Feeding the 1 to 7-year-old child. A support paper for the South African paediatric food-based dietary guidelines

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Abstract

Young children embark on a transitional nutritional journey, progressing from total reliance on caregivers to independence, autonomy and self-determination. Appropriate nutritional intake in young children is a diverse concept, incorporating suitable nutritional choices and feeding behaviours. Lessons learnt in childhood will have long-term effects on the individual and society overall. Since South African children are raised in a country where under- and over-nutrition exist simultaneously, a careful balance should be achieved in any national public health message. The South African paediatric food-based dietary guidelines for children younger than 7 years strive to facilitate the education of carers of young children in the adoption of healthy eating practices. The guidelines address issues regarding variety in the diet that has been shown to improve both micro- and macronutrient intakes. Specific reference is made to starchy foods, vegetables, fruit and water along with protein sources, which should be consumed regularly. Milk, has been emphasised in these guidelines because of the poor calcium intake in South African children. The only guideline that limits intake is the sweet treats or drinks message, because of public health concerns such as obesity and dental caries. Other messages pertaining to eating habits take cognisance of the child's physiological limitations in gastric capacity and suggest small regular meals. Clean, safe drinking water is the beverage of choice. Non-food-based guidelines are also included, which recognize the importance of active play, for developmental and health purposes, as well as regular clinic attendance.

Keywords: food-based dietary guidelines, pre-school children, South Africa.

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Appropriate nutritional intake in young children is essential to support continued growth and development. Children therefore represent one of the most nutritionally vulnerable groups in society. Dietary recommendations for the healthy child need to protect the rights of all children to adequate and appropriate nutrition, thus supporting ongoing optimal growth and development (Shaw & Lawson 2001). As outlined in the overview of the process paper, the South African paediatric food-based dietary guidelines (FBDGs) were conceptualized and created by a multidisciplinary team, with a paediatric focus (Bourne *et al.* 2007b).

This paper provides technical support to the proposed guideline statements for children aged >1 to <7 years. These statements are:

1. Encourage children to eat a variety of foods.
2. Feed children five small meals a day.
3. Make starchy foods the basis of a child's main meals.
4. Children need plenty of vegetables and fruit every day.
5. Children need to drink milk every day.
6. Children can eat chicken, fish, meat, eggs, beans, soya or peanut butter everyday.
7. If children have sweet treats or drinks, offer small amounts with meals.
8. Offer children clean, safe water regularly.
9. Take children to the clinic every 3 months.
10. Encourage children to play and be active.

Children and nutrition knowledge

The FBDGs for infants and young children in South Africa were written as a nutrition education tool to be used within all sectors of society and for both children and carers. Although there is no indication of nutritional knowledge influencing food choices in children at this age, it has been showed that children 4–7 years of age were able to understand some concepts relating to eating behaviour and health (Singleton *et al.* 1992). This emphasizes the importance of actively promoting the inclusion of nutrition awareness in pre-school curricula in order to consolidate healthy nutrition awareness.

Current nutrient intakes of South African children

In a recent technical report, Steyn *et al.* examined the main food groups consumed by South African children and adults in urban and rural areas. Table 1 shows the dietary intake of South African children aged 1–5 years. Although rural dwellers have a higher mean cereal and vegetable intake than urban children, the urban children far exceed their rural counterparts in the consumption of most other food groups. This is particularly true for all added sugar (sucrose), meat and offal, vegetable oil, dairy, fruit, roots and tubers (Steyn *et al.* 2006a).

'Encourage children to eat a variety of foods'

The transition from an 'all-milk' diet to 'table' foods between the ages of 6 months and 2 years represents a significant period of nutrition vulnerability. Children who are provided with a varied diet from a young age continue to consume a larger variety of foods in later life (Skinner *et al.* 2004b).

Using Krebs-Smith *et al.*'s (1987) total dietary variety score, a recent comparison of the South African Adult FBDGs (older than 7 years) (Vorster *et al.* 2001; Steyn *et al.* 2006b) with actual nutritional intakes of children aged 1–9 years from the 1999 South African National Food Consumption Survey (NFCS) (Labadarios *et al.* 2000) found that South African children, at this time, were not consuming an adequate variety of foods (Steyn *et al.* 2006b). Increasing the variety of foods consumed, although often difficult, has been shown to improve both macro- and micronutrient intakes. This is of particular important for nutrients such as calcium, iron and vitamins A, and C which are only found in a few foods (Maunder *et al.* 2001). These nutrients are found to be among the most common micronutrient deficiencies in pre-school children in developing countries (Labadarios *et al.* 2000; Muller & Krawinkel 2005; Mamabolo *et al.* 2006). By encouraging parents to offer a wide variety of nutritious foods, particularly colourful fruits, dark green leafy vegetables and deep yellow vegetables, in addition to foods rich in iron, such as lean meats and

Table 1. Food groups as consumed by South African children in urban and rural areas (adapted) (Steyn *et al.* 2006a)

Food groups	Children 1–5 years (<i>n</i> = 2048)		
	RSA g/day	Urban g/day	Rural g/day
Cereals	489	433	546
Sugar	65	93	39
Stimulants: tea and coffee	147	143	151
Vegetables	52	45	58
Meat and offal	45	56	34
Vegetable oils	5	6	3
Dairy	124	147	102
Fruit	48	70	27
Eggs	10	12	8
Legumes	17	15	18
Fish	7	8	5.8
Roots & tubers	29	32	27
Nuts and oil seeds	1	2	1
Soups	6	3	9
Condiments	0.2	0.2	0.1
Animal fat	0.1	0.1	0.2

RSA, Republic of South Africa.

iron-fortified cereals these nutritional problems may be addressed (Fox *et al.* 2004; Briefel *et al.* 2004).

‘Feed children five small meals a day’

In order to sustain growth, consumption of sufficient energy, protein and micronutrients is required. Young children have smaller gastric capacity and proportionally higher energy requirements than other age groups. This necessitates the ingestion of nutrient-dense foods in the form of two to three healthy snacks, in addition to three small meals each day. The type of snack provided can have a significant impact on the nutritional content of the child’s diet. Foods chosen for snacks should complement main meal choices and provide children with an important basis for lifelong healthy eating habits (Shaw & Lawson 2001; Thomas 2001). (Examples of portion sizes for meals and healthy snacks for young children can be found in Tables 2 and 3, respectively).

The phrase ‘five small meals’ as opposed to ‘three small meals and snacks’ was used as the word ‘snack’ elicited thoughts of highly refined convenience foods such as crisps, sweets and chocolate where as the phrase, ‘five small meals’ was seen to indicate more nutritious, healthy food choices.

‘Make starchy foods the basis of a child’s main meals’

During the consumer testing period of both the South African adult and paediatric FBDGs, the term ‘starchy foods’ was understood by the consumer groups to mean foods such as bread, cereals, grains, rice, pasta, potatoes, maize meal and flours (Steyn *et al.* 2006b; Bourne *et al.* 2007b).

A carbohydrate intake of 40–50% of total energy is recommended for children between the ages of 1 and 6 years (Shaw & Lawson 2001). Using the 24-h recall method of a representative sample of children aged 1–9 years, the 1999 South African NFCS reported an average carbohydrate intake of 65% of total energy in all provinces, with the exception of the Western Cape (59% of energy). This exceeds the above recommendations for carbohydrate as a percentage of total energy intakes. Nationally, maize porridge, added sugar (65% of which is from table sugar and 16.4% from carbonated drinks), brown bread and white bread contributed 70% of total carbohydrate intake in South African children aged 1–9 years (Labadarios *et al.* 2000). Maize porridge and bread contributed 27% and 14.8% of total energy intake, respectively (Vorster *et al.* 2001).

Table 2. Examples of serving sizes for pre-school children over the age of 1 year

	Number of servings per day	Food	Amount per serving
Starchy foods	3–6	Bread	1 slice
		Bagel, pita or roll	1/2
		Cereal cold	30 g
		Cereal hot	3/4 cup
		Cooked rice	1/2 cup
		Cooked potatoes	1/2 cup
		Cooked pasta	1/2 cup
Vegetables and fruit	4–6	Fresh, frozen or tinned vegetables	1/2 cup
		Leafy vegetables	1/2 cup
		Fresh, frozen or tinned fruit	1/2 cup
		100% fruit juice	125 mL (1/2 cup)
Milk and milk products	2–3	Cow's milk	1 cup
		Evaporated milk	1/2 cup
		Yoghurt	175 mL (1/2 cup)
		Cheese	50 g
Fish, poultry, meat and pulse vegetables	2–3	Cooked fish, shellfish, poultry, ostrich and lean meat	75 g (1/2 cup)
		Cooked legumes	3/4 cup
		Tofu	3/4 cup
		Eggs	2
		Peanuts and peanut butter	2 tablespoons

Nutrition requirements and actual intakes of healthy pre-school children vary widely both between different children and in individuals on different days. This variation is for a number of reason including age, body size, growth rate, appetite and activity level.

Table 3. Suggestions for healthy snack foods which are dentally friendly (Hunt 2003)

Food groups	Pre-school and school age
Breads and cereals	Breads preferably whole grain, crackers, rolls, toast, muffins made with minimal amounts of sugar and unsweetened dry cereals
Fruit and vegetables	Raw vegetables and fruit pieces, grated vegetables and salads, vegetable juices fresh or unsweetened, frozen or canned fruit in their own juices
Milk and milk products	Milk, yoghurt without added sugar, cheese, yoghurt or cottage cheese dips, cheese spreads
Meat, seafood, chicken	Hard boiled eggs, cheese, pieces of lean meat and/or chicken, tuna or sardines, peanut butter and other spreads made from pureed nuts, seeds and legumes

However, the 1999 NFCS also found that a fifth of South African children ingested less than half of their required daily energy needs and almost half of all South African children had an energy intake of less than two-thirds of their daily energy requirements (Labadarios *et al.* 2000). This trend was more noticeable in rural children than those living in an urban environment (Labadarios *et al.* 2000).

Age-appropriate healthy eating practices should be encouraged and complex carbohydrates, such as breads, cereals and grains, fruit and vegetables, introduced from a young age, would increase the nutritional value of the diet holistically without compromising optimal energy intake (Shaw & Lawson 2001). For example, Steyn *et al.* (2006b) found that a greater contribution to protein, fibre, zinc, niacin and

pyridoxine can be achieved by consuming brown as opposed to white bread.

It has been recommended that the minimum intake of dietary fibre for children older than 2 years should be 5 g plus the age of the child or 0.5 g per kg body weight (Edwards & Parrett 2003). Diets very high in fibre are, however, not recommended because of their bulky nature and the small stomach capacity of children. Additionally, the high anti-nutrient properties of some fibre-containing foods reduce the absorption of essential micronutrients (Shaw & Lawson 2001; Policy Statement *et al.* 2003).

Although low-fibre diets are not the sole protagonists of constipation, increasing fibre and fluid intakes are usually the first courses of action that should be undertaken by the caregiver. Constipation in pre-school children is a common concern. Although the condition is thought to be multi-factorial, diet is an important component. The average frequency of defecation is estimated to be four stools per day in the first week of life, two per day in the first year, which then diminishes to adult patterns of between three per day to three per week by the age of 4 years. Some children show an improvement in defecation patterns with the introduction of fibre and increase in fluid intake (Shaw & Lawson 2001).

'Children need plenty of vegetables and fruit every day'

Data from the NFCS 24-h recall method, estimated that less than 440 children out of a possible 2800 (just over 15%) had consumed any fruit in the last 24 h (Labadarios *et al.* 2000). The consumption of five colourful fruit and dark green leafy and yellow vegetable servings a day in toddlers is part of a healthy diet and can establish lifelong habits (Labadarios *et al.* 2000; Briefel *et al.* 2004). Skinner *et al.* reported that the number of different fruits and vegetables children were exposed to during the first 2 years of life was predictive of the variety consumed by the time children were of school-going age (Skinner *et al.* 2004b).

Sufficient intake of fruit and vegetables is important, as it normally correlates with the levels of certain micronutrients consumed. Fruit and vegetables have been reported to be the main sources of vitamins A

and C, while maize, bread and dried beans appear to be the major source of folate in South African children's diets (Labadarios *et al.* 2000; Vorster *et al.* 2001).

A proportion of people in South Africa practice vegetarianism in some form. Dietary surveys have found that lacto-ovo vegetarianism is generally satisfactory for children and can, if low in fats, reduce the risk of degenerative diseases. Children receiving vegan diets during the first 5 years of life are shown to grow less, but if the diet is nutritionally adequate, catch-up growth normally occurs by the age of 10 years. However, vegan diets must be planned carefully as they can be deficient in energy, protein, calcium, iron, zinc, riboflavin, vitamins B₁₂ and D and omega 3 fatty acids. Malnutrition has been seen in pre-school children on vegan diets. Mothers of vegan infants should be encouraged to breastfeed for at least the first 2 years of the child's life and older vegan children should be given soymilk fortified with calcium and vitamin B₁₂ (Shaw & Lawson 2001; Hunt 2003; Position of the American Dietetic Association and Dietitians of Canada 2003).

'Children need to drink milk every day'

Sufficient calcium intake during childhood can reduce the prevalence of osteoporosis and other chronic diseases in later life (Nicklas 2003). After the age of 1 year, the optimal intake of milk is considered to be 500 mL per day (Shaw & Lawson 2001). The World Health Organization (WHO) recommends continuation of breastfeeding into the second year of life and beyond. This is important as the micronutrient content of breast milk has a high bioavailability (WHO/2003). Milk is a valuable source of calcium, protein and energy but taken in excess may also diminish a child's appetite for other foods (Shaw & Lawson 2001; Vorster *et al.* 2001; Skinner *et al.* 2004b).

It is recommended that children over a year consume a minimum of 350 mg of calcium per day (Shaw & Lawson 2001) this can be acquired from a variety of sources. 350 mg of calcium can be obtained from any of the following; 300 mL cows milk, 75 g hard cheese, 175 mL yoghurt, 250 g bread or 50 g sardines. If children are unable to consume this amount daily

and/or their sources of calcium are mainly from vegetables, or if there is lactose intolerance or milk allergy, a calcium supplement should be considered (Shaw & Lawson 2001). In 1999, less than half of the recommended intake for calcium was achieved in 81–94% of South African children (Labadarios *et al.* 2000).

In Limpopo province, at the age of 1 year, calcium was shown to be one of the three most prevalent micronutrient deficiencies in children. The percentage of children with calcium deficiency increases further by the age of 3 years. In this province, at the age of 1 year, milk is one of the five most commonly consumed food items. By 3 years, it is outside the 20 most commonly eaten foods and tea is more frequently consumed than milk (Mamabolo *et al.* 2006).

Nationally, in South Africa, milk is one of only two animal products that contribute more than 5% of children's protein intake and milk intake generally falls well below the recommended 400–500 mL per day. Reasons for this appear to be mainly economic as is often evident in a country in transition (Labadarios *et al.* 2000; Vorster *et al.* 2001). Furthermore, there appear to be concerns about lactose intolerance among certain subgroups in the population.

Vitamin D is required for optimum calcium status. Dietary intake of vitamin D is important where there is little or no skin exposure to ultra violet light, particularly in darkly pigmented skin or when physiological requirements are particularly high, as they are in young children. However, in countries where there is usually adequate exposure to sunlight, it has been suggested that rickets is more likely due to calcium than vitamin D deficiency, and this may also be the case in South Africa (Pettifor 2004).

'Children can eat chicken, fish, meat, eggs, beans, soya or peanut butter every day'

The purpose of this guideline is to ensure an adequate intake of protein, as well as certain micronutrients such as iron and zinc. Protein intake of South African children is derived predominantly from maize porridge, bread, chicken and milk (the latter two providing 8.3% and 5.8%, respectively) (Labadarios *et al.* 2000). Diets supplying adequate amounts of energy will generally also provide sufficient protein. Recom-

mendations for protein intake in children between 1 and 7 years are approximately 15% of total energy although actual requirements are lower (Shaw & Lawson 2001). For poorer socio-economic groups, the inclusion of dried soaked beans, soya and peanut butter provide cheaper protein options. However, at present none of these foods contribute to more than 5% of total protein intake (Labadarios *et al.* 2000; Vorster *et al.* 2001).

Requirements for iron peak during periods of rapid growth such as in early childhood. South African children receive, on average, between 41% and 63% of their required daily iron intake (Labadarios *et al.* 2000). Studies indicate that low-iron intake causes behavioural changes and delayed psychomotor function, as well as having a negative impact on cognitive function and intelligence (Kazal 2002).

Iron deficiency anemia is usually caused by late introduction of and inappropriate choices of complementary foods and the early introduction of cow's milk, which is a poor source of iron and may in some children result in intestinal blood loss (Kazal 2002). If iron is predominately from non-haem sources, iron enhancers, such as vitamin C-rich fruit or diluted fruit juice, should be consumed with a meal (Shaw & Lawson 2001).

Anti-nutrients which inhibit iron absorption, such as tannins and polyphenols found in tea and coffee, and oxalates and phytates found in some fruit and vegetables should not be eaten in conjunction with iron-rich foods (Kazal 2002). It is common practice for South African children to be given herbal teas such as '*Rooibos*' (an indigenous South African plant where leaves are dried and infused to make tea) which, although generally do not contain tannins, provide little or no nutritive value and are often consumed in large quantities, displacing intake of other nutrients including iron. Intake of large quantities of herbal teas and other beverages over and above fluid requirements is therefore not recommended.

'If children have sweet treats or drinks, offer small amounts with meals'

South African pre-school and school children receive 9% of their carbohydrate intake and 5.5% of their

total energy intake in the form of sucrose (Labadarios *et al.* 2000; Vorster *et al.* 2001). WHO and Food and Agricultural Organization of the United Nations (FAO) set the goal of limiting sugar intake to 10% of energy or less (WHO/FAO 2003). However, these recommendations were not necessarily targeted towards children. Although generally low, the intake of sugar is considerable in certain South African paediatric population subgroups. It is also important to note that 16.4% of the intake of sugar in South African children is derived from cold drinks which are normally not consumed with meals and have a cariogenic risk (Labadarios *et al.* 2000; Vorster *et al.* 2001).

According to NFCS data, the percentage of energy intake derived from added sugar was highest in the Western Cape and Northern Cape (13–14%E) and lowest in the Free State, Northern Province and Mpumalanga (Labadarios *et al.* 2000). In recent data from the Limpopo Province, added sugar intake more than doubled between the ages of 1 and 3 years (Mamabolo *et al.* 2006). Although it is recognized that in certain population groups in South Africa, sugar provides an important affordable component of the energy content in the child's diet, parents should be encouraged to limit the number of sugar-containing drinks, desserts and sweets between meals (Labadarios *et al.* 2000; Tinanoff & Palmer 2000; Ponza *et al.* 2004; Mamabolo *et al.* 2006).

Ideal snack foods are those which stimulate the production of saliva (e.g. raw vegetables and protein-containing foods) and thus result in minimal adherence to the tooth. Suggestions for healthy snack foods are outlined in Table 2 (Hunt 2003). In order for teeth to be able to remineralize and for saliva to neutralize acids, it is recommended that children reduce high-frequency exposures to obvious and hidden sugars. This can be achieved by avoiding frequent consumption of sugar-containing drinks in bottles and 'sippy-cups', particularly at sleep times, and promoting non-cariogenic foods for snacks (Tinanoff & Palmer 2000; Butte *et al.* 2004).

'Offer children clean, safe water regularly'

South Africa as a whole consumes 65% of its sugar as table sugar. This amounts to 5.5% of total energy

intake, considerably lower than the goal of below 10% set by the WHO (Labadarios *et al.* 2000; Kazal 2002). However, cognisance must be taken that a significant 16.4% of this sugar comes from cold drinks (Labadarios *et al.* 2000). There is some evidence of an association between the risk of obesity in children and the consumption of sugar-rich drinks (such as carbonated cool drinks, sports drinks, fruit juices and other sweetened fruit drinks). The consumption of cold drinks has been related to bone fracture risk and dental caries prevalence in adolescents and pre-school children, respectively (Skinner *et al.* 2004a), while high intakes of fruit juice have been associated with a decreased intake of milk (Nicklas 2003; Mamabolo *et al.* 2006).

The consumption of water should be encouraged from an early age as early food and drink preferences (2–4 years of age) are highly predictive of preferences later in childhood. Consequently, water should be offered in place of sugar-rich drinks (Nicklas 2003), this is discussed further in this issue by Bourne *et al.* (2007a). Exposure of infants (6 months) to sucrose-containing drinks increases their subsequent consumption of sugar-containing drinks in comparison to children who had not had similar exposure (Nicklas 2003). Mineral water and sports drinks are not recommended in young children as they are often high in electrolytes. An excess of any fluid should be discouraged (Nicklas 2003; Bourne *et al.* 2007a).

The National Diet and Nutrition Survey Dental Survey (UK) indicates that a common cause of dental caries in children aged one and a half to 4 years is the high prevalence of bedtime and nocturnal consumption of sugar-containing drinks (including milk). It is recommended that a policy of 'water only after brushing' be adopted (Nicklas 2003).

Other food-related issues pertaining to children aged 1–7 years

'Take children to clinic every 3 months'

Primary healthcare facilities and mother and baby clinics are the principle sources of nutritional health-care information for many South African children. These clinics provide pre-school children and their

carers with growth monitoring procedures, and nutrition education. The integration of the PFBDG with the existing nutrition and child healthcare programmes, derived from WHO and United Nations Children's Emergency Fund (UNICEF), is further discussed in the FBDGs nutrition intervention for children at primary healthcare facilities in South Africa (Hendricks *et al.* 2007).

'Encourage children to play and be active'

The benefits of ongoing regular physical activity and active play are well known and include reduced risk of osteoporosis, cardiovascular disease, hypertension, some cancers, obesity and diabetes (Ruiz *et al.* 2006). Active play or gross motor play in pre-school children also improves social, emotional and cognitive development (Burdette & Whitaker 2005).

Prevention of obesity starting in childhood is critical and can have a lifelong, perhaps multi-generational, impact (Oken & Gillman 2003). There is a growing concern in South Africa regarding the prevalence of overweight and obesity in school-going children (Armstrong *et al.* 2006). The risk of developing obesity may be causally linked to both environment and genetics, with parental obesity being a strong predictive factor. Parenting styles may impact on the type and amount of food consumed. Eating, sedentary behaviours and exercise choices of children are often modelled on family behaviours (Birch & Fisher 1995; Policy Statement *et al.* 2003; Scottish Intercollegiate Guidelines Network 2003; Skinner *et al.* 2004b; Armstrong *et al.* 2006).

A South African study of 10 195 school children between the ages of 6 and 13 years from all provinces and socio-economic categories showed a prevalence of overweight in girls and boys of 17% and 14%, respectively. Obesity prevalence rates of 4.9% for girls and 3.2% for boys were recorded (Armstrong *et al.* 2006). Steyn *et al.* (2006a) associated stunting in childhood with an increased risk of overweight in South African adults. This finding suggests that stunting in childhood predisposes children to become overweight or obese when sufficient food is available. This poses a threat for the emergence of chronic disease risk factors when these stunted children become obese adults.

Because of the increased adoption of a sedentary lifestyle, physical activity and decreased television viewing should be encouraged as the amount of truncal movement performed by a child each day is a predictive risk factor for obesity (Burdette & Whitaker 2005; Ruiz *et al.* 2006).

Strategies which may help to increase levels of physical activity are (Burdette & Whitaker 2005; Ruiz *et al.* 2006):

- play during lunchtime at school;
- encouraging schools to have sufficient facilities for children to play outside;
- encouraging children to walk or cycle to school with their caregivers; and
- encouraging children to take part in school sporting activities.

It is recommended that children accumulate at least 30–60 min of moderate-intensity physical activity per day; this should include spontaneous playing, physical education, organized games and sports (Burdette & Whitaker 2005; Ruiz *et al.* 2006). In addition to this, the American Academy of Paediatrics states that television viewing is inappropriate for children under the age of 2 years because of its potential negative influences on development and activity as well as the aggressive promotion of nutrient-empty foods in advertisements (Policy Statement *et al.* 2003).

Other food-related issues pertaining to children aged 1–7 years

Neophobia or picky eaters

Parents commonly describe a toddler as being a picky eater if a limited variety of foods is consumed. Most children may be considered neophobic with respect to food, fearing new flavours and textures. This occurs predominately in the 3–5-year-old age group. This may be overcome with repeated non-threatening exposure to a particular food item. It has been demonstrated that eight to 15 exposures to the food in question are required before that food will be accepted and liked by a child (Butte *et al.* 2004; Devaney *et al.* 2004; Fox *et al.* 2004).

Familial interactions are increasingly recognized as a source of problems around feeding. Various environmental factors contribute to creating a situation that is not conducive to an optimal eating experience for young children. These include unrealistic parental expectations of age appropriate intake, failure of parents to model an appropriate mealtime, irregular meals and the consumption of meals while watching television or eating in an area where there are many distractions such as toys (Birch & Fisher 1995).

A common misconception among parents is that if a child refuses to eat a particular food the first time that it is presented that the dislike will be lifelong. If new foods are not introduced repeatedly, then some children will end up consuming a limited variety of foods (Butte *et al.* 2004; Devaney *et al.* 2004; Fox *et al.* 2004). Food choices are also associated with peers and or hero figures (Butte *et al.* 2004; Devaney *et al.* 2004; Fox *et al.* 2004).

It has been found that fussy eaters are often diagnosed by occupational therapists with tactile defensiveness, which can be described as an 'observable overreaction or withdrawal response to the experiences of touch or to other types of sensory stimuli that most people experience as inoffensive' (Smith *et al.* 2005). This can limit food choices and variety, while introducing 'messy play' and encouraging children to touch and interact with their food from a young age can avert this problem.

Table 4, below, provides an outline of useful factors when evaluating behavioural problems connected with learned associations (Shaw & Lawson 2001).

Failure to thrive

The causes of failure to thrive can be of both organic and inorganic origin. Inappropriate nutrition intake is

a vital predisposing feature of failure to thrive. While inorganic failure to thrive is caused by inappropriate nutritional intake, organic failure to thrive is usually seen when the nutritional intake is unable to meet the individual's nutritional requirement because of an underlying physical or medical condition. Determining factors inhibiting appropriate nutrition intake, can be elucidated by the use of a food diary (where appropriate), food recall and diet history. This information provides insight into feeding routine, food refusal, quantity, quality, types of foods and beverages and the frequency with which they are eaten (Shaw & Lawson 2001).

Food intolerance and allergy

It has been estimated that up to 6% of young children are affected by an adverse immune response to food (Sampson 2003). The greatest prevalence of food allergy diagnosis is reported in the birth to 1 year age group (Pearl 1997). Parental reporting of perceived food allergies and intolerances, however, have been estimated at 13–43% in pre-school children potentially causing unnecessary food restrictions and potential nutritional inadequacy as a result (Eggesbe *et al.* 1999).

Currently, double-blind placebo controlled trials show that more than 90% of all food invoked allergic reactions in childhood are as a result of cows milk, hen's eggs, peanuts, fish, soya and wheat. Fifty per cent of infants with cow's milk allergy will outgrow it by 1 year of life and 50% of those allergic to egg will outgrow them by 3 years (Fiocchi & Martelli 2006). It is therefore important to periodically re-challenge children, under professional guidance to prevent unnecessary dietary restrictions.

Table 4. Useful mealtime observations (Shaw & Lawson 2001)

Child	Parents
Expression of interest in own and the food of others	Awareness of child's needs and demands
Desire to feed or drink independently	Ability to tolerate mess
Quantity, texture and type of food eaten	Quantity, texture and type of food offered
Ability to concentrate and persevere	Management style, e.g. frustration and anxiety
Reaction to parent's behaviour	Control over child's behaviour

Conclusion: achieving nutrition requirements in the young child

Adequate nutrition intake may be reached by providing three meals and two to three small nutritious between-meal snacks. Total intake should be based on a wide variety of foods, including meat, chicken, fish, eggs and dairy products, fruit and vegetables, cereals and other starch-containing foods, such as potatoes and rice, with an emphasis on nutrient-dense foods.

Like other areas of development, children go from total dependence to independence. Independent feeding is not just the ability to get food onto the spoon, move it to the mouth and chew, but also the ability to make sound food choices and to eat for pleasure, health and satiety.

The infant progresses from being fed by the caregiver to meet his or her needs, to being able to participate in the process by 9 months. By 6 years of age, it is reasonable to expect children to have adopted the basic family attitudes to eating and participate in appropriate feeding behaviours.

Children should be allowed to develop feeding habits and determine intake by being offered a variety of foods at each meal. Foods which appear to be disliked should continue to be offered at different meals as acceptance of variety may not be immediate. Allowing children to eat to appetite and not force feeding ensures the continued existence of physiological satiety cues throughout life, reducing their risk for chronic diseases of lifestyle.

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