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Report of the working group on energy requirements of infants, children and adolescents

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General principles

1. Energy requirements of infants, children and adolescents should be estimated from measurements of *energy expenditure and growth*.
2. Recommendations for dietary energy intake should be consistent with the growth reference values endorsed by WHO.
3. Energy for play and other socially desirable endeavours including physical activity, exploration of the surroundings, learning and interactions with other children and adults is necessary for normal growth and development.
4. Because there are large differences between the lifestyles of children and adolescents in developed and developing societies, both in terms of occupational and discretionary activities, energy requirements will be determined largely by the level of physical activity.

Infants

1. Current FAO/WHO/UNU recommendations for dietary energy intake of infants seem too high, based on reported measurements of total energy expenditure and estimations of the energy deposited for growth. This observation should be confirmed by expansion of the available database on total energy expenditure of healthy infants, in terms of sample size and geographic distribution across the entire age range of infancy. Data are particularly scarce in the second 6 months of infancy.
2. Given the relative uniformity of behavior, physical activity and growth of infants from different geographic origins, the Working Group believes that

estimates of energy requirements can be applied universally to *healthy* infants.

3. More data must be sought on total energy expenditure of infants in populations at risk of high rates of infection and exposed to other sources of stress to determine if energy requirements are altered under these circumstances, taking into account also the needs for adequate catch-up growth.
4. To better define the energy cost of growth, changes in body composition during infancy must be confirmed.

Children and adolescents

1. The Working Group's recommendation to base energy requirements on energy expenditure and energy deposition were based on the following considerations:
 - (a) Compared with energy expenditure data, dietary intake data of population groups tend to overestimate energy requirements of children under 8, and to underestimate requirements of children over 12 years of age (the latter more so in rural developing areas).
 - (b) Current FAO/WHO/UNU recommendations for dietary energy seem too high for children under 5 and possibly under 8 years of age. The 5% added to the 1985 FAO/WHO/UNU dietary energy recommendations for children under 10 years of age (in order to allow for a desirable level of activity) seems unwarranted.
 - (c) Current recommendations seem somewhat low for adolescent boys in all societies, especially in rural developing areas. Current recommendations also seem somewhat low for adolescent girls in developing countries.
2. There is a need to expand the Schofield database on BMR of children and to evaluate the impact of the

updated database on the prediction of BMR of children of different ethnic backgrounds.

3. Habitual physical activity of urban children of lower socioeconomic status living in developing countries differs from that of their counterparts in urban developed and rural developing areas.
4. Because of the differences in lifestyles between developed and developing countries, recommendations for dietary energy intake of children over 5 years of age and adolescents should be made according to three levels of *habitual* physical activity similar to the 1985 FAO WHO UNU recommendations for adults.
5. To facilitate making specific recommendations for children and adolescents with different lifestyles, the Working Group recognized the need to:
 - (a) develop a standardized procedure for the collection of time allocation data in different societies across all age groups;
 - (b) obtain more information on the energy cost of activities in which children and adolescents typically engage;
 - (c) develop new approaches for a rapid assessment of the level of habitual physical activity.
6. Dietary energy recommendations for children must be accompanied by strong recommendations for levels of physical activity compatible with the achievement and maintenance of health and the prevention of obesity.
7. It is recognized that the energy requirements for the growth spurt in adolescence are not fully known.

More information is needed on body composition changes during the growth spurt in adolescence in order to quantify the energy cost of tissue deposition and the additional dietary energy needed during this period.

Methodological considerations

1. At present, the doubly-labelled water technique provides the most exact quantitative measurement of total energy expenditure of free-living individuals.
2. Minute-by-minute heart rate monitoring techniques are promising, less costly and more accessible, and should be validated more extensively in children against the doubly-labelled water method.
3. Time and motion activity diaries can be used to estimate the energy expenditure of children, but the energy cost of activities used to calculate energy expenditure should be specific to the child's age and sex. Time and motion activity diaries should also be validated in children in the field against the doubly-labelled water method or against minute-by-minute heart rate monitoring if the latter is considered acceptable, as described in the preceding paragraph.
4. Dietary energy intake surveys can be used to estimate the adequacy of diets. Intake data should be derived from representative population samples, and screened and edited to exclude data incompatible with fundamental principles of energy physiology.