



FEEDING CHILDREN: 4 - 6 YEARS

The information explosion in the science of nutrition very often creates the impression that available information is contradictory. Consequently, it is no longer easy to distinguish between fact, misinformation and fiction. The Nutrition Information Centre of the University of Stellenbosch (NICUS) was established to act as a reliable and independent source of nutrition information.

As children grow, their world expands and their social contacts increase in importance. They have a decreased interest in food and an increased interest in the world around them. They acquire knowledge by leaps and bounds and the early years are ideal for providing nutrition information and promoting positive attitudes about all foods. It is natural to enjoy food and it is the task of the parent to see that the child grows up with a positive attitude towards food.

Food Choices during Childhood

Children are growing and developing teeth, bones, muscles and blood and therefore need more nutritious food in proportion to their weight than adults. To provide all the essential nutrients, a child's meals and snacks should include a variety of foods from each group in amounts suited to the child's appetite and needs. Serving sizes increase with age. A portion of meat, grains, fruits or vegetables for children is loosely defined as 1 tablespoon for each year. (This rule of thumb applies until children reach the age of 12). To ensure that children have healthy appetites for food when they are hungry, parents and caretakers should make sure that any sweets, sweetened cooldrinks and concentrated sweets are allowed in moderation and not in place of nutritious food. Nutritional disorders such as obesity and dietary inadequacies are more likely to occur when nutrient dense foods (such as bread, milk, meat fruit) are replaced with less nutrient dense foods (such as sweets, sugar, cooldrinks). See table below.

Recommended Daily Food Intake for Good Nutrition

FOOD	2-TO 3-YEAR-OLDS		4-TO 6-YEAR-OLDS		COMMENTS
	Portion size	No of servings	Portion size	No of servings	
Milk and dairy products	½ cup	4-5	½-¾ cup	3-4	The following may be exchanged : ½ cup of milk, ½ cup yogurt , 15-20 g of cheese , 2½T nonfat dry milk powder
Meat, fish, poultry, legumes	30 - 60 g	2	30 - 60 g	2	The following may be exchanged :1 egg , 2T peanut butter , 4-5 T cooked legumes
Fruit and Vegetables		4 - 5		4 - 5	
Vegetables	2-3T cooked or few pieces raw		3-4 T or few pieces raw		Include one green leafy or yellow vegetable for vitamin A (spinach, carrots, broccoli)
Fruit	½-1 fresh or 2 - 4 teaspoon canned or 125 ml juice (pure)	1	½-1 fresh or 2 - 4 teaspoon canned or 125 ml juice (pure)		Include one vitamin C-rich fruit or juice : citrus, strawberries, melon tomato
Total of bread and grain products: Choose:		3		3	
Bread: whole grain or enriched	½-1 slice		1 slice		The following may be exchanged: 1/2 cup spaghetti, macaroni, noodles or rice
Cooked cereal	¼-1/2- cup		½ cup		
Dry cereal	½-1 cup		1 cup		
Fats and Oils	30 - 40 ml*				
Sweets and snacks: Sugar, jam, honey, sweets, sweetened cooldrinks, chocolates, crisps cookies, ice cream, etc.	In addition to and not as a substitute of nutrient dense foods . To be consumed according to level of physical activity and nutritional status of the child.				

Adapted from Krause and Mahan, 11th edition

T: tablespoon

* Guideline: 25 -30% fat of total energy roughly equals 30-40 ml in addition to fat from low fat milk and meat.

Nutrient Needs:

The Dietary Reference Intakes (DRI's), which replace the periodic revisions of the Recommended Dietary Allowances (RDA's), are based on current knowledge of nutrient intakes for optimal health.

Energy and Protein:

Dietary energy must be sufficient to ensure growth and spare protein from being used for energy without being so excessive as to cause obesity. A suggested proportion of energy is 50% - 60% as carbohydrates, 25% - 30% as fat and 10% - 15% as protein. Energy requirements of healthy growing children vary mostly, depending on their physical activity level and age. It is best to determine energy requirements on an individual basis using kilocalories per kg of weight or per cm of height. Protein needs decrease from approximately 1.2g per kilogram in early childhood to 1g per kilogram in late childhood. Energy requirements decline on an age-specific basis from 102kCal / kg for 1-3 year olds to 90kCal / kg for 4-6 year olds.

Recommended Dietary Allowances for Energy and Protein for Children

Age (Years)	KCAL			Protein g	
	Daily	Per kg	Per cm	Daily	Per kg
1-3	1300	102	14.4	16	1.2
4-6	1800	90	16.0	24	1.1
7-10	2000	70	15.2	28	1.0

Vitamins and Minerals:

The vitamin and mineral needs of children increase with their age. In general terms, a good planned and varied diet can meet the vitamin and mineral needs of children. **BUT:** The results of the National Food Consumption Survey of South African children aged 1-9 years (1999) showed that a very significant percentage of the country's population lives under adverse socio-economic conditions and that the dietary intake of micronutrients (see below) is poor. Socio-economic upliftment is considered essential to sustainable reduction of micronutrient deficiencies and undernutrition in general. This emphasizes the need to include and eat micronutrient dense food and to choose fortified staples and breakfast cereals as financial circumstances allow.

DIETARY REFERENCE INTAKES																	
AGE Years	VIT A (µg RE)	VIT E (mg α-TE)	VIT K (µg)	VIT C (mg)	Iron (mg)	Zinc (mg)	Iodine (µg)	Selenium (µg)									
4-6	400	7	55	25	10	5	90	30									
DIETARY REFERENCE INTAKES OF SELECTED TRACE ELEMENTS																	
AGE years	COPPER (µg)		MANGANESE (mg)		CHROMIUM (µg)		MOLYBDENUM (µg)										
4-6	440		1.5		15		22										
DIETARY REFERENCE INTAKES																	
LIFE-STAGE GROUP years	CALCIUM (mg/d)	PHOSPHORUS (mg/d)	MAGNESIUM (mg/d)	VITAMIN D (µg/d)	VITAMIN E* (Mg/day)	VITAMIN C* (Mg/day)	SELENIUM*	FLUORIDE (mg/d)	THIAMIN (mg/d)	RIBOFLAVIN (mg/d)	NIACIN (mg/d)	VITAMIN B6 (mg/d)	FOLATE (µg/d)	VITAMIN B12 (µg/d)	PANTOTHENIC ACID	BIOTIN (µg/d)	CHOLINE (mg/d)
1-3	500	460	80	5	6	15	20	0.7	0.5	0.5	6	0.5	150	0.9	2	8	200
4-8	800	500	130	5	7	25	30	1.1	0.6	0.6	8	0.6	200	1.2	3	12	250

Dietary Reference Intakes - 2000

Results of The National Food Consumption Survey of South Africa (1999)

For South African children as a whole, the dietary intake of the following nutrients was less than 67% of the RDAs:

Energy, Calcium, Iron, Zinc, Selenium, Folic Acid, Vitamin A, Vitamin D, Vitamin C, Vitamin E, Riboflavin, Niacin, Vitamin B6

General guidelines to ensure adequate dietary intake in this age group:

- Enjoy a variety of foods
- Make starchy foods the basis of most meals
- Eat plenty of fruits and vegetables every day
- Eat legumes regularly
- Foods from animals can be eaten every day
- Use fat sparingly
- Use salt sparingly
- Drink lots of clean, safe water
- Be active!

Food Based Dietary guidelines for children younger than five years of age are in the process of being developed.

Vitamin and Mineral Supplementation:

If the decision is made to supplement a child's diet with a multivitamin and mineral supplement, it is important to make sure that the supplement contains all or most of the individual vitamins and minerals according to the DRI's or at least 50 - 150% of the DRI's, since many supplements may or may not provide iron, zinc, calcium or other minerals. Daily supplements FOR well-fed, healthy, growing children are unnecessary, since their diets generally supply sufficient vitamins and minerals to meet their requirements. Children suffering from malnutrition, anorexia or poor food intake, children adhering to restricted diets such as vegetarianism or suffering from chronic diseases such as cystic fibrosis may benefit from supplementation of vitamins and minerals. Irrespective, the inclusion of fortified foods such as breakfast cereal and fortified staple foods in the children's diet is to be strongly recommended.

Adequacy of dietary intake cannot be assured without a detailed dietary history and the help of a dietitian. The need for supplementation is therefore best addressed on an individual level.

Nutrition-Related Problems in Childhood:

The findings of the National Food Consumption Survey indicated that: One out of ten of all children aged 1 – 9 years was underweight and just more than one in five was stunted. Furthermore, younger children (1 – 3 years of age) were most severely affected, as were those that lived in the rural areas and on commercial farms in particular. The level of maternal education was an important determinant for these nutritional disorders. *(The authors elected to focus on childhood obesity and food intolerance as nutritionally related problems and will not cover the causes, treatment and consequences of undernutrition and hunger in children, since the topic needs considerable discussion. However, childhood undernutrition is one of the major health problems in South Africa and needs special intervention. A number of government schemes are available to which these children and families can be referred to within the Integrated Nutrition Programme.)*

By contrast and highlighting the diversity of nutritional disorders in the country, the same survey showed that one out of thirteen children were overweight in the formal urban areas, a prevalence that was even higher among children (one out of eight children) of well educated mothers.

Childhood Obesity:

The longer a child has been overweight, the more likely that the overweight state will continue into adolescence and adulthood. Consequences of obesity in childhood include psychosocial difficulties and increased frequency of hyperlipidemia, hypertension and abnormal blood glucose control. Obese children display an abnormal blood lipid profile, high levels of total cholesterol, triglycerides, LDL cholesterol and VLDL cholesterol. Research has also confirmed an association between blood lipids and physical activity in children similar to that seen in adults. There is considerable evidence that obesity in childhood creates the metabolic platform for adult cardiovascular disease and that obesity is an important determinant of insulin resistance in children.

Cholesterol values for children and Adolescents:

Disease Risk	Total Cholesterol (mg/dL)	LDL Cholesterol (mg/dL)
Acceptable	< 170	< 110
Borderline	170-199	110-129
High	≥ 200	≥ 130

Children with high blood cholesterol should first be treated with diet and if, in children 10 years and older, blood cholesterol remains high after 6-12 months of dietary intervention, then drugs may be used to lower blood cholesterol.

Furthermore inactivity plays a major role in obesity development whether it results from television and computer use, limited opportunities for further physical activity or safety concerns that prevent children from enjoying free play outdoors. Television fosters obesity because it requires little energy beyond basal metabolism and replaces vigorous activities and may lead to increased food intake.

There has been a lack of consensus in identifying obesity in this age group, but internationally based cut-off points for body mass index for overweight and obesity have now been published. BMI has its limitations in determining obesity owing to variability related to sex, race and maturation stage.

Published cut-off points for body mass index for overweight and obesity by sex between 4 and 12 years of age

Age (years)	Body Mass index 25		Body Mass index 30	
	Boys	Girls	Boys	Girls
4	17.6	17.3	19.3	19.1
4.5	17.5	17.2	19.3	19.1
5	17.4	17.1	19.3	19.2
5.5	17.5	17.2	19.5	19.3
6	17.6	17.3	19.8	19.7
6.5	17.7	17.5	20.2	20.1
7	17.9	17.8	20.6	20.5
7.5	18.2	18.0	21.1	21.0
8	18.4	18.3	21.6	21.6
8.5	18.8	18.7	22.2	22.2
9	19.1	19.1	22.8	22.8
9.5	19.5	19.5	23.4	23.5
10	19.8	19.9	24.0	24.1
10.5	20.2	20.3	24.6	24.8
11	20.6	20.7	24.1	25.4
11.5	20.9	21.2	25.6	26.1
12	21.2	21.7	26.0	26.7

Adapted from Cole et al.

The most common form of growth monitoring in South Africa is the weight-for-age index. Children are weighed at Health Care Centres from birth up to the age of 5 years. Weights are compared to international reference standards for nutritional screening, with specific cut-off points to diagnose over-and underweight. The Road-To-Health Card (RTHC) has four percentile lines. If the child's **weight-for-age** falls above the 97th percentile line, overweight is indicated. A **weight-for-height** above the 75th percentile could indicate the onset of obesity and may require intervention. Children at risk should be monitored frequently so that early intervention can be provided.

Preventative strategies are thus also important in the fight against childhood overweight and obesity. Goals for prevention include establishing healthy environments for children at home, at school, and in the community. These environments should encourage families and children to practice and maintain the life skills that are conducive to maintaining a healthy weight.

The importance of parenting skills and teacher training in helping young children learn and practice healthy behaviours is being increasingly recognized. Targets for behavioural intervention include increasing consumption of fruits and vegetables ("5-a-day"), increasing consumption of fibre-containing grain products, changing from full-fat to 2% or fat-free dairy products after 5 years of age, preparing and eating family meals at home, increasing daily physical activity (e.g., active play 1 h/d), and restricting sedentary time (e.g., watching television for ≤ 2 h/d).

Treatment of Childhood Obesity:

An integrated approach is recommended involving diet, physical activity, psychological support and behavioral changes. In cases of excessive weight gain it is essential for the whole family to change their eating habits. The initial goal for obese children is to reduce the rate of weight gain with continued growth, which will accomplish the desired change in weight for height. Energy dense foods should be avoided and the intake of fat and refined carbohydrates (e.g. sweets, sweetened cooldrinks, high fat fried food) should be restricted.

The energy intake in this age group could, under expert supervision, be restricted by 100-200 kCal per day. The traffic light diet approach, when used as part of a comprehensive treatment, has produced significant decrease in obesity in preschool and preadolescent children. The diet is based on the food pyramid and groups food into categories: green food (go) may be consumed in unlimited quantities (e.g. nutrient dense foods such as fruit, vegetables, unrefined carbohydrates, dairy product lean meat and meat substitutes such as legumes and soy), **yellow foods (caution)** have an average nutritional value for the foods within the group (e.g. muffins, home baked cookies, high fat meats and processed meat products such as beef patties and viennas, take-away foods and sugar coated dried fruit snacks) and **red foods (stop/restrict)** provide less nutrient density per calorie because of high fat or simple carbohydrate content (e.g. potato crisps, hard boiled sweets, sweetened cooldrinks). Promotion of age-appropriate serving sizes is also important and contributes to helping the child develop and sustain healthful eating habits. Additionally, it is important that healthcare professionals help parents or caregivers recognise and prevent overeating.

The American Heart Association has released five guiding principles are important for the treatment of childhood overweight.

These guiding principles can be summarized as follows:

1. Establish individual treatment goals and approaches based on the child's age, degree of overweight, and presence of comorbidities.
2. Involve the family or major caregivers in the treatment.
3. Provide assessment and monitoring frequently.
4. Consider behavioural, psychological, and social correlates of weight gain in the treatment plan.
5. Provide recommendations for dietary changes and increases in physical activity that can be implemented within the family environment and that foster optimal health, growth, and development.

Additionally, dietary recommendations should emphasize decreasing the number of meals eaten outside the home, planning for healthier snacks, offering healthier, low-energy food choices (especially fruit and vegetables) and structuring eating times and places for family meals.

Counselling and recommendations must be made within the context of the family's living environment, socio-economic status and culture.

Food Intolerance:

The term food intolerance is used to denote reactions to food or food ingredients (toxic, metabolic or idiosyncratic reactions), which do not involve a known immune mechanism. Reactions include abdominal discomfort and pain, diarrhoea, asthma, urticaria and headaches and are often the same as those related to food allergies. Food intolerance includes reactions to specific foods when taken in large amounts (e.g. caffeine in multiple cups of coffee or tea), irritants in foods (e.g. spicy foods) and digestive impairment (e.g. lactose intolerance). A child can be intolerant to one or more foods. Food intolerance is usually diagnosed by relief of symptoms following withholding of the suspected food or its ingredient(s). Sulphites and monosodium glutamate (MSG) are food additives well known for the reactions they cause in people. Although the prevalence of these sensitivities in the general population is unknown, sulphites appear to affect mainly children and adults with

asthma and children more so than adults. Many foodstuffs contain sulphite preservatives, the most important being cooldrinks, dried fruit, cold meats. Reactions can be as mild as a throat irritation, to life-threatening bronchospasm, urticaria and exacerbation of eczema. MSG is a well-known flavour-enhancing additive, which is added to many foodstuffs. Clinical effects include asthma, The Chinese Restaurant Syndrome (headache, a burning sensation along the back of the neck, chest tightness, nausea, sweating and pins and needles in the face and limbs), urticaria and orofacial granulomatosis. Food labels should be read carefully, since avoidance of MSG containing foods remains the only treatment.

In general lactose intolerance is grossly overestimated. As a general rule, it is not always necessary to exclude lactose completely from the diet. Indeed, most people can consume a cup of milk or the equivalent of 12g of lactose with a meal without adverse effects. In addition, cultured dairy products, such as yoghurt, contain less lactose and can also be consumed, in moderate quantities, without any adverse effects. Nevertheless, there remains a small proportion of the population, who do develop unpleasant gastrointestinal symptoms, ranging from diarrhoea to flatulence to abdominal cramps soon after they consume milk. Such children's diets should be limited with dairy according to tolerance. Exclusion of any foods from a child's diet should only be implemented under the professional supervision of a dietitian to ensure adequate growth and variety.

To conclude:

In terms of a "healthy diet for a growing child" no one particular food must be eaten or be avoided in ensuring adequate nutrition. However, certain aspects of food should not be overlooked: The child should be offered a variety of foods. Milk is important, but should be limited to 600 ml per day and not replace solid foods, staple foods, preferably fortified, should be eaten daily according to appetite. Although the frequent consumption of fruit and vegetables is recommended and encouraged, the consumption of large amounts of these foods may cause abdominal discomfort and diarrhoea. Protein should be eaten according to requirements (meat, milk, eggs or meat substitutes) according to affordability.

Fat is important for energy provision as well as essential fatty acids. However, fat and refined carbohydrate intake should be moderated to prevent obesity and associated problems such as diabetes, hypertension, atherosclerosis and bone and joint abnormalities in later life. The need for generalized micronutrient supplementation is a hotly debated subject, but there is a general agreement that provided the diet of a child is adequate in energy and protein intake, deficiencies are unlikely to occur.

For further, personalized and more detailed information, please contact NICUS or a dietitian registered with the Health Professions Council of South Africa.

References from the scientific literature used to compile this document are available on request.

NICUS

Nutrition Information Centre of University of Stellenbosch
Division of Human Nutrition
P.O. Box 19063, Tygerberg, 7505
Tel: (27) 021-933 1408, Fax: (27) 021-933 1405
E-Mail: nicus@sun.ac.za
WEBSITE: <http://www.sun.ac.za/nicus/>

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