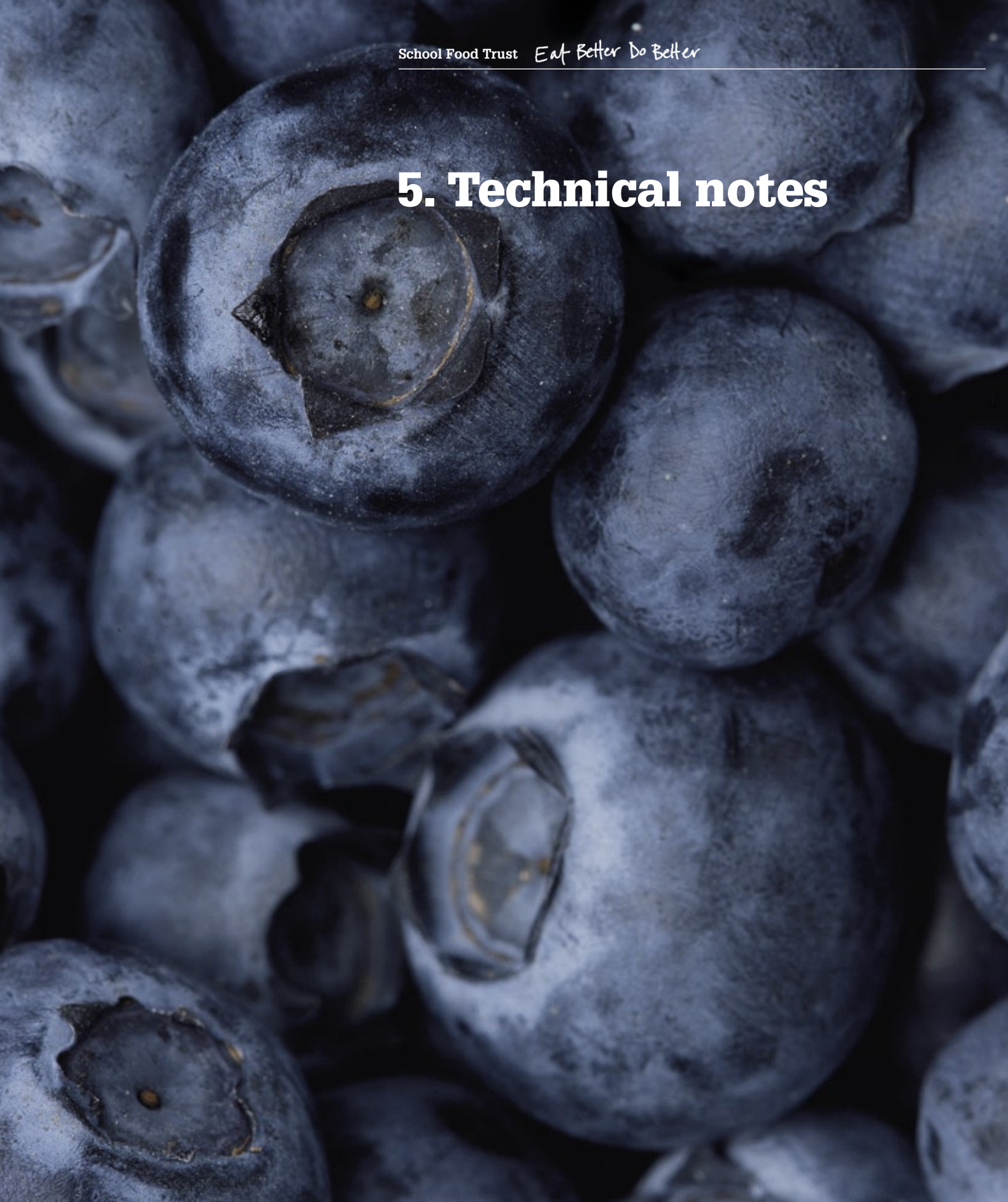
5. Technical notes



Technical notes

Estimated Average Requirement (EAR)

This is the average amount of energy or nutrients needed by a group of people. Half the population will have needs greater than this amount and half will have needs below this amount.

Reference Nutrient Intake (RNI)

This is the amount of a nutrient which is enough to meet the dietary requirements of about 97% of a group of people.

This section provides additional information on how the nutrient-based standards were derived and how they should be applied.

Table 1. Nutrient-based standards for primary and secondary schools

	Nutrient	Min/ Max	Proportion of recommended daily intake of nutrients	Nutrient value of an average school lunch	
				Primary	Secondary
	Energy (kJ) (kcal)	EAR	30% ± 5%	2215 ±111 530 ± 26.5	2700 ± 135 646 ± 32.3
Macronutrients	Carbohydrate (g)	Min	50% food energy	70.6	86.1
Macronutrients	Non-milk extrinsic (NME) sugars (g)	Max	11% food energy	15.5	18.9
Macronutrients	Fat (g)	Max	35% food energy	20.6	25.1
Macronutrients	Saturated fat (g)	Max	11% food energy	6.5	7.9
Macronutrients	Protein (g)	Min	30% RNI	7.5	13.3
Macronutrients	Fibre (g)	Min	30% calculated reference value	4.2	5.2
Micronutrients	Sodium (mg)	Max	30% SACN recommendation	499	714
Micronutrients	Vitamin A (µg)	Min	35% RNI	175	245
Micronutrients	Vitamin C (mg)	Min	35% RNI	10.5	14.0
Micronutrients	Folate (µg)	Min	35% RNI	53	70
Micronutrients	Calcium (mg)	Min	35% RNI	193	350
Micronutrients	Iron (mg)	Min	35% RNI	3.0	5.2
Micronutrients	Zinc (mg)	Min	35% RNI	2.5	3.3

RNI = Reference Nutrient Intake
EAR = Estimated Average Requirement
SACN = Scientific Advisory Committee on Nutrition

How the values for the nutrient-based standards were derived

The nutrient-based standards are based on current UK nutrient recommendations (Dietary Reference Values[4]; Salt and Health[5]). The Dietary Reference Values specify the amounts of energy and nutrients needed by groups of people.

For children and young people, it is an established principle of nutritional guidance that for a given age-sex group, nutrient-based standards should be based on the requirements of those children with the greatest need. The principle of greatest need, however, applies only to vitamins and minerals other than sodium. In England, it has not been applied to energy, macronutrients or sodium because this would promote overconsumption of these nutrients for the majority of individuals, which can be harmful.

The values for energy, macronutrients and sodium (Table 1, red text), have been calculated based on the breakdown of the following age distribution (Edubase for England 2006) assuming an equal number of boys and girls:

- Primary:
  40% 4–6 yrs, 60% 7–10 yrs
- Secondary:
  70% 11–14 yrs, 30% 15–18 yrs

The values for micronutrients, excluding sodium (Table 1, blue text), have been calculated for children with the greatest nutritional need and applied to the whole school population:

- Primary all micronutrients:
  boys and girls aged 7–10
- Secondary vitamin A:
  boys 15–18 years
- Secondary vitamin C:
  boys and girls 15–18 years
- Secondary folate:
  boys and girls aged 11–18 years
- Secondary calcium:
  boys 11–18 years
- Secondary iron:
  girls 11–18 years
- Secondary zinc:
  boys 15–18 years

See Appendix 3 for details of Dietary Reference Values and Salt and Health recommendations for school age children (for the nutrients specified in the nutrient-based standards).

Single sex secondary schools

The nutrient values in Table 1 are appropriate for mixed sex primary and secondary schools. However, there are sufficiently large differences in the energy and nutrient requirements of girls and boys aged 11–18 years to warrant different sets of values for single sex secondary schools. For example, the value for energy (Table 1), if applied to a girls' secondary school, would exceed their likely average requirements. If food were provided at this level, it would effectively either promote obesity or necessitate waste. Conversely, the energy provision currently stipulated would not meet the average requirement for boys. The table below shows the nutrient-based standards for single sex girls' and boys' secondary schools.

Table 2. Nutrient-based standards for single sex secondary schools

	Nutrient	Min/ Max	Proportion of recommended daily intake of nutrients	Nutrient value of an average school lunch	
				Secondary girls	Secondary boys
	Energy (kJ) (kcal)	EAR	30% ± 5%	2412 ± 121 577 ± 28.9	2985 ± 149 714 ± 35.7
Macronutrients	Carbohydrate (g)	Min	50% food energy	77.0	95.2
Macronutrients	Non-milk extrinsic (NME) sugars (g)	Max	11% food energy	16.9	20.9
Macronutrients	Fat (g)	Max	35% food energy	22.5	27.8
Macronutrients	Saturated fat (g)	Max	11% food energy	7.1	8.7
Macronutrients	Protein (g)	Min	30% RNI	12.7	13.8
Macronutrients	Fibre (g)	Min	30% calculated reference value	4.6	5.7
Micronutrients	Sodium (mg)	Max	30% SACN recommendation	714	714
Micronutrients	Vitamin A (µg)	Min	35% RNI	210	245
Micronutrients	Vitamin C (mg)	Min	35% RNI	14.0	14.0
Micronutrients	Folate (µg)	Min	35% RNI	70	70
Micronutrients	Calcium (mg)	Min	35% RNI	280	350
Micronutrients	Iron (mg)	Min	35% RNI	5.2	4.0
Micronutrients	Zinc (mg)	Min	35% RNI	3.2	3.3

RNI = Reference Nutrient Intake
EAR = Estimated Average Requirement
SACN = Scientific Advisory Committee on Nutrition

Special schools and Pupil Referral Units providing both primary and secondary education

The regulations[1] state that 'where a maintained special school or a pupil referral unit provides both primary and secondary education, a school lunch provided to a junior pupil must comply with the requirements for primary schools; and a school lunch provided to a senior pupil must comply with the requirements for secondary schools'.

In practice, the different nutritional requirement for primary and secondary pupils would be met by varying the portion sizes served.

For the purposes of analysis, schools can calculate values for nutrient-based standards taking into account the age distribution, so that only one analysis has to be carried out.

Example:
For a mixed sex special school or PRU with 30% primary age pupils and 70% secondary age pupils:

Using values from Table 1

Energy:
Primary standard = 530 kcal
Secondary standard = 646 kcal

Therefore, the standard for that school would be:
(530 x 0.30) + (646 x 0.70) = 611 kcal

Calcium:
Primary standard = 193 mg
Secondary standard = 350 mg

Therefore, the standard for that school would be:
(193 x 0.30) + (350 x 0.70) = 303 mg

Infant, Junior and Middle Schools

The nutrient values in Table 1 are appropriate for mixed sex primary and secondary schools. There are other schools for which these values may not be appropriate. These include infant, junior and middle schools*. It is important for schools to cater appropriately for the age range of their pupils, and to ensure that the standards against which menus are assessed closely match the nutritional requirements of their pupils. If the age of pupils in a school differs from primary and secondary, then it is more appropriate to use the values in Table 3 to work out the nutrient requirement for that school. Here is an example of how to do this.

Example:
For a mixed sex middle school with pupils aged between 7–14 (school years 3–10) with 50% aged between 7–10 years (school years 3–6) and 50% aged between 11–14 years (school years 7–10)

Using values from Table 3

Energy:
Aged 7–10 (school years 3–6) value = 557 kcal
Aged 11–14 (school years 7–10) value = 610 kcal

Therefore, the standard for that school would be:
(557 x 0.50) + (610 x 0.50) = 583.5 kcal

Iron:
Aged 7–10 (school years 3–6) value = 3.0 mg
Aged 11–14 (school years 7–10) value = 5.2 mg

Therefore, the standard for that school would be:
(3.0 x 0.50) + (5.2 x 0.50) = 4.1 mg

*Middle deemed primary schools should comply with the nutrient-based standards by September 2008 and middle deemed secondary schools by September 2009.

Table 3: Nutrient-based standards for ages 4–6, 7–10 and 11–14

	Nutrient	Min/ Max	Proportion of recommended daily intake of nutrients	Nutrient value of an average school lunch		
				Aged 4–6	Aged 7–10	Aged 11–14
				School years R,1,2	School years 3,4,5,6	School years 7,8,9,10
	Energy (kJ) (kcal)	EAR	30% ± 5%	2043 ± 102 489 ± 24.5	2328 ± 116.4 557 ± 27.9	2549 ± 127.4 610 ± 30.5
Macronutrients	Carbohydrate (g)	Min	50% food energy	65.2	74.2	81.3
Macronutrients	Non-milk extrinsic (NME) sugars (g)	Max	11% food energy	14.3	16.3	17.9
Macronutrients	Fat (g)	Max	35% food energy	19.0	21.6	23.7
Macronutrients	Saturated fat (g)	Max	11% food energy	6.0	6.8	7.5
Macronutrients	Protein (g)	Min	30% RNI	5.9	8.5	12.5
Macronutrients	Fibre (g)	Min	30% calculated reference value	3.9	4.5	4.9
Micronutrients	Sodium (mg)	Max	30% SACN recommendation	357	595	714
Micronutrients	Vitamin A (µg)	Min	35% RNI	140	175	210
Micronutrients	Vitamin C (mg)	Min	35% RNI	10.5	10.5	12.3
Micronutrients	Folate (µg)	Min	35% RNI	35	53	70
Micronutrients	Calcium (mg)	Min	35% RNI	158	193	350
Micronutrients	Iron (mg)	Min	35% RNI	2.1	3.0	5.2
Micronutrients	Zinc (mg)	Min	35% RNI	2.3	2.5	3.2

RNI = Reference Nutrient Intake
EAR = Estimated Average Requirement
SACN = Scientific Advisory Committee on Nutrition

How to calculate an average school lunch

Menu Cycle

A plan of menus for school lunches at a school or group of schools lasting for no less than one and no more than four consecutive weeks during a term.

Bread

Bread provided as part of a meal should be included in the nutrient analysis. The extra bread (without added fat or oil), available on an unrestricted basis to meet the needs of children with greater energy requirements should not be included in the nutrient analysis. The rationale for bread to be available as an extra is to encourage pupils to fill up on carbohydrate rather than high fat, high sugar foods.

The regulations[1] state 'The average school lunch for a school or a group of schools must be calculated by totalling the amounts of energy and nutrients provided by all school lunches in a menu cycle, and then dividing that total by the estimated number of school lunches served to individual pupils during that menu cycle'.

To achieve this in practice, you will need to enter details of all food and drink items provided in your menu cycle into the menu planning and nutrient analysis software, together with portion sizes. This will include recipes for food prepared from scratch and any product specifications for bought in items if they are not already present in the software's food composition database. Remember to include all food (except extra bread – see guidance in box) and drinks (see guidance in box on page 5.9) provided at all school food outlets at lunchtime. These may include hot meals counter, sandwich counter, deli/salad bar, milk bar, vending machines, and any other food or drink outlets on the school premises at lunchtime.

School lunch is defined as food provided for consumption by pupils as their midday meal. If some of the food and drink provided at mid-morning break is considered to be part of lunchtime provision it should be included when calculating an average school lunch.

Estimate your provision mix. For each food and drink item, estimate the number of portions you plan to provide during the menu cycle. Depending on which software you use, you may need to enter the number of portions or convert this into a percentage of total provision. The software can then total all the nutrients provided at lunchtime over the menu cycle.

To determine the nutrient value of an average school lunch, divide this total by the estimated number of school lunches you expect to provide over the menu cycle. For further information on defining a school lunch see page 5.9.

Fruit and vegetables

Remember, for the lunch provision to be compliant with the food-based standard for fruit and vegetables at least one portion of fruit and one portion of vegetables or salad must be provided per pupil per day. In practice, this means that you should include a portion of vegetables or salad and a portion of fruit for each pupil in the nutrient analysis. Fruit can be provided as fresh fruit, fruit juice, or as part of a fruit-based dessert. Vegetables can be provided as portions of vegetables or included in main dishes (e.g. vegetable curry or lasagne).

Although the standards apply to planned provision it is good practice to check if there is a difference between planned and actual provision. If the difference is relatively minor (e.g. a delivery may not arrive on time and a substitute has to be made), it is likely that the actual provision will still be compliant with the standards. This will almost certainly be the case if the planned provision was well above the minimum standards or well below the maximum standards.

While the standards apply to provision and not consumption, the aim is for pupils to eat healthily at lunchtime. For this to happen, one of the key aims of the school catering service must be to minimise the difference between provision and consumption. This makes sense from both a health and an economic standpoint. Good marketing of healthy food options, pre-ordering and meal deals should help to achieve this.

Check the difference between provision and consumption (measured on sales). If the differences are substantial, consider the reasons why. If circumstances are likely to recur (e.g. ongoing promotion of meal deals) adjust your planned provision mix for the next menu cycle.

Defining a school lunch

Bottled water

If the till receipts for bottled water are included in lunchtime sales, this will literally 'dilute' the nutritional value of the provision by increasing the apparent number of meals sold. For this reason, subtract the value of bottled water sales from the total lunch sales when calculating the number of lunches provided. Remember that free, fresh drinking water should be provided at all times in preference to bottled water.

Primary schools

Most of the food is provided as complete meals i.e. main dish, vegetable, dessert and drink. Therefore:

Number of lunches provided in primary schools =

Reported number of meals served (including those paid for plus free school meals)

Secondary schools

Defining a secondary lunch is more complex than a primary school lunch because there is more choice, a variety of outlets, different serving times, the type of food or combination of food is often not recorded in detail, and the number of 'meal equivalents' is not clearly definable.

Two pieces of information all caterers can provide are:

- total income (all till receipts) from lunchtime sales and
- the price of a free school meal (FSM) i.e. its monetary value in the dining room.

This information can be used to estimate the number of lunches provided. Add together the till receipts for a given period for all sales of food to which the school lunch standards have been applied. This may include sales of food at mid-morning break that are deemed to be part of the lunchtime provision. Divide this total by the value of a free school meal. Add the number of FSM provided.

Number of lunches provided in secondary schools =

$$\frac{\text{Total income from lunchtime sales}}{\text{FSM value}} + \text{Total number of FSM provided}$$

Technical considerations of recipe/product analysis

Accurate analysis of the nutrient content of an average school lunch will depend on good recipe calculations. This can only be achieved using standard recipes and understanding the strengths and weaknesses of the available nutrient databases*. More information is available in the Trust's 'Calculating the nutrient content of school lunch recipes' (reference). The following information summarises good practice when undertaking recipe and menu analyses.

Standard recipes

Standard recipes are written instructions for producing a consistent quantity and quality dish. Exact quantity, quality and cost of each ingredient are recorded along with a clear methodology. Standard recipes should contain the following: descriptive title of food item; number of portions; portion size; metric measurement of each ingredient; ingredient details; price per unit and calculation of price for quantity used in recipe; total cost and cost per portion; detailed instructions for preparation and service.

Incomplete nutritional information

Missing food ingredients

Some recipe ingredients may not be listed in the database(s) supplied. In these cases it will be necessary to ask the food manufacturer or wholesaler for the nutrition information, or find a similar product that can be substituted for the original ingredient.

New food ingredients or products

Data from wholesalers or food manufacturers can be used to create a profile for new food ingredients or products.

Missing nutrients

Values for all the nutrients that are required for analysis of school lunches may not be available. It may be necessary to estimate a missing value by comparing to a similar item which has been analysed, or using a value from a different nutrient database. It is advisable to take a conservative approach to an estimated value, to identify that it is an estimate, and note how this estimate was determined. It may be necessary to avoid a brand name in the naming of this product on your database, as it is unlikely to be a true reflection of the brand's nutritional profile.

* There are a number of commonly used nutrient databases. In the UK the most widely used is McCance and Widdowson's The Composition of Foods (6th Edition)[11]. Most menu planning and nutrient analysis software packages contain this database, and often include additional databases from other countries and those supplied by food wholesalers or manufacturers. For more information visit the Food Standards Agency website at www.food.gov.uk/science/dietarysurveys/dietsurveys

Fibre

The standard for fibre is based on non-starch polysaccharides (NSP). NSP information for many foods and products is detailed in McCance and Widdowson's The Composition of Foods (6th edition)[11]. However, fibre information stated on food labels is likely to be based on the Association of Official Analytical Chemists (AOAC) method. AOAC values are generally higher than NSP values. If NSP values are unavailable it will be necessary to estimate these values from the AOAC value based on knowledge of the food product, similar products and the comparison table in McCance and Widdowson's The Composition of Foods (6th edition)[11], which details NSP and AOAC fibre values per 100g. The conversion factor of 0.75 may be used to convert AOAC values to NSP.

NME sugars

NME sugars cannot be quantified by analytical techniques, but need to be calculated based on the food type. The most commonly used definition of NME sugars is:

'All sugars in fruit juices, table sugar, honey, sucrose, glucose and glucose syrups added to food plus 50% of the sugars in canned, stewed, dried and preserved fruits[6].'

The NME sugar values for individual food items are not generally available on nutrient databases. However, some information on the NME sugar content of food items is available in electronic format, on request, from the Food Standards Agency. To request, please email: **NUT-A-ENQUIRIES@foodstandards.gsi.gov.uk**

Cooking losses/gains

The cooking process may result in changes in water and/or nutrient content of food or dishes. When carrying out recipe analysis it is important to take these into account and analyse recipes as cooked.

Water loss/gain

Some food may lose a significant amount of water on cooking (e.g. meat). The amount lost will depend on the method. Other food items such as pasta, rice and lentils will gain weight on cooking. It is important that these weight changes are taken into account when carrying out recipe/menu analysis. Details regarding weight changes in individual food items can be found in McCance and Widdowson's The Composition of Foods (6th edition)[11].

Weight changes in recipes will be more difficult to calculate, but may be significant. This can be determined by totalling ingredient weights and weighing the cooked product. If this is not possible, use a weight change value from a similar recipe in McCance and Widdowson's The Composition of Foods (6th edition)[11].

Vitamin retention

Most nutrient databases will include details of cooked food items (e.g. vegetables) which will take into account the vitamin losses on cooking. When carrying out recipe analysis it is likely that vitamin loss will need to be considered. Details on typical vitamin losses for particular food groups can be found in McCance and Widdowson's The Composition of Foods (6th edition)[11]. It is important to consider the preparation methods, cooking and holding times of food items/ dishes cooked at your school to determine the appropriateness of these estimated vitamin losses.

More information on these considerations is available in the British Dietetic Association Toolkit[12] and in the School Food Trust's independent reviews of menu planning and nutrient analysis software[16].