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FEEDING THE PRESCHOOL CHILD

REPORT OF A PAG AD HOC WORKING GROUP

Food and Agriculture
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of the United Nations
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World Health Organization
Geneva

United Nations Childrens Fund
New York

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FEEDING THE PRESCHOOL CHILD

REPORT OF A PAG AD HOC WORKING GROUP

PREFACE

At the 16th Meeting in Geneva, September 1969, the FAO/WHO/UNICEF Protein Advisory Group recommended the establishment of an ad hoc Working Group on Feeding the Preschool Child. The ad hoc Group has since met in Geneva on two occasions, December 1969 and September 1970. The list of participants is given in an Appendix. The report which follows is based on the deliberations at the two meetings and was approved for publication by the PAG at its 18th Meeting in Rome, 9-12 February 1971.

On the initiative of the ad hoc Working Group, a Manual on Feeding Infants and Young Children, with special attention to home-prepared weaning foods, has been prepared by M. Cameron and Y. Hofvander. The PAG, at its 18th Meeting in Rome, 9-12 February 1971, also approved the publication of the Manual. Following a proposal from the ad hoc Working Group, the PAG has recommended the holding of a study group meeting on "Milk intolerance - its prevalence and public health implications" during 1971. It is also planned to hold at least one more meeting in 1971 of the ad hoc Working Group on Feeding the Pre-school Child to consider several new topics.

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FEEDING THE PRESCHOOL CHILD

REPORT OF A PAG AD HOC WORKING GROUP

1. NUTRITION IN UTERO

1.1 Introduction

The necessity of providing an adequate diet for the pregnant woman has been reviewed extensively in the medical literature (1, 2). Calculated from the WHO/FAO recommendations for dietary allowances, the additional amounts of nutrients for a woman with a gestation period of 280 days and lactating for 180 days (total 460 days) is as follows:

Calories	219,200
Protein, NPU 70, g	6,400
Calcium, g	176
Vitamin D, I.U.	168,000
Vitamin A, mcg	90,000
Ascorbic acid, mg	9,200
Folate, mg	74
Niacin equivalent, mg	1,540
Riboflavin, mg	90
Thiamine, mg	100

The figures may be used as desirable targets for those responsible for national or regional food policies.

Nevertheless, the subject of maternal-foetal nutrition remains difficult to interpret because of the many interrelated factors in the outcome of pregnancy, such as physical work during pregnancy and other physiological and pathological stresses. Besides, sufficient information is not available on the effect of maternal diet as related to general health of the woman during pregnancy and between pregnancies; foetal growth in utero; birth weight of neonate; and quality and quantity of breast milk produced. The available information on the subject has been recently reviewed (3).

1.2 Clinical evidence

Women from lower socioeconomic strata appear to be more vulnerable during pregnancy than women living in more favourable environments. Among the former are found:

a) A higher rate of low-birth-weight babies, which is true both in comparisons between countries and in comparisons between populations of differing levels within countries (4).

b) A higher incidence of toxaemia of pregnancy, especially among malnourished women and young primiparae (5).

c) A high prevalence of anaemia (defined as less than 11g haemoglobin per 100 ml), though the interpretation of haematological data is complicated by the physiological haemodilution of pregnancy. To prevent iron deficiency and anaemia, the WHO Scientific Group (6) recommended that 60mg of iron should be given daily throughout pregnancy and lactation; in regions where folate deficiency is prevalent 100mcg of folate should also be given.

1.3 Anthropometric evidence

1.3.1 Maternal height. Good correlations have been found between socioeconomic and nutritional status and the height of individuals within a community. Perinatal mortality rates are lower in tall women than in short women and tall women give birth to larger neonates (7).

1.3.2 Weight gain during pregnancy. Physiological adjustments occur early in pregnancy and reserve body fat is laid down, which, it is believed, will subsidize lactation if the maternal diet is low in calories (8).

In most developed countries the expected average weight gain is 10-12 kg. Charting weight gain has been found a useful device for monitoring progress of the pregnancy. In developing countries, however, weight gains may be only of the order of 2-7 kg and in some instances no weight gain has been reported (9, 10). Infants born of these mothers are likely to have a lower birth weight.

1.3.3 Maternal weight for height. The ratio of maternal weight to maternal height is also of great importance. Obstetricians have stressed the vulnerability of the underweight as well as the markedly overweight woman to pregnancy complications and a poor pregnancy outcome (11).

1.4 Effect of repeated pregnancies on maternal nutritional status and that of neonate

The desirable interval between pregnancies is at least two years, since the cumulative effect of repeated pregnancies may lead to a general "maternal depletion syndrome". Information on the relationship between maternal nutrition and foetal stores is scanty.

A statistically significant relationship has been shown between the number of pregnancies and maternal and infant death rates (12). In countries where a high infant mortality rate exists, repeated pregnancies are likely to occur, resulting in an increased maternal morbidity and mortality rate. Also, in families with closely-spaced pregnancies, surviving children will more likely develop protein-calorie malnutrition because of an inadequate diet and other stress factors than in those with well-spaced pregnancies.

Conversely, birth spacing measures can help not only in the maintenance of good nutrition in the mother, foetus and neonate but also help to maintain lactation. However, oral contraceptives containing high doses of oestrogens taken soon after delivery may unfavourably affect the duration of lactation. Though successful lactation seems not to possess a reliable contraceptive effect, further studies are required to understand the complex relationship between successful breast feeding and contraception.

1.5 Effect of diet in pregnancy on lactation

There is some evidence that changes in the composition of breast milk occur when the diet of the nursing mother is markedly inadequate. However, there are not many reported studies which indicate the effect of diet in pregnancy on the composition and output of milk.

Available data suggest that during early lactation, water-soluble vitamins and vitamin A content of breast milk may be influenced by the intake of these nutrients during pregnancy. Severe dietary stress during pregnancy may affect the production of breast milk and reduce the period of lactation.

1.6 Effect of maternal diet on neonatal weight

To date there have been very few adequately controlled studies in less developed countries and the ones undertaken in more developed countries have shown equivocal results, apparently because large populations with marked malnutrition are not found in these countries.

Follow-up studies on infants soon after birth and studies on twins provide convincing information that the small-for-date infants, those with low weight for gestational age at birth, may frequently suffer from long-term developmental sequelae in the form of backwardness in physical growth and intellectual performance (13, 14, 15). The sequelae are due, at least in some, to developmental defects acquired during intrauterine life, which may be of a genetic or an infective origin. However, the more important problem is what are the long-term developmental consequences of malnutrition during intrauterine life caused by factors extrinsic to the foetus. Observations gathered by the WHO in its study of low birth weight, which involved thirty-seven countries, indicate a widespread occurrence of small-for-date infants. There is a great need for the collection of more data, such as anthropometry of both mothers and neonates including birth weights, using carefully checked instruments and wherever possible, extending the observations by following up the growth and development of the infants.

Maternal malnutrition is only one of the several factors which has been associated with a low birth weight. However, a diversity of other factors are known to affect the weight at birth. For example, placentae infected with malarial parasite have been shown to be associated with low birth weight of infants (16). While such findings emphasize the importance of several factors which influence birth weight, these observations leave several questions unanswered. What is the significance of low birth weight? To what extent can

birth weight be improved and neonatal development helped by specific nutritional measures during pregnancy? To get practical answers to these questions, systematic studies must be carried out in different regions where food supplements are distributed to pregnant women to determine the effect on pregnancy outcome, birth weight, and neonatal growth and development. The choice of the supplement requires careful consideration and will depend on the prevalent deficiency, whether calories or proteins or both. What is the relative importance of calories and proteins? And when and for how long does diet need to be supplemented to influence pregnancy outcome, lactation and post-natal performance optimally? Could this possibly lead to dystocia? What is the rational and practical approach to some less severe, culturally-defined dietary limitations in pregnancy? Is it possible or desirable to delineate an optimal range of birth weights for particular communities in relation to maternal stature and genetic potential and survival of the child? In Guatemala, village children with birth weights below 2100g have been shown to have a greater neonatal and postnatal mortality than children born with higher birth weights (17).

1.7 Research areas

The above discussion points out the need for more careful and well-planned studies to clarify many issues. The primary need is to get more information on food consumption throughout pregnancy and lactation. Well-controlled trials in different less developed areas, where various types of maternal malnutrition are prevalent, are necessary to evaluate the benefits of supplementation. Studies using newer biochemical techniques may help to obtain data on foetal development and foetal stores and role of the placenta in the nutritional relationship between mother and foetus. Further work is also required to understand the effect of maternal diet during pregnancy and lactation on milk composition.

1.8 Advice on the maternal diet

Realistic advice must be given the mother regarding a diet based on locally available foods which is nutritionally well balanced, including concern for calories, proteins, minerals and vitamins,

and which is culturally acceptable and within economic reach.

The nutritional concern in pregnancy should also be integrated with still broader concerns such as education for family planning, for prevention and management of infections, and for avoiding heavy physical labour in the latter part of pregnancy. It can be expected that these approaches will greatly contribute to the improvement of preschool nutrition, not only by improving foetal nutrition and the outcome of pregnancy but also by ensuring maternal resources for lactation. A live and lively mother is needed for the care of her infant.

2. NUTRIENT REQUIREMENTS OF INFANTS AND YOUNG CHILDREN

2.1 Introduction

Growth during infancy and early childhood involves a great increase in body size, a rapid gain in weight, alterations in body composition and adjustments in physiological functions. During early infancy the above changes take place at a high rate, decreasing rapidly during the first year and more gradually afterwards. The nutritional requirements during early life, expressed on the basis of unit body weight, are therefore comparatively higher than those of adults.

Healthy full-term infants receiving only breast milk from well-nourished mothers are reported to grow satisfactorily during the first four to six months after birth. The nutrient content of the daily output of milk (on a gross average about 850ml when the infant is 4-6 months old) may, therefore, be accepted as an estimate of the nutritional requirement of infants of four to six months of age.

2.2 Energy requirements

Apart from the needs for growth and maintenance, energy is required by the infant for chemical maturation and for body activity. The variation in calorie requirements among infants is largely due to differences in their body activity. In a study by Rose and Mayer (18),

during a 4-6 month period, it was found that the calorie intake of the infants was more closely related to the degree of activity (as measured by a special "actometer") than to their size and not at all related to growth. The lowest intake in this series of 29 infants was 84 cal/kg and the highest 134 cal/kg per day.

The Joint FAO/WHO Expert Committee (1971) recommended 120 calories per kilogram body weight for infants up to 3 months; 115 between 3 and 6 months; 110 between 6 and 9 months; and 105 between 9 and 12 months (19). For children between one to four years inclusive, the Committee recommended 1350 calories per day.

2.3 Protein requirements

Protein is required for maintenance of tissue, laying down new tissue and for maturation. Reviewing the results of various studies on the amount of protein ingested by infants from breast milk or cow's milk which supports satisfactory growth, the Joint FAO/WHO Expert Committee (19) concluded that the following figures cover the protein requirements of infants and would provide for the full range of individual variability in terms of either breast milk or cow's milk protein:

up to 3 months - 2.25g per kg
3-6 months - 1.82g per kg
6-9 months - 1.62g per kg
9-12 months - 1.44g per kg

The protein requirements of infants are expected to be similar if other animal proteins are used, after suitable processing for use by infants. Yanez et al.(20) have shown that the growth of two-month-old infants was normal with an intake of 2.5g of adequately processed fish protein per kg body weight. Further studies, testing other varieties of processed animal proteins suitable for infant feeding, are necessary. In the case of vegetable proteins, which are known to be deficient in one or more essential amino acids, the protein requirement must be based on essential amino acid composition and the ability to meet the essential amino acid requirement rather than on the protein content of the food.

There are a few publications on the amino acid requirements of infants. In nearly all of these studies, the amino acid requirement has been determined under special conditions. Based on the results of these studies, the Joint FAO/WHO Expert Committee (1971) (19) has developed a requirement pattern as follows:

TABLE I

Amino Acid Requirement to Support Growth in Infants Under 6 Months of Age (19)

Amino acid	Requirement mg/kg/day	Quantity provided by human milk at a protein intake of 1.6g/kg/day (mg/kg/day)
Histidine	28	42
Isoleucine	70	74
Leucine	150	149
Lysine	103	103
Methionine	29	34
Cystine	33	34
Phenylalanine	61	67
Tyrosine	68	70
Threonine	87	69
Tryptophan	17	27
Valine	93	88

It will be seen that the requirements arrived at in the experiments were generally similar to those calculated from the composition of breast milk except for threonine, tryptophan and histidine. Since breast milk is adequate for growth of young infants, possibly the requirement of threonine arrived at from experiments may be somewhat high. Similarly, the tryptophan and histidine values might have been underestimated in the experimental values. The amounts present in 1.6 g breast milk protein are accepted by the Joint Committee as the best estimate of amino acids needed per kg infant body weight.

Even if the amino acid pattern is satisfactory, vegetable protein foods intended for infants and young children must be properly processed to ensure adequate digestibility and to minimize their bulky nature, which might prevent infants from consuming sufficient amounts to meet their protein needs. Although the value of certain processed products based on soybeans in the feeding of infants has been established, further studies are needed on the metabolic aspects of feeding various proteins of vegetable origin to infants under six months of age. Small quantities of animal protein concentrates could be added to such vegetable protein foods to improve protein quality.

For children between one and two years, the FAO/WHO Expert Committee (1971) has recommended 1.27 g protein per kg per day from egg or milk. For children between 2 and 3 years, the recommended intake is 1.19g per kg/day from the same sources. Proportionately greater quantities are needed if the protein used is one which is incompletely utilized. The intake capacity of children in this age group may not allow the provision of adequate protein of NPU below 60.

2.4 Fat requirements

There is evidence that humans require small quantities of polyunsaturated fatty acids. Deficiency of essential fatty acids has been produced experimentally in human infants when linoleic acid accounted for less than 0.1% of total calorie intake (21). When essential fatty acids are provided at about 1% of calorie intake in normal infants, skin manifestations of essential fatty acids deficiency do not appear and

rates of growth are as rapid as those of infants receiving higher intakes of linoleic acid. However, there is no information on the requirements of fat during infancy and childhood. Exclusively breast-fed babies receive nearly 50% of the calories from fat. Also, the linoleic acid content of human milk is nearly five times higher than that of cow's milk. Unsaturated fats and those containing medium- and short-chain fatty acids are better digested and absorbed by infants and children than those with saturated long-chain fatty acids. The absorption of fat-soluble vitamins, especially provitamin A, is facilitated by dietary fat.

The calorie density of fat appears to be important during early life when energy requirements per unit body weight are high. Fat also improves the palatability of the food. Based on these considerations, it is recommended that some quantity of fat be included in the diet of infants and children, preferably fats with short- and medium-chain fatty acids and containing the essential fatty acids. A level of fat contributing 50% of the total daily calorie intake may be aimed at for infants and not less than 25% of the total calorie intake for children between one and three years.

2.5 Carbohydrate requirements

There is no information regarding the carbohydrate requirements of infants and children. An infant fed exclusively on breast milk receives nearly 40% of the calories from the disaccharide lactose. This may serve as a rough guide, although the intake of carbohydrate calories has to be raised proportionately if the fat intake is reduced. Depending on the fat calories supplied, 40 to 60% of the calorie requirement may be given in the form of a suitable mono- or disaccharide during early infancy. Infants fed milk receive lactose as the main carbohydrate source. Though lactose seems to stimulate the absorption of calcium in the small intestine, it does not seem to possess any other advantage and may therefore be replaced by glucose or other mono- or disaccharides. For older infants and young children, the amount of carbohydrate calories may be around 60% of the total and may be provided largely in the form of starch.

2.6 Mineral requirements

With the exception of iron, the breast-fed infant is adequately provided with all minerals and it may be assumed that the quantities received through milk are well above the requirements, at least during the first part of infancy. Additional iron has to be provided after four to six months for all children. The WHO/FAO Expert Group (22) recommended the following iron intakes for infants and children.

	Animal food below 10% of calories	Animal food between 10-25% of calories	Animal food over 25% of calories
5-12 months	10mg	7mg	5mg
Children	10mg	7mg	5mg

For infants 0-4 months, breast feeding is assumed to be adequate. Healthy infants fed solely on breast milk receive approximately 300 mg of calcium per day. However, there is no information regarding calcium needs of growing children. The WHO/FAO Expert Group (23) suggested an allowance of 500-600 mg per day for infants not fed on breast milk. The same figure may be accepted for children between one and three years.

2.7 Vitamin requirements

The WHO/FAO Expert Groups (22, 24) have reviewed the available information on vitamin A, thiamine, riboflavin, niacin, ascorbic acid, folate, vitamin B_{12} and vitamin D, and have made recommendations regarding their requirements.

2.7.1 Vitamin A. For infants up to six months, the Expert Group concluded that breast feeding by a well-nourished mother is the best way to satisfy nutritional requirements. On the basis of the composition of human milk it may be suggested that during the first half of infancy,

the intake should be 425 mcg of retinol per day. The Group recommended an intake of 300 mcg of retinol per day for infants between six months and twelve months and 250 mcg between one and three years.

2.7.2 Thiamine, riboflavin and niacin. For infants up to six months, the Expert Group accepted that breast milk from well-nourished mothers will supply the nutritional needs adequately. This would mean that the intake of thiamine, riboflavin and niacin should be 0.20 mg, 0.37 mg and 1.5 niacin equivalents (1 niacin equivalent = 1 mg of niacin or 60 mg tryptophan) respectively for infants up to six months of age. For older infants and children under three years, the Expert Group recommended 0.40 mg of thiamine, 0.55 mg riboflavin and 6.6 niacin equivalents for 1000 calories per day.

2.7.3 Vitamin C. The vitamin C needs of most infants are met by full breast feeding at least during the first six months of life. This supplies an estimated 20 mg of ascorbic acid daily when the diet of the mother is adequate. The WHO/FAO Expert Group recommended that all infants and children have a daily intake of 20 mg of ascorbic acid.

2.7.4 Vitamin B_{12} and folate. The WHO/FAO Expert Group recommended 0.3 mcg and 40 mcg of B_{12} and folate respectively for infants and 0.9 mcg and 100 mcg of B_{12} and folate respectively for children between one and three years.

2.7.5 Vitamin D. Provitamin D is always present in the skin. When ultraviolet light rays of a particular wave length strike the skin, they convert the provitamin into vitamin D. Sunlight is able to convert the provitamin into the vitamin, but appears to be less efficient than artificial sources of UV radiation. Also, the UV rays of the sun do not penetrate deeply, especially in dark skin, due to absorption of these rays by the melanin pigment. However, if the whole or part of the body of the infant or the child is exposed to strong sunlight for short periods every day, there does not appear to be any special need for a vitamin D supplement. The vitamin D obtained through biosynthesis in the skin and that from breast milk would suffice. There is some evidence, however, that under special dietary and environmental circumstances, a vitamin D supplement may be necessary to give maximum calcium absorption (25). A daily intake of 10 mg (400 IU) of vitamin D has been recommended for infants and a similar amount for children (22).

2.8 Requirements for trace elements

A trace element may be defined as an element that occurs in the body in very small amounts. These elements participate in body metabolism by acting in combination with proteins or as prosthetic groups of enzymes.

If a concentration up to 0.005% (50 ppm) in the human body may be considered "trace", copper, zinc, cobalt and iodine may be included in the list of trace elements. There is also evidence to justify adding manganese, molybdenum, fluorine, selenium, vanadium and strontium to this list.

The estimation of minimum daily requirements for trace elements is difficult. Since their mechanism of action is attained as part of an enzyme or by linkage to a protein, it is difficult to know to what extent they are indispensable. In view of the known effects of iodine deficiency, it is suggested that infants and children receive at least 4 mcg of iodine per kg (26).

2.9 Requirements for water

The infant is readily susceptible to lack of water or insufficient intake of water. Similarly, excess intake of water by the infant has serious consequences. The problem of water requirement is particularly important in the case of breast-fed infants because of the difficulty of assessing the volume of milk intake. The subject requires detailed examination before suitable recommendations can be made.

3. FAMILY PLANNING, FERTILITY AND NUTRITION

3.1 Introduction

Section one touched on only one small aspect of the interrelationship between family planning and nutrition: the effect of fertility on nutrition of mother and foetus. The much broader relationship between the two can be categorized under three headings. First, the immediate effect

of fertility on the nutrition of members of the family; second, the community effect of fertility; and third, the programme relationships between those concerning nutrition and those pertaining to family planning.

3.2 The effect of fertility on the nutrition of members of the family

The effect of fertility on the nutritional status of the previously born child is known to be of great importance. In most references on kwashiorkor the impact of intervening pregnancy and prematurely curtailed breast feeding is mentioned. Gordon, in his analysis of pregnancy interval and mortality based on longitudinal studies in the Punjab, suggested that probably the most important impact was on the second-year mortality rate of the preceding child, although the data are not well developed in this area (27). Another important aspect of pregnancy spacing and family size limitation is the overall economic effect of limiting the number of children so that they can be adequately reared and nourished with the family resources.

3.3 The effect of fertility on the nutrition of members of the community

High population growth rates undoubtedly act as a brake on economic and social development. Among other things, it becomes necessary to achieve an equally high increase in food production just to maintain the nutritional status quo. An even higher rate of increase in food production is required if the nutritional status is to be improved. In addition, population pressure within a community may be one of the factors causing changes in staple food production to increase total available calories. Such a switch may easily result in a detrimental change nutritionally, e. g., a change from maize to cassava.

It is usually found that a gradual increase in purchasing power results in some nutritional improvement within the family, e. g., a higher consumption of animal proteins is seen in many countries. This improvement in purchasing power, however, has to be measured on a per capita basis. It follows that high fertility within a family can easily cause a lowering of per capita purchasing power, with a consequent

decrease in the nutritional value of quality protein. Hence, high fertility rates can result in a deterioration of nutritional status, both in the subsistence and the cash sectors of the economy. It is a universally observed fact in both industrialized and developing countries that for any given socio-economic level the nutritional value of the food consumed by a family decreases as the number of children in the family increases.

3.4 Programme relationships

There are many reasons why family planning activities should be coordinated with nutrition services and other measures for maternal and child health in developing countries. These have been extensively reviewed in several publications. One of the most important reasons is the shortage of manpower, particularly when one is trying to cover the peripheral rural population. In these areas one peripheral worker must cover the most urgent priority and can do it most efficiently by providing this in a continuum of family care. It is also apparent in these areas that there are many limitations to providing family planning only as an aspect of pregnancy management. Although mothers may be receptive to contraceptive advice during their care, immediately after delivery, many mothers will depend initially on the period of post partum amenorrhoea and in some cultures on post partum separation and will not be immediately receptive to other contraceptive measures. In these cases, contraception can best be offered later on as an aspect of continuing family care. The IUD introduced immediately post partum may also coincide largely with this period of post partum infertility unless follow-up is provided to ensure that the IUD stays in place or is reinserted, if necessary. Pills are not advisable in breast-feeding mothers. In all these cases, contraception can best be offered later on as an aspect of continuing family care. Both the IUD and the pill are likely to require continuous reinforcing inputs in order to be successful; the mother must be reassured when she starts the pill and experiences initial side effects. The same thing is true of the loop. These services can best be provided at the time that family care is being given and one of the main reasons for providing continuous family care is for both improvement of nutrition and overcoming problems interrelated with the nutrition of the children. The impact on the nutrition of the child and the assurance of its survival would thus appear to be the best rationale for introducing the subject of family planning to the mother. By making nutrition programmes and family planning programmes mutually supportive we could look forward to the strengthening of both.

4. SOCIOCULTURAL DYNAMICS OF BREAST FEEDING

4.1 The change

Traditional feeding of young infants* in all parts of the world has always depended on the availability of a sufficient supply of human milk, especially for the first six months of life. In the present century, there has been a progressive decline in breast feeding in the industrialized countries of Europe and North America, made possible by modern developments in dairying and food technology. These have resulted in widely available supplies of processed milk suitable for feeding young children and within the financial range of parents in these communities. Unfortunately, this decline in breast feeding and shortening of the duration of lactation has spread rapidly in the last two decades to less technically developed areas of the world with increasingly serious consequences. The dimensions of this change vary considerably, but is seen in an extreme form in Chile where breast feeding at one year of age has fallen in the past twenty years from 95% to 6%, and where only 20% of babies are still being breast fed at two months of age.

4.2 Benefits

There is increasing evidence that there are numerous biochemical, immunological and "anti-infective" differences between human milk and cow's milk and that for infants under unfavourable circumstances, breast milk has special value for the promotion of growth and development.

Breast feeding ensures an economic supply of hygienically clean food direct to the baby, provided the mother, during both pregnancy and lactation, receives an adequate balanced diet even if made up of low-cost locally-available foods. Also, breast milk is the original natural convenience food for infants, needing neither culinary preparation nor feeding utensils and available immediately.

* Infants below 6 months of age are referred to as young infants.

The act of breast feeding is much more than the supply of nutrients; it is rather a biological communication between mother and baby, of benefit to the emotional development of both mother and child, and is relevant to adult personality development and adjustment to the community later in life.

Successful breast feeding may also decrease the likelihood of puerperal breast infection, abcess and fissured nipples in the mother. The incidence of mammary cancer appears to be lower in communities with rapid cycles of pregnancy and lactation.

4.3 Alternatives

While the advantages of human milk are universal - as would be expected of a secretion adapted to a particular species over millenia - it is well recognized that successful infant feeding can be achieved with various cow's milk formulas, as well as suitable formulas using specially processed vegetable proteins or vegetable proteins combined with small quantities of animal milk. However, this presupposes that adequate quantities can be afforded, purchased and fed under good hygienic conditions, as is generally the case in industrialized countries. It may be noted that in the long range such feeding may exert an influence on certain aspects of child growth and development.

In less technically developed areas of the world, much more immediate and serious basic difficulties attend attempts to artificially feed young infants on a cow's milk formula. These include a lack of sufficient money to buy adequate quantities, poor home hygiene (including water supply, fuel, feeding utensils, storage, etc.), and inadequate nutritional knowledge of the mother. Under these circumstances, usual for the majority in less developed countries, artificial feeds mean the use of too diluted, highly contaminated solutions of cow's milk, resulting at best in undernutrition; at worst, in marasmus and diarrhoeal disease.

As a result of the present trend away from breast feeding to frequently ineffective bottle-feeding, a predictable change in the pattern of malnutrition in young children has come about in certain urban areas, with malnutrition occurring at an earlier age, often in the first months of life, and with marasmus the main clinical form rather than kwashiorkor. The consequences of this desperate situation are grave.

It is well recognized that marasmus requires prolonged, costly treatment to obtain a cure, and in addition malnutrition at this early age increases the likelihood of permanent brain damage.

Widespread lactation failure also has unrealized consequences as regards both national economics and food production (28), since alternative sources of protein food suitable for babies have to be imported (with expenditure of foreign currency) and/or produced locally.

4.4 Causes of failure to breast feed

Failure to breast feed appears to be associated with a change to an urban life-style. This is most marked in actual urban surroundings but with the increased speed of communications of both people and ideas, especially via the transistor radio, it is extending also into periurban areas and in some countries, such as Chile, even involves rural regions.

The main factors in the urban life-style responsible for the decline in breast feeding may be considered under three overlapping headings; sociocultural change, effect of health services and the influence of commercial persuasion.

4.4.1 Sociocultural change. An urban life-style is characterized by a move towards a money economy and foods that are purchased, towards a small family rather than an extended unit, and towards a different role for women, who may be expected to work away from the home for wages and who, in any case, become less definitely and predominantly concerned with child rearing. There is also less opportunity for young women to learn from older women. There is a tendency to adopt certain practices, such as bottle feeding, which appear to symbolize the new life of the townsman, as exemplified by the educated, well-to-do elite.

In urban circumstances, the Western attitude to the breasts as cosmetic sex symbols rather than for nourishing young babies dominates the scene, with anxiety as to breast feeding being likely

to lead to "losing one's figure", and custom making breast feeding in public taboo and even less acceptable at work.

4.4.2 Effect of health services. A major responsibility for the apathetic or misguided attitude to the current dangerous decline in breast feeding by mothers unable to provide a suitable substitute rests with the health services, including the general medical profession, and particularly paediatricians and obstetricians, nurses and midwives. Their complete lack of awareness is probably related to the fact that such infant feeding as is taught is concerned with problems of the elite, for whom Western-style bottle feeding with cow's milk formula is practical, and newer knowledge of the psychophysiology of breast feeding and the composition of human milk is rarely appreciated.

Conditions in obstetrical hospitals, children's wards and health centres are geared to artificial feeding. Newborn babies are routinely given unnecessary supplementary foods and switched to bottle feeding at the slightest "indication", or even automatically with no indication at all.

Paediatric wards may exclude mothers, even of breast-fed babies, and the indiscriminate use of bottle feeds in the ward promotes this practice.

Health services are often the channel through which food donations, of one sort or another, flow. In some cases, the food supplements issued, especially milk powders, have had the side effect of acting as "breast milk displacers", given with the tacit endorsement of the health services.

4.4.3 Commercial persuasion. During the last two decades the increased availability and consumption of expensive proprietary branded infant foods within developing countries, stimulated by commercial firms and in many countries also by the nature and scale of advertising campaigns which they have implemented, have seriously aggravated the trend towards breast-milk displacement. The passive attitude of many governments towards regulating the

flow and use of such foods according to their nutritional value and potential benefit to consumers is also deplored.

Particular devices used by commercial companies to induce support from health services must be especially censured, e.g. the employment by some firms of "milk nurses" to make home visits and attend clinics to promote sales of specific products, the issue of free samples, posters, calendars, etc., as an incentive to favour particular brands or companies. Insufficient discrimination has been shown by companies in the content of their advertising communications, and the extensive use of mass media as a channel for such communications may have multiplied any detrimental effect of commercial advertising efforts on nutrition of the pre-school child.

The extensive introduction and indiscriminate promotion of expensive processed milk-based infant foods in some situations may constitute a grave threat to the nutritional status of the infants for whom they are intended. The sophisticated luxury and fashionable appeal of such products to the mother may lead to the undesirable effect of displacing the child from the breast, in circumstances where the mother may have no access to affordable alternative foods which can be given safely and without risk of alimentary infection and diarrhoeal disease.

4.5 Preventive action against failure to breast feed

The situation is likely to become increasingly grave with the flood of the "disurbanized"; that is, those urbanized without the essential employment and income, social services, environmental hygiene, etc., to make an urban life-style of infant feeding possible for years to come. If nothing is done, marasmus and diarrhoea will become increasingly widespread. The problem is how to devise a programme which, if not capable of reversing the trend, may at least prevent its spread to unaffected areas and decelerate the rate of change, hopefully permitting the parallel development of industrialization, urban employment and economic improvement. Key groups in this preventive programme include health staff, especially paediatricians, obstetricians and teachers in training

schools; health administrators; peer groups; and those responsible for mass media, especially commercial infant food firms.

4.5.1 Information needed. Much additional information is urgently required on the current situation and future trends. This could be obtained through cross-sectional surveys of the pattern of breast feeding in representative communities in the world, using the same methodology and agreed definitions.

There is, therefore, an immediate need to devise appropriate field methods for investigating the social dynamics and epidemiology of breast feeding. The design of appropriate methods of investigation, including questionnaires, needs the combined expertise of the social psychologist, the anthropologist, the paediatric nutritionist and others. Logical preventive programmes, including appropriate cultural, social and economic motivations, can be based only on the results of such surveys.

4.5.2 Strategy. More detailed studies of the social dynamics of breast feeding will, it is hoped, lead to the development of more rational and effective ameliorative programmes; in the meantime, the following approaches should be pursued:

1) Education and propaganda. The vital significance of breast feeding until the baby is at least six months of age and proper introduction of nutritious supplementary foods need major emphasis as one of the main priorities in national policies, programmes and practices concerned with infant and preschool child feeding. At the same time, positive nutrition education is required, together with use through appropriate services of the most economical, nutritionally-adequate "emergency formulations". These facts must be channelled to training schools for all health personnel and nutritionists, and to those concerned with governmental nutritional and economic policy.

There is a great need for current information to reach medical schools and other training schools for health and other personnel, and to project the key role of human milk in modern nutrition.

The emphasis should be on the economic costs of failure to breast feed and the biochemical and immunological advantages of human milk as well as the dangers of artificial feeding for the less advantaged majority. The rising concern with the need to breast feed in modern life by educated women in the La Leche League International in the U.S.A., and similar groups in Europe and Australia, can be an important aid to the development of such a programme of education and propaganda at all levels under the leadership of local women.

2) Processed foods. Foods donated for feeding programmes or special foods marketed for feeding young children must be introduced with due care that they do not have a displacement effect on breast feeding. The manufacturing, promotional and marketing activities of commercial infant food firms need careful scrutiny within the context of each country or region. As with other commodities, locally appropriate food standards and regulations need to be developed in relation to minimum permissible levels of nutrients and labelling and to prevent harmful advertising.

More positively, there is need for contact between those concerned with child nutrition in developing countries and the major infant food industries. This should permit frank exchange of views and suggest less harmful ways of channelling modern technological and marketing knowledge towards the production of nutritious and appropriate foods which are still profitable.

3) Maternal legislation. Direct encouragement of breast feeding must also be sought by appropriate legislation motivating and permitting urban and rural mothers, including those working, to breast feed. A search of current and past health legislation is needed, for example, on various forms of lactation leave and/or dietary or financial bonus, the development of creches or day-care centres designed to permit breast-feeding, and systems of supplying food to lactating mothers. The rational application of such legislation in developing countries is often difficult. If demands on industry are unrealistic, enforcement may not be feasible. If a short lactation leave is legislated, mothers may assume that breast feeding can be safely terminated at the end of that period.

4.6 The major need

The major overall need is to alert governments, health services, nutritionists and the food industry to the emergency situation likely to develop in urban areas in the near future. Its implications are not only the certainty of rising mortalities from almost epidemic marasmus and diarrhoea, but also the economic burden of curative services and of obtaining breast milk substitutes on a large scale, as well as the long-term consequences of the effect of recovered cases of infantile malnutrition on the intellectual level of the community.

Man's ingenuity is needed not only to devise new protein sources to bridge the increasing "world protein gap" but also to prevent the nutritional setback of declining breast-feeding, currently occurring insidiously and with little appreciation of its consequences. A cornerstone of any public health nutrition programme for the prevention of childhood malnutrition must be the need to promote an optimal lactation pattern in the community. Budgetary provisions must be made to devise effective public health programmes as an essential part of bridging the protein gap.

5. COMPLETE FORMULATIONS FOR INFANTS UNDER SIX MONTHS DEPRIVED OF BREAST MILK

In many areas of the world infants below six months of age do not receive breast milk. In developing countries this failure usually means a most precarious beginning of the child's development and is often the cause of early death. The number of infants who are deprived of breast milk is increasing dramatically, not only in urban but also in rural areas, and may continue to do so despite attempts to slow down or reverse the trend toward decline in breast feeding. There are several possible approaches to deal with this critical risk situation.

5.1 Milk-based formulas and the alternatives

While it is theoretically possible to prepare in the home, from a combination of plant foods, nutritionally adequate preparations for

the infant under 6 months deprived of breast milk, in general this is not a practical public health approach to this problem at present. Modern science and technology are able to provide centrally-processed formulations based on vegetable proteins, such as the commercial soya-based formulations used in cases of milk allergy, which give quite satisfactory results in clinical testing in infants, even starting immediately after birth. Some of these formulations have also been tested in a few studies as the sole food for malnourished infants or infants recovering from malnutrition and have performed well. The production of satisfactory complete infant foods of this type presents special problems of formulation, processing and quality control; there has been vastly greater long-term experience with the use of milk-based formulas. Thus for some time to come necessary replacement of breast milk for infants under 6 months should be based primarily on animal milk. This view does not preclude the possibility of development and use of properly processed nutritious vegetable protein foods suitable for feeding infants under 6 months wherever such facilities exist. In areas where facilities currently do not exist, support and encouragement should be given to all efforts in this direction.

5.1.1 Milk supplies. Although there have been fluctuations from year to year in the supplies of milk products available for donation programmes, particularly with respect to individual countries, the current total supplies available to the World Food Programme and bilateral assistance are at an all-time high. In any case, the proportion of the available milk that would be required for younger infants in developing countries who are deprived of breast milk and can be reached with adequate supervision is relatively small. These needy infants should have the highest priority and all other uses should be secondary.

5.1.2 Home preparation of milk-based formulas. If fresh animal milk or full-cream milk powder (or milk or milk powder containing at least "half cream") are available, those responsible for the care of infants deprived of breast milk should be able to obtain these materials and be taught to prepare milk-based formulas properly (through addition of water and carbohydrates and boiling) and to feed them by appropriate techniques. However, this requires adequate

supervision and teaching should be carried out in a sustained fashion.

5.1.3 Centrally-processed milk-based formulations. There are numerous relatively expensive milk-based formulations on the commercial market (29). In almost all cases the milk fat has been replaced by vegetable fat; the carbohydrate portion may also be modified. Almost invariably these products are marketed in tins and are sold in both liquid and powder form. Additional technology may have to be developed to enable distribution in lower-cost packaging.

5.1.4 Use of non-milk formulas. Promising new technological developments have shown the way for preparation of low cost formulas with only part, or none, of the protein coming from milk or other animal protein sources. The starch of cereal grain flour can be partially predigested by treatment with amylases or by cooking-extrusion processing. This improves digestibility, acceptance and tolerance for the younger infant and allows adequate caloric density of the final preparation.

5.2 Other desirable qualities

In the case of formulations intended for early weaned infants, careful attention has to be paid to the choice of ingredients, adequacy of testing procedures, the consistency of the final preparation for consumption, and the suitability and hygiene of the feeding utensil. The formulation should:

a) Contain all the necessary nutrients (probably including some lactose) in satisfactory balance.

b) Cost as little as is feasible, consistent with sound paediatric nutrition.

c) Be safe as to composition and also with regard to possibilities of microbiological problems in the use of the preparations.

d) Have appropriate prestige and status.

e) Require only simple preparation for consumption.

f) Be easily digestible without undue "bulkiness" in passing through the infant's stomach.

g) Have minimal breast feeding displacement effect in the community.

To satisfy criterion g), it is essential that the preparation is not promoted commercially in a way that will discourage breast feeding.

To ensure consumption of available supplies by the target infants, it may be preferable to have the preparations relatively unattractive to adults yet acceptable to infants. Acidified milks, which also offer some advantage with respect to microbiological safety, are in this category.

To avoid the problem of infection, the utensils used are of critical importance. Since bottles and nipples should be avoided, it may be advantageous to have a final preparation which is unsuitable for bottle feeding. However, both liquid and semisolid final preparations should be tried. Suitable feeding cups have been described by Welbourn and de Beer (30) who also describe a "feeding kit" which includes a dry formulation, containers for storage and utensils for preparation.

5.3 Locale of manufacture

The arguments for indigenous production are not as strong for processed infant formulas as for other kinds of processed foods intended for children in the weaning period and later on, because the infant weaned before six months of age covers a relatively short period of time and because the use of the product should be limited only to those infant groups which are under health control; the total demand could and should be kept rather limited. Even if this type of food had to be imported, it should not mean a heavy drain even on a precarious economy. Indeed, it would be a worthy objective of

the World Food Programme and other international agencies to focus on this specific type of assistance.

5.4 Conditions of use

In order to ensure that these products will be beneficial and not cause harm certain prerequisites have to be fulfilled:

a) The mothers and their babies must be under constant supervision and carefully informed as to how to use the product, not only with respect to preparation, but also in the way of feeding including proper cleanliness.

b) Access to the product should be determined not by economic standards of the parents but by the true need of the infant. Ideally the product should be provided only to infants who fail to gain weight due to inadequate mother's milk supply. In these cases, the product should be given free of charge and in limited amounts at a time, covering the need for a week at the most. It is obvious that a programme of this kind can be carried out only by economic support from the government or the community and/or relief organizations. Furthermore, the distribution of the product should be through channels and services which can exert health supervision of the child (MCH centres, health centres, hospitals, orphanages, under the supervision of home economists, etc.).

c) When advertising products of this kind (infant formulas) great restraint should be observed and due consideration paid to the prevailing ecological situation. In at least one developed country (Sweden), leading producers of baby foods have, on advice of their medical consultants, agreed that processed formulas intended for infants below four months of age must not be advertised in the press. In a developing country, restraint with respect to promotional activities should cover at least the first six months of life. (Note: The problem of promotion in relation to infant formulas was discussed at a PAHO/WHO/UNICEF conference of paediatricians and representatives of the food industry on infant feeding in Latin America and the Caribbean, Bogota, 5-6 November, 1970).

5.5 Technology of manufacture, packaging and distribution

Breast milk should be the guide for proximate composition. However, the need for a fairly high proportion of fat may require packaging in tins or relatively expensive laminated bags, possibly under nitrogen. This can be avoided if it is feasible for the consumer to add the fat at the point of consumption. Alternatively, local mixing and rapid distribution, as in the case of the dry milk-sucrose-cottonseed oil mixture for treatment of kwashiorkor in Uganda (PAG document 10/28, 1960) may allow use of simple plastic bags. Further investigation is needed as to the feasibility of distributing fat-containing formulations in simple packaging when longer intervals between manufacture and consumption are necessary.

5.6 Testing requirements

Milk-based formulas of a composition similar to those which have been widely used would require minimal testing for nutritional value.

6. HOME - PREPARED WEANING FOODS

As long as adequate breast feeding continues, the infant is reasonably well protected, but the moment milk becomes insufficient, the young child enters a dangerous period of its life. The traditional society rarely has adequate special weaning foods suitable for feeding infants over 6 months and young children and in recent years efforts have been made to stimulate production of processed low-cost protein-rich weaning foods in developing countries. These efforts must be encouraged, but for a long time to come such products in most of these countries will reach only a small segment of the child population both for reasons of economy and marketing difficulties.

The avenue open for the vast majority of these children is better and more judicious use of locally available foods for the preparation of nutritious weaning foods in the home. The PAG is publishing a Manual describing home-prepared weaning foods and methods of feeding infants and young children (31).

7. INTRODUCTION OF PROCESSED PROTEIN - RICH FOODS

Experience has shown that introduction of processed foods without proper safeguards may cause more harm than good for large segments of the childhood population. Just as promotion of processed complete infant foods intended for formula preparation may cause mothers to abandon breast feeding, careless introduction of processed supplementary foods may also have an adverse effect on child feeding and child health. Also, the indiscriminate promotion of "western-style" baby foods in jars may cause mothers to spend their limited cash on these foods which might easily and inexpensively be prepared at home at a much lower cost. Distribution of imported supplementary foods may also act to hold back local efforts to manufacture and distribute such foods.

The following recommendations therefore seem warranted with respect to the situation in developing countries. The recommendations are intended primarily for processed, low-cost, protein-rich foods intended for older infants and young children (PAG Guideline No. 8, 1971). The points of view expressed are, however, pertinent also to "western-style" processed products intended for this age group and already widely in use in developing countries.

a) As a rule these products should not be recommended for infants below six months of age.

b) The introduction on the market and the promotion of these products should be carried out in close cooperation and contact with the health authorities, after obtaining the support of paediatric associations.

c) Whenever possible, products of this kind should be produced within the country. If they are imported, and especially if they are donated and intended for free distribution, great care must be taken not to weaken the interest and possibility of initiating production on a national level.

d) Simple but effective information with respect to the correct use of the product should always be found on the package or accompanying the package.

e) Products distributed through health centres, etc., should be available in the market.

f) In parallel with the introduction of products of this kind, efforts to improve education on nutritious home-prepared weaning foods should be intensified.

8. STANDARDS AND REGULATIONS FOR INFANT AND WEANING FOODS

The Codex Alimentarius Commission is currently engaged in drafting standards and regulations for infant foods. The standards should take into consideration regional variations, especially in the developing countries; stringent regulations can be introduced only gradually in those areas. However, legislation should aim at uniformity as much as possible, not only between countries but also within a country. For a protein food or for any infant food, community acceptability tests would often be at least as desirable as clinical tests. Similarly, the information given on the package should be clear, written in simple language and provide details on the source materials. The type of information given on the package is often so complex and confusing that it is difficult even for a nutritionist to decide the value of the preparation offered. The elaboration of codes for hygienic practice and microbiological standards for foods for children is being undertaken by the FAO/WHO food standards programme.

9. CHANNELS FOR INFLUENCING PRESCHOOL FEEDING

9.1 The four basic factors

Preschool feeding depends primarily on four factors:

1) Food availability, including cost, family income and facilities
2) Custom (cultural practices)
3) Individual family experience, attitude and responsibility
4) Realistic information provided to the family

Translating logical information into changed practice is a major obstacle in public health programmes. Personal service for the

preschool child is a particular gap because he is not reached directly through schools or maternal-infant care activities. Much useful experience is available, however, not only from nutrition studies but also from community development, home economics, communicable disease and family planning programmes.

In developing areas, changes in knowledge, attitude and practice depend largely on person-to-person communication. Even in the areas reached by the limited mass media, the media have only marginal influence on populations which are semiliterate and habitually dependent on the opinion of their family, neighbours and community leaders. Agents of change must work through these community channels.

9.2 The local-level worker

Covering the numerous families and communities of developing countries with limited resources is a difficult task. Several principles to help in the planning are suggested in the following paragraphs.

The community contact must be community-knowledgeable, must accept the community and must be accepted by the community. This objective can be achieved by recruiting agents from the areas in which they are to serve and avoiding moving them too far away during their training. Priority should be given to in-service training, which should be the main function of supervisors.

An intimate and continuing community input is required to take advantage of vital informal information channels, to guide group dynamics, to influence gossip, and to counteract rumors and other negative influences. There must be ample opportunity for feedback; simple one-day information by a nutrition worker has little value. It is important to inquire into reasons for resistance to changing feeding practices.

Local-level workers can absorb and execute only a limited number of functions. Careful priority should be applied in selecting the functions they are to pursue, based on the local problems and the most efficient approach. The objectives must be limited to a few key

changes rather than introducing a rigidly-structured, detailed, "optimal" feeding schedule.

In order to cover as many communities as possible with a limited number of workers, the latter must be multifunctional. Fragmentation of priority functions not only decreases the effectiveness of the worker but also requires duplication of personnel, facilities, transport and supervision.

Priority functions in many areas related to nutritional education include the management of pregnancy and delivery, including family planning, and the management of common diseases.

In countries where national planners are concerned with high population growth rates, and have recognized the need to rapidly cover the population with family planning information, the integration of nutrition functions can make both interests mutually supportive.

The auxiliary nurse-midwife, the local school teachers, community development agents and agricultural extension agents are examples of formal agents. Informal agents should also be mobilized; these may include the indigenous midwife, local healers, barbers, shop-keepers and religious leaders. When influential agents are not mobilized they are potentially serious negative influences. The successfully educated mother or the influential grandmother and the members of the family can in themselves be important informants for other mothers.

9.3 Higher-level workers

The functions of higher-level workers should focus on seeing that the right approach to the problem is used. This is done by supervision and training of local-level workers and by referring more complex questions to appropriate laboratory, research or information facilities. Whenever possible, physicians trained in paediatrics and/or obstetrics, who have the opportunity of coming into contact with children and mothers and whose advice is well received, should be associated with this work. They may require suitable training in modern principles of nutrition, with special reference to the regional nutritional problems and methods of overcoming them. Other professionals such as nurses,

teachers, etc. should be made aware of effective approaches through contact with their supervisors and their organizations and training institutions.

9.4 Clinical contact

The first contact with the preschool child is in the maternity ward, where the mother is most receptive to education on the needs of her baby and how to accomplish them. Contact with the mother during pregnancy is also significant in influencing foetal and childhood nutrition.

The most common contact with preschool children is during the treatment of illness; it can be an opportunity when the mother is receptive to education. If education is not effective, nutritional problems are likely to recur. In all treatment facilities, including hospitals, the health worker must emphasize education of the mother along with the treatment of the child. If village-level workers can educate, in addition to offering simple treatment, many nutritional problems can be managed before they require expensive in-patient treatment. Furthermore, work in the local setting is more likely to be communicated between mothers and to have general community impact.

Attempts to adapt management so that treatment is less expensive and more effective are now under development in special nutritional rehabilitation facilities (32). These nutrition-oriented facilities also serve as good locations for training peripheral workers.

9.5 Resource facilities

Resource facilities in the form of institutions and experts are needed for contributing to the training of workers, for performing or guiding survey work where necessary, for laboratory analyses, and for providing technical information and guidance to workers. Such resource facilities can play a more effective role if they have a defined relationship to service and training units. Programmes

should be planned so that each service and training facility has a designated resource facility.

9.6 Practical use of mobility

The efficient use of transport requires careful consideration. Mobile facilities are not only expensive but they are also likely to be lacking in impact on knowledge, attitude and practice, because they do not provide the continuity of service and the intimate personal contact required. In addition they suffer from problems of maintenance, lack of roads, and difficulty in following regular schedules. However, in certain special situations, the use of mobile transport is unavoidable.

On the other hand, transport is urgently needed for supervision and in-service training of peripheral workers. It can play a valuable role in special surveys. Under certain circumstances it is also useful for educational programmes and for distribution of supplies. In any case, it is best to use the simplest possible means of transport, which will have the fewest maintenance problems and will be able to get to the less accessible localities.

9.7 Commercial channels and government legislation

Stores are generally far more widely distributed than government health service units. Collaboration between nutrition programmes and commercial production and marketing has much potential. Governments can influence marketing policies and operations by providing information, and by appropriate legislation. The sale of food at a low price is generally of benefit to effective programme control.

The government can provide enrichment or fortification of foods, promote economic distribution of surplus agricultural products, lower taxes and other tariffs on good quality protein foods, tax nutritionally inappropriate products, and establish and administer laws regulating standards and codes of practice for hygiene,

processing, packaging and labelling. Governments should consult with nutritionists, paediatricians and other concerned specialists on all these matters before introducing administrative changes.

9.8 Mass media

Mass media should not be neglected; they may have particular potential for influencing opinion of leaders and for conditioning the public favourably for person-to-person contacts. In some areas the transistor radio is one of the principal sources of information. The potential of mass media for public education on health and nutrition has not been properly exploited and considerably greater efforts should be made to work through these media using responsible production and advertising techniques.

9.9 Distribution

An obstacle to feeding programmes in many countries is inadequate government machinery to supervise food distribution. The machinery is likely to be less adequate through health channels than through school channels. Until this machinery is strengthened the available help of UNICEF, CARE, AID, the World Food Programme and other sources will have limited application.

The hidden costs that have appeared in distribution programmes have raised serious questions about the cost benefits of some distributions. Furthermore, it is apparent that creation of permanent dependence on outside supply may be undesirable. For these reasons distribution programmes need to maximize educational benefits and seek ways of phasing themselves out. Collaboration with international donor agencies such as the World Food Programme and Food for Peace is desirable.

9.10 Role of schools

The schools ordinarily do not reach the preschool child directly. In some cases the schools might be used as centres of distribution to mothers and preschool children and of parent education. However, the approach through school has the greatest potential in educating the oncoming generation and in using students to educate their families. The school garden and the school lunch are important for practical education.

9.11 Other channels

Women's clubs and youth clubs can be channels of information and distribution. Information can sometimes be channeled through industrial employment; this is of growing importance with rapid urbanization, but there are also rural opportunities such as tea estates, where female labour is particularly likely to be employed.

9.12 The urban contact

Several aspects of the urban problem must be considered. With curtailment of breast feeding consideration should be given to early supplementary feeding through clinics, day-care centres and home visiting. All staff involved must clearly understand, however, that for the large nonprivileged groups of young infants in developing countries no substitute will equal breast milk with respect to safety in rearing. Day-care centres and nurseries for working mothers offer opportunities for improving preschool nutrition. In the towns the population is more literate and has more access to mass media. Since more food is purchased, rather than home grown, greater attention should be given to influencing the food market availabilities.

9.13 Manual

The PAG manual, "Feeding infants and young children with special reference to homemade weaning foods", which is in publication will be a valuable adjunct in strengthening channels for preschool child feeding and will serve as a guide for semitrained workers. It will be of great use in the work of home economists, public health workers, skilled MCH personnel and medical officers in the developing countries who have the opportunity of using their contacts with mothers and children as a channel for nutrition and health education.

9.14 Effective preschool protection programmes

It is apparent that a number of new preschool protection programmes have been in operation with varying degrees of success in some parts of the world in recent years. The pooling of experience and the methodology employed in these programmes will be of great benefit.

9.15 Other channels

It is obvious that all these information channels have limitations and there is great need to develop more effective channels through constant research followed by trials and evaluations. At the same time, priority must be given to influencing agricultural practices, industrial-commercial modification and other factors that can influence acceptance through availability. A reinforcement of current approaches is also essential in order to have adequate impact. All these efforts will help long-term progress rather than pose dramatic easy solutions.

10. METHODOLOGY OF PRESCHOOL CHILD FOOD CONSUMPTION SURVEYS

10.1 The problems

Information on infant and child feeding practices and on the quality of diet is available for many countries, but data on the quantity of food consumed by this age group are scarce. A few quantitative surveys have been made, nearly all on a small scale and with limited geographical and time coverage.

Collection of data on food consumption of preschool children in developing countries presents problems of methodology. The more important of these are accurate evaluation of breast milk intake, food consumption from a common dish and frequent nibbling outside the home.

Lack of data on these items makes it difficult to measure the exact quantity of food consumed by an individual child. A relatively large number of trained interviewers are needed to carry out an accurate quantitative survey in this age group. There is need to establish a good rapport between the interviewer and the family and a companionship with the child so that items of intake and amounts may be correctly assessed.

Methods to be used will depend on the country and its culture as well as on the aims of the survey. A survey of preschool children should always be preceded or accompanied by studies of family food habits, family availability of food and other socioeconomic data that will help in planning applied nutrition projects.

10.2 Scope and methodology of food consumption surveys

Surveys on preschool children could be undertaken on a national basis, as a part of national food consumption surveys. In more limited areas, surveys conducted periodically as part of action programmes, such as applied nutrition programmes, will be of great aid in providing baseline data for planning and follow-up surveys for evaluation. Special surveys may be organized to study specific problems in preschool children in selected areas.

The methods available include:

a) Individual weighing
b) Recall technique
c) Questionnaires
d) Mathematical extrapolation from family surveys (33)

It is preferable to use a combination of two or more of these, depending on the scope of the survey and other circumstances. Irrespective of the approach, the survey, to be useful, should be associated with clinical and anthropometric surveys and where facilities exist, biochemical tests (34, 35).

There is an urgent need to carry out a large number of surveys covering the preschool child in as many regions as possible. The data collected through these surveys will help in the precise planning of action programmes for the benefit of the children, such as education programmes directed to mothers and families and the development of homemade or processed food formulas and supplements. An essential part of the survey is information on food habits and practices, on amounts of breast milk consumed and on local food supply and cost. Such periodic surveys will also enable an assessment of the value of nutritional programmes in the region.

10.3 The need for a guideline for methodology

Compilation of a guideline for methodology of food consumption surveys for preschool children will facilitate uniformity in procedures and data presentation and help in the comparison of the food consumption data obtained in different regions and in the same region at different times. It will also help in instituting proper training for the interviewers who form the backbone of such surveys.

11. NUTRITION SURVEYS

To provide a base for assessment of improvement of nutrition of preschool children and for the evaluation of action programmes, there is need for surveys combining biochemical, anthropometric, clinical and food consumption data with information on food economics and socioeconomic/sociocultural status. In many countries it will be necessary to study a number of cultural entities. Local institutions often can conduct the surveys but may need technical advice, support for training and perhaps additional financial assistance.

Longitudinal surveys are also useful, particularly if specific problems are being studied, such as some aspects of growth and development or to ascertain the role of nutrition in mental development and behaviour.

12. MILK INTOLERANCE AND NUTRITIONAL IMPLICATIONS

12.1 Milk intolerance in kwashiorkor

It has been known for a long time that a certain percentage of children suffering from kwashiorkor show poor tolerance to milk feeding during the initial weeks of treatment. The milk intolerance manifests itself in the form of diarrhoea and abdominal discomfort, though these symptoms do not markedly affect the recovery of the child if the milk feeding is continued. The symptoms subside gradually and after a few weeks the children begin to tolerate the administration of milk well. This milk intolerance has been related to disaccharidase deficiency during the acute stage of kwashiorkor and it seems to affect lactase activity more severely than other disaccharidases.

12.2 Milk intolerance and lactase deficiency in the general population

Recent investigations (36) have shown that in some apparently normal adults the intestinal lactase activity is low or nearly absent and administration of relatively large quantities of lactose or milk caused abdominal discomfort and diarrhoea. While this condition was observed in a small percentage of a few hundred Caucasian adults studied, it is reported to be more frequent among Asians and Africans. However, several of the studies reported in the literature have been carried out as clinical investigations in hospitals on small groups of subjects. Information regarding the occurrence of this problem in children is also meagre. Moreover, a lack of relationship between milk intolerance and intestinal lactase deficiency has been suggested. The scientific evidence available at present is too meagre to support a clear statement on the public health significance of the problem and its nutritional implications. However, in view of the current interest, the subject of milk intolerance with special reference to its nutritional implications and public health importance requires further consideration.

13. NUTRITION AND INFECTION

13.1 Introduction

The interaction between malnutrition and infection in the patient as well as in the community is complex and varies in extent and severity depending on several factors. Broadly viewed, together they constitute an epidemiological unit. The interaction between malnutrition and infection has been reviewed in earlier publications (37, 38), and it is stressed once again that it is not possible to dissociate the effects of infection and of malnutrition. The frequency of infection increases and tends to be prolonged and severe in children with malnutrition. Figures 1, 2, 3 and 4 represent the nutrition, growth and health history of four typical children in Guatemala, Ethiopia, India and Iran. It is of value to consider, both for prevention and treatment, a combined attack against malnutrition and infectious diseases. This has always been the practice in maternal and child health programmes but both aspects should

be strengthened in appropriate balance and according to local priorities.

13.2 Collection of data

Governments should be better informed on the prevalence of malnutrition and its intimate relationship to the occurrence and severity of various infectious diseases. Appropriate information on the prevalence of malnutrition can come from two sources:

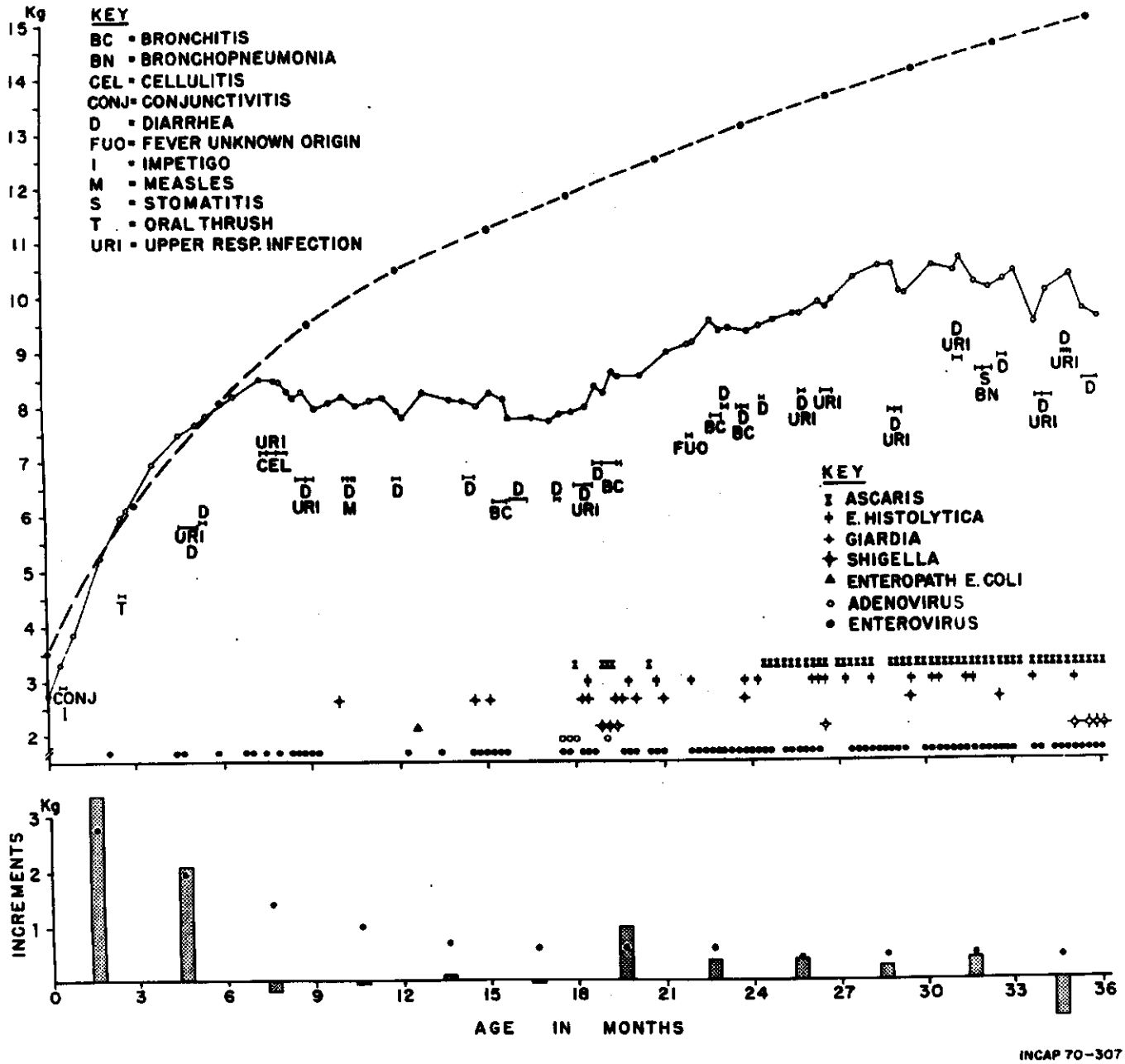
1) Registration of causes of mortality, most often limited to deaths in hospitals. In most cases only the primary cause of death is recorded and not the associated cause, e.g. malnutrition and/or anaemia, which may have been important factors in the death. Thus only advanced cases of PCM and anaemia, without concomitant infection, are registered as death due to malnutrition.

2) Nutrition surveys, mainly cross-section studies since they are cheaper and quicker. The examination of children, whose exact age is often unknown, may not reveal chronic moderate malnutrition which is characterized only by a smaller height for age. In some cases the malnourished child may on inspection appear well-proportioned (homeorrhesis). Although chronic moderate malnutrition aggravates the prognosis of common childhood infections and is of public health importance, in the results of some surveys only cases of advanced PCM are recorded. These represent only a small percentage of malnourished children.

13.3 The common problems

Common childhood infections are the ones which, due to their recurrence, constitute the main danger; they increase catabolism in malnourished subjects and often prove fatal. Among them diarrhoeas and respiratory diseases are the most common and, unfortunately, there is no possibility of immunization against these common ailments.

FIGURE 1



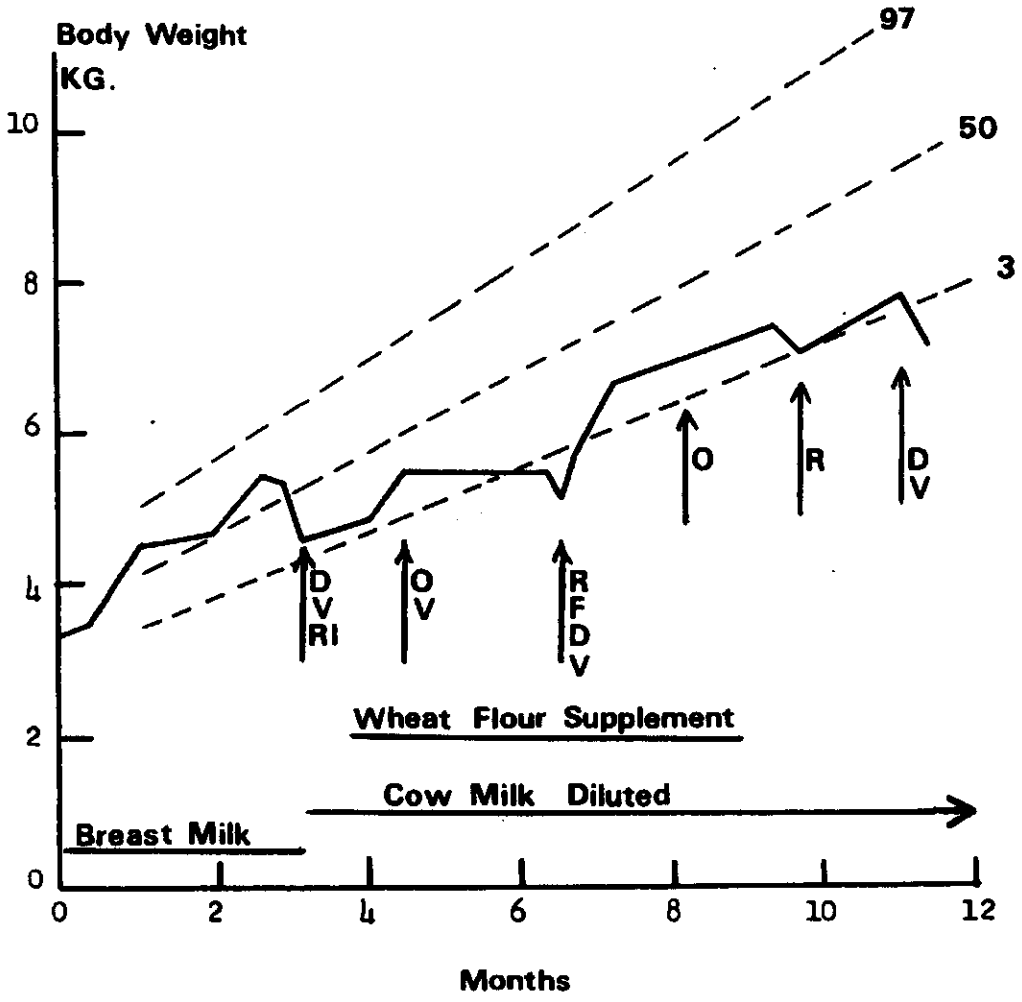
KEY :

Top: The solid line represents weight of child; the broken line is the median of the standard. The length of each horizontal line indicates duration of infectious disease. Each mark shows a week positive for the particular infectious agent.

Bottom: Observed weight increments (vertical bars) and expected median increments of the standard.

FIGURE 2

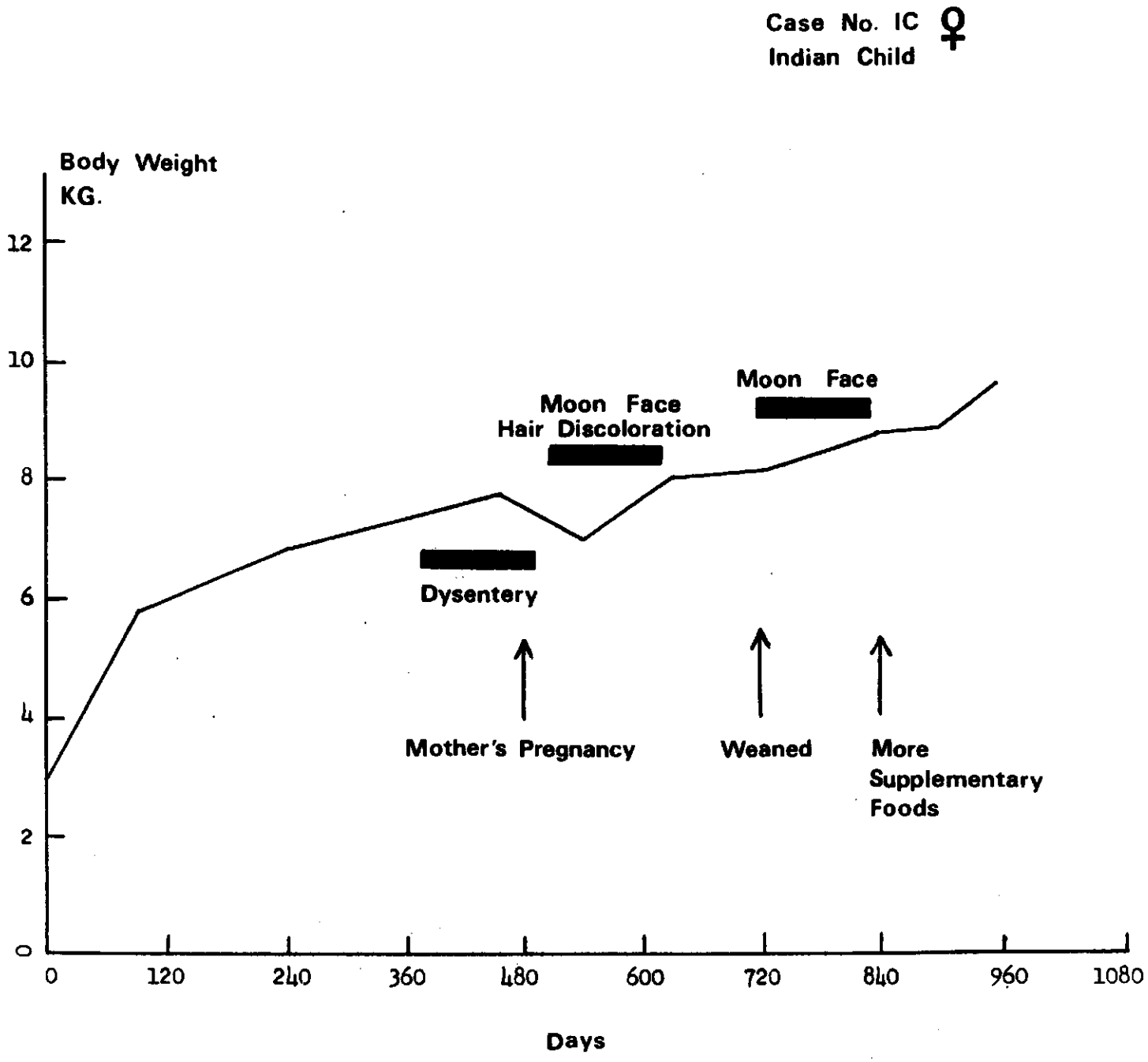
Case No. 4, ♀
Ethiopian Child



From A Study By Roland Eksmyr,
Ethiopian Nutrition Institute, 1969

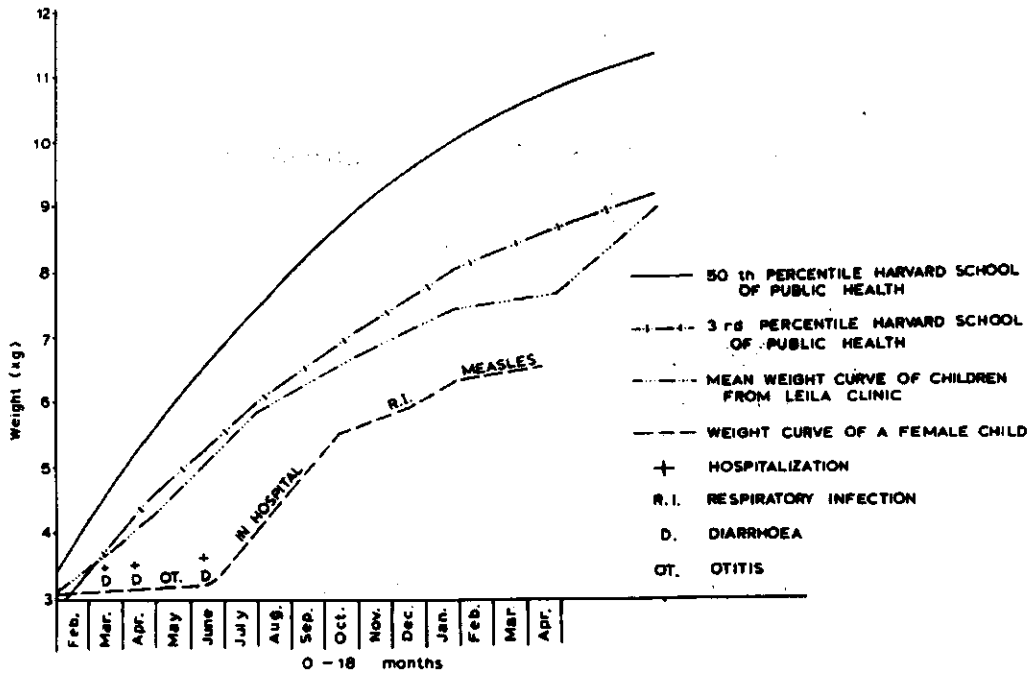
D	Diarrhoea
F	Fever
O	Otitis
R	Rash
RI	Resp. Infn.
V	Vomiting

FIGURE 3



From Annual Report, National Institute of Nutrition
Hyderabad, India, 1962, p. 39

FIGURE 4



WEIGHT CURVE IN RELATION TO INFECTIOUS DISEASES IN A FEMALE CHILD - IRAN

by Dr. M. Sadre, Food and Nutrition Institute,
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Special consideration should be given to malaria, which affects the nutritional status of the population in the endemic areas, and to measles, whooping cough, infections of the skin and chickenpox, all of which seriously undermine the nutritional status of the child.

There is evidence that severe helminthic infestation may lead to harmful effects on host nutritional status. Ankylostomiasis forms a real nutritional hazard through constant loss of blood, leading to loss of protein, iron and possibly other nutrients. This assumes significance in preschool child nutrition, since in certain parts of the world heavy hookworm infestation is reported to be present in infants and young children. Similarly, infestation with ascaris, especially with a high worm load, may aggravate malnutrition largely by disturbing digestion and absorption of all nutrients and particularly proteins. Further scientific information is required on the nutritional effects of these and other helminthic infestations, particularly the relationship between worm load and nutritional effects, and with regard to the latter, the extent and quality of the effects. The mechanisms by which these parasites affect the host nutrition also need to be studied. It is the clinical opinion of paediatricians in many parts of the world that giardiasis in infancy and early childhood is a serious cause of diarrhoea and malabsorption and the nutritional significance of this parasite lies in the fact that it is difficult to eradicate completely, resulting in frequent episodes of alimentary upset.

13.4 The solution

Ideally, the solution to the problem would be to carry out all the necessary measures simultaneously:

1) Immunization against specific diseases: measles, whooping cough, smallpox and tuberculosis

2) Improvement in sanitary conditions, primarily the supply of safe drinking water

3) Appropriate diet and nutrition education in order to ensure good nutritional status and maintain resistance against infectious diseases and any eventual injury.

In the long run, improvement in sanitary conditions should give the best results, but it is very difficult to carry this out successfully. There is evidence that unhygienic food handling at home is probably one of the most important factors in weanling diarrhoea.

The results of immunization are often difficult to evaluate. It would therefore be of interest to study them in a given region according to the nutritional status of different groups of children and to the local ecology. The vaccination campaigns should be planned according to the local pattern of epidemics and the resources available. For example, a vaccination campaign against measles should be repeated regularly for it to be efficacious. The effect of the vaccination programme on child mortality and morbidity may be partly masked if the children of the area continue to suffer from episodes of common respiratory and intestinal diseases, due to the poor sanitary conditions of their environment.

13.5 Research areas

An important problem is the reaction of malnourished children to the tuberculin test. In several countries it has been shown that malnourished children suffering from tuberculosis react positively only to high doses of tuberculin (39, 40). The problems of nonspecific tuberculin reactions and their interpretation are areas for further study. Further studies are also needed on the effect of PCM on defense mechanisms. The results of the few studies carried out so far seem to show that there might be a means of evaluating the frequency and effect of infections in malnourished children.

In the estimation of recommended intakes of nutrients, the FAO and WHO have so far concerned themselves with children in good health. In tropical countries, however, infectious diseases and episodes of infection are so frequent that in interpretation of recommended intake this factor should be taken into account and suitable increases in recommended allowances should be made.

14. SPECIAL MIXTURES FOR TREATMENT OF PCM AND FOR USE IN SUPPLEMENTARY FEEDING

14.1 In the early days of treatment of acute protein-calorie malnutrition the addition of casein and sucrose to skimmed milk powder to obtain a mixture with reduced lactose produces better results (41, 42). Addition of fat to these mixtures is necessary to provide adequate calories.

14.2 K-Mix-II

General application of this procedure is difficult, due to the relatively high cost of the pharmaceutical grade of casein used in earlier studies. Recently, however, a mixture of "food-grade" calcium caseinate 3 parts, skim milk powder 5 parts and sucrose 10 parts (by weight) called K-Mix-II, has been supplied by UNICEF for use in Nigeria. In the first half of 1970, 400 tons of this mixture were provided. Excellent response to this mixture with added groundnut oil has been reported (43). The "food-grade" calcium caseinate is of a quality which allows easy preparation of a suspension in water plus oil and easy passage of the suspension through a naso-gastric feeding tube, if necessary.

14.3 PKFM

Another mixture which has proved useful in feeding children recovered from kwashiorkor is a precooked, sweetened, fortified maize flour - soy flour mixture, called "post kwashiorkor feeding mixture" (PKFM). Eight hundred and fifty tons were supplied to Nigeria in the first part of 1970 and an additional 3,000 tons towards the end of 1970.

PKFM is a fully precooked, ready-to-eat high-protein mixture formulated as follows:

Corn (maize) meal	40%
Full fat soy flour	38%
Dry skim milk	5%
Sugar (sucrose)	15%
Vitamin-mineral mixture	2%
Added vanilla flavour	

Dry PKFM contains 20% protein and 8% fat and it provides 113 calories per ounce (4 calories per gramme). It is readily accepted due to the sweetness of the sugar component, the fat level and the added flavouring. It requires no cooking and for feeding it needs only to be mixed directly with water which has been boiled. Fairly concentrated preparations may be fed; for example, one volume of the dry mixture to one and one-half volumes of water. In any case, adequate water intake must be maintained.

14.4 Other useful mixtures suitable as supplementary weaning foods have been tested in limited trials and are listed in the report on "Consultation on human testing of protein rich foods" (WHO, Geneva, 9-11 March, 1970).

15. PRESCHOOL CHILD FEEDING IN TIMES OF DISASTER

15.1 The precarious situation of the preschool child

In times of disaster as at other times it is the children of preschool age who suffer most. Even at "normal" times in developing countries the vast majority of preschool children, especially in the age group six months to three years, are in a state of chronic malnutrition. Famine conditions will severely strike these dependent young children, who are already in a precarious situation, leading to a great increase in morbidity and mortality in this age group. The nutritional requirements of this age group are relatively high, not only in quantity but also in quality, e.g. with respect to protein. At the same time the young child is completely dependent on adults to help him meet these needs. In a famine situation, social and

family disruptions may leave the child isolated and helpless, even when not actually abandoned. Infectious diseases and gastroenteritis add to the plight. A systematic surveillance carried out in the Uyo area of Nigeria during the recent famine revealed that children under four years of age represented nearly 60% of the total of those suffering from malnutrition (44).

15.2 The effect of relief programmes on the preschool child situation

Almost any type of relief programme including food assistance will have at least some benefit for the young child directly and/or indirectly. This is true if the assistance is provided in the form of cereals, pulses, oil, sugar, dried fish, etc.

However, the younger the child the greater the need for special foods which provide the necessary amounts of good quality protein, vitamins, etc. For a long time the mainstay for this purpose has been dry skim milk powder and in later years the same enriched with vitamins A and D. It continues to be so, especially for the preparation of complete foods for infants who are prematurely weaned.

In recent years special low-cost protein-rich foods based mainly on vegetable products and providing an ample supply of vitamins and some minerals have come on the market. These foods have excellent supplementary food value and are intended for use especially as a weaning food. During the Nigerian civil war large quantities of CSM (a corn-soya-milk mixture fortified with vitamins and minerals) were shipped and proved of definite value in child feeding programmes. Programmes using imported weaning foods may be vital in periods of famine. Even so, mothers should be taught how best to use the few staples available locally for the production of homemade weaning foods.

Breast feeding, extremely important under ordinary conditions, becomes vital for the child during famine. Thus an essential part of the relief to benefit the child is to give pregnant and nursing mothers high priority in the feeding programmes.

The most vulnerable individual in times of disaster is the artificially fed infant below six months of age. Without special measures he will succumb in a matter of days. Therefore, all infants not breast fed should have the highest priority in relief programmes.

The administration and execution of food relief programmes can to a great extent be carried out by nonmedical personnel. However, experience from recent famines underlines the importance of establishing "adaptive MCH services" and special "famine hospitals" which serve as centres for emergency care, for checking panic and also initiating immunization programmes and other measures to protect against epidemics.

15.3 Machinery for implementation

A summary of the recommendations made in a recent symposium on nutrition and relief operations in times of disaster held in Sweden (45) is given below:

1) National governments and international organizations should establish a convention or modify the existing conventions and outlaw starvation as an instrument of conflict. This would be in line with the ban that has been imposed on bacteriological warfare.

2) A system for warning of impending famine should be worked out making use of existing extension channels (reports on crop failure, increase in food prices, population movements, sudden rise in incidence of malnutrition and of young child mortality). The data obtained should be made available without delay to the national governments.

3) A national coordination body should be established, charged with predisaster planning and coordination of external and internal aid in times of disaster.

4) A permanent secretariat should be established on an international level charged with the task of keeping up-to-date records on available relief resources and collection of data relevant to the prediction of impending disaster. Furthermore, a special expert analysis group

comprising specialists in management, health, nutrition, agriculture and the social sciences should be organized on a headquarters level. Such a group should be immediately available on alert both for advice in planning relief operations and for visits to the disaster area.

5) As part of the training of personnel for relief operations in times of disaster, special survey teams should be organized with instructions on how to collect anthropometric and dietary data both on preschool children and on older children and adults. Such teams, supervised by national institutes of nutrition and/or regional United Nations organization offices, could be of great value not only to evaluate the relief programmes but also for use in normal times.

6) A manual on nutrition relief operations should be prepared.

16. NUTRITION IN MEDICAL TRAINING

There is a serious need to improve the nutrition training of medical personnel, especially with respect to the needs of the preschool child and practical ways to meet them. Paediatric curricula should shift to broader considerations of MCH coverage and should stress preventive medicine and nutrition. Field training in urban slums and rural areas is needed. In this connection, reference should be made to the fact that the International Paediatric Association (IPA) held a workshop at the last congress in Mexico City, December 1968, devoted to paediatric education in which child health problems related to developing countries was given special attention. Furthermore, the IPA has announced a special workshop on nutrition at the forthcoming congress in Vienna to be held in August 1971.

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