circumference

[12] CAPI = Computer Assisted Personal Interviewing

Variable	Question	Responses	Universe

MUACInt	I would like to measure ^[Cohort baby name]'s mid-upper arm circumference.
	
	Are you happy for me to take this measurement?
	
	EXPLAIN THE MEASUREMENT TO THE MOTHER.
		Choice: single
		
		1 Mother agreed to mid-upper arm circumference
		2 Mother refused mid-upper arm circumference
			If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months

MUACWyNo	Why don't you want to have your baby's arm circumference measured?
	
	ENQUIRE SENSITIVELY BUT DO NOT PUSH FOR AN ANSWER
		Open: 150	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (MUACInt = 2) // Refused MUAC

SknFdInl	I would like to carry out a measure to assess how much fat ^[Cohort baby name] has under ^[his/her] skin. You may not realise that much of our body fat is located just under the skin.
	
	This measurement will be taken on your baby's back just below the shoulder blade.
	
	Are you happy for me to take this measurement?
	
	EXPLAIN THE MEASUREMENT TO THE MOTHER.
		Choice: single
		
		1 Mother agreed to infant skinfold measurement
		2 Mother refused infant skinfold measurement
			If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months

SknFdWNl	Why don't you want to have your baby's skinfolds measured?	Open: 150	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months

Variable	Question	Responses	Universe
	ENQUIRE SENSITIVELY BUT DO NOT PUSH FOR AN ANSWER.		And (SknFdInI = 2) // refused measurement

ILenInt	I would like to measure your baby's length.
	
	Are you happy for me to take this measurement?
	
	EXPLAIN THE MEASUREMENT TO THE MOTHER.
		Choice: single
		
		1 Mother agreed to infant length measurement
		2 Mother refused infant length measurement
			If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months

ILenWyNo	Why don't you want to have your baby's length measured?
	
	ENQUIRE SENSITIVELY BUT DO NOT PUSH FOR AN ANSWER
		Open: 150	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (ILenInt = 2) // refused infant length

WghtIAa	RECORD INFANT'S WEIGHT IN KG. RECORD MEASUREMENT TO THE NEAREST 0.01KG.
	
	IF MEASUREMENT IS NOT OBTAINED:
	CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT
	CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE PARENT OR BABY
		Number: 2, 6, 3..18	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (WghtIntI = 1) // Agreed measurement

WghtIAb		Number: 2, 6, 3..18	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (WghtIntI = 1) // Agreed measurement

Variable	Question	Responses	Universe
	RECORD INFANT'S WEIGHT IN KG. RECORD MEASUREMENT TO THE NEAREST 0.01KG. IF MEASUREMENT IS NOT OBTAINED: CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE PARENT OR BABY		

WghtIAc	RECORD INFANT'S WEIGHT IN KG. RECORD MEASUREMENT TO THE NEAREST 0.01KG.
	
	IF MEASUREMENT IS NOT OBTAINED: CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE PARENT OR BABY
		Number: 2, 6, 3..18	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (((WghtIAa = -3 or -4) or (WghtIAb = -3 or -4)) // unable to get two readings
			OR ((WghtIAa > 3) // Valid reading on first measurement
			And (WghtIAb > 3) // Valid reading on second measurement
			And (?))) // Difference between the two readings greater than 0.01Kg
			// Abs(WghtIAa - WghtIAb) > 0.01

WghtICom	IF THERE IS ANYTHING YOU WISH TO RECORD IN RELATION TO THE WEIGHT MEASUREMENT PLEASE DO SO HERE.	Open: 150	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months or 12 months
			And (WghtIntI = 1) // Agreed to weight measurement

HdCirca	MEASURE INFANT'S HEAD CIRCUMFERENCE AND RECORD IN	Number: 1, 4, 34..54.9	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (HdCiInt = 1) // agreed head circumference

Variable	Question	Responses	Universe
	CENTIMETRES. RECORD MEASUREMENT TO THE NEAREST 0.1CM. IF MEASUREMENT IS NOT OBTAINED: CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE PARENT OR BABY		

HdCircb	MEASURE INFANT'S HEAD CIRCUMFERENCE AND RECORD IN CENTIMETRES. RECORD MEASUREMENT TO THE NEAREST 0.1CM.
	
	IF MEASUREMENT IS NOT OBTAINED: CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT
	CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE PARENT OR BABY
		Number: 1, 4, 34..54.9	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (HdCiInt = 1) // agreed head circumference

HdCircc	MEASURE INFANT'S HEAD CIRCUMFERENCE AND RECORD IN CENTIMETRES. RECORD MEASUREMENT TO THE NEAREST 0.1CM.
	
	IF MEASUREMENT IS NOT OBTAINED:
		Number: 1, 4, 34..54.9	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (((HdCirca = -3 or -4) Or (HdCircb = -3 or -4)) // unable to get two measurements
			OR ((HdCirca > 34) // valid reading on first measure
			And (HdCircb > 34) // valid reading on second measure
			And (?))) // Difference between readings greater than 0.2cm (2mm)

Variable	Question	Responses	Universe
	CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE PARENT OR BABY		// Abs(HdCirca-HdCircb) > 0.2

HdCiComm	IF THERE IS ANYTHING YOU WISH TO RECORD IN RELATION TO THE HEAD CIRCUMFERENCE MEASUREMENT PLEASE DO SO HERE.	Open: 150	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months or 12 months
			And (HdCiInt = 1) // agreed head circumference

MUACa	MEASURE INFANT'S MID-UPPER ARM CIRCUMFERENCE AND RECORD IN CENTIMETRES. RECORD MEASUREMENT TO THE NEAREST 0.1CM.
	
	IF MEASUREMENT IS NOT OBTAINED:
	CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT
	CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE PARENT OR BABY
		Number: 1, 4, 8..22	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (MUACInt = 1) // Agreed to MUAC

MUACb	MEASURE INFANT'S MID-UPPER ARM CIRCUMFERENCE AND RECORD IN CENTIMETRES. RECORD MEASUREMENT TO THE NEAREST 0.1CM.	Number: 1, 4, 8..22	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (MUACInt = 1) // Agreed to MUAC

Variable	Question	Responses	Universe
	IF MEASUREMENT IS NOT OBTAINED: CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE PARENT OR BABY		
MUACc	MEASURE INFANT'S MID-UPPER ARM CIRCUMFERENCE AND RECORD IN CENTIMETRES. RECORD MEASUREMENT TO THE NEAREST 0.1CM. IF MEASUREMENT IS NOT OBTAINED: CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE PARENT OR BABY	Number: 1, 4, 8..22	If (RespType = 1) // Mother And (ModeType = 1) // CAPI And (Sweep = 2 or 3) // 6 months and 12 months And (((MUACa = -3 or -4) or (MUACb = -3 or -4)) // unable to get two readings OR ((MUACa > 8) // Valid reading on first measurement And (MUACb > 8) // Valid reading on second measurement And (?))) // Difference between readings greater than 0.2cm (2mm) // Abs(MUACa - MUACb) > 0.2
MUACComm	IF THERE IS ANYTHING YOU WISH TO RECORD IN RELATION TO THE INFANT MUAC MEASUREMENT PLEASE DO SO HERE.	Open: 150	If (RespType = 1) // Mother And (ModeType = 1) // CAPI And (Sweep = 2 or 3) // 6 months or 12 months And (MUACInt = 1) // Agreed to MUAC
SknFdSla	MEASURE INFANT'S SUBSCAPULAR SKINFOLD AND RECORD IN MILLIMETRES. RECORD MEASUREMENT TO THE NEAREST 0.2MM.	Number: 1, 4, 2..30	If (RespType = 1) // Mother And (ModeType = 1) // CAPI And (Sweep = 2 or 3) // 6 months and 12 months And (SknFdInI = 1) // agreed to skinfold measure

Variable	Question	Responses	Universe
	IF MEASUREMENT IS NOT OBTAINED: CODE IF INFANT MET THE EXCLUSION CRITERIA CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE PARENT OR BABY		

SknFdSlb	MEASURE INFANT'S SUBSCAPULAR SKINFOLD AND RECORD IN MILLIMETRES. RECORD MEASUREMENT TO THE NEAREST 0.2MM.
	
	IF MEASUREMENT IS NOT OBTAINED:
	CODE IF INFANT MET THE EXCLUSION CRITERIA
	CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT
	CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE PARENT OR BABY
		Number: 1, 4, 2..30	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (SknFdInI = 1) // agreed to skinfold measure

SknFdSlc	MEASURE INFANT'S SUBSCAPULAR SKINFOLD AND RECORD IN MILLIMETRES. RECORD MEASUREMENT TO THE NEAREST 0.2MM.	Number: 1, 4, 2..30	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months and 12 months
			And (SknFdInI = 1) // agreed to skinfold measure

Variable	Question	Responses	Universe
	IF MEASUREMENT IS NOT OBTAINED: CODE IF INFANT MET THE EXCLUSION CRITERIA CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE INFANT OR PARENT		
SknICom	IF THERE IS ANYTHING YOU WISH TO RECORD IN RELATION TO THE INFANT SKINFOLD MEASUREMENT PLEASE DO SO HERE.	Open: 150	If (RespType = 1) // Mother And (ModeType = 1) // CAPI And (Sweep = 2 or 3) // 6 months or 12 months And (SknFdInI = 1) // agreed to skinfold measure
ILena	MEASURE INFANT'S LENGTH AND RECORD IN CENTIMETRES. RECORD MEASUREMENT TO THE NEAREST 0.1CM. IF MEASUREMENT NOT OBTAINED: CODE IF INFANT MET THE EXCLUSION CRITERIA CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE PARENT OR BABY	Number: 1, 4, 54..90	If (RespType = 1) // Mother And (ModeType = 1) // CAPI And (Sweep = 2 or 3) // 6 months and 12 months And (ILenInt = 1) // agreed infant length
ILenb		Number: 1, 4, 54..90	If (RespType = 1) // Mother And (ModeType = 1) // CAPI And (Sweep = 2 or 3) // 6 months and 12 months

Variable	Question	Responses	Universe
	MEASURE INFANT'S LENGTH AND RECORD IN CENTIMETRES. RECORD MEASUREMENT TO THE NEAREST 0.1CM. IF MEASUREMENT NOT OBTAINED: CODE IF INFANT MET THE EXCLUSION CRITERIA CODE IF TECHNICAL PROBLEMS WITH THE EQUIPMENT CODE IF THERE WAS ANOTHER PROBLEM / ISSUE RELATED TO THE PARENT OR BABY		And (ILenInt = 1) // agreed infant length

ILenCom	IF THERE IS ANYTHING YOU WISH TO RECORD IN RELATION TO THE INFANT LENGTH MEASUREMENT PLEASE DO SO HERE.	Open: 150	If (RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3) // 6 months or 12 months
			And (ILenInt = 1) // agreed infant length

InAnStaf	RECORD THE ID NUMBER OF THE STAFF WHO TOOK THE INFANT ANTHROPOMETRY MEASUREMENTS FROM ^[COHORT BABY NAME]	Number: 0, 4, 1000..5000	IF (RespType = 1) // Mother
			AND (Sweep = 2 or 3) // 6 months or 12 months
			AND (ModeType = 1) // CAPI

InAnStat	ENTER THE NUMBER FOR THE MEASURING STATION WHERE THE INFANT ANTHROPOMETRY WAS CARRIED OUT	Number: 0, 2, 1..99	If ((RespType = 1) // Mother
			And (ModeType = 1) // CAPI
			And (Sweep = 2 or 3)) // 6 months or 12 months