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SUPPLEMENTARY FEEDING

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SUPPLEMENTARY FEEDING

The focus of this talk is on programs which distribute food in substantial quantities over extended periods of time through non-commercial channels to children under five-years old and to their mothers who may be pregnant or lactating. The object of such programs is to increase nutrient intake and/or dietary balance and thus beneficially affect the nutrition status of the recipients.

HISTORY OF SUPPLEMENTARY FEEDING PROGRAMS

Historically these programs have developed in three phases (Bailey & Raba, 1976). During the first phase, 1945-1960, UNICEF established programs for feeding war-ravaged countries and later children in developing countries. The food that was distributed was initially unfortified milk powder. Their packaging and distribution put a tremendous burden on health workers and valuable time was taken away from routine health care. Often there was no room for patients in the clinic due to the stacks of milk powder (C. Williams). Recently on a visit to Guatemala in the area of the last earthquake, at a clinic I visited in El Progresso the storeroom was filled to capacity clogged with

bags of decomposed milk powder and patients had to wait outside. The only beneficiaries here were rats (Baumslag, 1979). Last year in South Swaziland I saw the only examining room in a health post had been made inaccessible by bags of milk powder.

The second phase started in 1954-1970 when bilateral and voluntary agencies took over many of the programs. The agencies added to the list of hand outs, cereals (blended), oil, and foodstuffs such as tinned sardines. Since 1970, the third phase of donor involvement, the World Food Program, in addition to existing programs, developed many new programs.

FOOD AID AN EXPENSIVE AND SEEMINGLY ENDLESS BUSINESS

Over three quarters of a billion dollars was spent on food distribution to provide 125 million children with food in developing countries (Berg, 1973).

Currently the U.S. is the biggest provider of food aid and through Public Law 480 has provided 26 billion dollars of food assistance to foreign nations since 1954 when the program first started.

According to a report issued by a special task force on the operations of Public Law 480, the task force supported the concept of food assistance for humanitarian and development goals as the basic foundation of the program,

while recognizing the importance of the purposes such as market development, surplus disposal and political goals (New Directions for U.S. Food Assistance, 1978). The food assistance programs have been growing and so have the loans. Several countries are now in debt for foods such as grain.

Global food needs are enormous. The number of hungry and malnourished individuals in the world is estimated to range between 400 million and 1.2 billion people. To compound the problem even if food could be shipped in large amounts continuously, transport doubles the costs and storage and distribution adds further to the enormity of the problem.

OBJECTIVES OF FEEDING PROGRAMS

Supplementary feeding programs may legitimately have political as well as health, nutritional, behavioral and social goals.

Most feeding programs set out to: --

(1) assure normal physical growth and mental development of preschool children.

(2) to recuperate the malnourished

(3) reduce morbidity and mortality due to malnutrition through the provision of food as a corrective element in the diet and provide

nutrition education for pre-school children and their mothers.

With limited resources feeding programs can only be considered short term, stop gap measures and supplementary feeding should only be used as short term measures while longer term measures are being taken to develop skills, self help and increase income.

RATIONALE FOR SUPPLEMENTARY FEEDING PROGRAMS

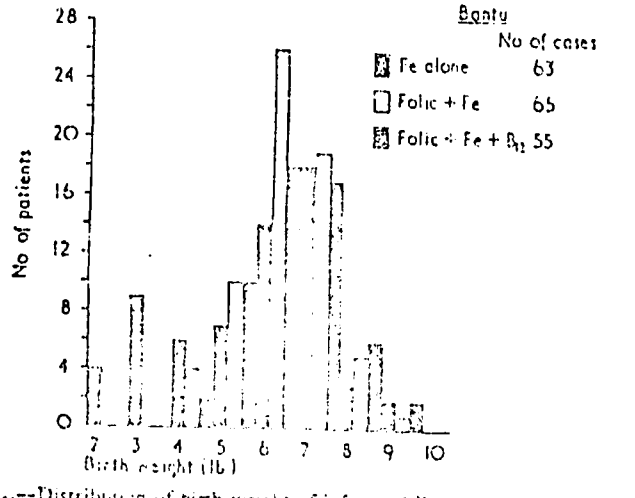
At critical periods nutrition supplementation over short periods can be invaluable in preventing malnutrition. From the body of scientific studies available it appears that the last trimester of pregnancy and the lactation period as well as the weaning period deserve special attention.

One of the ways which supplementary feeding may prevent malnutrition is through the distribution of foods to pregnant and lactating women. Maternal caloric supplementation of 170 extra calories per day during the last trimester of pregnancy has been found to significantly reduce the number of children with low birth weights (less than 2500 gms). Studies have been undertaken in Guatemala (Lechtig, 1975), Columbia (Mora, 1974) and in Mexico City (Chavez, 1974).

To date most have not succeeded in increasing average birth weight by more than 100 gms. despite the provision of sizeable food supplements.

In Soweto South Africa (Baumslag, 1970) found that antenatal folate supplementation for folate deficient mothers in the last trimester of pregnancy markedly reduced the number of low birth weight infants as can be seen from the table and figure below.

	Over 5 lb.	Under 5 lb.	
Iron	44	19	63
Iron + folic acid	61	4	65
Total	105	23	128



...—Distribution of birth weight of infants of Bantu mothers receiving various supplements in pregnancy.

The growth increment was greater than that obtained in the Guatemalan study (Lechtig, 1975), indicating that all malnutrition is not the same. This response to folic acid was later confirmed in India (Iyengar, 1972).

Hibbard stressed the importance of folates in spontaneous abortions and low birth weight and decried the fact that fetal loss from spontaneous abortion in humans is at a level that could never be tolerated in a cattle ranch.

Furthermore (Stein, 1975) established a high incidence of low birth weight infants among poor urban blacks. Serum albumin studies of mothers of low birth weight infants showed a direct correlation with infant size (see figure below).

Maternal protein depletion and small-for-gestational-age babies

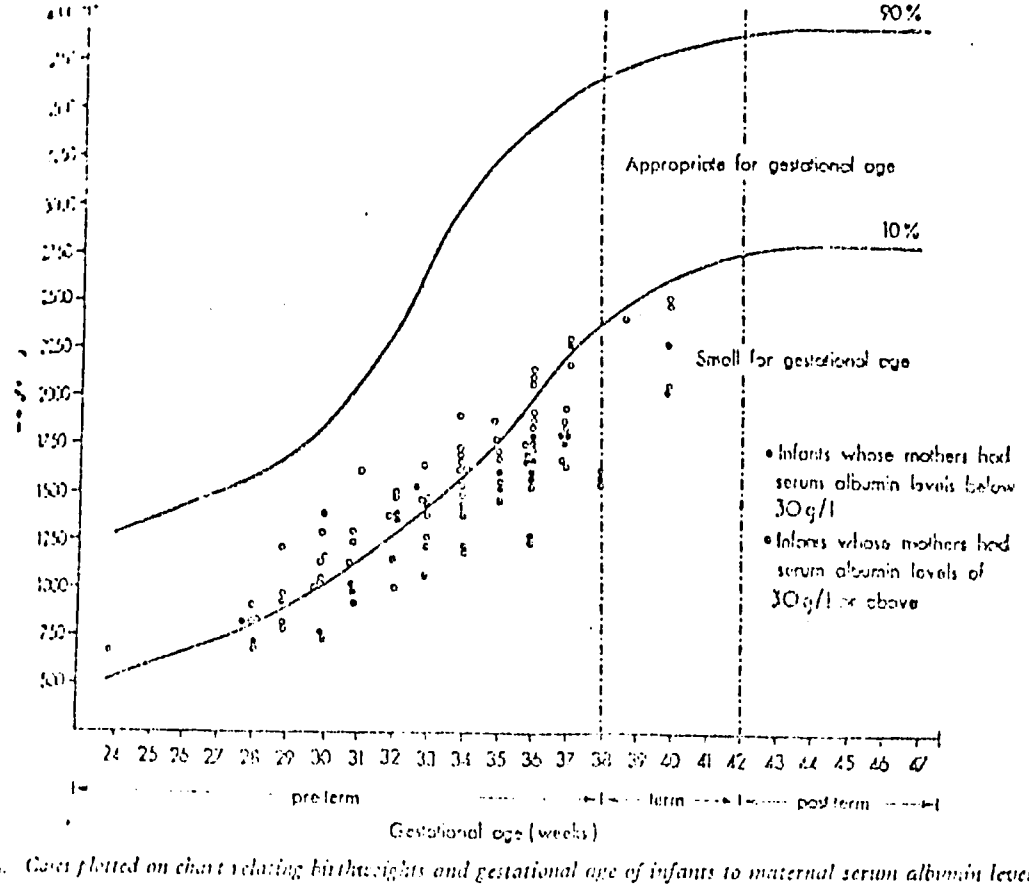


Fig. Cases plotted on chart relating birthweights and gestational age of infants to maternal serum albumin levels.

Pollitt and Underwood question the biological value of a low increment in weight gain in view of the high costs of e.g. the Guatemala and Columbia studies.

Since low birth weight and fetal wastage is a big problem in developing countries and the evidence implicates nutritional supplementation as an important component of nutrition interventions and for optimum effectiveness must be targetted at malnourished mothers and definite criteria used for their selection. Markers that could be used in identifying infants at risk for malnutrition are listed in the Table on the next page.

INFANTS AT RISK FOR MALNUTRITION

MOTHER

- Has unwanted pregancy.
- Caloric intake less than 2000 cal.
- Has malaria.
- Is less than 15 years of age or over 35 years.
- Multiple birth.
- Is alcoholic.
- Measurements:
  a. Head circumference less than 51 cm.
  b. Height less than 5 feet.
  c. Weight less than 38 kilos before pregnancy or 40 kilos at 20 weeks.

INFANT

- Birthweight less than 2500 grams.
- Sibling with malnutrition.
- Death of a sibling in less than 12 months.
- Close child spacing.
- Repeated diarrhea.
- Measles or malaria.
- Bottle fed.
- Death of, or desertion by parent.

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* Derived from several studies--not necessarily to be generalized.

Sources include: Shah, K. "Selection of Pregnant Mothers as Beneficiaries for Nutrition Supplements" Journal of Obstetrics and Gynecology of India, Vol. 25, number 3, 1975.

Aaron Lechtig et. al. "A Simple Assessment of the Risk of Low Birth Weight to Select Women for Nutritional Intervention," American Journal of Obstetrics and Gynecology, Vol. 125, May 1, 1976, pp. 25-34.

Naomi Baumslag, "Maternal, Infant and Child Nutrition" unpublished paper, Office of International Health, 1978.

Some data suggests that children with higher birth weights born to supplemented mothers show less growth retardation at 36 months than in children of unsupplemented mothers (Klein, et. al. 1976).

LACTATION

The nutritional status and dietary adequacy of mothers can affect the quality of breast milk. As many as 20-30 percent of mothers in developing countries may be underweight, fail to gain weight in pregnancy and lose weight during lactation. In addition, even the duration of lactation may be affected by weight gain during pregnancy (Whitehead, 1978). Seasonal shortages too have to be planned for.

Generally well nourished mothers produce 600-700 ccs milk per day, however, when their caloric intake drops to less than 2,000 calories the breast milk volume may decrease to 400-600 ccs. per day. (Senecal, 1959; Harfouche, 1970). Other investigators (Chavez, 1973 & Gopalan, 1959) increased milk quantity through supplementation. Milk output rose eg. when protein intake was increased. On a diet of 3000 calories milk output increased by 200 ccs per day. After three months lactating breast milk in malnourished mothers not only declines in quantity, but may decline in quality.

Total energy cost of lactation is met by the mother's fat loss resulting in a six percent weight reduction for lactating women whose diets are inadequate.

It is interesting to note (Karlin, 1976) that in a survey of nutrition programs only 15 percent of nutrition projects enrolled mothers as beneficiaries.

Additionally in many developing countries misinformed and poorly prepared pregnant women try to eat little in order to have easier labors with smaller infants. This harmful dietary practice increases the morbidity and mortality of the fetus.

WEANING PERIOD (approximately six to thirty-six months)

During this period when foods are introduced to supplement and finally replace breast milk, children are particularly vulnerable to diarrhea and infection. (Gordon, 1963). Supplementary feeding programs for children in this period are likely to have the greatest nutritional health impact provided they include not only food, but also preventive and curative services. On innumerable occasions it has been demonstrated that feeding alone is not enough e.g. an infestation of 40 round worms can result in a food loss equivalent to four eggs per week. Had specific health measures been taken the program would not just be feeding worms. It is important, therefore, that infections be dealt with or prevented concurrently with prescribed dietary interventions for maximal cost effective results. Feeding children has great political appeal and feeding school

children is easier than reaching toddlers but the critical period appears to be during weaning.

TYPES OF FEEDING PROGRAMS

There are three main types of programs currently in vogue: --

(1) on site feeding programs

(2) take home feeding programs

(3) nutrition rehabilitation centers (NRC)

1) On site feeding programs.

Early food distribution programs were developed on these lines requiring the participant to regulary come to a specific location for food. There are several disadvantages to this type of program such as the stigma; limited to nearby residents; necessity for someone to bring the child; need for adequate storage facilities; continuous means of supply and personnel to prepare and serve the food, to monitor the program and control participation. All these add to the high staffing costs. Programs rarely reached children under three years of age. Where these programs were associated with clinics some even claim it has improved clinic attendance. However, there is evidence to show that when the food runs out the clinic services are not utilized. Annex A (table 1) lists strengths and limitations of on-site programs. These programs often fail

to recognize children needing to be referred to hospital. They exist in day care centers, schools and clinics. Where part of the daily requirements are provided in order to reduce the nutrient gap and increase the dietary intake the effect is not achieved as the meal replaces instead of adding to the dietary intake.

2) Take home programs

These programs reach a wider group of participants and utilize smaller numbers of personnel, require less frequent attendance by family member and permit larger access. Analysis reveals that 40-60 percent of the foods received reach the target children. Ration size may have to be considerably increased, however, as was the case in Columbia (Mora, 1974) where 850 calories were provided in take-home rations and mothers only increased their dietary intake by 150 calories/day. The rations were substituted or sold or shared with the rest of the family resulting in a dilution effect. There is no question that targetting careful participant selection and community involvement are critical.

In one study in the Philippines (Asia Research, 1976) it was found that severely malnourished children benfitted from feeding programs but mildly malnourished children deteriorated nutritionally. The overall impact of programs of either type in filling the "energy gap" is disappointing

(Beaton and Ghassemi, 1979). Only 1-25 percent of the gap may be closed regardless of the type of program. (See Annex II).

Foods used in supplementary feeding programs

A survey (Karlin, 1976) of a variety of programs revealed that 50 percent used imported foods such as cereal, legume mixes blended from high protein foods - Wheat Soy Blend (WSB) and Corn Soy-Milk (CSM). These blends are interestingly unknown to consumers in the country of origin. Most programs are costly and use foods not available in the recipient country. Acceptability was low for a variety of reasons eg. in Bangladesh a fish protein concentrate (FPC) was poorly accepted in a pre-school program because it had a bad smell and mothers thought it contained pulverized frogs and snails. (Institute of Nutrition & Food Science Dacca University, 1977). On standing the FPC could be separated from the wheat sold to farmers as fertilizers. In Bombay (Pyle, 1971) found a Soy Milk Drink unacceptable because it smelt like crushed bed bugs! New foods have to be tested for acceptability in the setting in which the product is used or needless expense and waste may result (Anderson, 1977).

There are many considerations that have to be weighed in developing a feeding program. Begin (1976) suggests that communities vary in the availability of

local resources and some may be better off investing in e.g. improved road systems for market accessibility or improved irrigation for increasing individual crop yields.

In the Janked project people are activated to identify and help solve their problems by utilizing their own resources for feeding. Villages donate land for food production specifically for supplementary feeding programs which are governed by the village committee. Self reliance is promoted. (Arole, 1975).

3) Nutrition rehabilitation centres

Since Protein Energy Malnutrition is highly prevalent in many developing countries an alternative to hospital treatment was conceived. Nutrition recuperation occurs in centers, usually day care centers, where children are fed local foods at the lowest cost and mothers are given experiential nutrition education. Some of these programs are known as mothercraft centers.

As part of their education mothers are taught to cook nutritious low cost meals, some semblance of hygiene and child care, and given lectures on the three major food groups. These centers may be at a distance from the community, however, and mothers may have to leave their homes and stay in the residential setting for three to four weeks.

The programs portend to teach the mothers that malnutrition is due to insufficient or unbalanced feeding practices. Mothers may also be taught how to augment their food supply through home gardens and better use of available foods. Apparently the practice is not always as good as the theory. One demonstration unit I visited in Western Kenya, the demonstration garden didn't exist, nor were weight charts used, so useful in other situations as educational tools. The mothers believed their children were malnourished because they had measles and diarrhea and in spite of the program did not make any connection between malnutrition and food. It was disappointing to find that the M in MCH (Maternal and Child Health) programs appears to have been forgotten. Except for one program in Malawi mothers tend to be treated as appendages or necessary servants for their children. The mothers' health and nutritional status is ignored. There was a stigma attached to one Kenyan center visited probably based on the fact that it was situated close to a police barracks. Many of the women were divorced rejected first wives and the proximity was unfortunate. The program organizers were naively proud that they had devised a way of removing the stigma by issuing certificates for completing the program!

This type of program is generally very expensive and takes too few children approximately 200-300 per year.

They may be fed foods such as cereal blends, milk powder and Norwegian sardines and oil. I have visited centers where similar programs seem to collapse when the food aid doesn't come due to transportation failures especially in the rainy season. In these situations local foods bought by the mother for her personal requirements have to be used since the program only caters to children. Few programs have follow up visits at home, let alone visits prior to admission to the center even though these visits by trained personnel are essential to the success of the program. (See Annex A, 3).

In Zimbabwe at Howard Mission Rehabilitation Center follow-up is carried out in an attempt made to assess the nutritional status of the child and family as well as observations of any application of lessons learnt from the rehabilitation unit. Less costly forms of rehabilitation centers are being developed and have used rehabilitation in the village setting which allows the mother to learn her lessons and go home during periods in the day. The system is cheaper and makes use of community workers and community resources. Yet, in my opinion, it does not address the root nutritional problem which is the mother. If she is dependent, ignorant, poor and sick no lectures or demonstrations will break the cycle of malnutrition.

Results of a study of feeding program reports concludes that food distribution programs have a minimal impact on growth (Beaton, 1979).

Programs only lessened the nutrient gap by 10-25 percent. Programs reached children generally over three years of age and therefore too late. The average food ration per child provided only 300-400K Cals per day costing US$15-$25 per year. There is no data on morbidity and mortality reduction. However, it has been argued that there may be unmeasured benefits greater than physical growth and development. For instance they found that some children had increased physical activity and that leakage to other family members may be a useful by-product.

SUGGESTIONS FOR FUTURE PROGRAMS

1. Mother centered.

Program must be mother centered and not child centered starting with an analysis of the problems in the home and providing practical help with problems such as alcoholism or methods of augmenting the family income. Where women have had control of their finances and have social status, they have improved the nutritional status of the family.

2. Monitored prior start.

Nutritional rehabilitation needs to be monitored and programs for its elimination developed by the community at the home level. Younger children (6 months to 2 years) and malnourished mothers should be reached.

3. Home visits are essential for assessment, development of solutions, and evaluation of programs.

4. Programs should be integrated with other community development activities including in particular primary health care activities where this is feasible.

For many of us who have seen malnutrition, a preventable disease erradicated in countries where health, food, shelter and self dignity prevail, we can only regard feeding programs as a stop gap measure.

There is no point in merely providing people with food -- a band aid for a growing ulcer. An accurate diagnosis must be made, the etiology of or factors contributing to the problem defined and an effective treatment planned with the community making sure that solutions are practical and acceptable.

ANNEX 1

ON SITE FEEDING

Strengths	Limitations
Assures consumption of ration in intended quantity	Reaches few children under two years
Growth and recovery are possibly more rapid than in take-home	Ration is frequently substituted
Day care and child feeding facilities for working mothers	Takes responsibility for child feeding mother and creates dependency
Opportunity to educate children and prepare them for primary school	Expense of kitchen, eating facilities cook
Opportunity for psychological stimulation, socialization, and more normal mental development, especially through mixing malnourished children with the well nourished	Low coverage with attendance limit of thirty children
	Low geographic outreach
	Possibility of cross-infection
	Inconvenience of daily attendance

TAKE HOME FEEDING

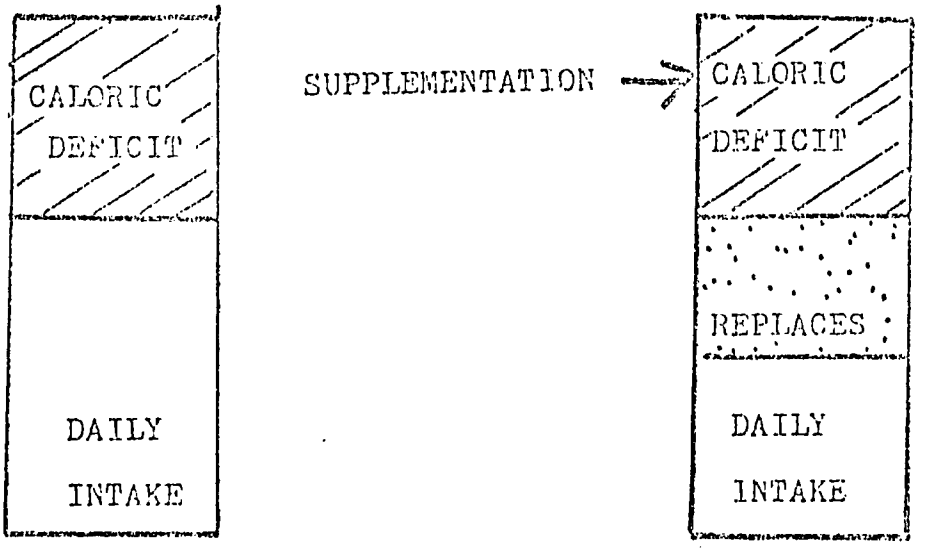
Strengths	Limitations
High geographic outreach	Sharing and selling ration result diversion to unintended
Covers children under two years old	Slow growth and recuperation
Convenient for mothers due to less frequent distributions and fewer lost wages	May not be appropriate for the severe malnourished child
High coverage with attendance of up to 600 children per center	May be too far for people to travel to distribution site
Less expensive than on-site because fewer facilities and staff needed	Less opportunity for education due to infrequent food distributions
Minimizes cross-infection risk	
More realistic maternal education through home treatment	
Home treatment can act as a nutrition education demonstration in distant communities	
Ration can be fed in more frequent, smaller portions than possible in on-site, resulting in higher nutrient intake despite bulk limitations	
Program located in a health center may promote greater use of health facilities	
Treats the malnutrition problems in its milieu	
Emotional disturbance is reduced because the child is not moved to a new psychological environment	

ANNEX 3

NUTRITION REHABILITATION CENTER

Strengths	Limitations
Promotes rapid rehabilitation and growth maintenance after graduation	Low coverage with attendance limit of thirty children
Assures consumption of total RDA	Does not directly reach other children
Avoids problems of sharing and substitution of the ration	Low geographic outreach; must be l with high rate of PEM
Maternal education prevents malnutrition in siblings and community	Low coverage of children under two
Maternal education and use of locally available, affordable foods create self-sufficiency	Expensive due to provision of total and need for cook, kitchen, and ea
Involves mother in recuperation of her child through mandatory education and work shifts	Education may not be mandatory or mother's economic limitations
Can treat severely malnourished and free hospital beds	Possibility of cross-infection
More cost effective because targeted	Removes mother from home, other ch job (especially residential NRC) a lost wages and inconvenience
	Requires dynamic, dedicated person
	Not successful in urban settings

FIGURE 1


CALORIC DEFICIT
DAILY INTAKE
SUPPLEMENTATION
CALORIC DEFICIT
REPLACES
DAILY INTAKE

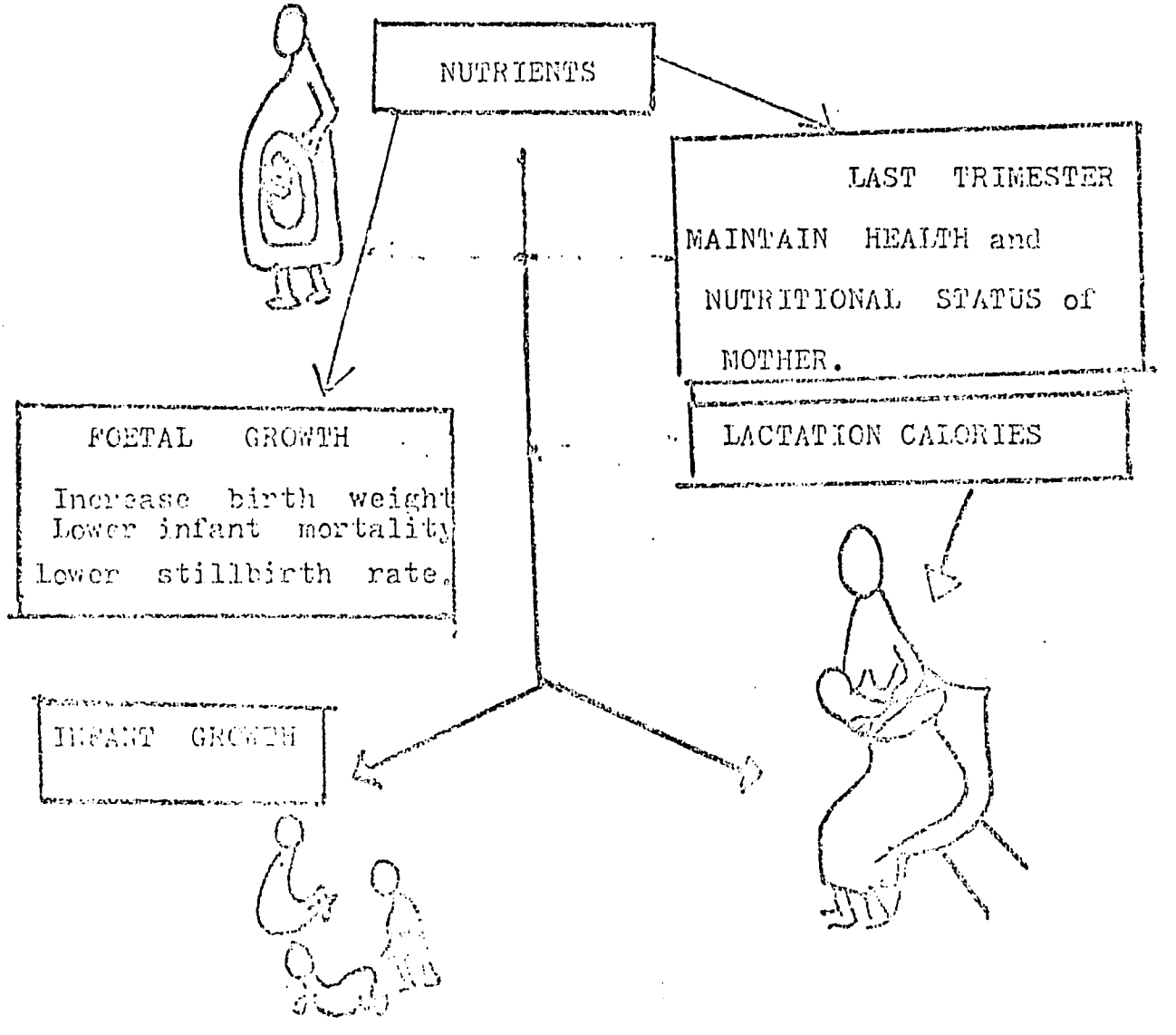

NUTRIENTS
LAST TRIMESTER
MAINTAIN HEALTH and NUTRITIONAL STATUS of MOTHER.
LACTATION CALORIES
FOETAL GROWTH
Increase birth weight
Lower infant mortality
Lower stillbirth rate.
INFANT GROWTH

FIGURE 2

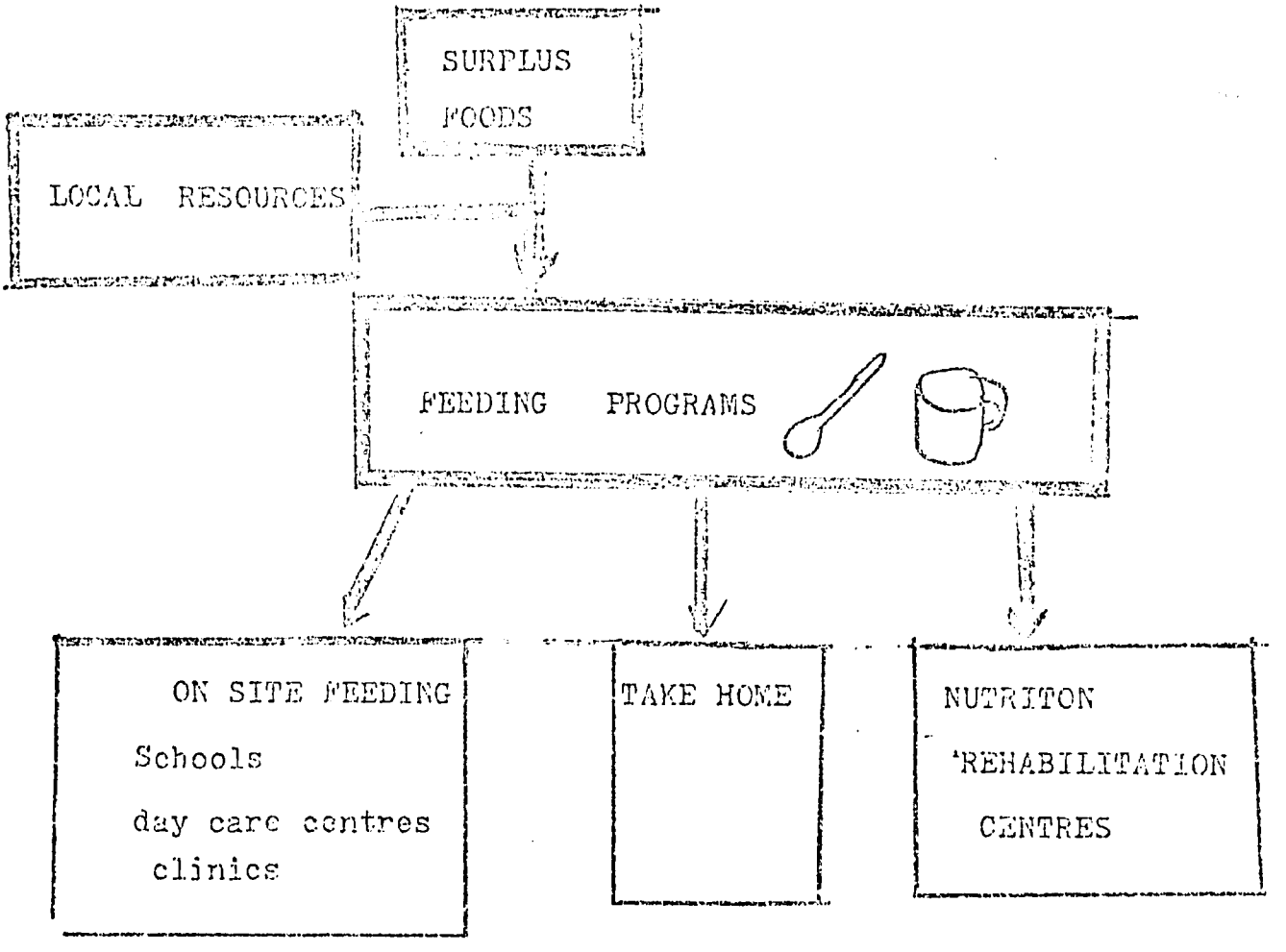
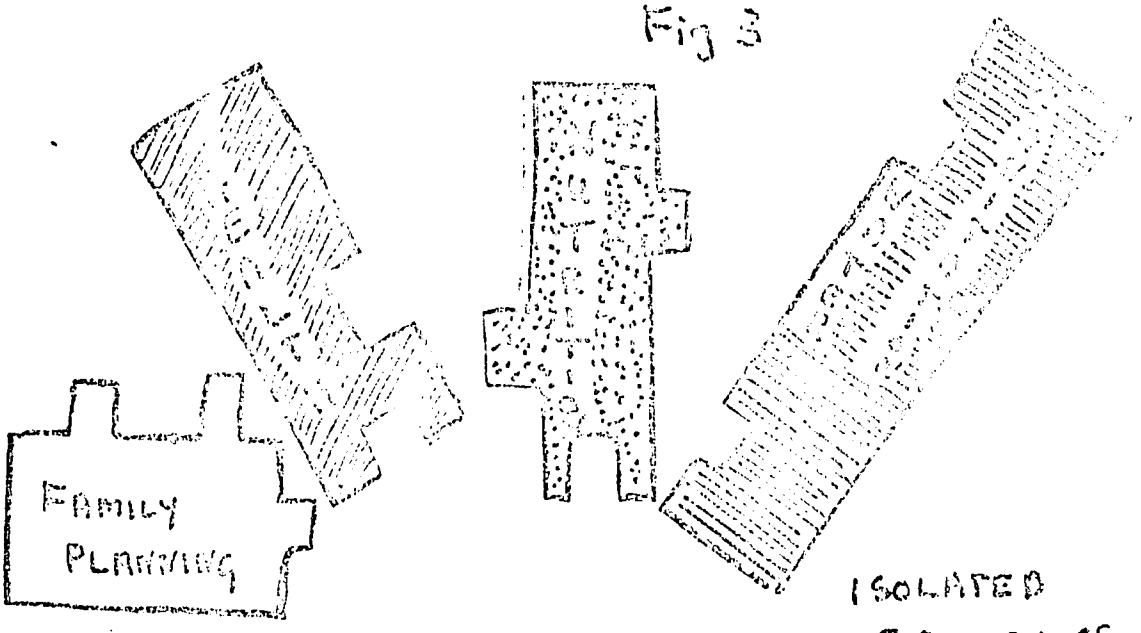
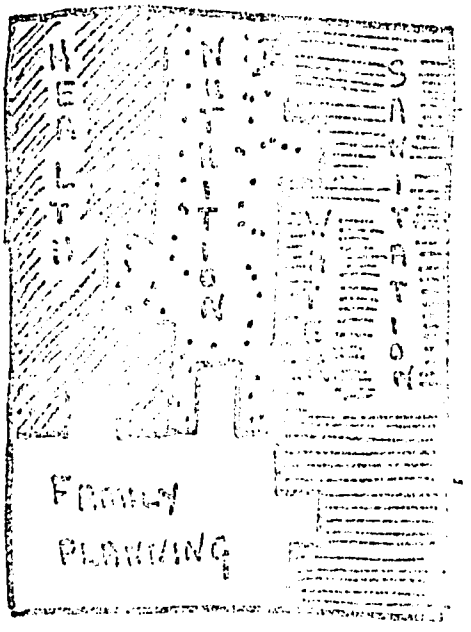

SURPLUS FOODS
LOCAL RESOURCES
FEEDING PROGRAMS
ON SITE FEEDING
Schools
day care centres
clinics
TAKE HOME
NUTRITON
REHABILITATION
CENTRES

Fig 3



ISOLATED
PROGRAMS



INTEGRATED
PRIMARY
CARE

Fig 4

The Downward Spiral of

Infection and Malnutrition

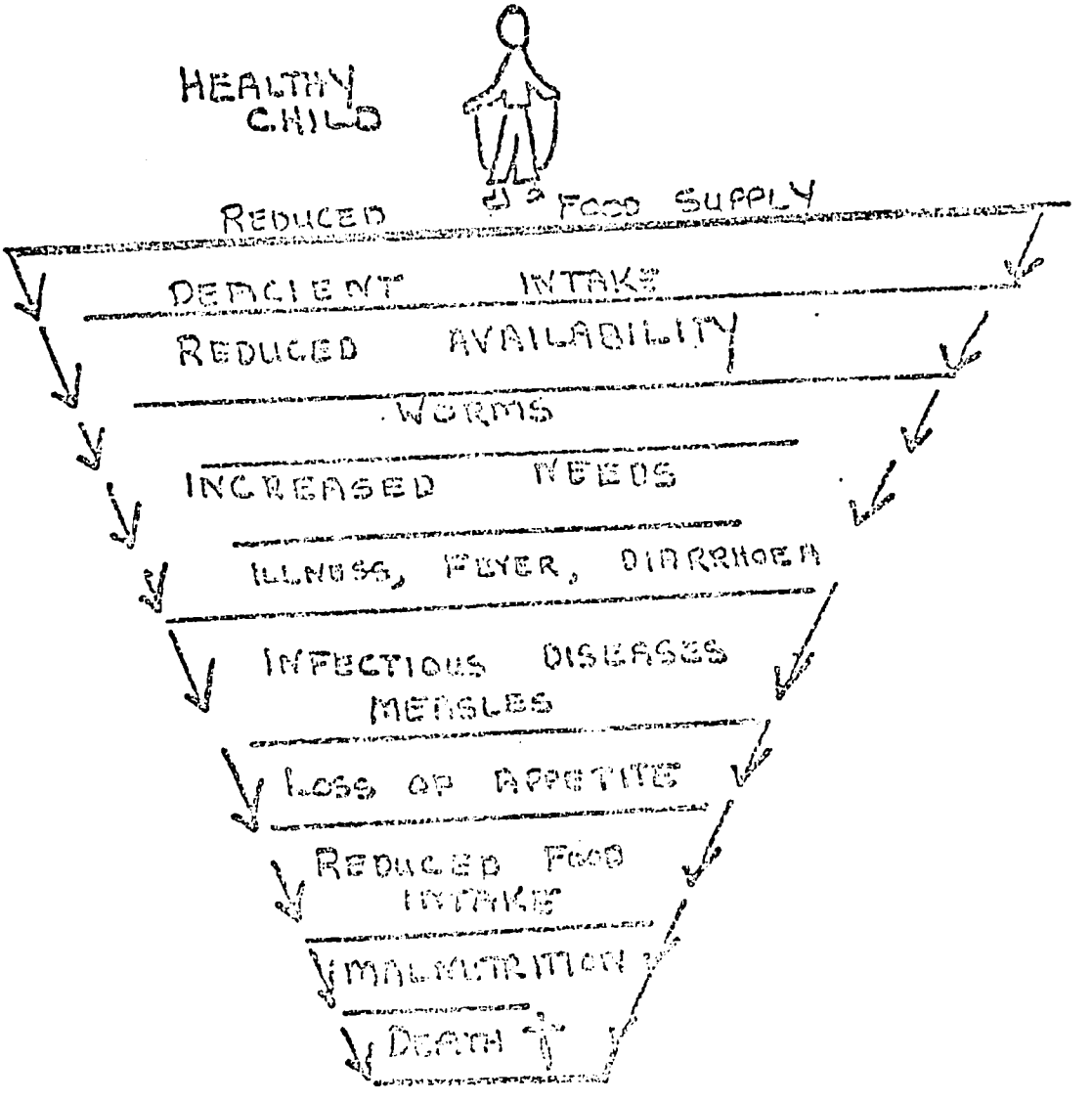


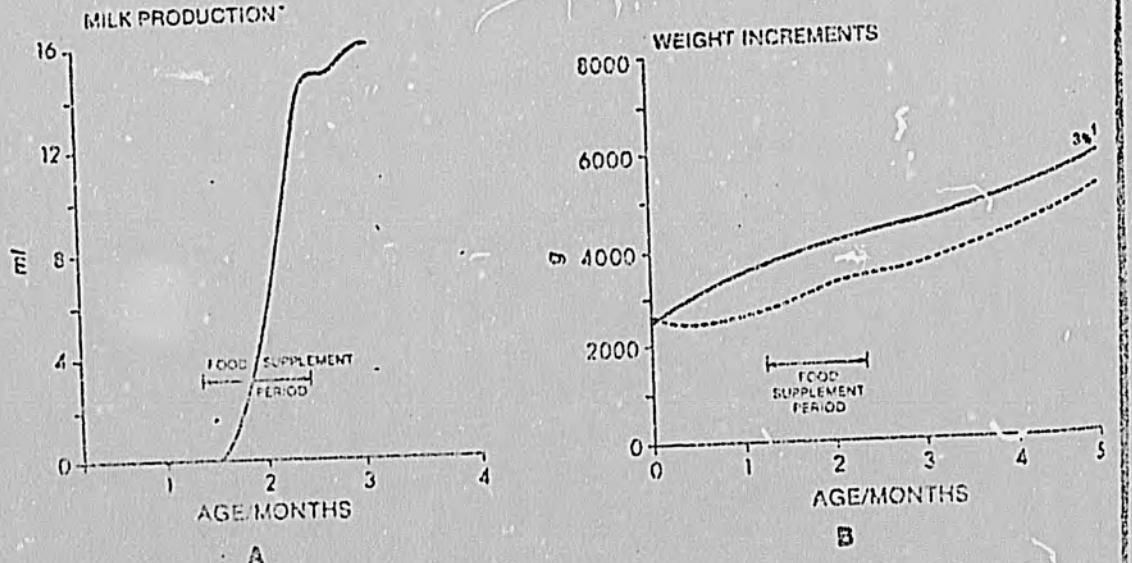
FIGURE 5.

. Effect of maternal dietary supplementation with protein on the volume and protein content of breast milk and weight gained by baby (Nigeria)*†

	Daily protein intake					
	50 g (initially, mean ± SD)	100 g (mean ± SD)	P	25 g (initially, mean ± SD)	100 g (mean ± SD)	P
Number of subjects	7	7		3	3	
Total milk solids (g/100 ml)	13.8 ± 1.3	13.4 ± 0.9		12.0 ± 0.6	11.9 ± 0.5	
Milk protein (g/100 ml)	1.61 ± 0.15	1.57 ± 0.19		1.20 ± 0.21	1.25 ± 0.23	
Milk lactose (g/100 ml)	8.1 ± 0.9	7.9 ± 1.0		7.3 ± 1.4	8.0 ± 1.8	
Milk produced (ml/day)	742 ± 16	872 ± 32	<0.05	817 ± 59	1059 ± 63	<0.05
Milk consumed (ml/day)	617 ± 15	719 ± 10	<0.05	777 ± 38	996 ± 74	<0.05
Weight gained by infant (g/day)	30.4 ± 3.6	45.7 ± 2.0	<0.05	10.5 ± 3.6	32.2 ± 10.1	<0.05

*From Edozien, J. C., Rahim-Khan, M. A., and Waslien, C. I.: J. Nutr. 106:312, 1976, copyright © American Institute of Nutrition.

†Subjects were fed the initial diets for the first 14 days and then a diet providing 100 g protein/day for the next 14 days. Results for each subject represent the mean values for milk samples collected during days 8 to 14 (for initial diet) and days 21 to 28 (for diet providing 100 g protein/day). Duration of lactation for all subjects was between 30 and 90 days.



A, Increments in milk production during maternal supplementation period. *Milliliters of milk obtained 1 hr after milk production. B, Weight increments of infants during maternal supplementation and follow-up period. †Boston growth curves. (From Sosa, R., Klaus, M., and Urrutia, J. J.: J. Pediatr. 88:568, 1976.)

FIGURE 6.

Comparison of the milks of healthy and malnourished mothers*

Factors	Apparently healthy		Clinically malnourished	
	Range	Mean	Range	Mean
Protein (g/100 ml)	0.95-1.36	1.09	0.76-1.32	0.93
Lactose (g/100 ml)	5.58-7.95	6.65	4.08-8.29	6.48
Fat (g/100 ml)	2.8-6.8	4.43	2.8-6.2	4.01
Calories (kcal/100 ml)	61-92	70.8	48-78	65.8
Amount (ml/day)	450-1290	922	180-1770	723
Protein (g/day)	[illegible]3-15.0	10.02	1.6-14.9	6.65
Calories (kcal/day)	[illegible]0-900	648	100-1080	475

*Modified from Hanafy, M. M., et al.: J. Trop. Pediatr. 18:168, 1972.

Comparison of the infants of healthy and malnourished mothers*

Factors	Apparently healthy		Clinically malnourished	
	Range	Mean	Range	Mean
Age (mo)	1-10	5.0	1-12	4.7
Arm circumference (% of predicted)†	43-133	72	43-102	70
Weight (% of predicted)†	60-139	102	43-120	86
Height (% of predicted)†	87-106	94	76-106	93
Serum albumin (g/100 ml)	1.8-4.6	3.11	1.2-3.7	2.50
NSII‡	55-119	83	45-101	70

*Modified from Hanafy, M. M., et al.: J. Trop. Pediatr. 18:189, 1972.
†Percent of predicted value.
‡Nutritional state index of infants.

Constituents of maternal milk in areas of socioeconomic deprivation compared to average figures from the Western world*

Constituent	Western world	India, New Guinea, and Pakistan
Protein (g/100 ml of milk)	1.16	0.9
Total lipids (g/100 ml of milk)	4.78	2.5
Lactose (g/100 ml of milk)	6.95	6.20
Phospholipids (mg/100 ml of milk)	2.3	1.11
Cholesterol (mg/100 ml of milk)	18.8	21.1
Calcium (mg/100 ml of milk)	30.9	28.4

*Modified from Jelliffe, D. B., and Jelliffe, E. F. P.: Human milk in the modern world, New York, 1978, Oxford University Press.

Table 9-3. The nutritional state of healthy and malnourished mothers*

Factors	Apparently healthy		Clinically malnourished	
	Range	Mean	Range	Mean
Arm circumference (cm)	20-40	32.9	16-22	19.3
Weight (% of predicted)	80-168	121.4	76-95	85.1
Serum albumin (g/100 ml)	2.8-5.9	3.81	1.6-3.2	2.53
Urea N/Creatine N	6-44	22.1	2-26	11.3
NSII†	82.5-152.5	116.3	50-95	71.5

*Modified from Hanafy, M. M., et al.: J. Trop. Pediatr. 18:168, 1972.
†Nutritional state index of mothers.

References

1. Bailey, K.V. & Raba. A. Supplementary Feeding Programs in Nutrition in Preventive Medicine, Edt. Bengoa, WHO, Geneva, p. 297, 1976.

2. Williams. C. (Personal communication).

3. Baumslag, N. Trip report - Guatemala, 1979.

4. Berg. A., The Nutrition Factor, Washington, D.C., Brookings Institute, 1973.

5. New Directions for U.S. Food Assistance - A report of the Special Task Force on the Operations of Public Law 480. U.S. Government Printing Office, Washington, D.C., Dec. 1978.

6. Lechtig, A. et. al. Effect of Food Supplementation. During Pregnancy on Birth Weight. Pediatrics, 56, 508, 1975.

7. Mora, J.O., et. al. Nutritional Supplementation and the outcome of Pregnancy in Columbian women: preliminary report on birth weight. Presented at the fourth Western Hemisphere Nutrition Congress, Bal Harbor, Florida, 1974.

8. Chavez, A., Martinez, C., & Yuschine, T., The importance of Nutrition and Stimuli on Child Mental and Social Development in Early Malnutrition and Mental Development. Proceedings of the Twelfth Symposium of the Swedish Nutrition Foundation, p. 211, 1974, Uppsala.

9. Baumslag, N., Edelstein, T. and Metz, J. Reduction of Incidence of Prematurity by Folic Acid Supplementation in Pregnancy. British Medical Journal. (3 January) 1, 16, 1970.

10. Iyengar, L., Proc. Nutr. Soc. India. 11: 27-32, 1972.

11. Hilbard, R.M., Folates and the Foetus, South African Medical Journal, 16th July, p. 1223, 1975.

12. Stein, H., Maternal protein depletion and small for gestational age babies. Archives of Disease in Childhood, 50, 146, 1975.

13. Pollitt, E. Early childhood intervention programs in Latin America: a selected review. Report to the Office of the Latin American and Caribbean International Division. Ford Foundation, New York, 1978.

14. Underwood, B.A., Success or Failure of Supplementary Feeding Programs as a Nutritional Intervention. Proceedings of the International Symposium Interventions. August 20-24, Santiago, Chile.

15. Klein, R.E., et. al., Effects of maternal nutrition on fetal growth and infant development. Bulletin, Pan American Health Organization, 10, 301, 1976.

16. Whitehead, R.G. et. al. Factors influencing lactation performance in rural Gambian mothers. Lancet 2: 179, 1978.

17. Harfouche, J.K. (1970). The importance of Breast-Feeding. J. Trop. Pediat. 16, 135, 1970.

18. Chavez, A. & Martinez, C. Nutrition and Development in Infants of Poor Rural Areas. Nutr. Reports Intnl. 7, 1, 1973.

19. Gopalan, C. Studies on Lactation in Poor Indian Communities. J. Trop. Pediat. 11, 87, 1959.

20. Lawrence, R.A., Breast Feeding, A Guide for the Medical Profession. C.V. Mosby Company, St. Louis, 1980.

21. Karlin, B., APHA Summary on the State of the Art of Delivering Low Cost Health Services in Less Developed Countries, Washington, D.C., American Public Health Association, 1976.

22. Gordon, J.E., Chitkasa, I.D., and Wyon, J.B., Weanling diarrhea. Am. J. Med. Sci. 245: (3) 345, 1963.

23. Mora, J.O., et. al. Nutritional supplementation and the outcome of pregnancy. 1. Birth Weight. Am. J. Clin. Nutrition. 32, 455-462, 1979.

24. Asia Research Organization Inc: Evaluation of the Targeted Maternal Child Health Program in the Philippines, Manila. 1976.

25. Beaton, G.H., and Ghassemi, H., Supplementary Feeding Programs for Young Children in Developing Countries, Report prepared for UNICEF and the ACC Sub-Committee on Nutrition of the United Nations, October 1979.

26. Karlin, B. Summary of on the State of the Art of Delivering Low Cost Health Services in Less Developed Countries. Washington, D.C. American Public Health Association, 1976.

27. Institute of Nutrition and Food Science, Dacca University of Bangladesh: Nutrition Surveillance of WFP Project 2266-Preliminary Report, Dacca, 1977.

28. Pyle, D., "CHF Soya Milk Acceptability Test," CARE, Bombay, 1971.

29. Anderson, M.A., Care Pre school Nutrition Project: Phase II report, CARE, New York, 1977.

30. Beghin, I.D. "Nutrition Centres for combatting Childhood Nutrition." in McLaren D.S. (ed.), Nutrition in the Community, New York: John Wiley and Sons. 1976.

31. Arole, M. and Arole, R., A Comprehensive Rural Health Project in Jamkhed, India, in Newell, K. (ed.), Health by the People. Geneva: WHO (1975).

32. Report on Effects of Maternal Nutrition on Infant Health Implications for action, An International Workshop, Panajachel, Guatemala, March 12-16, 1979, Archivos. Latino americanos de Nutricion, Vol. 29 (Supplemental No. 1), 1979.

33. Rush, D., Stein, Z., Susser, M., Diet in Pregnancy: A Radomized Controlled Trial of Nutritional Supplements, Birth Defects: Original Article series. Vol. XVI-No. 3, 1980. Alan R. Liss, Inc., New York.