369-370 medico friend circle bulletin

May 2016 - July 2016

Epigenetics as an interplay between nutrition and cardiometabolic disorders

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Abstract: There is growing unaddressed burden of cardiometabolic disorders particularly in the developing countries that is attributable to urbanization. One of the major life style factors that changes drastically with modernization is the change in dietary behaviours. The focus of cardiovascular research has shifted from genetics (understanding ethology) to epigenetic mechanisms that can potentially help in understanding the interplay between genes and environment, including nutrition. The dietary factors (particularly methyl donors and bioactive components), during early life development and entire lifespan, influence the epigenetics markers effecting health and diseases. The present article summarizes the role of epigenetic markers (particularly DNA methylation) in understanding the effect of nutrition on cardiometabolic disorders.

Keywords: Nutrition, DNA methylation, cardiometabolic disorders, early life nutrition

Introduction

Dietary behaviour is one of the most important determinants of health outcomes. Dietary exposures are known to influence health, both immediately and also in future (decades later). There is a need, therefore, to understand the mechanisms through which these dietary exposures are remembered/embedded or impact the health of an individual. Research suggests that one such mechanism is the epigenetic route, which mediates the effect of nutrients and dietary components (Mckay and Mathers, 2011; Vineis et al., 2014), around which there is a large field of research – nutritional epigenomics (Ong and Pérusse, 2011).

Epigenetics refers to the genomic changes that are transferred across generations, that may alter gene expression, but do not involve alterations in the primary DNA sequence. The term epigenetics was first introduced by Conrad Waddington to describe the mechanism by which same genotypes (DNA sequence) give rise to multiple phenotypes during development (Waddington, 1942). The common definition of epigenetics refers to heritable changes in gene expression that are not accompanied by alterations in DNA sequence (Callinan and Feinberg, 2006). The three major closely interacting epigenetic markers include DNA methylation, posttranslational histone modifications and RNA based mechanisms including the ones controlled by non-coding RNAs (miRNAs) (Goldberg et al., 2007; Link et al., 2010). Out of these, DNA methylation is the most well studied marker. This is because of the fact that we need RNA source to study miRNA which is not generally available in epidemiological studies (because of low resources and lack of interest) and intact chromatin for examining histone modifications. Whereas, DNA methylation can be measured in DNA source that is generally available in epidemiological settings.

DNA methylation and cardiometabolic disorders

Overall changes in DNA methylation and in specific loci of interest have both been associated with a range of health outcomes. While we know that epigenetic markers are tissue specific (Ollikainen et al., 2010), it has always been a challenge to measure these markers in the target tissue. Typically, whole blood is available in epidemiological studies, which is not useful for looking at tissues, although recently, studies have shown that DNA methylation changes in white blood cells can also serve as a useful biomarker for different health outcomes (Terry et al., 2011).

Recently, it has been suggested that epigenetic modifications related to globalization (including

related dietary factors) may crucially contribute to explaining the patterns of non-communicable diseases and thus deserve attention from different fields including environmental researchers, clinicians, public health experts and policy makers (Vineis et al., 2014). Moreover, epigenetic mechanisms are potentially reversible – that attracts therapeutic interventions and nutritional supplementation in cardiovascular management. The role of these epigenetic mechanisms in cardiovascular pathophysiology, particularly diabetes and obesity (Burgio et al., 2015), is now emerging as a key area of interest in understanding the interface between genotype to phenotype variability (Udali et al., 2013). The epigenetic mechanisms evidently alter the expression of genes involved in different pathways related to obesity and diabetes and a number of biomarkers have been identified (Martínez et al., 2014; Burgio et al., 2015). Some of the pathways include adipogenesis (Lillycrop et al., 2008; Zheng et al., 2011), appetite regulation (Widiker et al. 2010; Crujeiras et al., 2013; Uriarte et al., 2013), body weight homeostasis (Toperoff et al., 2012), glucose homeostasis (Yokomori et al., 1999; Kuroda et al., 2009; Bouchard et al., 2012), hypoxia (Brigati et al., 2010), inflammation (Bollati et al., 2010; Hermsdorff et al., 2013), lipid storage (Lomba et al., 2010), stress (Weaver et al., 2005) and thermogenesis (Shore et al., 2010). Similarly, a lot of work has been done in epigenetics of cardiovascular disorders including the DNA methylation patterns influenced by only nutrition factors. Animal models show that low protein diet influences lipid metabolism mediated by DNA methylation (van Straten et al., 2010) and maternal and foetal malnutrition influences various cardiometabolic traits in offspring later in life (Lillycrop et al., 2005 and 2008).

Editorial

Sunil Kaul

This is not the first time mfc is discussing malnutrition in its bulletin. The direction the world seems to be headed, tells us sadly that this will not be the last. But the editorial team chose this topic to bring all the debates onto the table once again. We know of some 'experts' who feel that if we are a nation of one-eyed people, we must not compare ourselves adversely with those having two eyes, as we are unique genetically and have suitably adapted to more efficient vision – how else can one understand the arguments of someone at the helm of the Niti Ayog that say that we are exaggerating our malnutrition by comparing it with global standards and hence must devise our own standards!

Our much touted ICDS programme at its best has only bothered to measure Severe Acute Malnutrition. What is striking from all studies is that our children suffer from scandalous levels of Chronic Malnutrition that can only be monitored when babies' lengths are also measured. But in all these years, Anganwadi Centres have never had the equipment or training or the willpower to measure it! Some of us may argue that the diet of children is too small to be affected by poverty, but if the first 1000 days of the child – 9 months in utero and 2 years thereafter - are crucial for not just the physical, but also the neurological, intellectual and structural foundations of the body, it is clear that even if we get everything right, RIGHT NOW, it may take a few generations to pass on a healthy maternal environment to a child in utero! The Aswachhta of Bharat is being targeted these days and may keep children healthy enough to reduce malnutrition; but the enigma of high levels of malnutrition in South Asia compared to many parts of Africa that are much poorer can also be explained by mothers not getting enough time to look after the children in rigid patriarchal setups - but who can dare tinker with the Mahaan Bharatiya traditions these days!

An efficient Public Distribution System could help tackle chronic hunger and the resultant malnutrition that may prevent us from seeing walking corpses in our rural hinterland, but it also has its effect on changing dietary choices enough to create new lifestyle diseases. In a society that is driven by the knowledge and experiences of the upper castes, it has also meant that diets with cheap and high protein have either been looked down upon or considered dispensable. Nutrition, like any other aspect of health has also become a very good indicator of the socio-political reality of our country.

Before we steal the thunder from our writers, most of who have written specially for this bulletin, we must gratefully acknowledge the responsible collaboration we have received from the entire editorial team to bring this issue out in its present form! We stop now and leave you in the company of our writers

Nutrition and DNA Methylation

It has been suggested that dietary supplements and nutrients can have long term implication of health across the lifetime (Zaina and Lund, 2012; Kanherkar et al., 2014) and even across generations (Zaina and Lund, 2012). Diet contributes potential factors that induce epigenetic modifications and is known to influence methylation status of cells in different ways (Davis and Uthus, 2004; Mathers and Ford, 2009; Schneider et al., 2010). The most common examples include the methyl donors and bioactive components (Mckay and Mathers, 2011). Folate, methionine, choline, betaine and vitamin B12 participate in the 1-carbon metabolism and are thus crucial for chromatin methylation reactions. Studies from India have also shown that vegetarian diets deficient in 1-carbon metabolism nutrients may be associated with variation in global DNA methylation (Geisel et al., 2005, Gadgil et al., 2014). Alcohol is also known to inhibit bioavailability and metabolism through different mechanisms and excess alcohol has been suggested to be mechanistically linked to folate deficiency (Schalinske and Nieman, 2005). Further, bioactive components including dietary polyphenols, (-)-epigallocatechin-3-gallate (green tea), isoflavones (soy), resveratrol (grapes), genistein (soybean), isothiocyanates (plant foods), curcumin and sulforaphane (cruciferous vegetables) modulate the enzyme activities that integrate the epigenetic mechanisms, including DNA methyltransferases and histone deacetylases and acetyltransferases. Similarly, increased fatty acid consumption has also been associated with epigenetic modifications (Chajes et al., 2008; Di Francesco et al., 2015).

Dietary factors broadly affect the epigenome during two time points – critical period of early development (discussed in below section) and dietary transitions during the entire life course that accumulate and ultimately influence health and disease risk (Jiménez-Chillarón, 2012).

Early life nutrition

Epigenetics has now been recognized as the molecular basis of for the Developmental Origins of Health and Disease (DOHaD) concept (Saffery and Novakovic, 2014), also known as foetal or developmental programming, or Barker's hypothesis (Barker et al., 1989). This is because of the fact that epigenetic imprinting activity is most active in the developmental period extending from pre-conception to early infancy (Simeoni et al., 2014). As we all know, tissues and organs are developed from a small zygote in response to finely tuned genetic and epigenetic programs; thus, imbalance between nutrient intake during this critical time (gametogenesis and embryogenesis) can lead to irreversible alterations (Gallou-Kabani and Junien, 2005; Jang and Serra, 2014). Moreover, epigenetic markers regulate the tissue specific gene expressions and thus epigenetic modifications are can potentially induce long lasting changes in gene expression and thus metabolism that persist throughout the life course (Lillycrop and Burdge, 2012). Imprinted genes in regulating feto-placental nutrient supply and demand and their function in response to nutrients and in post-natal period also play an important role in adaptation and evolution (Gallou-Kabani and Junien, 2005).

Epidemiologic evidence demonstrates the effects of intra-uterine environment (including maternal diet, maternal health, pregnancy complications, and epigenetic modifications) on later life metabolic health in the offspring (Smith and Ryckman, 2015). Diet during pregnancy can have lifelong consequences in offspring's health (Carolan-Olah et al., 2015). Early life nutrition is known to affect epigenetic profile (DNA Methylation) that can affect growth and metabolism later in life (Vickers, 2014). It has also been suggested that the risk attributed by maternal undernutrition, low birth weight and rapid postnatal growth (adiposity rebound) on increased risk cardiometabolic disorders is indeed mediated by trans-generational epigenetic modifications (Lillycrop, 2011; Barouki et al., 2012; Balbus et al., 2013). Foetal exposure to both insufficient and excessive nutrition and over nutrition in postnatal period can result in epigenetic changes, predisposing to cardiometabolic disorders in later life (Carolan-Olah et al., 2015). One of the first examples came from studying offspring born to mothers who experienced famine during pregnancy (Painter et al., 2006; Heijmans et al., 2008; Tobi et al., 2009; Hult et al., 2010; Huang et al., 2010; Talens et al., 2012).

Nutritional supplementation or restriction of maternal diet with methyl donors (folate, methionine, and choline) have been shown to affect the DNA methylation profile of offspring (Lillycrop et al., 2005; Sinclair et al., 2007; Dominguez-Salas et al., 2014). Seasonal variation in pre-conceptional nutrition is also known to induce alterations in DNA methylation (Waterland et al., 2010). Insulin-like growth factor-2 (IGF-2), an important protein in growth and development (Reik et al., 2000)) gene is maternally imprinted and is one of the well characterized epigenetic loci (Murphy and Jirtle, 2003) in relation of early life nutrition (Heijmans et al., 2008; Steegers-Theunissen et al., 2009). Animal models even suggest that paternal folate deficiency affects the sperm

function by differential methylation patterns and the altered gene expression is also transmitted to male offspring (Lambrot et al., 2013). Evidence also suggest that even the type of post-weaning diet can affect the expression of insulin-like growth factor-2 (IGF-2) gene that plays an important role in type 2 diabetes (Waterland et al., 2006).

Conclusion

Both animal models and human studies show that dietary factors, nutrients and early life nutrition influence the cardiometabolic health and disorders throughout the life course, and are mediated by epigenetic mechanisms, particularly DNA methylation. The focus of cardio-vascular research has shifted from genetics to epigenetics to understand the interplay between genes and environment. Large epidemiological cohorts are needed to take this forward to understand the mechanisms through which epigenetic signatures mediate the pathway between nutrition and health outcomes. This will help in developing therapeutic targets and dietary and public health interventions in general.

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Brain development: nutrition, nurture and policy

Antony Kollannur

What is the quality of the biggest product of India, *viz.*, the human resource? Is it an asset or burden? If citizens' development potential is fully achieved, it will definitely be an asset, not a burden to the nation.

Strategically, the hard work during the first two years of every child's life, can achieve this goal of human development to full potential. To be precise, we need to focus on the first 1000 days of life of every human being including its life inside the womb of mother. As a nation we have a cohort of 52 million babies under two years of age.We have to invest in them creatively both in time and resources. Unfortunately, as I will argue in the conclusion, the existing mechanism of ICDS through the Anganwadis falls short of this goal. Even admission to nurseries and kindergarten in private sector is only after three years and their staff lack technical training on psycho-stimulation. We are missing out the best window of opportunity to develop future generation.

What follows is in three parts. (1) A review of the biochemistry, neurology and genetic/epigenetic mechanisms of development in relation to the requirement of nutrition. (2) A study of the social, economic and cultural determinants of the development of the child. These hopefully will give the reader an understanding of the important relationship between the science of nutrition and the art of nurture in the development of the child. (3) a brief critique of the ICDS Anganwadi system on the basis of the first two sections.

I: Science – biochemistry, neurology, genetics and epigenetics in relation to nutrition

Why are the first 1000 days critical for the entire life span?

This is the critical period when the inherited capabilities of a human being to be bodily and mentally able, intelligent, and perhaps even exceptional are further shaped and often limited by the environment of initial growth.

The pre-school years (i.e., 1–5 years of age) is a time of rapid and dramatic postnatal brain development, i.e., neural plasticity, and of fundamental acquisition of cognitive development i.e., working memory, attention and inhibitory control according to Rosales, *et al*. [1]

The Lancet issue on Child Development in Developing Countries[2] too emphasises the first 1000 days of every child. These 1000 days are a time of plasticity, rapid and dramatic changes in the brain. It is a time for acquisition of fundamental cognitive and interpersonal skills.[3,4] Scientific research shows that a child's peak of growth of intelligence and cognitive development has already been achieved between the age of one and three. The reason for this is that growth of brain and nervous system takes place rapidly within first few months of life. The centres for vision and hearing develop maximally between the second and fifth months of infancy. In the visual and auditory cortex, the formation of experience-dependent synapses peaks about the fourth postnatal month, and is followed by a gradual retraction until the end of the preschool period.[5]

Similarly the centres for language and speech proficiency develop maximally between six and ten months even before her speech and language makes any sense to you. Even when the child is a toddler, her spoken vocabulary increases significantly and she gain greater motor coordination.

Preliminary results of research indicate that total cerebral volume peaks at age 14.5 years in boys and 11.5 years in girls, and that by six years of age, 95% of the brain volume is achieved.[6]

Pregnancy and infancy are important periods for the formation of the brain, laying the foundation of cognitive, motor, and socio- emotional skills' development throughout childhood and adulthood.[7] Theories of intelligence and cognition have proposed that a larger brain has a higher capacity to accommodate more neurons, axons and synapses. It has been found that brains of children of poorer families had up to six percent less surface area than their wealthier counterparts according to Kimberly Noble from Columbia University and Elizabeth Sowell from Children's hospital Los Angeles.

Influencers of brain development

Brain growth and development and their functional outcome, are subject to the influence of biological and nurturing factors and their interplay. During embryonic, fetal and early postnatal life, genetic determinants specify the fate of neuronal progenitors and their migration to brain regions These genetic

determinants also modulate synaptic signal transmission and contribute to the establishment and maintenance of the central nervous system.

At the same time, environmental determinants play an equally critical role in shaping the neural configuration through postnatal synaptic "blooming and pruning" that incorporates ongoing experiences into the developing synaptic architecture of the brain.[8] Some of these environmental determinants act by modifying gene expression through epigenetic mechanisms. In essence, an infant is born with the intrinsic capacity to learn, but how and what the infant learns is modulated by the environment.

What is the role of nutrition in brain growth and development?

Adequate nutrition for pregnant mothers and infants is necessary for normal brain development. All nutrients are important for neuronal cell growth and development, but some appear to have greater effects during the late fetal and neonatal time periods. These include protein, iron, zinc, selenium, iodine, folate, vitamin A, choline, and long-chain polyunsaturated fatty acids. Nutrition plays a complex role in postnatal brain and behaviour development during the pre-school years.

Nutrition is an environmental factor[9] as it represents access to resources from the environment (i.e., food and water). But in contrast to other environmental resources like medical care, education or experiences, nutrition can directly modify gene structure and mediate the expression of genetic factors. This epigenetic effect is by providing the specific molecules that enable genes to exert their potential or targeted effects on brain growth and development. The brain is a specialized tissue in which functionality depends upon the generation of electrical potentials and their conduction through long axonal components of cell-bodies and through the synaptic gaps between these cell-bodies. These special functions of brain needs higher amount of nutrients such as choline, folic acid, iron, zinc and special fats (e.g. gangliosides, sphingolipids and docosahexaenoic acid (DHA)).

Levi and Sanderson[10] described the epigenetic effects of nutrients, exerted by altering histone acetylation, and the effects of hypoglycaemic diets on the genetic expression of neuronal factors. Additionally, nutrients can act as growth factors. For example retinoic acid, the active form of vitamin A, is involved in central nervous system morphogenesis and patterning[11]

Some nutrients facilitate the incorporation of experiences into cognitive functions by being the basic structural components of neuronal cell-bodies and synapses. Evidence continues to suggest that specific fatty acids like DHA are important for synaptogenesis particularly during the third trimester of human gestation.[12]

Nutrition as a mediator of the impact of low socio economic status

Low SES leads to inadequate dietary intakes, nutrient deficiency and eventually, morbidity and mortality. Food insecurity and malnutrition have been linked to nutrient deficiencies leading to learning and developmental deficits amongst the most vulnerable, infants and toddlers.[13]Studies have shown that nutrition mediates the impact of SES on the increased likelihood of neural tube defects caused by inadequate intake of folic acid during the first trimester of pregnancy.[14]Also, the prevalence of iron deficiency-mediated changes in brain function are caused by inadequate intake of meats and vegetables rich in iron.[15]

Chronic undernutrition can deplete the energy resources of both parent and child, making the child more lethargic and less able to elicit attention from the parent and the parent becoming less sensitive and supportive of the child.[16]

Role of nutrition in brain development before and after birth: critical periods vs. windows of sensitivity

Functionality of nutrients depends on the timing of their delivery in relation to critical periods during brain development.[17,18]

A critical period encompasses a narrow time-frame during which a particular brain region develops or in which a specific experience must occur. Prenatal development has well defined milestones or critical periods like formation of the neural tube from which eventually evolves the central nervous system (neurulation). Folic acid is essential for neural tube closure for a short period around 22 days human gestation.[19]

Nutrient deficiencies during the *prenatal months usually cause irreversible effects* on neurogenesis and synaptogenesis because these processes only occur during a specific programmed time in embryogenesis.

In contrast, nutrient deficiencies during *postnatal development may induce errors that are reversible*

because of neural plasticity. At multiple separate time points across the postnatal life, changes in nutrient availability may occur and affect brain development. For example, iron deficiency may affect brain development and function in early infancy, during toddler's years or in adolescence.[20]Thus, the postnatal periods during which neural process occur can be labelled windows of sensitivity as they reflect an "opportunity or exposure," upon which nutrients or their lack may exert an effect, rather than critical periods as in prenatal brain development.

Neural plasticity supporting development and learning

This intrinsic capacity of the brain to remodel itself, referred to as neural plasticity, is the result of overproduction and trimming of neuronal connections, which are associated with changes in synaptic processes, neurogenesis and myelination of axons.[21,22] Most synaptic "blooming and pruning," although varying by brain region, usually occurs in postnatal period.[23] The overproduction and trimming of neuronal connections allows the developing synaptic architecture of the brain to capture and incorporate experiences, giving rise to behaviour as a manifestation of a coordinated neural network activity. Pascual-Leone[24] note that this brain plasticity is the mechanism that supports development and learning. That is why psychosocial stimulation is as much important as nutrition for development of brain and its faculties.

II: Art – how to impart psycho-social stimulation for brain development?

Stimulation for brain and mind is through inputs or signals through five sensory organs of the body, i.e., eye, skin, ear, nose and tongue. The intensity and frequency of flow of these signals during early childhood determines the attainment of level of intelligence and mental development. It also strengthens the synaptic connectivity. The baby's explorative learning and storage of acquired information and knowledge or inputs into the brain takes place every moment and hour of its early life. Its storage capacity is expansible and enormous. More than just gathering information, the baby derives analytical conclusions based on which it develops value systems and character. We are often mistaken when we say, "Oh! It is an innocent baby what does it know?" It does not react or respond immediately to your abusive words or quarrelling or physical assault. That does not mean that it has not understood the mood of parents. Their sensory inputs are functioning. It is all stored and the reaction may be much later in life. Imitation is a way of learning for babies.

The concept of "care of baby" revolves around psycho socio-stimulation described above. Breast feeding exclusively for six months and initiation of complementary feeding from six months onwards are essential and crucial for growth and development of infants. It is also a unique opportunity for maternal bonding and psycho-social stimulation. It demands both time and patience from mother. Then there is a time of transition from direct maternal control of infant nutrition to indirect maternal control in which infants and toddlers do not procure their own nutrition, but they begin to assert increasing autonomy regarding what they eat. Cleaning the baby, oil massaging, applying lotions and creams all add to its understanding of love and care through tactile and pressure stimulation. Carrying and rocking gives an assurance of security for the baby.

From two months of age the baby starts its social interaction by looking at people around and responding with a smile. It turns to the side from where a sound from a chime and humming toys originate. It recognizes the voice of its mother and its own name by six months. It explores tiny objects picked up with the fingers while crawling and even tastes it without any hesitation, be it an ant or dead insects or droppings. Curiosity is the pathway to learning. It takes some more months to learn the danger of touching a hot pressing iron or a burning candle. By the age of two to three years the non-stoppable curiosity will be through a volley of questions: who, when, what, why, how which are usually answered by patient retired grandparents than by busy working parents. Very often the same questions are repeated, explanatory narrations are repetitive too, but there is no word called "boredom" in a child's dictionary. Stories stretch their imagination. Cartoons and adventure stories are better enjoyed with repetition. All these are part of learning and development.

Showing the setting sun, blue sky with stars and moon, flying birds and fluttering butterflies, cow and calf, kitten or puppies are all visual stimulation to its occipital cortex-hindbrain. Lullabies and sweet, soft and rhythmic music and sweet talk to its ears stimulates its auditory areas of brain in addition to inducing sleep. Making the child feel the softness of flowers, leaves and your cheeks adds to their sensory learning. Playing

for baby with or without toys or with just facial expressions etc; are social interactions for child. These are all not a waste of time, but good investment for a child's development.

On the contrary repeated exposure of young children to stresses like neglect, abuse, domestic dysfunction like parental discord, maternal depression or rarely even crime leads to excessive release of a hormone called cortisol. Cortisol affects both a) the frontal portion of brain, which is the seat of personality, social behaviour and higher functions of brain as well as b) the deeper part of brain called hippocampus which stores memories, experiences and factual information-important for schooling.[25,26]

Early life stresses not only induce mental health problems later on in life but also affect the genes. Studies of these are progressing under the field of epigenetics.

Are kids learning and developing before going to school?

We all dream about a great future for our children. Parents start imagining who their child should become when they grow up from the day they admit them in formal school. That is because everybody believes that the child starts learning formally only in school. It is true that the actual learning of language, numerical and arithmetic proficiency and analytical skills are attained during school days. But the foundations for such a learning capacity are laid much earlier. It happens without us knowing about it. Intellectual development and attainment of maximum potential of senses have taken place before three years of age. Higher cognitive functions attain their maximum peak of growth between one to three years of age even before they meet any teacher in a school. Quite interesting isn't it?

Early cognitive and social-emotional developments are strong determinants of school progress. This development of brain is modified by the quality of environment. This environment includes status of maternal nutrition and stress as well as care given by the mother-modifying influence of biological and nurturing factors on human genes.

We have found that the growth and development of brain and nervous system of the offspring depends on the overall environment of maternal nutrition, psychological status and social interaction. The physical growth of brain and nervous system is due to division and maturation of neuronal cells and its root like extensions called axons and dendrites. The membranous surface of axons and dendrites of every neurons face each other and such interfaces are called synapses. Apart from the physical proximity of neurons across synapses, they communicate with each other through electrical discharges and chemical mediators across synaptic membranes. Brain function improves depending on the extent and intensity of inter-synaptic communications or stimulations. Cognitive as well as emotional and psycho-social development depends on these stimulations. Continuous and sustained stimulation is mostly needed during the first 1000 days of life. Unfortunately that is when it lacks the most in our country.

Why so?

Parents, care givers and society at large are unaware about the criticality of this period is one reason. Even if they are somewhat knowledgeable, they do not have sufficient time exclusively earmarked for the "care" of the child in their daily routine. More than money exclusive "time" is the capital to invest for the development of their child. Working mothers and busy parents offload this responsibility to grand-parents or domestic workers. If that is not possible they leave them in child care centre or crèche in private sector. But they do not have qualified or trained staff.

III: Conclusion: should ICDS approach change then?

The existing mechanism to reach out to 52 million babies in India is the ICDS through its Anganwadis available in every village and habitation in rural and forest areas across the country. Anganwadi worker and her assistant are supposed to take care of their development; both psychosocial and physical.The ICDS has mechanism for breast feeding promotion, initiation of complementary feeding, immunization, detection and treatment of minor illnesses, nutrition supplementation, health education and preschool education. However, policy directions and strategies for care and early stimulation for child development are lacking. This is a gross design defect in the architecture of ICDS since 1975. The services provided for above 3 year olds are far more comprehensive than under three children. The latter are only given take home ration of dry nutritious powder for preparing and feeding at home. That only fills the gap in physical growth, not of psycho-stimulation for development. The responsibility of

early child care and stimulation for development of under-three children is left to the discretion and imagination of parents and rest of the family members. The "care concept" and its implementation mentioned in section 2 above, is missing in the ICDS, world's largest programme for child development.

There is also no government system to take care of babies of poor families or mothers who go for work on daily wages. The experimental project of "Phulwari" of Chhattisgarh-Community managed creches[27] is one answer to this gap. Planners and policy makers may have a look at it for replication.

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Reflections on malnutrition among Under 5 Adivasi children in Gudalur Valley

ASHWINI Health Animators[1] & Support Team[2]

The ASHWINI health system has been involved with the health of the Adivasis in Gudalur and Pandalur taluks of Nilgiris district for the past 26 years. Care is provided in a three tier fashion with village health workers, assisted by health animators (community health nurses) in 8 area centres in the 2 taluks. The area health centres are supported by a secondary care hospital based in Gudalur. Almost all the staffs are from the Adivasi community and have been trained in community health and hospital work.

One of the earliest health programs conducted by ASHWINI among the communities has been in response to an extremely high infant and maternal mortality rate in the early 1990s when the program began.

The estimated infant mortality rate in 1988 was 250 per 1000 live births (See figure 1).The under 5 child health care program has been an integral part of ASHWINI's work, and has led to the dramatic reduction in the statistics of child mortality and an improvement in child nutrition. And in the year 2014 it was 46.5 per 1000 live births.

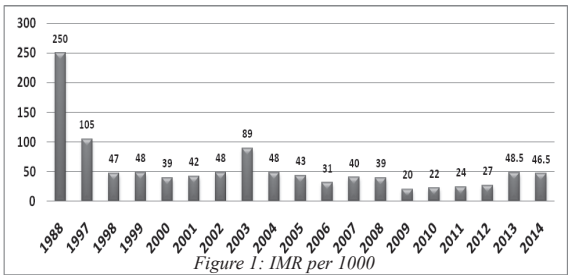

Figure 1: IMR per 1000

Initially, the ASHWINI programme consisted of medical intervention, dietary advice, and monitoring of maternal and child health. The under 5 program today consists of monthly weighing, nutritional advice on weaning, nutritional supplements , ensuring complete immunization, megadose Vitamin A, deworming, medical care at the doorstep, and hospital referrals as required.

Maternal deaths were over 600 per 100,000 in the nineties. It has steadily come down to 100 per 100,000 in the last five year period. (see figure 2).

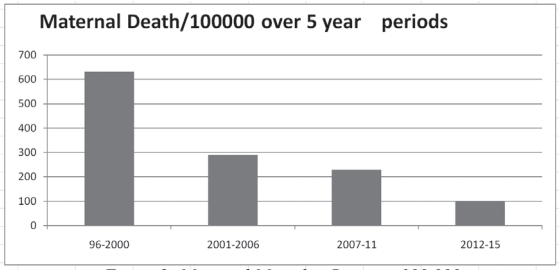

Figure 2: Maternal Mortality Rate per 100,000

On an average there are 300 deliveries every year.

The average prevalence of grade 3 malnutrition between1996-2000 was 3-3.5 % of the total children.

In the last 3 years there has been an increase in the number of the moderately malnourished children (see figure 3 below), showing an increase from 300 to 496 children over the past three years). This has been a cause for worry at ASHWINI and has led to some reflection and analysis of the possible causes, some of which we explore in this short note. Hopefully, this will lead to more rigorous analysis of causation and to steps to improve the situation.

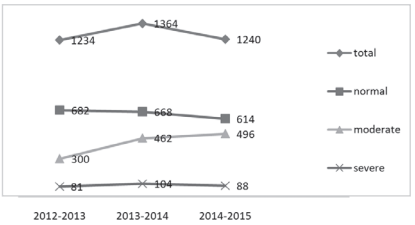

Figure 3: Child malnutrition as measured by weight -- (figures are number of children monitored)

What could be the possible reasons?

1. It is clear that the rise in under 5 malnutrition is not due to any decrease in access to balawadis or health care systems. The ASHWINI health network is active, and constantly improves health access across the care areas. The health animators are committed members of the community who keep scrupulous records of community health and individual illness.

2. The wage work available is largely on the tea plantations that form the industrial base of the region. The working conditions and wages have been strongly influenced by the dynamic socio-economic structure of both Tamilnadu and Kerala (Gudalur is at the junction of these two states and Karnataka). The minimum wage structure is in place according to government regulations. The wages earned by men and women have been increasing steadily and is currently Rs. 300 per day for men and Rs. 200 for women. Since these wages are equally available to families of both normal and undernourished children, and given statistical averaging, it is unlikely that lack of money is the cause of the problem. .

3. It is a known economic maxim that in underprivileged populations, a rise in income does not necessarily translate into a healthier or better educated community; it often leads to spending on luxuries, including alcohol, tobacco, mobile phones, etc. This said, there is no doubt that a higher wage would be desirable all round for better health security.

4. Each tribal family gets 20 kgs of rice free every month from the public distribution system in accordance with the Tamilnadu food security programme. Discussions with the community members have elicited the opinion that the Adivasis of Gudalur are less hungry today than their earlier generations. Coupled with the steadily rising wages, the PDS supply of rice provides a minimum safety net for the survival of the communities. However, there is a different problem that arises in relation to this, which we will discuss further on.

5. Discussion with the health animators (community health nurses) consistently raises the increased use of alcohol as the major cause of malnutrition in the <5 children. It is observed in their regular visits that the homes of malnourished children are in worse shape than those of the normal children. Based on their regular interaction with the families, the health animators feel that the father spends his wages on alcohol and does not contribute to the needs of the family. This leads to a direct reduction in food provided, even though the cereal component of the food is available from the PDS (this question will be explored a little more in the last point). Such a situation leads to inadequate food and starvation which hits both the mother and child.

6. It has also been observed (as is the case in general) that a proportion of the drunken men verbally abuse and physically harm wife and children. Clearly such a situation will lead to emotional trauma in the mother, which is likely to lead to chronic (if sub-clinical) depression. Such a situation will lead to neglect of the household, lowered interest in providing good food that will compound the problems of a lack of money due to alcohol. This would clearly lead to neglect of the children. Under such circumstances, the surprising fact that there isn't a greater increase in severely malnourished children suggests other mitigating factors that reduce the burden of starvation on the child's physiology.

7. The severity of the alcohol problem has been exacerbated by government promotion of the sale of alcohol across Tamilnadu. As part of the characteristic dual focus on increasing alcohol based state revenue, and controlling the ill effects of illicit liquor, Tamilnadu has begun to produce and distribute alcohol through the Tamilnadu State Marketing Corporation (TASMAC). Since this has happened in 2002 with the introduction of TASMAC shops there has been a great increase in the availability and use of alcohol. The general revenues from the sale of alcohol are given in figure 4 below. While it is true that the soaring revenues on alcohol in Tamilnadu (the highest in India) provide funds for welfare schemes, the downside is the increase in alcoholism among the consumers who are provided cheap liquor.

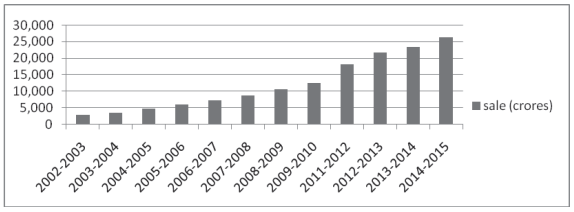

Figure 4: Sale of Alcohol -- Rs Crore

8. The other, more complex, possible reason is the poor diet. At present most families consume rice with a dilute rasam made of onions, chilies and tomatoes. As another paper in this journal will suggest, there is a very narrow dietary spectrum consisting exclusively of carbohydrates with minimal quantities of protein and fat. Such a dietary impoverishment is likely to be especially severe when there is no money available to supplement the PDS rice with purchased foods of a greater variety. Specifically, nothing special is being prepared for the under 5 children who have to consume large quantities of rice exclusively. Given the poorer ability to absorb large quantities of carbohydrate and the lack of more concentrated sources of calories (like fats) children are likely to be underweight and also malnourished in terms of nutritional variety and dietary balance.

   For variety of reasons only about 30% of the <5 children go to the balawadis and often the nutritional supplements from ASHWINI for the malnourished child is shared by the whole family.

9. Previously, families would eat a variety of caught, foraged and hunted foods like animals, fish, land crabs and tubers. This dietary variety was independent of money availability and would not have been affected by alcohol consumption. However, with the expansion of tea estates and decreased access to the forest as part of the national development process, this is not possible any more.

10. Another possible reason why malnutrition persists is perhaps that neither our health intervention nor that of government, had paid significant emphasis to clean water supply , sanitation and housing. Nutritional studies all over the world have pointed out these factors as contributing to increased morbidity, which in turn, causes malnutrition.

11. Finally, and very importantly, are we doing enough about maternal nutrition? Gestational and pregestational undernutrition and anemia result in low birth weight babies. Not only are they born at a disadvantage, the growth chart is so designed that it classifies them in the 'severe malnutrition' category, despite their normal weight gain.

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Action Against Malnutrition (AAM): A community based approach to bridge child care and nutrition

Soma Sen

According to the Convention on the Rights of the Child (CRC), a holistic approach that guarantees both child survival and development is the child's right. Early childhood development is the key to a healthy and productive life and the progress of a nation. Inadequate nutrition intake in early childhood leads to malnutrition,which has long term effect on physical growth and also interferes with cognitive development. Malnutrition amongst children also reflects as poor school performance and poor work performance in adult life. There is evidence that when a young child experiences severe, frequent, or prolonged adversity without adult support, the prolonged activation of the stress response can disrupt brain development. First three years of life are the most important and critical phase of child development, as it involves rapid physical growth as well as cognitive development.

An overall environment of 'care' integrating health, nutrition, and stimulation is considered to be critical for optimum growth and development of children. In a context of triple burden on women, of wage labour, household chores and child care, maternal support through crèche/day care becomes all the more critical. In addition, accessible and quality care benefits the social and financial needs of parents and the holistic developmental needs of children, but this aspect of child care is rarely understood.Unfortunately rather than an integrated approach for optimum child growth and development,child care programmes are tried with fragmented approach.Under ICDS, the focus for children under 3 is limited only to the distribution of Take Home Ration (THR).Several initiatives have been undertaken targeting only Severe and Acutely Malnourished (SAM) children mostly through using ready to eat (therapeutic) food. The component of child care through provision of crèche under anganwadi cum crèche, Rajiv Gandhi CrecheProgramme and crèches under MNREGA failed to reach its target and more critically, did not cover under 3 children. However, there were some positive examples laid down by civil society groups like Jan SwasthyaSahayog (JSS) and Mobile crèches.

In this context, considering the importance of a comprehensive approach of early childhood care, Action Against Malnutrition (AAM), a multi strategic nutrition intervention programme was initiated in 2012by a consortium of civil society organisations in some of the remotest pockets in India. AAM is being collaboratively implemented by the Public Health Resource Network (PHRN), Ekjut, Child In Need Institute (CINI), Chaupal, and IDEA in seven blocks spread across four states namely Bihar, Chhattisgarh, Jharkhand and Odisha.The project is being supported by the Tata Trusts. So far it covered more than 4572 children through 132 existing crèches and worked with more than 25,000 mothers through constant interaction and home visits to build their capacities on child care and feeding.

AAM: The model

Based on community based approaches of Ekjut, Jan Swasthya Sahayog (JSS), Mobile crèches and PHRN, a three pronged strategy was tried, tested, validated and adopted for the AAM initiative (see figure 1).

i. **Systems-strengthening:** to improve the delivery mechanism of government programmes addressing malnutrition through capacity building of the communities and service providers.

ii. **Community mobilization through participatory learning and action: m**eetings with women's group by trained facilitators to share information on nutrition,child care and related issues in order to develop problem solving skills of the community. It also involves strengthening Gram Panchayats (local bodies) in monitoring health, nutrition and other related services such as Integrated Child Development Scheme (ICDS), Public Distribution Systems (PDS) and Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA).

iii. **Crèches:AAM** Crèches are opened with the aim to provide a safe and conducive environment for children, whose mother goes for outside work and there is no adult caretaker at home. In addition to food, the AAM crèches provide the children child friendly and positive care giving environment to grow with their peer group and to protect them from negligence of care. Here, children in under three age group are being taken care by two caretakers selected from the community. One of the criteria for selection of crèche workers were their willingness to work with young children and sensitive to their needs. These crèche workers were trained on child care and feeding, provision of special care for identifying red flag children (severely malnourished, growth faltered and sick children) and referring children who need facility/ institutional care for health issues, nutritional rehabilitation etc. They were also specially trained on Early Childhood Care and Development (ECCD). AAM crèches also accommodate children with special need.

In AAM crèches, children are fed three times in a day, two snacks and one hot cooked meal which are locally produced,under the supervision of the caretakers. One egg is also provided twice in a week to each child. This covers 70% of the daily requirement of children. Red flag children get special care with locally produced energy dense food and weekly follow up to monitor their growth. Efforts are being made to feed

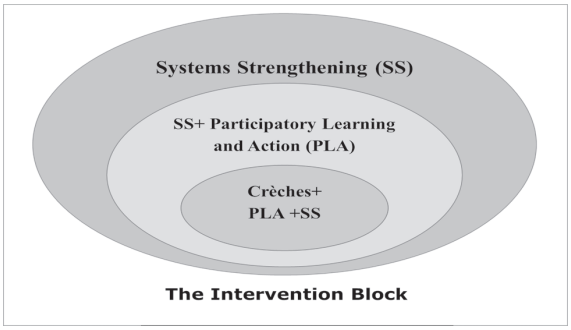

Figure 1. The AAM three pronged strategy in action

the children on special care, at least 5-6 times a day. Children are cared for in a responsible way when ill. Each child's progress is being monitored through regular growth monitoring. Critical children (severely malnourished and ill) are referred to health facilities for treatment based on protocol. Each crèche is provided with an emergency first aid kit and health check-ups are organized in partnership with the government. It is also ensured that children access ICDS and health services that they are entitled to. Children are exposed to age appropriate development activities to help them to develop in full potential.Crèche caretakers are supported by the supervisors and a mother's committee that has been formed as part of the programme. These committees are actively involved in logistic supply and crèche management.Baseline and endline research are inbuilt to evaluate the programme impact and an MIS has been developed to monitor and review the project. Public Health Resource Network hosts the Project Management Unit and manages the overall coordination of the project under the guidance of the advisory groups.The daily cost of food at the crèche amounts to approximately Rs.12 per child per day (0.20$) which is at par with the cost of other civil society initiatives and crèche cum anganwadi under restructured ICDS.

Some positive outcomes

AAM crèches continue to bring positive changes in the community. Now, child care is considered as an area of concern by the community. Children are given food separately and mothers also make sure that children do not sleep on an empty stomach at night which was a practice in the past. Hand-washing and food safety practices are also adopted at home. Earlier mothers used to rely on elder siblings or older family members for child care, or they used to take their children to work place or had to stay back at home in absence of such arrangements. We get to hear from our field team that, more mothers of crèche children have now started to go out to work with confidence, because of the good care and safety available to children in crèche. Contribution in family income by those who were not working earlier has led to their better status in the family, including increase in decision making power. Elder siblings have started going back to school, free from the compulsion to look after their younger ones. Mothers are now sending eligible children to anganwadis as well. Community contribution was also evidenced in terms of labour and kinds.In intervention areas, community awareness on rights and entitlements has gone up resulting on demands like regular functioning of Anganwadi and extra ration from PDS has started to come up.

The evidence through monitoring data was also suggestive of the improvement in the growth of the children. Individual tracking of 587 children over a period of 4-6 months from initial (May-June-July 2013 to November 2013) shows that there is an increase in proportion of children in the non-wasted category from 72% to 80% ($p<0.001$) and reduction in SAM from 8% to 4% (from 45 SAM children in the initial period to 24 in November - a reduction of 46.6%), which is statistically significant ($p<0.005$). It is found that overall wasting came down from 28% to 20% ($p<0.001$). Out of the total SAM children (45), 36% (16) improved to normalcy, 49% (22) improved to moderatelywasted and the rest 16% (7) remained SAM. Out of the total moderately wasted category, 67% (80) improved to normalcy, 7% (8) deteriorated to SAM and the rest 26% (31) showed no improvement. Overall, 84% (494 of 587) either maintained normalcy or showed improvement in grade over the period of 4 to 6 months. Seasonality does have some effect on wasting status of children; further analysis of data to see these are under progress (see figure 2).

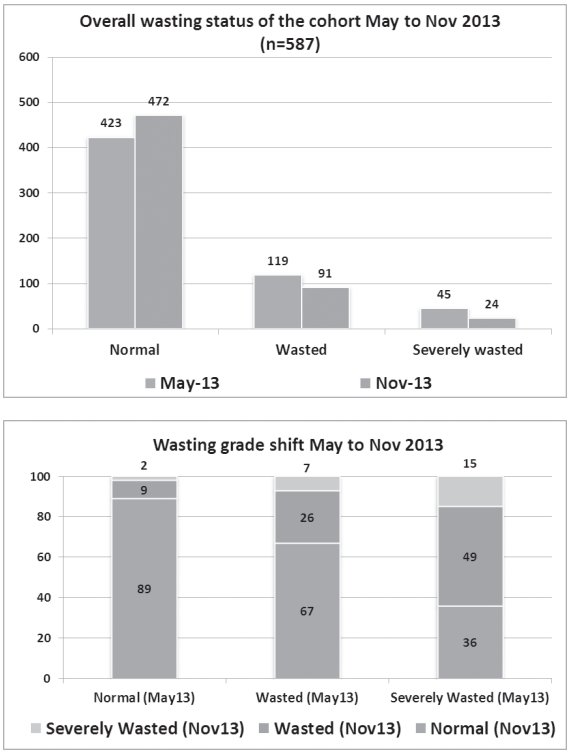

Figure 2. Changes in Malnutrition Grades as resulted by AAM

AAM is a unique and innovative project that has provided a deep understanding and experience of tackling the issues of malnutrition at community level. Since the programme was designed to allow documentation and analysis, there is also valuable data to track progress of crèche children over three years. This data can further be used to see the effect of seasonality, migration on growth pattern of children. Qualitative documentation that has been prepared can also be used to see the importance of crèche as a community support mechanism.

AAM's experience demonstrates crèches/day care centresfor under 3 children arefeasible to run in remote, rural and tribal areas ifadequate technical as well as operational understanding and financial support is provided. The final impact evaluation of AAM will provide further insights into this model. Meanwhile, consortium partners are actively engaging with the governments to help them to understanding the community approach through AAM. It is a demonstrative model and has the vast potential for scaling up especially in the context of recent programme of restructured ICDS which includes the component of Anganwadi-cum-Crèches in up to 5% of its centres.

As part of advocacy initiatives, The AAM has also organised a series of events across the project sites. One such event was the AAM Sabha organised in Ranchi, Jharkhand, wherein AAM project partners, team members and mothers as well as community members engaged in running the AAM crèches across four states came together to share their experiences with experts and administrators. Many members of AAM consortium have beenactively engaged in the Right to Food Campaign across the four states.

Many states have taken initiative in improving quality of food for children whichRight to Food Campaign has also been advocating for long time, such as inclusion of eggs in anganwadi in 3 districts and in mid-day meal across the state of Jharkhand. Government of Bihar also issued an order to include eggs in the anganwadi menu. Department of Women and Child Development, Government of India also has written to the Madhya Pradesh government to consider including boiled egg in anganwadi and mid day meal scheme, as a measure to fight malnutrition.

In Jharkhand, Nutrition Mission was launched and a new cadre PoshanSakhi was introduced. AAM consortium is trying to build up linkages with the state government in Jharkhand to technically support their nutrition initiatives.In Bihar, based on AAM experiences PHRN along with the Jan SwasthyaSahayog is providing technical support to UNICEF in developing resource materials for crèche/ anganwadi workers.

Though there are some positive steps taken by the state governments to improve health and nutrition status of children, more sustained efforts are needed to bring about any substantial changes. The AAM experience is being shared with the state governmentsto help inform their own strategies.

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Fulwari experience: community managed mother and child nutrition and care

Samir Garg, Satyaprakash Sahu, Ashish Parvat, Navneet Naik

Introduction: Fulwari initiative was started by Surguja district administration in Chhattisgarh as an innovation in 2012. The initiative has created community based 'Nutrition cum Daycare centre' known as Fulwari centres. Fulwari centres provide feeding and care for children 6 months to 3 years of age as well as to pregnant women and lactating mothers. These centres are managed by groups of mothers.

Genesis of Fulwari: A civil society group called 'Working Group for Children under Six' which included members from the Right to Food Campaign as well as the People's Health Movement had recommended to the Indian Government, a comprehensive set of interventions to tackle child malnutrition in India in 2007. Providing daycare services for children under-3 years was part of the above recommendations. 'Mobile Creches' had demonstrated efficacy of crèches around worksites for several decades. In Chhattisgarh, example of well-functioning and effective crèches in the tribal context existed in work of Jan Swasthya Sahayog near Bilaspur. After attempts to convince state government to start crèches failed, efforts were aimed at District administrations to take it up as an innovation. In April 2012, State Health Resource Centre (SHRC), Public Health Resource Network (PHRN), Chaupal and Pahadi Korwa Mahapanchayat jointly organised a gathering of particularly vulnerable tribal groups (PVTGs) in Surguja where the issue of malnutrition was raised in front of the District Collector and crèches were suggested as part of the solution. It led to formulation of Fulwari as a district innovation.

Need for Fulwari: Chhattisgarh state had very high child malnutrition with 47% children being under-weight and 52% stunted in 2005. Indicators of maternal nutrition and birth weight have also been very poor. The situation was worse in tribal regions of the state. The problems which were identified as contributing to malnutrition in tribal areas were:

a) Lack of access to diverse foods particularly high quality foods for children.

b) Gaps in child feeding in terms of frequency of feeding, variety, quantity, calorie density.

c) High levels of malnutrition amongst pregnant women. Low weight gain during pregnancy due to poor diet and inadequate rest. As a result high incidence of low birth weight

d) Mothers and other caregivers having inadequate time for child care and feeding and mothers are over-burdened with a variety of work

e) Recurrent infections amongst children

f) Gaps in knowledge and practices related to child nutrition

The above situation persisted despite multiple interventions being in place. Integrated Child Development Services (ICDS) has been the leading programme in India for addressing child and maternal nutrition. However, in the design of ICDS, resources are focused on needs of 3 to 6 year children. Children 3-6 years age come to Anganwadi centre daily. The Anganwadi worker provides them pre-school education and growth monitoring. The Anganwadi helper cooks for them and a hot cooked meal is provided to 3-6 year children. Thus, the infrastructure and manpower of ICDS is concentrated on services to 3-6 year children, whereas global evidence suggests that malnutrition can be addressed best by focusing on under-3 years of age and pregnancy. ICDS does cover children under-3 years of age but the main intervention remains provision of Take Home Ration (THR). The THR strategy has its limitations in addressing variety of nutritional needs including high quality protein. It is also difficult to ensure that the THR given to family is consumed by the children. Similarly, THR for pregnant women also has its limitations.

Design and implementation of Fulwari intervention

The key features of Fulwari were decided as:

a) Focus on feeding and care of under-3 year children, pregnant and lactating women

b) Organise daycare through habitation based collectives of mothers

c) Promote household and community level production of diverse foods

Mobilising panchayats and selection of habitations: After obtaining approval for Fulwari Initiative from the Zila Panchayat, the intervention was discussed with Gram Panchayats, Community Health Workers called Mitanins and their facilitators known as Mitanin Trainers (MT).

Fulwari is a 'demand-based' programme and not a 'target-driven' one. In each tribal block, a shortlist of

needy habitations is prepared by Mitanins and MTs based on the level of poverty, low socio-economic status of community, remoteness and levels of malnutrition. The MTs are trained to conduct community meetings regarding Fulwari. The MTs organize community meetings with help of Mitanins and local Panchayat members in each shortlisted habitation. MTs explain the purpose of Fulwari and the role community has to play in it and ask the community if they will be willing to run a Fulwari in their habitation by giving their voluntary time and space for it. Two to three meetings are done to confirm the willingness of the habitation. It is formalized in form of a resolution and the Gram Panchayat forwards the demand for Fulwari to the Block Panchayat. The Block Panchayat sanctions the Fulwari based on such demand notes received from Gram Panchayats.

Thus initiating a Fulwari requires significant mobilization of communities and dialogue with them to take a collective decision. Mitanins are able to conduct this due to their own experience and credibility as community based volunteers. Involvement of Panchayats also helps this dialogue.

Cost and fund-flow for Fulwari: Government provides through Gram Panchayats, an average annual grant of Rs.50,000 to each mothers committee running a Fulwari. It includes Rs.4000 for initial set-up in terms of utensils, mats etc. The rest of the funds are used on procuring local food stuff. The cost norm for food is Rs. 6 per child per day and Rs.15 per pregnant/lactating woman per day. Children get three meals in Fulwari daily including a breakfast. The breakfast is usually cooked from the Take Home Ration (from ICDS) contributed by mothers to Fulwari kitchen. Thus the actual availability of resources with Fulwari increases to nearly Rs.12 per day per child, in convergence with ICDS.

Day to day functioning of Fulwari: Fulwari crèche is set-up in space donated by a member of community for the purpose. Fulwari runs for about 6-7 hours a day. Most of the mothers leave their children in Fulwari and are then free to do their work.

The key design feature different from conventional crèches was the central role of involving mothers in managing the Fulwari centre. Fulwari does not have a full-time worker for cooking or child care.The mothers of young children constitute a mothers group which runs the Fulwari. The task of cooking and taking care of children in Fulwari is done by mothers by contributing voluntary time turn by turn. The group creates a weekly roster with two women on duty in Fulwari each day. Thus, each woman contributes one day per week to Fulwari. They have meals in Fulwari on the day of their duty. In addition, being part of a Fulwari frees the mother from child care for 6 days in a week. Thus is a crèche run with mutual pooling of labour by mothers. Thus, it shifts part of the child-care from mother to community. The mothers on duty in Fulwari cook, feed and take care of children including arranging play for them.

Menu: Since nutrition is a key objective of Fulwari, menus are a crucial component. It emphasizes the need to include eggs (half to full egg per child depending upon age, 4 days a week), green vegetables (daily), addition of oil in each feeding along with rice and pulses. The menu is finalized by mothers' groups keeping the local tastes and the above ingredients in mind.

Capacity building and hand-holding support: The mothers group requires regular guidance and hand-holding support which is arranged through Mitanins and MTs. Each Fulwari has fortnightly group meetings which are facilitated by MTs. Mitanin being a resident of the habitation is always accessible to Fulwari. MTs also provide capacity building inputs to Fulwari mothers on how to manage Fulwari and its records, health and nutrition.

Linkage with health: Nutrition is an issue with a close relationship with health. Recurring infections are a key cause of malnutrition in children. Therefore Fulwari ensures a close linkage with health services through Mitanins. One component is on prevention of infections which includes proper handling and storage of drinking water, hand-washing and use of mosquito-bednets.

Fulwari also makes it easier for health workers to access under-3 year old children as they are available together in Fulwari. Mitanin monitors if any children are absent and follows-up in their homes. In case any child is sick, Mitanin is able to intervene immediately. Thus, monitoring sickness in children and its treatment gets facilitated by Fulwari.

Benefits from the innovation and factors responsible for its success:

a) Impact on malnutrition

- Baseline Survey by an external agency hired with support from Unicef (February 2013) showed: Underweight 29%, Severe-underweight 16%

  Second Round Survey (March 2014) by external agency: Underweight 24%, Severe-underweight 10%

Thus, 24% reduction was achieved in overall under-weight rate over one year. The decline in severe under-weight rate was sharper at 38%.

- August 2013, Rapid Assessment By Ravishankar University and JN Medical College Raipur showed 600 gm additional mean weight gain for children in Fulwari compared to children without Fulwari over the period February to August 2013 (6 month).
- Chhattisgarh Interim Assessment Cohort Study (by SHRC) shows that amongst the severely-underweight children in Fulwari, 64%were able to come out of severe-underweight category.
- The low birth weight incidence was lower for newborn born to pregnant women enrolled in Fulwari (14% of children <2.5 kg birth weight) as opposed to children born in neighbouring habitations without Fulwaris (26% of children <2.5 kg birth weight).

Fulwari has shown the following additional benefits:

- Growth monitoring improved
- Mothers were able to be free from child care for 6 days a week as childcare was provided in Fulwari. It acts as a mutual psycho-social support group for mothers.
- Psycho-social development of children has improved as Fulwari promotes holistic early child development practices in form of local made toys, home-like ambience, play, songs and activities of children. It also brings together elements of nutrition, health and psycho-social development for this critical age-group.
- Household level production of vegetables etc. increased
- Panchayats started getting involved in Nutrition and Health which also strengthened their social image
- Fulwari 's collective ownership by mothers, the autonomy enjoyed by their groups and their control over funds minimises chances of pilferage
- Fulwari does not involve any fixed costs as there is no building or salary to be provided. This makes it scale neutral i.e. very small habitations having even less than 10 children can be covered. There are a large number of such habitations in tribal areas.
- It strikes a blow against un-touchability against Dalits and other forms of social discrimination. Fulwari involves pregnant and lactating women from various castes cooking and eating together. ICDS and mid-day meals had broken the barriers to some extent in case of children but Fulwari importantly extends this to adults.

Replication: The model initiated in Surguja district has been replicated across 19 districts of Chhattisgarh. The state government has made it a state scheme in 2013-14. Today, there are 2850 Fulwaris operational in 85 tribal blocks of the state with enrollment of around 35000 children and 16000 pregnant/lactating women. The state government has increased the allocation to Rs.30 Crores from 2015-16 onwards to allow expansion into 6000 Fulwaris.

PRIs play the key administrative and fund-flow role in district, block and village level. Mitanin programme and SHRC (associated with health department) provide the capacity building, supportive supervision and problem-solving support. Recently, Women and Child Development department has also been involved at the state level.

The replication process has thrown some challenges also: a) ensuring departmental involvement and designing their role in a programme built on multi-sector convergence and community ownership b) improving fund-flow to Fulwaris by reducing delays and bottle-necks.

Centre for Innovation in Public Systems (CIPS) Hyderabad and independent experts hired by the Panchayat department have scrutinised and documented the functionality of Fulwari centres. It has been assessed through a number of field visits by officials from central government and nutrition experts. After it won a national award from central government, Administrative Staff College of India has been entrusted with facilitating replication of the model in other states.

Conclusion: The experience from this government scheme in Chhattisgarh underscores the need for active role of governments to address under-nutrition through spot-feeding and care of under-3 children. Weaving-in aspects like maternal nutrition, local food production and psycho-social development are part of the holistic nature of this intervention. It is able to promote voluntary collective action by tribal mothers and families which is made feasible by availability of adequate facilitation support for community processes. The autonomy enjoyed by groups of mothers in

implementation is a key design feature which needs to be preserved in any replication of this model.

While the Fulwari model exists in tribal context in Chattisgarh, such interventions are very much needed in any context of poverty and under-nutrition. Further study and evaluation of Fulwari and combining it with lessons from other public and civil society experiments can provide the way-forward for a universal daycare and nutrition programme in India.

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Source of Strength of Working Hands

Du Saraswati

In order to enquire into the source of strength of working hands, we undertook extensive fieldwork consulting subaltern communities. It was very difficult to ask questions about food habits. One of the tribal girls we interviewed retorted, "What food? Most of the time there is nothing to eat!" Some belonging to other communities said that the yield of the day's begging is mixed well together and boiled on the fire before being eaten. P. Sainath in one of his articles states that some communities go in search of rat holes to collect the grains that rats pilfer and hoard. Such is the intensity of hunger in our country. Harsh Mander in one of his lectures says that some of the Dalit women who live in the border areas of Nepal, Uttar Pradesh and Bihar spend their entire day in search of food. They look for undigested grains in cow-dung to clean and use.

There are some proverbs in Kannada which allude to the hunger of the downtrodden communities:

'Close the lid on the pot when the *Holeya*[1]'s stomach is full.'

'Horsegram is enough for the *Holeya*.'

'When the *Holeya* was given leftovers, he thought it was jaggery and ran to Bangalore.'

In Mangalore, the coastal region of Karnataka, there is a saying "In the homes of the haves, one finds milk and curd, while in the huts of the have-nots one finds *basale* thatched roofs" (a temporary roof constructed out of Malabar spinach creeper). The *basale* creeper is their main food source.

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The following recipes indicate the role of women in producing nutritious food for their family, and in procuring low-cost, easily available food sources from their environment.

1. Meat of cow, sheep, buffalo and goat:
    a. The blood of sheep, cow, buffalo and goat is collected when they are killed. When the blood solidifies in a short while, it is cut into small pieces and fried. The fried pieces are then boiled with a masala prepared by grinding green chillies, onion, garlic, cumin, pepper and salt. Soft liver is sometimes added. This dish is known to be good for the elderly who cannot easily digest meaty food.
    b. Meat of the cow, sheep or goat is dried, pounded to make a fine powder, and then seasoned and cooked in masala. This is said to be good for children and those without teeth.

c. The water strained out after cooking beef is given to old people and the sick as tonic.

2. Different varieties of rat as food

a. Beak rat – This rat is generally found alone in its hole. The hole is quite deep. The rat is caught by pouring water into the hole to force it out. The meat of this rat is said to be as tasty as pork.

b. White rat – These are generally found in groups of 5-6 in the rat-hole. A cow-dung cake is lit in a pot and the rats are smoked out. To ensure that they don't escape, a cloth is put around the mouth of the hole to catch them when they come out. If they die from smoke inside the hole, they are dug out. The meat of this rat is said to taste like chicken.

c. Net rat – These rats reside in burrows that they dig to upto 20 feet underground. Each hole has around 30-40 rats. The burrow has some openings for air circulation. When any attempt is made to catch them, the rats use these openings to escape. So the openings are first plugged to stop air circulation and force the rats out. As they come out one by one, they are caught. The fat content in this meat is said to be high.

d. Big rat – Each rat of this variety weighs nearly a kilo. These rats generally reside in small anthills. The rat is roasted on fire, its body hair removed and cleaned, then cut into small pieces and masala is added to prepare a watery curry. The alternative way is to smear it with salt and pepper and roast it on fire. This is supposed to be tastier.

3. *Kunkurugadde* (wild onion) roti – *Kunkurugadde* is a kind of onion generally found in plains. After washing, it is baked on ash-covered cinders. Then it is mashed and mixed with ragi flour. This is then patted on a cloth before transferring it on to a pan for roasting. This is said to be good for health and is called "roti of the poor".

4. Crab dishes:

a. Crab potion – The crab is cleaned and finely ground. Then it is put in a cloth and the liquid is strained and collected. Masala made of salt, green chillies, tamarind, onion, garlic, coriander and coconut kernels is added to the strained liquid and the whole concoction is boiled. Thereafter, seasoning can be added. This is supposed to be nutritious for women convalescing after delivery. It is said to improve breast milk.

b. The crab is pounded and boiled with garlic, pepper and 4-5 glasses of water. When the water is reduced to half, it is strained and it is given to women post-partum everyday for three days before they drink water.

5. White ants in anthills – These are caught, cleaned and eaten. In another variation, after cleaning, they are split, put in ghee and the ghee is given to babies.

6. Mushroom *sambar* – The cleaned mushrooms are seasoned and boiled. While boiling, meat masala is added.

7. Monitor lizard *sambar* – The cleaned meat of the monitor lizard is fried in oil and cooked with masala made of clove, garlic, onion, ginger, curry leaves and chilly powder. While boiling, a small quantity of jaggery or sugar is also added.

8. *Gulkai* sambar – After de-seeding the *gulkai*, it is cleaned and boiled in water. Fried *avare* beans are added. A masala made of green chilly, onion, garlic, tomato, coriander powder and salt is put in the *gulkai* and boiled.

9. *Goddu khara* – Roasted onion, garlic, tamarind, coriander leaves, mint leaves, red chillies, cumin, salt and a little water is ground together. Variations of this dish are made by slightly altering the ingredients.

10. Milk *gojju* – Brinjal or potato is cleaned and cut into pieces. It is boiled along with garlic, salt and chilly powder. After boiling and cooling it, milk is added along with some more garlic and chilly and the mixture is again boiled. This is said to be very tasty and a good curative for clearing phlegm.

11. Crane egg – Cranes lay eggs in thorny bushes near lakes and tanks. The light blue-coloured eggs are eaten. Cow dung is plastered on the egg, which is then thrown into fire. After 10-15 minutes, the egg is retrieved from the fire and the baked dung is removed. The shell is also removed and the insides are eaten.

12. Roasted beef – Dried beef is roasted in fire and used as a side dish taken along with main course, all through the year. It is also eaten along with *goddu khara* as side dish.

13. Rabbit-horn plant:

a. Curry – The rabbit-horn plant is found in shrubby, hilly forests. The stems are brought in, cleaned, cut and boiled for 10-15 minutes along with red chilly, cumin powder and salt.

b. *Chutney* – The stems are cut and fried in oil along with onion, garlic, cumin, salt, chilly

powder, black pepper and seasoned and used along with rice or *mudde* (steamed cake, usually of ragi millet). It is said to be a good appetizer, and also for general health.

14. Rain Flies –
    a. Raw – the flies which swarm the sources of light after a bout of rain are caught and eaten raw.
    b. The rain flies are dried, and added to rice grains, fried horsegram, chickpea, grated coconut and jaggery, and this tasty mixture is eaten in and around Chitradurga district (mentioned in "Janapada Aduge" by Chikkkanna Nuggekatte)
15. The Soliga tribe uses many fruits available in the forest like *kaale, kaare, sooli, jagadi, pokala, darasale*, palm dates, wild cactus, wild jambhul, cashew fruit, etc. as food. Either these fruits are eaten raw, or juice is extracted from the fruits and taken. They use some of seeds of the fruits in local medicine. Salted *jambhul* fruit is kept overnight and eaten in the morning.

Some more recipes of the poor:

1. *Naamadalige* – Jowar flour is cooked along with jaggery, grated coconut, ginger, cardamom and then beaten flat on a wooden platform, cut into 4 pieces, then offered to the God and eaten.
2. *Maradi Bobbatlu – Maradi* trees are found in the forests of Tumkur and Madhugiri taluk of Karnataka. The tree bears fruit in May. The seed of the fruit has a hard shell around it. Once the fruit juice is sucked by the birds, the dried up fruit is collected, the shell broken open to take out the seed which tastes like badam. This oily seed is called "pappu", and it is used to make *bobbatlu* (mentioned in "Janapada Aduge" by Chikkanna Nuggekatte).
3. The poor make rotis out of different varieties of corn. They also use corn to make their sweet dishes in the form of bobbatlu and *sajjige*.
4. Crab:
    a. Fried – after cleaning the crab, it is filled with a masala prepared out of chilly powder, coconut, garlic, onion, coriander leaves, mint leaves, cinnamon, coriander seeds, black pepper and tomato, and deep fried.
    b. Crab sambar – The same masala is used to prepare sambar.
5. Buffalo meat sambar – The cleaned buffalo meat is cooked in water. While it is cooking, a masala made out of coconut, chilly powder, garlic, ginger, coriander, fenugreek, spinach, poppy seeds, pepper, turmeric powder, salt, jaggery is added. This is generally the food of the scheduled castes, and it is taken along with roti, *mudde* and rice.
6. Fox-meat *sambar* – Cleaned pieces of fox-meat are seasoned with cumin seeds. Pepper, garlic, and tamarind are ground into a paste and added to the meat while it is cooking. Salt is also added. Finally chilly powder and jowar flour is added to the boiling *sambar*. The people of Ramakonda caste are known for this recipe. It is also given to women convalescing after delivery.
7. *Karri-Nakki* (Pork sambar) – Cleaned pieces of pork are cooked in water. While cooking, a masala made of grated coconut, coriander, ginger, garlic, black pepper, clove, cinnamon, tomato and salt is added. Generally this dish is prepared by the Korava community. It is given to women five days after delivery.
8. *Aambara* – The water in which lentils are cooked is drained out, and seasoned with mustard seeds, cumin seeds and boiled along with coriander leaves, curry leaves, garlic, tamarind extract, chillies, salt and a little bit of jaggery. When *bobbatlu* is made, instead of pure jaggery, this sweet mixture is used as a stuffing in the recipe.
9. Fish *sambar* – Cut onions are fried along with a masala made out of garlic, coriander leaves, mint leaves, ginger, fried coconut and onion. Fried black gram powder and chilly powder is added, and when boiling, cleaned pieces of fish are added.
10. *Chutneys*:
    a. Red-ant chutney – In Malnad, chutney is made out of red ants called *chiguli*.
    b. Crab chutney – Varieties of crabs like *karedi* and *belledi* are used to make chutney and *sambar*.
11. Rice left-over from ritual practices is collected, dried out and used later.
12. Food is also prepared out of tubers obtained without any cost in their surroundings.

Translated by VB Tharakeshwar

[Reproduced courtesy of Anveshi Broadsheet on Contemporary Politics (Vol 1 No 4 September 2012) *Food Politics and Hegemony*]

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[1] *Holeya – a scheduled caste, previously referring to bonded labourers*

Organic farming in Sittilingi and food security

Anand Zachariah

Tribal Health Initiative, Sittilingi in Dharmapuri District was started by Regi and Lalitha in 1992. Today they run a 30 bed hospital which provides secondary level health care. The health outreach programme provides primary health care in 33 villages in the Sittilingi valley and the Kalrayan Hills (http://www.tribalhealth.org/). This writeup is based on visit to THI to study the organic farming initiative.

In 2004 Regi and Lalitha undertook a padayatra of all the villages of the Tribal Health Initiative. During the padayatra they spent one day in each village talking to individual families and meeting with the village community in the evening. The question that they asked them was, 'if you think of health in its broadest sense, what needs to be done now to improve the health of the people?'. A common theme that emerged in nearly every village was that the new form of agriculture, using high yield variety seeds, pesticides and fertilisers was causing significant expense with less financial benefit and leading to widespread debt. The food that was obtained was also causing ill health. It is from this process of community discussion that the farming initiative emerged.

There was initially a long phase of about 3 years where they undertook ongoing and continuous discussions about organic agriculture with the community. They needed education about this, and involved persons with experience and expertise in organic agriculture. It took a long time before people were willing to try it out and they had to provide financial support to meet the initial costs.

Sittilingi is an arid area where they do traditional agriculture for a variety of millets. The community has traditional experience and knowledge regarding this. One of the steps was to identify the crops that were traditionally grown there. In the farming initiative they have tried to go back to these traditional crops.

The idea of the farming initiative was that modern farming was affecting their health and making them nutritionally and financially vulnerable. The farming initiative was to address the social determinants of health. It also had within it, the importance of sustainable relationship of the community with the environment, dignity of agricultural work and self-reliance.

Sittilingi Organic Farmers' Association (SOFA) is the farmer's association born from this idea. It consists today of about 300 farmers who are doing only organic agriculture. SOFA provides the technical resource, the documentation and marketing for the organic farmers. The cash crops are cotton, turmeric and sago. However organic food products are also having a market. The curcumin content of the turmeric from Sittilingi is the highest outside Kerala and is fetching a good profit from an export market. In view of the significant profits being obtained from agriculture, they have formed a producer company (Part IXA of the companies act of 1956). The profits that are earned are put back into the company. The shareholding is based on the quantum of farming produce provided by each farmer.

They have worked on mixed farming through multi-cropping. The focus has been on millet farming, ragi, bajra, kumbu and chollam. They have encouraged people to go back to millet diet and taking at least one millet meal a day.

Murugapandian one of the leading farmer's of SOFA, feels that organic agriculture is financially viable and the input costs are low. He says that the land is able to provide for almost all the family's food needs except for salt and spice. When they do not have grain, vegetables or fruits, they barter or buy them from their neighbours. Essentially the food that they eat is from the local community. He feels that it has led to better health and they fall sick less frequently.

One of the health workers said that their diet has changed as a result of the farming initiative. They eat millets and a good quantity of vegetables.

Regi says that the organic farming initiative has led to better health. The average weight of women is in 50's and men in the 60's (kg). Maternal anaemia is uncommon. The rates of Tuberculosis are low in the tribal villages. Even in drought season, there is food available and reduced food intake and starvation does not take place.

They have new initiatives such as, seed mother- a person who will take responsibility for maintaining and preserving the seed of a particular local variety. They have being trying to popularise recipes. They had a festival of millets where they asked people to prepare recipes of millets that were known to elders.

Link to SOFA https://tribalfarming.wordpress.com/organic-farming/sofa-sittilingi-organic-farmers-association/

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Development and adult undernutrition in the Gudalur Adivasi community

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[The Gudalur Valley has an Adivasi population, with a history of land ownership, shifting cultivation, hunting and gathering. They have been displaced from their traditional lands in modernization brought about largely by the arrival of tea. Since the 1990s, four of these communities, Kattunayakans, Bettakurumbas, Paniyas and Mullukurumbas, have formed the Adivasi Munnetra Sangham (AMS) with the help of an NGO called ACCORD, to fight for land rights. The organization consisting of about 18000 members who had been displaced, have successfully resettled. ACCORD continues to work on community questions of identity and development.

A separate health NGO ASHWINI was started to take care of the health problems of the communities. ASHWINI set up the Gudalur Adivasi Hospital, a secondary hospital to provide support and referral services to the community health work.

Some successes in the field of health have been: a) bringing down the maternal and child mortality to levels that were comparable to or better than the rest of the nation; b) a community insurance scheme which became a model for study at the WHO and in several international forums.

ACCORD and ASHWINI have activists (animators and health animators) primarily drawn from the Adivasi communities. Both these organizations function primarily on the decision making of the AMS and their activists.]

Introduction

Christian Medical College Vellore and Anveshi Hyderabad have worked with ASHWINI and ACCORD to study community health problems at Gudalur among the Adivasi communities with the approval of the AMS. The following is a joint report by all the organizations which collaborated in the process. As such it represents a composite perspective of community members, development and health activists, medical practitioners and academic researchers. The study follows a participatory research paradigm geared towards community led action. Since the research was not a purely scientific study on passive populations, but a collaborative effort in which community members actively decided on and engaged in the processes that involved themselves, the paper too expresses a composite mix of scientific information, socio-political reflection and community decision making.

The study initially set out to examine the prevalence of diabetes in the region, as there was a perception that the clinical cases were rising. It used three different approaches to study the problem:

a) An epidemiological study of diabetes, hypertension and cardiovascular risk factors such as smoking and nutritional status. This study is academically the most rigorous of the three and is now being written up as a scientific paper analyzing the data according to age, sex, community, and other important variables.

b) A pilot analysis of one year's mortality data to provide a better understanding of the relationship between socio-economic and epidemiological indices (hypertension, diabetes and cardiovascular risk factors) and mortality. This will not be summarized since further studies are in progress.

c) A set of experimental qualitative and quantitative interviews to study three vectors of development (see last section for discussion): a) food habits, b) activity patterns, c) levels of stress and also changes in living conditions experienced by the interviewees since childhood. The following sections discuss the results of these interviews.

Epidemiological study – a summary

The epidemiological study was conducted with a sample size of 768 individuals distributed across the four tribes; blood glucose, blood pressure, weight, height and history were obtained.

Broadly speaking some of the results obtained from the epidemiological study were:

- The prevalence of Diabetes was low (overall prevalence was 1.82% and low for all tribes except Mullukurumbas with prevalence of 4.12%).
- There is a significant prevalence of hypertension among all the communities (overall prevalence of 13.8%) and needs a well planned community health and clinical intervention.
- Undernutrition [BMI <18.5] is a serious problem for all the communities except the Mullukurumbas. Overall prevalence is 41.54%; individual tribe prevalence: Paniya 56.22%, Bettakurumba 40.54%, Kattunayakan 60.00% and Mullukurumba 19.34%.

While the initial study focused on development and diabetes, the public health problem that was identified was the problem of undernutrition.

Sociopolitical study

The sociopolitical study was an experimental effort to try and elicit through interviews, descriptions of food consumed, activity undertaken, stress

experienced and memories of childhood. The interviewees were diabetic and normal people available and willing to talk. The objective was to explore changing trends in their life practices.

A questionnaire with four sections was developed.[6]

1. The food section elicited information about the monthly purchase of rations, vegetables, flesh foods, oils and fats, dairy products, gathered foods such as greens, meat, fish, eggs, etc. From this data the composition of the food consumed by each individual in the family was computed through a calculation of carbohydrates, proteins, oils and fats. The composition of the food in terms of qualitative differences (cereal, flesh foods, fats, etc.) was assessed.[7]
2. The activity section was based on a detailed subjective description of the kind of work done on a given working day.
3. The stress section was designed to take into account specific stressors that arise in community life. These stressors were selected based on a community discussion of what causes stress in their daily lives. The interviewees were asked whether specific stressors (debt, money shortage, community disputes, failures to meet tradition, elephants, broken marriages, eloping children, etc.) existed in their lives. These were then examined qualitatively to try and estimate the extent of stress faced.
4. The childhood memories section was structured as a personal memory of how different their childhood was from how they experienced life today.

The interviews lasted for about an hour and fifteen minutes each.

The interviews were conducted with over 35 individuals over the past 1 year, and of these the last 15 interviews were taken as satisfactory for data analysis since all questions of the interview form were asked and answered. The remaining 20 were used to understand the qualitative background.

Orientation of the study

Two factors changed as the study progressed:

a) Since the epidemiological study found that diabetes was not a health priority, the original objective of seeking commonalities and differences between normal and diabetic families was no longer important.

b) When seen against the new problem of undernutrition discovered, the interviewees chosen were relatively better off and were not immediately representative of the food, activity or stress patterns of the poorer off socioeconomic strata who are likely to populate the under 18.5 BMI group of the epidemiological study.

However, these interviews do represent how the communities eat, work, confront stress, and how they have changed since childhood. They thus offer the best case scenario of the lives of those who are seriously underweight.

The broad qualitative indications about food and activity that were gleaned from the interviews were as follows (the stress and childhood memories section provide inputs to the analysis that follows):

Food

1. All interviewees use the free PDS rice supply of 20 Kgs per month. This suggests that there is an underlying food inadequacy (or wage inadequacy) which even the somewhat better off among the communities alleviate by depending on the PDS supply. The inadequacy is also indicated by the presence of undernutrition noted in the epidemiological study.
2. The food consumption pattern is dominated by carbohydrates (cereal, mainly rice – the cheapest source of energy) and with a limited quantity of proteins (usually dal) and fats (cooking oils) indicative of a precarious diet.
3. Beneficial foods consumed in small quantities are: backyard greens, a variety of gathered and bought vegetables; an occasional satisfaction of a cultural preference for meat, fish and eggs.

Thus, the recent history of development in Gudalur (past twenty years) has resulted in an increase in cereal availability (rice through PDS), a consequent reduction in hunger, and yet a severe narrowing of the kinds of food consumed (see "Quality and quantity of food" section that follows for a discussion of this).

Activity

The general and rough pattern of activity reported suggests that among the poor and able bodied, men tend to do moderate work (standing, carrying moderate loads, walking, etc.) to hard work (carrying heavy loads, chopping trees, digging), while women largely tend to a combination of moderate work (walking with moderate loads, washing clothes, carrying children, sweeping) and seated activity (cooking, cleaning vessels). The aged seem to live sedentary lives with some activity. The present level of activity seems definitely less than that recollected by the interviewees about their childhood (see section on "Vectors of development" in the last section, for reasons).

Possibilities for further research and change

1. The communities still have extensive knowledge of hunting and gathering foods even though they

live in a wage-market economy. They still share hunted animals on an egalitarian basis.

2. The community preference includes fish and chicken, suggesting some non-market measures for augmenting these foods. They also retain some poultry.
3. Weaknesses are a) preference for cereal heavy diets; b) almost nil consumption of millets, nuts and oilseeds; c) lack of a milk consuming culture.

Possible avenues for improvement in the food basket are community gardens, fishery in ponds or behind dams across small streams, where the fish can be shared by the community.

These possibilities have resulted in a phase II of the study which is in progress, consisting of the following aspects:

1. A more accurate assessment of undernutrition, hunger and chronic energy deficiency among the worse off of the tribal village settlements (settlements vary in their health and well being).
2. An educational approach that tries to guide these villages in community initiatives to broaden their food baskets through group discussions. This will be linked to the earlier conceived Gardens for Health project that is being conducted by ACCORD.
3. A research pilot project to find out the remembered history of food practices among the communities based on group discussions with elders.
4. One possible further avenue for propagation of better indigenous food cultures would be to have a periodic fair (santhai) where traditional foods are displayed, discussed and revitalized.

Impasses and opportunities on the wider horizon

Quality and quantity of food

Most of the respondents said that their parents and forefathers had a varied diet. It was possible to hunt and fish extensively in addition to foraging for vegetables, fruits and tubers in all seasons. Food was rarely purchased in the market. Many interviewees felt that their parents and grandparents were physically more energetic and capable than they are today. However, most of the interviewees also recollected a constant presence of hunger during childhood.

Now, all the respondents consume PDS rice. There is relatively less hunger now than previously. However, the food basket has narrowed. While the better off did eat marginally better quantities of pulses, flesh foods and oils, the less well off were fully focused on providing a full meal of rice. On the positive, many persons interviewed said that their families gathered greens from their backyards and from the nearby forests on an almost daily basis. Most of the food is purchased, though some hunting and fishing continues.

What is very clear from the discussions is that while PDS rice is a key contributor to food security, the economic precariousness of the families and the changing conditions of living have eliminated a variety of foods.

Question: How do we combine the benefits of relatively less hunger today with the healthier, wider food basket of an earlier period?

The vectors of development

The developmental process that is engulfing the Adivasi community way of life has many vectors.

1 the arrival of the tea gardens, the growth of wage labour, the strengthening of the market economy;

2 the depredation and protection of forests both of which limit access and utility, and also make everyday life on its margins difficult due to the increasing presence of elephants and leopards;

3 the slow intrusion of towns, roads, bus transportation with their double effect of improving access to the market and also to the excesses of urban life such as alcohol;

4 the arrival of schools, educational systems and the change in the way the young think;

5 the health initiative of the state, and more so of ASHWINI as an organization which works among the tribal communities with activists educated within and recruited from those communities;

6 The community development initiative of ACCORD and the political modernization process that is brought about by the AMS.

These different vectors of development function differently, with both positive and negative effects on the physiological health of the community members. Each of these vectors have more or less direct effects on the foods eaten, the kinds of life lived, the labour undertaken and the access to health care. The solution is not to stall them as evils that befall the community, nor do we completely dissolve the community as a relic of the past that will collapse with modern individualization. Clearly the formation of the organizations AMS, ACCORD, ASHWINI and the Gudalur Hospital are attempts to moderate the developmental onslaught and facilitate better access to the Adivasi communities. These ends of community process finally show themselves in the body of the people, their strength, their immunity, their weakness and vulnerability.

It is important to understand that the three lowest rungs of the ladder of the development processes today are reducing mortality and morbidity and improving relative well being which then serves as the springboard for the flourishing of the members of these communities.

Intersections and differences in adaptation to modernity

The different vectors of development affect the four different communities differently. While it would take ethnographic studies to establish comprehensive differences and similarities between the communities, the following is a telegraphic sketch:

The Mullukurumbas are economically the least precarious of the four communities with land ownership, settled cultivation patterns, a reasonable degree of wealth and success. They are adventurous and willing to take the risks of going out to do better jobs. In these senses, they are perhaps the most 'modernized' of the four communities. However, with all this, the Mullukurumbas show the highest prevalence of diabetes and hypertension in this region.

The Bettakurumbas are economically less well off, often wage labourers. Bettakurumbas tend to be focused on community culture, and not too open to influences from the outside. This closed culture sometimes results in an apparent reluctance to approach the hospital for treatment of illnesses. Yet, their work ethic will take them out to different places to find a living.

The Paniyas, the most populous community in the region, have a history of being bonded labourers with plains landowners, tea gardens, etc. They are one of the two poorest communities in the region, yet at home in a modern wage economy. The Paniyas have the kinds of health problems associated with poverty but do come to the hospital if they are able (economically, physically).

The Kattunayakans are the other of the two poorest communities in the region, least open to developmental influence but most endowed with a sense of community identity. This too is changing and opinion has it that they like to get their children educated. They have a very high percentage of individuals with low BMI, more cases of TB than the other groups and also more cases of undernourished children. However, the problem of diabetes is non-existent among them.

Problems of strategy

Our four cultures confront problems of strategy. If adults are undernourished, suddenly increasing the quantity of food may entail abdominal obesity and attendant evils. Yet the phase two studies of undernutrition preliminarily indicate vulnerability to disease. What nutritional strategies are available to a community in such a situation? How do we as a community decide who needs help and who does not?

Thus one of the broader points for community reflection is what do modernity and development mean for the communities of Gudalur? Do they mean embracing wealth and new forms of disease? Or do they mean a reclusive life which severely controls its access of modern amenities and has its own profile of disease?

We should learn to see development and health as conscious choices made through some transformation of our practices and culture. A democratic politics of health within the AMS would have to work on these issues with broad consultation. Many unanswered questions like these face our communities as we confront an uncertain future.

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Notes :

[1] Adivasi Munnetra Sangham, Gudalur – See http://www.adivasi.net/accord.php. Those who collaborated in the research for this paper were KT Subramaniam and T Aiyappan.

[2] Action for Community Organization Rehabilitation and Development, Gudalur – See http://www.adivasi.net/accord.php. Those who collaborated on the research for this paper were Srikanth Chakravarty, V Vijimol, N Vasantha and Stan Thekaekara

[3] Association for Health Welfare in the Nilgiris, Gudalur – See: http://www.ashwini.org/. Those who collaborated on the research for this paper were Janu K, Janaki K, Uma K, Meenakshi M, Cheeru, Sreedharan B, Urvashi KC, Omana M, Kichan M, Shanta and Geetha K, Bindu K and Chandran V, Lata K, Malathi Manikandan, Kathryn Boyd, Mahantu Yalsangi, Jiji Elamama, Durga Manoharan, Anna Oommen, Shylaja Menon and Nandakumar Menon.

[4] See: http://www.cmch-vellore.edu/. Those who collaborated on the research for this paper were – L. Jayaseelan, Kavitha Ramanathan and Anand Zachariah.

[5] Anveshi Research Centre for Women's Studies, Hyderabad – See http://www.anveshi.org.in/. R Srivatsan was the collaborator who contributed to the project.

[6] For sample of interview questionnaire tables see: https://www.dropbox.com/s/bz7c4dr1uo9a4mm/Interview%20Tables%2023rd%20Jan%20modified.docx?dl=0

[7] For a sample of the initial data computation with respect to diet see:https://www.dropbox.com/s/gcy7qaovo1l1ygl/Sample%20table%20for%20assessment%20of%20caloric%20intake%20Gudalur.xlsx?dl=0

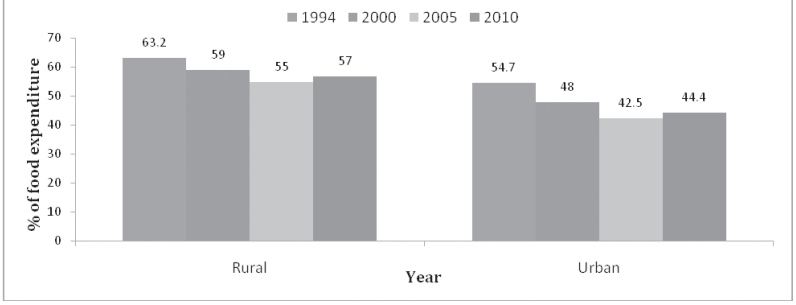
Growing food prices and crumbling nutrition scenario: the need of universal food coverage for better nutrition for all

SukumarVellakkal, Raman VR[1]

Although India is celebrating its remarkable economic growth with an increase in the purchasing power of the people over the past decade[1], there is grave concern about poor nutrition outcomes [2-4]. One plausible factor is the sharp increases in the food prices that happened in tandem with the economic growth[5].

In parallel to the financial crisis and the global food prices spike in 2007-08, prices of all the major food items including rice and wheat had increased in India, with some Indian states experiencing nearly doubling prices for rice, wheat and pulses between 2005 and 2010[6]. This inflationary pressure at higher level continues till date. An immediate impact of such food price spike is a distortion in the household budget with a squeeze on the food budget. The basic proposition in the theory of economic development, as postulated by the Engel's law of development, is that the proportion of food expenditure to total household expenditure should come down when income increases. As shown in Figure 1, it is evident from the estimates from the National Sample Survey Organization's (NSSO) consumer expenditure survey that the proportion of food expenditure to total household expenditure has been declining until 2005 in India- a positive sign of economic development [7, 8]. However,in contrast to the further expected decline in the proportion of food expenditure to total household expenditure in the subsequent years, the food price spike of 2007-08 had resulted in an increase in the proportion in 2010 (post-food price spike period) from 2005 (pre-food price spike period):to 57.0% from 55.0% in rural India and to 44.4% from 42.5% in urban India.This trend can be interpreted as a reversal of India's path of economic development in the recent years due to food price inflation.

Figure 1. Trends in the proportion of food expenditure to total household expenditure during 1994 to 2010, rural and urban India



A study showed that this sharp increase in the domestic food price during 2007-08 was also associated with decline in the intake of vegetables and fruits for the low income population, and such food price spikes were associated with an increased risk of malnutrition among children in India[5]. Another study showed that the rising food prices, particularly of high-protein meat and dairy products, were associated with worse child mortality outcomes, particularly in the most deprived Indian states[11]. This reconfirms the concern that reducing the burden of under-nutrition in India cannot be accomplished solely relying on an economic growth-mediated strategy, and a concerted household support-led strategy is required [12].Therefore, policies to ensure the affordability of food in the context of economic growth are likely critical for promoting nutrition.

For an inclusive model of economic development along with better nutrition, it is the high time for the governments, both at the national and sub-national levels, to intervene and to ensure food security. While the National Food Security Act (2013) [13] was a late but important beginning after the right to food petitions in the Supreme Court of India [14], the scope of the public distribution system (PDS) should be enlarged instead to just distributing the subsidized rice, wheat and sugar. By effectively utilizing the huge distributional network of the PDS across the country, the governments should distribute nutritious food including more pulses, oils and even vegetables and fruits at subsidized rates. Feasibility of provisioning eggs and other non-vegetarian food items through the fair-price outlets could be explored too. More such fair-price food shops that go beyond tokenism would require to be opened across the country too, to contain the rising food prices—Kerala's Maveli(fair-price) Stores [15]could be seen as a model for such an expansion. Some of the essential food consumables are made available to public in affordable prices here, compared to the open market prices. For example, according to a user, these stores sold Pigeon Peas split (Tur Dal) in the Ramadan season of June-July 2016 at Rs 89 per Kg for ration card holders and at Rs 120 for non-ration card holders, while the market prices were near to Rs 180 per Kg.

Increased budget allocation and effective implementation of the ICDS program, especially for revising and reforming the 'supplementary nutrition provision' to 'full feeding', will be required. Improving the school mid-day meals programmes and expanding its coverage is another important step. Free of cost and nutritious food should be made available to all those in need, at least to needy children below the age of three, and pregnant women. Community kitchens for provisioning free food for the needy populations is another initiative

worth considering in this regard, which could be provisioned and run through rural and urban local bodies, involving youth platforms and other community based organisations. Some of these suggestions are in resonance with the recommendations put up by some others; however, these are important in the current context as well.

In essence, as the healthy population can significantly contribute to the nation's economic growth in the long run, the policy interventions for ensuring universal access to affordable and quality food is vital.We may call such an initiative as 'Universal Food Coverage', for better nutrition for all.

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MFC statement on escalating challenges to health in india

[published in the Economic and Political Weekly, Nov 7, 2015]

It is an established and accepted fact that the health of the people in a country depends on the access to a network of basic needs that includes nutritious food and health care. A conducive physical and biological environment at the place of living and work, egalitarian social relationships, emotional well being as and a peaceful social environment are all recognised determinants of health of any population. To those of us working in the field of health, it is clear that there is a significant deterioration in the conditions needed for people's health.

Vital for health are not only the number of doctors, drugs and hospitals but also the distribution of these resources and the access to these by all groups within the community. The functioning of the state and the orientation provided by the political leadership of the nation are crucial to the administration of health care and all the resources needed to lead a healthy life with dignity and freedom. Also critical is a varied and balanced diet according to availability.

Challenges of public health administration

Indeed the health system is a core social institution whose development, effectiveness and accessibility are determined by the political will. The past two years' central budgets have effectively reduced allocations on health. The previous government has dragged its feet in meeting the promise of doubling the health budget to 2.5% of the GDP. The present Niti Aayog has made the situation worse by backing the reduction of public health expenditure from its already abysmally low levels even further. The withdrawal of the government services will have catastrophic effect because the private health services will exploit not only the poor and marginalised strata, but also many in middle classes. The

worst affected would be those in 'unprofitable' backward areas where the privatised health care will not go. The slashing of governmental health expenditure has now entered a multi-sectoral phase: The changes being brought about in labour and environmental protection laws are also in directions that will create unhealthy conditions for a vast majority of the marginalised sections and regions. The food supplementation schemes such as the ICDS programme are under threat.

Food fundamentalism, society and government

India has one of the most varied food preferences ever seen in the world: wheat in the north, rice in the south, over 10-15 kinds of millets like ragi, bajra, makai, etc., several varieties of pulses. India has the largest number of oilseeds in the world, til, groundnut, sunflower, mustard, mahua, safflower, castor, rice bran, and many more minor oilseeds etc. In addition we have a few vegetarians (less than 20%), many non-vegetarians (around 70-80%), vegans, non-vegetarians who do not eat pork, non-vegetarians who do not eat beef, tribals who will not drink milk, but will eat beef, entire populations who live on small animals, birds, insects which they hunt for survival. In addition, we have vegetarian Jains who will not eat root vegetables, including garlic and onions, and one can go on.

The development of any food culture is a long term historical adaptation to what is available in specific situations.

Despite this we are also home to the largest number of hungry undernourished populations (adult and children) in the world who are anaemic, with multiple nutrient deficiencies (50—80%.) Of course one justification made by the Vice Chairman of Niti Aayog is that Indians are not meant to be tall! On the one hand, it is disturbing that the Govt. has failed to feed populations in India. It has failed to control the price of important sources of proteins like pulses. The Right to Food Act has not yet been rolled out.

On the other hand, attacks on meat eating populations belonging to certain communities in the name of a sacred Hindu vegetarianism will tear the already weak fabric of this country. This is nothing less than an attack on the eating cultures of the country, and can have a catastrophic avalanche effect. The current governmental climate of aggression on food culture—whether the pressure to eliminate eggs in the school lunch programme, or the banning of beef in Maharashtra—presents alarming tendencies in the domains of health, economics and culture.

The lynching at Dadri and the lackadaisical governmental response to it are the tragic outcome of the wider structural problem we have described.

Administrative cutbacks, political apathy and passive encouragement

Overall, a) the freezing of health and social sector budgets; b) the weakening and dilution of critical labor protection and environment protection laws in the name of development; c) the overwhelming influence of the private sector and its vulgar profit logic on all decision making; d) the harping on a farcical notion of an ancient India that had discovered everything that was worth knowing'; and e) the consequent subversion of any rational mindset, are all aspects of the present public health crisis. The price will be paid in both short term increases in illnesses, in long term morbidity, in the tragic and avoidable loss of lives, and the decline in well being of all.

The lack of a strong message from government's political leadership that all are to be treated as equal citizens is directly responsible for criminal acts such as lynching, murder, aggression and vandalism perpetrated on the people (dalits, religious minorities, women, tribals and rationalists). This passive response to cultural aggression serves as an active encouragement given to a majoritarian, coercive mindset. It results in direct increase in the blatant incidents that are taking lives of Indian citizens. Such an atmosphere has a telling effect on the emotional and physical well being of the population. The government has to forcefully convey its commitment to justice and democracy, punish those who disobey, and expel from government and police posts all who actively or passively encourage such activity.

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Medico Friend Circle is an organization of committed physicians, experts from academia and activists from civil society. We have worked over forty years on various aspects of health in India. Ever since the Indian state embarked the neo-liberal pathway of development (and even before), Medico Friend Circle has consistently criticised the governments for their blinkered approach and lack of vision in the health care sector and its public responsibility. We are deeply concerned at this state of affairs that is in short terrible for the idea that is India, and the health of the Indian people.

We demand:

- An immediate reversal to the cuts in health and social sector spending.
- Immediate reversal of the dilutions introduced to labor law and environmental law.
- Strengthening and improvement of the ICDS programme.
- Immediate price control of all essential food commodities.
- Action to fulfill the government's responsibility to create an environment in which all sections feel a sense of justice, especially the more vulnerable, that fosters social harmony, and the health and wellbeing of all.

Signed
Medico Friend Circle

Increasing inequity, chronic hunger, and the peoples' health

Binayak Sen

Chronic hunger, as shown by low levels of BMI, affects large sections of the adult Indian population today. Cereal and protein consumption of the people are both declining, and the average protein intake is dangerously low. The reasons are complex and need to be understood with reference to several factors that have to do with trends in agricultural production, public distribution, and the overall development paradigm.

The broad contours of malnutrition in children are fairly well known. The National Family Health Survey (NFHS)-3 shows 47% of children below 5 years of age as being malnourished, by weight for age criteria. Around half of all deaths occurring below five years of age are associated with malnutrition as an important factor. However, adult malnutrition, or chronic hunger, is less well known. Our main source of data on adult malnutrition have been the BMI surveys conducted by the National Nutrition Monitoring Bureau (NNMB), a part of the Hyderabad based National Institute of Nutrition. In a classic example of shooting the messenger, the NNMB was shut down by an executive order in October 2015, thus depriving us of our major source of BMI data.

The loss of livelihoods and poverty that large sections of our people face today finds its reflection in the surveys of the National Nutrition Monitoring Bureau (NNMB). These nutrition surveys reported that around 35 % of the population has a BMI of less than 18.5, which can therefore be characterized as suffering from chronic calorie deficiency.

The BMI is a robust index of nutritional adequacy or deprivation and is calculated as follows: (Weight in kilograms)/(square of the height in metres).The optimum and healthy individual BMI is between 18.5 and 23. Those with BMI below 18.5 are undernourished, and those with BMI above 23 are overweight with the risk of associated health problems.

The actual distribution of hunger in the Indian population is more uneven and harmful than even the NMMB data indicates. Documentary evidence and studies to this effect are mounting. Micro surveys and studies in recent times with specific population subsets (for example, the former workers of the closed tea estates of north Bengal) substantiate this. Our own surveys during 2015 in the Raipur and the Dheklapara tea estates in the Doars area belonging to the Duncans group indicate that more than one third of the population of adults residing in these closed gardens has BMI levels of under 18.5.

It is important to reiterate in this context that chronic hunger is not restricted only to the rural population as some believe. In some ways urban hunger is more serious and widespread than the rural. Recent NSS reports of declining employment and consumption levels in urban areas point towards this.

The evidence of health indices associated with hunger shows a worsening situation in our times. Two important studies can be referred to in this context. The Jan Swasthya Sahyog study (Anurag Bhargav et al) reveals the strong relationship of malnutrition and TB in the villages of Bilaspur district in Chhattisgarh. The JNU study (by Rajib Dasgupta) documents a fivefold increase in deaths from tuberculosis, over a ten year period.

Food production, procurement, and distribution issues are also important in this context.Today we produce more food than we are able to market and distribute to our people-we don't have systems to even store the amount of food we produce properly, leading to huge losses in storage. The costs and losses of procurement and distribution of food are both huge. Peoples Union for Civil Liberties' (PUCL) PIL in the Supreme Court,with reference to right to food, has addressed many of these issues.The green revolution technological option adopted by our agricultural planners has had severely deleterious consequences for the Indian farmer and caused widespread destruction of the soil over large areas. Our stress on high yielding seeds and intensive agriculture has led to a dependence on the inputs of multi-national seed corporations, loss of the seed heritage of indigenous farmers, cereal based mono-cropping, and concentration of landholdings, as the small and marginal farmer's viability has become more and more difficult. Poorer people in rural India depended traditionally on common property resources for their survival. Many food resources—roots, tubers, greens, fruits and flowers, fish, molluscs and other food—were collected throughout the year from the commons. However, today the corporate mining and industrial lobby eyes the forests and common lands for their activities, and their claims are backed up by a militarized state acting on the principle of eminent domain.

Such genocidal state complicity in the creation of hunger is not new in India - we have earlier seen examples in the Bengal famine of 1943, when British policy combined a diversion of food resources for military needs as the same time as it embarked on a scorched earth policy in Midnapore to forestall a possible Japanese invasion across the Bay of Bengal.

There is a predominance of a cereal based diet bolstered through the anti-poverty programmes and the public distribution system that focuses on making cereal based food security available to people. The share of calorie intake from oils has increased due to the import of cheap palm oil-leading to the destruction of the indigenous oil industry.A diet, based largely on

calories and without access to pulses and proteins, leads to heightened incidence of metabolic syndrome even among the poor.

All of this has led to an unprecedented crisis in the lives of many people, as far as their access to an adequate and nutritious diet is concerned. The state, as the backer of most of these policies, cannot escape responsibility from what amounts to a genocidal attack on ordinary people. At the same time, we are forced to confront tough questions regarding the efficacy of the rights based approach. For any real resolution of hunger and its attendant issues, communities need to regain the control of their lives and resources, which includes control of common property resources, their seed and food sovereignty and their livelihoods.

Can we imagine and work towards a political economy that makes this possible?

'*Deal with reality, or reality will deal with you.*' (Unknown)

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Notification and appeal

20th July 2016

Dear subscribers,

The bulletin is now 40 years old and thriving in content. It has moved from a cyclostyle form during the first two years to a printed bulletin in the following 38. Much later, the bulletin archive has also been put up on the internet. The time has come for another change because of various constraints and opportunities.

Based on a discussion with the editorial committee, the conveners, the executive committee and the managing trustee, we have decided on the following:

Because of a) the financial non-viability of producing and delivering the print version of the magazine with inadequate subscriptions; b) given the general trend in journals to move online (BMJ, EPW, Lancet, PLOS One, etc.), become efficient and save the environment by cutting paper use.

We have decided to move to an interim online PDF version of the mfc bulletin available on the mfc website (www.mfcindia.org) for this issue and the next. However, we will supply a limited number of good quality Xerox copies of the bulletin in the same format to institutional subscribers, and to the (hopefully few) life subscribers who write back to us saying they are unable to read on line.

We hope to take up the decision to go to full on line version like the IJME during the coming Annual General Meeting in February 2017.

We have already raised this issue in the egroup, and a majority who responded have said it is all right to migrate to a full online format.

We would request the life subscribers to also write either by regular mail or email to us (one contact address below) to give us your opinion.

In any case, we will do our best to provide the institutional subscribers a hard copy of our bulletin even if we migrate fully to an on line version.

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Anthropometry: evolution of measurements and associated issues

C. Sathyamala

This paper presents a brief history of the development of anthropometry as a measure of nutritional status and flags some contentious issues that need further debate.

Since the early eighteenth century, military recruits were screened on the basis of their 'stature'. However, it was during the stock market crash of the 1930s that, for the first time, a systematic attempt was made at the international level to develop indicators to assess and standardize measures for health effects of food deprivation (nutritional levels) on both individuals and populations. This was necessitated by a paradox of falling mortality rates observed in countries affected by the economic depression despite reduced food intakes among the labouring population as a result of mass unemployment and under-employment (Borowy 2008). Thus, death rates did not reflect the health consequences of food deficits that were not as large or as acute as that in famine conditions. Hence more sensitive indicators of food insufficiency not amounting to frank starvation had to be identified and quantified (to justify policy interventions). Accordingly, the League of Nations Health Organization initiated a series of conferences to arrive at an agreement on the most suitable method of detecting early indications of malnutrition not sufficient to cause death in the immediate period and to recommend standard methods for studying dietaries (Boudreau 1935). Although there was no uniform prescription, large scale surveys covering at least 10,000 families or 10% of the population using simple methods and small scale studies using elaborate clinical criteria were recommended. Combinations of anthropometry (weight and height), colour of skin, subcutaneous fat, muscular development, nitrogen content in urine, protein in blood, measuring pulse were suggested as measures to assess nutritional status (Borowy 2008). However, by the second half of the twentieth century anthropometry established itself as a proxy for nutritional status and became an accepted part of epidemiological surveillance. In the 1950s attempts to grade undernutrition in children by comparing weight-for-age against a standard was attempted. Arbitrary cut off points to measure different grades were employed without laying claims to their physiological and pathological significance (Gopalan and JayaRao 1984).[1]

Anthropometry as a measure of nutritional status

Nutritional anthropometry is defined as "measurements of the variations of the physical dimensions and gross composition of the human body at different age levels and degrees of nutrition" (Jelliffe as quoted in Shetty 2003).

> The classification of cases of protein-calorie malnutrition into three degrees, namely third (severe), second (moderate), and first (sight) [sic], is purely conventional but makes it possible to give a clearer idea of the observed gradations in the severity of the problem. The classification is usually made on the basis of the ratio between the child's weight and age (Gomez). It should be pointed out, however, that clinical signs may be of great importance and that, for example, the presence of a nutritional odema automatically classifies the case in the third degree whatever the patient's weight. (Bengoa 1967:169)

Thus by necessity and definition these indicators of bodily manifestations of inadequate food intake were social constructs based on arbitrary statistical cut off points with implicit norms. That these cut off points were arbitrary was accepted in the early 1970s until Bengoa, Chief, Nutrition Unit, WHO, used this classification of weight-for-age and its gradation into severe, moderate and mild malnutrition to describe the 'problem of malnutrition' in developing countries (Bengoa 1974). Thus the statistical cut off points began to acquire physiological significance. Even at that time this classification based on the mean weights and heights of 'healthy children in North America or Europe' was considered arbitrary and by using this as a physiological standard, in "many countries, up to 40% of pre-school children … [were] regarded as malnourished" (Waterlow 1974: 88). Waterlow introduced the concept of wasting (deficit in weight for height) and stunting (height for age) by pointing out that a "deficit in weight for age may be produced in two different ways or by a combination of them… [and are] quite different clinically and physiologically, and should not be classified as if they were the same" (p 88). Waterlow proposed that "to be taller is not necessarily to be healthier… a malnourished child… [is] 'cured' when he [sic] has reached his normal weight for height. At this stage most of the children are still underweight for their age, because they are stunted, but clinically they appear to be healthy, and this is borne out by the low rate of recurrence after discharge from the hospital. I myself do not regard such children as malnourished just because their weight for age is low" (p89). His recommendation, in the context of intervention programmes was that supplementary food should be given to children below the age of 2 years only as attempts to rehabilitate older children who were stunted was unlikely to accomplish much.

Gopalan and JayaRao (1984:7), acknowledged that Waterlow's classification of stunting and wasting were useful categories clinically but disagreed with their use in policy making, because "none of these measurements had any proven physiological validity as indicators of the severity of undernutrition". According to them, the fallacies of grading undernutrition on the basis of the degree or type of growth retardation "stem from the following

considerations: (a) the multidimensional nature of the undernutrition process, (b) the plurality of nutrient deficiencies, and (c) the complex multi-factorial interactions (both of factors within the environment and of those between the host and the environment) involved in the evolution of undernutrition in poor communities" (p8). Hence,

> The quantum of cases of 'severe' undernutrition in a poor community will considerably exceed the quantum of cases of 'severe' growth retardation, because while all 'severe' cases of growth retardation, will undoubtedly be also severely undernourished, not all cases of 'severe' undernutrition will be necessarily severely growth retarded. Severe undernutrition can exist in the absence of 'severe' grade of growth retardation. (Gopalan and JayaRao 1984:10).

An ecologic analysis of the cross sectional data from the WHO publication, Global Nutritional Status published in 1989 showed that while median levels of stunting between regions showed relatively little variation, there was little correlation with wasting, suggesting not only that the relationship may not be linear but that different patterns emerged when continents were considered separately (Victora 1992).

> There is little doubt that weight loss and therefore wasting is basically an 'acute' condition, despite the fact that some children may remain wasted for prolonged periods of time. Also, failure to grow (resulting in stunting) is a 'chronic' or a long lasting condition. However, referring to these conditions as 'acute' and 'chronic' malnutrition is misleading. The present results challenge conventional thinking by suggesting that wasting and stunting are not just different presentations of the same phenomenon of dietary inadequacy, varying only in terms of timing or intensity. (Victora 1992:1109)

Victora (1992) went on to hypothesize that while wasting and stunting may share common causes, such as insufficient energy intake and infections, there may be other causal factors or 'limiting' factors involved to explain the differences; for instance, improvement in living conditions were associated with reduced wasting in some populations whereas they increased linear growth in others.

The relative insensitivity to detect changes in short-term food intakes, inability to distinguish specific micronutrient deficiencies, inability to pinpoint causality, and cost of collecting high quality representative data are some of the limitations of anthropometry in assessing nutritional status of children (Shetty 2003). Critics have pointed out that there is little correspondence between the prevalence of 'undernourishment' as estimated by the FAO and underweight estimated by anthropometry in both adult women and young children (Svedberg 2003). The most reliable indicator for measuring undernutrition is said to be growth faltering and failure to gain weight in children and weight loss among the adults; and the most reliable method appears to be through repeated measurements in individuals, particularly children (Klansen 2003).

The consensus that emerged in the FAO symposium on "Measurement and Assessment of Food Deprivation and Undernutrition" was that in children, anthropometry was most suited for tracking an individual child's growth in terms of weight and height and has been used as a powerful tool within the framework of community nutrition programmes (Kennedy 2003). As an outcome measure, its major strength was in monitoring and evaluating interventions, and it was useful in calculating costs of interventions. Tracking of height and weight was also seen as a powerful advocacy tool "that can be used for political motivation". To reconcile the conflicting evidence from cross-country comparisons of the various indicators (about which many of the participants were not unduly concerned "as they were meant to measure different things"), it was proposed that a model factoring both physical activity levels and health status of the population be used. This model would require valid variables for measuring physical activity level and health status of populations. The participants agreed that there was an international consensus in the use of anthropometry among children under five years of age and that "anthropometric data always should be presented together with the confidence intervals and information on the distribution (mean, z-score and standard deviation)". They also agreed that there were no accepted indicators for the adolescent age group, and that the use of BMI in adults was still in the early stages of development. An international consensus needed to be developed on age groupings and BMI cut off points.[2]

Body Mass Index: A composite measure

Since adults do not grow linearly, it is not possible to use height for age and weight for age as measures of nutritional sufficiency. Chronic Energy Deficiency (CED) was the term that was proposed to describe inadequacy of food for maintaining a steady health status in adults. The classification of adult CED was initially proposed on the basis of body mass index (BMI) in conjunction with indices of energy turnover such as physical activity levels (PAL) (Ferro-Luzzi et al 1992). However, it was difficult to incorporate this into the measure since the expressions were mathematically unstable, and thus it was decided to use only BMI. BMI was seen to provide coherent results with a misclassification in only 5% cases leading to its acceptance as a single measure for adult CED (ibid).

In much of human history corpulence was considered a sign of good health (and wealth) and fat an advantage, but it was in 1902 that the need for an index of 'normal' body weight was felt by the Insurance companies when they noticed an increase in death

claims from their obese policy holders (Eknoyan 2007). Tables of normal weights based on average weights recorded for a given height were constructed but were found to be problematic as there was a wide range of weights for a person of the same age and sex. To resolve this, the distribution of weight for a given height was classified into small, medium and large frames and the average of these were considered ideal and later as desirable weights. Following the Second World War, when body weight and mortality in cardiac disease and diabetes began to be perceived as a public health problem, a reliable index of obesity became necessary for epidemiological studies. In 1960, the previously known Quetelet Index, was found to be appropriate.[3] In 1972, the validity of the Quetelet Index was confirmed through studies, and was then named the Body Mass Index (BMI). Quetelet's propositions were based on the notion of *average man* which conceptually assigned the human ideal to the middle rather than to the highest end of the distribution of the normal curve, then considered the ideal most evolved human being ('Tales of Statisticians' Undated). However, it also created the notion that the 'average man' was the 'normal' man (representative of the population) whose characteristics were studied on the basis of large numbers where the 'general causes dominate the numerous influences of trivial ones (Coven 2003:3). In Quetelet's words, '[t]he greater the number of individuals, the more the individual is effaced, and allows to predominate the series of general facts which depend on general causes according to which society exists and is maintained' (as quoted in Coven 2003:3). Quetelet, a determinist, believed that 'If the *average* man were ascertained for one nation, he could represent the type of that nation. If he could be ascertained according to the mass of men, he would represent the type of human species altogether' (as quoted in Coven 2003:2; emphasis as in original), yet he also accepted that the average person would vary across time and place due the variations in that population and that the mean could vary among different people and even within a single country (Coven 2003).

Between 1987 and 1992, the International Dietary Energy Consultancy Group (IDECG) of the UNU[4] developed BMI as a measure for CED culminating in a symposium entitled 'The Functional Significance of Low Body Mass Index (BMI)' in November 1992.[5] BMI was defined as a 'simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m^2) (WHO 2010). The use of single BMI cutoff is much more controversial as a healthy BMI is likely to vary with age, sex, pregnancy/lactation, ethnicity, climate and other factors (WHO 1995 as cited in Klansen 2003). In consultation with an international group of experts, the WHO then arrived at a consensus regarding the cutoff points for classifying body mass into various categories of thinness, overweight, obesity and normal range. Questions have been raised as to the applicability of the same cutoff points to all populations. In 2002, an expert group recommended that individual countries should set their own cutoff points for risk assessment on the basis of their own morbidity/mortality data (Choo 2002). However the final report concluded that while 'the proportion of Asian people with a high risk of type 2 diabetes and cardiovascular disease is substantial at BMIs lower than the existing WHO cutoff point for overweight (e"25 kg/m^2)… available data [did] not necessarily indicate a clear cutoff point for all Asians for overweight or obesity' (WHO Expert Consultation 2004:157). Moreover, rationale for using BMI in children was to assess childhood obesity and is not a suitable measure in an undernourished child population.

BMI indicates current status of nutrition in adults and is not a good indicator of the nutritional status of these adults in childhood. Height in adulthood is a good marker not only for past nutritional status of individuals but also of cohorts. For instance, Europeans were severely 'stunted' by modern standards during the eighteenth and nineteenth centuries. Anthropometric data, particularly height, has come to be recognized as a measure of not just current nutritional status but also as a historical record of the nutritional experience of a population. The physical stature indicates how well the human organism has thrived or is thriving in its socio-economic environment, and height is used as a proxy measure for the various economic variables (Komolos 1992). It was in the mid-1970s that economists began to undertake a systematic effort to understand the long term decline in mortality and its links to health as indicated by the changes in heights of a population (Floud 2004). Data from Europe has shown that height increases with an improvement in living standards as, for instance, the height of English boys aged thirteen from the lower economic class increasing by nearly twenty centimeters between 1790 and 1990 due to an improvement in living standards during this time (Komolos 1992). The secular changes in the mean heights in populations is said to reflect the changes in food availability and other environmental factors over a period of time which may not be captured by BMI.

To conclude, the history of the evolution of these measures illustrate that what is taken as the norm or a given was/is contestable and continues to be fluid. The anthropometric 'status' in itself is not a 'diseased' state but is a marker of nutritional status which is associated with specified health outcomes. Anthropometry is a composite outcome measure which encompasses various determinants including availability of food, health services, and environmental factors. There is no single effective measure for assessing nutritional adequacy as height/weight are outcome measure of multi-causation, one of which is food intake. Because of this, depending upon a particular political expediency, it is not difficult to create discourses where determinants other than food can be held more important in the hierarchy of causes as the current focus on open defecation and its association with

stunting points to. Yogesh Jain's paper ('Measuring undernutrition and hunger: some reflections') in this issue of the Bulletin and the deliberations in the two Consultations on malnutrition and its coordinated by the Centre of Social Medicine and Community Health, JNU, (brief report by Ritu Priya in this issue of the bulletin) raise similar and additional questions demonstrating the need for further debate and reflection.

Acknowledgments: Thanks are due to Yogesh Jain, R. Srivatsan and Adithya Pradyumna.for feedback on a previous draft.

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Notes :

[1]Cutoff points are based on how far they deviate from the average and when Gomez, a Mexican paediatrican first proposed his classification, it was from data on children admitted to a hospital in Mexico city in the early 1950s (Gueri et al. 1980)

[2]Revisiting the NFHS data in the light of the above, the use of these various measures become questionable and their interpretation problematic as these surveys are cross sectional and do not follow the same children as a cohort study would. Further, In the light of this discussion, the explanation that '[t]he stagnation of underweight indicators can be thought of as an averaging of the opposite movements of stunting and wasting,' (Deaton and Drèze 2009:50-51) reflects a lack of appreciation of such measures in children.

[3] The Quetelet Index is named after its originator, the Belgian social statistician AdolpheQuetelet (1796-1874), who in 1832, proposed that in adults, the normal body weight in kilograms is proportional to the square of the height in metres,

[4] The International Dietary Energy Consultancy Group (IDECG) was established for the study of dietary energy intake in relation to the health and welfare of individuals and societies. Its specific objectives, as defined at the foundation meeting in Geneva, on 3 September, 1986 can be found in http://www.unu.edu/capacitybuilding/foodnutrition/idecg-index.html accessed 6.7.10

[5]In 1994, an entire issue of the European Journal of Clinical Nutrition was devoted to the publication of the proceedings of this IDECG symposium held at FAO Headquarters, Rome, Italy on 4-6 November 1992.The digitalization of this issue of the journal was funded by the Nestle Foundation(source: http://www.unu.edu/unupress/food2/uid10e/uid10e00.htm accessed 6.71.0

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Measuring undernutrition and hunger: some reflections

Yogesh Jain

Amidst the prevailing confusion, it is best to spell our basic premises and let there be an expressed agreement about them. This is necessary since any debate that does not happen on a commonly agreed ground can be unfructuous Listed below are essential truths, and let disagreement , if any, be said upfront in deliberations on measures.

1. When measured by anthropometry , one can pick up acute shortage of nutrient intake, as well as longer term chronic shortfall of nutrient assimilation. Thus measures like weight for age and height for age assess all nutrient shortfalls. Weight for height (WFH) measures acute shortfall of nutrient assimilation. Since height does not decrease after increasing (with the exception of a few centimeters loss in old age) It has an archaeological value for nutritional status during the growth phase of the skeleton.

2. Acute shortfall of nutrition assimilation is both a marker of an illness (which can sometimes kill) as well as a risk factor for illness and mortality in the short term. Thus identifying it is of programmatic (cost effective) value for the objective of preventing deaths in the short term. You can offer hospitalization or nutrition rehabilitation, or intensive home based care, all for what we call as Severe Acute Malnutrition (SAM) care.

3. However, chronic shortfall of food , measured by stunting , with or without acute wasting is clearly associated with increased risk of many important illnesses (which, again, can kill), as well as be responsible for large numbers of overall child mortality. The other implication of stunting is poor work capacity and ability to earn, which is critically important for all who live off their ability to labour. What proportion of mortality can be explained by SAM and what proportion by chronic undernutrition is not known clearly by a perusal of medical literature. My informed guess is that chronic shortfall of food causes more than 50 per cent of deaths (and thus the majority) in childhood. Thus it is important to not remove our attention from this type of undernutrition. WFH and body mass index (BMI) don't pick these up. Multi-upper arm circumference (MUAC) may be able to pick this up, but I can't say with much confidence how well it picks this up, and what cutoffs should be used in its measurement.

4. While the risk of dying is higher among those with severe undernutrition (measured as more than minus 3 z scores below median) than among those with some undernutrition (between -2 and -3 z scores below median) , the overall contribution of undernutrition to childhood deaths is overwhelmingly larger (more than 80%) by the non severe grades of undernutrition. Thus, even if one is focusing on child survival and not comprehensive development, addressing all undernutrition makes sense.

5. Nutritional insults incurred during the first two years, particularly those that sustain (meaning thereby chronic undernutrition), result in decreased intellectual ability, and thus has long term consequences for even those who may not be living off their physical labouring ability. Chronic undernutrition or stunting affects the ongoing development of higher cognitive processes during childhood years rather than merely showing a generalized cognitive impairment. Stunting could result in slowing in the age related improvement in all higher order cognitive processes and may also result in long lasting cognitive impairments.Thus it is imperative to intervene early and for all types of nutrition shortfall, not just acute shortfall.

6. The sad truth is we don't know many children's and people's ages: thus we need age independent criteria for measuring under nutrition. For this,many candidates have come forward such as MUAC, MUAC for height, WFH and BMI. The minimum problem with all these age independent variables is that they don't pick up chronic hunger- they only pick up acute shortage of nutritional assimilation. The other problem is that many of these variables may actually not be age independent. For example, MUAC is not age independent , even between the ages of one and five years.

7. Technology, tools or parameters used in measurement have to first fulfil the principle of it being effective and accurate. If this entails a technology to be necessarily more expensive or sophisticated, so be it. We can't compromise on its effectiveness. Efficiency or simplification cant be allowed to trump effectiveness of meeting the primary objective. Once a technology is accurate and effective, then the second and third principles of user friendliness and cost should come into consideration. So if the intention is to pick up undernutrition accurately, the tool or parameter that you choose should first be effective in achieving your objective. Once chosen, we should look at which one among them is user friendly and /or cost effective.

8. Are our resources for addressing a major issue like food deprivation, or nutrition shortfall limited? If it is not , then we must address all the issues that emerge from the biology of undernutrition and social needs.
9. If the resources are limited (one should only invoke this limited resource bogey after much careful thought), even then we should measure undernutrition accurately and appreciate collectively all the implications of this serious problem. Then using the underpinning of equity, try to do what ever we can do. Merely addressing SAM may be a pragmatic programmatic decision for short term gains in an emergency, but it cannot be a policy decision NOT TO address other forms of food deprivation'

There are two broad ways of measuring undernutrition. The first is anthropometric methods which use principles of mensuration, are quantitative ; the other set of methods are more qualitative , and include medical status.

The Anthropometry methods require two steps- first a measurement and then some methods of interpreting them. They are in general more robust measures of undernutrition, but only when done accurately, and repeatedly so that we have trends. But they are susceptible to statistical chicanery. What you measure could be as big as heights , or as small as foot sizes and arm girths, or may be derived indices using formulas. Some people like to measure fat or muscle mass or even body proteins such as hemoglobin.

Interpreting measurements requires comparison to some reference standards and again some formulas. Many of these measures are simpler than other, or are easier to measure, and they also vary in their cost of the aid or equipment they require. Overall, they are the predominant methods used in measuring nutrition shortfall.

The non-anthropometric measures of food deprivation or hunger are more direct ones concerning human life, and they tend to measure those outcomes which we want to protect or prevent from happening . For example, measuring tuberculosis prevalence rates in the community, or pneumonia rates in under 3 children, or cognitive abilities in 12 year olds, or death rates due to malaria in a community are a few of such measures. They tend to be broadly softer measures, but are more convincing at human or social levels of discourse or debate. The estimation of such parameters is not more complex than weight, height, MUAC, SAM and would make more sense as these parameters directly decide the quality of life the child most likely will have.I would strongly recommend these as measures of hunger in our society.

Why do we want to measure a person's (or a population's) nutritional status?Because we know that in children, proper nutrition is linked to a child's physical and mental development, and this has implications for their future health and learning and earning capacity. In short, malnutrition in childhood impacts negatively on the human capital of a society.

I would recommend measurement for the following reasons

a. Get a firm grip on the problem.
b. So that you can plan your interventions: short term and long term
c. So that you can monitor what you have done- for an individual , for a family or for a community.

For the individual child, progression into malnutrition is not a sudden occurrence, but happens gradually over a period of months. Therefore it is possible to detect this slide into a poorer nutritional status (whether it be due to illness or lack of adequate nutrition), if there is regular measurement of the child's nutritional status. A one-time measurement of nutritional status for an individual child, therefore, has limited value. It detects where the child currently is, but not from where she reached that point – whether she is improving from a worse situation, or is worsening from a better nutritional status.

Cross-sectional surveys, therefore, using whatever method (WFA or MUAC), give the current situation in a population of children, and repeated measurements of this cohort can provide a pointer to the change in the profile of this group, though not indicate the course that any specific child is taking.

When screening a large cohort of children, the ones identified as severely malnourished may be singled out for special attention: hospitalization if they are also sick; special nutritional rehabilitation measures if they are not. Risk of death is high in this group, and by identifying and taking care of this cohort one is no doubt saving lives.This is important in an emergency situation leading to large scale displacement and disruption of routine services.

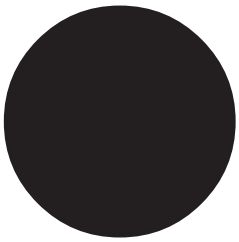
The measurement of MUAC has thus been used as one of the rapid screening tools in such situations where birth records may not be easily available to calculate exact ages of the children.However, as a routine monitoring tool to identify children in urgent need of attention within a programme like the ICDS, the MUAC leaves much to be desired. The arguments for the MUAC are that it is easier to be used as it is colour coded and therefore does not need literacy skills. Practically, the problems are several: identifying of the mid-arm level at which the reading should be taken, the exact tightness with which the tape should be drawn around the arm, the fact that in many places it is being used over the sleeve of the shirt or kurta that the child is wearing at the time.

There are several academic arguments about MUAC not being really age-independent and therefore the adjustment required to be made to make it a proper tool; about what cut-off reflects more exactly the severely malnourished group of children etc.

But why have we suddenly turned our backs on the time-tested weight-for-age method to monitor growth of children? Especially where we have a huge network of anganwadi centres (AWC) who have been doing this for years now (I admit, with varying degrees of success), it is still a more robust and accurate measure of a child's nutritional status than MUAC. Though there are issues of some anganwadi workers (AWW) not knowing how to plot weights on the graph (they can be taught), or to read the spring scale (again, they can be taught), these in themselves are no reason to discard the method in favour of MUAC. It seems to me to be a case of throwing the baby out with the bath water: are the growth charts not being filled? – forget that and let us turn to another method though it may be as good. It will give us rapid results (if properly done) for a very small percentage of children, and to hell with the rest. When they come on our radar is when they go below -3SD, and then we will scramble. Most AWWs have rather meticulous records of births in their area. So birth dates are not an issue, except maybe in areas not covered by AWCs, where an effort must be made to get the birth date from the Patwari or someone else in the village. Thanks to people still having an unshakeable belief in the merits of schooling, most register the child's birth somewhere for a birth certificate. Even if they don't, the birth can be narrowed down to the month, which is not a bad thing. (WHO Anthro has an adjustment for birth date not known, and rounds off the age to the month). So there are ways in which we can strengthen the current monitoring system. This, as we know, can identify growth faltering, where we should start taking steps. Not wait till some magical red colour on a tape to find that this child needs attention. By this time it is often too late. Not a child death, perhaps, but a child permanently impaired both physically and mentally.

We see this as a deliberate attempt to make the debate on nutrition as abstract, 'academic' and intellectual only and also to show that things are improving and will continue to improve. It is disheartening to see how systematically we ensure that most of our children remain less than 'human'.

369-370 medico friend circle bulletin



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See website www.mfcindia.org for these reproductions of useful documents in the topic of malnutrition

- Blessed are the small in size – if they are Indians: *Kamala S. Jaya Rao*
- Egroup Archive: Early debate on Arvind Panagariya's views on nutrition.
- People's charter for food and nutrition security 3rd August 2009
- Conversation on MFC egroup about nutrition, food, policy and politics

Malnutrition: Politics of Knowledge and Strategies: A Summary of two Consultations

RituPriya

The following is a brief summary of the deliberations from two consultations on malnutrition coordinated by the Centre of Social Medicine and Community Health, Jawaharlal Nehru University (JNU),in collaboration with other institutions.[1] Distinguished public health scientists, nutritionists, policy analysts, economists, administrators and social activists, with years of experience of working on the relevant issues, participated.[2] Both workshops were geared to suggesting effective policy approaches for dealing with pervasive undernutrition in the country. Towards this, it was considered critical to (i) question the prevailing dominant conceptualisation of the problem and its causal pathways; (ii) develop and adopt methods and tools to effectively identify and deal with the problems of starvation and acute malnutrition as well as chronic hunger; and (iii) conceptualize, design and adopt in practice, mechanisms necessary for the operationalization of effective preventive action. Following are some of the important issues highlighted during the Consultations.

Technical questioning of officially used tools for identifying starvation and undernutrition

There was rejection of the colonial definition of starvation that is still officially adopted by the civil administration. Based on this definition, the autopsy diagnosis of starvation required the absence of any grain of food in the stomach of the deceased. It was instead argued that a starvation death reveals a longer term condition of deprivation and of undernutrition of the whole family and community, and thereby the diagnosis should be made based on the circumstances of the deceased and their social environment. Guidelines by the Jan Swasthya Abhiyan Hunger Watch Group on "Verification of Starvation Deaths & Detection of Hunger in the Community" were based on this concept. Piloting of such a methodology had demonstrated the value of such an approach. However, its use did not continue for long. Some thoughts as to why the group did not go ahead showed that the method required too much time, money and effort to follow up with surveys. Though many members in the Right to Food (RtF) campaign did continue to use this tool on their own, there was no coordinated activity. Also, perhaps, it was too technical; it definitely needed the intervention of doctors at some point. The Commissioners' Office having taken this tool on and putting it into the Supreme Court petition was found to be hugely valuable. It was felt that through training at least something could be done to revive the use of this important tool.

Similarly, in the second workshop there was questioning of the current use of the mid-upper arm circumference (MUAC) as a tool for diagnosing undernutrition in children. It was shown through empirical data that the use of reference points based on African experience was not valid for the Indian context where it under-reported the prevalence of malnutrition.

The second workshop also highlighted the discrepancies in global estimates of undernutrition produced by organizations such as the Food and Agriculture Organization (FAO), where it seemed to under-estimate the rates of undernutrition in an attempt to demonstrate achievement of the Millennium Development Goals (MDGs).

The national nutrition monitoring was found to be inadequate to address the immediate needs of those who were found to be malnourished because the data became available after a long period and was therefore useful for post-facto situation analysis and inputting into long-term policy and planning. Therefore the need for a rapid method for community level nutritional monitoring and surveillance was felt necessary.

Bridging the civil society divides

Debates among the civil society actors and groups working on nutrition and food security showed diversity of approaches that became sharp when specific actions were to be taken or policy recommendations were to be prioritized.

The first workshop addressed the debate between those who prioritized macro approaches to food security such as a universal Public Distribution System, as against those who insisted on a focus on individual vulnerabilities and needs such as the children, the elderly, the disabled and the homeless. It was highlighted that these micro and macro level approaches needed a bridging *meso* level. Identifying communities with vulnerability and those with impending food shortages could help prevent the acute malnutrition and starvation *before* it set in. The recommendation, therefore, was to develop a tool that would go beyond merely the bio-medical criteria to include changes in availability and access to food items, social/occupational vulnerabilities and economic capacity, and dietary practices, in order to quickly capture early signs of food distress and generate evidence for instituting measures for mitigation of acute malnutrition on a large scale.

However, this was considered as too managerial a solution by some participants who wanted greater attention to the politics of food programmes, the lack of political will to deal with the problem seriously being a major barrier to any impact even if an excellent community based tool is designed and used for early

identification of acute undernutrition. Unless it is followed by action, the identification is of little value. Therefore, it was concluded that such tools should be designed for use by the communities and civil society groups working with them, for their follow up action which could also be available to any civil administrator who is serious about dealing with the issue.

The second workshop dealt with issues of those working on food security from two different perspectives—one stream prioritizing a focus on universal entitlements and provisioning of subsidized food grains by the state (through PDS) and another stream focussed on food production for adequacy and diversity in food access as well as food sovereignty. While building upon the earlier discussion on defining and developing tools for early detection of hunger and malnutrition, this time the issues of food production and agriculture impacting on food and nutrition security were included in the structure of the workshop. They pose two dimensions of the current civil society action related to food security. The first is well reflected by the Right to Food campaign, the second is espoused by those working on sustainable and holistic agriculture and issues of farmers. Issues of food adequacy through the Green Revolution technologies versus those of food safety became central in the presentation from Punjab. Increasing mothers'time spent in work as against decreasing time for child care was empirically documented.

Depleting food diversity and decreasing dependence on local production with homogenization of the PDS universalized wheat-rice consumption were highlighted as causes for reduction in nutritional value of diets. The negative consequences of this were further shown in both agricultural production and nutritional status.

The conceptual issue emphasized was the medicalisation and commodification of undernutrition by reducing it to micro-nutrient deficiencies and their supplementation. The natural link between local ecologies, food production and dietary patterns was made redundant by the Green Revolution and PDS framework that were premised on centralized production and procurement of wheat and rice for distribution to the whole country. The next step then was to substitute the food items with chemical supplements.

The politics of food

The first workshop had ended with recognition of the limits of techno-managerial measures for nutritional assessment and supplementary feeding programmes. While the lack of recognition of undernutrition by governments, health workers and communities was emphasized, the solution seen was community based nutritional surveillance for local and administrative action to prevent starvation and acute malnutrition. Food production systems, economic disparities and lack of political will needed to be addressed for any effective action, it was pointed out.

The second workshop ended with participants criticizing the lack of attention in the discussions to issues in agriculture and food production that related to dalits and adivasis such as that of land distribution. Larger issues of international trade, food grain market and prices, wasteful consumption patterns of the well-off nationally and internationally were also not discussed.

What was raised were issues of agricultural viability for small farmers and women farmers, the severe depletion of ground water sources, of the economics of agriculture being affected also by the non-availability of workers and increasing wages, higher cost of all inputs etc. The diverse conflicts of interest in the way issues of agriculture and rural development are being addressed emerged sharply.

What was suggested by one approach was the need for a caring society so that both community and state action could be based on solidarity across socio-economic sections. Another suggested that we should stop addressing hunger in a top down fashion and speaking for the vulnerable, but attempt to understand why the survival networks of the marginalised were no longer working. That is, view people not as beneficiaries but as members of communities with distinctive characteristics that define them socially, economically and culturally.

Evidently what is needed is dialogue across the technical/socio-political divide and the food production/entitlement provisioning divide so as to address the issues as holistically as possible. This without setting aside contentious issues but taking them head on so as to identify the possible trade-offs in each systemic solution and make conscious social action and policy choices in a rational and transparent manner.

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[1]The first one, 'National Consultation on Developing Tools for Early Identification of Acute Hunger for Effective Administrative Action', was held on the held on the 13th May 2010 was organized in collaboration with the Office of the Commissioners to the Supreme Court, South Asian Dialogues on Ecological Democracy (SADED), and the Centre for Equity Studies (CES). The second one, 'Tracking Hunger and Malnutrition for Food and Nutritional Security in India- A Policy Consultation', was organized in collaboration with Oxfam India, SADED, CES and Public Health Resource Network (PHRN).

[2] The full report of proceedings of both the consultations are available at http://www.jnu. ac.in/SSS/CSMCH/ceiah.pdf and http://www.jnu.ac.in/SSS/CSMCH/thmfnsi.pdf

Food in the 'planetary boundaries' era

Adithya Pradyumna

Do we eat to live, or live to eat? Food is indeed associated with values. There are also several families that don't have the luxury to ask such "value" based questions.Central to the very notion of what it means to be 'alive', food is deeply engrained as a basic need, and also a source of great pleasure. It is a very important cultural symbol, and the food choices of individuals and communities are a part of their identity(Haverkort and Hiemstra, 1999). Consuming food of one's desire or choice could be seen as an indicator of individual liberties and rights, and people tend to besensitive about comments on food choices.

To reiterate the definition of food security: "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life", cited in (FAO, 2006). The Right to Food campaign in India also highlights the message that there indeed is a "right to food" which is a necessary pre-requisite for the right to life. Here the focus is not just any food, but a combination of food sources that will ensure good health, especially keeping in mind the lack of access to adequate and healthy food among the poor. Famines, which are situations of extreme food scarcity in a region, have been an important concern in several developing countries, and policies have been put into place to address them over the past decades(Dreze et al., 1995). India's Public Distribution System (PDS), which has been present in various forms in India since even before Independence (Regional Office for Asia and the Pacific, n.d.), is responsible to make food accessible to all persons in India. Due to the policy emphasis on "production", absolute scarcity in quantitative terms has become rare in recent times, though problems with equitable distribution continue to exist – as can be seen with very large sections of the population continuing to experience undernutrition (CAM, 2011). The emphasis on production continues also because of the projected and expected increase in world population to cross 9 billion in the next thirty years(Whitmee et al., 2014).

Over the past few decades, there have been significant shifts both in the way we produce food, and what we eat. In simple terms, the production of food has shifted from being labour and farm input intensive to machine and chemical intensive. Concomitantly, there has been a great increase in the proportion of processed foods as part of our diet and a great reduction in the diversity of food sources and types. The same food is being processed in many different ways giving a false impression of diversity (as has been seen with corn in the US(Ferdman, 2015)). The author has conducted several group discussions in the recent past in rural semi-arid areas, and in each of the discussions in every village, the common sentiment is that health has worsened for this generation as compared to the previous one, and the perceived reason for that is the use of chemicals in agriculture(Mhaskar et al., 2016). Indeed, based on the definition of food security, we see that neither is our food safe and nutritious, nor does it facilitate an active and healthy life. More so, there is a simultaneous threat to long term food security through these methods of production and consumption (as will be discussed later).

However, a good proportion of the population, especially in urban areas may be quite happy with food, to the extent that it is of less concern whether the food is "healthy". For instance, even in the recent case of lead contamination in a popular instant noodles brand, several individuals were still keen on eating it and opposed any suggestions of ban (despite the fact that instant noodles are already known to be unhealthy). In some developed countries, government is regulating salt content in foods as a public health measure, and a section of the population feel that it is too paternalistic a stance (from anecdotal evidence, and as can be seen in the comments exchanged in this blog post (Nestle, 2011)). People in urban areas apparently "want" to eat fast food and junk food. Are these situations indicative of an expression of liberty or an addiction?

The planetary boundaries framework

The widely acclaimed and discussed *Planetary Boundaries* framework (Steffen et al., 2015), first published by the Stockholm Resilience Centre in 2009, talks about 9 planetary boundaries which define a safe operating space (in environmental terms) for humanity. The framework lays out key entities and processes which together define the integrity of global and regional ecology, transgressing which would compromise the stability of earth's life-sustaining systems. The boundaries refer to a cumulative burden of degradation of particular key entities or processes – beyond the level of the earth's ability to manage it. Transgressing each of these boundaries can trigger unexpected and exponential changes in the earth's processes and systems. This framework in a way represents the operationalisation of the earlier

postulated Gaia Hypothesis(Lovelock, 1979), which looks at the whole earth and the biospheric processes as a single organism. The framework can be better understood in the context of its relation to food systems, as has been described in the following paragraph.

A closer inspection of the listed planetary boundaries will reveal that most of these (if not all) are associated with food systems. The obvious one may be *land system change*, where forests have been cleared for plantations or for industrial livestock production, as can be seen contemporarily and most dramatically in Indonesia and South America respectively. *Biogeochemical flows*(the cycling of minerals such as nitrogen and phosphorus in the air, water, land and living things) are also most importantly linked with agriculture – with both nitrogen and phosphorus being key components of chemical fertilisers. These fertilisers being washed into waterways are creating havoc in aquatic ecosystems due to algal blooms, a recent example of which has just been seen in Florida, US this summer(Tan, 2016).

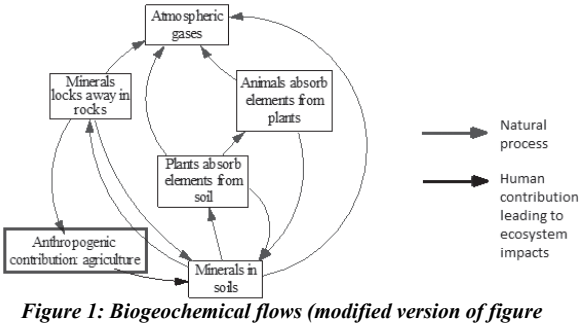

Figure 1: Biogeochemical flows (modified version of figure from © Copyright 2007 www.sciencebitz.com)

Pesticides, used to grow food, and plastics used to pack foodare part of the *novel entities* boundary (related to cumulative global burden and potential impacts of synthetic chemicals, nanomaterials and GMOs), and so far an official "boundary"limit for this particular entity has not been determined due to associated complexities, uncertainties and lack of information. The *biospheric integrity* boundary (measured by species diversityand rate of extinction of species) too is largely associated with food systems (amongst other things) – over-fishing, deforestation, pesticides, and homogenisation of agriculture. Food systems have also been shown to be a key contributor to greenhouse gases, along with burning of fossil fuels(IPCC, 2014). The consequent *climate change* (another boundary), in turn affects several other planetary boundaries, and has been called as the greatest global health challenge of this century (Costello et al., 2009). *Stratospheric ozone depletion*, another planetary boundary, was mainly associated with the use of chlorofluorocarbons in refrigeration, which are central to a globalised and industrial food system.

Based on current assessments, two of these boundaries have already been crossed – *biogeochemical flows (nitrogen and phosphorus)*, and *biosphere integrity* (extinctions/million species a year), and these are very serious concerns. Two other boundaries of land system change and climate change are approaching their respective boundaries.

The health community has responded to the Planetary Boundaries framework with their own "Planetary Health" perspective (Whitmee et al., 2014), the idea being that the health of the planet (which is a key determinant for health of the population) is in jeopardy, and appropriate steps taken at a global and regional level can improve the situation of human and planetary health (for a simple explanation on planetary health, visit the cited infographic on the Lancet website (The Lancet, 2015)). Here, too, we see that the way food is produced and consumed greatly affects population health. The shift to low diversity and processed foods is associated with the so-called lifestyle disease epidemic. Also, the current emphasis on increasing production and decreasing food insecurity employ the same systems and processes that have jeopardised long term food security and planetary health, which comprises car-based lifestyles, supermarkets, obesity, and road traffic accidents (Roberts and Edwards, 2010). A potential win-win situation has been highlighted where chronic disease and environmental degradation can simultaneously be addressed by addressing food systems issues(Whitmee et al., 2014). There is a need for urgent reform, keeping in mind that we are already flirting dangerously with planetary boundaries.

The doughnut model

An Oxfam report has taken the Planetary Boundaries framework one step further (and ironically called it the doughnut model), defining not just the outer boundary, but also an inner boundary concerned with the equitable distribution of sustainably usable resources (Raworth, 2012).

Here, the case of the genetically modified (GM) food sector is instructive. Genetic modification aims at "production" through lab based technology, strategically utilising fears of food insecurity, climate change and pesticides (the latter being products of the

same industry). While many advocates of planetary health take a liberal stand on GM crops (discussing that it should be part of the solution package), the planetary boundaries framework considers them as "novel entities", which is something we cannot easily determine the impact or risk of. While some are of the opinion that it may not be a bad idea to have GM crops in the mix of options, it has been seen from the Bt cotton experience that GM seeds are aggressively propagated (both by industry and government(Newell, 2003)), at the cost of farmers' choices and the lack of availability of traditional varieties for farmers who wanted to revert. So putting GMOs in the mix is not as straightforward as it seems. GM Vitamin-A rich "Golden Rice" has been suggested as a public health measure to eradicate night blindness (Golden Rice Humanitarian Board, 2015). While it may appear attractive to governments (and some humanitarian agencies) which have become accustomed to (or even dependent on) vertical programmes and schemes (ignoring potential long-term negative impacts on livelihood, biodiversity, land and health), efforts towards comprehensively addressing malnutrition by increasing access of all to local and diverse foods (such as the supporting kitchen gardens, making millets available through the PDS, the positive deviance hearth approach and improved sanitation, among other things) would yield multiple benefits of concomitantly addressing various forms of malnutrition and other determinants of health, including livelihood challenges. Poverty, degraded environments, unjust and inappropriate agricultural and economic policies, and lack of information may be the most important reasons for under-nutrition and obesity, and no silver (or golden!) bullet will solve this. The effort should go into reformingfood systems themselves and addressing poverty.

This is part of a growing agro-ecology movement that still has not made adequate headway into policy. As the UN Special Rapporteur on the Right to Food points out "the most pressing issue about reinvestment (in agriculture as seen after the 2008 food price crisis) is not how much, but how"(De Schutter, 2010). Agro-ecological approaches are seen by policymakers and economists as not addressing "production" concerns, but these approaches have been suggested as important complements and even substitutes to industrial agriculture – that the paradigm shift in food systems must be given a chance. A strong political will towards the betterment of small farmers and a right to food approach have been suggested (De Schutter, 2010). Another perception is that "healthy food" is expensive. While there are unfortunate agricultural policies that make healthy alternatives expensive, sometimes these healthy foods are also products of unsustainable practices and food fads. The good thing is that there are local and sustainable alternatives to expensive healthy foods. There is a need for re-examination of food systems, just as increased attention is being paid to health systems.

A transformation of the food systems would appear impossible in the short term, but it is possible in the medium and long term,drawing on existing good practices. Several change agents, many of whom are farmers themselves are showing that high production of healthy and nutritious food can be achieved in ecologically sustainable ways(De Schutter, 2010). Some groups are addressing the large disconnect between producers and consumers, and such efforts are seen to increase respect and income for the farming community, and the health of the consumers. The health sector too has an important role to play – to recognise the planetary health dimensions of nutritional choices, and to identify and promote foods that contribute both to human and planetary health. The choices to be made are not "one-size fits all", and are very context dependent. There is a need for a lot of collective reflection, research and action, especially at the local level. While the close cultural, political and personal associations with food make it a touchy area for discussion, the times have cornered us into entering a discussion on our food and food systems. It is high time we take the next step as a public health community.

Acknowledgements: Thanks to Devaki Nambiar, Dhruv Mankad and R Srivatsan for their editorial inputs.

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A Journey through the MFC Bulletins – a hunger for nutrition, a thirst for justice…

Dhruv Mankad

[A labour of love well beyond the call of duty - Eds.]

Meeting friends - the friends could be new - to explore and debate on a new issue every year – has probably made mfc what it is. Looking through the glasses for quite satiating writings related to Hunger and Nutrition, the mfc bulletins no 1-368, a forty years stretch - shows some interesting features- original and reproduced articles, debates, letters, news, appeals and so on. The topics range from causes of malnutrition – biological, socio-economic and political ones to the effects of these causes. Some articles touch upon the important allied theme – anthropometry and growth charts also. The writers and respondents are quite well known – C. Gopalan, P.V. Sukhatme, David Morley, LeelaVisariya, MaliniKarkal, Prakash Kotecha, Sheila Zurbrigg, Umesh Kapil, Jean Drèze, Angus Deaton and of course, the in-house ones like Kamalaben Jaya Rao, VeenaShatrugna, Abhay Bang, Ashwin Patel, Anil Patel, Sathyamala, Radha Holla, Laxmi Menon and AnantPhadke and several others too, contributing significantly to this theme.

What is surprising is that even though there have been long strides world over on this theme, we are still groping to find solutions. They say that overcoming malnutrition is a generational process…! Hopefully, looking backwards, the next generation is able to take this process forward - toward food security and food safety. Have a look at the list here…

[Please log on to www.mfcindia.org and type the title in the search window to get the article. You may also search date wise under the 'Bulletins' tab on the site.].

SNo	YEAR	MONTH	BULLE--TIN No.	TITLE	AUTHOR
1	1976	April	4	The Myth Of The Protein Gap	Jaya Rao Kamala S
2	1976	May	5	Who Is The Culprit?	Patel Ashwin
3	1976	May	5	The Protein Gap	Shah D.P
4	1976	July	7	Who Is The Culprit?	Jaya Rao Kamala S
5	1976	Aug.	8	Vitamin A Deficiency	Jaya Rao Kamala S
6	1976	Aug.	8	Dairy Research For Whom?	Singh Narendra
7	1976	Sept.	9	Dairy Research For Whom?	Jaya Rao Kamala S
8	1976	Nov.	11	The Baby Killer	Mike Muller
9	1977	Jan.	13	Socio-Economic Aspects Of The Nutrition Problem In India	Jaya Rao Kamala S
10	1977	Feb.	14	How Relevant Are Feeding Programmes	Qadeer Imrana
11	1977	April	16	The Green Revolution For Whom?	Jawlekar Kalpana
12	1977	April	16	How Important Is Birth Weight In Infant Health	Jaya Rao Kamala S
13	1977	July	19	Nutritional Problem In India	Singh Narendra
14	1977	July	19	How Important Is Birth Weight In Infant Health	V.S
15	1977	Sept.	21	How Important Is "Size At Birth"?	Jaya Rao Kamala S
16	1978	Mar.	27	How Not To Try Solving Nutritional Problems?	Singh Narendra
17	1978	Nov.	35	Prayer Of The Hungry	Rendra W.S
18	1979	Mar.	39	Too Much Iron In Milk - a News Clipping	New Scientist
19	1979	June	42	Nutrition In India, Medical Problem: Political Solution	Lele R.D
20	1979	July	43	Nutrition: Medical Problem - Political Solution	Jaya Rao Kamala S
21	1979	July	43	Dear Friend	Patel Anil
22	1979	July	43	Who Are The Real Hungry?	Sukhatme P.V
23	1982	April	76	Nutritional Basis Of Minimum Wages	Gopalan C
24	1982	April	76	From The Editor's Desk	Jaya Rao Kamala S
25	1982	Dec.	84	The Nestle Boycott	Jaya Rao Kamala S
26	1982	Dec.	84	From The Editor's Desk	Jaya Rao Kamala S
27	1982	Dec.	84	International Code Of Marketing Of Breast-Milk-Substitutes	Lucey J.F
28	1982	Dec.	84	The `Infant Formula Controversy' : A Notorious Threat Of Reason In Matter	May Charles D
29	1982	Dec.	84	Breast Versus Bottle-Scientific Evidence	Plank S &Milanesr (Extract)
30	1983	June	90	Weaning Food & Diarrhoea	Medico Friend Circle
31	1983	Aug.	92	World Health Authorities Condemn Industry Practice	Kakitahi J.T
32	1984	Oct.	106	Recommendations On Breast-Feeding Indian Academy Of Paediatrics	
33	1985	June	114	Food In The Hands Of Big Industry	Jaya Rao Kamala S
34	1985	July	115	Blessed Are The Small In Size - If They Are Indians	Jaya Rao Kamala S
35	1985	Nov.	119	KGAT Card For Detection Of Malnutrititon	Kapil Umesh & Gupta M.C

36	1986	Dec.	123	Bill to Restrict Ads on Breast Milk Substitutes	The Times of India, 1986
37	1988	Jan.	136	Sex Differentials In Nutritional Status In A Rural Area Of Gujarat State Part 1	Visaria Leela
38	1988	Feb.	137	Sex Diffrentials In Nutritional Status In A Rural area - Part 2	Visaria Leela
39	1988	Mar	138	Report of the XIV Annual Meet of the MFC on Child Health	
40	1988	July-Aug.	138	Dear Friend: Sex Differentials In Nutritional Status In A Rural Area Of Gujarat State Part 1	Morley David
41	1994	Jan. -Apr	202-205	World Hunger - 12 Myths	Karkal Malini (Abridged by)
41	1998	Sept.-Oct	258-259	Re-thinking Public Health, Food, Hunger & Mortality Decline In Indian ...	Zurbrigg Sheila
42	1998	Nov.-Dec.	260-261	Re-thinking Public Health, Food, Hunger And Mortality Decline In Indian..	Zurbrigg Sheila
43	2001	Sept-Oct	288-289	Body Weights - Role of Nutrition	Veena Shatrugna
44	2001	Nov-Dec.	290-291	Calorie Intake Patterns of Rural Indian Households: Evidence from National Sample Survey Data	Brinda Vishwanathan and J.V. Meenakshi
45	2001	Nov-Dec.	290-291	Biodiversity: the basis of nutritional adequacy and food security	Vanaja Ram Prasad
46	2001	Nov-Dec.	290-291	The politics of food: keeping the other half hungry	Devinder Sharma
47	2001	Nov-Dec.	290-291	Level of Malnutrition and Gender Difference in the prevalence of malnutrition among ICDS Anganwadi	Dr. Prakash V. Kotecha, Dr.Kailesh Bhalani and Dr. Samir J. Shah
48	2001	Nov-Dec.	290-291	Millions in India starving amid bumper harvests	Ranjit Devraj
49	2002	Jan-Feb.	292-293	How Gender Sensitive is the National Nutritional Policy of India? - A View Of The Policy Through The Gender Lens	Shubhada Kanani
50	2002	Jan-Feb.	292-293	Effective Nutrition Education And Communication; Issues and Challenges In Government Health Systems	Dr.Shubhada Kanani
51	2002	Jan-Feb.	292-293	What about the Health of the PreTeens Girl	Vacha Team
52	2002	Jan-Feb.	292-293	Food Security through Public Distribution System	Veena Shatrugna
53	2005	Feb-Mar.	309	A Gender and Rights Approach to Breastfeeding Promotion	Lakshmi Menon and Radha Holla
54	2006	Feb-Mar.	315	Hunger and Health: An Interdisciplinary Dialogue: Joint Statement from a Workshop	
55	2008	Feb-Mar	327-328	People Call Upon GAIN to Leave India and Government of India to Regulate PPPs	
56	2008	Aug-Sept	330	The Hunger Bazaar : Ethical Issues in	Radha Holla and

				Public Private Partnerships in Nutrition and Conflict of Interest	Lakshmi Menon
57	2010	Apr - July	340-341	Letter of Concerned Health Professionals for Biosafety in Food	
58	2010	Apr - July	340-341	Addictive Policies of the Maharashtra Government : Alcohol at the Expense of Food Grain Availability	Sagar Atre
59	2011	Aug	348-350	Food and Nutrition in India: A Public Health Perspective	C Sathyamala
60	2011	Aug11-Jan12	348-350	Response to Sathyamala	Jean Dreze & A Deaton
61	2013	Mar- June	355-356	Unfair, Unscientific Criticism of Nutrition-researchers in India	Anant Phadke
62	2013	Mar- June	355-356	Response to Dr. Anant Phadke	Veena Shatrugna
63	2013	Mar- June	355-356	Further Response on Email from Anant Phadke	Anant Phadke
64	2013	Mar- June	355-356	The Culture, Politics and Economics of Vegetarianism	R. Srivatsan
65	2013	July 13-Feb 14	357-360	A Snapshot of Health and Nutrition of the Ageing/Elderly Poor Public Health Resource Network and Pension Parishad	

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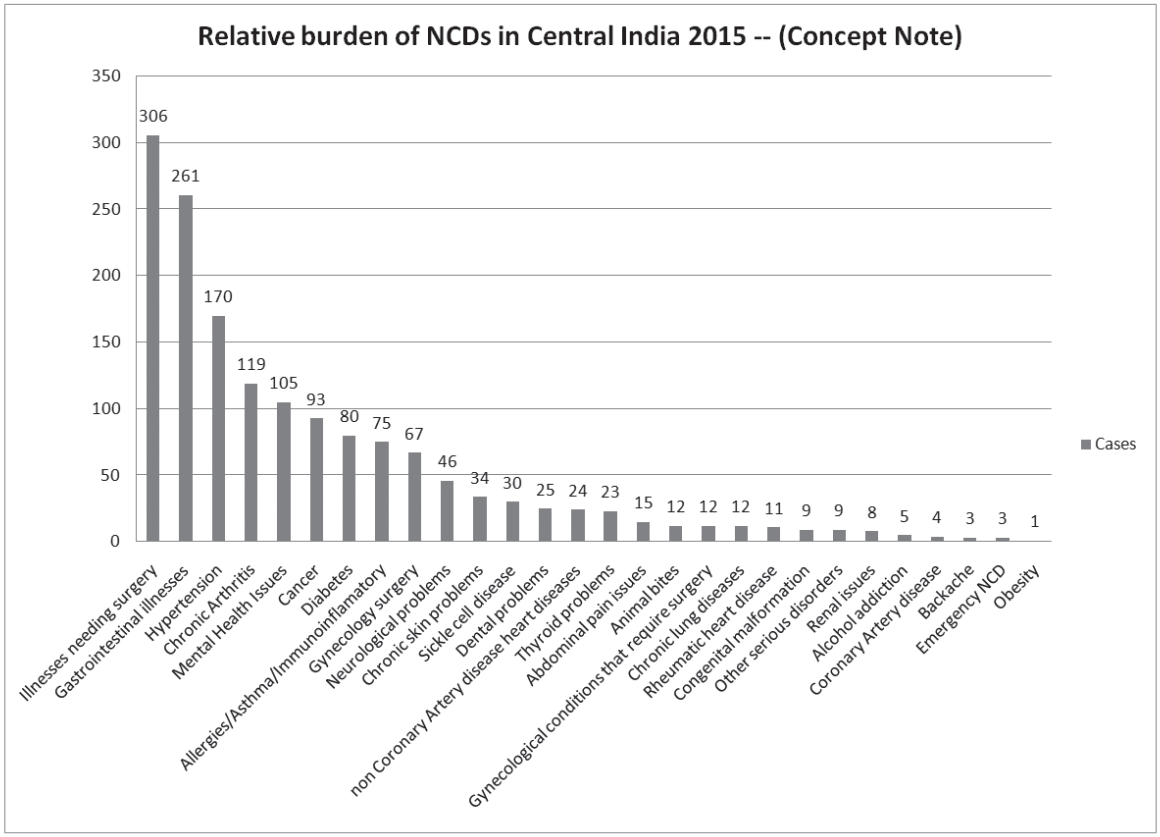

Concept note for MAM 2016:

Addressing non-communicable diseases among the poorest in the current health care scenario

Yogesh Jain

The definition, nominal confusion

The phrase "non-communicable diseases" (NCDs) is a negative termfor a heterogeneous group of illnesses that are not transmitted from one to the other through infectious organisms. Most of these illnesses develop over a long period, months if not years, many affected people go around without any symptoms and most people require treatment for several years if not life-long. Thus most of the NCDs are chronic illnesses.If we add the management of tuberculosis, HIV and leprosy among the infectious illnesses to these NCDs, most chronic illnesses would be covered.

However as Anurag had so eloquently elaborated in an earlier communication in the MFC, these binaries of acute vs chronic or communicable vs non communicable are neither perfect nor always valid, and thus we should accept the conventional division of human ailments into broad categories such as maternal and child health problems, infectious illnesses, NCDs and injuries only as loose groups with some overlap.

The term NCDs is only 30 odd years old. When this was coined, the implication of grouping these illnesses together was first that these illnesses were results of risk factors that operated at an individual level (like tobacco use or sedentary lifestyle) rather than at community level (like dearth of supply of safe drinking water, or failure of mosquito-control). Second, it was assumed for some reasons, that these were somehow not related to deprivation, but perhaps to an excess or imbalance, and thus were not related to poverty. Not sure why this came up - but this may be because the first four risk factors postulated for these NCDs were excess of bodyweight, blood glucose, body lipids or blood pressure. And these risk factors were seemingly opposed to conventional risk factors such as undernourishment, insanitation, crowding leading to infections such as diarrhoea, pneumonia and tuberculosis. All of these were conventionally seen more among the poor, as well as the maternal and child health problems which too were more common in the poor or those who had poor health systems to support them.

How these associations of NCD with affluence or deprivation evolved over last 30 years is an interesting and telling story. It is likely that this was caused by observation of large enough, possibly higher number of those conventional NCDs among the affluent than made by those health workers who worked among poor communities. Or it may have been observed even in organised surveys of Burden of Disease in certain populations that showed equal or almost equal prevalence of NCDs across the socioeconomic gradient. However, we still need to settle this question of the distribution of the burden of NCDs across the socioeconomic gradient better. We have grown up with the dictum that 'illnesses are biological embodiments of deprivation'. However,during the last 50 years or so probably a deeper socio-economic causation is at work because of which there is epidemic of 'modern diseases' among both the poor and the non-poor. On one hand there is deprivation, under-consumption among the unorganised toilers whereas there is overconsumption and disease-prone life-style among the middle-class and the rich, but which has also spread to the working class. This new epidemic arises out of model of socio-economic development which is based on production for the sake of production to cater to the profit hungry corporations leading to a glut of consumer goods on one hand; on the other hand it gives rise to a population which, as a response to the alienated and stressful life at workplace, and cut-throat competition in the race to earn more money, finds solace in excess consumption at home by becoming an easy prey to the advertising and other gimmicks of these same corporations.For the unorganised toilers, the poor, the same profit hungry and senseless productive system implies on one hand deprivation from healthy food, working and living environmental conditions, long working hours, and on the other hand indulgence in cheap unhealthy food, addictive substances as a response to alienation and boredom at workplace and by becoming prey to the marketing gimmicks of the giant corporations.In India, the unorganised toilers, the poor suffer from double burden of diseases - it suffers from traditional diseases of infections and undernourishment born out of lack of development, deprivation as well from the new epidemic born out of mal-development.

Burden and pattern of NCDs

The confusion about this relative distribution may have appeared because of this clubbing of disparate illnesses. We need to unpack these illnesses to see their individual association with deprivation or otherwise. The big 4 NCDs are themselves large groups such as 1. Diabetes, 2.Cardiovascular diseases, 3.Chronic lung diseases and 4.Cancers. These are supposed to account for over 80% of all NCDs in the world. Diabetes is a heterogeneous illness umbrella under which comes type 1 diabetes which has a low and almost constant rate across populations, and type 2, which is associated

with obesity and insulin resistance in over 80% in the Western Hemisphere, and there is a large not- easily-classifiable group of diabetes patients who have associated undernutrition and occur among very poor people in Asia and Africa. And information about their burden is patchy, as information from poor areas of the world suffers disproportionately from lack of completeness. Similarly, heart diseases are a rather heterogeneous group of illnesses. Some researchers based in the west, and in urban and peri-urban areas of poor countries such as India have mistakenly drawn generalisations from their small studies that over 75% of the heart diseases are of coronary artery and atherosclerosis related. Since data from poor areas are patchy and often not of very good quality, contrary observations on cardiovascular disease profile don't seem to affect sweeping generalization such as that most cardiac disease burden all over the world is of ischemic origin. There are some data sets that show that only as few as 20% of heart diseases in, say central Indian and sub Saharan African villages are of coronary artery disease origin and rheumatic diseases still account for over 40% of all heart diseases. Third, cancers could be infection related such as those of uterine cervix in women and many lymphomas and others may be related to use of tobacco or other toxins, exposure to which is often more in the poor. Thus relative distribution of cancers also needs to be unpacked for differential distribution among different socioeconomic classes too. Finally, chronic lung diseases could be obstructive most commonly related to tobacco smoke or indoor air pollution (likely to be more common among the poor) and post infectious such as destroyed after a bad tuberculosis or bronchiectasis after a bad pneumonia or after silica dust exposure. All these are likely to be more common in the poorer income quintiles.

We need to also question whether in developing countries, these big 4 NCDs really do account for the majority of all NCDs (over 80%). We see a large spectrum of problems such mental health problems, chronic arthritis, blood disorders especially hemoglobinopathies, chronic skin disorders, epilepsy (two thirds of these presently go untreated) and strokes, illnesses that require surgery for its treatment and many others that produce a heady mix of these illnesses, so much so that it becomes almost immoral to make the earlier statement that NCDs afflict the affluent alone.

In a small study of looking at the diagnosis of all new patients who presented to the outpatients at JSS hospital in Central India, we found that NCDs constituted 57 % of all diagnosis, and a very wide spectrum of illnesses within the NCD basket(see figure 1). We need to document the pattern of these NCDs among the poor communities. Our attempt to get state level data in CG has presently met with disappointment as the data is so incomplete as to make no sense. And ditto at the national level. And we know that since many of these illnesses have a significant proportion of asymptomatic people, a true estimate of the burden depends heavily on good screening methods as well as on well-functioning and responsive- to-the-needs health systems which can enthuse people to access them for care.

In some African countries, where such burden of disease documentation is being attempted, they call it the long tail of NCDs, implying that diseasesother than the big 4 NCDs are of several types even though they are about 30% of the total NCDs. These diseases there include entities such as rheumatic heart disease and cardiomyopathies, Burkitt's lymphoma and cervical cancer, asthma and bronchiectasis, type 1 and malnutrition-associated diabetes, appendicitis and peptic ulcer disease, hemoglobinopathies, post-infectious glomerulonephritis, epilepsy and suicide, burns and drowning. This data seems incomplete, and we have to wait and watch whether the tail will wag the dog or the other way around.

The phenotypes of illnesses such as diabetes, hypertension and its complications, chronic arthritis or mental health illnesses need to be studied as it is seen in the poor communities. It is highly likely that these phenotypes and outcomes are likely to be different in the poor due to deprivation. And that needs to be taken cognisance of in any planning of health systems for the poor communities. We need to study the pattern of heart disease in the marginalised communities. Similarly, we need to study the outcomes of epilepsy among the poor.

Simultaneous with the delineation of the burden and pattern of illnesses, we need to study the risk factors that result in these illnesses. As pointed out in an earlier communication presented at the last mid annual meet of the MFC 2015, the proportion of adverse cardiovascular events accounted for by conventional risk factors such as dyslipidemia, hypertension, diabetes, strong family history and smoking was only about 50% even thoughthe '*Interheart*' study suggested that traditional risk factors accounted for ~90% of MI risk . A closer look suggests that psychosocial factors (stress? poverty?) accounted for an Odds Ratio of 2.67 and a Population Attributable Risk of 32.5%, almost the same as that of smoking.

We need to go beyond individual risk factors and explore the social-cultural structures which have arisen which have led to the high prevalence of these risk-factors. Atomization, dearth of community life, paucity of social mechanisms for sharing of stress arising out of economicand social insecurity etc. need to be explored.

> Disease causality operates at three levels – cellular/biophysical, socio-cultural and economico-political and hence the remedy will also be at three levels. *Disease-causality at cellular/biophysical level*(pathogenic germs or chemical-derangements -deficiency or excess of certain biochemical etc. etc.) is addressed by the science of clinical medicine. *Disease-causality at social level* (deficient sanitation/water supply at community level or wide-spread alcoholism or unsafe transport conditions or sedentary, stressful life-styleat social, community level etc. etc.) will addressed by the science of epidemiology and community medicine. For example, it explains why in a community so many people get diarrheas or get alcoholic cirrhosis or get fatal head injuries; something which cannot be explained by clinical medicine. *Disease-causality at economico-political level*(capitalist path of development, especially its monopoly phase which generates pathogenic model of development, or the paradigm of growth for the sake of growth in degenerated state socialism) is explained by economic-political analysis. It explains why social pathology continues to reproduce itself, something which cannot be explained by epidemiology[1].

How do we limit potential risk factors such as those mentioned above as the only cardiovascular risk factors to be considered? How does one start increasing the pool of risk factors such as say chronic stress, or income poverty, or lower birth weights, or not having enough food, or just extreme sadness due to an event? I wonder whether people have proved that oral tobacco use is NOT a CV risk factor.I think we need to unbundle the word 'chronic stress', but at no rate should we dismiss it as being unimportant. . It is well known that even the biochemistry of stress is very different in responses to diverse physically/ pathologically/socially/economically/politically stressful situations. Hence different NCDs may respond very differently to different kinds of stress. We need to have careful studies that study association with less known or unproved risk factors of these NCDs.

When there is adequate evidence based preventive measures and strategies to minimise morbidity as well as case management technologies, non implementation of those steps must be highlighted and force the policy planners and implementers to take remedial measures. For example in Silicosis, stopping dry pulverization of rocks and mined pellets, installing motors and dripping sets for wet processes, setting up of dust enclosures, exhaust ventilation for closed buildings and yards, ensuring free distribution and wearing of personal protection masks and respirators, compulsory periodical check-ups for workers and medical treatment of affected workers etc has to be enforced strictly by the owners of mining sites and factories. Similarly in Fluorosis, the responsibility of department of rural water supply and drinking water mission in mitigating the chronic suffering of poor must be reinforced periodically.

While there is government sponsored behaviour change campaign for reduction of stress, promotion of physical exercise, avoidance of tobacco, alcohol etc, there exists, hypocritical government involvement of generating revenue through licensing of production and sale of alcohol.

We need to even look at the risk factors that affect outcomes too. For example, even for a genetic illness like Sickle cell disease, the outcomes in the tribals is poorer than among those who come in the OBC(lower and middling classes in India) group. *Like in other illness groups, it is not the biological agent causing the disease that is most important; the host characteristics are the ones that determine the severity and the outcomes most.* And I think this operates in the NCDs too. *In perhaps no other illness group do the quality of the public health systems affect the outcomes and course of illnesses as in NCDs.*

The quality of service delivery in public health systems is tested more in the secondary and tertiary management of complications of NCDs. Management of congestive and ischemic failure in congenital or rheumatic heart disease, corpulmonale, stroke complications, repeated dialysis for chronic renal failure, haemolytic crisis in Sickle cell, complications of haemophilia etc needs best use of technologies for repeated episodes for long periods. Quality drugs and diagnostics and strict adherence to evidence based management protocols are a must in public health institutions.

How to address NCDs

Drugs and hospitals are important components of management at an individual level, particularly if someone presents with an acute complication.

We are aware that for acute and/or severe presentations of any illnesses, communicable or non-communicable: a hospital is justifiably important, and if the management strategy could be communitized, it could go to a health worker too outside of a hospital. For example, for an acute illness like falciparum malaria, we are looking towards an ASHA to perform a rapid kit test and administer prompt treatment, or to prevent serious haemorrhage after birth, she is being expected to offer the woman 3 tablets of misoprostol. Other examples are of home based care of a newborn, or Integrated Management of Childhood Illnesses.

But for chronic/continuous illnesses, there are only some models available at a large scale,like delivery of blister packs for leprosy and tuberculosis drugs or DOTS. Similar strategies for depression, epilepsy and

other mental illnesses could be explored. Hospitals are inadequate for their optimal care. City NCD clinics are an option only for cities.The usual duration of dispensing of medicines in rural public health facilities is still for a few days. How do we keep people motivated to continue medications for years?

What can work for NCDs? Frankly we need good answers for the right delivery platforms. More than in MCH and infectious disease care, we need well-functioning health systems for care of NCDs. These health systems have to provide comprehensive, affordable and appropriate care, have good data recording systems and surveillance systems and have to be sufficiently comunitised to reach the underserved. Supportive supervision for all community functionaries has to be built in upfront.

Further, we need new ways too. We have to learn from the models of disease based patient groups, like the way PLHIV have done or AA have done. At JSS, we have attempted some such work over the last two years, and our early results are promising. Similarly, in rural Rwanda and Mozambique formation of disease patient groups and use of trained mid-level health workers have been strategies to address these. The community based palliative care model for cancer, stroke and severely disabled persons in Kerala is worth expanding in other states. Many gram panchayats and local self-governments in Kerala have owned up and find resources for their palliative care programme and run it successfully with minimal required technical back up from specialists. But a lot more needs to be done. The point is – we desperately need effective models for managing chronic diseases, not just preventive strategies.

This is not to say that we don't need preventive strategies to address risk factors. Controlling intake of salt and sugar is important. We need to also see the impact of our public distribution systems on causing imbalance of food constituents, such as making our diets even more predominant on cereals and their carbohydrates with very little pulses, oilseeds and animal foods, and institute remedial measures. If birth weights determine occurrence of adult illnesses decades later, there is merit in instituting measures during pregnancy and pre pregnancy periods as preventive measures. Once we know the contribution of chronic stress in causation of NCDS, how to handle chronic stress is a challenge that we will have to confront.

Given the fact that health care priorities compete for finances with champions of each set of illnesses pitching in for their select priorities, the best way still would be universal health coverage. In the absence of that, good quality data should allow countries and provinces within countries to prioritise which set of illnesses to focus on.

In late 2015, The Lancet has set up a commission to address the problems of NCDs in the poorest billion in the world,the largest proportion of them are in India and selected sub-Saharan African countries. Essentially as an academic coalition, the concerns they plan to address include settling the burden and pattern of NCDs among the poor as opposed to the non- poor, and then to suggest best delivery platforms, and to make a case for correct financing of NCDs focusing on the concerns of the poorest. They would like to learn majorly and specifically from the Indian context. It is highly likely that the commission's meeting is organised in tandem with the MFC's annual meeting. And we could contribute to and learn from the proceedings in the lancet commission.

With this backgrounder, we need to get papers on the following

1. Burden of the NCDs among the communities in which the majority are poor. Or data analysis in which burden of diseases is disaggregated according to the socioeconomic status. Large population data is definitely valuable, but so would be rich case studies.
2. Phenotype of the NCDs as seen among the poor people - of diabetes, of heart disease, or mental health disorders, or cancers, or lung disorders
3. Any study of risk factors associated with NCDs of the poor, at all three levels- cellular/biophysical, social or politico-economic.
4. We need grass-root level experiential papers on how the NCDs have evolved over time along with modes of production changing and with levels of physical work changing over time, and with the imbalance in our foods happening due to the Public distribution schemes etc.
5. Successful models of chronic disease care provision - either micro models or better, larger models
6. Efforts at prevention of chronic diseases - successful efforts within the country or elsewhere.
7. The politics of NCDs and care programmes for them.

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[1] *Comments made by AnantPhadke , on the circulated draft concept note, May 2016.*

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	Indian Rs			US $	
Membership type	Individual (online)	Individual (Hard copy)	Institutional (Hard copy)	Asia (online)	Rest of the world (online)
Annual	100	300	500	20	20

The Medico Friend Circle bulletin is the official publication of the MFC, Both the organisation and the Bulletin are funded solely through membership/subscription fees and individual donations.

In addition to these subscriptions above, we will need to raise Rs 12,000 per year as donations to subsidize the full expenses of generating three issues of the bulletin per year.

Cheques/ money orders/DDs payable at Pune, to be sent in favour of Medico Friend Circle, addressed to Manisha Gupte, 11 Archana Apartments, 163 Solapur Road, Hadapsar, Pune - 411028. (Please add Rs.15/- for outstation cheques). email: masum@vsnl.com

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MFC website: www.mfcindia.org

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Edited and Published by R Srivatsan and Sunil Kaul for Medico Friend Circle, 11 Archana Apartments, 163, Solapur Road, Hadapsar, Pune 411028.

Views and opinions expressed in the bulletin are those of the authors and not necessarily of the MFC.

Manuscripts may be sent by email or by post to the Editor at the Editorial Office address.

MEDICO FRIEND CIRCLE BULLETIN PRINTED MATTER –PERIODICAL

Registration Number: RN 278565/76

If undelivered return to Editor c/o Anveshi, 2-2-18/2/A Durgabai Deshmukh Colony, Amberpet, Hyderabad 500013.