NUTRITION AND NATIONAL DEVELOPMENT

(THIRU T. S. AVINASHILINGAM CHETTIAR AVARGAL'S
SIXTIETH YEAR COMMEMORATION LECTURES)

By

RAJAMMAL P. DEVADAS

M.A., M.Sc., Ph.D (Ohio State), D.Sc. (Madras)

SRI AVINASHILINGAM HOME SCIENCE COLLEGE FOR WOMEN
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FOREWORD

Shri T. S. Avinashilingam has been the embodiment of the true spirit of Karma Yoga. He has chosen to serve God through man. Therefore no better tribute could have been paid to him than the lectures on Nutrition and National Development which Dr. Rajammal Devadas delivered under the T. S. Avinashilingam's 60th year commemoration lecture series. To large sections of our population, "God is bread", to quote Mahatma Gandhi. Therefore, a true index of the state of national development in our country can be provided only by the extent of success we achieve in ensuring that no child, woman or man, goes to bed hungry and no human being's physical or mental potential is stunted by malnutrition.

All interested in this vital field of nutrition as a catalyst of national development, will feel grateful to Dr. Rajammal Devadas for putting together a large volume of valuable information in a lucid and authoritative manner.

New Delhi
March 23, 1980

Sd./-
(M.S. SWAMINATHAN)

THIRU T. S. AVINASHILINGAM CHETTIAR AVARGAL'S SIXTIETH YEAR COMMEMORATION LECTURES

Delivered by Dr. (Tmt.) Rajammal P. Devadas

AN APPRECIATION

by

Prof. G. R. DAMODARAN
B.Sc., Engg., D.Sc., C. Engg., FIEE (Lond), FINucE. (Lond), FIE (India)
Vice Chancellor, University of Madras

In these lectures delivered under the auspices of the University of Madras, in honour of the T. S. Avinashilingam Chettiar's 60th Year Commemoration, Professor Rajammal Devadas, a distinguished educationist, who has several scholarly contributions in the field of Home Science and Nutrition, has dealt with the fountainheads in a most lucid and logical style and has argued for the thesis that among all the challenges, the most compelling is the eradication of poverty and its concomitant socio-economic problems like hunger, mal-nutrition and ignorance. As she rightly points out, "Nutrition, one of the components of the levels of living, is at once a determining factor, and end result of development".

If love is the health of the soul, nutrition is the strength of the physical body. The health of a citizen is the nation's best asset. Science attempts to obtain a disinterested knowledge of the world of nature. In technology we use this knowledge for the multiplicity of progress and development of social activities. Under the stimulus of recent advances in scientific knowledge and technological devices, the pattern of life is changing at an

unprecedented rate. Man is struggling to shape himself anew that he may achieve his destiny which life has shown can be his. If the fruits of knowledge in the fields of Home Science and Nutrition are rightly used, they will give us strength, vitality, a fuller freedom and a better human life for the individual and society.

Professor Rajammal Devadas in these lectures, gives us her reflections on many problems which are agitating the minds of serious students of Home Science.

I hope that this book written with vast learning and insight will help to give all those who work in the field of Nutrition, a right orientation.

Madras,
April, 24, 1980

Sd./-
(G. R. DAMODARAN)

PREFACE

I feel highly honoured and privileged to have been invited by the University of Madras to deliver this year's Sri T. S. Avinashilingam Chettiar Avargal's sixtieth Year Commemoration Lectures, on the theme, "Nutrition and National Development".

Sri T. S. Avinashilingam, 'Ayya Avargal' as endearingly and reverentially addressed by those who know him, is a saint, following the foot prints of the world's great teachers, Sri Ramakrishna Paramahamsa, Swami Vivekananda and Mahatma Gandhi. Combining their spiritual messages which have inspired him, and the applications of modern science and technology, his life is a convincing example for true education. His contributions to the nation's freedom struggle, political leadership, development of Tamil education and welfare are enormous. Choosing Brahmacharya, he has given his All for these noble causes which are ever dear to him. As the first Minister of Education of the undivided Province of Madras in Independent India, he initiated, with great vision and courage, several reforms which are valid even today. He placed Thirukkural in the reach of all pupils and gave the Library movement, the unique position it enjoys today.

'Ayya Avargal' has been a continuing inspiration for us in our efforts to apply the principles of Home Science towards improving the lives of individuals,

communities and the nation. His foresight, commitment and abiding affection have been the impelling force behind the many innovations in development - education launched by Sri Avinashilingam Home Science College. May God bless Him with several years of health and strength to continue to guide us, is my constant prayer to the Almighty.

National Development is the crucial need of the hour. It is a magnificient obsession for Ayya Avargal whose concern for the nutrition of our children is great. I am therefore thankful for this opportunity to spell out the Role of Nutrition in National Development.

I have selected the following aspects of national development in this series of three lectures :

1. Nutrition and national development as seen by Swami Vivekananda, whose radiant exhortation form the foundation for these lectures.
2. Socio-economic aspects and
3. Nutrition and mental development.

Much of the documentation used in these lectures is drawn from the work done at Sri Avinashilingam Home Science College and I am grateful to my colleagues, Dr. Godavari Kamalanathan, Vice Principal and Professor of Nutrition, Dr. Usha Chandasekhar, Professor of Nutrition, Smt. Ramathilagam, Assistant Professor of Economics, Dr. N. Jaya, Professor of Child Development, Dr. Parvathi Easwaran, Professor of Nutrition and I. Swaminathan, Artist for their valuable help.

To the University of Madras, I am grateful for their invitation through Dr. Kulandaivel, Convenor of

the Committee and Vice Chancellor Dr. G. R. Damodaran for his appreciation. I am indebted to the distinguished International Agricultural Scientist Dr. M. S. Swaminathan, Fellow of the Royal Society of U. K., Vice Chairman, Planning Commission, Government of India for his Foreword. There is no parallel for the eminence, graciousness and scholarship of Dr. Swaminathan and I deem it a special honour to receive his Foreword.

More than any other development factor, society is in need of strong values to save it from decadence and extinction. Ayya Avargal's life and service give a unique media for inculcating spiritual and human values. Planners, policy makers and administrators will help the country, if they would incorporate spiritual values in the educational frame work.

Rajammal P. Devadas

Coimbatore
April 16, 1980

RAJAMMAL P. DEVADAS

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should continue to be the core of all development plans for socio economic, cultural, educational and scientific progress.

Swami Vivekananda appeared on the Indian scene at a time when our national life needed him most. His life itself was, and is still an inspiring message and would for ever breathe life in the dead bones of our national life. Swamiji proclaimed, "The cause of all apparent evils is in ourselves". But help does not come from without; it comes from within ourselves - we have to live and work and earn that help - the ultimate goal for all human development.

Swamiji's central message is strength, and faith in our selves and people. To him weakness was sin. He traced much of the nation's weakness to physical weakness and considered physical weakness as one of the main cause of our miseries, the cause of our incapacity to work hard and to work in cooperation with others. In his proclamations about physical stamina, Swamiji has given implicitly the interrelated factor of good nutrition. The starting point to achieve strong faith is physical well being. In this connection, Swami Vivekananda made the statement, that we will be nearer to heaven through football than through a mere study of Gita, and that we will understand Gita better with out biceps, our muscles a little stronger, and that we will understand the mighty genius and strength of Krishna better, with a little strong blood in us, that we will understand the Upanishad better and the glory of the Atman, when our body stands firm as our feet, and we feel ourselves as men. The body, Swamiji recognised is the basic instrument through which all material and spiritual strivings are achieved. Without a strong and healthy physique no achievement is possible. Swamiji also stressed that religion cannot be preached to an empty stomach. He wanted people to eat good food, work well and maintain perfect health.

In Swami Vivekananda's opinion, even for leading a spiritual life, a healthy body was absolutely essential. He said "The body is the temple of the soul and so must be main-

tained properly". Mahatma Gandhi also emphasised 'Mane sana in corpore sano,' that is "a healthy mind in a healthy body is a self evident truth and perhaps is the first law for humanity". Physical strength is correlated with mental stamina and the finest values of human development. The role of cooperation is illustrated in the following words. "To make a 'great future India', the whole secret lies in organisation, accumulation of power and coordination of wills." One of the marvellous verses of the Atharva Veda Samtita which says, "Be thou all of one mind, be thou all of one thought, for in the days of yore, the Gods being of one mind were enabled to receive oblations. That the Gods can be worshipped by men is because they are of one mind".

With spirituality as taught and practised by the great sages, particularly Swami Vivekananda, forming the back drop, let us examine the processes of development and nutrinal improvement. In this series of lectures, commemorating our revered Ayya Avargal's sixtieth birthday, three main aspects, namely, (1) swami Vivekananda's Views on Natinoal Development and Nutrition, (2) Socio economic and Health Factors in Nutrition and (3) Mental Aspects as Related to Nutrition and National Development will be considered.

Meaning of Development

Development is defined today in terms of man, all of man and whole of man. This concept is enshrined in our 'Antyodaya' schemes. What happens to the last man is development (Adiseshiah, 1979). Viewed thus, the aim of all development is to improve the conditions of life for the great mass of poor people in the country, to ensure for them freedom from hunger and want, and to provide for them reasonable opportunities for effective participation in the productive endeavours which will improve and enrich the "quality of life".

This humanistic criterion of the development, has emerged from the failure of the GNP concept of development. In the past, development has been equated with overall economic growth. It is now clear that increase in the Gross National

Product and the national per capita income need not necessarily lead to reduction in poverty and malnutrition among the lower socio economic groups of the population. Social justice must result in the percolation of the benefits of economic development, to the poorer sections of the people.

Development means more of the good things of life for all strate society - the hard working labourer in the farm and in the factory, the professional and the elite. Development means the ability to attain one's goal in personal and national life. It means fulfilment of individual needs and maximization of human happiness (Weidner, 1978).

Development is fundamentally an egaletarian goal. Development is based upon the assumption that man can control his own destiny, even in the midst of adverse environmental conditions, which often intervene to make the attainment of any set of goals difficult. Ultimately development is the manner in which man seeks his identity with other human beings, in society. Production and productivity are the two measurable parameters of development. However, development cannot be equated with increased investment for increasing production of capital and wage goods, since the ultimate goal of development is better quality of life, which depends upon a healthy environment and availability of goods and services for individual and group development (Weidner, 1978). Thus development is related to a particular focus - man and his set of values, goal priorities, system constraints and ideological considerations.

Development is the end purpose of planning and it is not mere economic growth. Different models of development can be derived. The approches of planners and policy makers are determined by their adherence to the particular model of development they choose.

The United Nations launched the first Development Decade in 1961, in which development was implicitly defined as the attainment of a minimum annual rate of growth for

the developing countries, that is, five per cent of their GNP at the end of the decade. It was Perroux, the French economist, who reflecting over the Harrod and Domar model explained that a great amount of structural change was needed to make growth a part of development. That is, identification of growth is not so much with total volume of production, but with the capacity to produce. This analysis led to the First Definition of Development as Growth Plus Change.

This means, that development is measured by the extent to which the skewed distribution of wealth is corrected, by the number of people who are lifted above the poverty line, by the facilities for education, health and housing provided to them, by the range of employment generation by economic growth, price stability, political participation of the unorganised and disinherited majority and by cultural progress.

Economic growth in its comprehensive coverage is indispensable to fulfil the basic needs, in a poor country (Haq, 1978). The most familiar type of indicator of economic development is known as 'coincident', comprising measures of economic performance such as Gross National Product, industrial production, urbanisation, employment, unemployment, personal income and retail sales. These show how well or otherwise the economy is faring, because they measure the aggregate economic activity. They rise and fall more or less together, in a roughly 'coincident' fashion, and indicate whether the economy is currently experiencing a recession or a slowdown, a recovery or a boom. Still other types of indicators such as labour cost per unit of output, the level of inventories and interest rates on mortgage loans are described as 'lagging', because their fluctuations usually follow those of the 'coincident' indicators.

Over riding the economic indicators, are the indicators born out of the Basic Needs Approach, a list of 'core' needs, namely, food and nutrition, drinking water, health, shelter and basic education. These are the real indicators of personal, family and national development.

An adequate diet, with sufficient calories, protein, carbohydrates, fats, vitamins and minerals, to allow men, women and children to carry out essential physical and mental activities in good health is a basic human right. The need for drinking water, defined as reasonable access to water that does not contain any substance harming the consumers, health or making the water unacceptable to them, is basic to survival. The basic health services are the public and private measures needed to prevent and cure the most common avoidable or curable diseases and other forms of bodily injuries. The number of people presently deprived of these basic health services is estimated to be atleast 300 million in the country. There should be permanent housing (shelters) to protect people from the harmful climatic influences and other dangerous factors in their natural environment (Haq, 1978).

Education is basic to development. Hence it is an important yardstick to measure national development. The number of literates, illiterates, the quality of education, the available facilities for research development and the awards and prize received at the national and international levels are significant indicators in this aspect. The ecology variables of population, organization, environment and technology, together with the principles of interdependance, differentiation, dominance and key functions are the other more implicit components of development.

In the last century itself, Swami Vivekananda had foreseen these facets of development. Discussing the eating customs of the different countries he had visited and their effects on health habits, he says, that all their rules and prohibitions with respect to food are for the most part in the interest of good health, and to have full health and vitality. We must have full control of body and mind, that is, practise 'Yoga'. The combination of strong body and strong mind was perceived by Swamiji in the form of Yoga - the highest form of concentration of the mind - the essence of all knowledge. While every human has the right to this knowledge, different means are utilised to achieve it and hence the degree of attainment is also not uniform. In this pursuit, man differs

from man and this difference has brought in the socio economic and cultural disparities.

One can go on analysing the causes and reasons for the endless suffering of man, but what is to be done and how are we to forge the "Rama Rajya"? Swamiji gives the answer. He says, "In spite of the greatness of the Upanishads, inspite of our boasted ancestry of sages, compared to many other races, I must tell you that we are weak. First of all it is our physical weakness. That physical weakness is the cause of at least one kind of our miseries".

"Whether you belive in spirituality or not, for the sake of the national life, you have to get a hold on spirituality and keep to it. Then stretch the other hand out and attain all you can from other races, but everything must be subordinated to that one ideal of our life - namely, spirituality, and out of that,a wonderful, glorious future India will come". These words of Swami Vivekananda stress beyond doubt that the ideal development is spiritual, or the inner human value system. With this as the centric nucleus man should strive for the individual well being and national development.

Swamiji proclaims, "My ideal is growth, expansion, development on national lines. As I look back upon the history of my country, I do not find in the whole world another country which has done quite so much for the improvement of the human mind. Great things have been done in the past in this land, and there is both time and room for greater things to be done yet. Our ancient law givers were breakers of caste, but they were not like our modern men. They did not mean by the breaking of caste, that all the people in a city should sit down together to a dinner of beefsteak and champagne, nor that all fools and lunatics in the country should marry when, where and whom they choose, and reduce the country to a lunatic asylum, nor did they believe that the prosperity of a nation is to be gauged by the number of husbands its widows get".

"Why does not the nation move? First educate the nation, create your legislative body, and then the law will be forthcoming. First create the power, the sanction from which the

law will spring. The kings are gone, where is the new sanction, the new power of the people? Bring it up. Therefore, even for social reform, the first duty is to educate the people. All efforts only reach the higher castes of Indian people. who are educated, mark you, at the expense of the masses. Every effort has been spent in cleaning their own houses. You must go down to the basis of the thing, to the very root of the matter. That is what I call radical reform. Put the fire there and let it burn upwards and make an Indian nation."

"What we want is strength, so believe in yourselves. We have become weak, and that is why occultism and mysticism come to us, these creepy things; there may be great truths in them, but they have nearly destroyed us. Make your nerves strong. What we want is, muscles of iron and nerves of steel. We have went long enough. No more weeping, but stand on your feet and be men. It is man-making theories that we want. It is man making education all round that we want. And here is the test of truth-anything that makes you weak physically, intellectually and spiritually, reject as poison; there is no life in it, it cannot be true".

How does one work for the masses? "Well, this is the basic idea of man making education - an educational system built around character building, self help and dignity of labour." Swami Vivekananda was himself a great teacher; and what is more, he was also the disciple of a great teacher. Therefore he was able to assert from his own experience that education, "is not measured by the amount of information that is imparted to the pupil" but that it must lead to life building, man making, character making assimilation of ideas. He knew how badly India needed a good system of education that would deal with the superstition and obscurantism that stalked the land, make for the application of science to industry and agriculture leading to increase in production and removal of mass poverty, dispel the darkness induced by ignorance and mass illiteracy, develop a proper feeling of national pride and self confidence, and give the people a correct picture of their religion that would make them feel that God was in man and workship lay in the service of the masses.

CIRCULAR FACTORS IN NATIONAL DEVELOPMENT

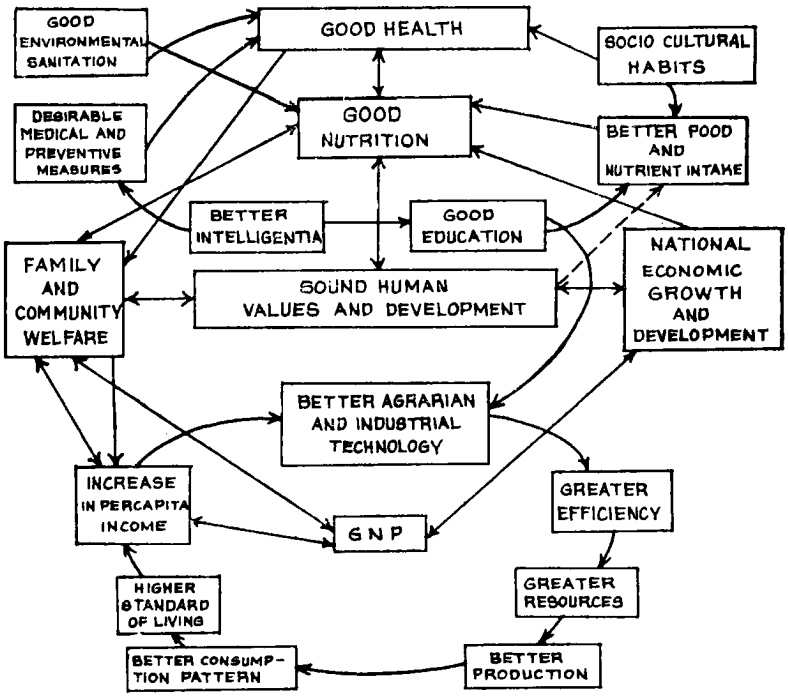

Figure I

"Education should therefore free the individual from the fear of the power that be or of the unknown. Whether the youth of India accept the vedantic approach for shedding fear or the power of science and technology over the environment for doing so, what is clear is, that fear is the greatest deterrent to progress and it should be the task of education through knowledge and the all round development of the human personality to get rid of fear, and stand up and face the challenge of life and its many problems". He wanted man making education for the young, and the educated young men to use their education to make men out of others.

The message of Vivekananda to youth regarding their education is centred around use of the intellect rather than accumulation of information, concentrate rather than memorising, integrated development of the human personality in the ascending scale of body, mind and heart, cultivation of fearlessness in pursuit of truth, and compassion and fraternity in dealing with fellowmen, science instead of superstition, rationality in place of obscurantism, and absorption of the spirited message of the vedanta that all men are divine and it only needs will, strength and effort to realise their divinity, and in the process recognise the common bond that makes all humanity kin. All those who seek education will find a perennial source of inspiration in this everlasting message of Swami Vivekananda.

Thus various components of National Development are interrelated. The flow diagram, figure 1, presents the interrelationship between the various factors of National Development. When one factor is affected the other factors are automatically affected. Hence for the total development of the nation, all the requirements need to be fulfilled. Development must be therefore conceived in a holistic, organic and dynamic manner. Its planning requires a human centred approach and its implementation calls for man making education and spirituality.

Nutrition is a Multifaceted Discipline

Among the various factors influencing National Development, the role of nutrition is crucial. The science of nutrition, which is a relatively new discipline, deals with the relationships between man and his food. It is the study of the constituents and functions of food, and the many ways in which they interact in the human body and influence the personality of man. It involves the biological, physiological, psychological, social and economic factors that govern man's choice of food for his own nourishment. As such nutrition is a multifaceted discipline, Figure 2. The study of nutrition requires exploration into the social, biological and physical sciences. It has evolved from chemistry and physiology, just as biophysics has more recently evolved from biology and physics. It is based on, and integrated with, the sciences of chemistry, biochemistry and physiology,

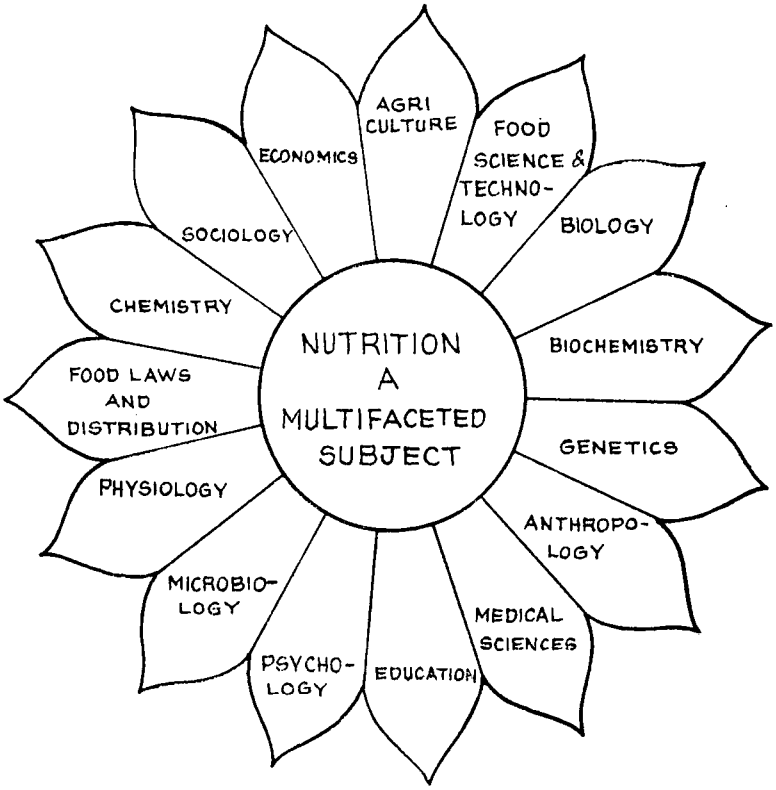

Figure II

(Proudfit and Robinson, 1970). Psychology, sociology, anthropology, geography and education are influential in determining the diet of man as a group and as an individual. Agriculture, economics and commerce define the availability of food. The functions of nutrients and the utilisation of food in the body are the realm of the nutritionists, dietitians, biochemists, microbiologists, and physical scientists (Stare and McWilliams, 1977).

Nutrition has served as a tool for government, politics, voyages, war, and conquest - It has influenced exploration, discovery, colonization and the facts of populations. In modern life, it is an integral component of farming, food production, food processing, medicine, education, transportation, industry and trade. It conditions the socio economic, scientific and cultural aspects of the society by influencing the health and vigour of the individual and community, and the prevention, treatment and recovery from disease (Youmans, 1966).

Nutrition occupies an important place in the curricula in universities, colleges, higher secondary and primary schools and in professional courses. It is part of Home Science, Animal Sciences, Horticulture, Medicine and allied Health and Paramedical fields. With the rapid advances in research, the knowledge of nutrition and its interdisciplinary contours are enlarging constantly (Harden and Lamb, 1973).

Since sound body and good health are essential for achieving human development and the development of the nation as a whole (Stare and McWilliams, 1977), improvement of nutritional status of the population can be achieved only through the combined and concerted efforts of all the interrelated professions, and physical and social scientists and educators. As Swaminathan (1978) points out that as far as our country is concerned, the nutritional goal should aim at both producing more and better quality foods and at generating additional purchasing power among the rural and urban poor. The agriculturist produces an abundant food supply of high nutritional quality. The food scientist processes the food produced, incorporates the essential nutrients into them, and conserves and preserves them. Anthropologists, educators and psychologists evaluate nutrition in terms of why people eat the way they do and how to improve their food behaviour. Their findings contribute to the techniques of nutritionists, sociologists and health professionals who labour to improve the nutritional attitudes and opportunities of society; biochemists and nutritionists examine the nutritional status of individuals and groups; Governments are concerned with the prospects of improving the nutritional status of the entire state and country; and demographers assess the future in terms of population growth and food supplies available to the individual.

The Misery of Malnutrition

Spectacular advances in science and technology and in transport and communication have been witnessed during the last few decades. Space and distance have been conquered; the genetic code has been broken. Mankind is on the threshold of synthesising the genes. However, these advance have come from parts of the world, where there is freedom from want, and the

quality of life is high. At the same time, these important developments have not really contributed to human development and happiness, because malnutrition and the consequent miseries continue to be the major deterrants to progress affecting nearly half of mankind. People cannot be happy with hungry stomachs, as Swami Vivekananda had pointed out forcefully. The future alone does not appear bright. Varying degrees of malnutrition continue to afflict nearly half of all children below the age of five years; 17.4 to 18.9 per cent are suffering from varying degrees of Energy - Protein - Malnutrition (EPM). Children under five years who die before reaching their fifth birthday, account for 40 per cent of the deaths in our country. Repeated infections and fevers deplete the body reserves of protein of the surviving children. If malnutrition persists into their school age they may never fully overcome their early physical handicaps, and are likely to be apathetic and slow learners. That is why of every 100 children enrolled, only about 40 reach class III, and only about 25 reach class V. The rest dropout at some stage beginning roughly from age nine, mostly due to poverty and sickness arising from malnutrition (Directory and Year Book, 1977). Adults as well as children, suffer the consequences of preventable dietary deficiencies. Most widespread are the complex nutritional anemias, vitamin A deficiency which results ultimately in blindness and Iodine deficiency.

Malnutrition is attributed to poverty, poor food production, inequitable distribution and faulty consumption, ignorance of the mothers about nutrition, various other economic and social factors and lacuna in the technological development. Malnutrition in the early years reduces the productive capacity of the adults because it leads to stunted growth and mental retardation of the young. Physically, they lack the energy and stamina which are essential for satisfactory work. Chronic and severe malnutrition in childhood increases the chances of children becoming poor readers and poor writers. These, in turn, lead to defects in neuro-integrative functioning, school failures and subsequent subnormal adoptive abilities. This chain of events constitutes a vicious circle, Figure 3, which has a devastating spiral effect on society, causing a low level of adaptive functioning, non application of modern knowledge to every day living, undesirable social customs, infections and insufficiency of food.

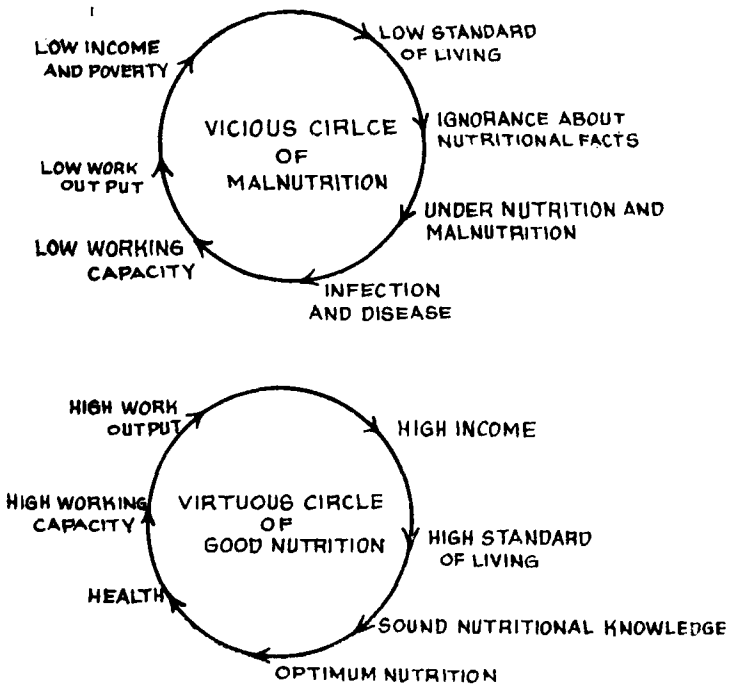

Figure III

Malnutrition lowers the community's resistance to disease resulting in higher morbidity, apathy, lethargy, sluggishness and poor working efficiency. These factors lead to low income, low standard of living, poverty and back to malnutrition and infection. This chain of events, that is, lack of adequate food-undernutrition and malnutrition-low working efficiency-low production of food-low income- poverty must be broken, and a state as that represented in the virtuous circle should be achieved, which depicts good nutrition-good health-high working efficiency-greater production of food-high income and prosperity.

Cost of Malnutrition

A. Treating Clinical Cases

Malnutrition is a great economic drain to the nation. The nutritional status of a country influences significantly not only its

health status, but also its socio economic development. The total cost of malnutrition, to a nation is made up of a number of components, some evident and others not so evident. The most important among the obvious components is the cost of treating clinical malnutrition, in terms of drugs, hospitalization, transportation and food. To this must also be added the cost of treatment of cases suffering from a variety of non nutritional diseases, which would not have either occurred or needed hospitalization, but for their associated background of malnutrition. To these two obvious costs must also be added the invisible cost of loss of income to the family arising as a result of one or both parents having to attend to the sick child during hospitalization.

B. Cost of Child Wastage:

Child waste includes the cost of going through pregnancy and child birth, cost of all the ceremonies, cost of lactation, cost of food consumed by the child during the first few years of life, cost of clothing, education, recreation-toys, time spent in rearing the child and the cost at the time of the death. Till such time that a child reaches the productive age, there is no return to the nation on all the inputs connected with the development of the child, and the death of the child at anytime during this period, should be considered as a total loss to the economy of the country. These aspects should be studied in depth by economists.

C. Cost of Decreased Productivity:

Improvement of the nutrition among workers is associated with increased efficiency and greater work output. As a result of malnutrition, the capacity to work is lowered because of apathy, lethargy, lack of initiative and stamina. In addition, increased susceptibility to infection and consequent absenteeism from work are potential sources of loss to the nation through lowered productivity.

Problems of Women

The World Conference on Agrarian Reform and Rural Development (1979) has focussed attention on the rural women's

problems beyond poverty and workload, which perpetuate their social and economic marginalization, and thus impede development. Among them are:

- Legal discrimination, particularly in relation to (male) rights as head of household, ownership of property and inheritance, which indirectly deprive women of adequate nutrition,

- Other obstacles to equality, rooted in tradition, cultural attitudes and customs (often shared by women), even when contrary to law;

- Discrimination in access to productive resources (within the family as well as in the society at large);

- Low and/or unequal pay scales for work predominantly performed by women, and lack of Union Organization to secure job protection or bargaining rights;

- Lack of consideration of the effects on women in the introduction of technology and lack of interest in the development of technology pertinent to work women perform;

- Difficulties of rural women of all ages to gain equal access to education, and consequent illiteracy rates of upto 90 per cent. The Poor educational status is true not only for women but also for the nation as a whole. The number of illiterates in 1971 was 386 million, as against 340 million in 1947!

In housing conditions, also the position is far from satisfactory. The shortage of housing is acute in urban and rural areas and much of the available accommodation is qualitatively substandard. According to the 1971 census, the usable housing stock was 8.25 crore units, for the entire population of 54.8 crores (India 1977 and 1978)!!

All these problems and socio-economic-cultural constraints affect the nutritional profile of women and thereby their

children, families, communities and the nation at large. Let us now turn to Swami Vivekananda for guidance to overcome these Himalayan Obstacles to progress.

Swami Vivekananda's Views on National Development and Nutrition

In order to attain strength of body, one needs to fulfil many inter-related requirements. Swami Vivekananda has enumerated them. He speaks at length about food, water, cleanliness, medical care and related factors. "Food" Swamiji says, "Contains all the energies that go to make the forces of our body and mind... It has been transferred and conserved, and given new directions in the body... but body and mind have nothing essentially different from the food that we eat. Just as the force and matter we find in the material world become body and mind in us, so, essentially, the difference between body and mind and the food we eat, is only in manifestation. There are certain kinds of food that produce a change in the mind; there are other sorts which produce a change in the body; and in the long run have a tremendous effect on the mind. It is a great thing to learn a good deal of the misery we suffer is occasioned by the food we take. You find that after a heavy and indigestible meal, it is very hard to control the mind: it is running, running all the time. There are certain foods which are exciting; if you eat such food, you find that you cannot control the mind. It is obvious that after drinking a large quantity of wine, or other alcoholic beverage, a man finds that his mind would not be controlled; it runs away from his control".

Swami Vivekananda asks, "What better material is there than nourishing food to build up the body composed of various elements, and the mind which sends out infinite waves of thought? But if that food which goes to sustain the body and strengthen the mind is not properly assimilated, and the natural functions of the body do not work properly, then that very thing becomes the root of all evils". These words endorse the nutritional truth, that intake of food which is adequate in quality and quantity makes men healthy and strong.

Even in Swami Vivekananda's time, the controversy about vegetarian and non vegetarian food had appeared in the horizon. "So long as vegetable food is not made suitable to the human system through progress in chemistry, there is no other alternative but meat-eating. So long as man shall have to live a Rajasika (active) life under circumstance like the present, there is no other way except through meat eating. It is true that the Emperor Asoka saved the lives of millions of animals by the threat of the sword, but is not the slavery of a thousands years more dreadful than that? Taking the life of a few goats as against the inability to protect the honour of one's own wife and daughter, and to save the morsels for one's children from robbing hands - which of these is more sinful? Rather let those belonging to the upper ten, who do not earn their livelihood by manual labour, not take meat; but the forcing of vegetarianism upon those who have to earn their bread by labouring day and night is one of the causes of the loss of our national freedom. Japan is an example of what good and nourishing food can do".

In these projections, Swamiji has brought out beautifully the scientific aspects of food chemistry. Meat, an animal protein food has the essential amino acid pattern which is basic to life, and its biological utilisation is easy and direct. Development of improved technologies today have helped man to develop foods like novel proteins, textured vegetable proteins in such a manner that they can be equated to animal preteins. This is what Swamiji had foreseen when he said, "Vegetable foods may be made suitable to the human systems through progress in chemistry."

Swami Vivekananda had brought out explicitly the relationship between food and energy, and what happens to food in his saying "The Physiological meaning of food is assimilation of energy from the sun." The energy reaches the plant, which cultures it in photosynthesis; the plant is eaten by animal and the animal by man. The scientific truth that we take much energy from the sun and make it part of ourselves is thus proved

Swamiji spoke about good food as a growth promoting feature: "We have to take care what sort of food we eat a

the beginning and when we get strength enough, when our practise is well advanced, we need not be so careful in this respect. While the plant is growing it must be hedged around lest it be injured, but when it becomes a tree the hedges are taken away; it is strong enough to withstand all assaults." These views are of special significance in this International Year of the Child. Good food and good nutrition in early childhood have the way for a strong and healthy future.

Swamiji exhorts that the food we eat must be simple and taken several times a day instead of overloading the digestive system only once or twice a day. This again has sound scientific backing. It implies, "Never get too hungry. Never over eat". "He who eats too much cannot be a Yogi." 'அளவுக்கு மிஞ்சினால் அமிர்தமும் நஞ்சாகும்'. However good a food may be, too much of it will be wasted. The Tamil Saint Thiruvalluvar also gave this advice 2000 years ago in the following four couplets.

The gift of body you may long retain
If food digested, within limits you eat again

அற்றால் அளவறிந்துண்க அஃதுடம்பு
பெற்றான் நெடிதுய்க்கும் ஆறு

When food is digested, if you hunger feel
Select your food with care and make a meal

அற்றதறிந்து கடைப்பிடித்து மாறல்ல
துய்க்க துவரப் பசித்து

With self-control, eat agreeable meals,
And then your life no sudden sickness feels.

மாறுபா டில்லாத உண்டி மறுத்துண்ணின்
ஊறுபா டில்லை உயிர்க்கு

Ignorant of his digestive fire who eats
Numerous disease he meets

தீயள வன்றித் தெரியான் பெரிதுண்ணின்
நோயள வன்றிப் படும்

Swamiji also talks about proper selection of food. What is proper food, and what kind should one eat have to be determined by oneself. He thus points out the biological truth that food needs are individualistic, depend on the kind of work one does, average body size, composition etc.

The Bhagavad Gita gives the relationship between food and attitude of people. Accordingly there are three types of food.

1. Sattvika — the foods that are dear to the people who are healthy, happy and cheerful and are full of vigour and vitality.

2. The Raja sika — Foods that are pungent and are capable of producing pain, grief and disease and definitely injurious to spiritual practice

and 3. Tamasika — Foods that are stale, tasteless, stinking and impure. The inner capacity of individuals taking to such varieties of food is reflected in their "Karma" and in turn in their capacity and ability to help human development.

The Gita's ideology is reflected by Swamiji, when he says "The proper diet means, generally, simply do not eat highly spiced foods." He points out: "There are persons born with the tendency to sleep all the time. Their taste will be towards that type of food which is rotting such as crawling cheese. They will eat cheese that nearly jumps off the table. It is a natural tendency with them. Then there are active people. Their taste is for everything hot and pungent such as strong alcohol. The Sattivika people are very thoughtful, quiet and patient. They take food in small quantities, and never anything bad."

Quoting from the Shrutis, Swamiji writes, "when the food is pure, the Sattva element gets purified, and the memory becomes unwavering," Ramanuja points out this truth from the Chandogya Upanishad. The materials which the body receives through food go a long way to determine not only the body

structure but also mental make up. Therefore we need to take special care of the food we eat. According to Shankaracharya, the word "Ahara" means, the senses participations. Without pure food, the indriyas (organs) cannot perform well. These explain the relationship between good food and mental development in general, and that proper mental development is essential for the control and direction of human actions.

Swamiji held strong views about improper food as a causative factor of disease. Rightly he linked disease with precipitating factors such as inadequacies, environmental sanitation and medical care. In total, he perceived the health picture to be a sum of all these interactions. In this context, Swamiji speaks about buying food from street vendors which are kept exposed to dirt, dust and germs and thus stale and polluted. Such foods he refers to as foods possessing 'nimitta dosha' and capable of creating dyspepsia and diabetes. Swamiji also speaks about starchy foods being injurious to health due to its "sugar system". How wisely he suggests that fruits and milk are best suited to attain longevity! Particularly, those who take much fruits regularly do not appear to loose their youth, as the acid of fruit dissolves the foul, crust formed on the bones which is mainly the cause of bringing on old age. Today nutritionists see the truth in this counsel in the form of roughage and residue for longevity by combating the ill effect of atherosclerosis. In the final analysis, Swamiji suggests that there is no end to the contentions held by people of different nationalities on different foods. But the judicious view admitted by all is, "To take such food as is substantial and nutritious and at the same time, easily digested. The food should be such as to contain the greatest amounts of nutrients in the smallest compass, and be at same time quickly assimilable. Otherwise, it will have to be necessarily taken in large quantities, and consequently the whole day will be required only to eat and digest it. If all the time and energy are spent only in digesting food, what will be left to do other works? In these exhortations, Swamiji emerges as one of the soundest nutritionists, who could understand the Specific Dynamic Action and metabolism of foods, the energy release from foods, and the energy transfer and cost of activities. He had correlated well nutritious food with good

stamina to work, which alone can accord work efficiency to the starving nation !

Swami Vivekananda paid attention also to the methods of food preparation. "All fried foods are really poisonous". How prophetically he had forecast the evils of cholesterol? He suggested that foods and their preparation must be related to the climatic conditions in which people live. "In hot countries", he says, "less oil and ghee be taken." "While the poor die of starvation because they can get nothing to eat, the rich also die of starvation because what they eat is no food". He suggests simple methods of cooking namely, "Boiling makes the food more assimilable, and addition of excess ghee and spices are undesirable". Swamiji pointed out that expenditure on medicine would not be needed, if one can eat the right kind of food in right amounts and have good exercise like walking and if one lives in a good sanitary environment and inhales fresh air. Sickness will not come near him. Here again in Swamiji's statement, there is an echo of the following Thirukural.

No need of drugs to heal your body's pain,
If you digest your food before you eat again

மருந்தென வேண்டாவாம் யாக்கைக் கருந்திய
தற்றது போற்றி உணின்.

All the current efforts of the UN for the safety of the environment and the biosphere (SCOPE) had been so ably spelt out with divine vision! Swami Vivekananda says, "In most cases medicines kill the patient sooner than the illness itself." He effectively summarises the fundamental causes of ill health, "impure water and impure food are the cause of all maladies."

The relationship between nutrition and infection also comes out in Swamijis simile for the democratisation of the nation! "When the life-blood is strong and pure, no disease germ can live in that body. If it flows clear, if it flows strong and pure and vigorous, everything is right; political, social, any other material defects, even the poverty of the land, will all be cured if that blood is pure. To take a simile from

modern medicine, we know that there must be two causes to produce a disease, some poison germ outside, and the state of the body. Until the body is in a state to admit the germs, until the body is degraded to a lower vitality so that the germs may enter and thrive and multiply, there is no power in any germ in the world to produce a disease in the body. It is only when the body is weak that these germs take possession of it and produce disease! Just so with the national life. It is when the national body is weak that all sorts of disease germs, in the political state of the race or in its social state, in its educational or intellectual state, crowd into the system and produce disease. The solution is not by bringing down the higher but by raising the lower up to the level of the higher". How did Swamiji know the current state of the nation, so clearly?

Swamiji emphasised the need for pure drinking water. He considered the city water filtration technique as the bed for further infections. By experimentation, he had found that the three pot method using charcoal and sand or the use of cloth and alum, as practised in the villages, were the best methods for getting potable water. Today, in the minimum needs base for the VI plan, the Planning Commission has included drinking water! Swamij's experiments with drinking water are still valid.

Swami Vivekananda placed highest hope in education. "Educate and raise the masses and then alone a nation is possible". "Education is the manifestation of the perfection already in man". Swami Vivekananda pointed out various paths by which the highest sublimation of the human mind and work the Ghana Yoga, Bhakthi Yoga, Rajya Yoga and Karma Yoga. Of these, Swamiji considered the path of work 'Karma Yoga' as the most suitable for the present age. The spiritual way of life was the way to achieve the goals through 'Karmas' and this way of life as Swamiji perceived was not for the ordinary man, but for the strong and the brave, and perhaps the only way to achieve life that can give abiding joy. A nation or a people are strong only to the extent that they adopt this

way of life and to the extent of the number of men and women, who strive sincerely for these high ideals.

What we really need then is that sprit of working together for the good of all, that strength of mind which Swamji called, "Muscles of iron and nerves of steel" - that gigantic will which nothing can resist, which can penetrate into the mysteries and secrets of the universe and will accomplish their purpose in any fashion, even if it meant going down to the bottom of the ocean or to the heights of the sky and meeting death face to face

To accomplish such an action, Swamiji's message, is upliftment of masses. He says, "I consider that the great national sin is the neglect of the masses, and that is one of the causes of our downfall. No amount of politics would be of any avail until the masses in India are once more well educated, well fed, and well cared for. They pay for our education, they build our temples, but in return they get kicks. They are practically our slaves. If we want to regenerate India, we must work for them".

The messages of Swami Vivekananda thus give hope and light to the lowest man or woman, for by his own efforts he can reach the highest pinnacle of glory. As our Revered Ayya Avargal himself puts it, "Swami Vivekananda considered every soul as a spark of the divine; all men and women as personification of divinity, by serving whom, one can reach the highest spiritual stage. Above all, he had great faith in our country and young men, by whose untiring efforts, he foresaw the birth of a great and glorious India" (Avinashilingam, 1976).

"This national ship, my countrymen, my friends, my children - this national ship has been ferrying millions and millions of souls across the waters of life. But today, perhaps through our own fault, this boat has become a little damaged, has sprung a leak, and would you therefore curse it? If there are holes in this nationalship, this society of ours, we are its children, let us go and stop the holes. Let us gladly do it with our heart's blood, and if we cannot, then let us die. We will make a plug of our brains and put them into the

ship, but condemn it, never". "Give up the awful disease that is creeping into our national blood, that idea of ridiculing everything, that loss of seriousness".

We have had a glimpse of what Swamiji has given us to build a glorious nation. But where do we really stand today? Where are we going? Having recognized the existing problems, the future needs to be planned carefully. Nutrition is beginning to move into prominence on development policy agendas. New knowledge and techniques have made direct attacks on the major dietary deficiencies, which appear more manageable now. Breeding of staple crops to raise the quality and quantity of foods, and pricing and distribution policies benefitting the low income producer and consumer are possible. Research has identified the Principal targets for nutrition policy as weanling infants, preschool children and expectant and nursing mothers. Such an improvement would mean education in nutrition in all its perspectives - better food production and preservation; improved methods of cooking, storage and distribution of foods, population education coupled with knowledge of nutritional principles and an awareness of basic preventive health measures which would bring in better health for all the citizens. The nation would then have better productivity, higher earning capacity, enhanced purchasing power, greater national wealth and proper augmentation of resources in the food, agriculture and industrial fronts, to raise the living standards of the masses. When both the human and material aspects are improved together, the national character will rise higher; social and economic justice would be the order of the day. They will bring out that essence of life, namely, human freedom in the medium of spirituality which our great teacher Swami Vivekananda had foreseen.

Our education should be geared to the lofty principles Swami Vivekananda had expounded. Through the highest Karma yoga, we must be able to achieve that spark of life for all human beings, poor or rich alike, which the Father of the Nation had dreamt in his Ram Rajya. Such a revalation would bring to national development the real meaning namely,

'Development unto the last'. Therefore "Arise, awake and stop not till the goal is reached".

With this serene background, in the next lecture we will deal with the relationship between food, nutrition and mental abilities and how such relationship affects National Development. In the third lecture socio economic and health aspects of nutrition and its implications to National Development will be analysed and strategies for national reconstruction will be given.

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LECTURE II

NATIONAL DEVELOPMENT AND NUTRITION- SOCIO ECONOMIC ASPECTS

Implication of Development

In the 1960's development was equated with economic growth, that is, the rate of growth in per capita income. The case for economic growth then was that it gave man greater control over his environment and enabled him to have greater leisure and more services (Arthur Lewis, tho Nobel Laureate of 1979). The need for the reappraisal of the goals and strategies of development become apparent to the developing countries and the international community, with the failure of the growth in per capita income to percolate to the bottom in the expected proportions.

Singer (1975), the noted development economist, stresses that the purpose of development is not output-It is to produce a better life for people. Output is only a means to an end. Alan Berg (1973) in his monumental work, 'The Nutrition Factor which rationalises the economics of and the need for, nutrition intervention programmes, observes', "The purpose of national development - of foregoing consumption today in favour of more investment - is to generate a high level of human well-being tomorrow for more people."

McNamara, the President of the World Bank, in his address to the annual meeting of the Board of Governors in 1971, remarked "Development has for too long been expressed in terms of growth of output. The availability of work, the distribution of income and the quality of life are important measures of development. Development is a multi dimensional concept." In fact, paragraph 18 of the International Development Strategy (1975) sets the ultimate purpose of development as the provision of increasing opportunities to all people for

a better life. The immediate and principal objectives of development efforts are, to: bring about a more equitable distribution of income and wealth for promoting both social justice and efficiency of production; raise substantially the level of employment; achieve a greater degree of income security; expand and improve facilities for education, health, nutrition, housing and welfare, and to safeguard the environment. These objectives are at once the determining factors and end results of development.

In this consensus on the meaning of Development, the Indian economists also agree. According to Kurien (1974) "Development is liberation and growth to fullness of human beings..... The problem of development in our country is not primarily the procedures for the accumulation and allocation of capital, but the animation of the many millions we have in our land and the utilisation of the non-labour resources for the achievement of this objective" Joseph (1978) states, "Economic development is a process by which a population increases the efficiency with which to provide goods and services, thereby increasing individual living levels and general well being."Economic development is both a physical reality and a state of mind in which society has through some combination of social, economic and institutional processes, secured the means of obtaining a better life. Better life includes the following objectives: To,

(1) Increase the availability, and widen the distribution of basic life sustaining goods such as food, shelter, health and protection;

(2) Raise the standard of living of the people and enhance their material well being so as to generate greater individual and national esteem; and

(3) Expand the range of economic and social choice to individuals and nations so as to emancipate themselves ultimately from the forces of ignorance and misery.

The plan frames, right from the Fourth Five Year Plan had acknowledged the need of the times and redefined the goals

and strategy of development, in terms of what should happen to those below the poverty line. The three main objectives of the Sixth plan are: elimination of unemployment, improving the economic conditions of the people below the poverty line and the provision of public goods and services. In effect, all the three are interrelated and involve the diminution of inequality and poverty among the major sectors of the community.

Indicators of Socio-economic Development

Even as the concept and components of Development underwent a metamorphic transition, the United Nations Research Institute for Social Development was seized with the inadequacy of per capita national income as the index of development and has tried to evolve some reliable socio economic indicators of development that would measure the levels of living more realistically. A staff paper, 'Contents and Measurements of Socio-economic Development', brought out by the Institute (7) expressed that through percentage increases in per capita national income persist as the basic target of economic planning, as a general measure of development covering social and economic aspects, it had the following weaknesses. It did not, as:

1. An aggregative concept, reflect structure and distribution
2. A monetary concept, take account of values that were outside the monetary sphere; and
3. A market based concept, apply to subsistence economics, or non-market sectors of partly market economics.

The UN Institute undertook a methodological exercise in developing reliable indicators of socio economic development, out of data relating to 115 countries and 73 variables, using a correspondence system of agreement. The 18 core indicators that emerged from this study were:

1. Expectation of life at birth
2. Population in localities of 20,000 and over as per cent of total population

3. Consumption of animal protein, per capita per day
4. Combined primary and secondary enrolment as per cent of age group 5-19 years
5. Vocational enrolment as per cent of age group 5-19 years.
6. Average number of persons per room
7. Newspaper circulation per 1000 population
8. Telephone per 100,000 population
9. Radio receivers per 1000 population
10. Per cent of economically active population in electricity, gas, water, sanitary services, transport, storages and communications
11. Agricultural production per male agricultural worker
12. Adult male labour in agriculture as per cent of total male labour
13. Electricity consumption kwh per capita
14. Steel consumption kg per capita
15. Energy consumption kg of coal equivalent per capita
16. GDP derived from manufacturing as per of total GDP.
17. Foreign trade (sum of imports and exports) per capita and
18. Salaried wage earners as per cent of economically active population.

Nutrition as the End and Means of Development

Article 47 of the Indian constitution considers the raising of the level of nutrition and standards of living as primary duties of the state. The raising of the levels of living or improvements in the quality of life of a country are better expressed in terms of its real health level, its real education level, etc and not in terms of the amount of money classified

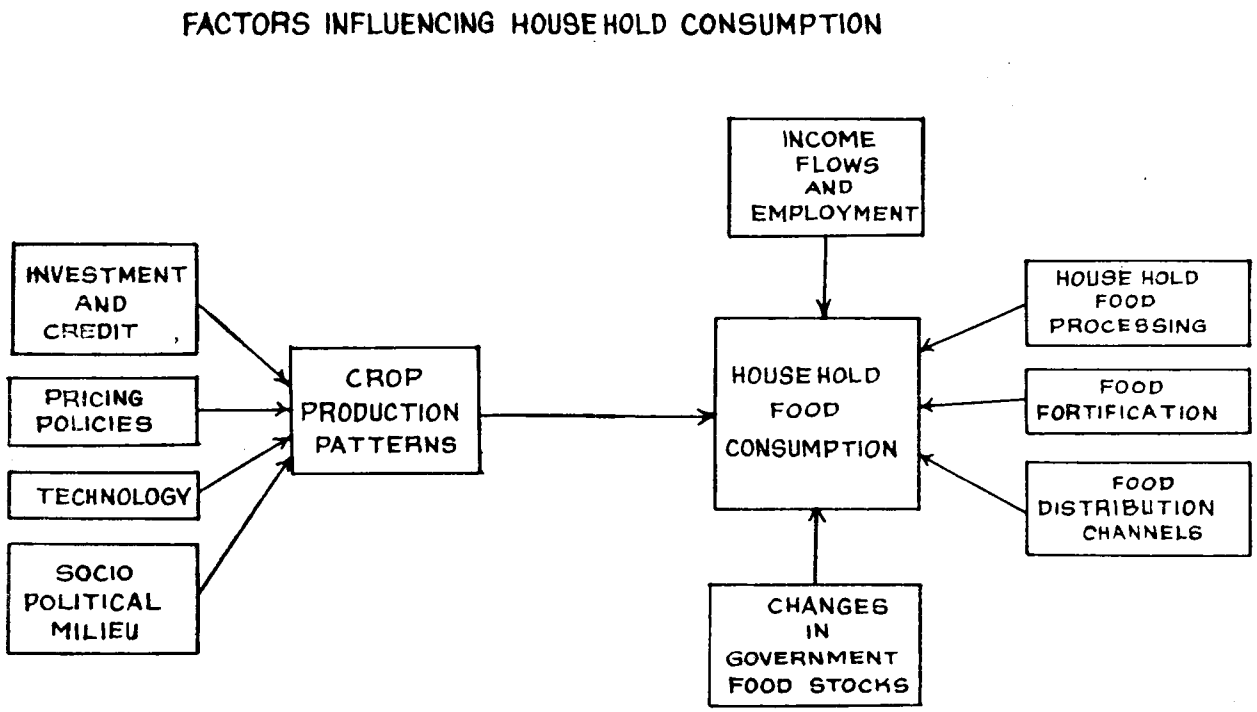
FACTORS INFLUENCING HOUSE HOLD CONSUMPTION
INCOME FLOWS AND EMPLOYMENT
INVESTMENT AND CREDIT
PRICING POLICIES
TECHNOLOGY
SOCIO POLITICAL MILIEU
CROP PRODUCTION PATTERNS
HOUSE HOLD FOOD CONSUMPTION
HOUSE HOLD FOOD PROCESSING
FOOD FORTIFICATION
FOOD DISTRIBUTION CHANNELS
CHANGES IN GOVERNMENT FOOD STOCKS

Figure I

as spent on those objectives. In fact, Singer (1975) regards, better nutrition as the whole purpose of development. "Why on earth do we want to increase output? Presumbly so that people can eat better, and otherwise improve their living conditions".

The target group of population whom the benefits of development are to reach also conceive development in terms of better food intake and nothing else. In an interview in 1970 with Dilip Hiro (1976) a journalist, Gopal Naicker, a landless labourer was vocalising his concept of development in these words. "My wish in life is just to get enough to eat, nothing more".

Alan Berg's study which focusses on the effect of malnutrition on nations and ways in which the problem can be addressed begins with the conviction that man is the key to development, that the quality of human existence is the ultimate measure of development and that among the factors effecting human condition, food and nutritional adequacy is perhaps the major determinant. In spite of the fact that the well - being of a man does depend heavily on economic, educational, environmental and other opportunities, nutrition remains the center piece of development.

The nutritional status of people and the extent of their socio-economic development mutually act and react upon each other. As explained by Taylor (1978) the elements of the macro food system, are highly influenced by several agricultural variables, Figure I depicts these interrelations.

The size of the macro food system depends largely on the nature of performance in agriculture, in respect to food crop production. As Swaminathan (1974) remarks the poor nations can move fast towards providing the minimum needs of their people provided agriculture is attended to seriously on the basis of sound principles of ecology and economics. The nutritional status in turn is influenced by several socio economic variables as shown in Figure 2.

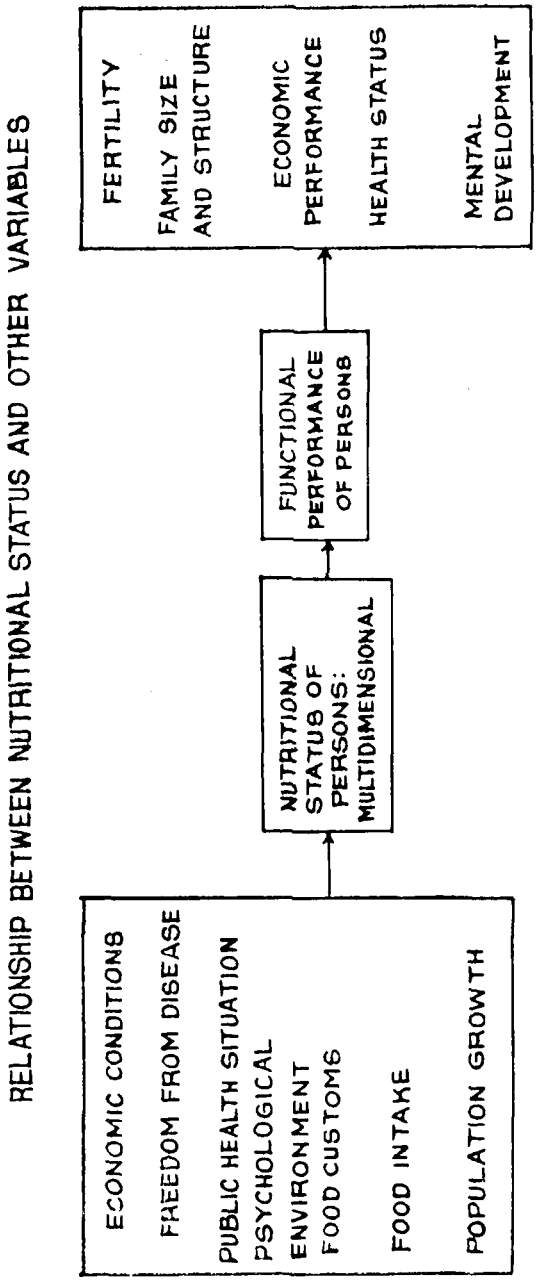
RELATIONSHIP BETWEEN NUTRITIONAL STATUS AND OTHER VARIABLES
ECONOMIC CONDITIONS
FREEDOM FROM DISEASE
PUBLIC HEALTH SITUATION
PSYCHOLOGICAL ENVIRONMENT
FOOD CUSTOMS
FOOD INTAKE
POPULATION GROWTH
NUTRITIONAL STATUS OF PERSONS: MULTIDIMENSIONAL
FUNCTIONAL PERFORMANCE OF PERSONS
FERTILITY
FAMILY SIZE AND STRUCTURE
ECONOMIC PERFORMANCE
HEALTH STATUS
MENTAL DEVELOPMENT

Figure II

Defining levels of living in a broad sense to include nutrition and health status, Myrdal (1968) observes, "In developing countries a change in the levels of living effects the contribution man makes to production." On the other hand in the rich countries, the standards of nutrition are generally so high, that a rise in the quantity or an improvment in the quality of food, has no significant effect on labour productivity. They may even lower it by obesity and other complications of affluence. This is not so in India, where for a large part of the population even the calorie intake is grossly inadequate to maintain optimal levels of health, energy and labour input and efficiency. Qualitative deficiencies and imbalances particularly, shortages of protein, vitamins and essential minerals, are also widespread. Thus both undernutrition and malnutrition impair stamina and decrease labour input and efficiency

Even as better nutrition has a salutory bearing on economic performance, so also it exercises a beneficial influence on the other aspects of functional performance, namely, fertility behaviour, family size and structure, mental development and health status.

Achivements of the Process of Economic Development in Terms of Nutrition

Nutrtional deprivation and the interrelated problems of ill-health are two of the most serious manifestations of poverty. Hence increase in food intake and the resultant gains in nutrition are crucial for economic achievement. What then are the achievements of the process of economic development in terms of nutritional advances? What is the profile of the country in regard to the actual availability of major nutritional items as a result of 33 years of planned development?

Table 1 gives the per capita per day availability of major food groups for 1950-1951 & 1976-1977,

TABLE I

Per Capita Per Day availablity of Major Nutritional Items (In India 1950-51, 1976-77)

(Natarajan 1978)

Year	Cere - als	Pul- ses	Milk & milk products	Oil and ghee	Sugar products
Requirements	400	85	284	57	57
1950-51	334	61	130	7	35
1956-57	374	72	131	9	48
1961-62	399	62	128	10	54
1964-65	419	82	125	12	54
1965-66	360	48	120	9	52
1966-67	362	40	118	9	48
1967-68	404	56	118	11	45
1968-69	398	57	122	9	50
1969-70	403	52	111	9	54
1970-71	418	51	124	13	57
1971-72	420	47	122	11	50
1972-73	382	41	117	9	51
1973-74	412	41	120	11	50
1974-75	370	40	120	10	57
1975-76	404	52	124	11	49
1976-77	427	—	125	—	54

Even in the production of cereals, which consitute 80 per cent of the average Indian meal, the minimum has been crossed marginally only eight times since 1950-51. Regarding pulses, the nation has not touched the minimum needed even once. What is worse, its production has consistently declined to about half the level of the requirement. Milk and milk products have not been adequate throughout to meet even 50 per cent of the requirement. The nearest achieved in oil and ghee was less than 25 per cent of the requirement. Sugar production alone has been closer to the requirement level.

These availability figures, at the macro level, at the level of the mythical being, 'The average Indian', confirm the field studies in nutrition that malnutrition is essentially due to food inadequacy, and that the problem of malnutrition pervades the entire cross section of the population pyramid.

The position would have been worse if our agricultural production had not responded to the yield oriented strategy in the cultivation of cereals namely, the Green Revolution. Berg (1973) observes, "Given the dominance of cereals in providing the major nutrients, the recent remarkable increases in cereal production due to the Green Revolution have great nutritional implications".

The dramatic increase in cereal production using new seed varieties in India is shown in Table II.

TABLE II

Cereal Production Using New Seed Varieties in India

(000s of tons)

Year	Wheat	Paddy rice	All cereals
1960	10,324	51,297	84,600
1966	10,424	45,657	80,163
1968	16,540	60,645	102,445
1970	20,093	62,500	111,209
Production increase 1960 - 70 percent	95	22	31

Source : Compiled from FAO production year Book 1963 and 1970.

The wheat crop had nearly doubled its yield, in the decade 1960-70. The increased yield means not only more calories but also more protein, vitamins and minerals. The

27 million tons of extra production translates roughly into three million tons of protein. Its impact in terms of individual nutrient intake is shown in Table III.

TABLE III Nutrients available from the Average Pre Capita Grain Production Increases (1960-1970)

Population increases (per cent)	27
Total production increase (per cent)	95
Per capita production increase per cent	50
Daily per capita increase in	
Commodity (g)	33
Calories	114
Protein (g)	3.8
Iron (mg)	1.2

(100 g of wheat contain an estimated 344 calories 11.5 of protein and 3.5 mg of iron; 100 g of milled rice contain 354 calories, 8.0 g of protein, and 2.0 mg of iron).

The average per capita annual wheat production has gone up by 50 per cent. The increased per capita amounts of protein, calories and iron available to individuals met a significant proportion of nutrient requirements.

Ryan and Asokan (1977) of ICRISAT (International Crop Research Institute for Semi-Arid Tropics) examined the actual nutrient impact of high yielding varieties in wheat to test whether the yield oriented breeding strategy had improved the aggregate nutritional status of the community. Using the data from the six major wheat growing states : U.P., Punjab, Haryana, Bihar, Rajasthan and Madhya Pradesh, they had fitted trend lines to represent the change in the nutrient picture from the Pre-Green Revolution period 1954-55 to 1964-65, and the Post Green Revolution period 1964-65 to 74-75. They concluded that the production

status of protein, energy and essential amino acids would have been far inferior, had it not been for the High yielding Varieties (H Y V) of wheat. Considering the nature of the distribution of these added nutrients among the nutritionally affluent and nutritionally vulnerable population groups apart, which is largely a function of the basic distribution of wealth, and income and government policies, the Green Revolution *per se*, in wheat did raise the overall level of total or per capita contribution of the primary nutrients in the aggregate diets of people.

The nutritional success of the High Yielding Varieties of wheat in India illustrates how a sufficiently large increase in production of a cereal, primarily as a result of an yield oriented plant breeding strategy, can produce a significant improvement in aggregate nutritional well-being. Furthermore, other research studies by Ryan *et al* have shown that yield increases under the Green Revolution have also provided a mechanism for enhancing real income of low income consumers of food grains via the effect on prices. In this way, the yield increases provide the wherewithal for the purchase of additional nutrients by the nutritionally most vulnerable sectors.

However, availability is not the same as consumption at the ultimate individual and family level. The volume of purchasing power at the disposal of the famlies, the level of food prices in the retail market, the size of the family food budget· food habits and socio cultural beliefs - all these influence and determine the actual food intake and the nutrition status of families in different socio economic groups, and of individuals and vulnerable subjects within the families.

Low Income and Poverty

Inadequate income is one of the main determinants of the incidence of malnutrition in the developing countries. Singh (1978) has identified the factors determining poverty to be per capita income, degree of industrialisation and urbanisation, agricultural production, degree of unemployment, and pattern of income distribution and has assessed them quantitatively. Among the conclusions of his model is one about the wage rate.

The population below the poverty line continues to swell, in spite of the process of economic development from one Five Year Plan to another. The Planning Commission, in the Sixth Draft Plan, has defined the poverty line on the basis of nutritional requirements of 2400 calories per person per day for rural areas and 2100 calories per person per day for urban areas. According to this norm, the proportion of people below the poverty line at All India level in 77-78, is 48 per cent in the rural and 41 per cent in the urban areas, the total number being 290 millions. Conceptually, this implies that these millions have been affected by absolute poverty, in that they do not have even the subsistence incomes necessary to secure the bare essentials of food, clothing and shelter. These low levels of living are manifested quantitatively and qualitatively in terms of low income, inadequate housing, poor health, limited or no education, high infant morbidity and mortality, low life and work expectancy and in most cases a general sense of despondency and despair. Malnutrition and ill health deepen their fatalistic outlook on life. The low levels of living and low productivity prevalent among them are self - reinforcing social and economic phenomena resulting in an under - development equilibrium, which Mydral (1968) characterises as an illustration of a "circular and cumulative causation".

Food Prices in the Retail Market

In developing countries food grains prices play an important role in determining real living standards. In contexts in which as much as 50 per cent of total income may be spent on food grains, and more than 40 per cent of the population live below the subsistence level, the economic welfare of large groups in the population rises and falls in inverse relation to domestic food grains prices (Chinn 1978). As a result, policies affecting food grains prices are often critical economic and political issues. In periods of short supplies, the implied equilibrium price is regarded as imposing an unacceptable burden on consumers of purchased foodgrains.

A frequent response of governments in such cases has been to attempt to establish government control of

TABLE IV Deficiency in Calorie Intake

Nutritional status	Deficiency in Calorie intake					
	Per Capita Per day	Per adult man-unit	Expenditure gap per capita per day	Percentage gap in expenditure	Calories as per Rs. of food expenditure	Protein per rupee food expenditure
Below the nutritional deficiency line	—751.8	—739.8	—1.41	44.34	1250.7	
Above nutritional deficiency line	+262.8	+314.7	+1.68	——	1088.7	30.5
Overall	—441.2	—404.2	—0.46	——	1172.7	31.1

The details of calorie - protein balance are given in Table V.

food grains markets. In India direct controls on the purchase, movement and distribution of various food grains has been in existence in one form or other since late 40's.

An evaluation of Fair Price Shops carried out by Singh (1973) in terms of its twin objectives of food relief and price stability, compared the controlled and actual prices of paddy and wheat in the U. P. between 1943-1968. He found that retail controlled prices had been substantially lower than the market prices and that the fair price shop had checked the rise in general prices. As regards the extent of food relief to the vulnerable sections of the rural population, the study showed that the coverage was very satisfactory, in that nearly 90 per cent of card holders had income of less than Rs, 300/- per month, the average family size of the card holders being 5.56. Seventy per cent of the card holders wanted the Fair Price Shops to continue with extended facilities as an agency of Public Distribution thereby, indicating the extent of fulfilment of its objectives.

Food Intake and Nutritional Status at the Individual House hold Level-Determinations

The determinants of food consumption and nutrient status at the level of the households have been studied by a number of researchers. Their studies recognise that "at the very basis, the problem of under nutrition and malnutrition, is the problem of unequal distribution of incomes and absolutely low income for a high proportion of the population. Studies on measuring poverty on the basis of minimal food energy needs, have also reinforced the conclusion that undernutrition constitutes a pervasive and persisting mass phenomenon in the country. They underline that socio cultural and environmental factors influence nutrition, but the importance of these factors should not be exaggerated, when concerned with the widespread phenomenon of undernutrition and malnutrition of the vast segment below the critical points of survival and minimum levels of living.

A study of the nutritional status in relation to the food expenditure of households, demographic aspects and food

budget changes in relation to nutritional status of households in Anakapalle District of Andhra Pradesh was made by Serveswara Rao and Krishna in 1973-74. They examined the behaviour of such variables as energy values of food, protein intake, calorie-protein balance and food composition in relation to levels of food expenditure. Taking 2,200 calories per capita per day as the minimum amount of energy required, they had estimated that families in the per capita food expenditure classes of the less than Rs. 3/- are nutritionally deficient, with 69 per cent of the population in this range, the share of the total income of this group was only 34 per cent. The per capita income of the households above the nutritional deficiency line was found to be Rs. 8.38 as compared with Rs. 1.91 for the others. The statistical tests showed that in 75 per cent of the cases, variations in calorie intakes were correlated with variations in total expenditure. The correlation co-efficient between per capita expenditure and per capita income was found to be .76.

If the calorie deficiency in the nutritionally deficient households were to be made up, per capita income of this group should increase by 44.3 per cent. The estimates of deficiency in calorie intake are shown in Table IV.

TABLE V **Calorie - Protein Balance**

Nutritional	Calorie intake per capita per day (calories)	Protein intake per capita per day (gram)	Protein per 100 calories (gram)
Below the nutritional deficiency line	1413.3	35.82	2.53
Above the nutritional deficiency line	2427.9	68.11	2.81
Overall	172.3	45.71	2.65

The per capita per day protein intake varies substantially between the households above and below the nutritional deficiency line (68.11 grams as against 35.82 grams).

TABLE VI **Demographic aspects of households by levels of nutrition**

Nutritional level of households	No. of couples	Total yrs. of married life for the women in the couples	Total No. of births			Births per. yr. of married life	Loss of pregnancy	Loss of pregnancy per yr. of married life
			Live births	Still births	Total births			
Below the nutritional deficiency line	209	3555	772	11	783	.2203	34	.009
Above the nutritional deficiency line	106	2033	351	2	353	.1736	39	.0192
Overall	315	5588	1123	13	1136	.2033	73	.0131

The Calorie-protein ratio, however, was relatively stable, indicating that given the food habits and the energy and protein value of foods, protein intake would rise more or less in proportion to the calorie intake. For the poor households, therefore, the problem of protein deficiency was essentially a problem of calorie deficiency. The stability of the calorie-protein ratio also implies that there is little evidence of shifts to foods with higher protein.

The demographic aspects of these households by expenditure groups are shown in Table VI.

Households below the nutritional deficiency line had a higher propensity to reproduction and higher rate of infant mortality, bringing out the demographic dimension of malnutrition. The conclusions from this research are revealing:

1. Nutritional deficiency problems of the households below the poverty line cannot be solved except by increasing the total food production and supplies and the purchasing power of the households.

2. In the dynamic context of population growth, and given the high elasticity of demand for food on the part of the poor households, the importance of redistributing incomes in favour of the poor and of redirecting investments in favour of agricultural and food production is indicated.

3. Protein deficiency is very closely related to calorie deficiency. There is no evidence of shift to foods with higher protein and less calorie value as expenditure on food rises.

4. Finally, the demographic pressure on food resources available to the households below the poverty line is significant and can be considered as an independent cause of nutritional deficiency though not as important as the factor of inadequate wages and income.

Pandey, *et al* (1977) carried out a study on the nutritional status of selected produce - consumer farm households of U.P, as contrasted with others, that is, the buyer-consumer households in 1973-74. Using the multiple regression they had determined the impact of the following variables.

(1) The size of operated land, (2) On farm availability of food grains per day per household, (3) Total household income, (4) Household size and (5) Educational level of the household, on the nutritional status of this group. They found that consumption of all food items in households on the large farms was considerably higher than that by the households on the medium and small farms. All the households, regardless of the farm size, exhibited a highly cereal dependent consumption pattern.

The co-effecients of on farm availability and household size were found to be positive and highly significant. The regression results indicated that an increse in the food grains availabilty / production by one kilogram per day (i.e 3.65 quintals per year) would raise the calorie intake only by about 135 units per day per household. This meant that emphasising cereals production alone on the farms cannot fully meet the calorie deficiency on farm households. More emphasis therefore needs to be given to the production of pulses, oil seeds and milk, whose availability and consumption were far below the required level, particularly on the small and medium farms. The co-efficient of education was positive though with a large degree of variance, indicating that higher education would be helpful in improving the nutritional level of farm hoseholds.

Nutrition and Productivity - Work Output

One way to invest in human capital is to improve health in all aspects, physical, mental and emotional. Health, like knowledge can be improved in many ways. A decline in the death rate at working ages may improve earning prospects by extending the period during which earnings are received. A

better diet adds strength and stamina and thus earning capacity. Reynalds (1978) found that industrial workers in less developed countries to be quite responsive to material incentive, willing to trade additional effort for additional income, such similarity was seen in the case of peasant farmers also, who were quite 'economic' in their production behaviour. The real differen between wage earners in poor countries and their counterparts in affluent regions lie in other directions. Among other factors, because of health and dietary deficiencies, they have less physical vigour and capcity for sustained effort.

Mydral (1968) believes that raising the levels of nutrition will also raise the levels of the other components like better living, health and education and raising all components will increase productivity. The cumulative effects of nutrition on productivity are both direct and indirect.

A relationship appears to exist between nutrition and work output under ordinary work situations. Productivity among workers in developing countries is generally low. This has been attributed to their poor physique as a consequence of malnutrition. Evidences based upon epidemiological data collected during wars and other scarcity conditions indicate that inadequacy of food intake results in reduced work efficiency and production (FAO, 1962). Physiological studies indicate that maximal oxygen uptake as measured by the use of bicycle ergometer is reduced in malnutrition. The impairment in maximal work capacity among malnourished subjects is related to their small body size or reduced lean body. From the practical point of view the possible adverse effect of small body size among large segments of the Indian population, brought out by chronic undernutrition, on work output is important in the context of national productivity.

The Food and Agriculture Organisation (FAO, 1966) of the United Nations, has pointed out that countries with the lowest per capita daily proteins and calories consumption are also those with the lowest productivity. Dill's study of polish miners in the Ruhr, comparing calorie intake with work performed on Cassel's on the rubber plantation workers of Indo-China reveal

that the qualitative aspect is even more important than the quantitative parameter. With an impressive array of evidence they have shown that there may be as much as 40 per cent difference in the productivity between a poorly fed worker and a well fed worker.

Sathyanarayana *et al* (1978) at the ICMR, studied the relationship between nutritional status on the one hand and work capacity and work output on the other. They focussed the investigation in two situations:

1. Physical work capacity was determined in adolescent boys with different nutritional background using a bicycle ergometer. This was a longitudinal study on the growth and development of nearly 1500 children belonging to 20 villages in rural Hyderabad.

2. Nutritional status and work output were investigated in real life situations among industrial workers.

The results of these studies demonstrated that both underweight and overweight influenced adversely work output. Chronic undernutrition leading to low body weight in adulthood, resulted in reduced work capacity and reduced work output even under routine life situations.

Results of multiple regression analysis revealed that the single most important factor which was related to work capacity was current body weight, accounting as it did for about 64 per cent of the variation in work capacity.

Productivity can be maximised therefore by ensuring that workers have normal body weight. Attainment of this objective calls for proper nutrition during growth and development in early life. Attempts to improve nutritional status of children during the preschool and school age should thus be assessed not only by present better health, but also in terms of economic benefits through increased productivity.

Adequate food, thus appears to be the key to India's productivity. Good nutrition can exert a current, continuing and maintenance influence on the productivity of the labour force, enabling it to earn higher incomes. Therefore efforts to meet the food needs of workers is not only a humanitarian gesture, but an economic investment in the future productivity of the human resource which constitutes the heart of a society's capacity for productivity.

The essence of economic progress lies in raising the productivity of labour. India's labour productivity needs to be increased to promote economic development through better nutrition. Removal of poverty requires increased productivity, which means enhancing the working capacity of the people, which in turn demands the provision of adequate wholesome food. An energy deficient society is weak and not adaptable to fast changing environmental conditions in comparison to a high energy society. Such a hardened society cannot take advantage of the expanding opportunities for economic development generated by advances in science and technology (Sethna, 1977). Poor diet, resulting in under and malnutrition, reduces working efficiency by (a) decreasing the worker's resistance to disease, (b) increasing the rate of absenteeism; (c) causing lethargy, lack of initiative and drive; (d) increasing accident rates.

"By human productivity, we refer not only to the quantity, interest, requlrity, skill and general efficiency of labour inputs, but also to enterprise and other aptitudes and dispositions that when improved, tend to raise production". Myrdal warns that, consumption in India, is at the margin, far lower than that required for optimum productivity. Almost every increase in worker's consumption raise productivity. All consumption is simultaneously productive, though in varying degree. Theoritical economists right from the time of Alfred Marshll have reasoned that a worker's productive capacity is not independent of his wage level. Higher wages, Marshall thought would make for better diets, housing and health care which in turn, would increase working capacity. Upto some point, it was recognised that real wage increases would be actually self financing. Empirical studies in the capital rich USA

have also shown that wealth depends primarily on the productivity of human beings, which is at once the means as well as the end of human endeavour.

The two aspects of the problem, consumption and productivity, are highly complex, and do not admit of precise quantification. The research evidence bearing on this problem in India is almost nil.

Impact of Health Impairment on Absenteeism Among Workers

The synergetic relationship between good nutrition and good health and poor nutrition and poor health is only too well known. Adequate empirical studies, directly dealing with the association between nutrition and economic performance, are not available. Gandhi *et al* in 1971 reported, in the Indian Journal of Medical Research, sickness and absenteeism among the Textile workers of Kanpur. Dutta and Sharma studied the medically certified absence cards of 1038 workers, in the textile mills of Jaipur in 1978, in terms of number of spells, duration of each spell and the diagnosis.

There were 1228.32 absence per 1000 workers, accounting for a loss of 19.80 days per worker per year. The average duration of absence per spell of sickness was found to be 16.12 days. Symptoms of ill defined conditions, acute respiratory infections, intestinal infections, infections of skin, bronchitis, emphysema, asthma, arthritis and rheumatism, prenatal and postpartum care, laceration and open wounds, superficial injuries and other accidents contributed to 75.44 per cent of total sickness absence. While some of these complaints may be particular to the occupation, if the complaints primarily due to nutritional deficiencies and under nutrition could be in investigated, the impact of nutritional deprivation on work attendance could have been assessed.

As to the rest of the findings of the study, spells of sickness increased with increasing age. Similarly age and duration of absence were positively correlated; absenteeism was

related to literacy and percapita income. No clear association emerged as to the rural and urban origin of workers; sickness absenteeism was more among females than among males.

The FAD (1966) gives several examples from experimental work and field observations, to indicate that provision of an adequate, balanced diet has a beneficial effect on working efficiency, general well-being, and ultimately on productivity. In considering the dietary requirements of workers, calorie intake is the most important factor influencing work output. The requirements for calories increase with increase in physcial activity. Therefore adequate provision should be made for sufficient calories in the worker's diets. The worker's requirements for protein, vitamins and minerals do not vary as much as calorie requirements ; however, more protein than the recommended allowances may be needed under certain circumstances to improve and to increase the worker's physical strength. In some cases, more vitamins, especially of the B group may be beneficial in improving working efffciency.

The impact of malnutrition on the individual, and of an improvement in nutrition (or an avoidance of undernutrition or malnutrition) can be economically equated to curing (or preventing) disease. Improved nutrition that returns an absent worker to the active labour force, or that overcomes a debility that is reducing a worker's productive capacity, or that enables a child to return to school or to improve his understanding or retention of lessons taught, or that enables an adult to absorb more effectively in inservice training or the advice of agriculture extension, all increase the flow of earnings above what it would have been in the absence of the improvement in nutritional well being.

Once a person is restored to well-being, adequate nutrition becomes a maintenance expenditure. Thereafter it contributes to present income, in the sense that in its absence, the person would lose some of the income generating capacity he or she had when nutrition was adequate. It contributes to future income in the sense that its absence would interrupt current learning or otherwise dilute activites that are necessary or contributory

to future income generation. All distinction between consumption and investment would be destroyed if the expenditures on eating by all people who were adequately fed were labelled investment by extension of the idea that they were a necessary condition for maintaining a flow of income.

Thus, an improvement in nutrition can have a continuing current or maintenance effect on the productivity of enactive member of the labour force, or it can take the form of an investment, enabling a person to get into a higher future income stream.

Cost Effectiveneas of Intervention Programme

Nutrition and Medical Services-Intervention in Children

Extension and improvments in health care services in the country have progressively reduced the death rates from 36.3 per thousand in 1921-30 to 18.9 in 1961-70. The mathematical implication of the death rate in the rank 10 to 20 per 1000 is that half or more of the children will die before they reach the age of 16 or 18 or 20 years ie. before they can start to produce or even complete their training. They cannot become producers, or if they do, they cannot make a full contribution to production or development. They are 'excess consumers'. Of those who start producing, again half or more will die long before they have finished their productive life. It simply does not pay to give them training or invest money in 'human investment'. Such high incidence of death rates, together with high birth rates affect adversely the rate of consumption, rate of investment and capital output ratio, rendering physical capital investment and monetary savings less important. The true investment in such a situation consists in the raising of a healthy new generation who will be the producers of tomorrow. Long term development calls for equipping better the present generation of children. Feed. clothe, house, educate and train them in such a way that they become more efficient producers than their forefathers. The studies on Protein Calorie Malnutrition done by the Indian Council of Medical Research reported by Gopalan (1973) have confirmed that the major bottleneck is calo-

ries, not protein. He has emphasised the need for reorienting the approach towards filling this food gap. Thus one aspect in the process of gearing children to tomorrow's developmental tasks lies in improving and strengthening their nutrion status, for which nutrition and health intervention programmes aimed at special age groups of children have been tried. An examination of their cost effectiveness would indicate the viability of extending them to more age groups and wider areas.

The Narangwal nutrition project in the Punjab covering 10 villages and 2,900 children under age three, was carried out in the period 1968 through 1973 by the Rural Health Research Centre in Narangwal. This project among other things, measured the cost effectiveness of the impact of nutrition and preschool child health care. The programme utilised family health workers posted in the study villages to provide the primary care contacts for nutrition and health services.

The service package for children in the experimental group consisted of varying combinations of medical care (MC) and nutrition supplementation (NUT). The programme showed that the costs to provide an average village of 1,000 population with combined NUT+MC services for preschool children (under 3) was Rs. 14 per capita per year in the pilot sdtuy. This would be reduced by half, with the statewide coverage of the programme. As compared with control villages, the number of ill children going untreated in the study villages was reduced from 60 percent to 20 percent.

On Costs of Prenatal Deaths Averted

The study obtained also the ratios of costs per death averted, by relating the cost of service programme in each experimental group to differences between numbers of death in each experimental group as compared with the control group. The lowest cost/effectiveness ratios were Rs. 570, Rs. 710 and Rs. 1010 for 'prenatal child care' costs per prenatal death averted in NUT+MC and MC experimental groups respectivly. These include the direct costs for surveillance visits every two

months to identify pregnancies and distribution of iron and folates, tetanus toxoid immunisations, and nutritional advice during pregnancy.

On Costs of Infant and Child Deaths Averted

The lowest child service costs per death averted were in the MC experimental group of villages in which the costs of services to children under one were about Rs. 1110 per infant death averted. Using this figure as an index of 1.0, other costs per death averted in relation to this were:

Cost per infant death averted

MC	1.0
NUT	1.5
NUT+MC	1.6

Cost (excluding nutrition) per child death (1-3 years) averted

MC	6.9
NUT+MC	11.2

Cost (including nutrition) per child death (1-3 years) averted

NUT	21.2
NUT+MC	27.9

It appeared that still births were less expensive to prevent than infant deaths and the latter were one seventh as expensive to prevent as child deaths. Hence the research evidence to concentrate the nutrition health intervention programme among pregnant women, infants and children in that order.

The Narangwal project demonstrated that the benefits of nutrition care included better growth and development as well as reduced mortality. Prevention, early detection and treatment of infectitious diseases appeared to be the most effective way of reducing mortality in both infants and children.

The impact of the intervention programmes in operation in Tamil Nadu, like the Applied Nutrition Programme and Special Nutrition Programme have been studied by Devadas and her associates. Devadas *et al* (1970) have studied the impact of ANP on the Nutritional Status of the Expectant Women in Pannimadai village. They found that the programme had encouraging results. But the ANP supplements were still inadequate and they recommended that the quantities of the supplements be increased and regularity in distribution be improved. A similar study of the ANP's impact on the nursing women undertaken in 1971 by Devadas *et al* also confirmed the above findings. A study of the impact of the ANP on the preschool children in the same village (1971) showed that there were significant increases in the heights and weights of the children in this group and there was rapid decrease in the clinical signs among them.

Devadas *et al* (1977) had also evaluated the contribution of the Special Nutrition Programmes in operation in urban slums. With the supplementation under the programme, they found that the growth trends of 1120 children over a period of six months approximated the Tamil Nadu and All India Value, inspite of the fact that they belonged to lower socio economic status.

As regards the evidence of impact of direct nutrition intervention programme on adult productivity, Sukhatme (1974) is skeptical: "Direct nutrition intervention, especially through protein, rich food by itself cannot bring about lasting improvements in intelligence, physical growth and health, unless appropriately combined with other social and economic measures. That such nutrition programmes directed to the poor will themselves bring about economic development, seem less probables". The hypothesis that Sukhatme proposes on the basis of observation of the advanced countries is that the productivity of man at any point of time t depends partially on his nutritional level at time t, and partly on his nutritional level in utero and during childhood. On the aggregate level, the production of labour force in any country is expected to depend upon the aggregate level of nutrition at time t and at time t-20 to t-50. Assuming that the labour force in between 20 and 50 years old, he found a regression of national income per caput on production of protein

per caput 2-50 years ago, to account for some 60 per cent of the total variation in income levels.

This finding of Sukhatme on an aggregate level predict that only a limited improvement in adult performance could b attributed to nutrition intervention programmes among adult workers. Sukhatme's finding contradicts the several field and studies on relationships between nutrition and working efficieney quoted in an FAO publication (1966)

Conclusion

The foregoing discussion leads to the following conclusions :

1. 'Development is transformatian of life and activities in all their economic, social, cultural, institutional environmental and human aspects' (FAO-1979)

2. Nutrition, one of the components of the levels of living, is at once a determining factor, and end result of development.

3. Advances in agricultural production under the NTV programme have improved the aggregate nutritional status in the country. Through lower food prices, they have also improved the potentials of the nutritionally most vulnerable groups to purchase the required additional nutrients.

4. Two-hundred and ninety millions, still live below the subsistence level. If the wage per person per day is raised by Rs. 1, the proportion of people below the poverty line would fall by 5.36 per cent.

5. The Public Distribution System through the Fair Price Shops can achieve its twin objectives of food relief and food stability.

6. Undernutrition, arising from inadequate purchasing power, appears to be the basic problem of the households below the nutritional deficiency levels.

7. Food habits, as symbolised in caloric protein balance remain fairly stable among the households of all expenditure groups, indicating that they do not readily shift to foods of high protein and low energy value, with increases in income.

8. On the farm availability of food products influences the food intake and nutritional status of farm households.

9. The empirical evidence on the extent of relationship between nutrition and productivity in India is nil. Research must be stepped up in this direction.

10. As regards the efficacy of nutrition and health intervention programmes, the experience of the Narangwal project shows that they are highly rewarding in terms of attention to larger numbers of sick children, prenatal and child deaths averted.

11. The limited evidence on health impairment and absenteeism among workers shows that sickness results in a less of 19.80 days per worker per year.

Strategy Suggested

An integrated approach to development that emphasises.

1. Achievement of self sustaining cumulative economic growth
2. Expanding employment
3. Reducing poverty and
4. Slowing population growth is needed.

In order to increase food availability, there is need to extend the yield oriented strategy to the cultivation of pulses, so that the protein caloric balance among the population could be improved and maintained.

In this context, the announcement of the National Policy of Nutrition with its three dimensions: increasing and

improving the food supply in all its aspects, raising consumption to meet the nutritional requirements of the population; and improving biological utilisation, is not a day too soon. It truly recongnises the need for an integrated- intersectiral and bold food and nutrition planning and implementation.

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LECTURE III

NATIONAL DEVELOPMENT AND NUTRITION-MENTAL AND SOCIAL ASPECTS

Children are the richest human resource of any country. They kindle in every human heart a delightful feeling, surpassing barriers of race, creed, caste and financial status. They are the living poems, "better than all the ballads that ever were sung or said". However, such feelings of the mind or poetic expressions need to be tempered with the grim realities facing the child population today. Affluence, poverty and its deprivations, fast pace of life, divorced parents, lack of attention and affection at the formative period and many other material and psychological causes retard their growth along healthy lines. The problems and needs of children in the poorer strata of society range from basic sanitation to limited monetary resources.

Happy is the land which knows no hungers as predicted by the Sage Tiruvalluvar

உறுபசியும் ஓவாப்பிணியும் செறுபகையும்
சேராதியல்வது நாடு

A kingdom true is one which knows no famine's ill - impact'
And which knows naught of endless plagues or enemies grievous act

பிணியின்மை செல்வம் விளைவின்பம் ஏமம்
அணி என்ப நாட்டிற் கிவ்வைந்து

Absence of disease, mighty wealthy, largest yields from land, joys and security are the five-fold jewels of a kingdom grand. But India is far from that enviable situation - Children are often victims of a vicious circle of poverty - malnutrition - over - population - overcrowding and disease, leading to more poverty and larger quantum of suffering.

The second - half of the 20th century has witnessed an increasing degree of concern with the requirements of national development and public policy. These have led to the consideration of nutritional adequacy as an important factor in the life of a child from the time of gestation to the time of his acceptance of full responsibility as a socially functioning adult (Cravioto *et al*, 1971). Hence the main objectives of the national policy is to provide effective services to children during the pre - and post - natal period and childhood to ensure their health - physical, mental and social (Banik, 1976).

The three major factors that generally determine the nutritional situation of the country are population growth, food production and the distribution of food. The population of India, which stood at 361 million in 1951, rose to 547 million in 1971. According to current projections India's population, even allowing for the most optimistic estimates of the impact of family planning programmes, will touch the 900 million mark by the turn of the century. India's performance with regard to food production must be judged in the light of this relentless growth of population.

Malnutrition is widely prevalent among the vulnerable groups, namely, infants, expectant and nursing women of the poor communities. A large proportion of the vulnerable expectant women suffer from anaemias during the last term of their pregnancy. Such malnutrition has now been shown to be responsible for low-birth weights of infants (small for-date babies) and to result in a high degree of pregnancy wastage, nearly 30 per cent.

Apart from the immediate effects, the long-term effects of malnutrition are serious. The quality of a very high proportion of human resource in the country is being undermined because of the ravages of malnutrition (Gopalan, 1974). The disastrous consequences of undernutrition and malnutrition have engaged the attention of all who are concerned with the intellectual and social progress of the nation.

The prevalence of moderate Energy Protein Malnutrition in many countries among children is of the order of 30 per cent (Bengoa, 1970). These are the children Bengoa has called the 'survivors', regarded as a reservoir of permanently handicapped people in the society, whose offspring again will be handicapped. The residual effects of malnutrion in the form of impaired stamina, diminution in stature and lack of resistance to disease will tend toward loss of vigour and lack of incentive and vitality in the future citizens (Gopalan, 1968).

Even when the importance of nutrition is recognized several practical considerations stand in the way of according nutrition priority in national planning. On the one hand, the complex multiplicity of interrelated problems requiring immediate solution, malnutrition being one of them, harrasses the nation. On the other hand, the resources which are available are pitifully inadequate to cover even the basic minimum requirements. The planners are, thus, faced with the unenviable task of having to decide the relative priorities of several urgent claims competing for budgetary allocation (Gopalan, 1974).

Children need an environment which prepares them for optimal growth and development and to understand and meet their own needs as well as those of the community. One important aspect of these needs is nutrition (Bonhasrie and Wader, 1977). Sound physical well being through adequate nutrition makes easier, the development of wholesome, mental and emotional health; aud poor physical health and unhappiness usually travel together (Anderson and Langton, 1964).

Nutrition and Child Health:

Adequate food is essential for all people, but this need has not been satisfied at any point of time. Consequently, malnutrition and hunger have become inseparable companions. During the last few decades, man's knowledge has developed tremendously and, for the most part, he has applied it for his benefit. Inspite of this, many millions of children and adults continue to suffer from undernourishment and hunger (Scrimshaw and Behar, 1976).

In most parts of the country, infants after birth are breast fed. The practice has great health significance and contributes much to the survival of the children in the very poor conditions in which they live. Unfortunately, the practice of breast feeding is rapidly declining particularly in the poor urban areas, and to some extent among the rural populations. This is a result of changes in the structure of societies and the influence of the culture and values of the industrialized world. The consequences are disastrous. Formula-fed children are subject to health risks during their infancy and later life which could be avoided by breast feeding. For populations which are not economically and culturally prepared, who do not have at home the necessary facilities and resources, and who live in an unsanitary environment, bottle feeding of children with milk formulas is extremely dangerous, exposing them to severe malnutrition and deadly infections at a very early age.

Weaning a Critical Period:

After the age of four to six months, breast milk alone is not sufficient to satisfy the nutritional requirements of the child. Other foods must be added. The period of weaning is critical in the child's life. For economic, cultural and other reasons, children are often deprived of the additional foods they need. The result is that their growth starts to slow down, they become apathetic, react less to social and psychological stimuli, and are most susceptible to infectious diseases. These are all manifestations of chronic malnutrition. Even though the amount of breast milk may not be sufficient to satisfy all the child needs after this period, it is still of great value and breast feeding must continue along with the supplementation of weaning foods. If the child is completely weaned before he is prepared to share the family diet, the consequences will be severe.

The weaning period from the age of four to six month until about two to three years, coincides with a time in the baby's life when the immunity to common infections inherited from the mother and complemented by the anti-infectious properties of breast milk, diminishes and finally disappears. As a result of the introduction of other foods and the children's

greater mobility they become much more exposed to the heavily contaminated environment. Thus frequent infections are compounded with chronic malnutrition. Some children develop severe malnutrition and die if not properly treated in time. Many more although not recognized as malnourished, will die early of measles, diarrhoea, respiratory infection and other common diseases of childhood, which do not attack well nourished children. Those who survive will be retarded in their growth and development, physical and mental, and will eventually become the small, chronically malnourished and uneducated parents of another generation with the same fate. This is how malnutrion contributes to the perpetuation of poverty and misery.

Nutrition and Mental Development

Recently attention has been focussed on the possibility that Calorie Protein Malnutrition in young children may affect intellectual development. The brain is part of the central Nervous System, which is body tissue just as muscle or bone. The process of brain growth is largely one of protein synthesis. Hence, development ot the brain is likely to be impaired by severe dietary deprivation during the growth period.

Whether malnutrition can harm the developing brain in a permanent, irrevokable manner is one of the most intricate questions of the present time. The other well known effeets of malnutrition on individual morbidity and mortality are important, but from the point of view of the surviving child what can be more vital for a member of the human society, than that his intellectual faculties and his potential mental capacity are fully preserved?

Dobbing and Sands (1970) have demonstrated two peaks of cell division in the brain, one around 26 weeks gestation, and a second around birth. The authors have attributed the first peak to neuronal division and the second to proliferation of glia. Two studies carried out in a hospital in Santiago, Chile (Winick and Rosso, 1969, Winick *et al.* 1970), have shown that severe malnutrition during the first year of life results in the death of the infant, in a reduced

number of cells in the brain and a reduction in a total lipid cholesterol and phospholipid content. If malnutrition prolongs into the second year, then the lipid/DNA ratio or lipid per cell gets reduced. The rate of cell division in various regions of the human brain and the effect of malnutrition on those regions have also been studied (Rosso, *et al* 1970). The results indicate that the rate of cell division postnatally is about the same in the cerebrum and cerebellum and that in both of these regions, as well as in the brain stem, DNA synthesis stops at about the same time (approximately one year of age). Malnutrition reduces the number of cells in all the three regions.

Multiplication of neurons is completed by the second trimester of pregnancy. The growth spurt starts in the third trimester and continues postnatally. During this period, glial cell multiplication, rapid lipid synthesis and myelination take place. Protein Energy Malnutrition reduces the cell number and affects adversely myelination. Brain size is also reduced (Ghosh, 1979). The maternal rejection of an infant through failure to breast feed leads to further brain growth impairment and intellectual poverty.

It has been observed that the head circumference of children who died of undernutrition during the first year of life is reduced and that this reduction reflects accurately, the chemical changes involved. Normal size and cortical thickness have also been reported to be decreased. The dorsal spinal roots have been found to be retarded. Increased permeability of the perineural diffusion barrier to exogenous protein and decrese of RNA in the protein cell body of spinal motor neurons have also been noticed (Drotar *et al*, 1976). Dobbing (1974) has postulated that the regions of the brain showing the most rapid cell division, are those most vulnerable to the deleterious effects of malnutrition.

Rao and Sarma (1972) have analysed 40 brains from foetuses of various gestational ages, ranging from 13 weeks to term, for a variety of chemical constitutents. There was a steady increase

TABLE I **Composition of Brains of two Children who died of Kwashiorkor**

Age yrs.	Body wt. (g)	Brain wt. (g)	DNA (mg)	RNA (mg)	Protein (g)	Total lipids	Phospholi-pids (g)	Cholestrol (g)	Glyco lipids (g)
2	6000	708	983	703	44.9	54.7	33.2	14.3	7.2
4-5	7000	683	1,217	1,352	42.9	58.3	34.3	17.5	64
1	9200*	942	1,000	1,368	52.3	57.0**	34.2	13.2	—
2	13600*	1,120	915	1,600**	80.00**	130**	68.0	35.8	—
3	14750*	1,270	924	1,800**	100**	160**	82.1	47.0	—

* Reported normal Values

** Calculated approximate Value

in the weight of the brain. To know the possible effects of nutritional constraints on the chemical composition of brain, brains of two children who died of kwashiorkor were analysed. The results are presented in Table I.

For the sake of comparison, certain reported normal values and some calculated values based on certain figures found in literature are included. In the brains of kwashiorkor children, the DNA values seem to be normal while the figures for RNA, protein and total lipids are significantly lower. Thus it appears that cell size was affected in kwashiorkor. This study points out that during intra uterine growth of human brain, a spurt of various synthetic activities occur suggesting that considerable development and chemical maturation (myelination) of human brain takes place after birth.

Such studies need to be undertaken from different angles. Firstly, more number of foetal brains have to be analyed to substantiate the findings reported here. Furthermore, the growth and development of brain must be followed beyond birth so that more precise knowledge could be obtained regarding the age upto which the rapid growth of this organ continues.

Udani *et al* (1971) have studied relationship between body weights and brain weights in undernourished children.

The difference in average body weight in kilograms and weight deficit in percentage in Fair (Group I) and Poor (Group II) nutritional groups are in Table II.

There is a marked reduction in brain weight in poorly nourished children compared to fairly nourished children particularly under the age of 3 months. In the later ages the differences are less marked.

For Group II children, the brain weight deficit is not only due to postnatal malnutrition, but due to a great extent to foetal malnutrition, because maximum growth of brain occurs in the last three months of intra uterine life. The reduction

TABLE II Brain Weights in Fair and Poor Nutritional Groups of Children of Different Age Groups

Nutritional grades	Age group	Group I		Group II		Difference G	% Reduction/Brain weight Deficit in II
		No. of cases	Brain weight G	No. of cases	Brain weight G		
a) Normal	Under 1 month	3	433.3	33	283.3	150	34
	1—3 months	15	590.0	32	442.0	148	25
	7—12 ,,	26	801.0	45	727.0	74	9
	4—6 ,,	20	750.0	33	620.0	130	17
b) Mild PCM	5—9 years	21	1209.0	15	976.0	233	18
	10—12 ,,	2	1320.0	2	1150.0	170	12
c) Moderate PCM	13 months to 4 years	64	993.4	46	811.0		13

in brain weight in these age groups is more likely related to reduction in the number of neurons (Winick and Rosso, 1968). This, in turn, is likely to lead to the more damaging results of poor learning or a subclinical mental functioning in the child due to neuronal deficiency. With the poor nutritional condition persisting the reduction in brain weight appears to be permanent. Whether this deficit and reduction in brain size will lead to future functional impairment remains to be confirmed.

Although the existence of a relationship between malnutrition and mental functioning has long been accepted (Birch, 1971) the possible permanency of mental immaturity after early malnutrition has only recently been given attention. Smythe (1955) set out to test his theory that early retardation of brain growth might never be made good, once the most rapid growing period had passed (Stock and Smythe, 1963). Much evidence has since accumulated to support this assumption (Dobbing and Sands, 1973 ; Martin, 1973; Natham, 1974).

The human or physical environment in itself may influence intellectual performance. Therefore in several studies sibling controls have been used to minimize this effect. The index cases have been post-kwashiorkor patients (Berch *et al*, 1971; Evans, Moodie and Hansen, 1971), post marasmus patients (McLaren *et al*, 1971) and malnourished children of mixed clinical type (Hertizing *et al*, 1972). The results of all these studies show that, in comparison with healthy siblings, many ex-patients remain intellectually at a disadvantage after acute malnutrition and hospitalization, but, when the family background is one of chronic malnutrition, the intellectual level of the entire sibship tends to be depressed.

In a longitudinal study, Evans *et al* (1975) found that this tendency could be prevented by adquate supplementary feeding and medical care during the first two years of life. However, superiority in growth disappeared soon and the mean Full Scale Intelligence of the children studied was significantly better than that of their 40 older siblings with recorded evidence of early acute or chronic malnutrition. One returns thus to the possibly

grave relevance of undetected malnutrition to community mental health (Moudie *et al*, 1972; McLaren *et al*, 1973; Latham 1974). In 1972, Monckeberg *et al* compared a large sample of young children from a poor socio economic background with others in better circumstances and found significant evidence of retardation in psychomotor development in the former.

Craviota *et al* (1971) found that when the respective performance of the siblings and the malnourished groups were compared, the children who were severely malnourished were significantly over represented in the lower extreme of distribution of I.Q. scores. Significantly lower scores were obtained by the malnourished children in tasks requiring both verbal and non verbal elements.

Auditory-Visual Integration :

The mean performance of previously malnourished children and their siblings in a test, which required the child to identify visual dot patterns, corresponding to rhythmic auditory ones, was very poor. The children's ability to equate a temporally structured set of auditory stimuli with a spatially distributed set of visual ones, was inferior age by age in the group, which had suffered severe malnutrition in infancy.

Champakam *et al* (1968) administered a whole battery of intersensory tests-Visual, Heptic and Kinesthetic. The Visual-Kinesthetic Intersensory Integration, an ability closely related to learning to write was explored by the method of equivalence in the perception of geometric forms. The kinesthetic sense, in this context, refers to the sensory inputs obtained through passive arm movement. Their results showed that the Visual Kinesthetic Intersensory Ability was poor in malnourished children.

The reports of Cravioto *et al* in Guatemala and Mexico and Champakam *et al* in India on neuro integrative adequacy in three different cultural settings (India, Guatemala and Mexico) are significant because they suggest that functional lags could occur due to mild and moderate degrees of EPM and may not be

limited to the extremely severe cases represented by kwashiorkor and marasmus.

Among those who suffer from milder forms of malnutrition, there is evidence that malnutrition is associated with specific types of intellectual impairment. Klain *et al* (1970) compared the performance of Guatemalan children, who had been rehabilitated from malnutrition in Day Care Centres, with children from the same social setting, but were never malnourished. Using a variety of tests, they report that the malnourished children did not develop the mind set to invest sustained attentional involvement in difficult cognitive tasks and were less motivated to perform.

A follow up study of severely malnourished and mildly malnourished children over a per food four years was carried out by Devadas and Jaya (1978). Correlation and regression analysis between mental ability scores and physical attributes were computed to find out whether or not the physical and nutritional attributes had any relationship to the variations in the mental ability score of children who were malnourished earlier and their siblings separately. An attempt was also made to compare the nutritional and mental attributes of those malnourished earlier with those of their siblings at the corresponding age periods.

Comparison of the deficit per cent of severely malnourished and mildly malnourished children with regard to their mental attributes (pooled) brought forth the fact that the higher the level of malnutrition, the lower were the mental ability scores. The multiple regression approach, revealed that the calorie deficit played the most prominent role in determining the mental ability score of children, who were malnourished earlier. Comparison of the mental attributes of the malnourished children with those of their siblings, at the corresponding age periods revealed very low scores of mental abilities for the malnourished children than for their siblings.

Developmental model

While the social structural approach focusses on the social position of the family as determining the environmental effects,

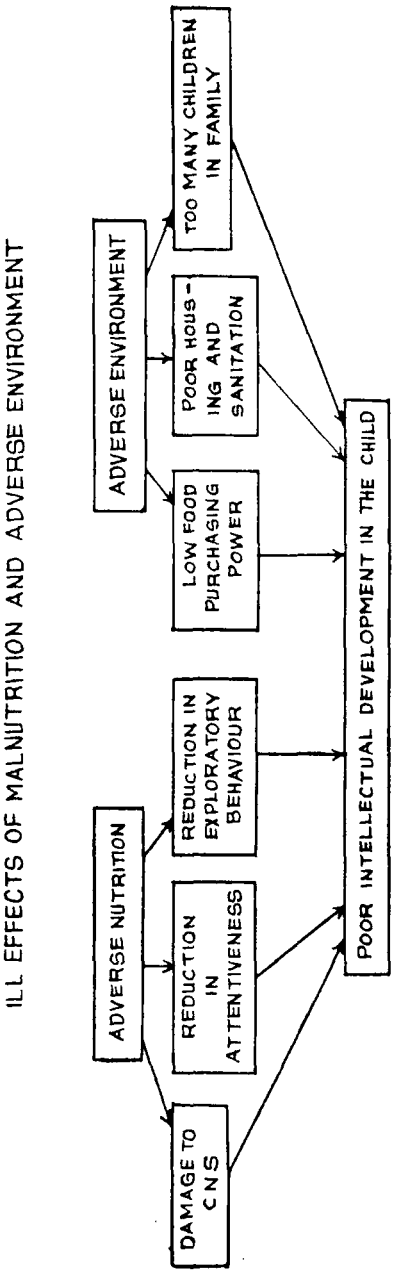
the developmental perspective centres on the characteristics of the child himself, as they determine his ability to utilize the environment.

During gestation, the foetus is affected by environmental factors indirectly through the mother, specially through her nutritional health experience. After birth, the infant relies primarily upon his visual attention to experience the environment and his care taker to manipulate his environment for him. With increasing age, the infant develops motor capacities and can manipulate his own environment by exploring and experimenting.

In later infancy, the restrictiveness of the environment becomes salient for the developing child (Hess *et al*, 1968). The presence of responsive toys, non-crowding of the home and space to play outside may all influence the child's intellectual development (Bing, 1963). In later infancy, the child is able to use symbolic means of interacting with his environment, and his mother's teaching becomes increasingly important. Her ability and motivation to teach the child is influnced by her own level of education and literacy (Bee in Aldous, 1971).

Social variables important for intellectual development vary and increase in number with progressive age depending on the developmental level of the child. Figure 1 summarizes a developmental perspective. Malnutrition may inhibit environmental effects in two primary ways as reflected by the Developmental model (Christiansen *et al*, 1974). Firstly, malnutrition may retard the appearance of specific developmental stages. Secondly, as the child reaches each developmental level, his ability to respond to, and utilize the environment may be limited. In early infancy, visual attentiveness may be lowered by malnutrition and in later infancy, malnutrition may depress, the exploratory behaviour of the child, as well as lower his alertness and attentiveness.

Using the Einstein developmental test, based on Piagetian stage sequence of sensory-motor development, indications of



IMPACT OF MALNUTRITION ON HUMAN DEVELOPMENT

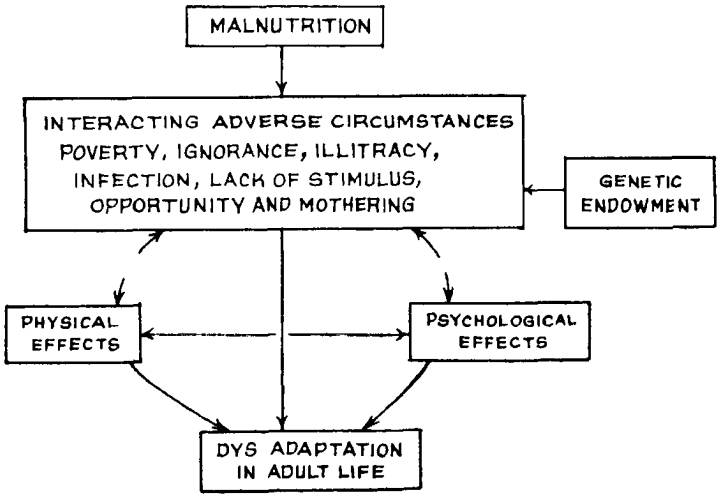
Figure I

retarded stage acquisitions were found when moderately malnourished and well nourished subjects were compared (Ortiz *et al*, 1973). Heywood (1972) postulates that malnutrition affects responsiveness of parental behaviour by altering the behavioural characteristics of the child. Caretakers are less responsive to malnourished children. Lower care taker responsiveness consequently inhibits the intellectual development of the child. Thus the malnutrition - environment relationships appears to be reciprocal.

In simplified form, McLaren and Burman (1971) have revealed, as shown in Figure 2, this interaction in the life of the underprivileged child. Both endowment and circumstances influence his development, but there are additional effects mediated by malnutrition. It is in this context that the devastating role of malnutrition should be considered as contributing to a crisis in the child's life.

Figure II

IMPACT OF MALNUTRITION ON HUMAN DEVELOPMENT



In contrast to the fortunate child, countless numbers are born whose natural endowment, whether favourable or otherwise will continuously interact with grossly adverse circumstances to produce DYS adaptation in adult life.

Learning

Learning is an important basis of human behaviour. It is influenced by various factors such as social, motivational, perceptual and nutritional.

Malnutrition affects school performance both directly and indirectly. A child who is malnourished is more susceptible to infection and illness and so accumulates absences. When he is in school, his alertness and his ability to concentrate are reduced. The malnourished child limits his activities in order to conserve energy (Latham and Cobos, 1971). He plays less, verbalizes less and thus generally lacks the stimulation and experiences that are necessary for learning.

Singh *et al* (1977) studied 204 male school going children, aged 5-9 years, who were divided into well nourished and malnourished groups. They found that, it was not only the intellectual potentials but 'intelligence at work' measured in terms of the scholastic performance, that was affected by nutritional status. Well nourished children have superior learning capacity than the malnourished children. Children suffering from even milder forms of malnutrition underwent changes in their mental functions which may be responsible for their failure to profit from the school exposure.

Any child who has suffered malnutrition loses a substantial period of time in which he cannot learn and this may extend. In addition, the psychological trauma he is liable to experience in the hospital, may influence adversely his learning capacity atleast for sometime Srikantia, (1974), and Kallen (1971) describe how a child who lags in nutritional status and development is ill prepared for future learning tasks. The language that is heard is characteristically limited to the most functional and ill enunciated usage and this may prove a lasting handicap. To this is added the neuro integrative dis-organization that makes skills of reading and writing difficult to master and the stage is set for early failure.

Yehya *et al* (1974) report retardation in learning to walk and speak also. Bengoa (1974) state that a reduced learning capacity is likely to occur in undernourished / malnourished children, who in surveys may be classified as 'apparently healthy' because they show no obvious clinical signs of malnutrition. Such children may also be handicapped for life. Anything less than optimum nutrition would reduce the chances of the child's attainment of his genetic potential.

Nutrition and Social Development and Behaviour

The interdependence of the Physical and psychosocial aspects of well being is strikingly revealed in the effects of hunger and malnutrition on human behaviour. Hunger affects human behaviour directly by reducing vigour, ability to cope with stress and interest in pursuits other than those related to obtaining food. These effects are described by Gift *et al* (1972) among the young men who participated in the Minnesota Study of Experimental Starvation conducted during World War II.

> The men often neglected to shave, brush their teeth, and comb their hair; their social initiative underwent remarkable change. Their earlier interest in having a voice in the making of policies and rules for the conduct of the non scientific aspects of the experiment dwindled. The men became indecisive, unable to make personal plans, and unwilling to participate in group activities. The subjects spent more and more time alone. It became "too much trouble" or "too tiring" to have to contend with other people. With the decline in the interests which had previously been held in common with others and with the growth of feeling of social inadequacy the men became self centred. Because of this egocentricity and irritability, of which the subjects were well aware, it was difficult for them to maintain socially acceptable behaviour.

Sociability, grooming, ability to plan and to participate in group activities and interest in sex dropped off profoundly. The men rated themselves as lacking in self discipline and self control, restless, indecisive, sensitive to noise and unable to concentrate.

According to Smith (1977), a high proportion of old persons who had low nutrient intake lacked resistance to stress and higher nutrient intakes increased resistance to stress, regardless of the non nutritional disorders of age. Dobbing (1974) believes that nutritional growth restriction does have a specific part to play in lowering human achievement, along with all the other environmental disadvantages which so often accompany it.

To function adequately in the modern sophisticated, demanding and often intolerant society, one must have recognition and a certain understanding of complicated rules and procedures according to which one is expected to operate. This capacity normally develops through the public mechanism involved in the process of socialisation. However, the intellectually handicapped individual usually moves out from the sheltered environment into the open community without having acquired this learning to an effective degree. He discovers that he does not have the skills necessary to make constructive and proper use of society's resources and facilities. Consequently, it is difficult for him to gain satisfaction in his attempts to seek company, support, advice, service or action on his behalf.

Adolescence is a critical period in a person's life. It is influenced by all the other aspects of his life, nutrition being no exception. Since adolescent boys and girls undergo rapid growth, they need more food. Two dangers await a hungry youth (Majumdar, 1976). He may become irritable, apathetic and develop undesirable personality; he may fail to put in required efforts for study or work. Shankar (1976), Helan (1973) and Sharma (1971) putforth that the delinquents come from backgrounds of social and economic deprivation

which includes lack of adequate nutrition. Rutherford (1977) opines that an increasing number of young persons under 14 years of age are being diagnosed with an alcoholic problem. Right type of nutrition and sociol education might have a key role to play in the prevention of use of alcohol by the young people.

Kallen (1973) reports a greater deficit in language than in other areas of development among infants hospitalized with severe malnutrition, kwashiorkor or marasmus. A major portion of these deficits are a direct consequence of the lack of stimulation and decreased interaction with whom the child is attached which occur as a consequence of the hospitalization experience. The apathy which characterizes the severely malnourished infant makes him less receptive to the available stimulation and the hospital situtation often tends to lack appropriate stimulation. At the same time, there is apt to be a reduction in the consistent verbal and other forms of interaction with family members which are required for adequate language development.

Parents and teachers have reported that the non-malnourished siblings of the malnourished were superior in socialization, better in behavionr than those who were malnourished during their second year of life (Devadas and Jaya, 1978). Observation of Graves (1978) in the Katmandu valley, on the behaviour of 36 well nourished and undernourished children, 7 to 8 months old, and their mothers reveal that the underfed children showed less exploratory activity and attachement behaviour, especially distance interaction and a greater need for physical closeness to the mother. The overall time spent in play had decreased.

Food deprivation causes profound behavioural changes (Todhunter, 1976) affecting motivation, the frame work of social relationships on the workspot, attitudes towards work and sense of participation in the decision-making process.

Interaction, Stimulation and the Development of the Self

The malnourished infant or child tends to be apathetic, passive, and fussy, as is the neglected or unstimulated child. With the lack of stimulation, created by the inability of the child to perceive or respond to it, an inhibition of intellectual development occurs. Even with the mildly malnourished child or the hungry child the anxiety and concern over food may utilize significant amounts of energy and attention, thus reducing his attention to learning tasks. An individual's perception of himself develops only as he perceives the responses of others towards his own behaviour. For the malnourished child who has been passive, apathetic and fussy, and whose life has been interspersed with episodes of infectious disease, there is a high probability that the responses of others to him will confirm his picture of himself as sick and less able. In addition, failure to learn certain developmental tasks early in life may create a situation where the tasks presented to the individual are continually beyond his ability and he will never have the opportunity to catch up. This situation can lead to a sense of being lost in the world and in an unwillingness to attempt difficult tasks. A malnourished child not only might define himself as inept, but also lower his level of aspiration and consequently, his level of effort.

The Relationship Between Role Competence and Nutritional Status

Competence is the combination of skills, attitudes and motivations which enable the individual to operate effectively within his environment. Competence involves effective role performance for self and for society (Smith, 1968). Kallen (1972) has suggested the following ways in which nutritional status might be related to role functioning :

1. Decreased energy level may affect the general learning process.

2. Disease aud death rates may affect the emotional ties between parents and children and by implication, the

learning contingencies associated with appropriate role learning

3. Malnutrition may simply make people dull and thereby disqualify them for certain roles in society.

4. Malnutrition may lead to decrease energy levels making it difficult or impossible for children to do or pay attention to all things necessary for appropriate role functioning.

Watson (1972) has given the following list of contrasting attitudes, feelings, beliefs, levels of interest and motivation, based on actually measured personality changes in research patients whose nutrition was improved from average towards the optimum, with consequent changes in personality I to II.

	Personality I reflecting average nutrition	Personality II approaching optimum nutrition
1.	Seeks for security out of lack of self confidence	Sets high-but realistic-goals and has the confidence to take the required risks.
2.	Hates to admit mistakes	Admits mistakes and takes blame.
3.	Mainly interested in himself and his own comfort, responds to almost everything else with indifference, apathy	Has many interests beyond himself and generally has activities planned to look forward to
4.	Is uncomfortable around others and avoids and tends to resent them	Really enjoys people and actively seeks the company of others.
5.	Expects the worst will happen and dreads what the future may bring.	Looks forward to the good things the future holds in store.
6.	When everything is going well, can generally find something to be pessimistic about	In times of trouble can generally find something to be optimistic about.

	Personality I reflecting average nutrition	Personality II approaching optimum nutrition
7.	Remembers most of the psychological scars of the past; carries them with him into the future.	Recovers from, and forgets emotional blows quickly, leaving the past behind.
8.	Has few friends, and can find something to criticize about everyone	Has many friends, and accepts others for their best qualities.
9.	Feels guilty and helpless about many past short comings	Accepts past mistakes without feeling guilty, resolving to be better in the future..
10.	Thinks life is a raw deal, and wonders why he was born at all.	Cherishing the life that has been given to him and tries to make the most of it.
11.	Feels almost sure he is going to be cheated.	Expects to be treated fairly.
12.	Resentful, unforgiving and unforgetting.	Forgives quickly and easily.
13.	Sensitive to real or imagined slights or criticism.	Feelings not easily hurt, tries to accept criticism objectively.
14.	Emotionally flat, never really happy under the best conditions.	Feels cheerful and happy most of the time.
15.	Easily gets into arguments, feels others are hurting him.	Tactful, tries to avoid arguments.
16.	Continually puts things off, and tends to forget them entirely.	Gets things done on time.
17.	Easily forms rigid opinions without objective evidence	Tries to be open minded until he evaluates all sides of a question.
18.	Has a low opinion of himself.	Thinks favourably of himself.

The psychological malfunction associated with EPM and restricted performance as a consequence of organic damage produced by nutritional deficiencies may be present singly or in combination in malnourished subjects. Which occurs depends on other factors such as food intake, general physical health, previous psychological status, family dynamics, societal forces as well as other conditions of which the age of the subject when the episode of malnutrition occurs may be of decisive importance. Lack of early learning due to lack of responsiveness will inhibit role development and adequate social functioning and will tend to perpetuate within the society a group of which remains in a disadvantaged position.

Family and Maternal Factors :

Mentally healthy families are those composed of individuals who maintain 'optimal good health and functioning' (Dyer, 1979). When parents are able to offer good food and communicate well, they are providing a good model.

The effects of nutrient depletion on women vary greatly due to the differences in pre pregnancy nutritional status, the amount of physical work done, diseases and infestations with parasites (Sebastian, 1977). Because 'chronic' malnutrition is widespread among women and because they undergo constant cumulative nutritional drains from repeated pregnancies and lactation, they develop a maternal depletion syndrome.

The WHO Director General, Hafdan Mahler warns, 'poor malnourished parents produce malnourished children. who in turn, will become poor and malnourished patients', This vicious spiral must be broken by improving child health and nutritional levels. The well being of the majority of the nation's population is at stake. This is a challenge to the governments and communities during the International Year of the Child and in the years to come.

Ghosh and Mohan (1979) point out that kwashiorkor and poor mental function may be largely due to some un-

favourable maternal attributes. In any poor community, many children subsist on inadequate diets and are exposed to similar unfavourable environmental conditions, but not all of them develop kwashiorkor. It is possible that children are born to, and brought up, by mothers who are least intelligent, least resourceful, most ignorant and poorly motivated. They suffer most. These very same maternal attributes may influence the mental development of the child also, directly, whether or not nutritional deprivation is present. Poor intellectual function and kwashiorkor may, therefore be reflections of common parental attitudes. Some data on this possibility has been obtained by Srikantia and Yogananda Sastri (1971). They administered a questionnaire to a group of mothers whose children were ill with kwashiorkor and to another group of mothers of the same socio economic group whose children were ill with non-nutritional diseases. This questionnaire was designed to evaluate concepts regarding food values, weaning practices and attitudes on general health care. In all these three areas, mothers of children ill with kwashiorkor knew much less than mothers of other children, though they had the same socio economic background. Table III gives the findings.

TABLE III Evaluation of Knowledge of Mothers Pertaining to Nutrition and General Health

	Mothers of normal children	Mothers of Kwashiorkor
Food concepts	40.2 ± .30*	27.8 ± .10
Weaning practices	49.6 ± .27	36.6 ± .11
General Health Care	75.6 ± .29	37.8 ± .09

*Mean values expressed as % of maximum 1 ± SE 50 subjects in each group

FACTORS RELATED TO A CHILD'S NUTRITIONAL STATUS

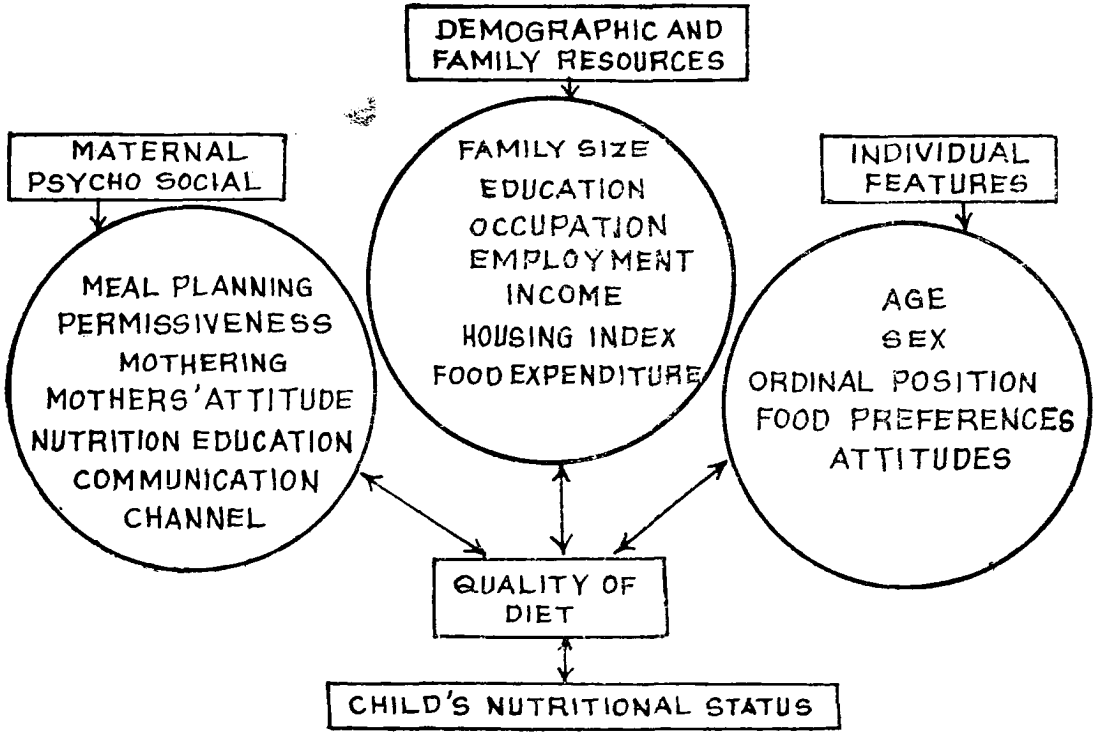


Figure III

Evaluation of the mother's intelligence using Weschler's test for adults is still in vogue. In ten children who were reexamined after a lapse of two years from the initial assessment, there appeared no evidence for the "intelligence gap" to close. This may appear to support the view that malnutrition had irreversibly retarded mental development. But it must be remembered that these children were continued to be brought up under conditions at home that provided little opportunity for them to really improve. The several factors related to the child's dietary status in the family is illustrated in Figure 3. Table IV illustrates the correlations between the demographic and resource variables and psychosocial characteristics of the mothers, which were most strongly associated with the dietary variables diversity (Caliendo and Sanjur, 1978).

There is growing realisation that the capacity to communicate nutrition concepts and advice has not kept pace with the expansion of scientific knowledge. A kind of 'application gap' exists. Much light is needed on how to optimize existing food habits.

Education determines the nature, direction and quantum of behavioural changes. Psychological factors such as maternal attitudes concerning meal planning and preparation, may be significantly more important than resource factors such as income, in determining the diets offered to the child. Nutrition classes for mothers do help to improve the dietary status of their preschool children, by having an effect on the mothers's attitute.

Maternal malnutrition and undernutrition produce a diminution in birth weight, and the lactation of underfed mothers results in growth restriction. Brain growth may also become permanantly impaired by these means in under privileged communities (Swaminathan, 1978). In fact growth retardation for a very large number of children in underprevileged communities begins in mother's womb, due to lack of proper food and antenatal care (Rao, 1971).

TABLE IV **Correlations between the Democraphic and Resource Variables and Psychological Characteristics of the Resources**

Variables	Person Product Moment Correlations	
	Dietary Diversity	Dietary Quality
Increased household number	−0.052	−0.257+
Mother's education higher level	0.044	0.376++
Father's education, higher level	0.033	0.186*
Mother employed	0.071	−0.011
Father's occupation	0.039	0.210*
Higher income level	0.138	0.238+
Nutrition education higher level	0.277+	0.392++
Greater importance of meal planning	0.139	0.185*
Mother feels household Chores monotonous	−0.165*	−0.307++
Mother feels difficulty in meal preparation	−0.125	−0.208*
Mother experiences irritability	−0.271+	−0.244+

1 Ranked vertically from labour to professional

* Significant at 0.05 level

\+ Significant at 0.01 level

++ Significact at 0.001 level

** Positive number indicate a positive correlation between variables. Negative numbers indicate a negative correlation between variables.

The rapid changes of modern life have brought in corresponding changes into the traditional family. The breaking

down of the joint families into nuclear families and other such social phenomena, have resulted in an increasing number of destitute children estimated to number 1.5 million; approximately 30,000 children are placed in the institutions under various Children's Act, while about 55,000 are being cared by charitable and religious institutions, and 20,000 are being helped by the grants-in-aid programme of the government (Roy *et al*, 1979).

Child Labour

Child labour is a social evil, which cannot be easily abolished. Children in India are put to work in the rural and urban areas almost as soon as they are able to work. In cities they take up jobs such as domestic work, cleaners, food vendors, shoes shines and errand boys. Child labour is cheaply available in the cities.

Even though employment of children has become necessary under the low economic conditions, it is essential that the type of employment given to a child, will first and foremost enhance the welfare of the child, specially nutrition and health. Children, like tender plants, need care and attention to protect them from the vagaries of nature and withering influences pervading the modern society. Once they grow up suitably clothed, physically and mentally, against the element, no force can shake them from the paths of right courses. In the healthy up-bringging of our children, lies the future greatness of our country. Therefore our deep concern should be that all children shall have food, shelter, clothing, education, medical care and security. This concern should act as a strong bond between the community, society, government, voluntary organisations and all the others concerned. The future greatness of the country depends on the way our children are fed, nurtured and taught today.

Conclusion

Malnutrition is a complex problem embracing many social, health and medical aspects. In the long run, only socio economic development will correct and eliminate the basic causes

of malnutrition, which are poverty, ignorance and poor environmental conditions, in which large sectors of the population now live.

However, young children cannot wait for a long time for reforms to bear fruit. They are affected *Now*. The continued suffering of children will contribute to the perpetuation of low standards of living. Lack of money is not always the main hurdle in improving the diets of children. Significant improvements can be made with a better utilization of locally available and acceptable foods that are commonly eaten by the family, but not given to young children at the right time or in adequate amounts and proportions. Efforts to promote the maintenance of breast feeding and counteract the factors responsible for its decline and to improve weaning practices in the local context, while respecting traditional values, can go a long way towards providing a better diet for young children even under the prevailing trying circumstances. But improved diet must go together with basic sanitation and health care of mothers and children. This will only be possible within the primary health care approach, with the active participation of the communities themselves.

Nutritional improvement is one of the most complex, multifaceted, difficult, socio economic and scientific challenges, in the Indian democracy. It is an essential pre-requisite for, and a significant force in the national development effort. It is multisectorial involving inputs from agriculture, education, health, rural development, industry, technology and other disciplines. Continuous and consistant measures, in terms of an organised system for the delivery of supplementary food, integrated with health services, nutrition education, immunisation, hygiene, sanitation and family planning are required for improving the calibre of the nation in the nutritional and mental ablities aspects.

Almost every aspect of human life is deeply influenced by, for good or bad, and dependent on nutrition. But there is less of public awareness and education, of the dynamic interphase and interaction between nutrition and national development. This is largely responsible for the lack of a strong national policy for nutrition. Research effort, on a

massive scale is also acutely needed. We need science to fight hunger, disease, poverty and other problems that the country faces today. Just as global action is required in the economic front, global strategies are also needed to feed every hungry mouth in our country in order to lead the nation to reach the goal of prosperity for all tempered by justice and spirituality.

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