

Annexe B. Newcastle pilot report



The impact of using of calibrated utensils to assess portion sizes in infants aged 4 to 18 months and a comparison of weighed and estimated methods

Pilot study of the Diet and Nutrition Survey of Infants and Young Children

Final report

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Introduction

One of the key objectives of the Diet and Nutrition Survey of Infants and Young Children (DNSIYC) was to gather detailed, quantitative information on the food and nutrient intakes, sources of nutrients, and nutritional status of a representative sample of infants and young children aged 4 to 18 months from the UK population. Prior to commencing the main stage of DNSIYC, a pilot study was conducted to determine the most accurate approach for estimating portion sizes in infants. The aims of the pilot study were to assess whether the provision of measuring equipment alters either the foods given to children or the amount consumed by comparing measured intakes to weighed intakes; this study is described in Part 1 of the report.

Part 2 describes an additional study which was proposed following a review of the dress rehearsal stage of DNSIYC. The aim of the additional study (referred to as DNSIYC2 in the report) was to compare mean weighed daily intakes with estimated intakes using basic household measures (no measuring equipment) in infants and young children aged 4 to 18 months.

Part 1

B.1. Introduction and background work

The pilot study was divided into three phases; a pre-pilot, pilot phase I and phase II each with a specific aim. This introduction will briefly outline the methods and findings from the pre-pilot and pilot phase I. The report will then go on to describe phase II in more detail.

Ethical approval for the work to proceed was granted by Newcastle University Ethics Committee on 25th Aug 09.

B.1.1. Pre-pilot

The aim of the pre-pilot was to ascertain from mothers their views on the best and most convenient way of measuring what infants and young children eat.

A short email survey was sent to existing contacts, friends, colleagues and family. The survey collected information on the types of feeding equipment used with children aged 4 to 18 months and perceived difficulties with measuring what infants eat, for instance common problems experienced at feeding times which may make recording difficult.

Group discussions and individual focus groups with parents/guardians were conducted to discuss current feeding practices and the best and most convenient methods for assessing infant's food intake.

Respondents to the email survey (n=9) suggested that measuring what infants eat would be challenging and proposed a range of recording methods including: duration of breastfeeding, weight of food served and food leftover, using measuring jugs, measuring spoons, feeding spoons and graded drinking cups.

The discussion groups (1 group consisting of 5 parents and 4 one-to-one discussions) highlighted the perceived difficulties of recording and measuring children's food when eating outside of the home especially when children were being cared for by those other than parents. When presented with two approaches to recording portion size (recording amount consumed only or recording amount served and the amount leftover) all of the participants suggested they thought it would be easier to measure food served and left rather than food consumed. When shown and asked about the equipment we proposed for measuring (Beaba graduated pots, graduated drinking cups, measuring spoons and feeding spoons) parents gave varied responses. On the whole, they liked the Beaba cups and it was thought that the graded sides would be helpful for measuring foods. It was felt that the measuring spoons would be good for 'runny' mixtures and measuring

powders and porridge however the feeding spoons didn't allow for accurate measurements and also wouldn't be used for children older than 12 months. They also highlighted that solid foods i.e. pizza and bread would have to be measured by dimension as they would not fit into any measuring equipment and suggested that providing graded ice cubes may be useful for pureed/ frozen foods.

Overall, it was agreed that the Beaba graduated pots, graduated drinking cup and the measuring spoons were all fit for purpose. It was concluded that the feeding spoons would not offer accurate records of amount eaten and each parent's understanding of a 'spoonful' would be different. Also for older children they would be redundant. They were therefore excluded from the measurement equipment.

B.1.2 Pilot phase I

The aims of pilot phase I were:

- To create a range of designed-for-purpose food diaries and trial these with mothers to ascertain ease of use and accuracy.
- To test the measurement equipment for ease of use and accuracy. Figure B.1 shows the equipment which was provided.

Five diary versions were created to answer two questions;

- Is it easier to record the amount of food and drink served and leftover or just amount consumed?
- Is it easier to record food and drink together or separately?



Figure B.1: Measuring equipment provided for the estimated method

We also sought to answer the question 'How easy is the food diary to complete in general'. Mothers were asked to comment on the ease of use and appropriateness of space provided and to comment on the design and layout of the food diaries in general.

In total, 10 mothers were asked to complete a 4-day food diary. Efforts were made, within the time pressures of the work, to ensure an even spread of Index

of Multiple Deprivation (IMD) and to make sure the full age range (4 to 18 months) was represented. Two 4 to 8 month babies, four 8 to 12 months and four 12 to 18 months were recruited. The majority of parents reported that diary completion was easy and straightforward and stated that they thought recording food and drink together was easier. Two parents noted that milk feeds would be difficult to define as either foods or drinks.

It was clear that the majority of parents would prefer to record the food and drinks together [this was adopted in pilot phase II]. There was a less clear majority preference to record the amount served and the amount leftover rather than consumed, however as no clear conclusions could be drawn from this small study sample this was explored further in pilot phase II.

In terms of the equipment provided, the spoons were deemed useful, especially for scraping out bowls and measuring leftovers and for soft foods such as porridge. The graduated pots were useful for measuring single component meals such as baked beans, but not for mixed component meals, such as shepherd's pie. Finger foods such as fruit pieces and bread sticks posed a problem in terms of measuring the amount consumed, as the graduated pots were not suitable for this. Over all there was a mixed response for the graduated pots. They were considered useful for measuring, however two parents used their own weighing scales instead of the equipment provided as they thought the graduated pots were too complicated and using scales was "much easier and more accurate".

The findings from the pre-pilot and pilot phase I were used to inform pilot phase II.

B.2. Pilot phase II

The objectives of pilot phase II were:

- To trial the modified purpose-designed diaries with 50 parents to investigate ease of use.
- To assess whether the provision of measuring equipment alters either the foods given to infants and young children or the amount consumed by comparing measured intakes to weighed intakes.
- To determine the most accurate approach to reporting portions to achieve the best estimate of amount consumed.

B.2.1. Methods

Recruitment began in early October 2009. Recruitment fliers were distributed by researchers in Newcastle city centre to parents/guardians with young children, and if interest was expressed a recruitment pack was posted to them. Recruitment posters were displayed in local community centres and mother and baby groups, and permission was given to put fliers into children's bags at a local primary school to recruit parents of younger children. All parents/guardians expressing interest received a detailed recruitment letter and consent form to be completed and returned to the Human Nutrition Research Centre (HNRC) at Newcastle University before participation in the study.

In total 71 recruitment packs were sent out, and by w/c 16th November 2009 we reached our target of 50 participants for the study. To ensure both age groups were evenly represented (4 to 8 months and 9 to 18 months), 25 babies were recruited in each group.

Parents/guardians were asked to complete two 4-day food diaries; a 4-day weighed intake diary using weighing scales provided, and a second 4-day estimated intake diary using measuring equipment provided (same equipment which was provided in phase I). The order of administration was randomised. All 50 parents completed weighed intakes with the same diary format which was as served/leftover. For estimated intakes two diary formats were tested. Twenty five parents completed estimated intakes with diaries containing an 'amount consumed' column (requiring the parent to calculate and record the amount consumed) and 25 completed estimated intakes with diaries containing 'amount served' and 'amount leftover' columns (this would require processing by coders to calculate the amount consumed).

Prior to completion, parents were visited at home and an explanation of how to complete the diary and use the equipment was given. They were asked not to use their own scales when doing the estimated diary (as some had in pilot phase I). Contact details for the research associate were given to the parent, should they have had any problems or queries while they were taking part.

Once the study period was over, a follow-up interview took place to check through the food diary and also discuss the ease of using the equipment. Parents were then given the equipment for study period two and the procedure followed as above. On completion each participant was given a letter of thanks along with a token of thanks (£30 shopping voucher).

B.2.2. *Transfer of food weight data between MRC HNR, Cambridge and HNRC, Newcastle University*

The completed food diaries were sent to MRC Human Nutrition Research (HNR), Cambridge for coding. The estimated diaries required volume and household measurements to be converted to weights for analysis. Figure B.2 illustrates the process of data transfer between HNR, Cambridge and HNRC, Newcastle University to allow conversion factors (volume: weight ratios) for specific foods to be created.

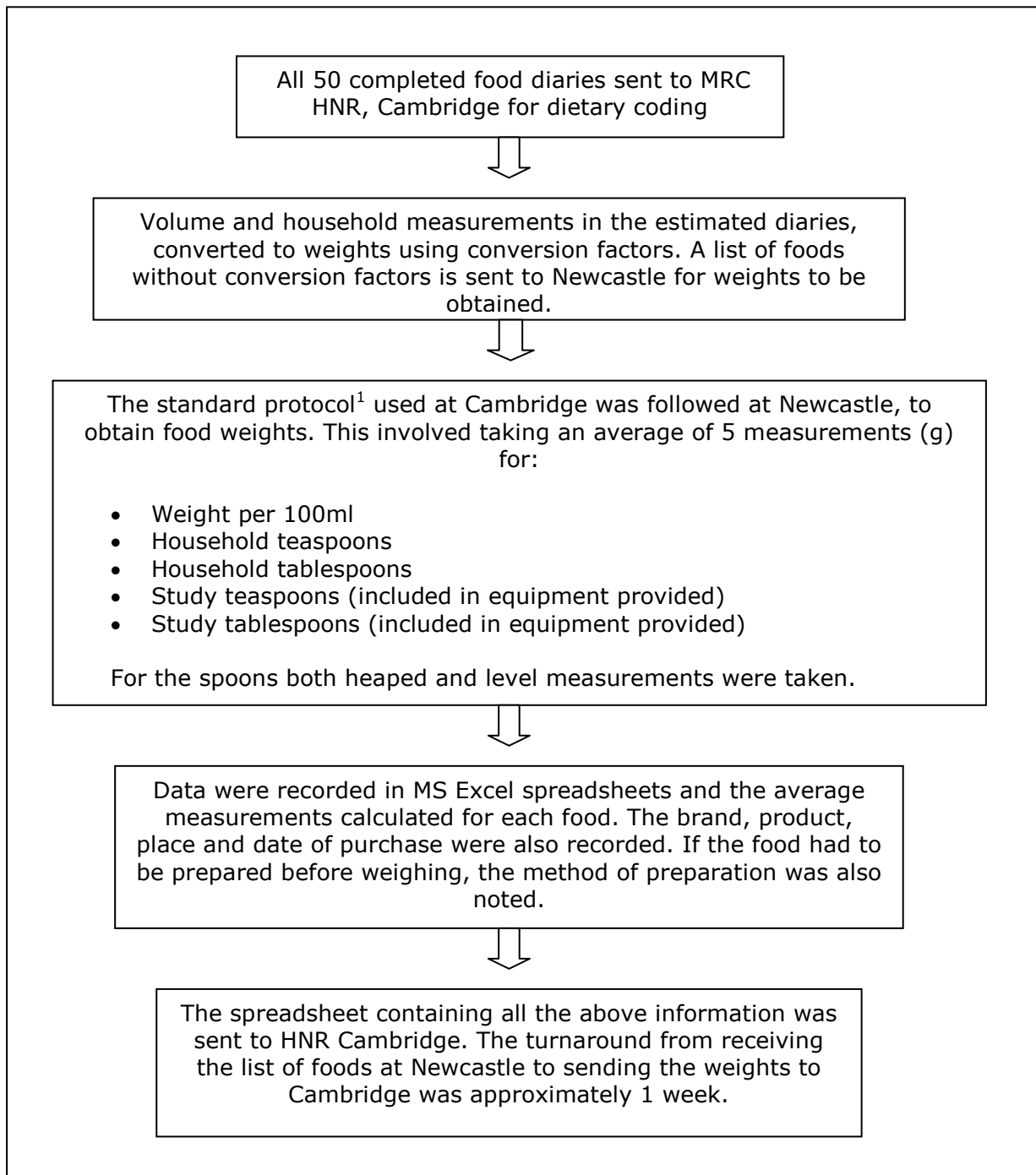


Figure B.2: Process of data transfer between MRC HNR Cambridge and HNRC Newcastle University

B.2.3. Results

Table B.1: Number of parents completing each diary type

| Diary Type | 4-8 months | 9-18 months | Total |
|------------------------------|------------|-------------|-------|
| Weighed | 25 | 25 | 50 |
| Estimated- 'as consumed' | 12 | 13 | 25 |
| Estimated- 'served/leftover' | 12 | 12 | 24 |
| Total | 49 | 50 | 99 |

(One parent was not able to finish the estimated diary as her baby had been unwell)

Table B.2: Method preference

| Diary Type | 4-8 months | 9-18 months | Total |
|---------------|------------|-------------|-----------|
| Weighed | 15 | 16 | 31 (66%) |
| Estimated | 4 | 7 | 11 (23%) |
| No preference | 4 | 1 | 5 (11%) |
| Total | 23 | 24 | 47 (100%) |

(Information on preferences was not collected from three mothers, therefore 47 in total)

Table B.1 shows the number of parents completing each diary type, and table B.2 shows the method preference of each parent (this was asked at the final follow-up interview). Although the majority of the mothers indicated that they preferred weighed diaries, this will not be the chosen method for the main study.

B.2.3.1. Feedback for weighed method

The majority of parents found the weighed method easy and straightforward. Difficulties arose when they were away from the home and they did not take the scales with them e.g. eating at restaurants, cafes or at a friend's house. Some mothers also found it time-consuming to weigh every component of a meal and also when they wanted to give their child a quick snack it was extra hassle to weigh the item.

A large proportion of mothers perceived the weighed method to be more accurate, and although some found it more time-consuming they preferred to record the measurements accurately.

Table B.3 lists foods which some parents found difficult to measure and how this was overcome or discussed (weighed diaries):

Table B.3: Foods which were often found difficult to measure when completing the weighed diary

| Difficult foods/ situations | Why challenging? | How did you measure it? Is there an easier way to measure? |
|--|---|---|
| Finger foods | Mostly ends up on the floor and 'gummed' by baby not really eaten | |
| Pasta | Unsure whether to weigh dry or cooked | Advised cooked weight- so can subtract leftover weight |
| Pre-frozen foods | Remembering the ingredients & quantities | Mother estimated. But could lead to using jars of baby food instead |
| Food from restaurant/ café | Didn't take scales | Mother used household measures |
| Home-made meals | Time-consuming to weigh each item of food. | |
| | Leftovers all mashed together, can't measure separately. | Mother estimated. Advised to estimate also. |
| Food on bib & floor | Fiddly to pick up leftovers especially when pureed food | Mother estimated. Advised to estimate also. |
| Liquids | Sips of water hard to measure/ quantify. | Used measurement on beaker |
| | Easy to forget to record. Spillages | Used measurement on beaker |
| Food & snacks given to baby by friends/ family e.g. at baby groups | People often give baby bits of food without me knowing | Mother asked friend if she could borrow scales |
| | Hard to remember when out | Jotted it down on bits of paper |

B.2.3.2. Feedback for estimated method

From the interviews which took place after the study period, although it took parents slightly longer to familiarise themselves with the estimated method, the majority of them found the method straightforward.

Some mothers felt the estimated method wasn't as accurate as the weighed method, especially when using the graduated pots to measure lumpy foods such as pasta and mashed fruit. However some mothers stated that the estimated method was much easier especially when away from the home as they could use

household measures to describe foods eaten in cafes, restaurants and at baby groups, instead of taking the scales with them. For example, it was easier and less time-consuming to write '1/2 a banana' as opposed to weighing it. It was also possible to write down foods after their child had eaten as it didn't need to be weighed beforehand.

The main problem experienced amongst parents was how to measure finger foods using the equipment provided. The majority of mothers with babies in the older age group (9 to 18 months) expressed some difficulty in quantifying pieces of toast, breadsticks, cubes of cheese etc, as the graduated pots were not useful for this type of food.

Table B.4 lists foods which some parents found difficult to measure and how this was overcome/discussed (estimated diaries):

Table B.4: Foods which were often found difficult to measure when completing the estimated diary

| Difficult foods/ situations | Why challenging? | How did you measure it? Is there an easier way to measure? |
|------------------------------------|--|---|
| Finger foods | Couldn't use the graduated pots | Perhaps easier to weigh |
| Pasta | Couldn't use the graduated pots. Had to chop pasta into small pieces to fit into pots. | Perhaps easier to weigh |
| Weetabix | Gloopy mixture sticks to sides of graduated pot & can't read measurement | Advised spoons may be easier |
| | Unsure whether to use spoons or graduated pots. | Advised could use either |
| Mashed fruit | Lumpy texture hard to read level in graduated pots | Advised measure to closest line (mother didn't feel this was accurate enough) |
| Pieces of toast | Couldn't use the graduated pots. | Advised could use fraction of whole slice. |
| Home-made meals | Time-consuming to measure each item of food. | |

B.2.3.3. General comments and suggestions for improvements by mothers

A proportion of mothers found difficulties when trying to recall ingredients and quantities in meals which had previously been made and frozen. One mother admitted that she gave her infant a jar of baby food instead of the meal she intended to give, as she simply couldn't remember the ingredients. Similarly, one mother said she found it tempting to give her child jars of food instead of home cooked meals which had lots of ingredients, as writing down all the ingredients and recipe was time-consuming.

On the layout of the diary, many parents expressed a need for more space especially in the '*Where? With whom? TV on? At table?*' column. Mothers who completed as consumed diaries for the estimated method, had experience of recording both as consumed and as served/leftover (as all weighed diaries had served/leftover format). Although it was not directly asked whether they preferred recording served and leftovers or as consumed, some mothers favoured served/leftover columns as they found it easier to record both amounts and therefore did not have to calculate the amount eaten. One mother (of a 6 month old child) expressed a strong dislike for the as consumed column. She stated that after having her child her memory was "awful". She would measure the amount served in tablespoons but by the time her child had finished she had completely forgotten what she had originally measured. She then guessed the amount which she felt was very inaccurate. She commented that she was struggling with very basic maths (due to sleep deprivation) and found it difficult to work out the amount consumed. She felt other mothers with young children and those with poorer maths ability (she was an accountant with a maths degree) would find this difficult also and perhaps the diaries would not be accurate.

On the equipment provided, the majority of parents found the spoons and the graduated pots very useful. The drinking cup was used mainly by the 9 to 18 month age group, and was thought to be 'too old' for the younger children. However, most children already had a drinking cup or bottle which had a graded side. Some mothers felt a small notepad would be useful for jotting things down while they were out of the house and for when they were "in a rush". One mother thought a simple calculator would have been helpful to work out the amount consumed.

B.2.3.4. Transfer of food weight data between HNR, Cambridge and HNRC, Newcastle University

The process of data transfer described in Figure B.2, was followed for all required food weights for pilot phase II. In total 111 foods were weighed.

The procedure set out was considered successful and the process will be carried forward to the DNSIYC Dress Rehearsal. Once the food diaries are coded the foods

requiring conversion factors will be passed onto Newcastle for weighing and the data sent back to Cambridge. The aim was to complete this cycle on a weekly basis.

B.2.4. Statistical comparison of methods

B.2.4.1. Average daily intakes

Analysis was conducted using SPSS software. The mean daily intakes were calculated for each diary completed. The mean and standard deviation were calculated for the weighed method and for the estimated method. The estimated diaries were then split into the two diary formats; 'as consumed' and 'as served/leftover'. Table B.5 shows the mean daily intakes of food weight (g) and energy (kcal) for the two methods and for the two estimated diary formats. The data are presented first for all age groups together and then split by the two age groups in Tables B.6 and B.7.

Table B.5: Mean (range, SD) daily intakes for weighed and estimated methods and for 'as consumed' and 'as served/leftover' diaries

| | Method and diary type | | | | |
|--------------------------|------------------------------|---------------------------|--------------------------------------|---|------|
| | Weighed (n=50) | Estimated (All) (n=49) | Estimated (as consumed) (n=25) | Estimated (as served/ leftover) (n=24) | |
| Food (g) | Mean | 954 | 975 | 1018 | 930 |
| | Min | 598 | 550 | 636 | 550 |
| | Max | 1731 | 1311 | 1311 | 1215 |
| | SD | 221 | 179 | 178 | 173 |
| Energy (kcal) | Mean | 731 | 789 | 828 | 748 |
| | Min | 445 | 372 | 499 | 372 |
| | Max | 1131 | 1312 | 1223 | 1312 |
| | SD | 159 | 178 | 172 | 178 |

Table B.6: Mean (range, SD) daily intakes for 4 to 8 month age group for weighed and estimated methods and for 'as consumed' and 'as served/leftover' diaries

| | Method and diary type | | | |
|--------------------------|-----------------------|---------------------------|--------------------------------------|---|
| | Weighed (n=25) | Estimated (All) (n=24) | Estimated (as consumed) (n=12) | Estimated (as served/ leftover) (n=12) |
| Food (g) | Mean | 940 | 966 | 1005 |
| | Min | 598 | 550 | 636 |
| | Max | 1731 | 1311 | 1311 |
| | SD | 236 | 200 | 201 |
| Energy (kcal) | Mean | 661 | 711 | 754 |
| | Min | 450 | 372 | 499 |
| | Max | 887 | 950 | 950 |
| | SD | 116 | 127 | 120 |

Table B.7: Mean (range, SD) daily intakes for 9 to 18 month age group for weighed and estimated methods and for 'as consumed' and 'as served & leftover' diaries

| | Method and diary type | | | |
|--------------------------|-----------------------|---------------------------|--------------------------------------|--|
| | Weighed (n=25) | Estimated (All) (n=25) | Estimated (as consumed) (n=13) | Estimated (as served/leftover) (n=12) |
| Food (g) | Mean | 968 | 984 | 1030 |
| | Min | 675 | 677 | 749 |
| | Max | 1525 | 1275 | 1275 |
| | SD | 208 | 161 | 161 |
| Energy (kcal) | Mean | 801 | 863 | 895 |
| | Min | 445 | 597 | 619 |
| | Max | 1131 | 1312 | 1223 |
| | SD | 167 | 190 | 188 |

For both age groups, the average intakes (g and kcal) for the 'as served/leftover' diaries are closer to the weighed intakes, compared to 'as consumed'.

B.2.4.1.1. Paired t test to compare mean daily intakes for weighed and estimated methods

The paired t test showed no statistically significant difference between weighed and estimated methods, for mean food intake (g). However for mean energy intake (kcal), there was a significant difference ($p < 0.05$).

Table B.8: Proportion of estimated intakes within 10% and 50% of weighed intakes

| | n | Proportion of sample within 10% of weighed | Proportion of sample within 50% of weighed |
|---------------------------------------|----|--|--|
| Weighed vs. Estimated (g) | 49 | 43% | 96% |
| Weighed vs. As consumed (g) | 25 | 44% | 92% |
| Weighed vs. As served/leftover (g) | 24 | 42% | 100% |
| Weighed vs. Estimated (kcal) | 49 | 45% | 92% |
| Weighed vs. As consumed (kcal) | 25 | 44% | 92% |
| Weighed vs. As served/leftover (kcal) | 24 | 46% | 92% |

Table B.8 shows the proportion of estimated intakes which were within 10% and 50% of weighed intakes. Just over 40% of estimated intakes were within 10% of weighed, and over 90% were within 50% of weighed.

B.2.4.1.2. Two-sample t test to compare mean intakes for 'as consumed' and 'as served/leftover'

To compare 'as consumed' data (n=25) with 'as served/leftover' data (n=24), a two-sample t test was performed as they were completed by different individuals.

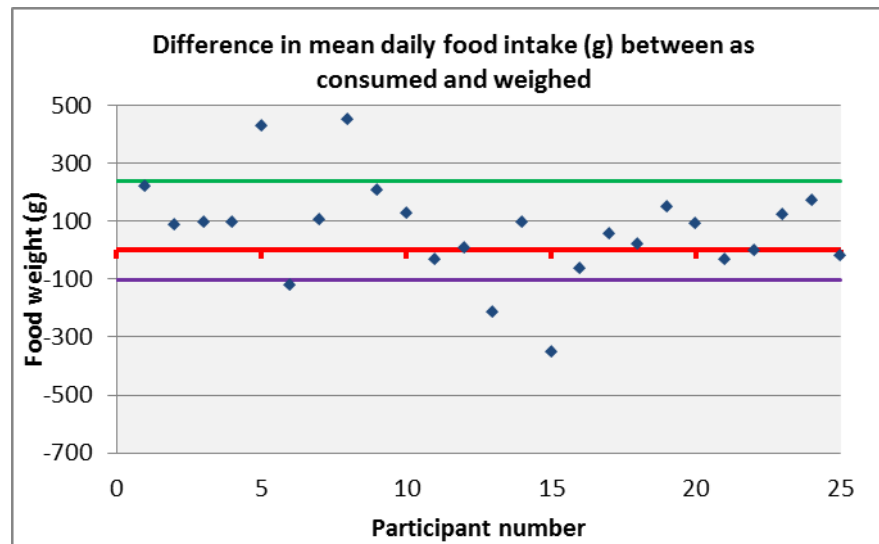
Table B.9: Two-sample t test results

| | Mean intakes | Significantly different (<0.05) |
|--|---------------------------|---|
| As consumed vs. Served/leftover (g) | as consumed = 1018g | 0.084 |
| | served/leftover = 930g | |
| As consumed vs. Served/leftover (kcal) | as consumed = 828kcal | 0.119 |
| | served/leftover = 748kcal | |

The table above shows there were no significant differences in intakes between 'as consumed' and 'as served/leftover' diaries.

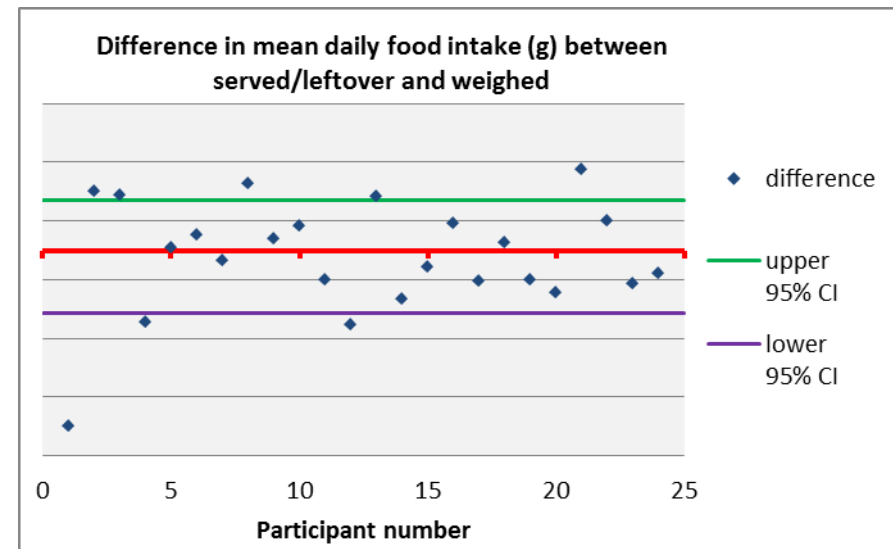
B.2.4.1.3. Difference Plots

Figures B.3-B.6 show the differences in mean daily intakes of food (g) and energy (kcal), between 'as consumed' and weighed, and between 'as served/leftover' and weighed, for each baby. A value close to zero (indicated by the red line) would suggest that there is little difference between the two methods compared in each figure. A minus value represents an average under-estimation for the estimated method.



Average difference = 68g
Upper Confidence Interval = 238g; Lower Confidence Interval = -102g

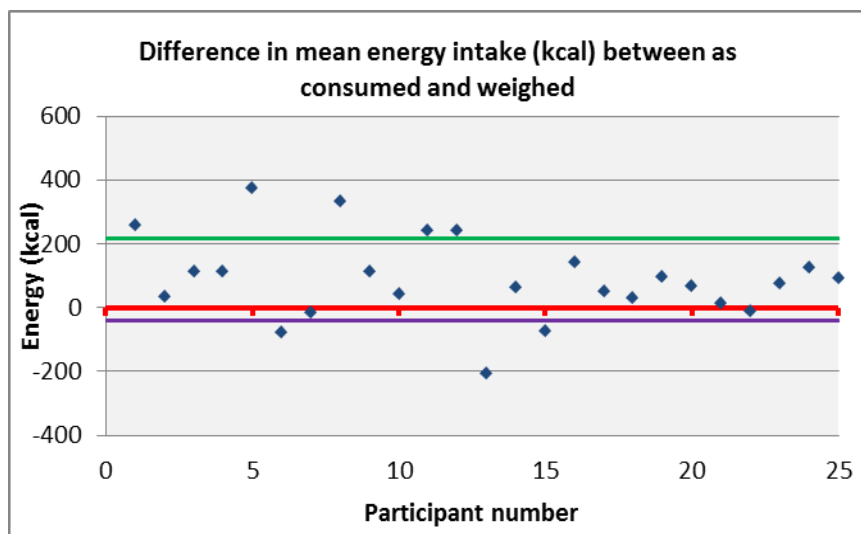
Figure B.3: Scatter plot showing difference in mean daily food intake (g) between estimated (as consumed) and weighed



Average difference = -21g
Upper Confidence Interval = 170g; Lower Confidence Interval = -213g

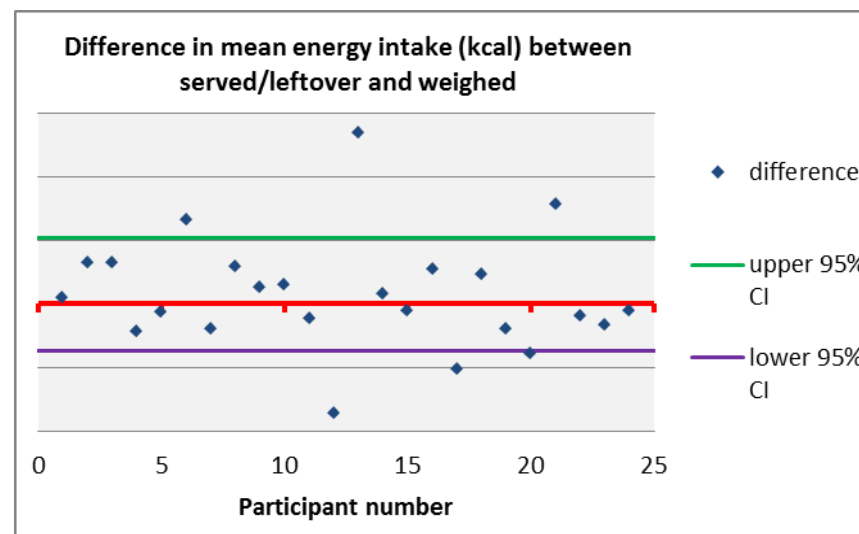
Figure B.4: Scatter plot showing difference in mean daily food intake (g) between estimated (served/leftover) and weighed

Figures A3 and A4 show the differences in mean daily intakes of food (g) between 'as consumed' and weighed (figure A3) and 'as served/leftover' and weighed (figure A4). On average there were more over-estimates for the 'as consumed' diaries (average difference of 68g) compared to 'as served/leftover' for which there was an average under-estimate (-21g).



Average difference = 89kcal
 Upper Confidence Interval = 218kcal; Lower Confidence Interval = -40kcal

Figure B.5: Scatter plot showing difference in mean daily energy intake (kcal) between estimated (as consumed) and weighed



Average difference = 28kcal
 Upper Confidence Interval = 205kcal; Lower Confidence Interval = -150kcal

Figure B.6: Scatter plot showing difference in mean daily energy intake (kcal) between estimated (served/leftover) and weighed

Figures B.5 and B.6 show the differences in mean daily energy intakes (kcal) between estimated and weighed, for 'as consumed diaries' (Figure B.5) and 'as served/leftover' diaries (Figure B.6). Mothers who completed the 'as consumed' diaries were more likely to over-estimate, with an average difference of 89kcal compared to those who completed the 'as served/leftover' diaries, average difference 28kcal. However there is a wider confidence interval range for the 'as served/leftover' diaries compared to the 'as consumed'. For 'as served/leftover', the confidence intervals cover a range of 355kcal, and for 'as consumed' 258kcal. Although there is an average under-estimation for the mean daily intakes for the 'as served/leftover' diaries (-21g), there is an average over-estimation for the mean daily energy intakes for 'as served/leftover' (28kcal). One reason for this may be that the foods which tended to be under-estimated were low energy dense foods, such as water or other non-milk drinks, and therefore this did not impact greatly on the overall mean energy intakes.

B.2.4.2. Commonly consumed foods

The 50 most commonly consumed foods were selected, and the average portion weights calculated. To determine whether there was a significant difference in portion sizes between the weighed and estimated methods for certain types of food, each of the top 50 foods were assigned a 'food type' depending on its properties. The food types were as follows; amorphous (takes shape of container), baby milks and drinks, discrete (e.g. breadsticks, rice cakes), vegetables, and others. A full list of the top 50 foods and the food group they were assigned to can be found in Addendum A.

Tables B.10 and B.11 show the mean portion size (g) and energy (kcal) for each food type for weighed and estimated methods and for 'as consumed' and 'as served/leftover' diaries. For the younger age group (4 to 8 months) 'vegetables' were added to the amorphous group as it is likely that these would have been pureed.

Table B.10: Mean food (g) and energy intakes (kcal) for 4 to 8 month age group for each food type for weighed and estimated methods and for 'as consumed' and 'as served/leftover' diaries. (n= number of occasion each food type consumed)

| | | Method and diary type | | | |
|--------------------------------|------|-----------------------|-----------|-------------|-----------------|
| | | Weighed | Estimated | As consumed | Served/leftover |
| Amorphous | | n=224 | n=234 | n=106 | n=128 |
| Food (g) | Mean | 24 | 26 | 26 | 27 |
| | Min | 0 | 1 | 1 | 1 |
| | Max | 128 | 125 | 125 | 120 |
| | SD | 21.0 | 25.0 | 25.5 | 24.7 |
| Energy (kcal) | Mean | 14 | 15 | 16 | 14 |
| | Min | 0 | 0 | 0 | 0 |
| | Max | 107 | 105 | 105 | 88 |
| | SD | 19.1 | 20.3 | 22.2 | 18.6 |
| Baby milks & drinks | | n=805 | n=749 | n=367 | n=382 |
| Food (g) | Mean | 92 | 97 | 102 | 93 |
| | Min | 1 | 0 | 0 | 1 |
| | Max | 2600 | 238 | 224 | 238 |
| | SD | 107 | 60 | 59 | 60 |
| Energy (kcal) | Mean | 56 | 63 | 66 | 60 |
| | Min | 0 | 0 | 0 | 0 |
| | Max | 182 | 157 | 155 | 157 |
| | SD | 44 | 44 | 45 | 43 |

| Discrete | | n=164 | n=119 | n=65 | n=54 |
|----------------------|------|-------|-------|------|------|
| Food (g) | Mean | 20 | 22 | 20 | 24 |
| | Min | 0 | 0 | 0 | 1 |
| | Max | 110 | 108 | 100 | 108 |
| | SD | 22.6 | 22.7 | 21.4 | 24.1 |
| Energy (kcal) | Mean | 24 | 28 | 28 | 27 |
| | Min | 0.6 | 0.3 | 1.3 | 0.3 |
| | Max | 96 | 104 | 95 | 104 |
| | SD | 21.1 | 23.3 | 21.9 | 25.1 |
| Other | | n=78 | n=75 | n=46 | n=29 |
| Food (g) | Mean | 6 | 5 | 4 | 8 |
| | Min | 0 | 0 | 0 | 0 |
| | Max | 64 | 72 | 31 | 72 |
| | SD | 12.6 | 11.5 | 5.4 | 17.0 |
| Energy (kcal) | Mean | 19 | 19 | 17 | 22 |
| | Min | 0.2 | 0.1 | 0.1 | 0.3 |
| | Max | 165 | 112 | 112 | 102 |
| | SD | 24.2 | 22.6 | 20.8 | 25.4 |

The 'amorphous' foods were likely to have been measured using the graduated pots and spoons, for the estimated method. Table B.10 shows very little difference in mean weights between the estimated and weighed methods suggesting that the equipment provided offers an accurate alternative to weighing. There was little difference in intakes between the two diary formats and the weighed method. For baby milks and drinks, mothers were advised that they could use the graded side on the baby's drinking cup for both methods; consequently no considerable differences were found. For discrete food items, such as bananas and biscuits, household measures were used for the estimated method, and again little differences in mean intakes can be seen between the methods. Finally the 'other' food group consisted of a range of foods which were measured using a mixture of the equipment and household measures; no differences can be seen between the methods.

On the whole, mean intakes for the estimated compared to the weighed method were very similar for 4 to 8 month age group. This is also true for intakes in the 'as consumed' diaries and 'as served/leftover' diaries, where no great differences can be seen.

Table B.11: Mean food (g) and energy intakes (kcal) for 9 to 18 month age group for each food type for weighed and estimated methods and for 'as consumed' and 'as served/leftover' diaries. (n= number of occasion each food type consumed)

| | | Method and diary type | | | |
|--------------------------------|------|-----------------------|-----------|-------------|-----------------|
| | | Weighed | Estimated | As consumed | Served/leftover |
| Amorphous | | n=80 | n=96 | n=38 | n=58 |
| Food (g) | Mean | 46 | 50 | 57 | 45 |
| | Min | 2 | 4 | 15 | 4 |
| | Max | 100 | 139 | 120 | 140 |
| | SD | 25.6 | 25.1 | 20.0 | 27.1 |
| Energy (kcal) | Mean | 48 | 54 | 55 | 54 |
| | Min | 0 | 0 | 0 | 1 |
| | Max | 102 | 194 | 194 | 167 |
| | SD | 28.7 | 39.9 | 38.3 | 41.2 |
| Baby milks & drinks | | n=586 | n=594 | n=328 | n=266 |
| Food (g) | Mean | 80 | 81 | 84 | 77 |
| | Min | 1 | 1 | 1 | 1 |
| | Max | 375 | 280 | 230 | 280 |
| | SD | 63 | 59 | 56 | 63 |
| Energy (kcal) | Mean | 37 | 38 | 40 | 35 |
| | Min | 0 | 0 | 0 | 0 |
| | Max | 188 | 188 | 154 | 188 |
| | SD | 46 | 46 | 44 | 47 |
| Discrete | | n=231 | n=203 | n=105 | n=98 |
| Food (g) | Mean | 25 | 27 | 32 | 20 |
| | Min | 1 | 1 | 1 | 1 |
| | Max | 178 | 150 | 150 | 100 |
| | SD | 26.3 | 26.9 | 32.4 | 17.5 |
| Energy (kcal) | Mean | 37 | 43 | 46 | 40 |
| | Min | 1.2 | 1.4 | 1.4 | 1.9 |
| | Max | 187 | 203 | 203 | 151 |
| | SD | 33.4 | 40.2 | 42.1 | 38.0 |
| Vegetables | | n=151 | n=176 | n=59 | n=117 |
| Food (g) | Mean | 24 | 18 | 27 | 14 |
| | Min | 1 | 0 | 0 | 1 |
| | Max | 184 | 198 | 198 | 56 |
| | SD | 31.1 | 23.7 | 34.1 | 14.6 |
| Energy (kcal) | Mean | 13 | 8 | 12 | 7 |
| | Min | 0 | 0 | 0 | 0 |
| | Max | 133 | 143 | 143 | 40 |
| | SD | 22.1 | 15.7 | 23.7 | 9.0 |

| Other | | n=138 | n=134 | n=72 | n=62 |
|----------------------|------|-------|-------|------|------|
| Food (g) | Mean | 11 | 10 | 14 | 6 |
| | Min | 0 | 0 | 0 | 0 |
| | Max | 100 | 148 | 148 | 52 |
| | SD | 20.6 | 21.8 | 28.2 | 8.8 |
| Energy (kcal) | Mean | 30 | 30 | 33 | 25 |
| | Min | 0 | 0 | 0 | 0 |
| | Max | 148 | 209 | 209 | 149 |
| | SD | 32.4 | 36.4 | 40.4 | 30.8 |

Again, as for the 4 to 8 month age group, no great differences can be seen in intakes between weighed and estimated for 9 to 18 month age group. For amorphous foods, there was little difference in mean intakes again suggesting that the equipment provided is a useful alternative to weighing. Table B.11 also shows that for amorphous foods, the 'as served/leftover' diaries have closer mean intakes to the weighed method compared to 'as consumed'.

Overall, Tables B.10 and B.11 indicate that the estimated method is a good alternative to weighing, for both age groups of children.

B.2.4.2.1. Difference plots for specific foods

The top three most commonly consumed foods were selected; these were bananas, carrots and potatoes (onions omitted as it was likely these would have been part of a recipe). The average portion weights were calculated for each age group (Table B.12), for the weighed method, 'as consumed' and 'as served/leftover'.

Table B.12: Average portion weights for bananas, carrots and potatoes (n= number of eating occasions)

| Food | Age group (months) | Weighed | | As consumed | | Served/leftover | |
|-----------------|--------------------|---------|----------------------------|-------------|----------------------------|-----------------|----------------------------|
| | | n | average portion weight (g) | n | average portion weight (g) | n | average portion weight (g) |
| Bananas | 4-8 | 32 | 41 | 18 | 43 | 10 | 39 |
| | 9-18 | 56 | 39 | 19 | 53 | 18 | 30 |
| Carrots | 4-8 | 37 | 15 | 19 | 15 | 25 | 14 |
| | 9-18 | 40 | 14 | 18 | 21 | 29 | 16 |
| Boiled potatoes | 4-8 | 22 | 19 | 10 | 17 | 13 | 25 |
| | 9-18 | 35 | 51 | 11 | 53 | 12 | 33 |

Differences in mean portion weights between the weighed and estimated methods were calculated for each child, for bananas, carrots, and potatoes. This could only be calculated for children who ate the specific food during the weighed method and the estimated method, therefore reducing the number of eating occasions which could be included. Figures B.7-B.9 below illustrate the differences for 'as consumed' and 'as served/leftover'. Negative values indicate an average under-estimation for the estimated method.

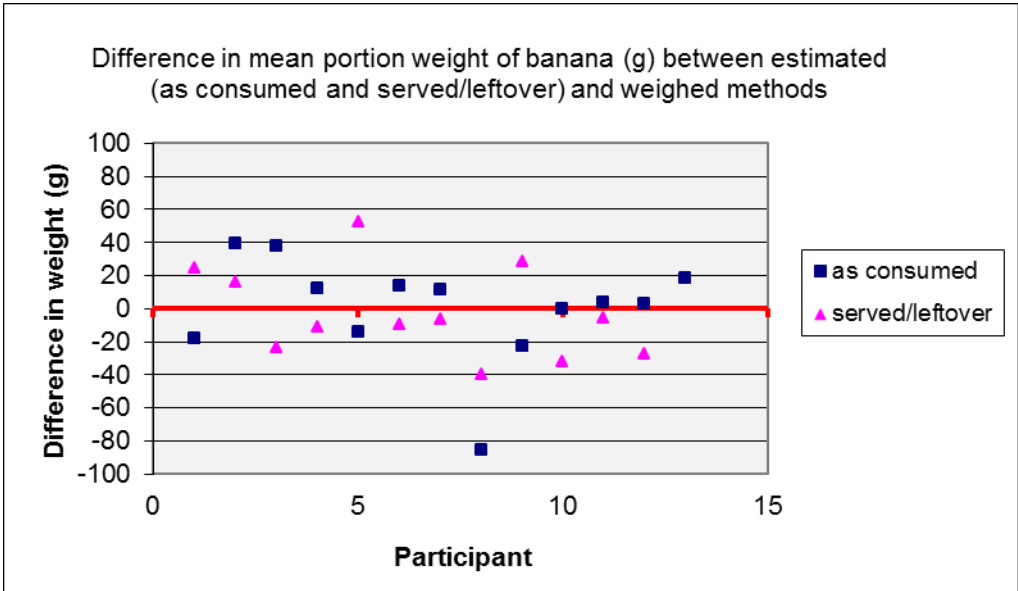


Figure B.7: Scatter plot showing difference in mean portion weight of banana (g) between weighed and estimated (as consumed and as served/leftover diaries)

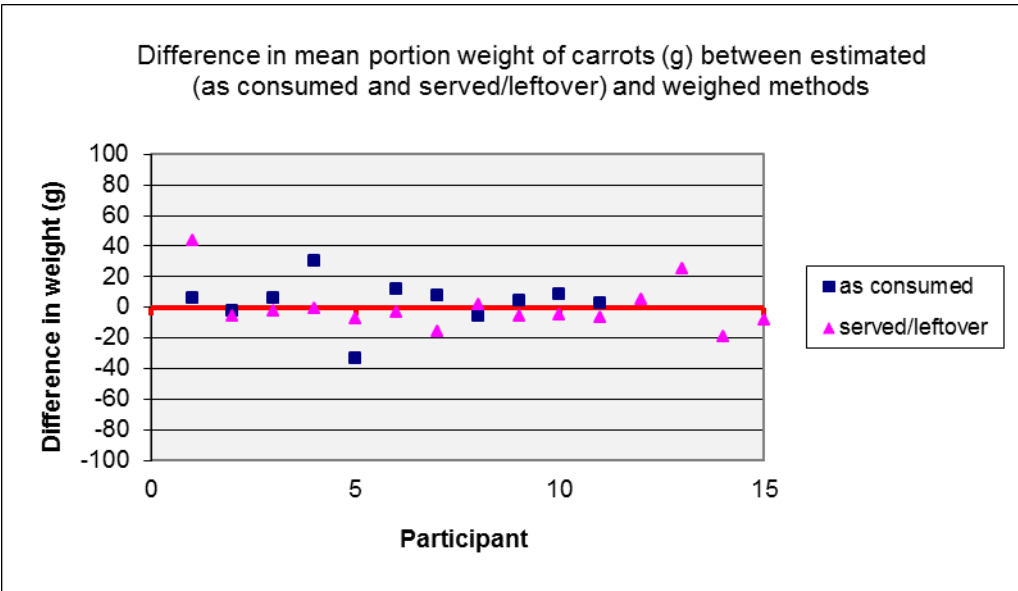


Figure B.8: Scatter plot showing difference in mean portion weight of carrots (g) between weighed and estimated (as consumed and as served/leftover diaries)

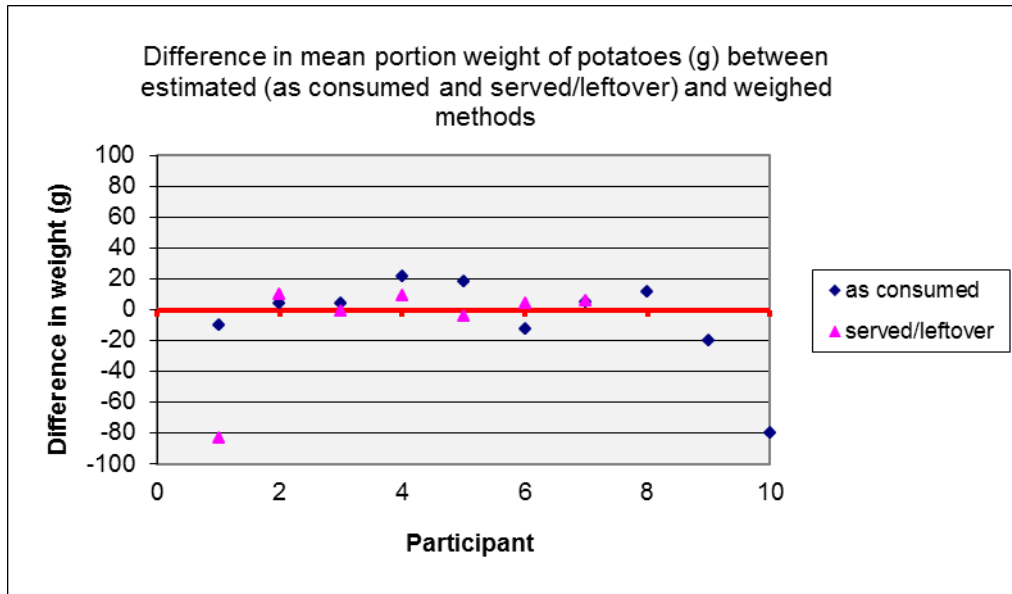


Figure B.9: Scatter plot showing difference in mean portion weight of potatoes (g) between weighed and estimated (as consumed and as served/leftover diaries)

No clear patterns can be seen in the mean intakes of any of the above foods, for 'as consumed' or 'as served/leftover'. Perhaps surprisingly, the largest variation in differences can be seen in figure A7 for bananas (-86g to 52g) which were assigned 'discrete' food type. In figure B.7, 8 out of the 12 participants who completed 'as served/leftover' diaries under-estimated the amount of banana consumed. Nine out of the 13 participants who completed 'as consumed' diaries over-estimated the amount of banana in the consumed.

For carrots and potatoes (assigned 'amorphous' food type for babies 4 to 8 months, and as 'vegetables' for 9 to 18 months), the majority of the values lie around zero, indicating little difference in average portion sizes between the methods. However the number of eating occasions included was relatively small.

B.2.5. Conclusions

The main findings from each part of this pilot study are set out below.

B.2.5.1. Main findings from Pilot phase I

From the feedback given by parents, it was clear that the majority would prefer to record food and drinks together in the diary [this was adopted in pilot phase II]. There was a less clear majority preference to record the amount served and the amount leftover rather than consumed; this was further explored in phase II.

B.2.5.2. Main findings from Pilot Phase II

B.2.5.2.1. Method and diary preference

- The majority of the mothers indicated that they preferred the weighed method, and although they found it more time-consuming, they preferred to record the measurements accurately. However this method has not been tested in this age group and it may adversely affect response rates. As the results are from a small sample, the weighed method will not be the recommended method for the main stage of DNSIYC.
- Although it was not directly asked during the interview whether mothers preferred recording served and leftovers or just consumed, some mothers indicated that they favoured served/leftover columns as they found it easier to record both amounts and therefore they were not relied upon to work out the amount consumed themselves.

B.2.5.2.2. Equipment provided

- For the estimated method, the main problem experienced amongst parents was how to measure finger foods using the equipment provided. The majority of mothers with children in the older age group (9 to 18 months) expressed some difficulty in quantifying pieces of toast, breadsticks, cubes of cheese etc, as the graduated pots were not useful for this type of food.
- Overall parents found the spoons and the graduated pots very useful. The drinking cup was used mainly by the 9 to 18 month age group, and was thought to be 'too old' for the younger children. However, most children already had a drinking cup or bottle which had a graded side and so the cup provided by the study was not required. Some mothers felt a small notepad would be useful for jotting things down while they were out of the house and for when they were "in a rush". One mother thought a simple calculator would have been helpful to work out the amount consumed.

B.2.5.2.3. Comparison of mean daily intakes

- On the whole, mothers tended to over-estimate portion sizes when using the 'as consumed' diaries compared to the 'as served/leftover' for which there was a slight under-estimation. The average difference between mean intakes of food for 'as consumed' diaries and intakes for weighed was 68g, (an average over-estimation). The difference between 'as served/leftover' and weighed was -21g (a slight under-estimation).
- The t test results found no significant differences between the mean intakes from the 'as consumed' diaries and the 'as served/leftover' diaries.

B.2.5.2.4. Comparison of mean daily intakes of commonly consumed foods

- The mean intakes of amorphous foods from the estimated method were very similar to those from the weighed and similarly the intakes of discrete food items from the estimated method (household measures used) were also very close to the intakes from the weighed. This suggests that the graduated pots and measuring spoons and the use of household measures may be an accurate substitution for weighing particularly for these foods
- For the 9 to 18 month age group, the mean intakes of amorphous foods for the 'as served/leftover' diaries were closer to the weighed intakes, compared to 'as consumed'. This may suggest that asking parents to record the amount served and the amount leftover is more accurate (relies less on the parents' maths ability).

The results from this report must be treated with caution due to the small sample size. Although each mother completed both a weighed and an estimated diary, they were on different days, and therefore many factors may have influenced the amount and the types of foods they gave to their child and the amounts consumed over the four days.

B.2.6. Recommendations for DNSIYC Main Stage

The following recommendations were based on the perspective of the coding and data preparation phase. Other implications in terms of the logistics and the resourcing of the queries involved were also considered before a final decision was made.

The results from phase II indicated that the estimated intakes method, supported by the use of measuring equipment, provided very similar results to those of weighed intakes and therefore was a feasible and viable method to be adopted for the main stage of the study.

From the feedback given by parents, the graduated pots and measuring spoons were deemed useful. However it should be emphasised to parents that the pots are to be used for soft mixtures/foods and alternative methods should be used to measure discrete food items, for example counting the number of chips, grapes etc. The graduated drinking cup provided appeared to be used mainly by the older children. As children tend to have a cup with a graded side with which they are familiar the graduated cup could be removed from the equipment provided.

From the findings above, it appeared that 'as served/leftover' diaries provided a more accurate way of recording children's food intakes than recording 'as

consumed'. Although there was no overwhelming difference between the two methods of recording intakes the additional factor of an overall majority preference of participants for the 'as served/leftover' diaries and a closer estimate of this method to the mean daily intake as reported by weighed intake suggested that this should be considered as the chosen method for the main study.

Part 2

B.3. DNSIYC-2 study

B.3.1. Introduction

As described in Part 1, prior to the main stage of DNSIYC, pilot work was completed to assess whether the provision of measuring equipment alters what is fed to infants aged 4 to 18 months. Fifty parents were asked to complete two 4-day food diaries; an estimated method using graduated utensils and a weighed method using scales. The findings showed little difference in average daily intakes (food weight) between the two methods; 954g/day for the weighed method and 975g/day for the estimated. The intakes of amorphous foods (foods which take the shape of the container, e.g. purees, porridge etc.) were also very similar for the two methods (mean daily intakes of 24g and 26g for weighed and estimated respectively [4 to 8 month age group only]). These findings suggested that the equipment did not influence the amount of food given to the child and may provide an alternative method to weighing. This is important as it is generally understood that the burden associated with weighed assessments had led to reduced response rates in previous surveys.

A report of the findings was submitted to MRC HNR Cambridge and the Department of Health in June 2010. However, a review of the coding rates during the 'dress rehearsal' phase of DNSIYC showed that the use of the graduated implements resulted in a low coding rate (number of diaries coded per week) and a high number of queries in the food diaries. Based on the expected number of participants in the main stage of DNSIYC, there was concern that this would have major resourcing consequences for the main survey. The final decision was to proceed with a household measures estimated approach for dietary data collection, without using the graduated utensils.

Although the estimated household measures method has been extensively used in older age groups,² further work was proposed to validate this method against weighed intakes in infants and young children aged 4 to 18 months.

B.3.1.1. Objective

To compare mean weighed daily intakes (food weight [g] and energy [kcal]) with estimated intakes using household measures.

B.3.2. Method

Recruitment began in late January 2012. Recruitment posters were displayed in local Sure Start centres, nurseries and leisure centres. Contact was made with leaders of baby and toddler groups, who kindly passed on details of the study to parents via email and flyers. All parents/guardians expressing interest in the study received a detailed recruitment letter and consent form to be completed and returned to the HNRC before participation in the study.

In total 37 recruitment packs were posted out. By w/c 19th March 2012, 30 participants had consented to take part (18 children aged 4 to 8 months and 12 children aged 9 to 18 months).

Parents/guardians were asked to complete two 4-day food diaries; a 4-day weighed intake using weighing scales, and a second 4-day estimated intake using basic household measures, e.g. tablespoons, teaspoons, number of slices of bread, number of grapes etc. The order of administration was randomised. The estimated food diaries used for DNSIYC2 were the same as those used in the main stage of DNSIYC. The weighed diaries were an adapted version of these.

Parents were visited at home and an explanation of how to complete the diary was given. They were requested not to use their own scales when completing the estimated diary. Contact details for the Research Associate were given to the parent, should they have had any problems or queries while they were taking part.

On completion of the first food diary, a follow-up interview took place to check through the food diary and discuss the ease of recording. Parents were then given the second food diary to complete. On completion of both food diaries participants were asked their preference of recording method (weighed or estimated) and asked to describe any problems they may have encountered. Each participant was given a 'goody bag' as a token of thanks for taking part; this contained an activity toy, a three-stage trainer cup and a set of measuring spoons.

As with the pilot study, all completed food diaries were sent to MRC HNR, Cambridge for dietary coding.

B.3.3. Results

B.3.3.1. Recruitment

Due to a significant delay in the receipt of ethical approval (application to extend original application), the timeframe for the study was reduced from 5 months to 3 months. The original aim was to recruit 50 participants, but due to the unforeseen time constraints the number completing both food diaries within the time frame was 30.

B.3.3.2. Feedback from parents

Parents were asked their views on each method after completion of both diaries. Parents were asked if they experienced any difficulties when measuring foods, and if they had any thoughts on how to make it easier. Method preference is shown in Table B.13.

Table B.13: Method preference

| Method | 4-8 months | 9-18 months | Total |
|---------------|-------------------|--------------------|--------------|
| Weighed | 5 | 4 | 9 (30%) |
| Estimated | 7 | 8 | 15 (50%) |
| No preference | 6 | 0 | 6 (20%) |
| Total | 18 | 12 | 30 (100%) |

There was an overall preference for the estimated method. However six parents were unable to give a preference; three found both methods to be equal, two parents were still exclusively breastfeeding, and one mother served only jars of foods, and therefore recorded the weights on the labels for both methods.

B.3.3.2.1. Feedback for weighed method

Of the nine parents who expressed a preference for the weighed method, seven gave reasons based on a feeling of greater accuracy and precision. Although some said it was more time-consuming to weigh, they preferred to measure the foods accurately. They also stated that it was easier to weigh finger foods rather than estimate portion size.

Table B.14 lists some foods which parents found difficult to weigh or record, and how this was overcome.

Table B.14: Foods which were often found difficult to measure when completing the weighed diary

| Difficult foods/ situations | Why challenging? | How did you measure it? Is there an easier way to measure? |
|--|--|---|
| Measuring leftovers for baby-led weaned babies | Food is often mushed up, thrown or chewed. Sometimes leftovers weigh more as it has been 'gummed'. | Weigh what is possible. Plastic sheet under baby's highchair? |
| Leftover peanut butter on bread | Difficult to weigh peanut butter only | Advised to estimate proportion left |
| Foods eaten out of the home | Didn't want to carry scales around | Advised could estimate portions on these occasions |
| Freezer foods | Remembering ingredients | Estimated |
| Length of breastfeeds during night | Baby sleeps in same bed and feeds himself through the night. I don't wake up so difficult to know exactly how long | Estimated |
| Restaurant foods | Unsure what the ingredients are | Described food |
| Leftovers of a mixture | Estimating proportions is difficult | |
| Yoghurts | Some pots of yoghurts didn't have weights on. Perhaps on card sleeve which already thrown out. | Name and brand recorded. Checked by researcher. |

B.3.3.2.2. Feedback for estimated method

The majority of parents preferred the estimated method. The main reason was that it was easier to estimate when out of the home instead of carrying the scales around. Although it was recommended to record all foods in the diary at the time of eating and not from memory, some parents liked the estimated method because it was possible to record in the diary some time after eating; this was especially true when out of the home. The instruction booklet was also considered a helpful addition.

Table B.15 lists some foods which parents found difficult to estimate.

Table B.15: Foods which were often found difficult to measure when completing the estimated diary

| Difficult foods/ situations | Why challenging? | How did you measure it? Is there an easier way to measure? |
|------------------------------------|--|---|
| Homemade family meals | Difficult to estimate the proportion of a large meal | |
| Counting spoonfuls | Easily distracted | Had to guess the number but didn't seem accurate |
| Little bits of leftovers | Finding them as he crawls | Measured everything I could find but may have missed some. |
| Finger foods | Most ends up on floor so not sure how much is eaten | Estimated |
| Freezer foods | Remembering the ingredients | Recorded approximate ingredients |

B.3.3.3. Average daily intakes

Table B.16: Mean (range, SD) daily intakes for weighed and estimated methods

| | | Weighed (n=30) | Estimated (n=30) |
|----------------------|------|---------------------------|-----------------------------|
| Food (g) | Mean | 983 | 1025 |
| | Min | 663 | 693 |
| | Max | 1489 | 1613 |
| | SD | 215 | 232 |
| Energy (kcal) | Mean | 753 | 806 |
| | Min | 446 | 452 |
| | Max | 1147 | 1235 |
| | SD | 180 | 225 |

Paired t test showed no statistically significant differences between weighed and estimated food weight intakes (g). The data for energy (kcal) was not normally distributed; therefore a non-parametric test was used (Wilcoxon signed rank test). This gave a non-significant result for energy intakes (kcal).

B.3.3.4. Top 10 foods contributing to total group energy intakes

The top 10 food groups that contributed the most to total group energy intakes were calculated; these were breast milk, commercial toddler foods and drinks, fruit, high fibre breakfast cereals, other milk and cream, pasta rice and other cereals, vegetables (not raw), white bread, whole milk, and yoghurt/fromage frais and dairy desserts.

The average food and energy intakes were calculated for each food group, for both methods.

Table B.17: Mean food (g) and energy (kcal) intakes for weighed and estimated methods for the top 10 food groups (n=number of eating occasions)

| | | Weighed intakes | Estimated intakes |
|--|------|------------------------|--------------------------|
| Breast milk* | | n=496 | n=518 |
| Food (g) | Mean | 104 | 103 |
| | Min | 2 | 14 |
| | Max | 135 | 135 |
| | SD | 33.3 | 33.5 |
| Energy (kcal) | Mean | 69 | 69 |
| | Min | 1 | 9 |
| | Max | 91 | 91 |
| | SD | 22.3 | 22.5 |
| Commercial toddler foods & drinks | | n=114 | n=139 |
| Food (g) | Mean | 31 | 28 |
| | Min | 0 | 0 |
| | Max | 200 | 230 |
| | SD | 45.8 | 43.3 |
| Energy (kcal) | Mean | 30 | 27 |
| | Min | 0 | 0 |
| | Max | 206 | 166 |
| | SD | 34.5 | 29.5 |
| Fruit | | n=271 | n=264 |
| Food (g) | Mean | 28 | 31 |
| | Min | 0 | 0 |
| | Max | 200 | 150 |
| | SD | 29.3 | 28.4 |
| Energy (kcal) | Mean | 21 | 23 |
| | Min | 0 | 0 |
| | Max | 190 | 405 |
| | SD | 26.3 | 36.6 |

| | | | |
|--|--------------------------|-------------------------|------------------------|
| High fibre breakfast cereals | | n=43 | n=42 |
| Food (g) | Mean Min Max SD | 16 0 100 16.8 | 17 0 132 21.4 |
| Energy (kcal) | Mean Min Max SD | 49 1 124 35.6 | 49 0 128 36.3 |
| Other milk & cream** | | n=181 | n=157 |
| Food (g) | Mean Min Max SD | 110 1 252 67.5 | 123 1 252 65 |
| Energy (kcal) | Mean Min Max SD | 75 1 182 45.6 | 85 2 171 41.9 |
| Pasta, rice & other cereals | | n=56 | n=70 |
| Food (g) | Mean Min Max SD | 20 1 187 30.2 | 21 1 122 27.9 |
| Energy (kcal) | Mean Min Max SD | 40 2 264 47.7 | 39 2 299 53.7 |
| Vegetables (not raw) | | n=300 | n=299 |
| Food (g) | Mean Min Max SD | 17 0 139 19.2 | 21 1 135 25.0 |
| Energy (kcal) | Mean Min Max SD | 9 0 114 14.1 | 11 0 167 19.8 |
| White bread | | n=45 | n=41 |
| Food (g) | Mean Min Max SD | 20 1 75 15.7 | 19 1 71 15.6 |
| Energy (kcal) | Mean Min Max SD | 53 2 236 46 | 51 3 209 43.7 |

| Whole milk** | | n=68 | n=85 |
|--|------|------|------|
| Food (g) | Mean | 101 | 84 |
| | Min | 1 | 4 |
| | Max | 278 | 224 |
| | SD | 68.4 | 69.3 |
| Energy (kcal) | Mean | 66 | 56 |
| | Min | 1 | 2 |
| | Max | 187 | 150 |
| | SD | 44.2 | 46.4 |
| Yoghurt, fromage frais & dairy desserts | | n=83 | n=71 |
| Food (g) | Mean | 53 | 49 |
| | Min | 3 | 3 |
| | Max | 120 | 120 |
| | SD | 23.1 | 25.5 |
| Energy (kcal) | Mean | 51 | 50 |
| | Min | 2 | 3 |
| | Max | 122 | 102 |
| | SD | 21.8 | 24.3 |

* Intakes for breast milk were derived using the same method³ for both methods, and therefore no differences were anticipated.

** For drinks, the parent was asked to record the volume for both methods and therefore the method of recording did not differ.

Table B.17 shows few differences between weighed and estimated intakes for the selected food groups, suggesting that the estimated method performs as well as the weighed method in the measurement of these particular food groups.

B.3.4. Comparison of pilot study data with DNSIYC2 data

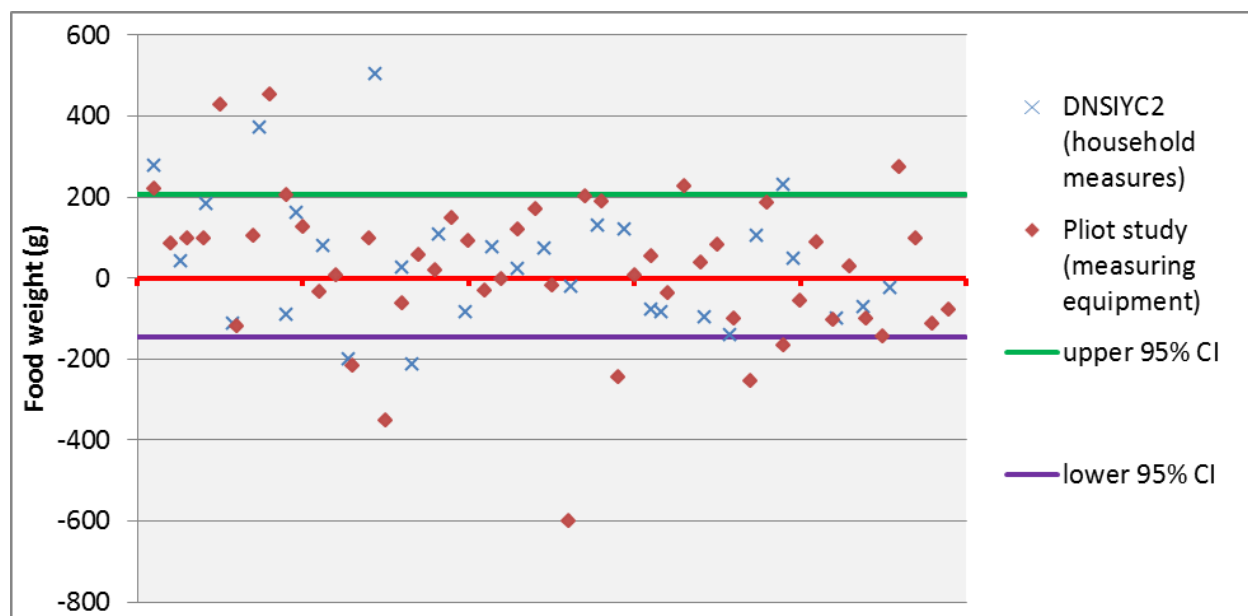
Table B.18: Average difference between weighed and estimated intakes for pilot study and DNSIYC2 study

| | Pilot study (n=49) (average age 9.7mo) | | | DNSIYC2 study (n=30) (average age 8.7mo) | | |
|----------------------|---|---|---------------------------|---|--|---------------------------|
| | Mean weighed intakes | Mean estimated intakes-equipment | Average difference | Mean weighed intakes | Mean estimated intakes-household measures | Average difference |
| Food (g) | 954 | 975 | 24 | 983 | 1025 | 42 |
| Energy (kcal) | 731 | 789 | 59 | 753 | 806 | 53 |

Table B.18 shows the weighed and estimated intakes for the pilot study and the DNSIYC2 study, and the average difference in intakes between the two methods. The average age of the children taking part in the pilot study was a month older than those taking part in DNSIYC2. The average difference in food intakes for the pilot study is almost half that for the DNSIYC2 study, however this is only a difference of 18g. The differences between estimated and weighed energy intakes are similar for both studies.

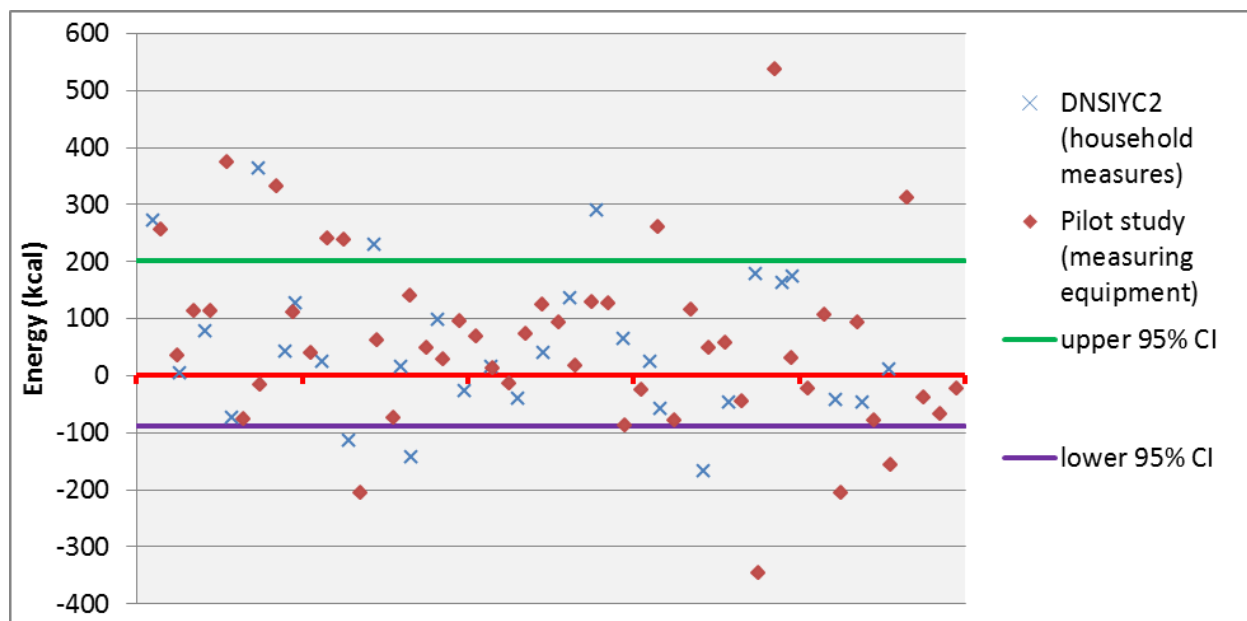
B.3.4.1. Individual difference between estimated and weighed intakes

Figures B.10 and B.11 show the differences in estimated and weighed intakes for each participant taking part in the pilot study and the DNSIYC2 study. The red line indicates zero; the closer the plots are to zero, the smaller the difference between intakes (estimated and weighed).



Range of difference: Pilot study= 1052g; DNSIYC2= 717g

Figure B.10: *Scatter plot showing difference in mean daily food intakes (g) between estimated and weighed intakes for both studies*



Range of difference: Pilot study= 883kcal; DNSIYC2= 532kcal

Figure B.11: *Scatter plot showing difference in mean daily energy intakes (kcal) between estimated and weighed intakes for both studies*

For both estimated methods (measuring equipment and household measures), participants were more likely to over-estimate than under-estimate portion sizes. The range of the difference in intakes (between estimated and weighed) was greater for the pilot study (estimated method using measuring equipment).

B.3.5. Conclusions

B.3.5.1. Main findings from DNSIYC2 study

The majority of parents preferred the estimated method over the weighed method. An important factor in this decision was ease of recording foods out of the home. For the estimated method, it was possible to record foods after they were consumed as the portion size could be described (parents were advised not to rely on memory). This was seen as an advantage over the weighed method, where portions needed to be weighed before consumption.

As in findings of the pilot study, some parents felt the weighed method was more accurate and they preferred to record the measurements accurately, although it was considered more time-consuming.

The average daily food and energy intakes were similar, and no statistically significant differences were found between the two methods.

B.3.5.2. Comparison of pilot study data and DNSIYC2 data

The average daily intakes for the estimated method using household measures were 50g greater than those for the estimated method using measuring equipment. The use of the measuring equipment gave estimated intakes which were closer to weighed intakes.

There was an overall preference for the weighed method in the pilot study, however in DNSIYC2 there was a majority preference for the estimated method using household measures. Therefore it may be considered that estimated intakes using measuring equipment was a more burdensome method than estimated intakes using basic household measures. This is an interesting finding as it is generally understood that weighed assessments had led to reduced response rates in previous surveys, due to high participant burden.²

It is important to note that conclusions drawn from both studies are limited due to the small sample size.

B.4. References

1. Determining new or updating out of date portion size data for NDNS and in house DINO databases (HNR.SOP.0498.01)
2. Bates B, Lennox A, Bates C, Swan G (2011) National Diet and Nutrition Survey-Headline results from years 1 and 2 (combined) of the Rolling Programme (2008/9-09/10). Department of Health.
3. Paul AA, Black AE, Evans J, Cole TJ, Whitehead RG. Breastmilk intake and growth in infants from two to ten months. *J Hum Nutr Diet* 1988; 1(6): 437-450.

B.5. Addendum A

**Table B.19: Top 50 most commonly consumed foods
(n= number of eating occasions)**

| | Food | Food type | n | Average portion weight (g) |
|----|---|----------------------|-----|----------------------------|
| 1 | Breast milk | Baby milk/ drinks | 898 | 92 |
| 2 | Water (not as a diluent) | Baby milk/ drinks | 674 | 46 |
| 3 | Whole milk (winter) | Baby milk/ drinks | 404 | 104 |
| 4 | Carrots, boiled | Vegetables | 168 | 16 |
| 5 | Bananas | Discrete | 153 | 41 |
| 6 | Aptamil first formula made up | Baby milk/ drinks | 131 | 127 |
| 7 | Onions, boiled | Vegetables | 119 | 11 |
| 8 | Cow & Gate formula for hungrier babies made up | Baby milk/ drinks | 105 | 141 |
| 9 | Potatoes, old, boiled | Vegetables | 103 | 35 |
| 10 | Weetabix | Discrete | 103 | 17 |
| 11 | Water (diluent for concentrated low calorie soft drink) | Baby milk/ drinks | 89 | 84 |
| 12 | Cheddar cheese | Discrete | 88 | 12 |
| 13 | Aptamil extra hungry formula made up | Baby milk/ drinks | 76 | 110 |
| 14 | Sweet potatoes, boiled | Vegetables | 76 | 30 |
| 15 | Fromage frais, low fat fruit | Amorphous | 75 | 54 |
| 16 | Olive oil | Other | 69 | 1 |
| 17 | SMA first infant formula made up | Baby milk/ drinks | 68 | 165 |
| 18 | Pasta (white) | Other | 65 | 40 |
| 19 | Petit Filous fromage frais | Amorphous | 62 | 56 |
| 20 | Butter, salted | Other | 59 | 5 |
| 21 | Plain flour after baking | Other | 59 | 6 |
| 22 | Broccoli, fresh, boiled | Vegetables | 56 | 23 |
| 23 | Butter unsalted | Other | 56 | 3 |
| 24 | Cow & Gate follow on milk 6mth plus made up | Baby milk/ drinks | 56 | 147 |
| 25 | Peas, frozen ,boiled | Vegetables | 47 | 14 |
| 26 | Whole milk (summer) | Baby milk/ drinks | 46 | 84 |
| 27 | Aptamil follow on milk made up | Baby milk/ drinks | 45 | 117 |

| | | | | |
|----|--|-------------------|----|----|
| 28 | Canned tomatoes | Amorphous | 43 | 30 |
| 29 | Organix flavoured baby rice cakes | Discrete | 43 | 3 |
| 30 | Grapes, white | Discrete | 42 | 18 |
| 31 | Garlic | Other | 41 | 1 |
| 32 | Parsnips, boiled | Vegetables | 41 | 16 |
| 33 | Tangerines | Discrete | 41 | 53 |
| 34 | Bread, white, toasted | Discrete | 40 | 11 |
| 35 | Fruit drink (concentrate) low cal not blackcurrant | Baby milk/ drinks | 40 | 5 |
| 36 | Sugar, white | Other | 40 | 4 |
| 37 | Yogurt, low fat fruit | Amorphous | 39 | 64 |
| 38 | Pears | Discrete | 37 | 41 |
| 39 | Bread, wholemeal, toasted | Discrete | 36 | 17 |
| 40 | Spreadable butter (75-80% fat) | Other | 36 | 4 |
| 41 | Apple, dessert/eating, stewed- no added sugar | Discrete | 35 | 25 |
| 42 | Breadsticks | Discrete | 35 | 6 |
| 43 | Oats rolled, plain, dry weight | Amorphous | 35 | 20 |
| 44 | Water (as a diluent for dried foods) | Baby milk/ drinks | 35 | 44 |
| 45 | Bilberries | Discrete | 34 | 21 |
| 46 | Orange juice unsweetened | Baby milk/ drinks | 34 | 2 |
| 47 | Robinsons no added sugar (concentrate) | Baby milk/ drinks | 33 | 12 |
| 48 | Butternut squash, baked | Vegetables | 32 | 25 |
| 49 | Bread wholemeal | Discrete | 30 | 19 |
| 50 | Celery, fresh, boiled | Vegetables | 30 | 4 |