DUAL NUTRITION BURDEN IN INDIA – DETERMINANTS , DIMENSIONS & IMPLICATIONS FOR NCD

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WHAT IS DUAL NUTRITION BURDEN

Developing countries are currently undergoing economic, social, demographic, health and nutrition transitions.

The term dual nutrition burden was coined in the 1990s to denote the phase of ongoing nutrition transition in low and middle income countries, characterized by persistent under-nutrition mainly among poorer segments of population and emerging problem of over-nutrition seen mostly among the urban affluent segments.

DUAL NUTRITION BURDEN IN INDIA

During last two decades, Indian scientists have been in the forefront of global efforts exploring epidemiological, clinical and biochemical dimensions and health implications of dual nutrition burden.

These studies have defined :

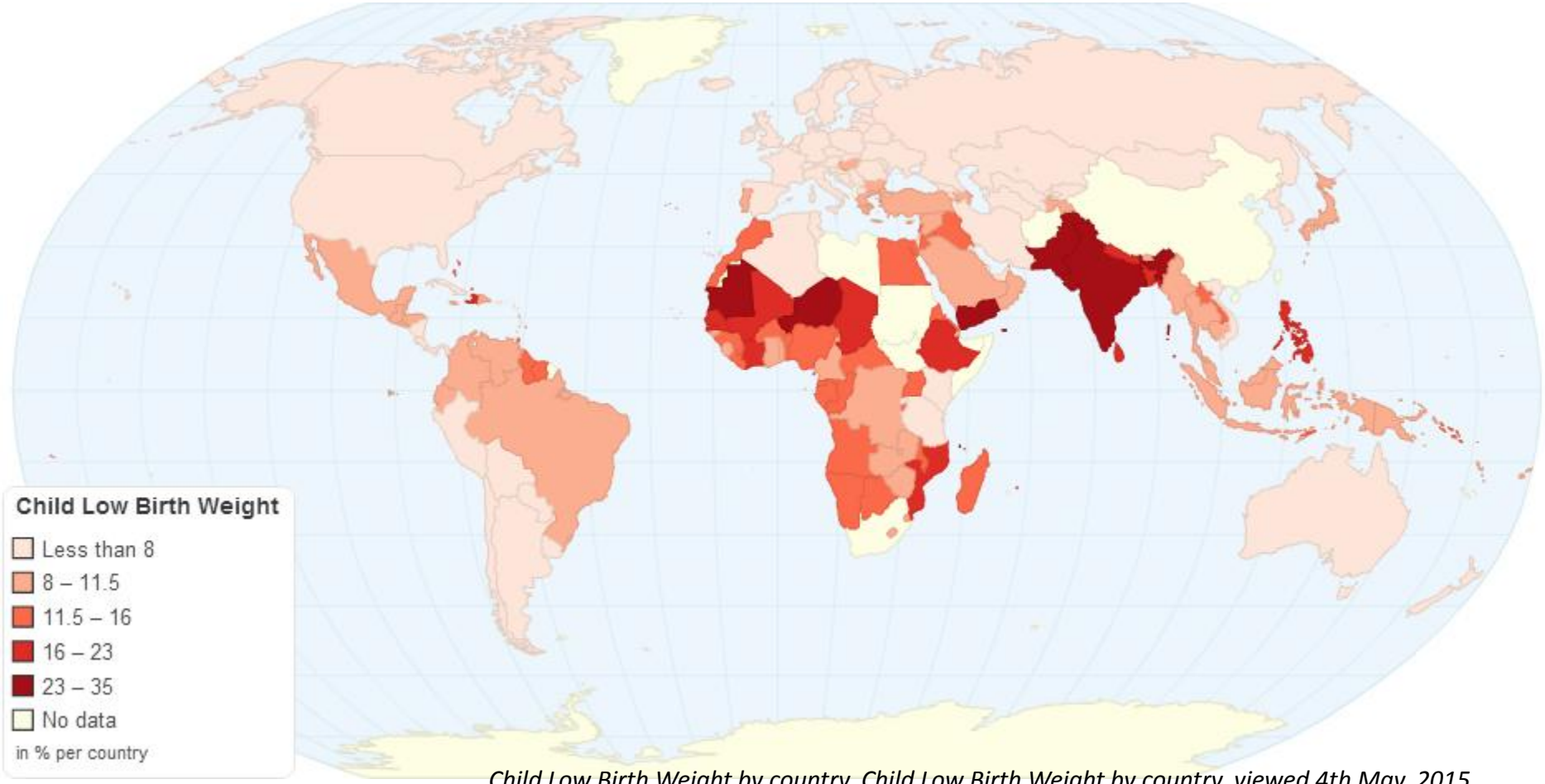
- determinants of dual nutrition burden
- magnitude of dual nutrition burden
- Documented impact of dual nutrition burden on risk of NCD

This presentation will review the Indian data on

- **determinants of dual nutrition burden**
- **dimensions of dual nutrition burden**
- **Under-nutrition and risk of morbidity & mortality**
- **dual nutrition burden and risk of NCD**

DIMENSIONS OF DUAL NUTRITION BURDEN

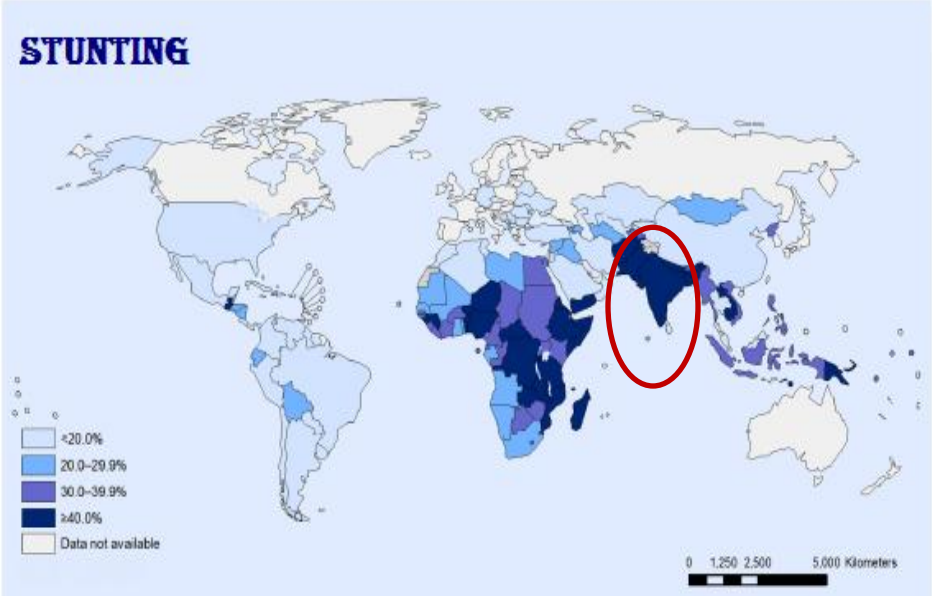
LOW BIRTH WEIGHT RATES IN INDIA

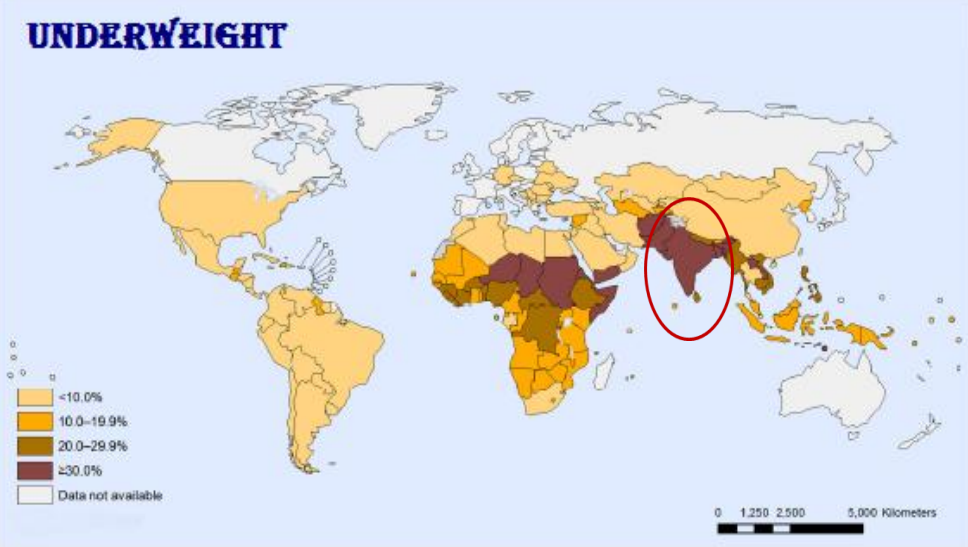


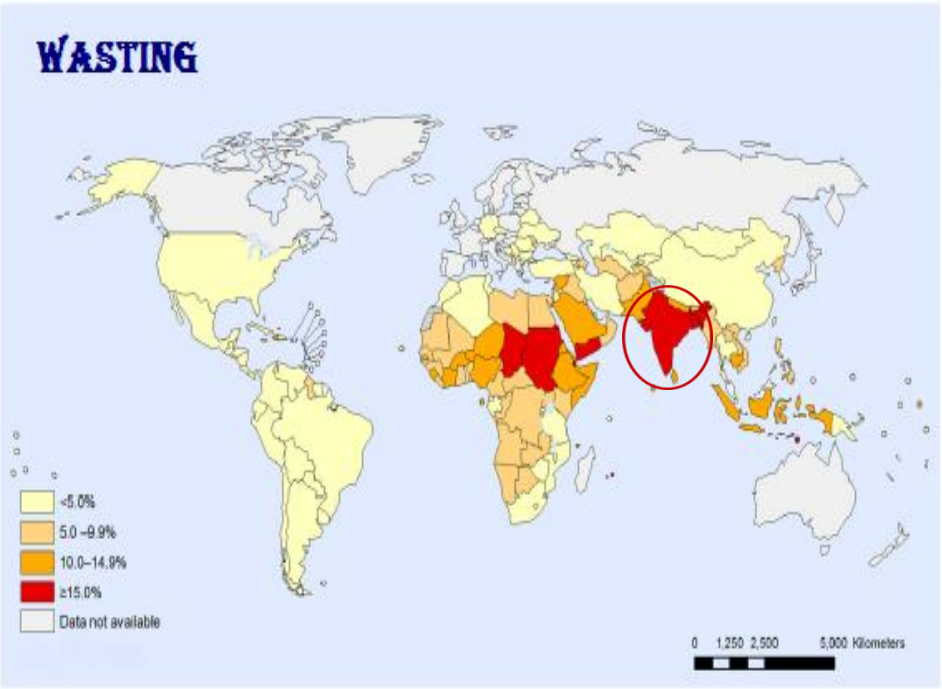
Child Low Birth Weight by country, Child Low Birth Weight by country, viewed 4th May, 2015, <http://data.unicef.org/nutrition/low-birthweight>. & http://data.unicef.org/wp-content/uploads/2015/12/low_birthweight_from_EY_107.pdf accessed 05.07.15 book is written in Dec 2004 "LOW BIRTHWEIGHT COUNTRY, REGIONAL AND GLOBAL ESTIMATES"

Low birth weight rates in India are the highest in the world.
India is the home of the largest number of low birth-weight neonates

UNDER-NUTRITION RATES IN PRESCHOOL CHILDREN

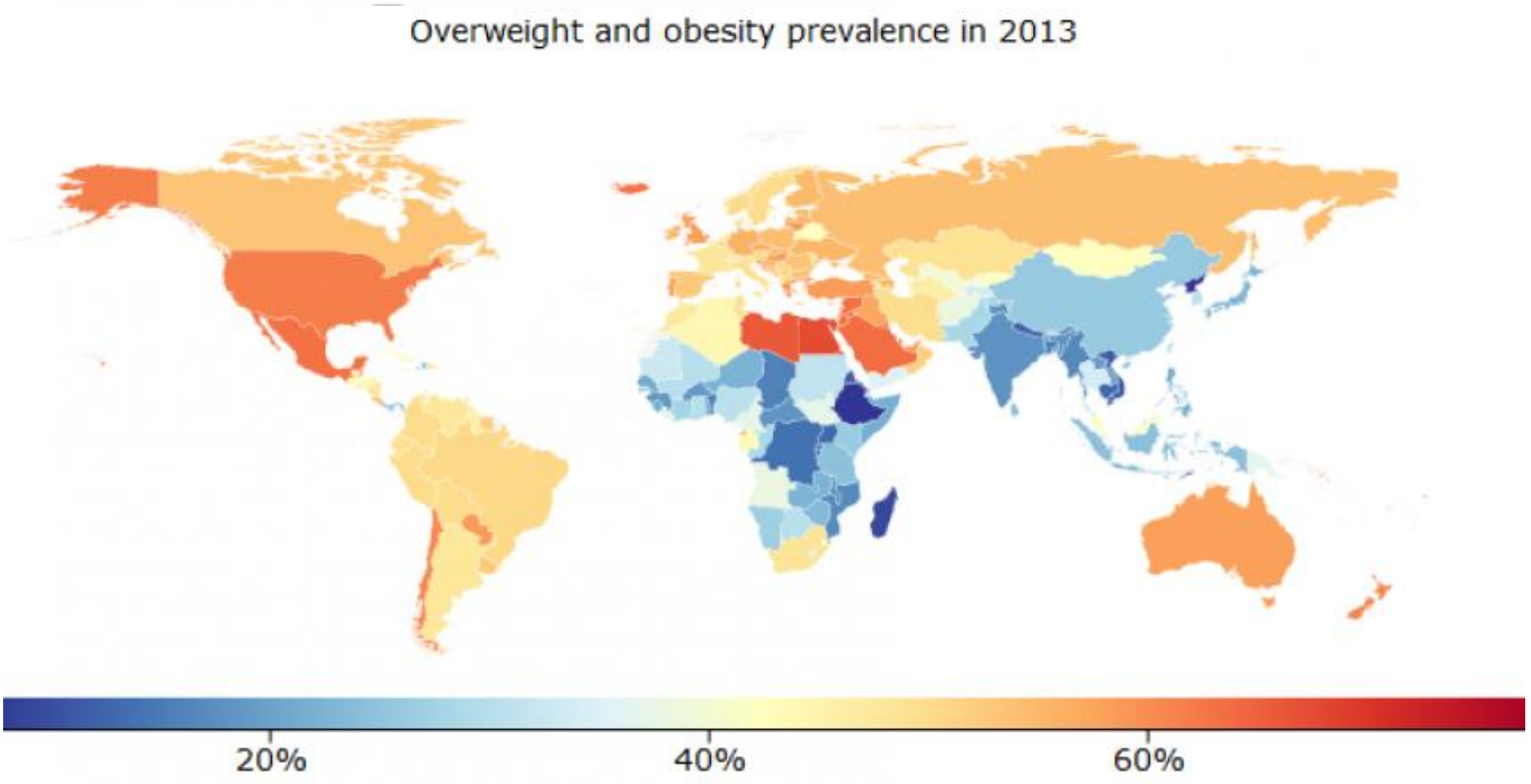






Stunting, underweight and wasting rates in Indian pre-school children are among the highest in the world.

India has the largest number of undernourished children and adults in the world

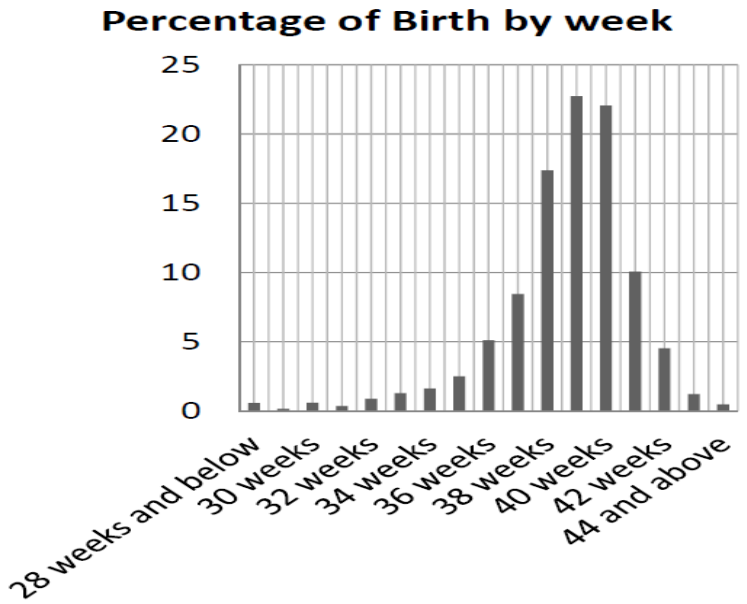


Prevalence of over-nutrition in India is relatively low

But in terms of numbers, India is projected to have the largest number of over-nourished children, adolescents and adults all of whom will be at higher risk of NCDs

DETERMINANTS OF DUAL NUTRITION BURDEN

LOW BIRTHWEIGHT AND UNDERNUTRITION



Mean Weight for Each Week of Gestation

Gestational age (weeks)	Number of observations	Mean weight (gm)	S.D
28 and below	29	922	282.0
29	8	1,117	234.3
30	30	1,326	279.1
31	18	1,499	417.2
32	45	1,608	314.0
33	65	1,941	562.9
34	82	2,052	616.9
35	126	2,205	620.1
36	257	2,421	553.3
37	425	2,691	464.5
38	874	2,760	442.8
39	1,143	2,843	432.4
40	1,110	2,895	460.3
41	506	2,911	459.7
42	228	2,927	440.8
43	61	3,000	379.7
44 and above	24	2,780	411.3

- *Ref: Ghosh,. Bhargava, et al; Pediatrics,Vol. 47,No. 5.May 1971*

One third of Indian neonates weigh less than 2.5 at birth

Low parental height , low maternal weight gain in pregnancy and anaemia are major factors responsible for high low birth weight rates

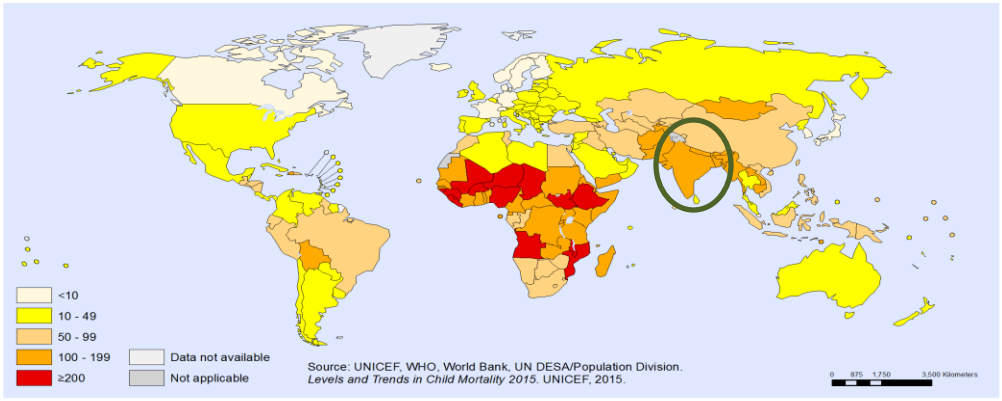
Major concern about low birthweight was because LBW had higher mortality

Dr Ghosh from Delhi showed that mature but small Indian neonate survives if provided essential neonatal care

Only those weighing below 2kg or preterm or ill need admission in ICU.

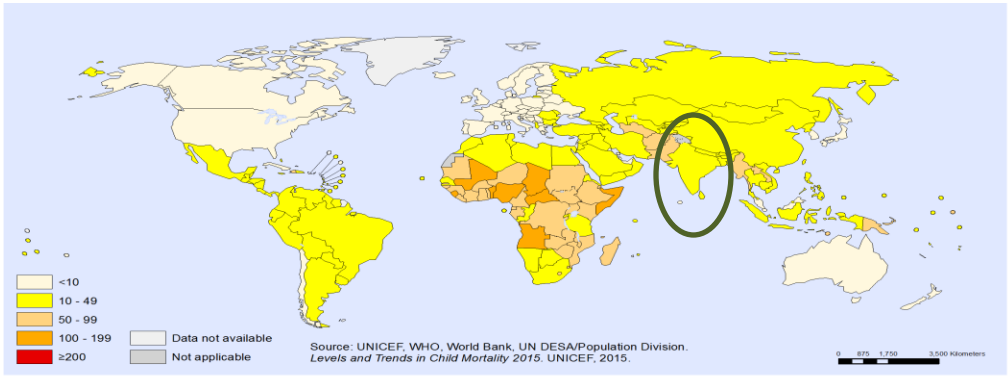
SOUTH ASIAN ENIGMA

UNDER FIVE MORTALITY 1990



Data Source: World Health Organization
Map Production: Health Statistics and Information Systems (HSI)
World Health Organization

UNDER FIVE MORTALITY 2015



Data Source: World Health Organization
Map Production: Health Statistics and Information Systems (HSI)
World Health Organization

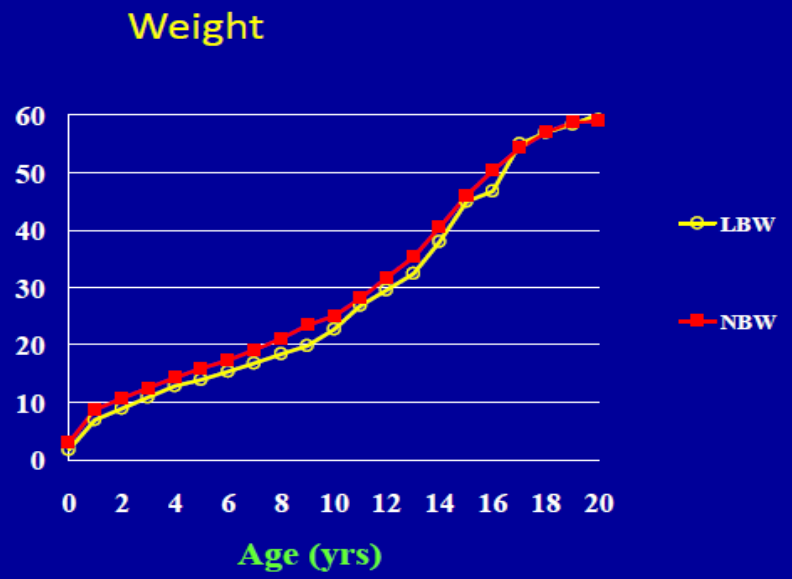
India followed these recommendations in providing intensive care to neonates.

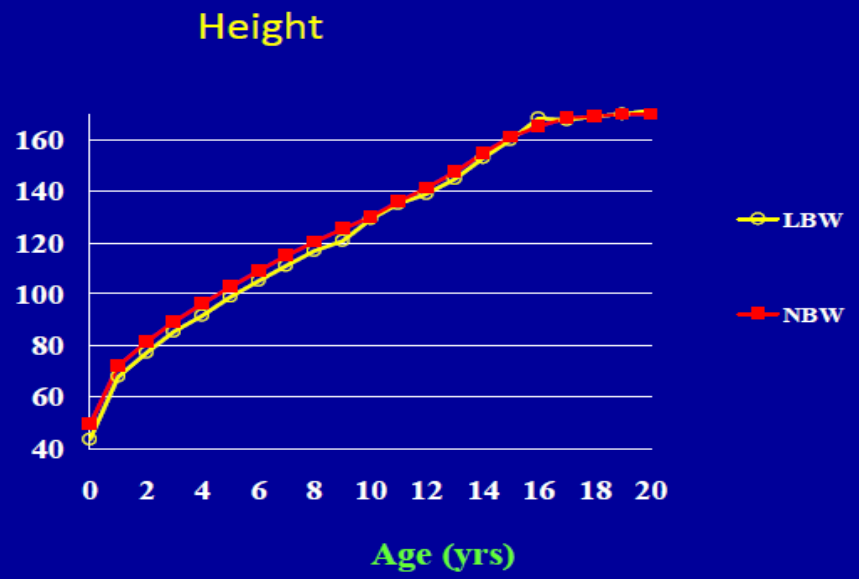
Despite high LBW rates (30%) and under-nutrition rates (>40%) NNMR, IMR and U5MR in India both in 1990 and in 2015 are comparable to other countries

India nearly achieved the MDG target for U5 MR though it could not bring about reduction in low birth-weight rates

These small children grow along a lower trajectory, and are mis-classified as undernourished

Linear Body Growth NDBC Birth Cohort Normal & Low Birth Weight Birth -20 years





Low birth weight children grow along a lower trajectory as compared to neonates with normal birth-weight

The shorter children with lower weight (as compared to WHO standards) are classified as stunted and under weight though they grow along the trajectory appropriate for their birth weight and length

WHO MGRS - USE OF BMI FOR ASSESSING NUTRITIONAL STATUS IN CHILDREN

When under-nutrition was the major nutritional problem in children, underweight and stunting rates were used to assess prevalence of under-nutrition

With the emergence of dual nutrition burden, countries where stunting was common reported that some stunted and underweight children were overweight for their height. Some of them had risk factors associated with cardiovascular diseases

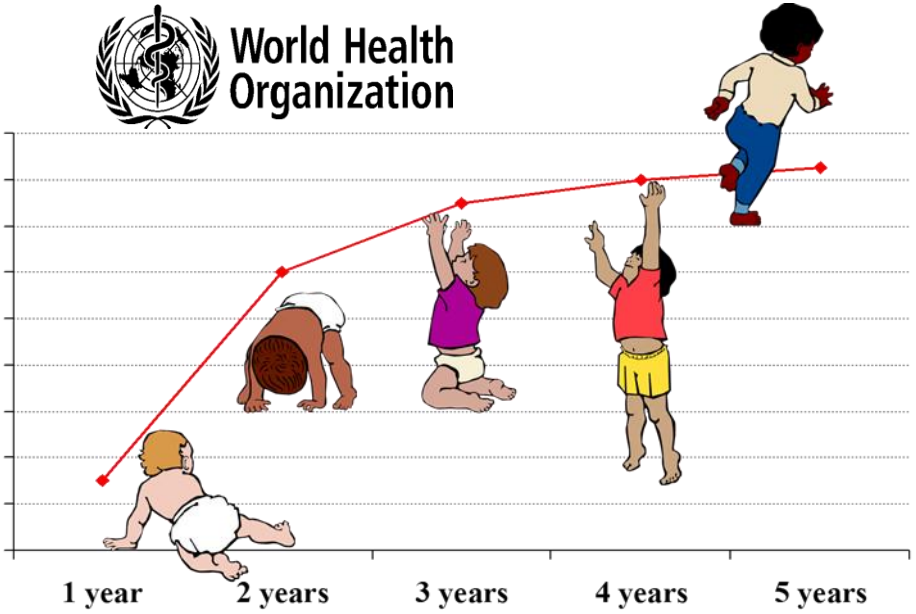
In adults BMI has been used as the parameter for assessing both under- and over-nutrition

In children BMI varies with age and because of lack of standards BMI-for-age was not used for assessing nutritional status in children

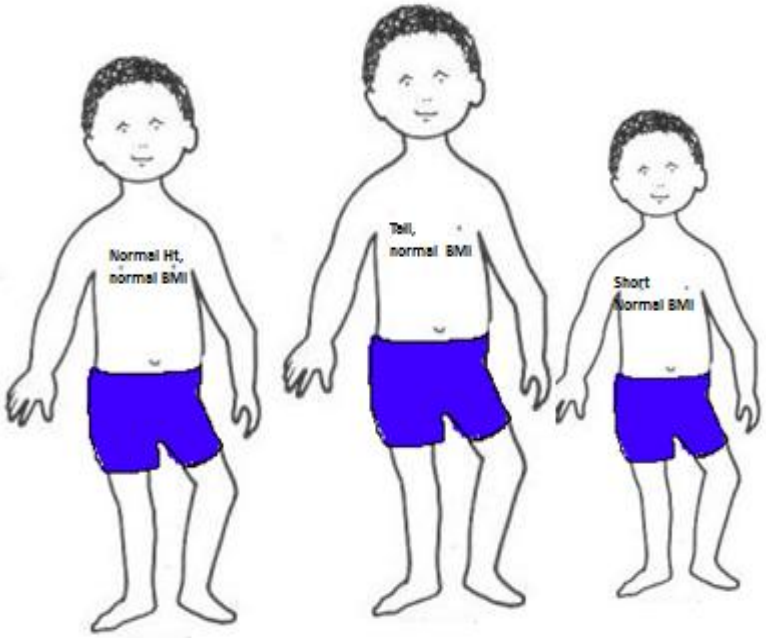
WHO developed the standards for BMI-for-age in under-five (WHO - MGRS 2006) and 5-18 years (WHO - anthro) and recommended that these should be used to assess both under- and over-nutrition in children.

India has been using BMI for age also for assessment of nutritional status

WHO Child Growth Standards 2006

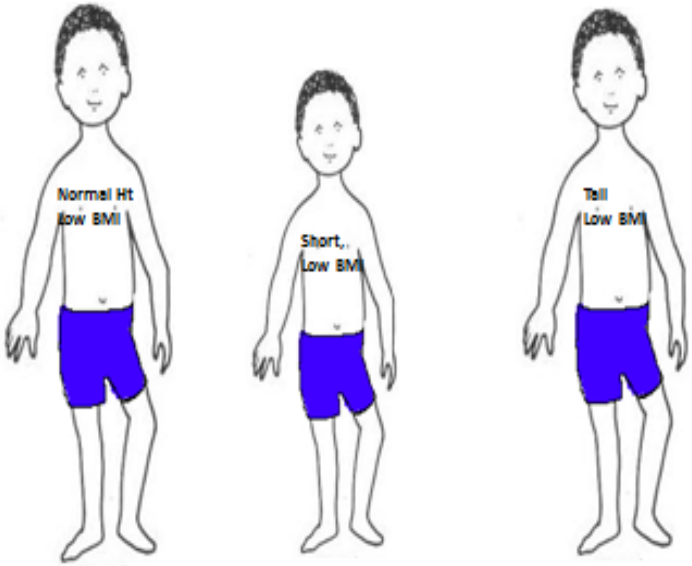


Children with normal BMI can be normal in height , tall or short.
Children with normal BMI do not require nutritional interventions

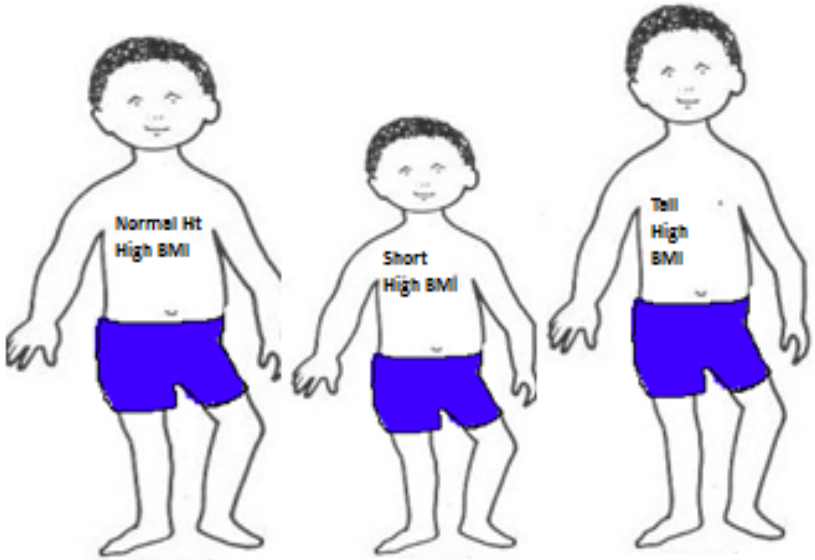


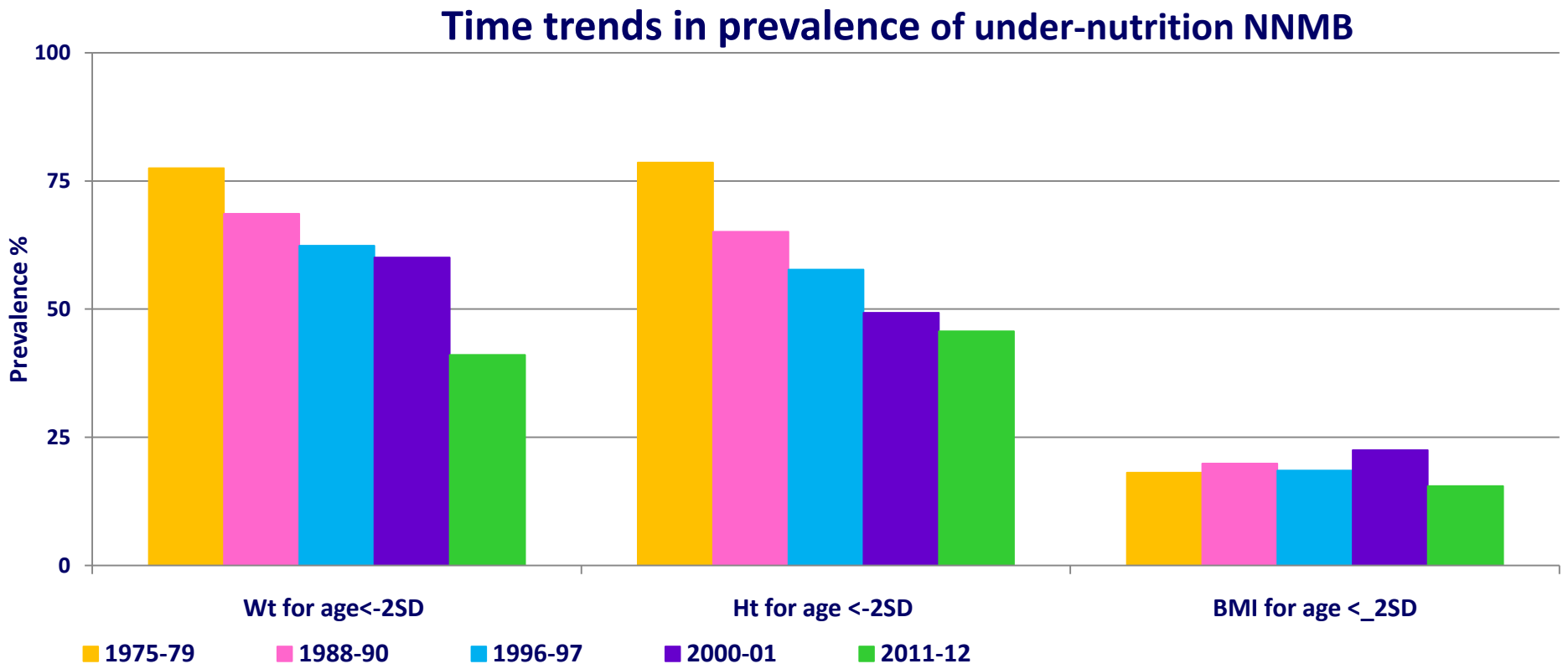
Children with low BMI can have normal height , be tall or short .

They all require additional energy intake to ensure linear growth



Children with high BMI can have normal height, be tall or short.
They all require adequate physical activity to reach normal BMI





There has been a slow(1%/yr) but steady decline in under nutrition pre-school children, but even now over 40% have low weight and height for age.

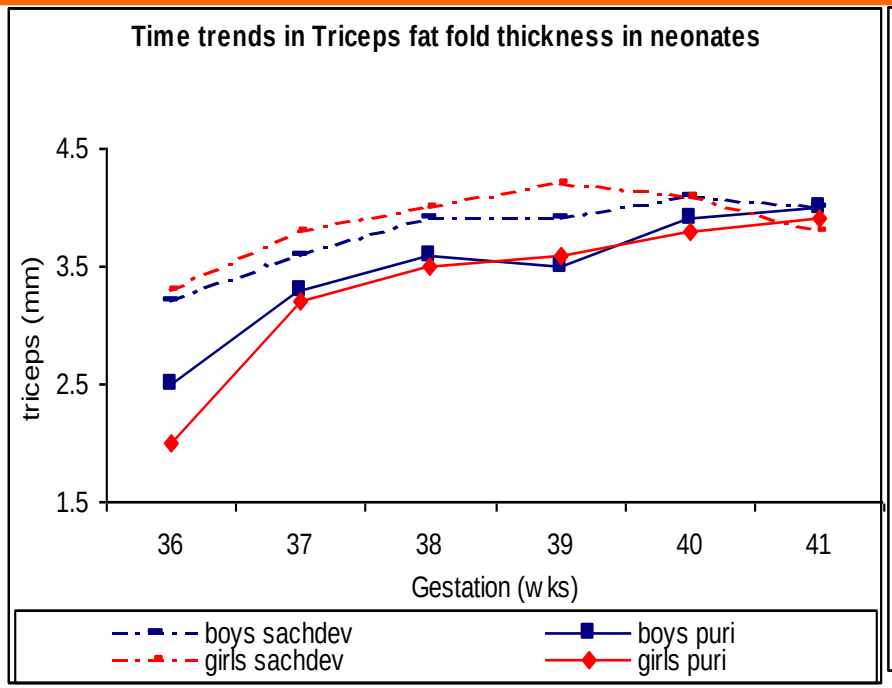
In India most households are food secure. Lower birth-weight and consequent lower trajectory of growth are responsible for the high stunting and underweight rates.

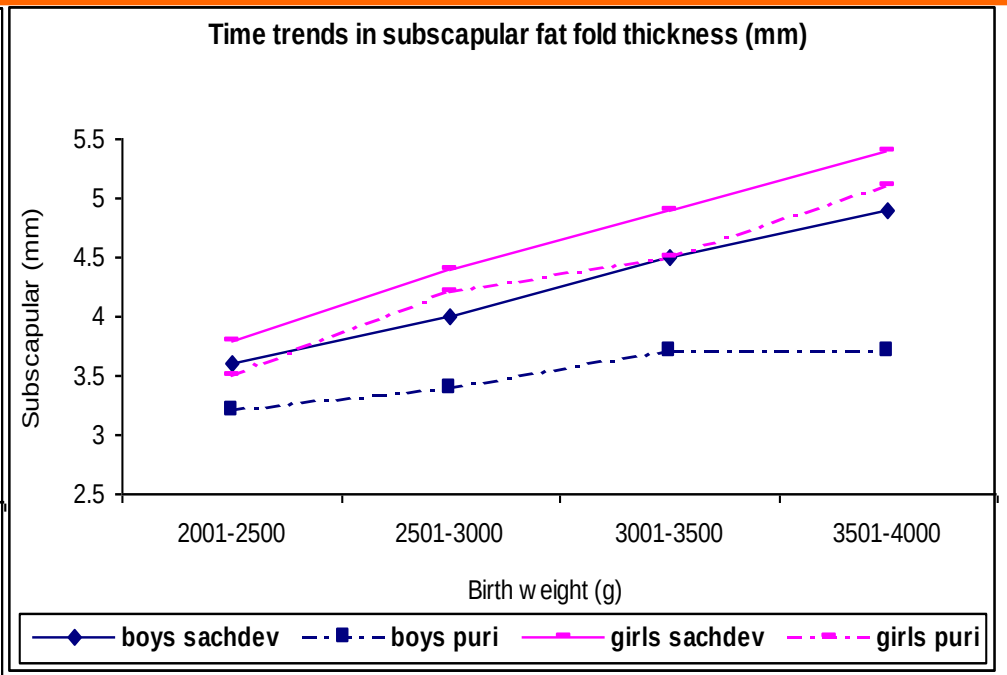
Wasting rates are relatively low. Identifying thin children and providing them needed care (food supplements if food intake is low, heath care if there are infections) could rapidly reduce wasting.

This in turn will accelerate reduction in under weight and stunting.

UNDERNUTRITION -OVERNUTRITION LINKAGES

THE THIN -FAT INDIAN NEONATE



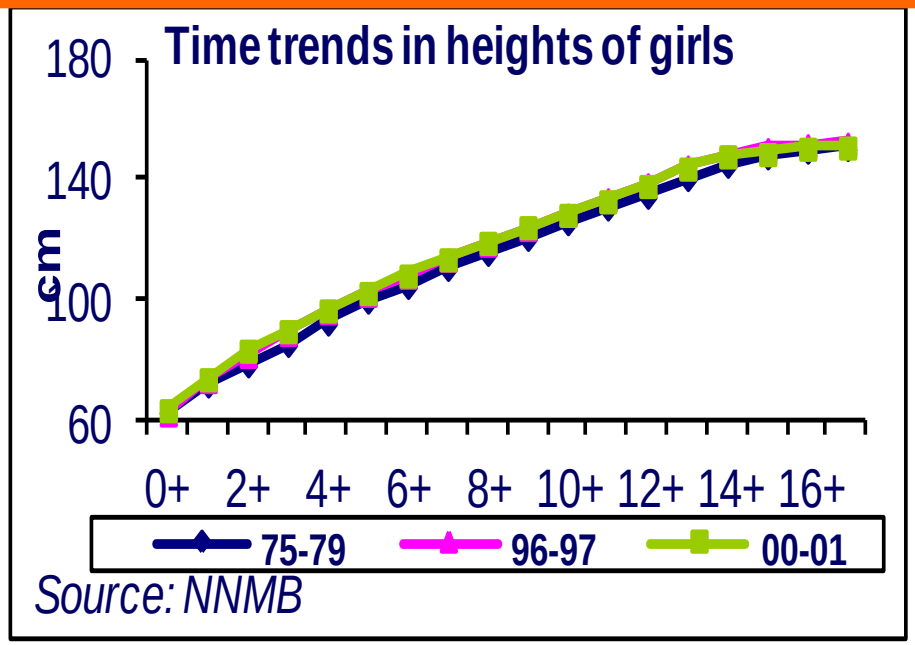


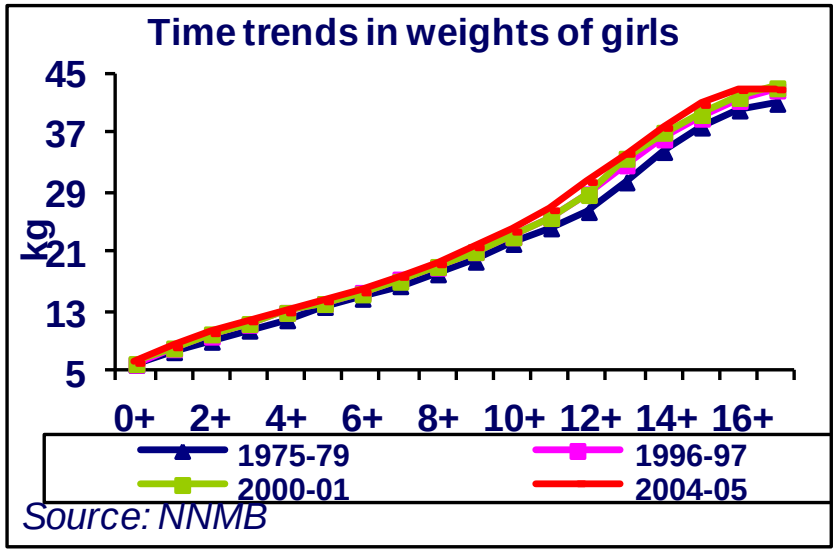
Indian neonates are short and wasted; they have low muscle mass but fat mass is spared.

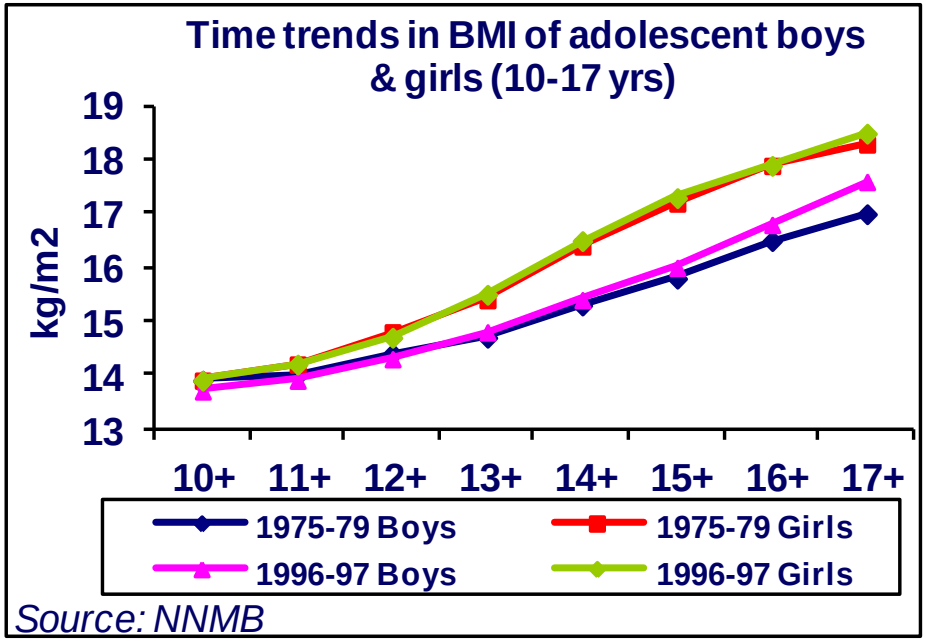
Over the last three decades there has been no change in birth weight but there has been an increase in fat fold thickness of neonates - in boys and girls, in all gestational age and birth weight categories

Indians' proneness for adiposity begins in utero

NUTRITIONAL STATUS OF CHILDREN



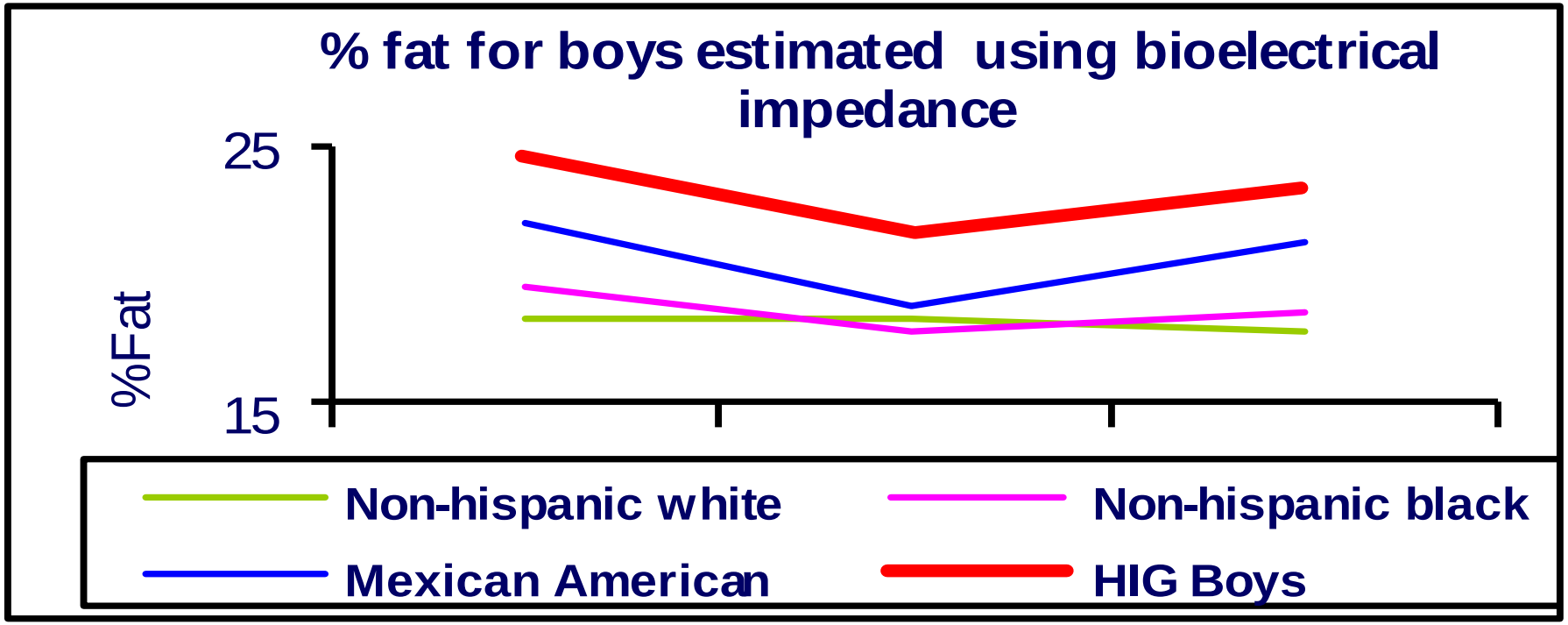




Over two decades there was very little increase in height but some increase in weight.

As a result there has been some rise in BMI in the 0-16 year age group

This is mainly due to increase in body fat



Over years there has been an increase in adiposity in school age children both in urban and rural areas

Comparison of data on % fat in Delhi urban high income group adolescent boys with Non-Hispanic white, Non-Hispanic black and Mexican Americans showed that % body fat was highest in Indian boys.

Adiposity in adolescents is associated with adiposity in adults.

Adult men and women have higher body fat for a given BMI as compared to Caucasians

RISK OF NCD IN DELHI COHORT

Age	Men	Wt (Kg)	Women	Wt (Kg)
At birth	803	2.89	561	2.79
2 yrs	834	10.3	609	9.8
12 yrs	867	30.9	625	32.2
30 yrs	886	71.8	640	59.2
BMI ≥25	886	47.4	638	45.5
Central Obesity (%)	886	65.5	639	31
Impaired GTT/diabetes	849	16	539	14

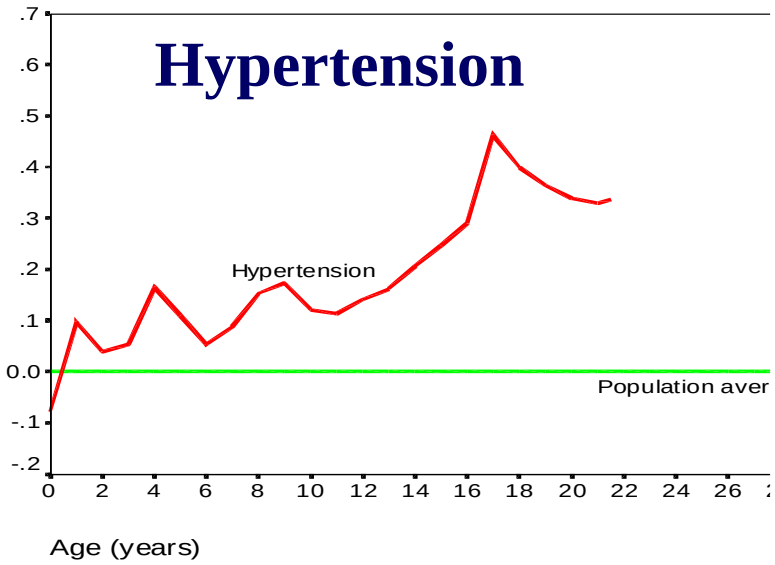
Source: Bhargava et al, 2004

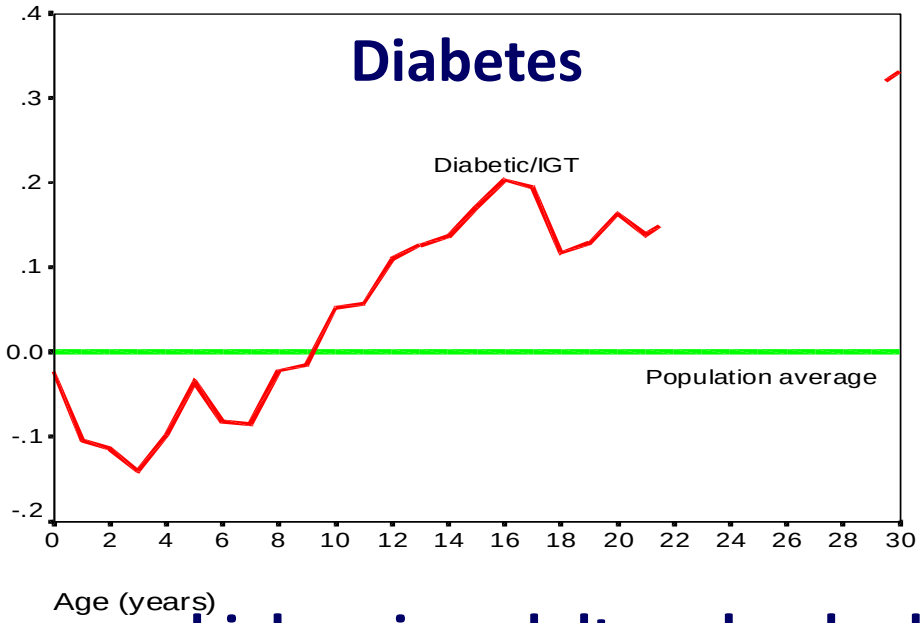
One-third of Delhi cohort children weighed <2.5kg at birth

They had low mean birth weight, were under weight and stunted during infancy, childhood and early adolescence.

At 30 years they were overweight, had abdominal adiposity and high diabetes and hypertension rates.

EARLIER GROWTH AND ADULT DISEASE



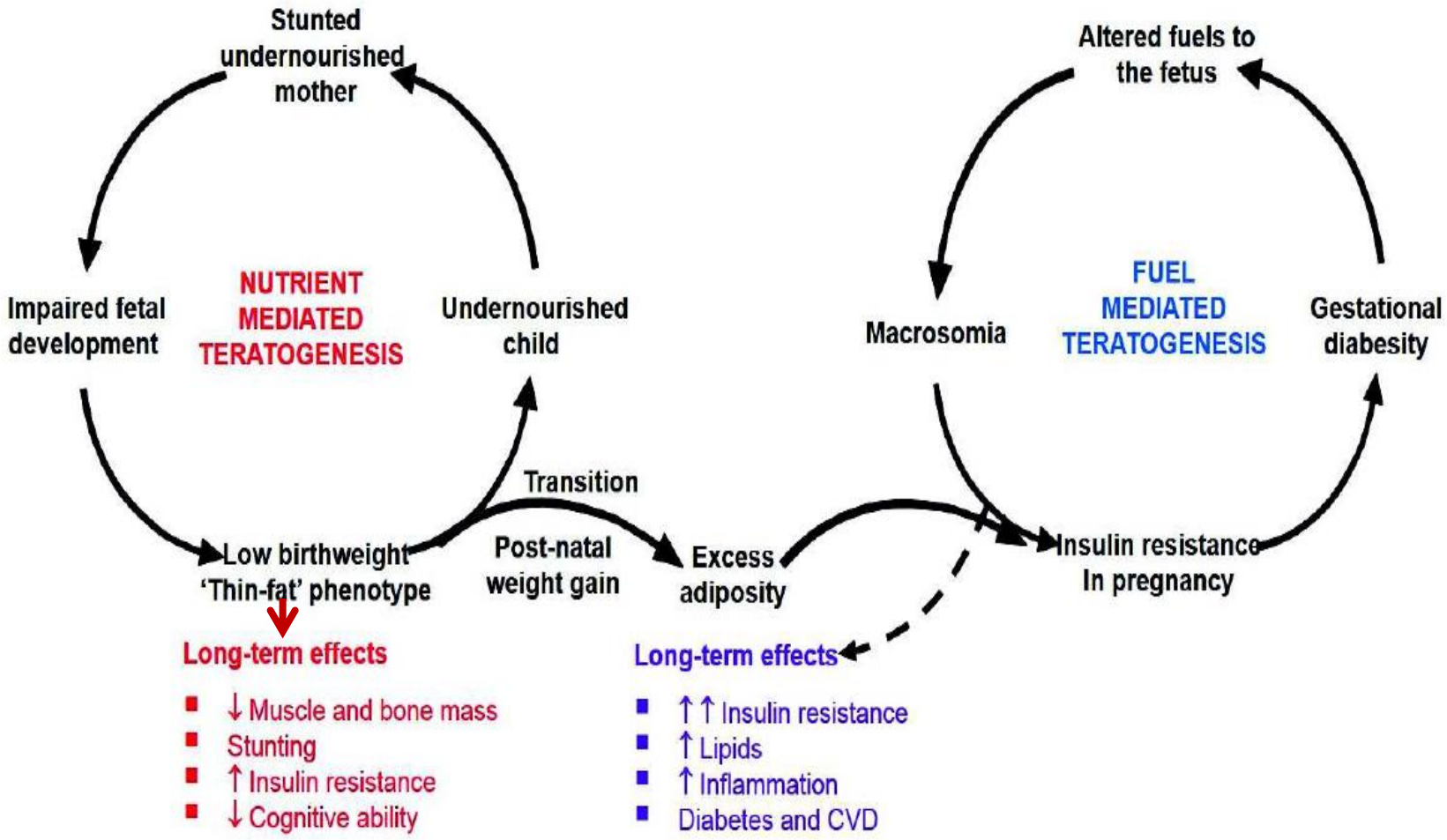


Risk of hypertension and diabetes was higher in adults who had gained more weight and BMI (mainly body fat) in childhood and adolescence.

Childhood under-nutrition and later access to adequate food may predispose to over-nutrition in adult life and also predispose to hypertension and diabetes.

Bhargava SK, Sachdev HPS, *et al.* New Engl J Med 2004; 350: 865

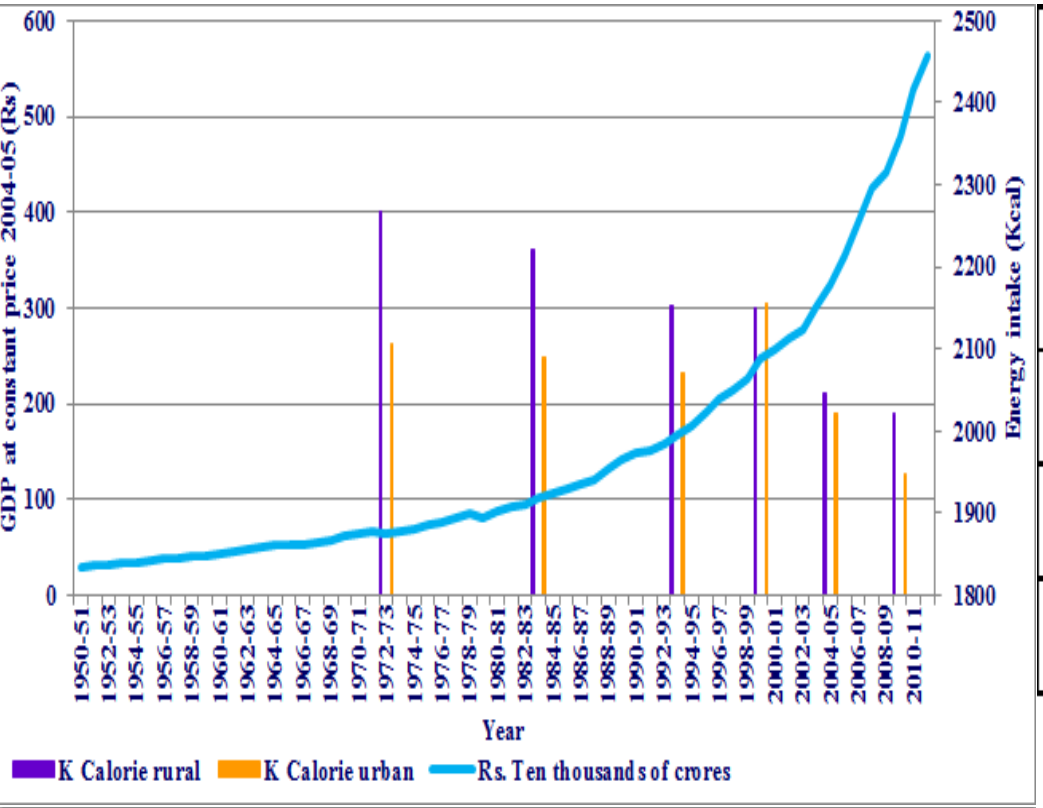
DUAL NUTRITION BURDEN AND RISK OF NCD



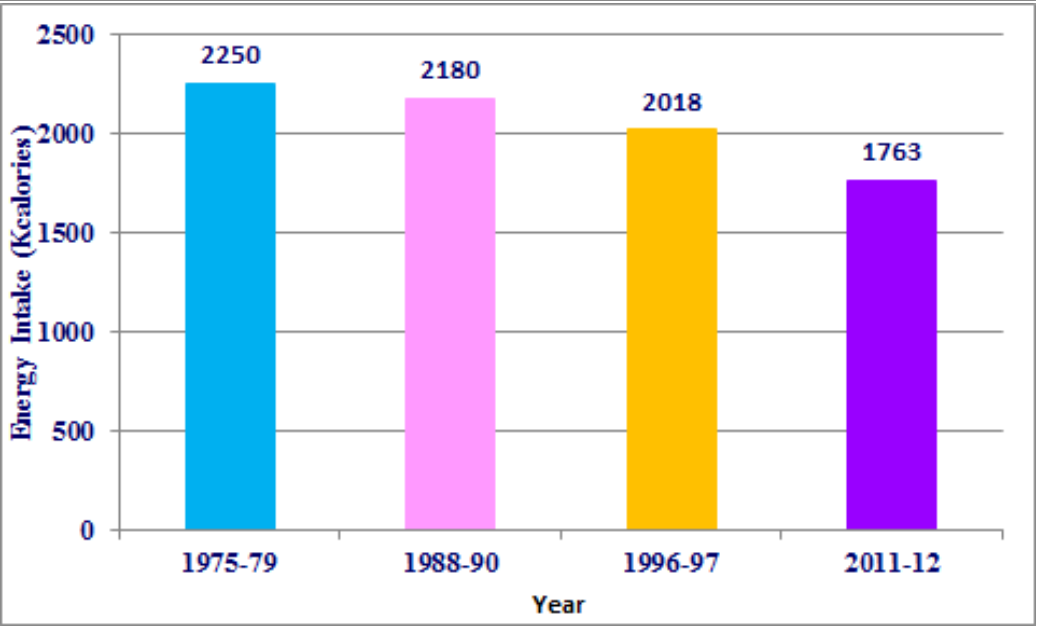
Both maternal undernutrition and overnutrition are associated with changes in foetal development

Both predispose to increased risk of NCD in adult life

DETERMINANTS OF DUAL NUTRITION BURDEN IN ADULTS



Groups	Weight (Kg)	BMI	Energy Intake	Energy expenditure
30-39	59	24.8	2134	2056
40-49	64	26.4	2264	2191
50-59	69	28.6	2195	2146



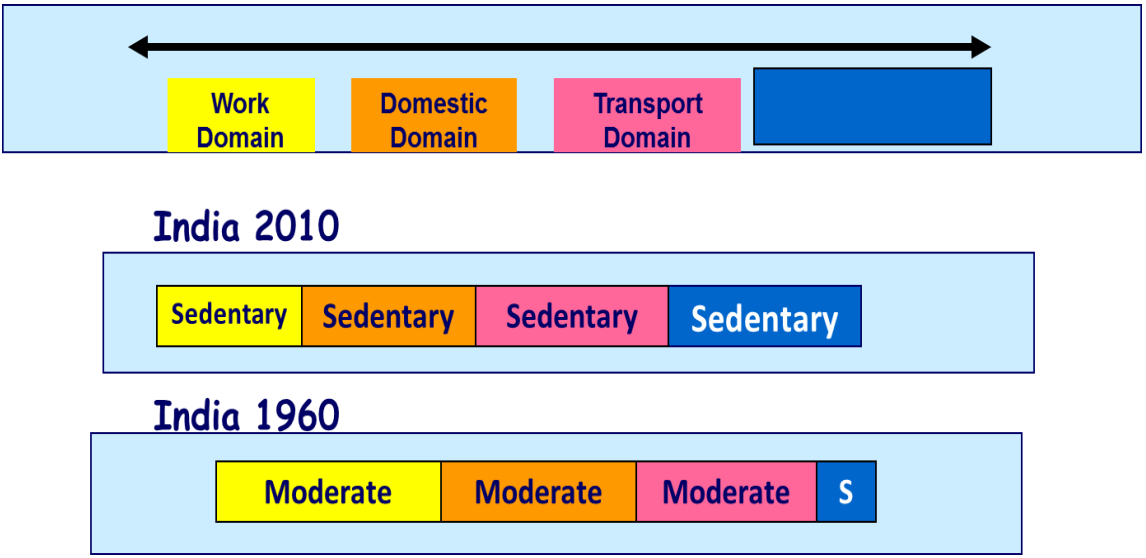
India is one of the fastest growing economies in the world

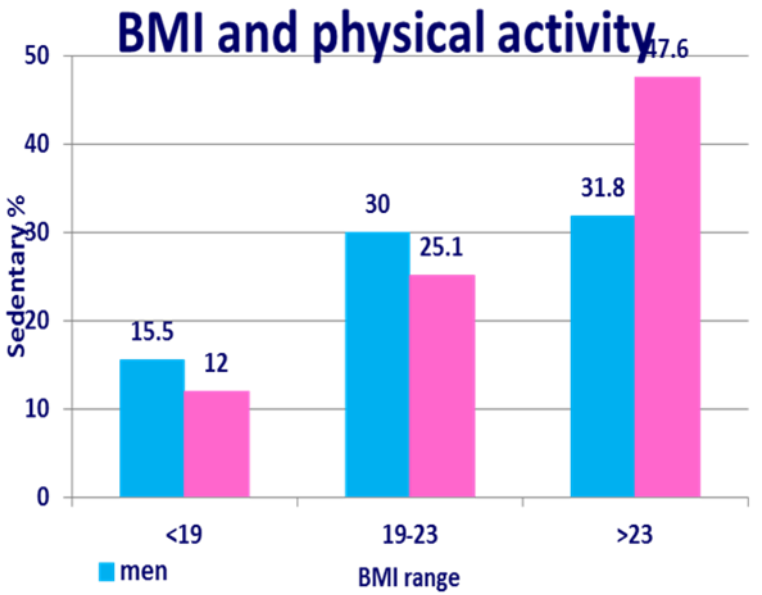
Despite rising per capita income there has been a progressive fall in the energy intake .

Despite this fall the average intake exceeds energy requirement by about 100 Kcal.

This positive energy balance is responsible for rise in overnutrition

PHYSICAL ACTIVITY





Until two decades ago, Indians had adequate physical activity in domestic, occupational and transport domains.

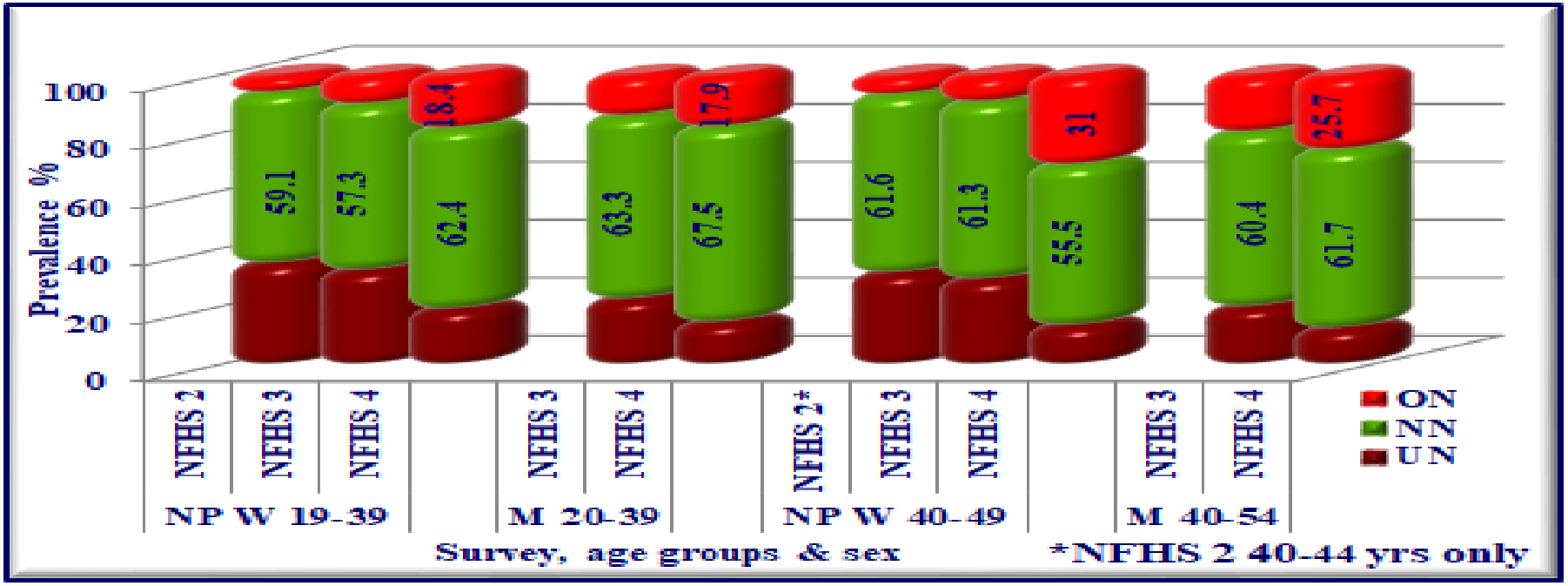
Over the last two decades, physical activity in daily chores had declined. Discretionary physical activity continues to be sedentary.

This has resulted in a reduction in energy requirements.

Sedentary person have a higher BMI as compared to the those with moderate physical activity

Steep reduction in physical activity is the major factor responsible for the increase in over-nutrition rates in India

DUAL NUTRITION BURDEN IN ADULTS



In the last two decades there was progressive reduction under-nutrition rates. This is perhaps due to overall improvement in quality of life

Across years over half the adults are normally nourished. They should be advised to continue their lifestyle and physical activity and remain normally nourished

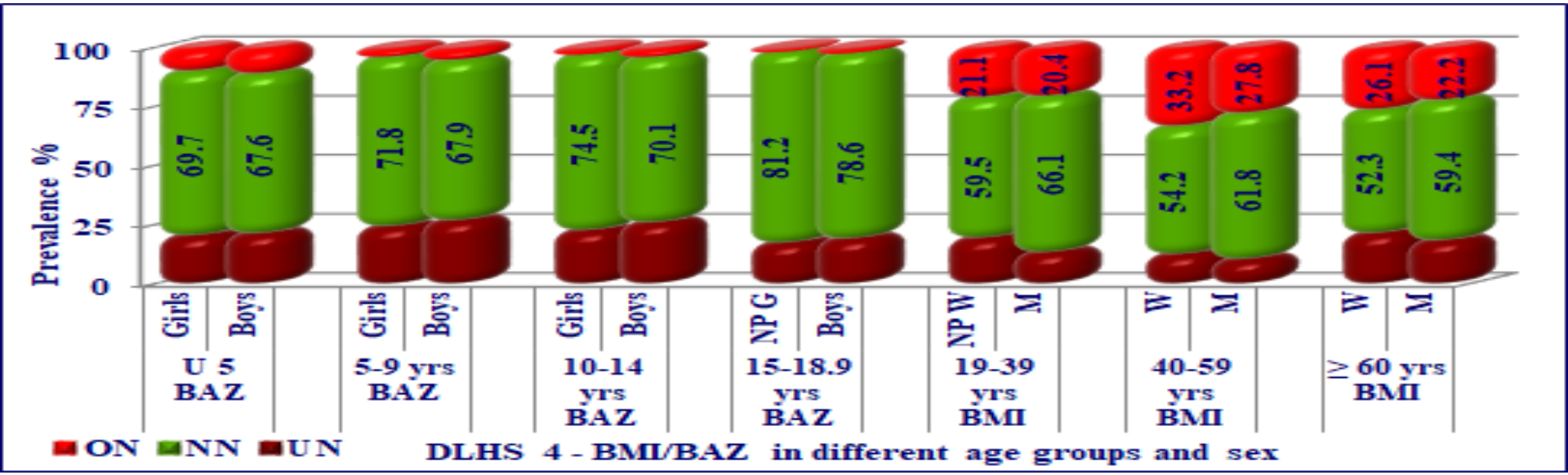
The progressive rise in over-nutrition in men and in women and consequent rise in CVD and diabetes are major concerns.

Indians have higher body fat for any given BMI as compared to Caucasians

The risk of CVD in Indians begins even when BMI is >23

Indians develop CVD at a younger age

DUAL NUTRITION BURDEN IN PENINSULAR INDIA



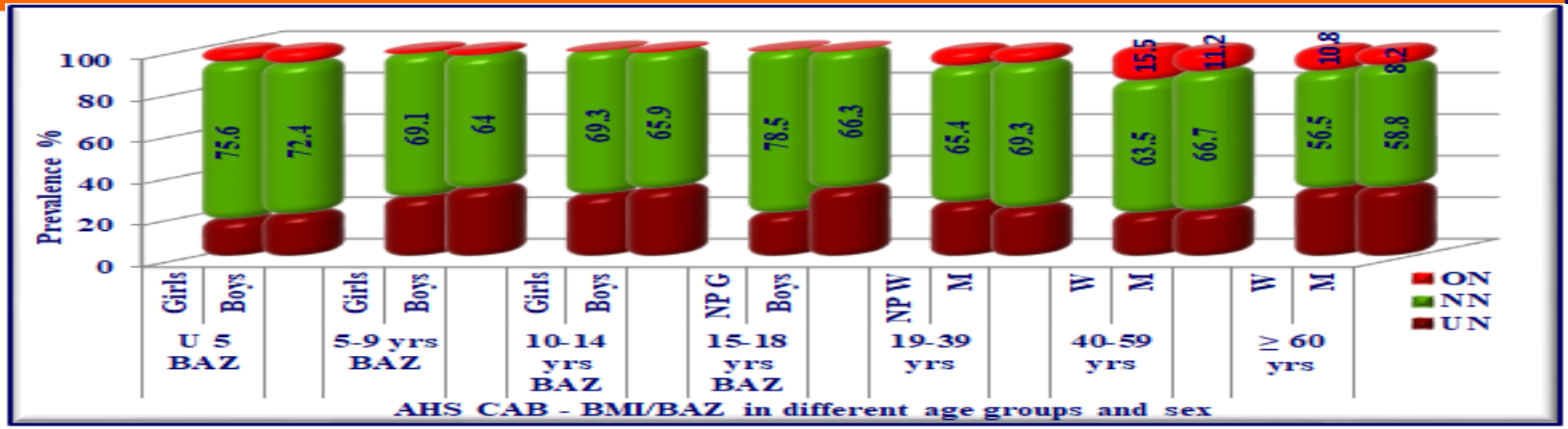
In peninsular India prevalence of under nutrition is low in children and over 3/4th of adolescents are normally nourished.

This should be considered as an opportunity; healthy eating and adequate physical activity can enable them to grow into normally nourished healthy adults .

More than half the adults are normally nourished. They should be encouraged to continue their lifestyle and remain normally nourished.

Among adults under-nutrition rates are low, but over-nutrition is major problem . These states have functional health systems; they need to be geared up to cope with detection and management of overnutrition and NCD.

DUAL NUTRITION BURDEN IN AHS STATES



In AHS states prevalence of under nutrition is high. Early identification and effective management of children with wasting is essential.

However over 2/3rd of adolescents are normally nourished; overnutrition rates in children is very low .

This should be considered as an opportunity; healthy eating and adequate physical activity can enable them to grow into normally nourished healthy adults .

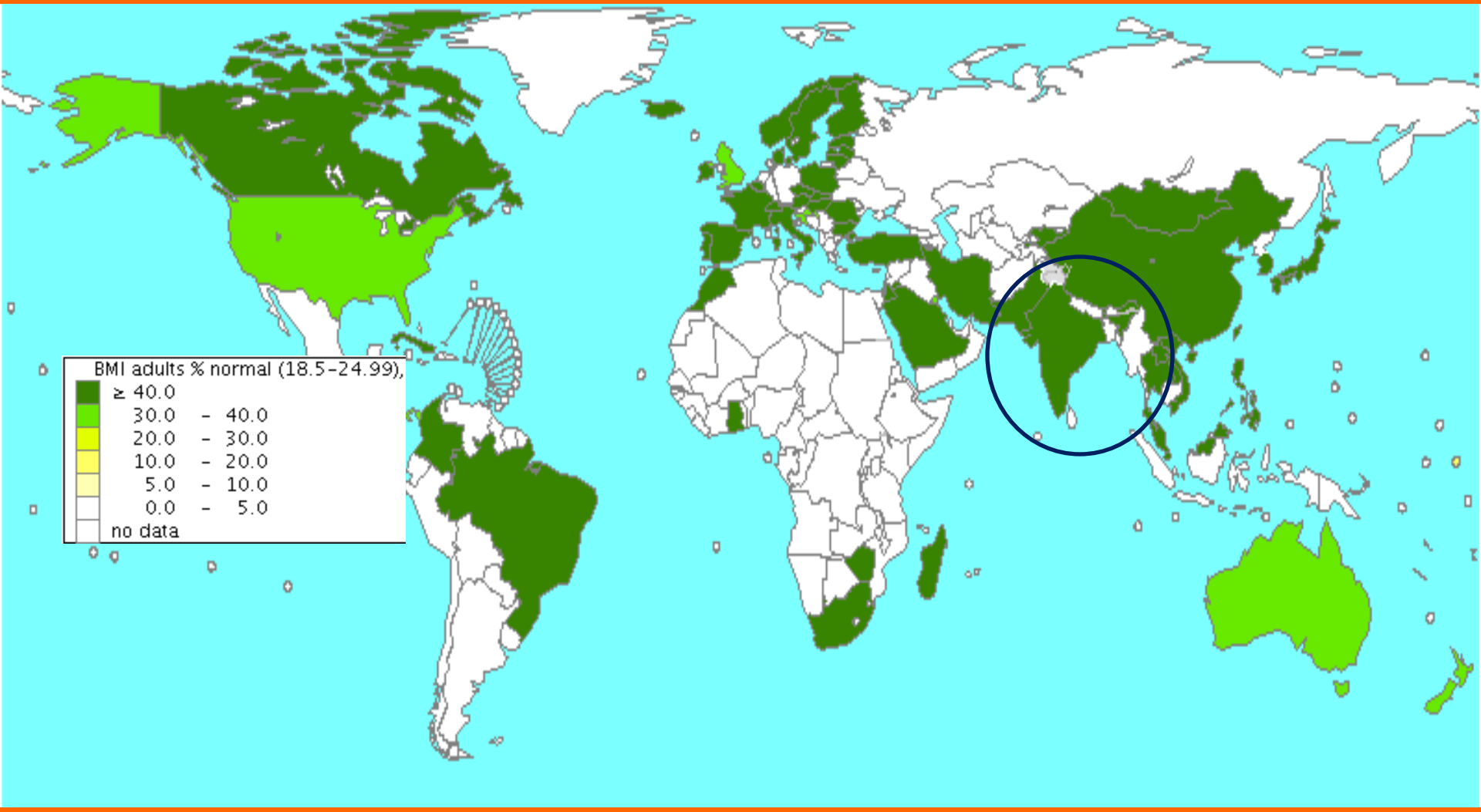
Among adults under-nutrition is a major problem and should be addressed.

More than half the adults are normally nourished. They should be encouraged to continue their lifestyle and remain normally nourished.

Over -nutrition rates are low, and these low rates should be maintained by ensuring adequate physical activity

WAY FORWARD

PREVALENCE OF NORMAL NUTRITION (BMI)



More than 50 % of the adult population and 80% of < 5 children in India are normally nourished .

This is a major advantage ; we should endeavor to see that majority of Indians remain normally nourished and healthy

In India, under-nutrition and its health consequences and poor maternal and child health indices are still public health problems.

Most of these health problems are symptomatic and acute; they can readily be treated.

Over-nutrition and associated non-communicable diseases are now emerging as major public health problems

Most of the non-communicable diseases are asymptomatic in the initial phases.

Patients seek care mostly when complications set in

NCD management requires lifestyle modification and life long medication.

India's health system has to reorient and gear itself up for successfully managing prevention, early detection and effective management of dual nutrition and disease burden

PROGRAMMES FOR COMBATING DUAL NUTRITION BURDEN

ASSESSMENT OF NUTRITIONAL STATUS

- Screen by anthropometry to detect under and overnutrition
- Assess dietary intake & physical activity

EFFECTIVE MANAGEMENT OF DUAL NUTRITION AND HEALTH BURDEN

- Provide appropriate nutrition education & care, monitor improvement
- Assess health problems; provide appropriate and affordable health care

- **Assessment of nutritional status is an important component of both public health interventions and care of individuals seeking health care.**
- **Ideally nutritional assessment should be carried out periodically in all individuals and more often in vulnerable segments of population such as children, adolescents, pregnant and lactating women and elderly citizens.**
- **Neither nutrition and health services nor our population, are geared for such routine periodic assessment and appropriate counselling for early detection and effective management of nutritional deficiencies and excesses before clinical problems arise.**
- **Therefore assessment of nutritional status should be carried out as when there is an opportunity - when any person seeks health or nutrition care or as a part of community-based nutrition surveys**

Once assessment is done appropriate advice should be given depending upon their nutritional status:

- **normally nourished persons - promote their current lifestyles and provide support for continued normal nutrition and health status**
- **those who are under- or over-nourished and are at risk of health problems - provide appropriate nutrition and physical activity counselling, if required nutritional supplementation and monitor improvement**
- **those with illness- identify nutritional problems, provide appropriate health and nutrition therapy to restore normal health and nutrition and monitor response.**

Nutritionists and physicians have to play a critical role in combating the dual nutrition and disease burden by appropriate nutrition and life style counselling and nutrition and health care

Promoting synergy between health and nutrition services will enable the country to achieve rapid improvement in health and nutritional status of the population

THANK YOU!

SKB