

Micronutrient Deficiency in India: How Can We Make India Deficiency-Free?



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OF NUTRITION

National Nutrition challenges

Malnutrition is one of the most important public health Problems, arises either from deficiency or excess or imbalance of a single or various nutrients in the body.

We are facing 'triple burden of disease'

1. Protein energy malnutrition (PEM)

- Undernutrition (stunting, Wasting & Underweight)
- Low birth weight (LBW)
- Chronic energy deficiency (CED=BMI <18.5)

2. Micronutrient deficiencies (MND)

- Vitamin A deficiency (VAD)
- Iron deficiency anemia (IDA)
- Iodine deficiency disorders (IDD)
- Zinc deficiency disorders

3. Diet related chronic non-communicable diseases (NCDs)

- Overweight and obesity
- Insulin resistance
- Type 2 Diabetes
- Hypertension, Cardiovascular diseases (CVD),
- Cancers etc.

**1. Undernutrition:
Marasmic child**



Triple Burden of Malnutrition



3. Overnutrition: Obesity

**2. Micronutrient deficiency:
Anemai**



Fact I: Worsening Nutrition Situation Around The World



1



2 billion people lack key micronutrients like iron and vitamin A



155 million children are stunted



52 million children are wasted



2 billion adults are overweight or obese



41 million children are overweight



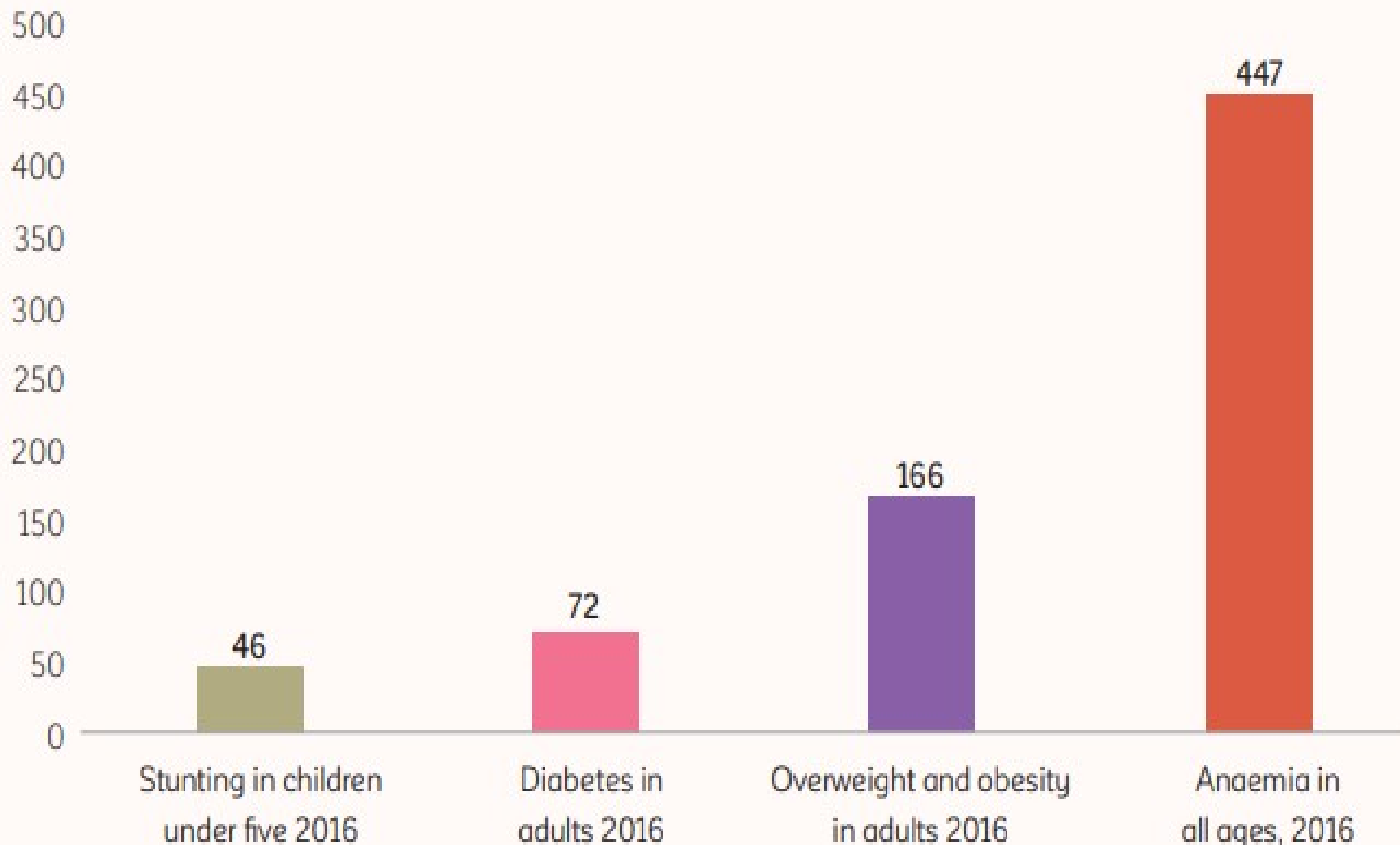
88% of countries face a serious burden of either two or three forms of malnutrition

And the world is off track to meet all global nutrition targets

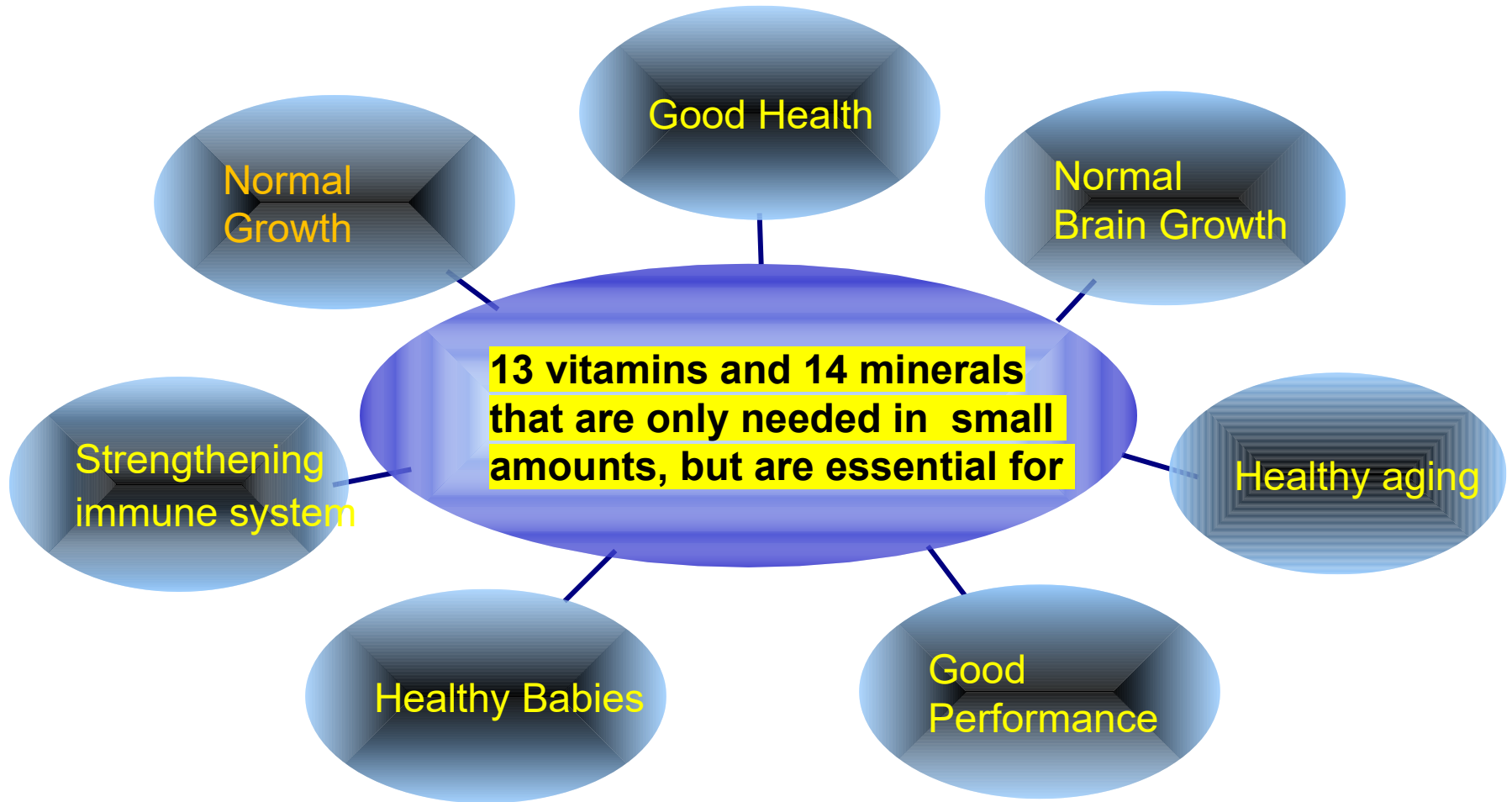
...but the SDGs present an unprecedented opportunity for universal and integrated change.

The burden of malnutrition among children and adults in India (presented in millions)

Millions



Micronutrients (vitamins and minerals) are essential for many functions and health



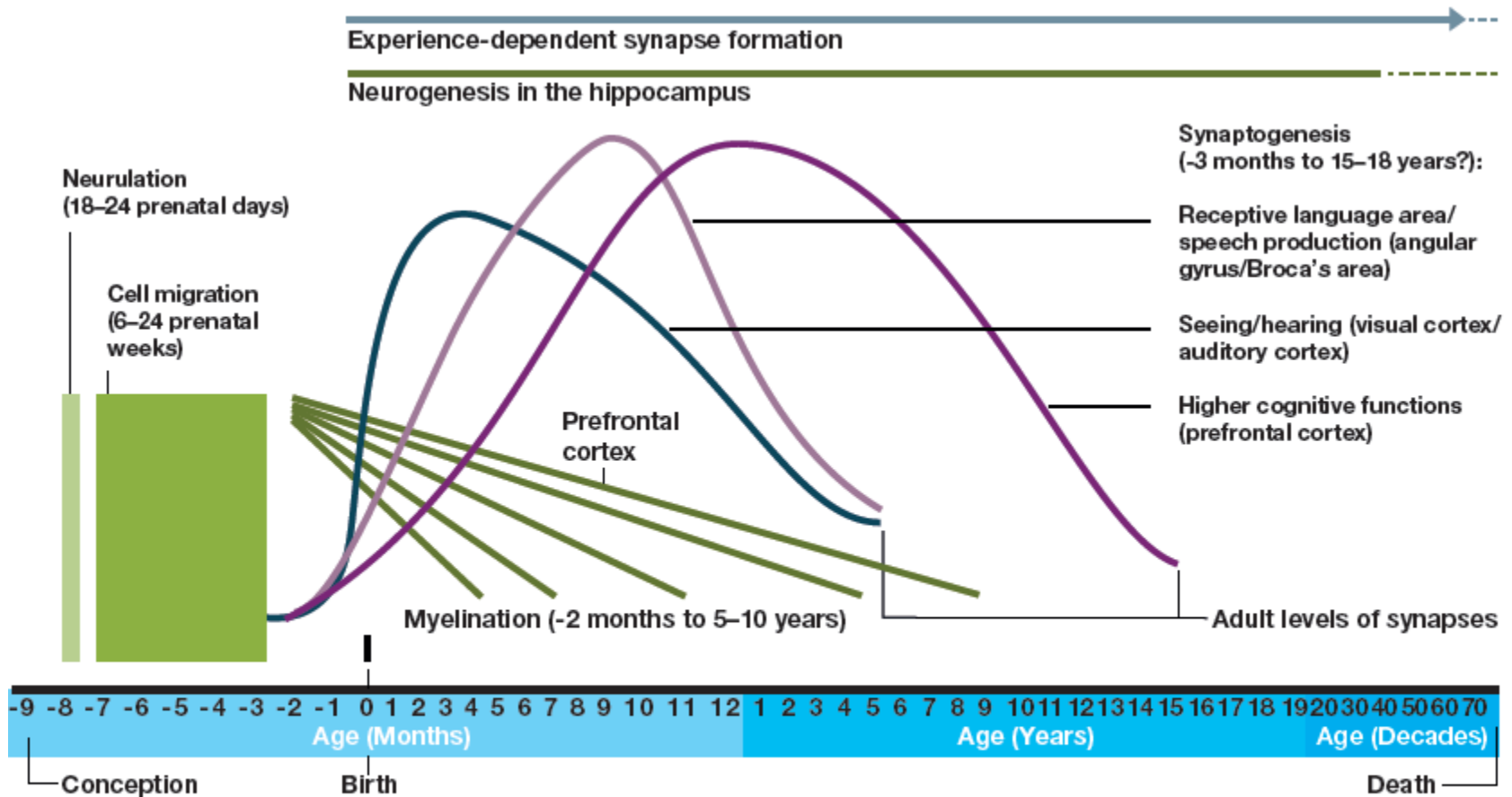
They cannot be produced by the body and have to come from the diet only

Micronutrient deficiencies affect

- **Resistance to infection**
- **Cognitive development**
- **Foetal and child growth**

**The public health implications of
micronutrient deficiencies are potentially huge
and significant for its prevention and control
of diseases**

Developmental course of human brain development



This figure shows that the rapid period of brain development occurs within the 1,000-day window between the start of a woman's pregnancy and her child's second birthday.

Thomson, Nelson (2001) *Developmental Science and the Media*

Convincing evidence for iodine, folic acid and iron

**Most
micronutrient
deficiencies are
usually found
amongst**

- **resource poor population**
- **groups**
- **food insecure and vulnerable households in developing countries**

Key risk factors

- **Poverty**
- **Lack of access to a variety of foods**
- **Lack of knowledge of appropriate dietary practices**
- **High incidence of infectious diseases**

Micronutrient Deficiencies

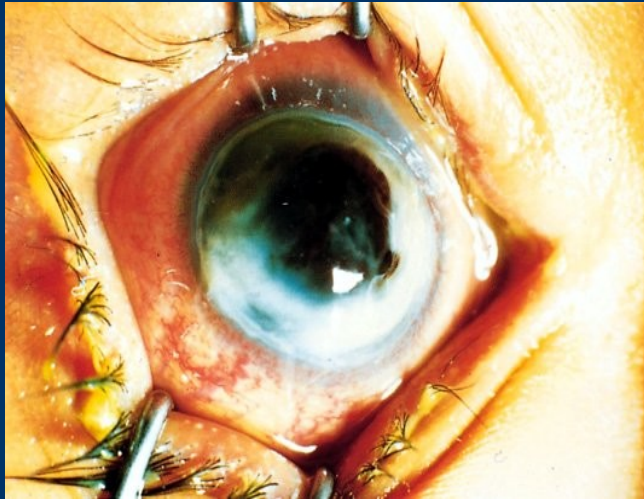
The Ugly Face of “Hidden Hunger”



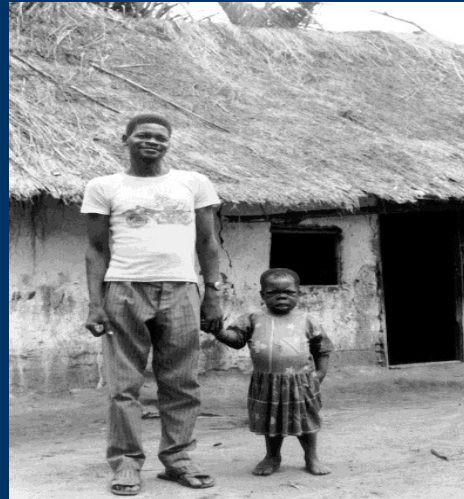
Iron Deficiency



Folic Acid Deficiency



Vitamin A Deficiency



Iodine Deficiency



Zinc Deficiency

Prevalence of ocular signs and subclinical vitamin A deficiency and its determinants among rural pre-school children in India

Avula Laxmaiah ¹, Madhavan K Nair, Nimmathota Arlappa, Pullakhandam Raghu, Nagalla Balakrishna, Kodavanti Mallikharjuna Rao, Chitty Galreddy, Sharad Kumar, Manachala Ravindranath, Varaganti Vikas Rao, Ginnela N V Brahmam

Affiliations [+](#) expand

PMID: 21884647 DOI: [10.1017/S136898001100214X](#)

Abstract

Objective: To assess the magnitude and determinants of vitamin A deficiency (VAD) and coverage of vitamin A supplementation (VAS) among pre-school children.

Design: A community-based cross-sectional study was carried out by adopting a multistage, stratified, random sampling procedure.

Setting: Rural areas of eight states in India.

Subjects: Pre-school children and their mothers were covered.

IRON DEFICIENCY ANAEMIA

a major nutritional problem



ANAEMIA IS MOST COMMON AMONG PREGNANT WOMEN AND LACTATING MOTHERS



Causes

- Low iron, folate intake in pregnant, lactation
- Blood loss
- Hookworm infestation
- Increased needs in pregnancy lactation

consequences

- Fatigue
- Low work efficiency, productivity
- Maternal deaths
- Pregnancy wastage
- Premature delivery
- Low birth weight babies

ANAEMIA ASSESSMENT IS MADE THROUGH



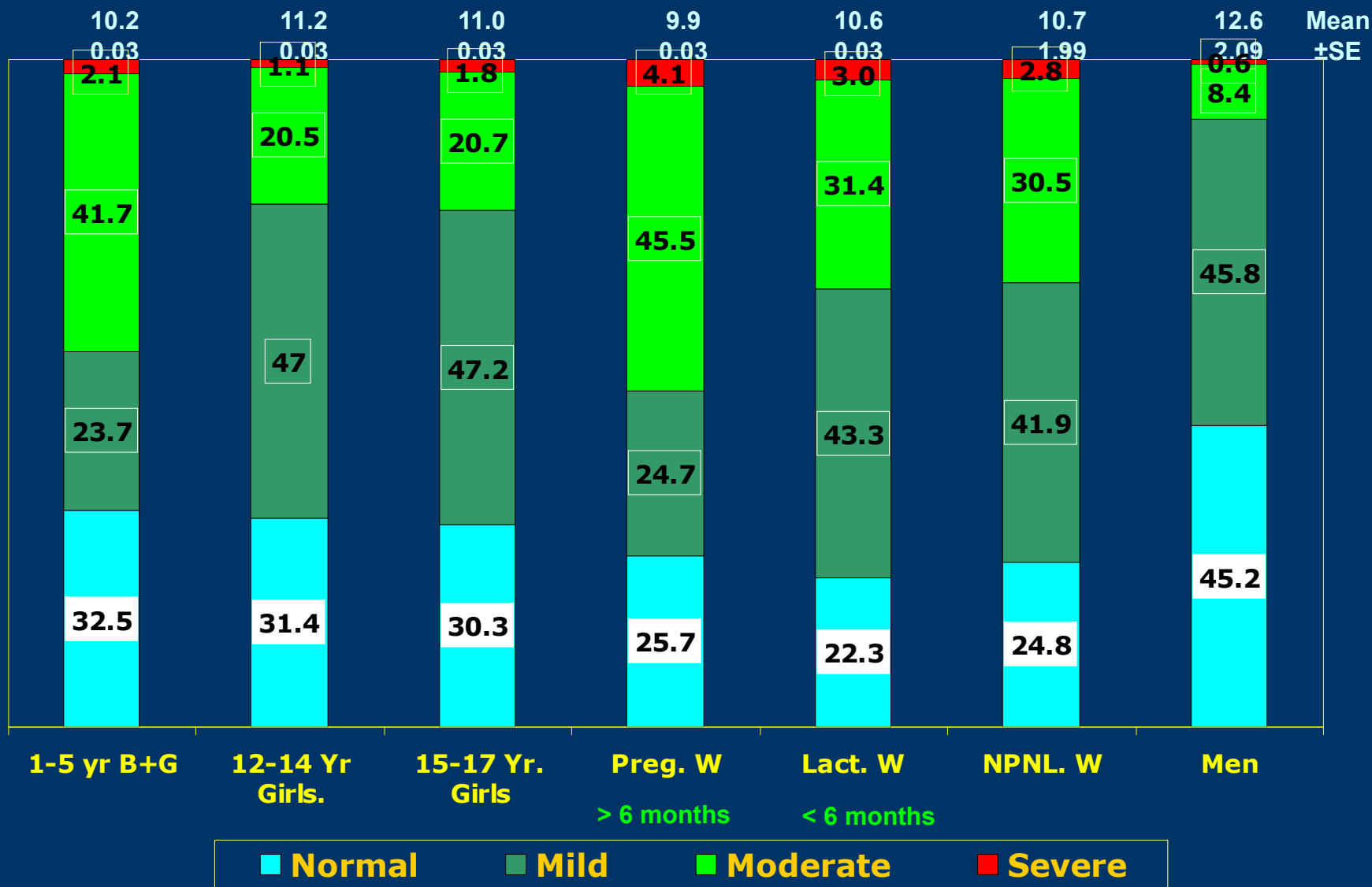
Standard method in clinic



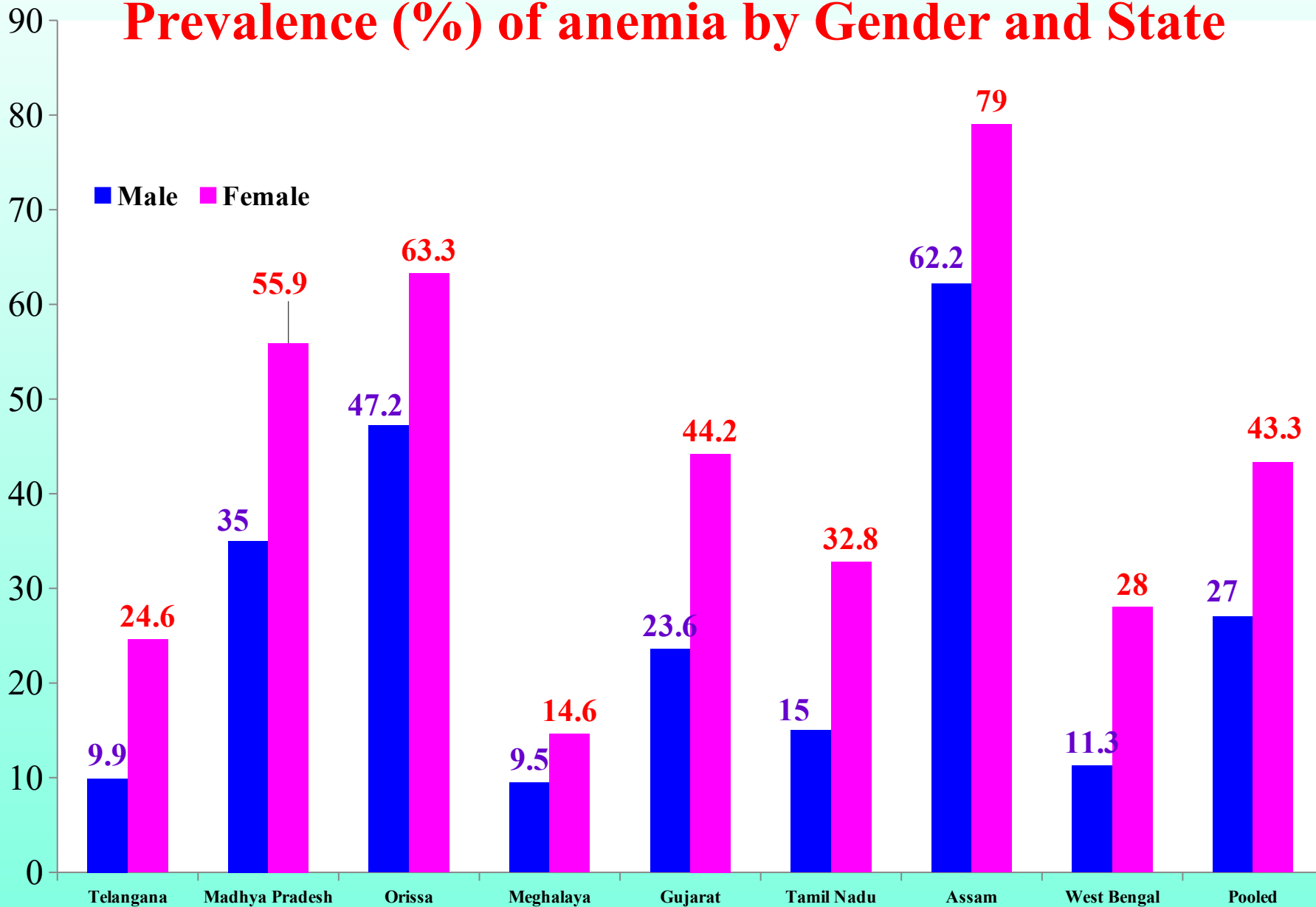
Filter paper method in the field

Folifer tablet distribution

Prevalence (%) of Anaemia by Age, Gender & Physiological Groups



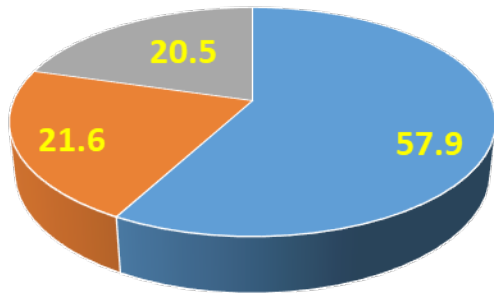
Prevalence (%) of anemia by Gender and State



Pan India B12 deficiency study - unpublished data

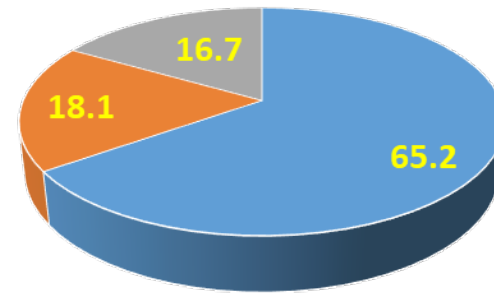
Contribution of Vitamin B12, Folate and Ferritin to the Total Anemia

MALES



■ Iron ■ Vitamin B12 ■ Folate deficiency

FEMALES



■ Iron ■ Vitamin B12 ■ Folate deficiency

Males: Percentage of Contribution -

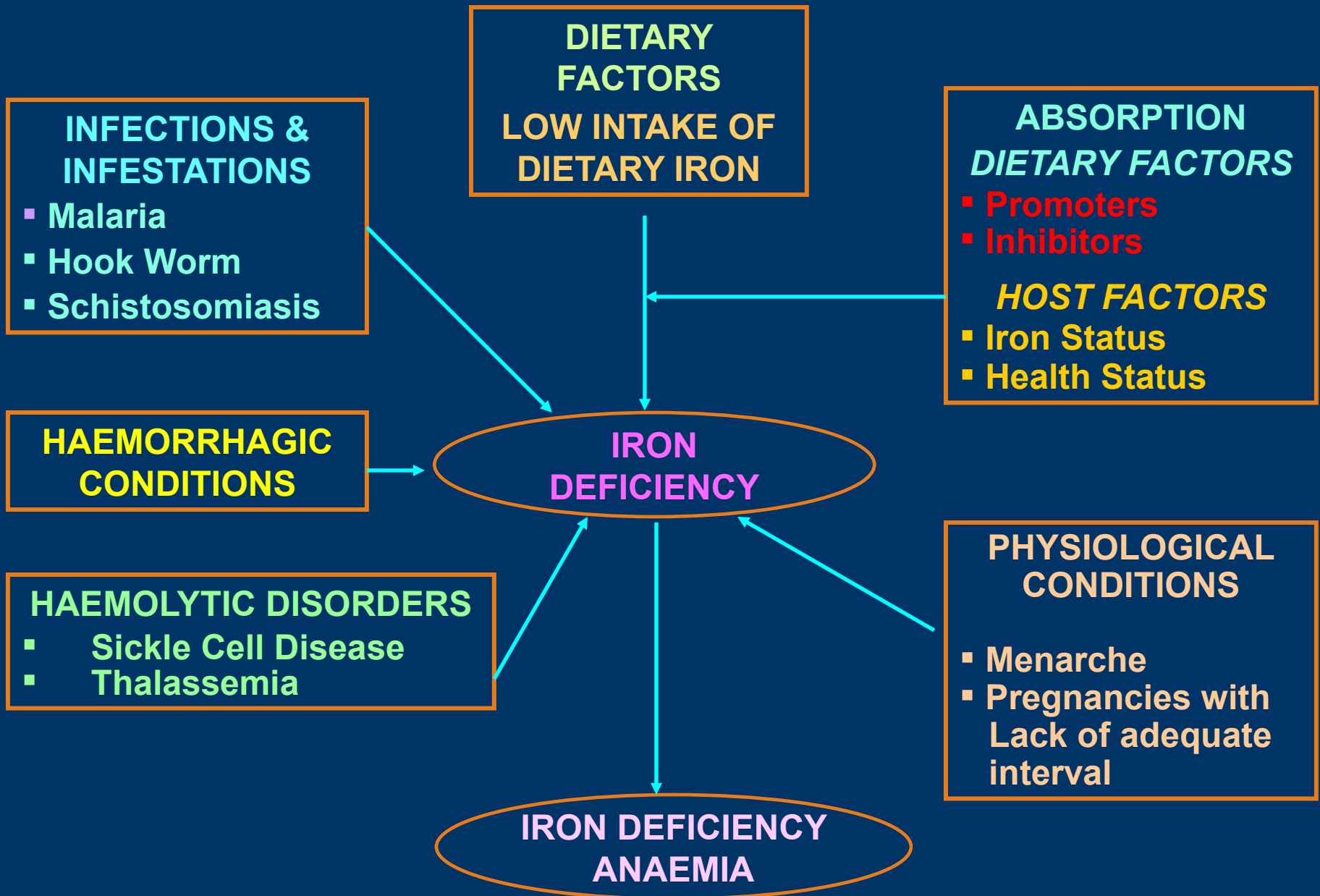
1. Iron deficiency Anemia: 57.9%
2. Vitamin B12 deficiency Anemia: 21.6%
3. Folate Deficiency Anemia: 20.5%

Females: Percentage of Contribution -

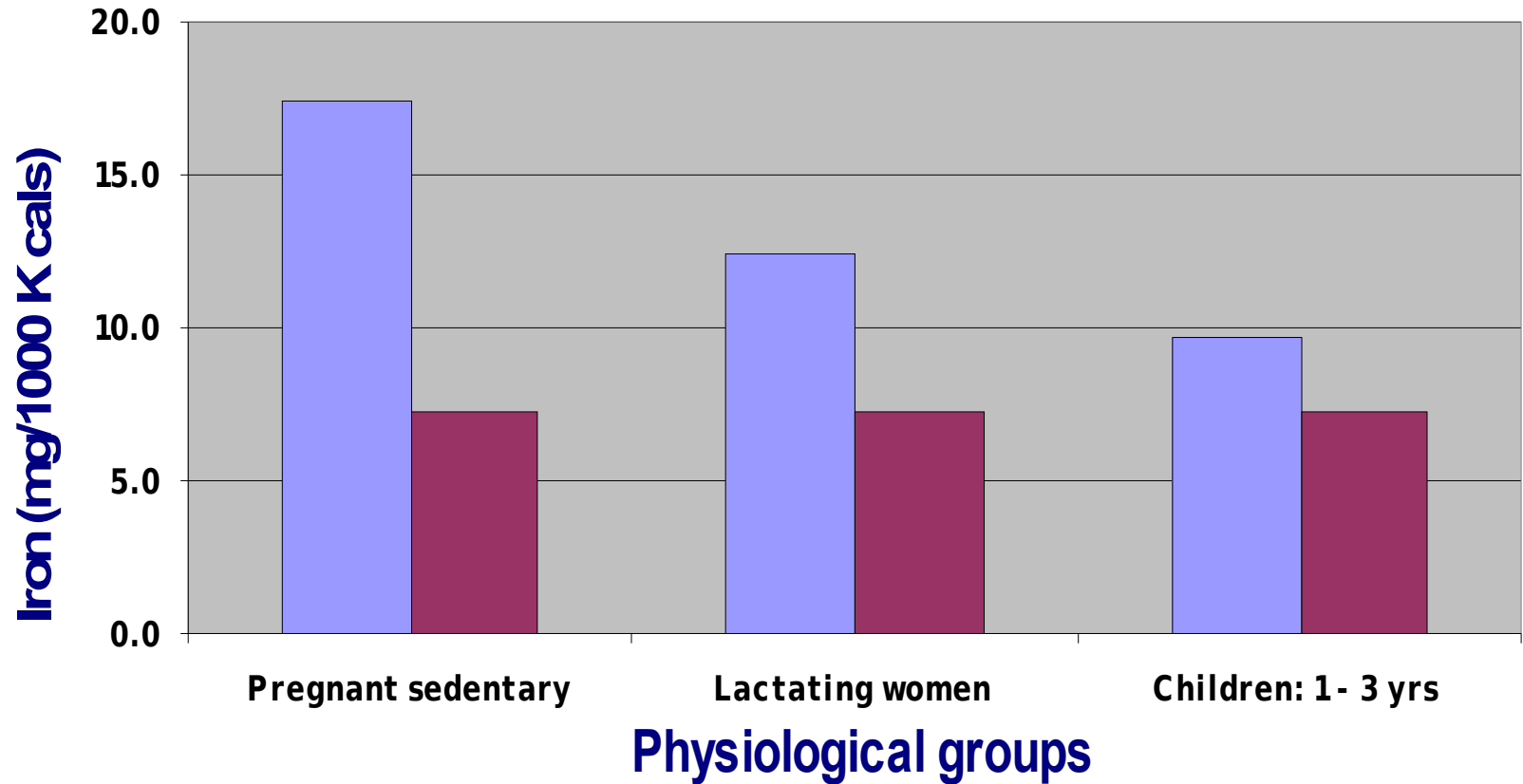
1. Iron deficiency Anemia: 65.2%
2. Vitamin B12 deficiency Anemia: 18.1%
3. Folate Deficiency Anemia: 16.7%

Pan India B12 deficiency study - unpublished data

AETIOLOGY OF IDA



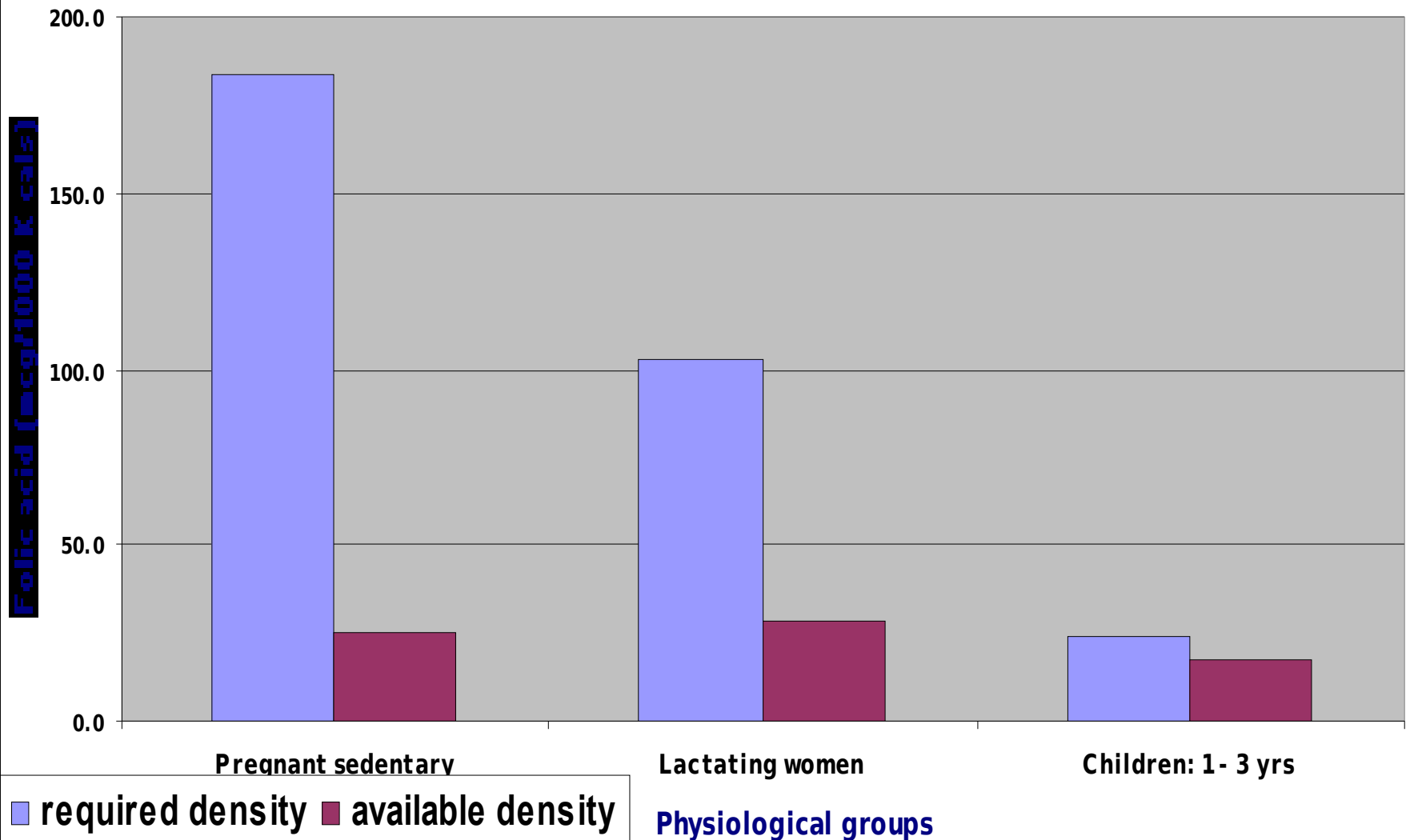
IRON DENSITY TO MEET RDA



■ required iron density ■ available iron density

Computed from NNMB data, rural survey, 2001

FOLIC ACID DENSITY TO MEET RDA



Computed from NNMB data, rural survey, 2001

Prevalence and Determinants of Micronutrient Deficiencies among Rural Children of Eight States in India

Avula Laxmaiah^a Nimmathota Arlappa^a Nagalla Balakrishna^b
Kodavanti Mallikarjuna Rao^a Chitty Galreddy^a Sharad Kumar^a
Manachala Ravindranath^a Ginnela N.V. Brahmam^a

Divisions of ^aCommunity Studies and ^bBiostatistics, National Institute of Nutrition, Indian Council of Medical Research (ICMR), Hyderabad, India

Key Words

Micronutrient deficiencies · Vitamin A deficiency · Bitot's spots · Anemia · Iodine deficiency disorders · Preschool and school-age children · Adolescents

Abstract

Background/Aims: Micronutrient deficiencies continue to be a major public health problem in India. The aim of this

children who used sanitary latrines. **Conclusions:** Micronutrient malnutrition is a public health problem among rural children, and it was higher among children of SC/ST, illiterate parents and those not possessing a sanitary latrine. Thus, there is a need to improve environmental sanitation; fortification of foods could also help in mitigating the problem.



Vitamin B₁₂ and Folic Acid: Significance in Human Health

Nutritionist's Perspective

A Laxmaiah

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Vitamin B₁₂ and folic acid are essential for formation of red blood cells, and are also believed to prevent disorders of central nervous system, mood disorders, and dementia [1]. Nutritional anemia due to vitamin B₁₂ and/or folate deficiency is generally associated with hyperhomo-cysteinemia, which has been linked with pregnancy complications like pre-eclampsia, recurrent pregnancy loss and intra-uterine growth restriction [2]. A common cause of vitamin B₁₂ deficiency is poor intake or absorption mediated by three transport proteins viz haptocorrin (HC), intrinsic factor (IF) and transcobalamin II (TCII). The deficiency is more common among vegetarians because they lack vitamin B₁₂ in their diets [3]. Some of gastrointestinal diseases, such as Celiac disease or Crohn's disease which interfere with food absorption, may also lead to vitamin B₁₂ deficiency [4]. Several studies from many parts of India (Bengaluru, Chennai, Delhi, Hyderabad, Pune, Varanasi) suggest that a large proportion of individuals (20-40%) are deficient in vitamin B₁₂ and folic acid, presumably due to adherence to a strict vegetarian diet. Reports also suggest that polymorphisms in genes involved in vitamin B₁₂ absorption also contribute to the large pool of vitamin B₁₂ deficiency. The National Health and Nutrition Examination Survey also estimated that 3.2% of adults over age 50 have a seriously low vitamin B₁₂ level, and up to 20% may have a borderline deficiency. Large amounts of folic acid can mask the damaging effects of vitamin B₁₂ deficiency by correcting the megaloblastic anemia caused by vitamin B₁₂ deficiency [5].

Prevalence and predictors of Vitamin B₁₂ deficiency: genetic associations for low vitamin B₁₂ levels

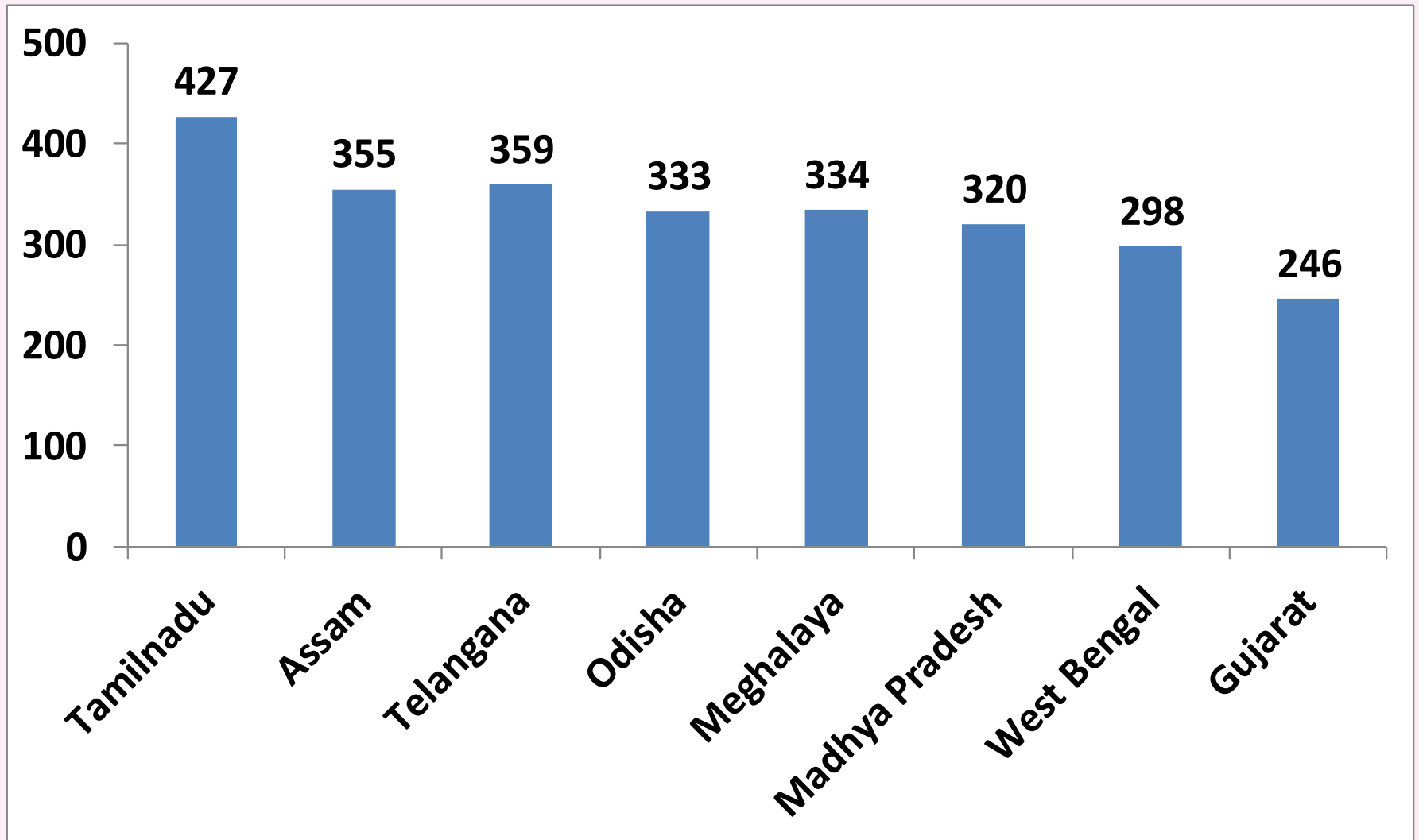
Project Coordinator : Dr. A. Laxmaiah, Scientist G

**Head, Division of Community Studies,
O/I, NNMB Units, NIN, Hyderabad**

Principal Investigators

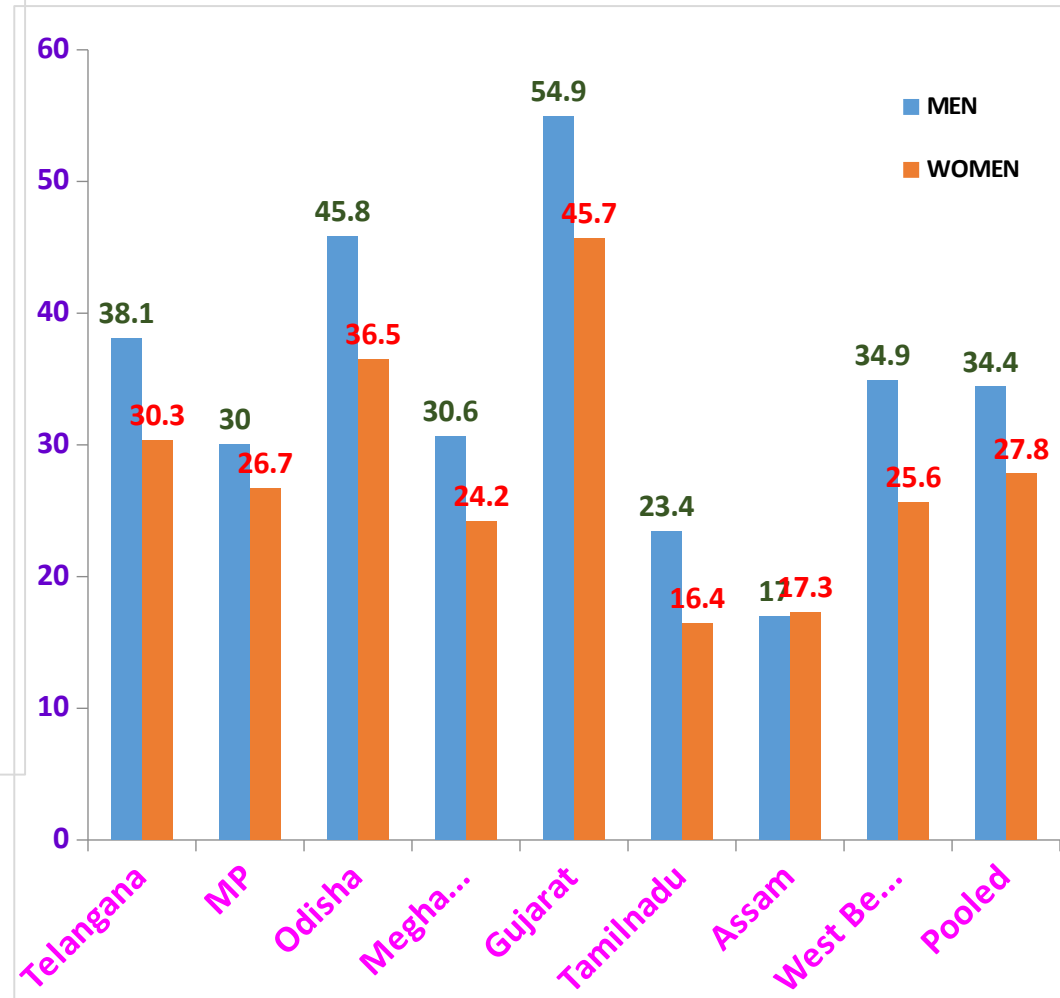
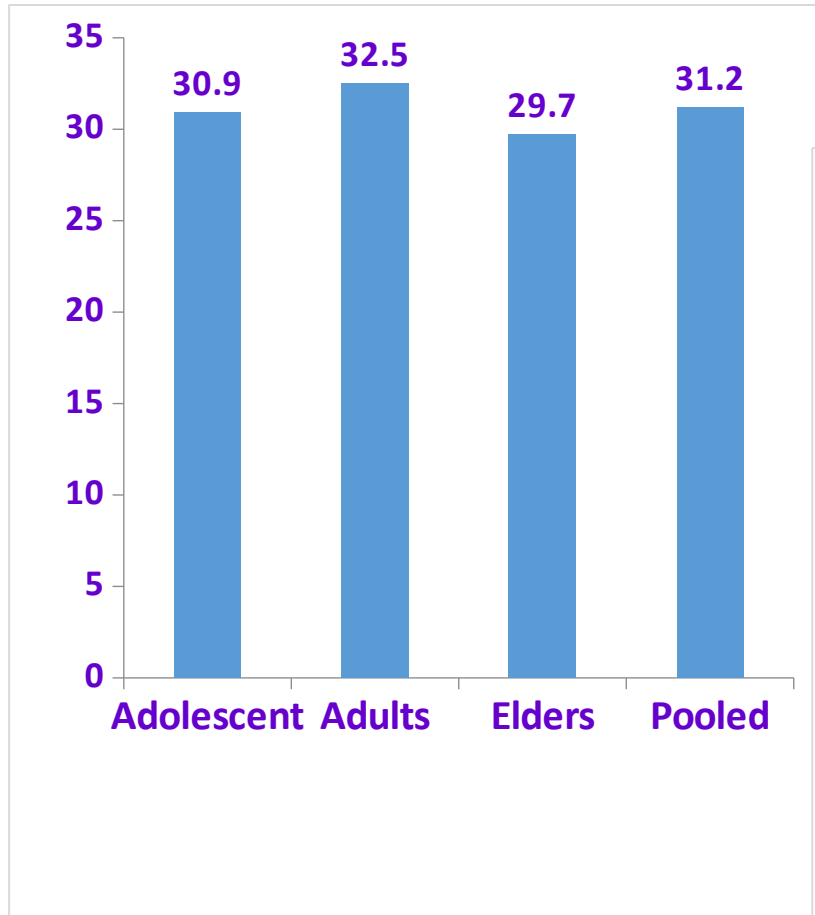
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Mean Vitamin B12 levels (pg/ml) by states



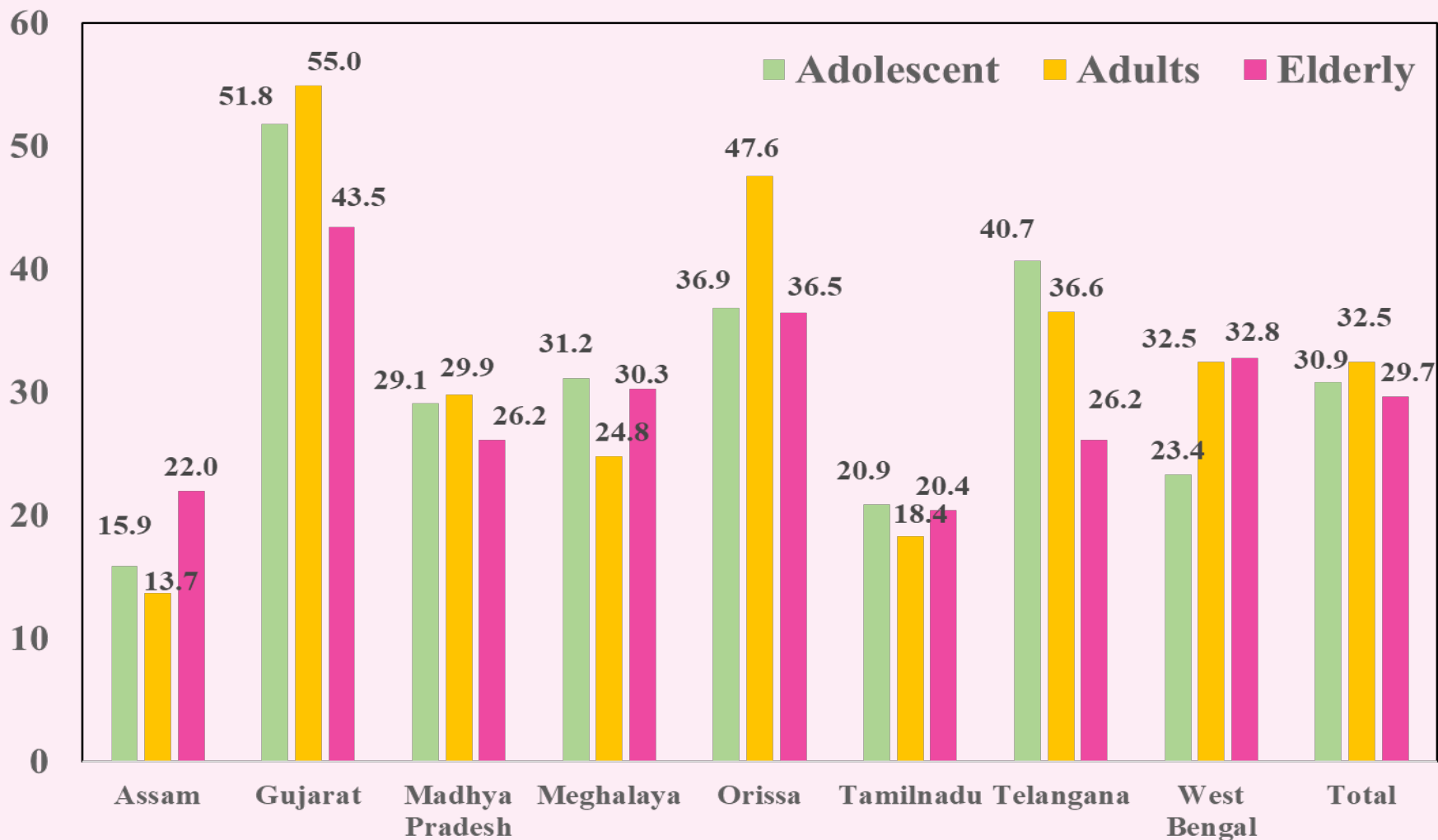
Pan India B12 deficiency study - unpublished data

Prevalence (%) of B12 Deficiency (<200pg/ml) by Age Groups and Gender



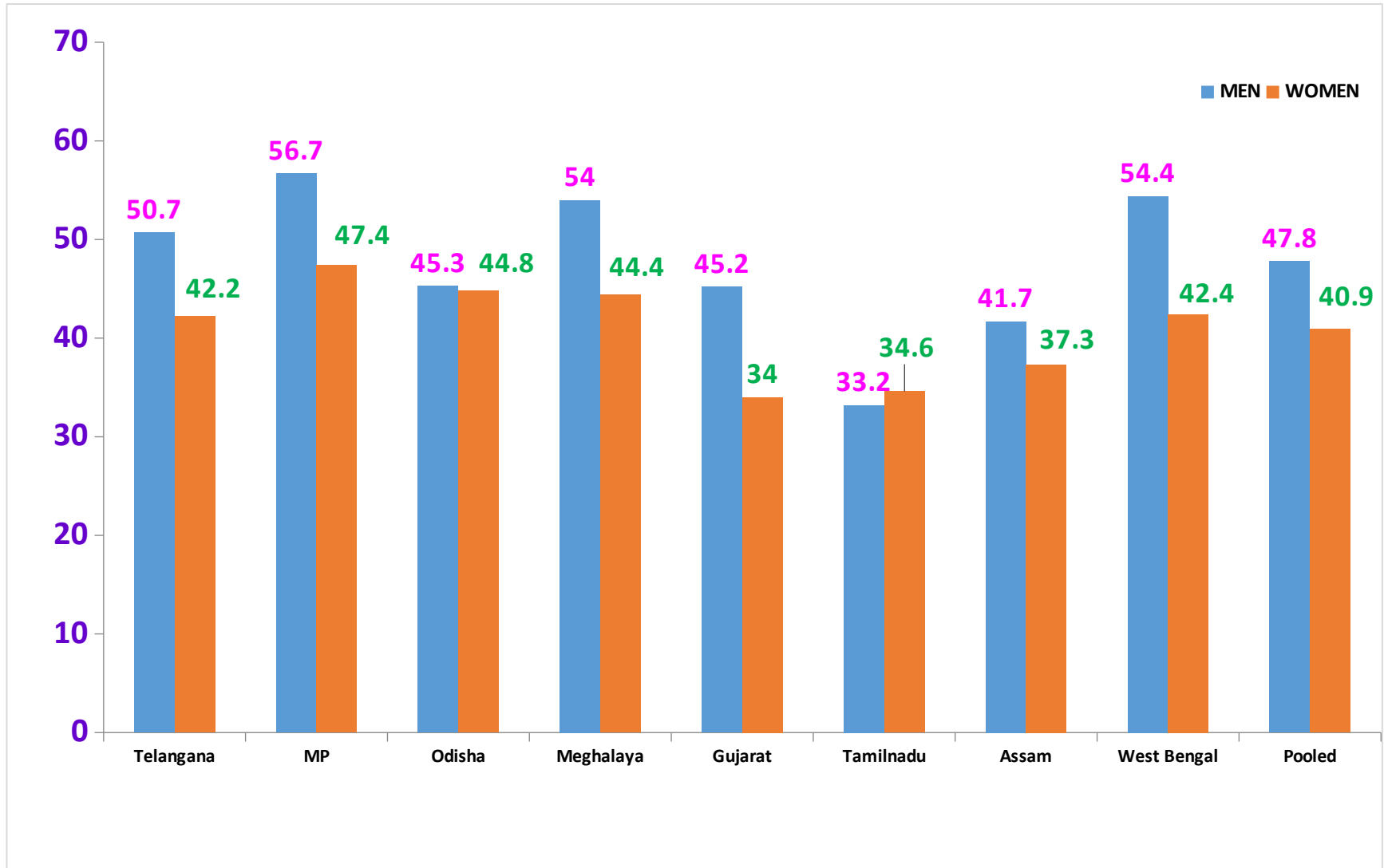
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Prevalence (%) of B12 Deficiency (<200pg/ml) by Age groups and States



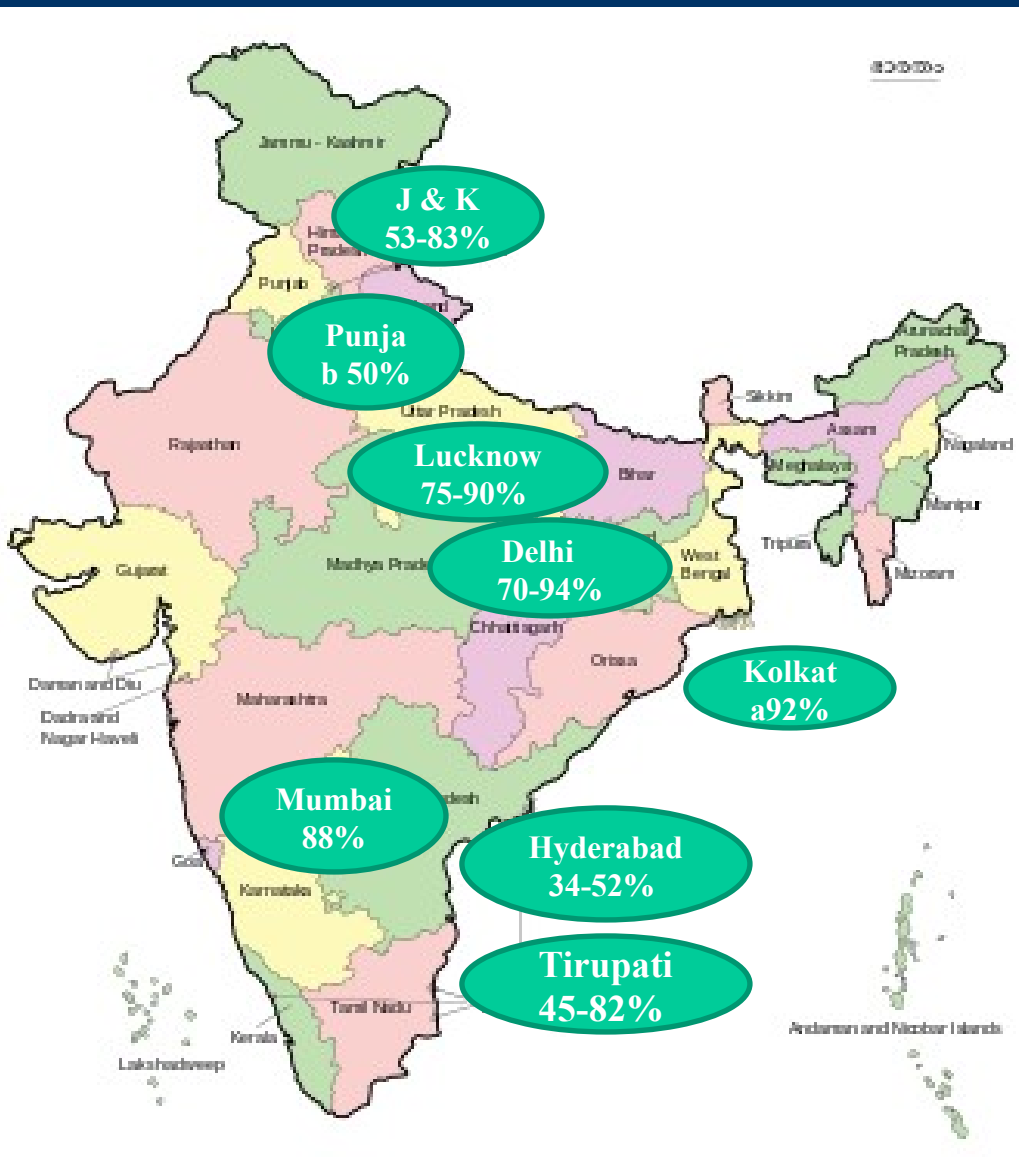
Pan India B12 deficiency study - unpublished data

Prevalence (%) of Folate Deficiency (<3 ng/ml) by Gender and State



Pan India B12 deficiency study - unpublished data

Prevalence of vitamin D deficiency in India

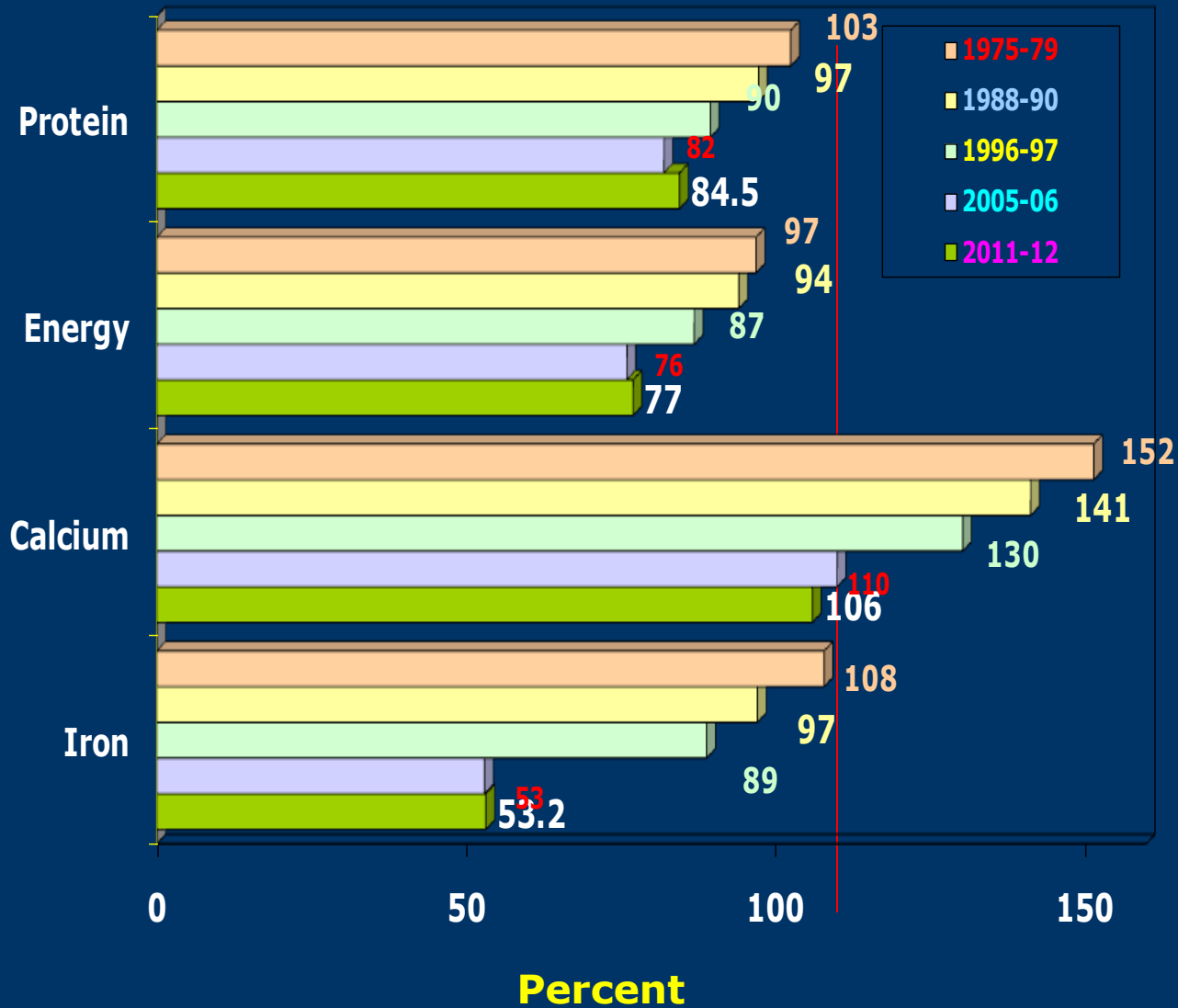


- High prevalence of vitamin D deficiency (serum 25 (OH) vitamin D3 < 20 ng/ml) found in studies across the country
- Vitamin D deficiency: high prevalence in women especially during pregnancy & lactation was observed

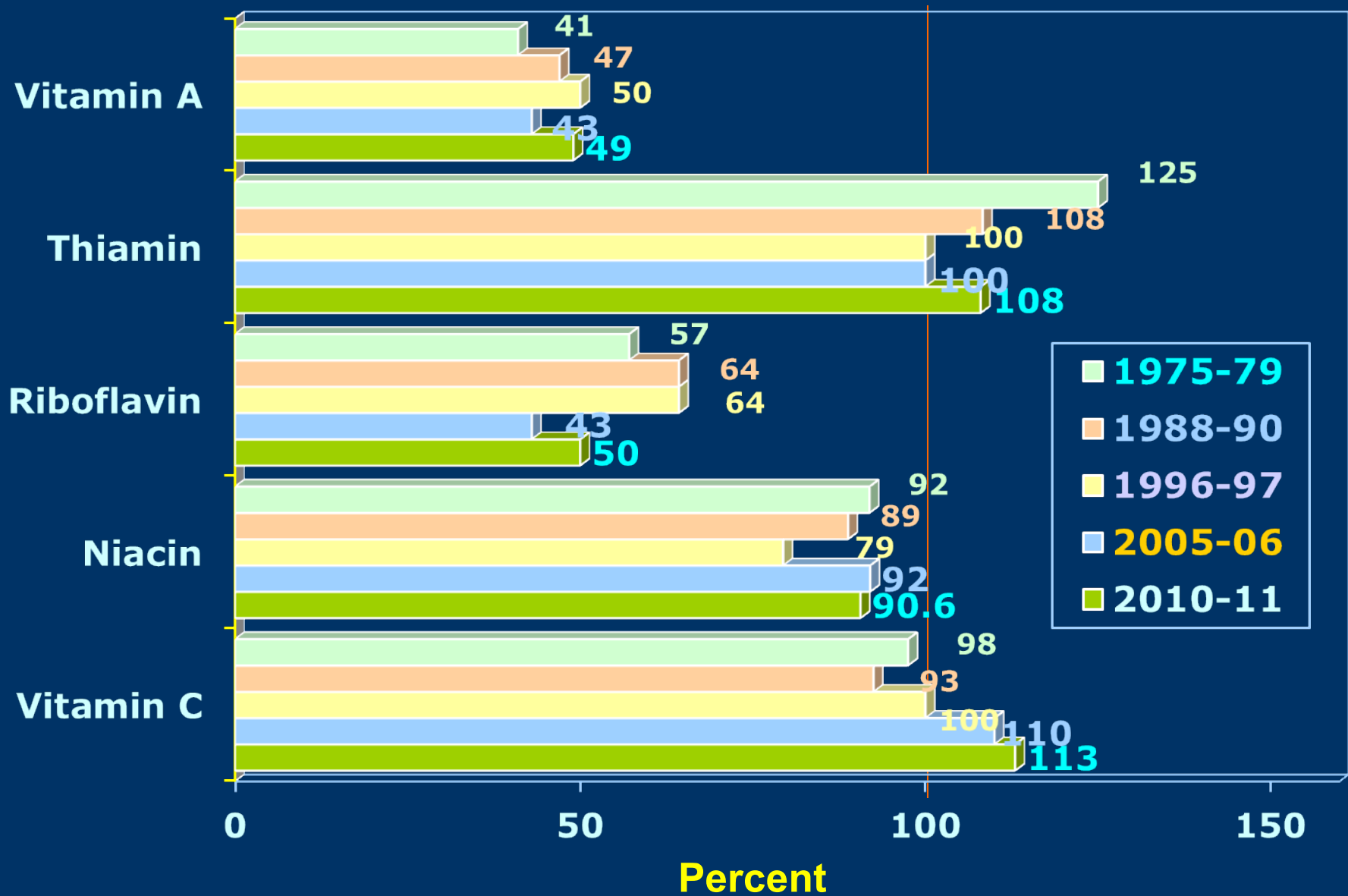
*Regardless of who
the Father of a disease is,
Surely its Mother is
IMPROPER DIET*

Old Chinese Proverb

Average Intake of Nutrients (per CU/day) as % of RDI by Period of Survey



Average Intake of Nutrients (per CU/day) as % of RDI by Period of Survey (Contd.)



PREVENTIVE STRATEGIES

HEALTHY DIET

ENERGY
GIVING FOOD

Rice, wheat, oats & corn;
ragi & jowar; Jaggery/
honey/sugar & oil/ghee

Seasonal fruits
& vegetables
(especially raw),
whole grains &
pulses (partially
polished or
unpolished)

FIBER FOOD

Soya beans, milk &
milk products, meat,
fish, eggs, nuts,
chana, peanuts

Seasonal fruits,
vegetables & green
leafy vegetables



My Plate for the Day

Promotes Health
Prevents Hidden Hunger and Protects from Diseases



Food groups	Foods to be Consumed/day (g)	%E/day/ food groups	T.E/day/ food group	T. protein/day (g)/ food group
Cereals and Millets	270	45	900	20
Pulses*	90	17	340	21
Milk/ Curd (ml)	300	10	200	10
Vegs + GLV	350	5	100	4
Fruits#	150	3	67	1
Nuts & Seeds	20	8	150	4
Fats & Oils\$	27	12	243	-

$\frac{1}{2}$
VEGETABLES

$\frac{1}{4}$
PROTEIN

$\frac{1}{4}$
STARCH

TYPES OF MILLET:



SORGHUM OR JOWAR

PEARL/ SPIKED MILLET OR BAJRA



PROSO/ COMMON MILLET (BARAGU)



FINGER MILLET (RAGI)



FOXTAIL MILLET (NAVANE)



KODO MILLET (ARAKA)

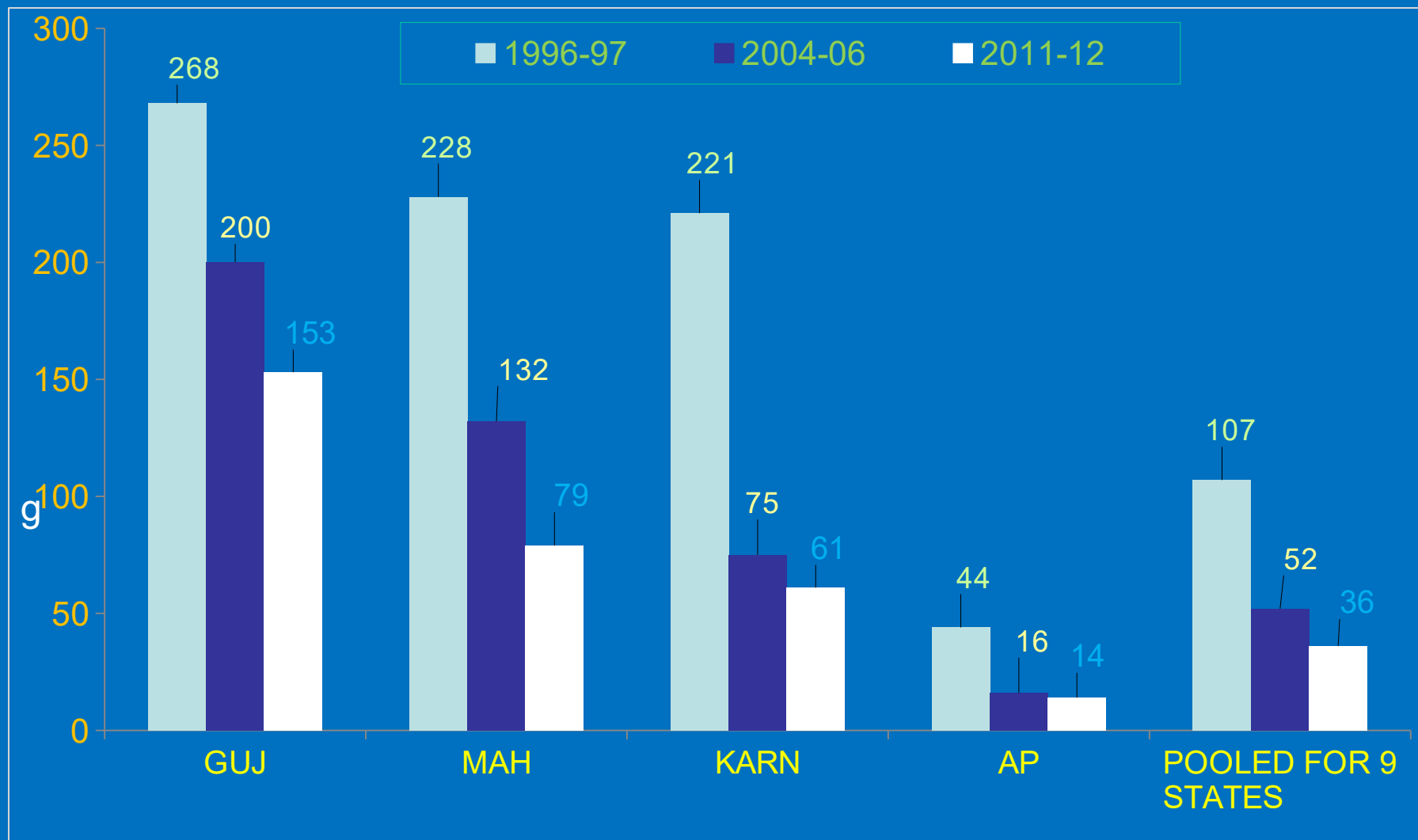
LITTLE MILLET (SAMAI)



Millet as food



TIME TRENDS IN THE CONSUMPTION OF MILLETS (g/CU/day) AMONG RURAL POPULATION

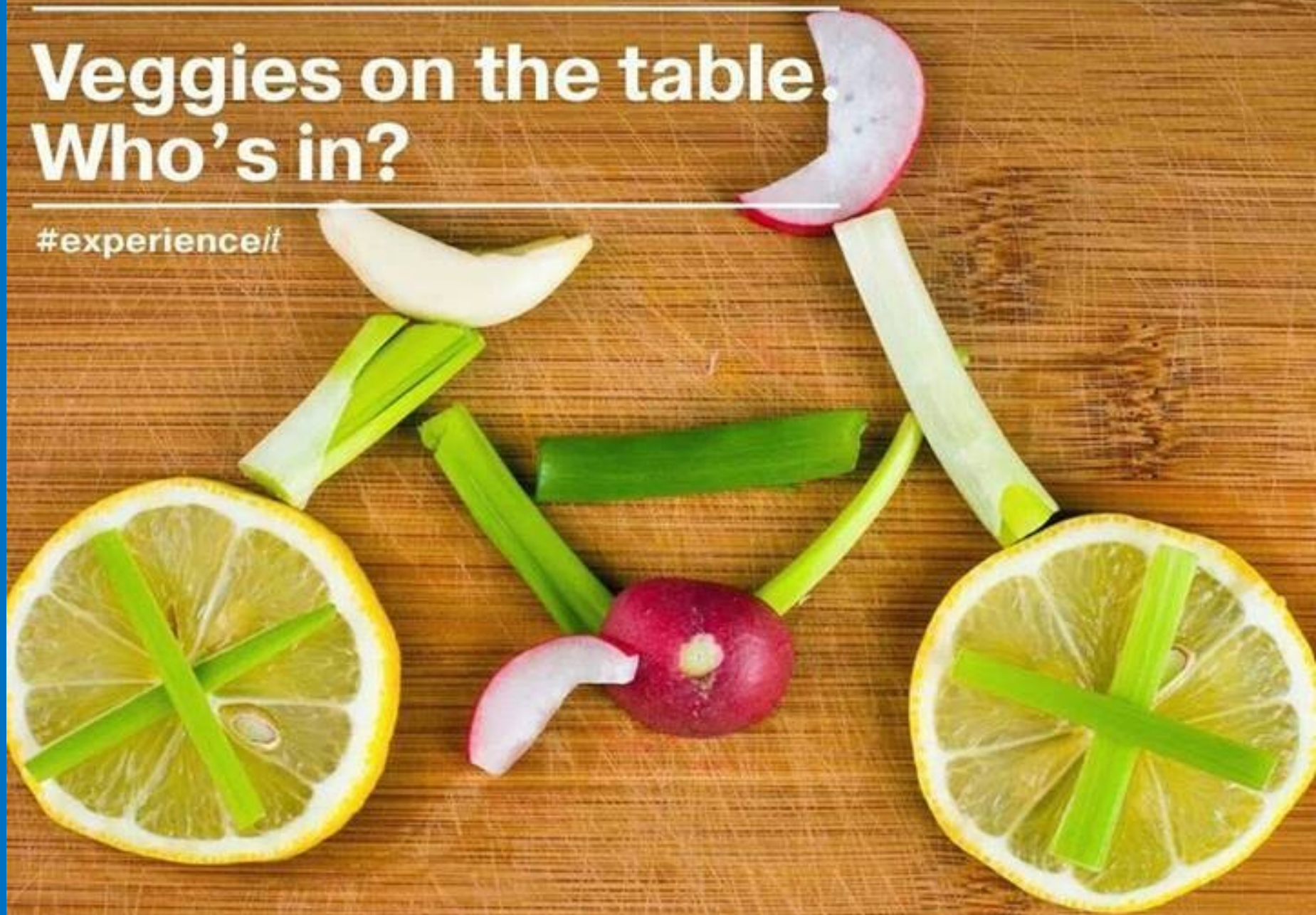


There was a significant reduction observed in consumption of millets among rural and tribal population in India, while it was increased in urban population over a period of two decades— NNMB Surveys



Veggies on the table. Who's in?

#experienceit







FUNCTIONAL FOODS

VITAMINS

MINERALS

ANTIOXIDANTS

PHYTONUTRIENTS

HORMONES

N-3 FATTY ACIDS

FIBER

Thank You



THANK YOU FOR PATIENT HEARING