NUTRITIONAL REQUIREMENTS OF THE PRESCHOOL AND PRIMARY SCHOOL CHILD

J. D. L. HANSEN, M.D., M.R.C.P., D.C.H., *Department of Child Health, University of Cape Town*

This Congress has adopted as its theme the nutrition of the preschool and primary school child. This has been done because of an ever-widening appreciation of the importance of good nutrition in this age range. Dietary deficiencies have their most marked effects at this time because of the specific demands of growth and development. These effects may be immediately catastrophic as shown by high morbidity and mortality in severe deficiency states. Milder or less obvious degrees of malnutrition or undernutrition may retard growth sufficiently to cause permanent stunting, lessen resistance to stress and infection or subtly prevent the full potential of an individual as a useful citizen in our society.

The need to define nutritional requirements or allowances for all age groups has become of national importance in the 20th century. It has been very evident during times of war and blockade. More currently the population explosion has forced national and international agencies to make specific recommendations for individual and group requirements under varying environmental circumstances.[1-5]

I consider a most useful and simple definition of 'requirement' to be that adopted by the recent Joint FAO/WHO Protein Committee,[1] viz. 'under conditions of ordinary life the nutritional requirements of an individual are made up essentially of two components: (*a*) a basal amount below which it is believed that normal health and growth cannot be achieved, and (*b*) an additional amount to provide for the stresses including infections to which everyone is exposed'.

When estimates are being made of the allowances for populations or groups a further addition must be made to cater for individual variability. Finally, the extra demands associated with serious injuries and diseases when they occur must be taken into account. This sounds a complicated process, but we now have enough knowledge to make recommendations with a fair degree of scientific validity. With regard to protein requirements, the formula shown in Table I has been followed.[1]

TABLE I. FORMULA FOR PROTEIN REQUIREMENTS

$R = (U_B + F_B + S + G) \times 1{\cdot}1$

R = Requirements of nitrogen per kg. body weight per day

U_B = basal urinary N loss per kg. body weight per day (2 mg. N per basal Kcal)

F_B = basal faecal nitrogen loss (20 mg./kg./day)

S = N loss from the skin (20 mg./kg./day)

G = N increment during growth per kg. body weight per day

1·1 = addition of 10% for stress of ordinary life

$R \times 6{\cdot}25$ = protein requirement (in terms of reference protein)

The results of these calculations are shown in Fig. 1.[1] The upper level (+ 20%) is likely to cover the requirements of all but a very small proportion of the population and may therefore be regarded as a practical allowance. The lower represents a figure below which protein deficiency may be expected to occur in all but a very few individuals.

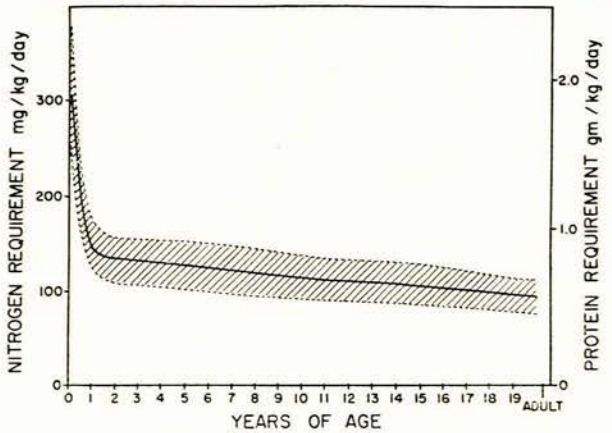

Fig. 1. Protein requirements according to age. Adapted from Joint FAO/WHO report.[1] (Published by kind permission of the World Health Organization.)

The protein and calorie requirements for the different age groups are compared in Table II.[1,3] It is evident that these are relatively much higher in the preschool and primary school years, and that the reduction per kg. body weight by the age of 10 years is quite considerable.

TABLE II. COMPARISON OF PROTEIN AND CALORIE REQUIREMENTS

	Calories		*Proteins*
	Per day	*Per/kg./day*	*G/kg./day*
0–3 months		120	2·3
3–6 months		110	1·8
6–9 months		105	1·5
9–12 months		100	1·2
1–3 years	1,300	105	0·88
4–6 years	1,700	96	0·81
7–10 years	2,100	69	0·77
Adult man	3,200	49	0·6
Adult woman	2,300	42	0·6

In contrast, vitamin requirements are not particularly age determined. Some average daily requirements are seen in Table III.[4,5] Of great practical importance is the requirement of vitamin D. In spite of South African sunshine the incidence of rickets in the first year of life is extremely

high in the urban areas. Every effort must be made to see that this age group gets its supplement from the infant welfare centres. Once children are ambulant and able to get out of doors the problem is no longer evident.

TABLE III. AVERAGE DAILY REQUIREMENTS

Vitamins				*Minerals*	
A	*D*	*C*	*Niacin*	*Fe*	*Ca*
I.U.	*I.U.*	*mg.*	*mg.*	*mg.*	*mg.*
1,500–5,000	400	20–40	2–15	6–12	500–600

Frank vitamin-C deficiency is relatively rare in South Africa.[6] Nicotinic acid deficiency among primary school children is probably the only serious frank vitamin deficiency state which is at present manifest.[7] It occurs in certain primarily maize-eating population groups together with protein deficiency. The indiscriminate issue of vitamin tablets to school children except in the special circumstances mentioned appears to be unwarranted.

As far as minerals are concerned, iron deficiency in the coastal belt is a serious problem, and supplementation of basic diets in the early years may well be indicated. Examples of requirements of this mineral and for calcium are shown in Table III.

In general it can be said that we now have enough information about nutritional requirements and that this information is easily available in several publications.[1-5] The current practical problems that face public health administrators and nutritionists in the Republic are: (1) to determine the extent to which requirements of essential nutrients are or are not being met; (2) to recommend and implement the adoption of measures to meet these requirements where there is evidence of deficiency.

With regard to the first, various surveys and hospital statistics have already indicated the prevalence of frank nutritional disease throughout the country.[8,9] This applies particularly to the protein-calorie malnutrition syndromes of kwashiorkor and marasmus. The recent decision to make kwashiorkor a notifiable disease has assisted the authorities to pinpoint areas where the incidence of this syndrome is high.

For subclinical deficiency states the evidence is much more scanty and difficult to come by. However, in the primary and preschool age groups we have a very simple measure of nutritional adequacy that needs more exploitation, i.e. expected growth rates or expected weight for age (Fig. 2). The first effect of nutritional deficiency, especially protein-calorie deficiency, is to retard the rate of growth or in more severe cases to stop it altogether. Paediatricians have for a long time used standard growth curves against which the progress of a child can be measured. The usefulness of this approach for the assessment of nutritional status in groups of children is now established beyond doubt. Evidence accumulated in the Cape and Transvaal has shown that internationally accepted growth charts may be used for all our races.[10-12] Children failing to come up to these standards are either suffering from disease or adverse environmental and nutritional factors.

These data, accumulated in the last few years, have made us much more aware of the over-all nutritional problem that exists in the country. It is important to develop and have a concept of this problem in order to deal with it properly. One such concept of protein-calorie malnutrition is presented in Fig. 3. It is quite clear that there are

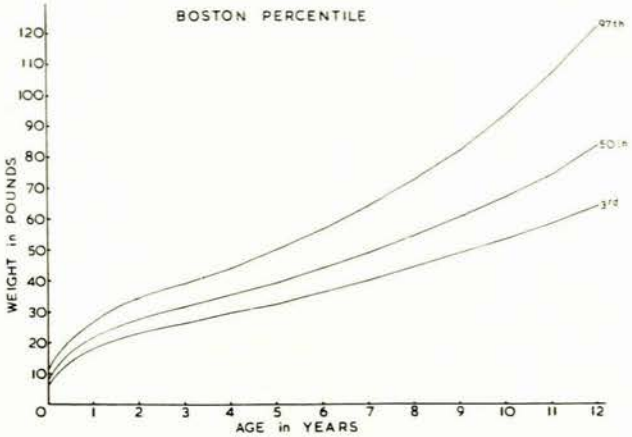

Fig. 2. Normal range of expected growth. The 50th percentile line represents the average weight for age. The 3rd percentile represents the lowest normal weight for age.

vast numbers of children who superficially appear well, and may even look fat, but nevertheless are underweight for age. It is from this group that the hospital or clinic patient comes. These children present with a variety of seemingly unrelated complaints such as gastroenteritis, respiratory disorders, complicated measles, worms, etc. Chronic morbidity and mortality is almost exclusively related to the underweight child during infancy and early preschool years. Well-nourished children with the same complaints do not become so ill or need such prolonged care and treatment. The underweight child with the stress of infection more easily develops frank kwashiorkor or marasmus. It must be appreciated that kwashiorkor represents but a fraction of the over-all protein-calorie nutrition

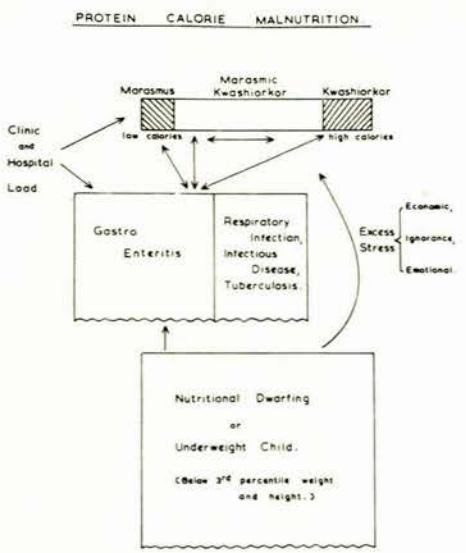

Fig. 3. A concept of protein-calorie malnutrition.

problem in this country. If we are to reduce acute and chronic ill-health in children and ensure that future generations realize their full potential, a concentration of effort on measures to reduce the incidence of underweight children should be made.

This brings us to the second problem—what can be done about the meeting of requirements? With regard to the preschool child, the Preschool Protection Programme suggested by the 6th International Congress of Nutrition in Edinburgh in 1963[13] has recommended certain practical measures that should be adopted both at the central, regional and local level. In essence these represent a plea for greater awareness of the health problems of this important age group. At present these children tend to have inadequate health supervision because they are not covered by the infant welfare clinic services, and several years elapse before they come under the school medical service. More preschool clinic facilities should be established so that proper supervision, education of parents and, where necessary, food supplements can be provided. To determine where and how many clinics are needed, the relevant authorities should do weight-for-age surveys of all preschool children at regular intervals. In addition medical practitioners must be educated to include assessment of nutritional status in the physical examination of patients and to treat or give advice accordingly.

As far as the primary school child is concerned frank nutritional disease is not as common as in the preschool child. Weight surveys of various groups of school children in different parts of the country have, however, shown a large number who fail to reach normal standards of growth.[9,14] The full effect of such undernutrition on eventual physical development and intellectual attainment is hard to measure and assess. Nevertheless, it may be significant.

Annual weight-for-age data should be available to every school medical officer. Armed with objective evidence of growth failure, perhaps steps could be taken to reintroduce school feeding where it is needed. I am well aware that this is a difficult and complicated problem and that school feeding in the past has led to waste and abuse. Nevertheless, there is much documented evidence that school meals lead to a rise in child health. Careful reconsideration of this valuable public health measure is needed. Perhaps a few well-controlled trials should be instituted in various parts of the country to establish its value and the difficulties encountered. No over-all country-wide standardized scheme can be expected to function efficiently, and feeding schemes should be developed on a strictly regional basis. Subsidized local and voluntary endeavour is probably the best method.

SUMMARY

The nutritional requirements of the preschool and primary school child are now well established and known. The evidence accumulated in the last 10 years shows that protein and calorie deficiencies are the major nutritional problems of these age groups, but particularly of the preschool child. The recognition of these deficiencies has been made much easier by the use of weight-for-age growth charts. Special measures to meet nutrition requirements should be adopted in all instances where children are found to be underweight for age.

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