सत्यमेव जयते
Ministry of Health and Family Welfare
Government of India

Comprehensive National Nutrition Survey

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Presentation in ILSI India Seminar on
Current Trends in Food and Nutrients Consumption in India

Birth to Adolescence

The Largest Micronutrient Survey ever Conducted

CNNS
Birth to Adolescence

Total Sample Collected

- Survey sample (Anthro) : **112,316**
- Bio-sample (blood/urine/stool) : **51,029**

Data Collection Period

- from 26 Feb 2016 to 24 Oct 2018

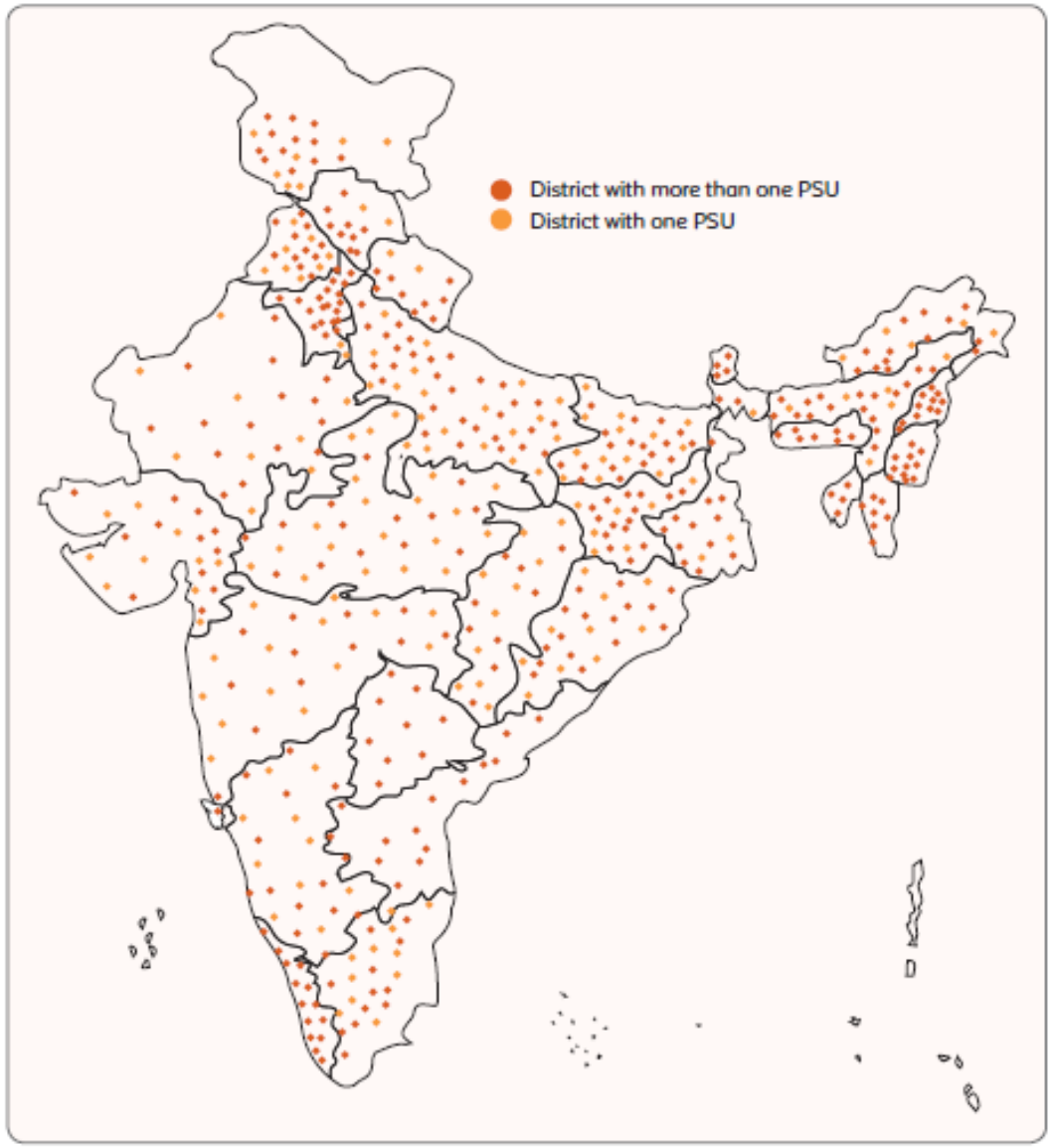
Geographical Representation

- All 30 states of India
- Urban & Rural areas

Survey design

- Cross-sectional, household survey
- Multi-stage random sampling method

CNNS covered **2035 Primary Sampling Units** from more than 82% of districts from the Census of 2011 (516 out of 628 districts) across 30 states



The CNNS presents data for the first time ever

Birth to Adolescence

A comprehensive nutritional profiling across four age groups:

- Pre-school children 0 - 4 years
- School aged children 5 - 9 years
- Early adolescents 10 - 14 years
- Adolescents 15 - 19 years

National and State level estimates across the age groups of:

- Detailed information on triple burden of malnutrition (overweight, stunting, anemia)
- Biomarkers indicating micronutrient status from venous blood and urine samples
- Biomarkers of risk factors of non-communicable diseases (NCDs)
- Assessment of the multi-factorial causes of anemia:
  - Iron and micronutrient deficiencies
  - Hemoglobinopathies,
  - Infection and inflammation,
  - Dietary diversity
- Cognitive development, school readiness and educational achievement

Expected Outcomes from the CNNS

Birth to Adolescence

The state of the art assessment of micronutrient status

- Data to serve as baseline for POSHAN Abhiyaan and Anemia Mukt Bharat
- Greater understanding of anemia in India and States across age groups
- Data to support policy on IFA, vitamin A, B12, D, Zinc and Salt Iodization

New data to describe interactions between malnutrition and risk factors for Non-Communicable Disease (NCDs)

- Will support evidence based policy development for:
    - Reductions of Undernutrition
    - Prevention of Overweight and Obesity
    - Prevention of Non-Communicable Diseases

Partnerships for Implementation of the CNNS

CNNS
Birth to Adolescence

Survey Implementation by MoHFW, Government of India & Supported by UNICEF

Technical Support: US Centre for Disease Control & UNICEF

Regular Review and Technical support: Technical Advisory Group constituted by MOHFW

Quality Assurance and External Monitoring: AIIMS, PGIMER, NIN, KSCH and CDSA

Overall Field Coordination, Trainings, and Data Analysis: Population Council

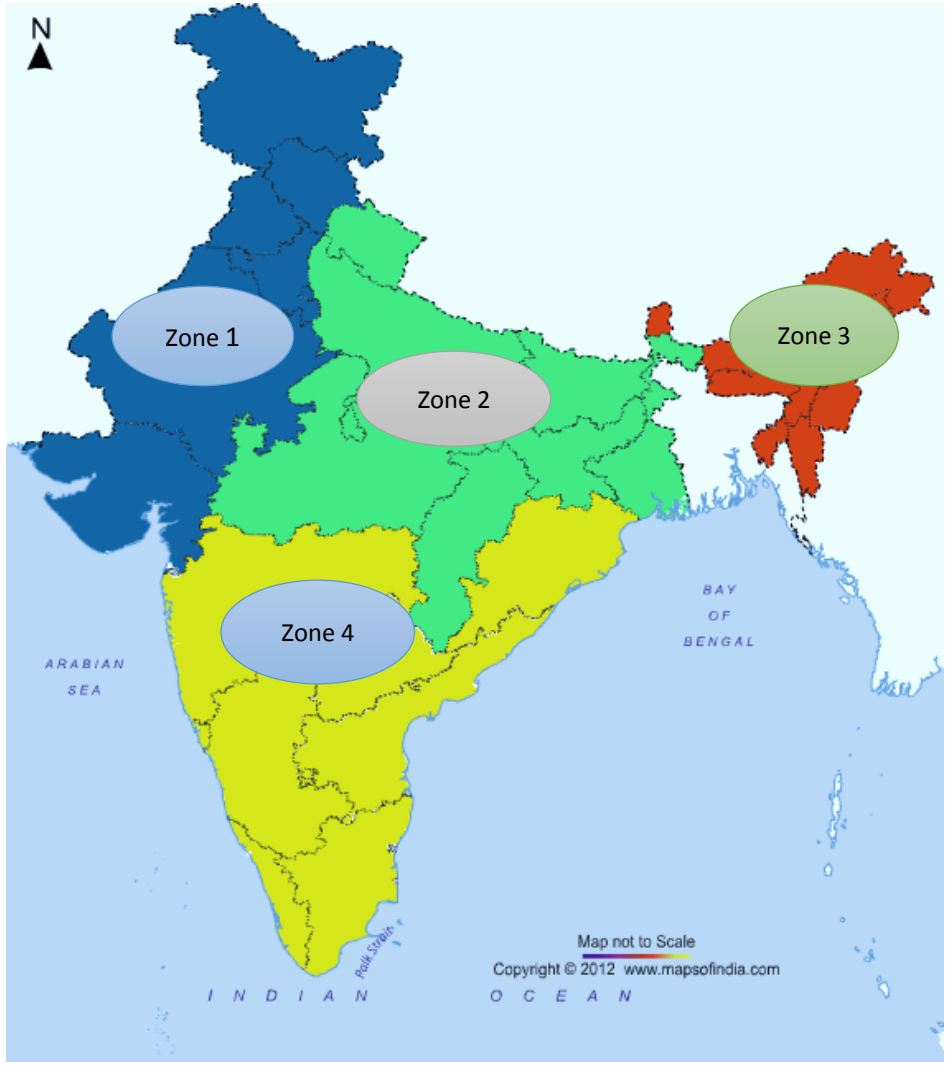
Biological Sample Collection, Transportation and Analysis: SRL Limited

Survey and Anthropometric Data Collection: IIHMR, KANTAR, GFK and SIGMA

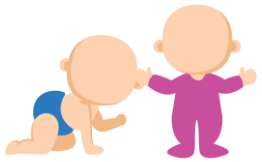
CNNS Implementation

- National Stakeholder Consultation to develop CNNS protocol
- 2 weeks of pilot/field testing to finalise survey instruments and protocol
- 2 weeks of National Training of Trainers
- 4 weeks of state level training for survey team
- Standardization of anthropometry measurers
- Strong data quality assurance system
- Regular review and feedback by TAG, constituted by MoHFW
- 3 tiers of field monitoring

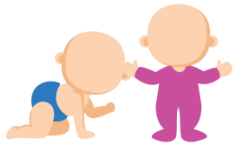
Four zones of survey implementation



Anthropometry measurements

Pre-school children (0-4 years)	School-age children (5-9 years)	Adolescents (10-19 years)
		
• Height • Weight • Mid-upper arm circumference (MUAC) • Triceps skinfold • Subscapular skinfold (1-19 years)		
	• Waist circumference	

Biomarkers: Micronutrient deficiencies and NCDs

Indicator Group			
Anaemia and haemoglobinopathies	• Haemoglobin • Variant haemoglobins		
Inflammatory biomarkers	• C-reactive protein		
Protein	• Serum protein and albumin		
Micronutrients	• Iron: Serum ferritin, serum transferrin receptor • Vitamin A: Serum retinol • Zinc: Serum zinc • B-vitamins: Erythrocyte folate, serum B12 • Vitamin D: Serum 25 (OH) D • Urinary Iodine		
Non-communicable diseases		• Blood Pressure • Blood glucose, HbA1c • Lipid profile: Serum cholesterol, LDL, HDL, and triglycerides • Renal function: Serum creatinine, urinary protein creatinine ratio	

Monitoring and Supervision

Three-tiers of Data Quality Assurance

Third Level

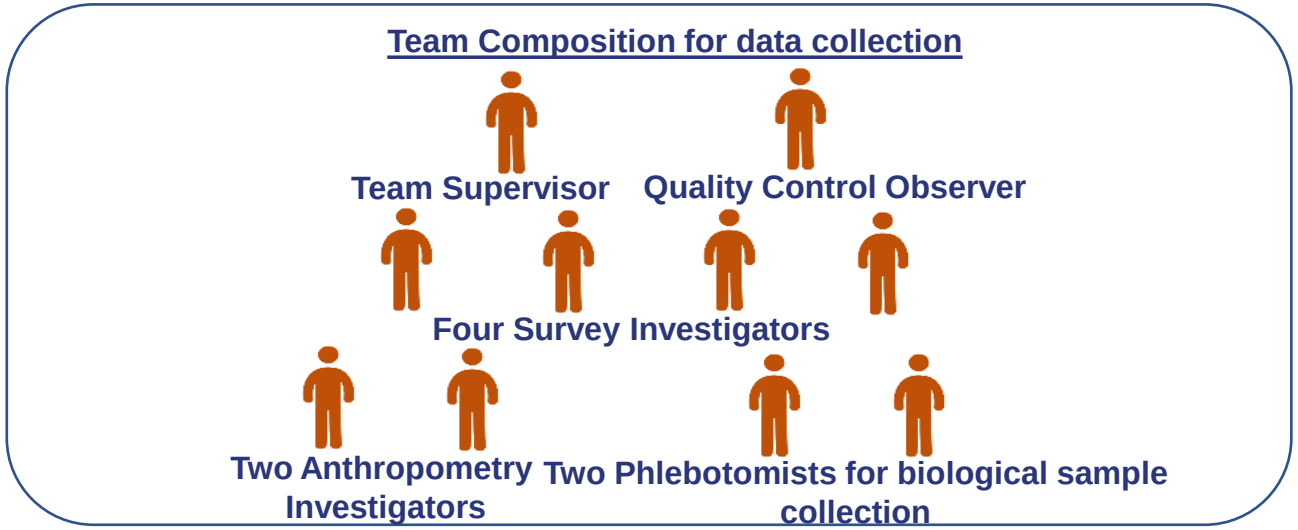
- Field work/protocol/training monitoring: by quality control team
- Biological sample quality control : by AIIMS, NIN and US CDC

Second Level

- 3-member Data Quality Assurance (DQA) team for re-interviews & observations
- Concurrent monitoring of biological sample collection, storage and transportation by CDSA

First Level

- Internal monitoring by the Quality Control Observer
- Daily supervision of the field work by Team Supervisor



Quality Assurance Measures for Data Quality

Evaluation of Interviewers
prior to employment

Survey team

- Written and oral test
- Mock interview
- Ethics test

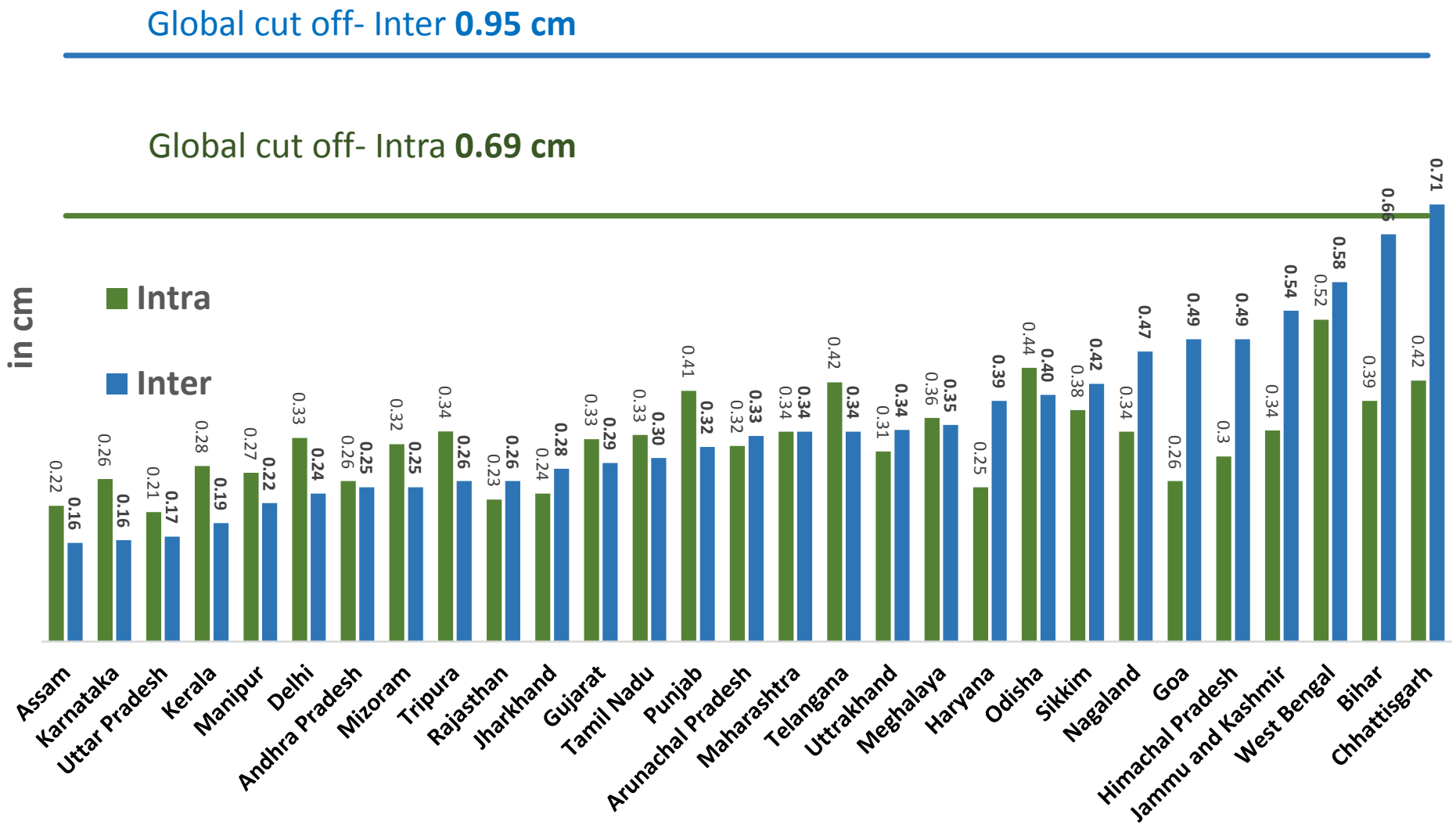
Anthropometry team

- Standardisation
- Selection based of demonstrated capacity measured by technical error of measurements (TEM)

Quality Assurance Measures

	DQA team conducted consistency checks, and provided feedback on real time basis
	No more than 4 interviews allowed in a day by an interviewer
	Daily SMS based monitoring/ alerts system for biological sample (from PSUs, collection points and reference labs).
	Sample transportation in thermal insulation bags maintaining temperature at 2-8° Celsius for up to 16 hours
	Time and temperature monitoring of samples by digital data loggers

Technical Error of Measurement - Height



- All anthropometrists were tested for their capacity to make accurate and precise measures of height, weight, MUAC, TSFT and SSFT prior to employment
- All anthropometrists hired for CNNS passed the standardization tests with technical errors of measurement below international recommended cut-offs

Results

Anthropometry

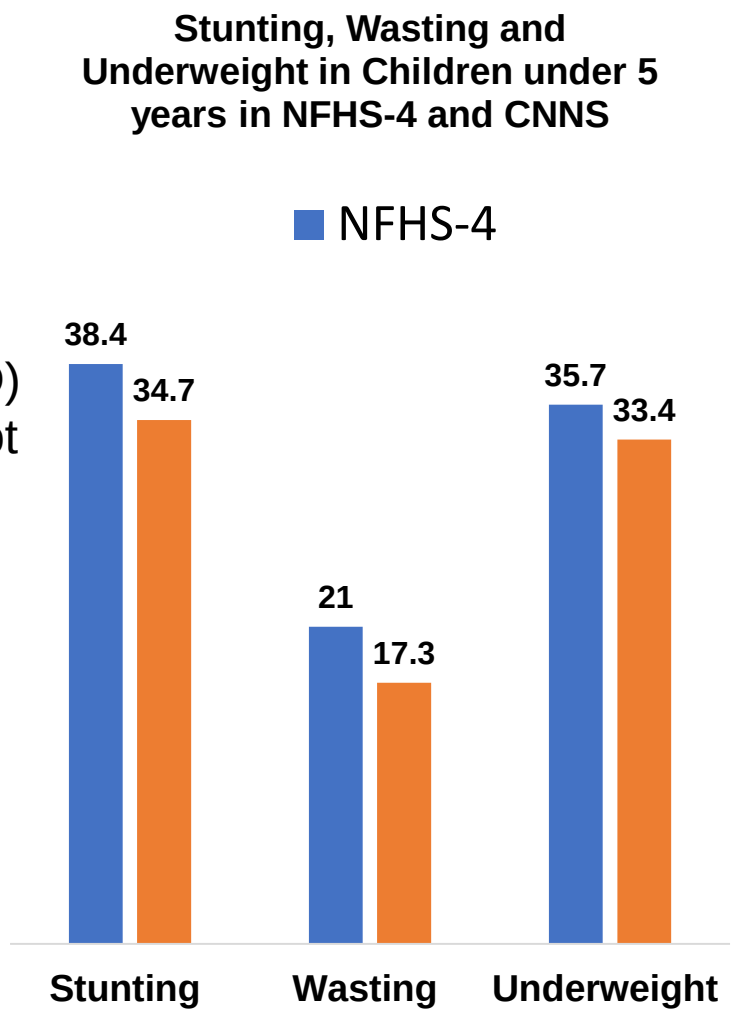
Reduction of Stunting, Wasting and Underweight in Children Under 5 years

- Lower prevalence of stunting CNNS - 34.7% NFHS-4 - 38.4%
- Lower prevalence of wasting CNNS - 17.3% NFHS-4 - 21.0%
- Lower prevalence of underweight CNNS - 33.4% NFHS-4 - 35.7%

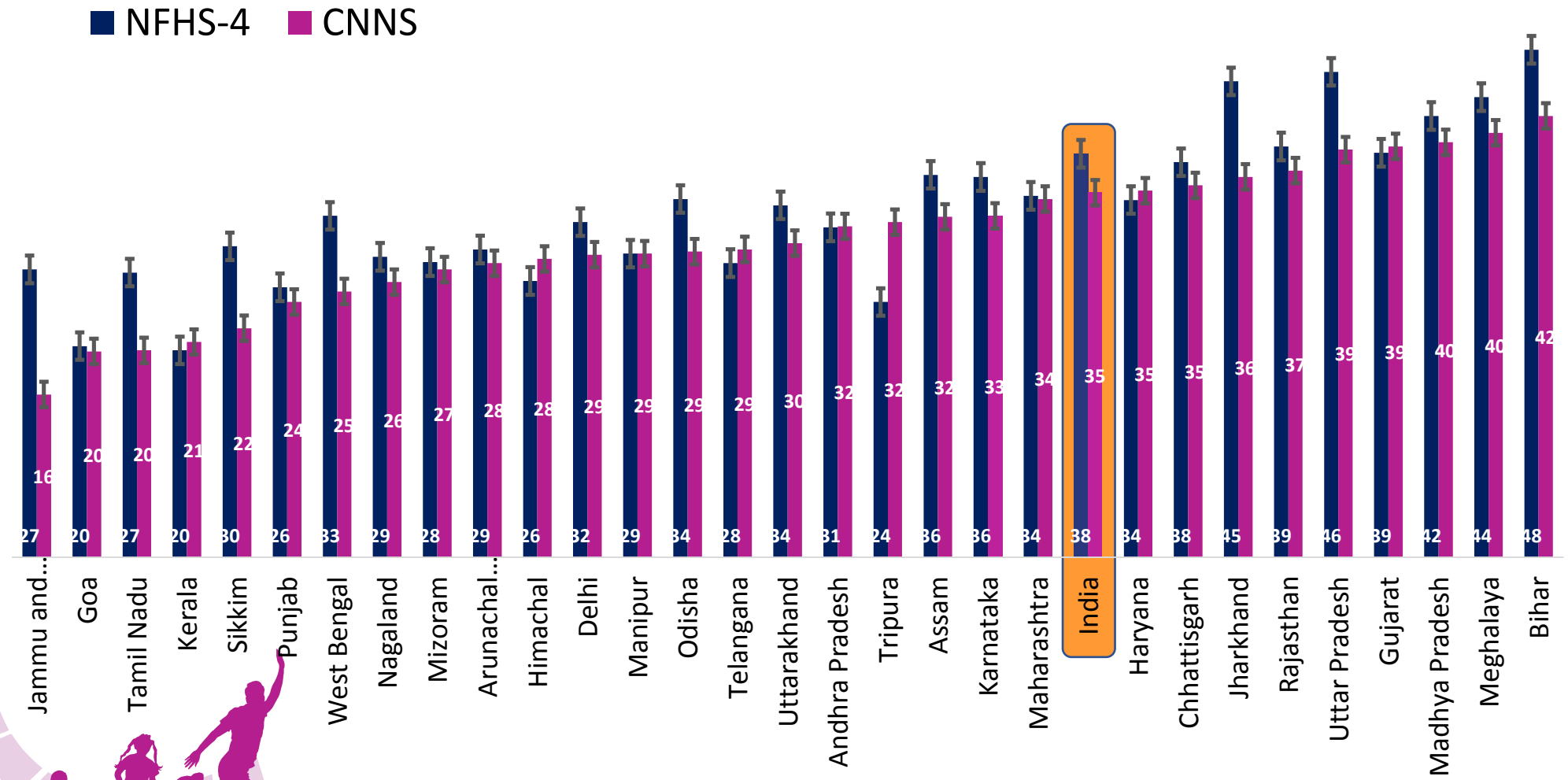
Nutrition in Children 5-9 years and Adolescents 10-19 years

- One quarter of 5-9 and 10-19 year olds were thin for their age (BMI-Age <-2SD)
- One in five children 5-9 years old were stunted. The school age period does not provide an opportunity for catch up growth in height.
- About 5% of 5-9 and 10-19 year olds were overweight or obesity

The double burden of malnutrition (stunting and overweight) is present among school age children & adolescents in many states.

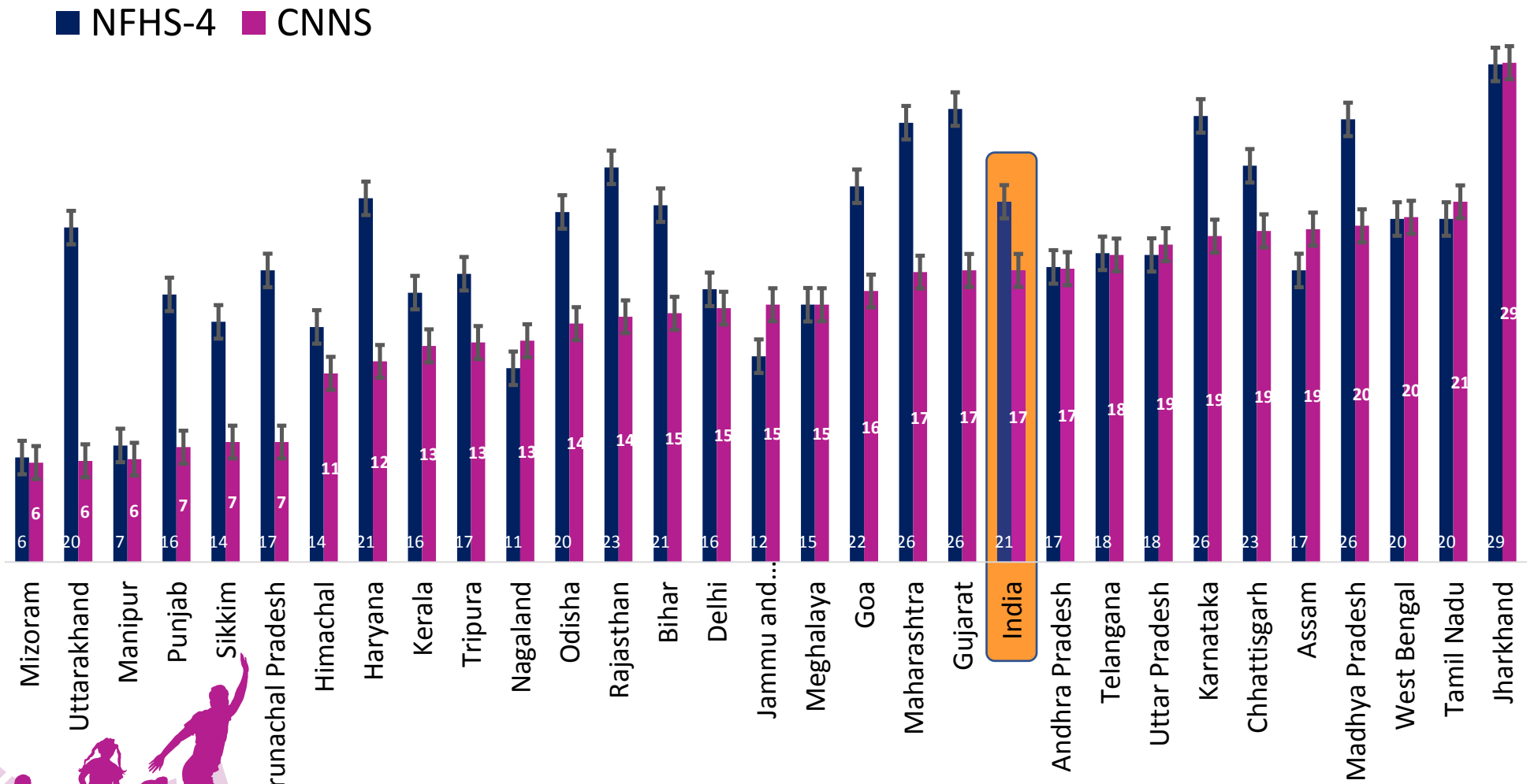


Stunting Continues to Decline among Children Under Five



Lower prevalence of stunting in children under five years of age was found in CNNS - 34.7% as compared to NFHS-4 -38.4%

Overall Wasting Trends are Declining but still High in Children Under Five



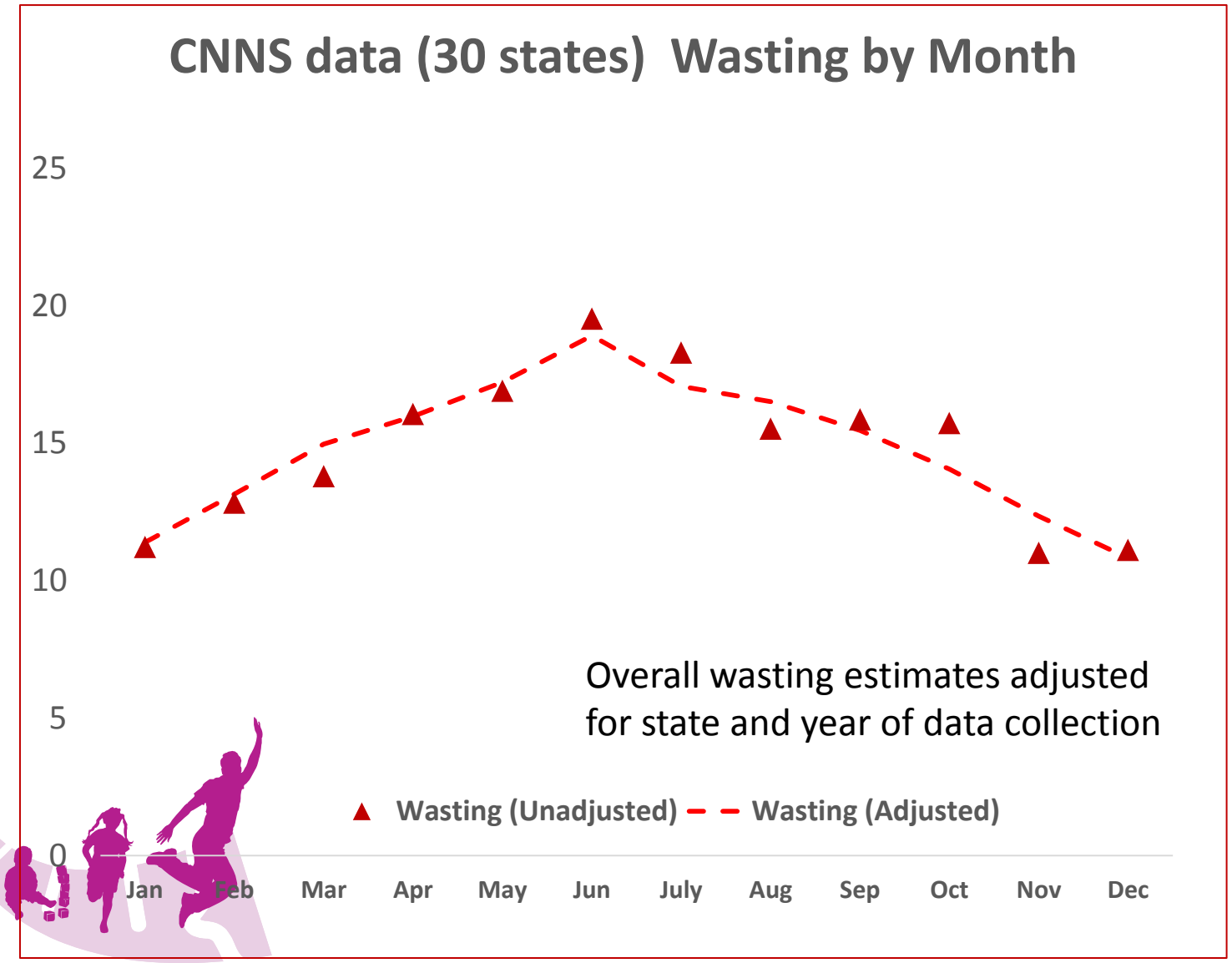
Wasting is affected by seasonality. All comparisons of wasting trends should account for month of data collection

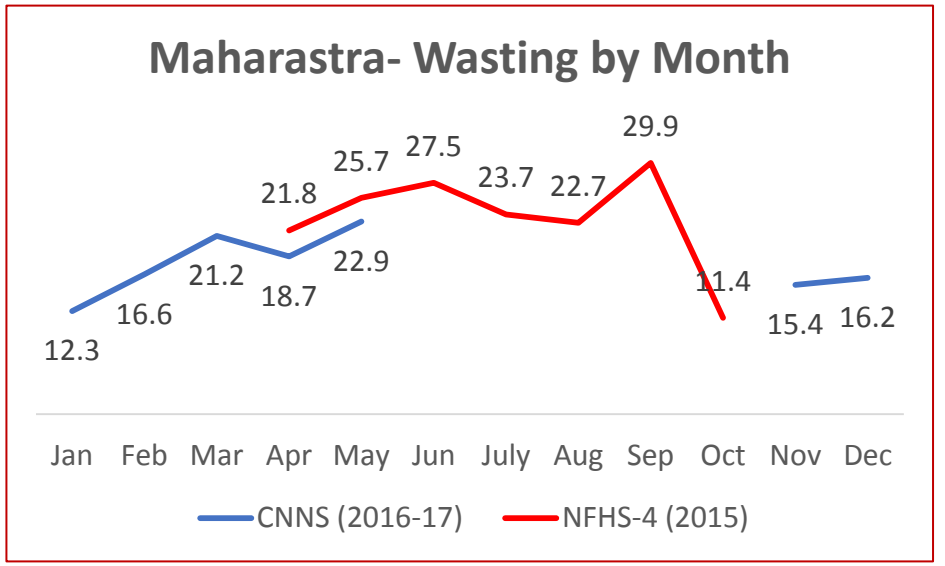
Lower prevalence of wasting was found in CNNS - 17.3% as compared to NFHS-4 - 21.0%

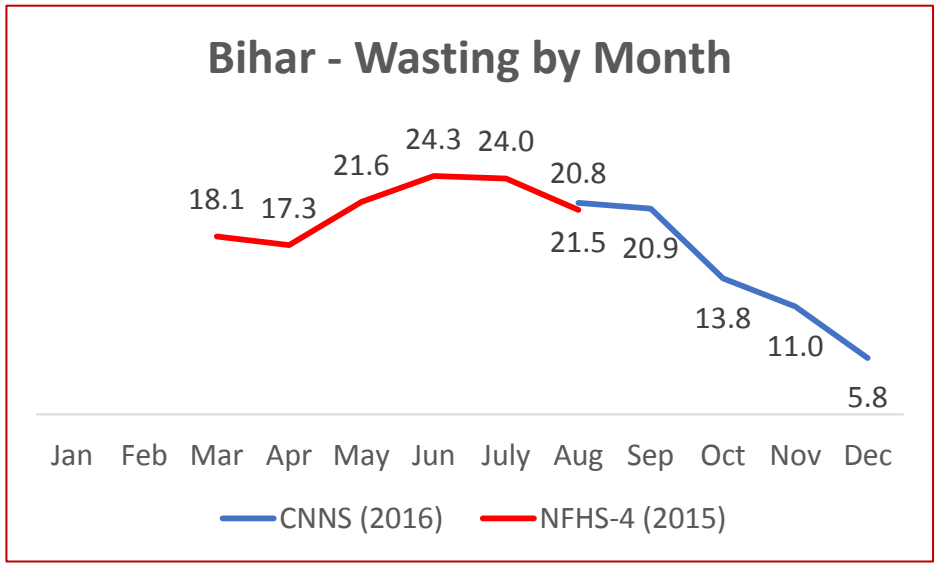
Wasting Prevalence is Affected by Seasonality

Seasonality affects estimates of acute malnutrition (MUAC and WHZ)

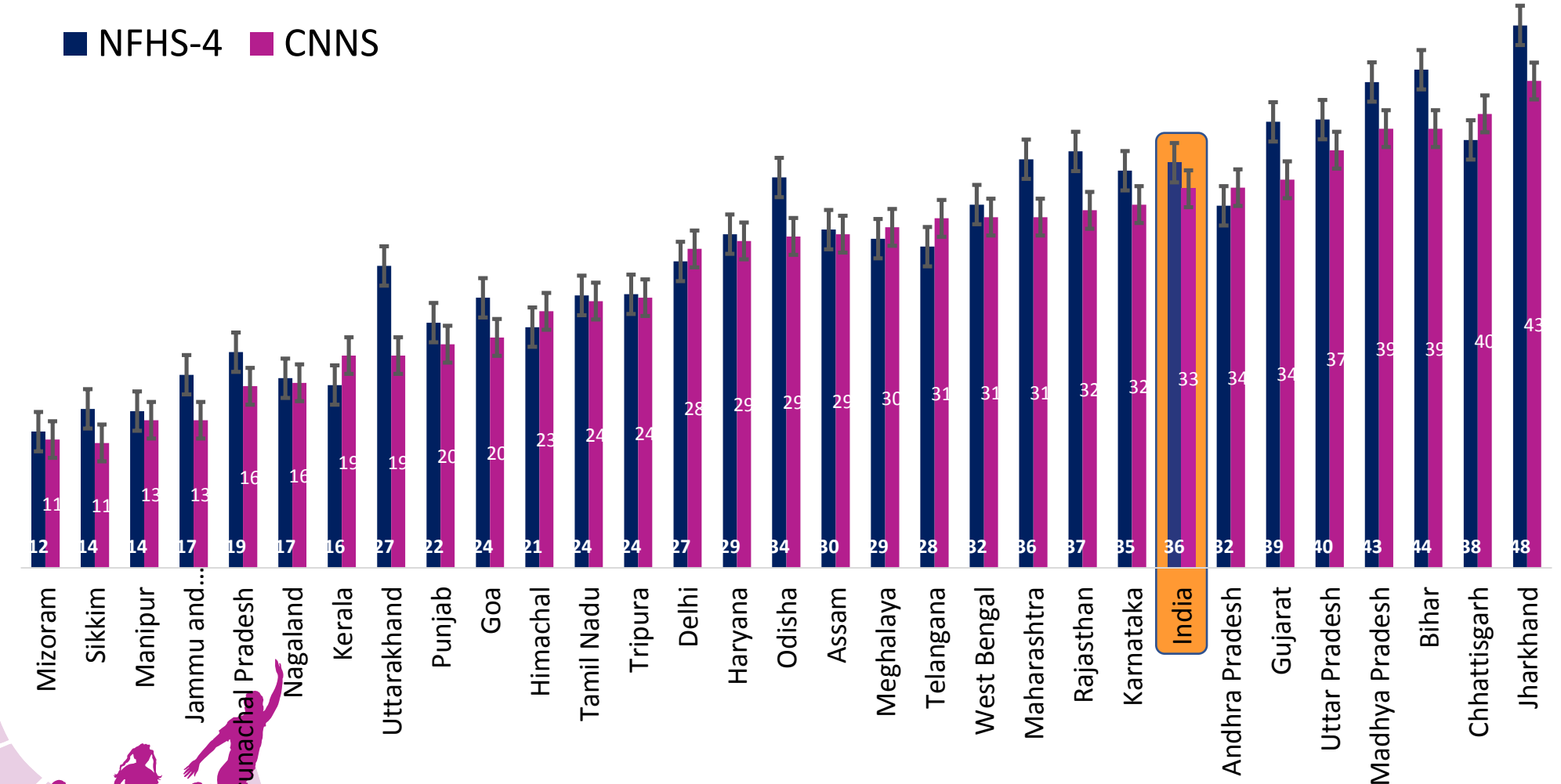
CNNS Birth to Adolescence







Significant Decrease in Underweight in few states In children under five



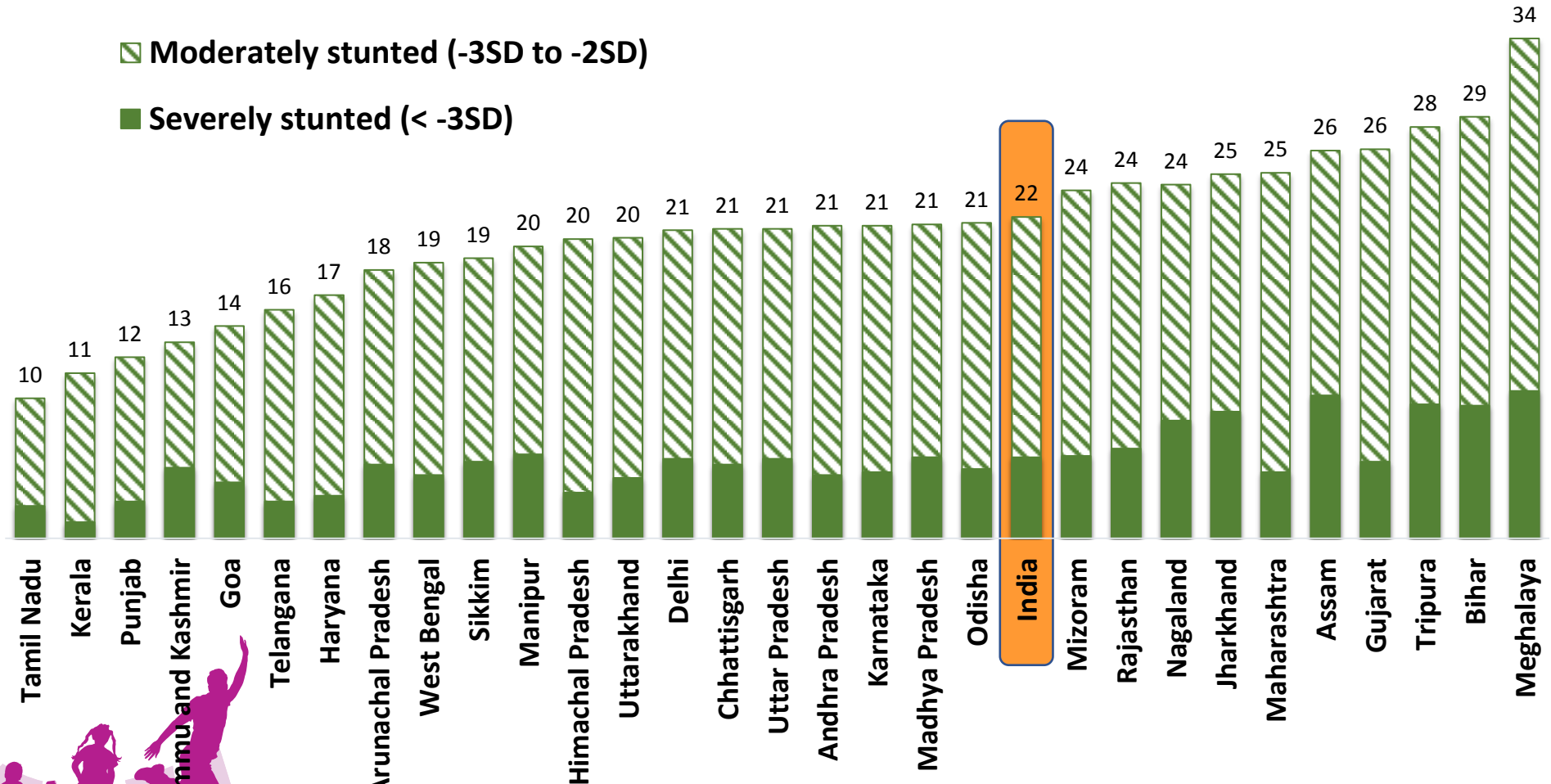
Underweight is a composite measure of chronic and acute malnutrition.

Lower prevalence of underweight was found in CNNS - 33.4% as compared to NFHS-4 - 35.7%

Time Period from 5-9 years of age does not provide opportunity for catch up growth in Stunting

Birth to Adolescence

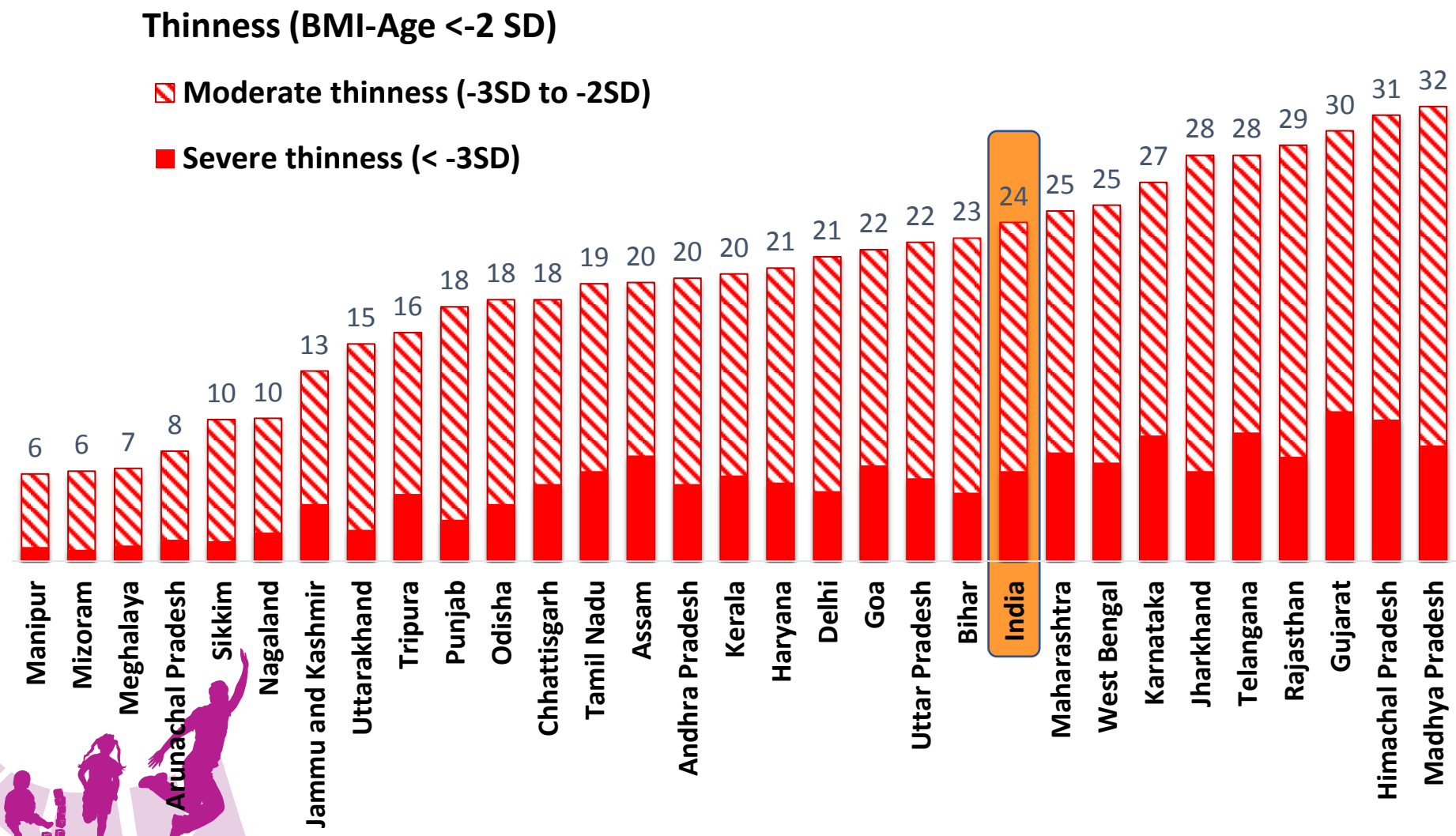
Stunting (HAZ-scores) in Children 5-9 years



Almost one quarter of children aged 5-9 years were stunted

Significant proportion of children who were stunted in childhood remain stunted into their schooling age reducing their potential capacity for education

One quarter of Adolescents aged 10-19 years remain thin

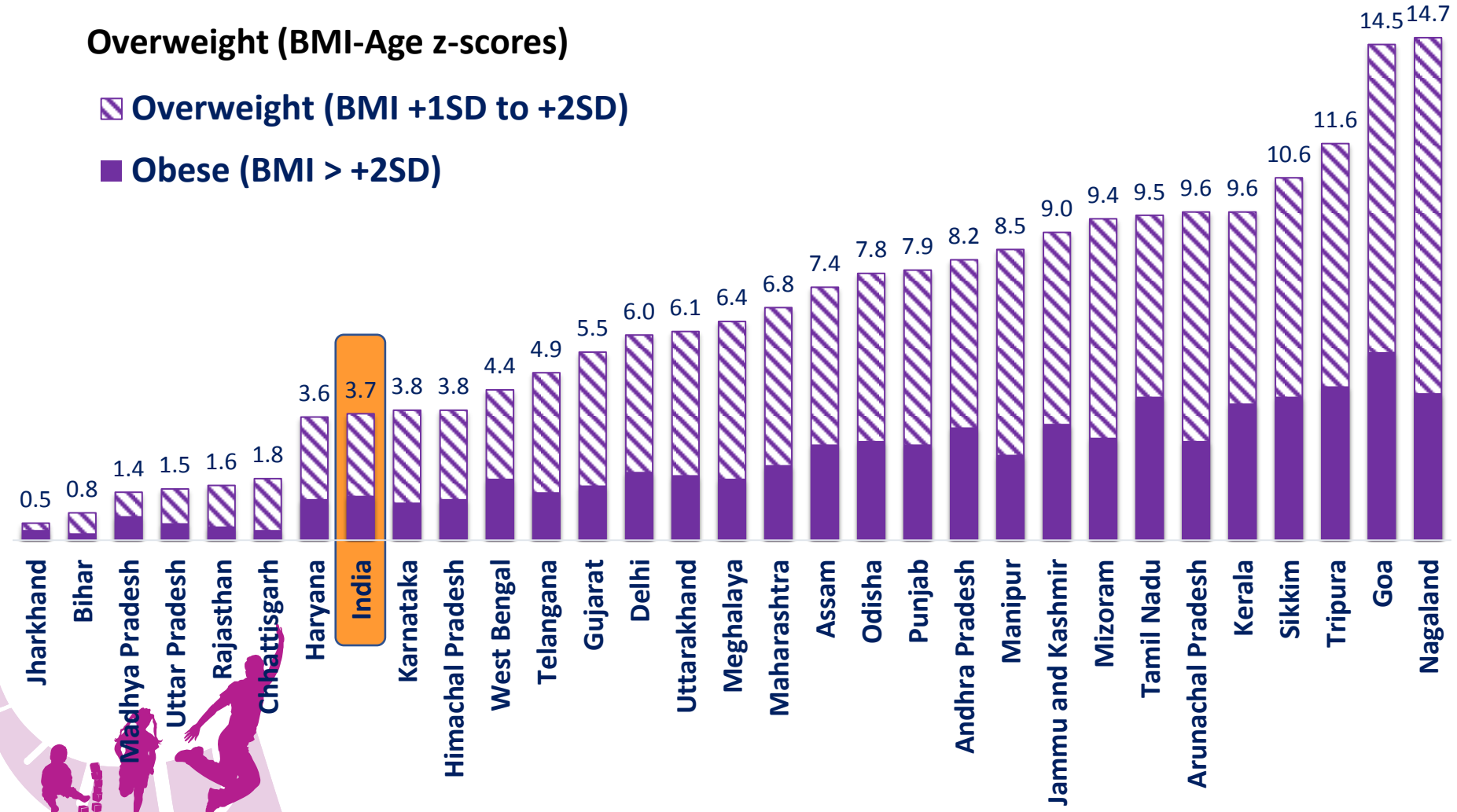


Thinness among adolescents is 20% or higher in the majority of states.

For children to benefit from their last growth spurt before adulthood, they need to be well nourished. This is especially important for young women who become mothers on average at age 20 years

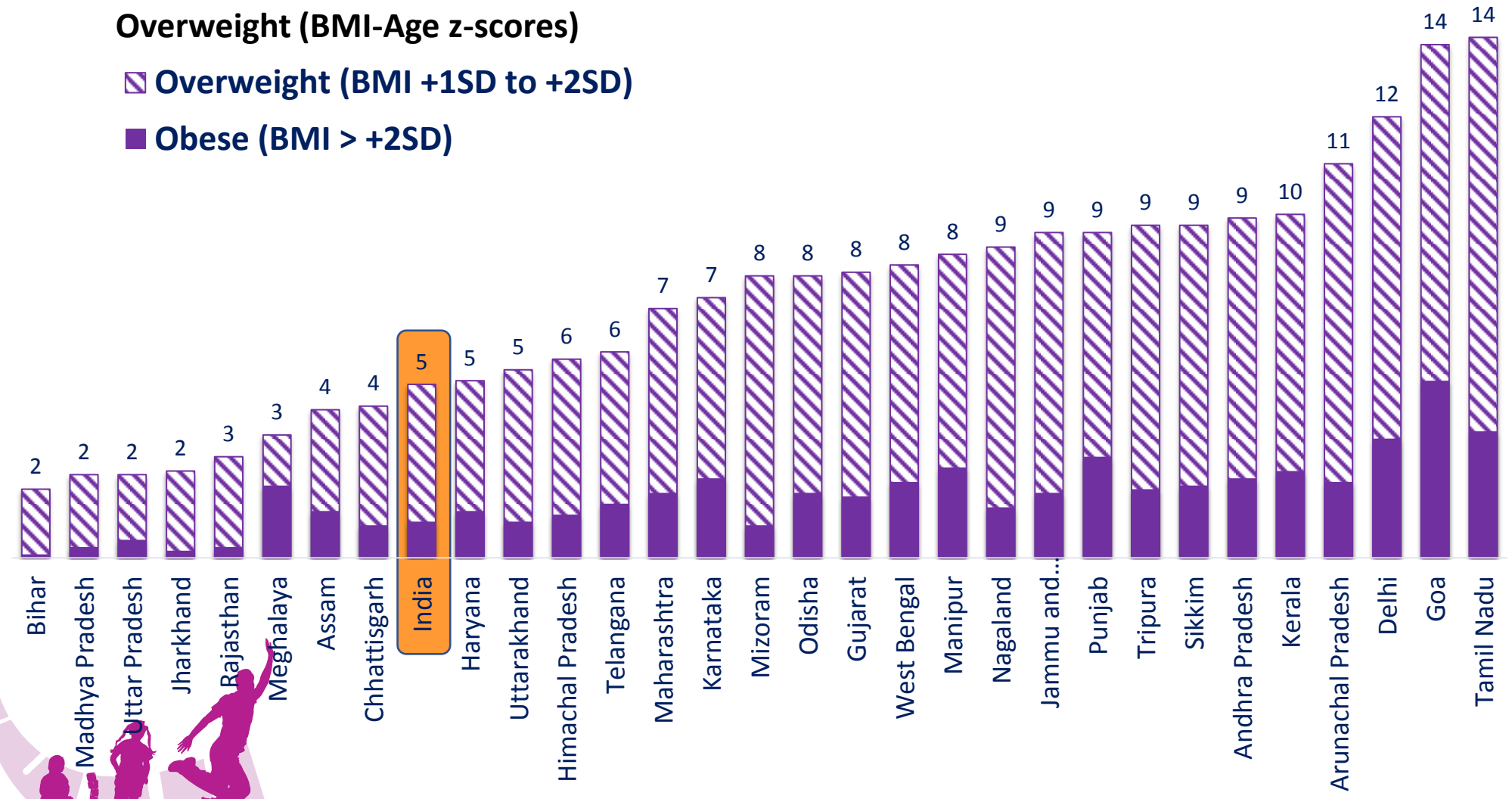
Seasonality does not affect in thinness in adolescents

Overweight and Obesity in Children aged 5-9 years is Evident in Many States



- **The double burden of malnutrition is present in many states**
- **The demographic dividend when India's large adolescent population enters the work force will be greatly reduced if they suffer from rising rates of NCDs caused by poor nutrition and health in early childhood.**

Overweight and Obesity is on the rise among Adolescents aged 10-19 years

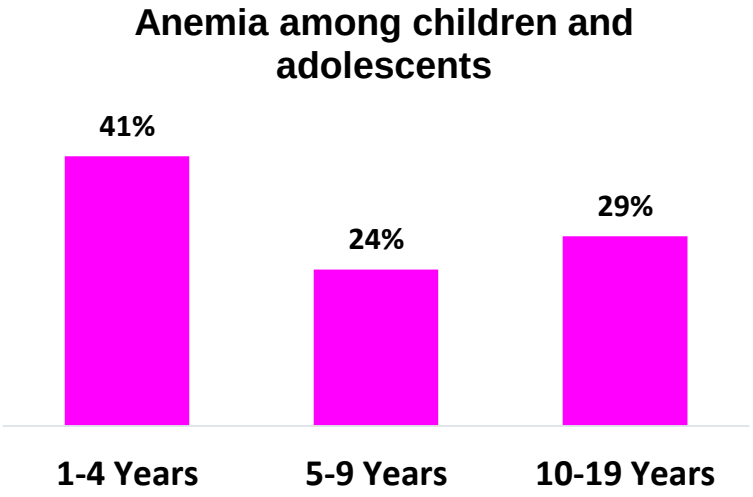


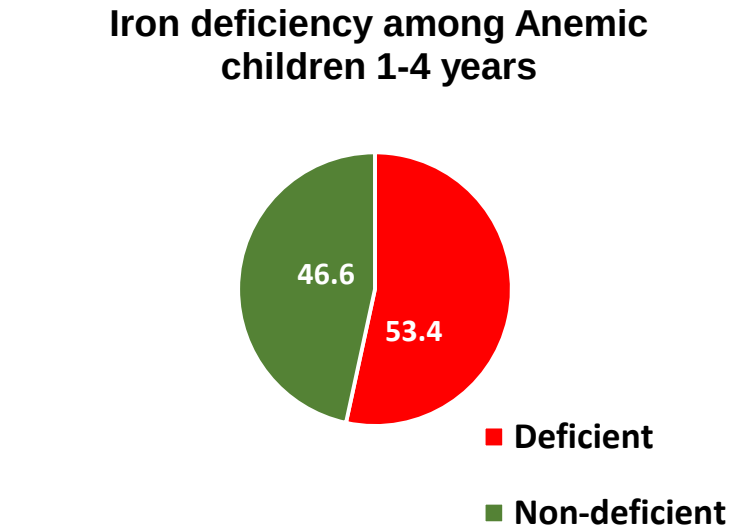
Obesity and overweight among adolescents aged 10-19 years is more evident in Tamil Nadu, Delhi, and Goa.

Nutrition and health interventions in early childhood provide opportunities for improved population health and wellbeing.

Anemia and Iron deficiency

- Anemia estimates (as measured by gold standard methods in CNNS) 41% (1-4 years), 24% (5-9 years) and 29% (10-19 years)
- A validation study from AIIMS found NFHS-4 Hemocue method overestimates anemia as compared to gold standard CNNS method - Venous blood and Cyanmethemoglobin method with laboratory spectrophotometer
- 32% of children aged 1-4 years, 17% of children aged 5-9 years and 22% of adolescents aged 10-19 years of age have iron deficiency measured by serum ferritin
- Half of the anemia in children under five is associated to iron deficiency





Anemia is highest in children 1-4 years of age

Birth to Adolescence

1-4 Years

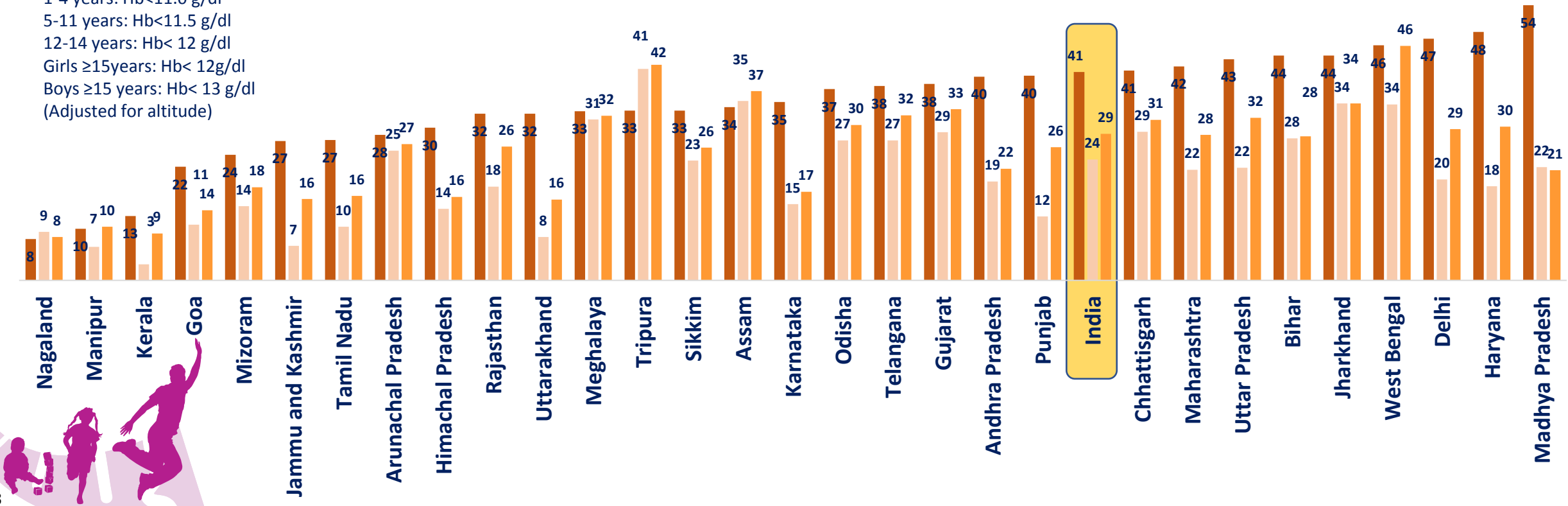
5-9 Years

10-19 Years

In the majority of states, anemia is significantly higher in children aged 1-4 years compared to the children aged 5-9 and 10-19 years

The CNNS is the first national survey to collect data on the multi-factoral causes of anemia (iron and micronutrient deficiencies, inflammation, disease, hemoglobinopathies and diet)

Anaemia Cut Offs (WHO)
1-4 years: Hb<11.0 g/dl
5-11 years: Hb<11.5 g/dl
12-14 years: Hb< 12 g/dl
Girls ≥15years: Hb< 12g/dl
Boys ≥15 years: Hb< 13 g/dl
(Adjusted for altitude)

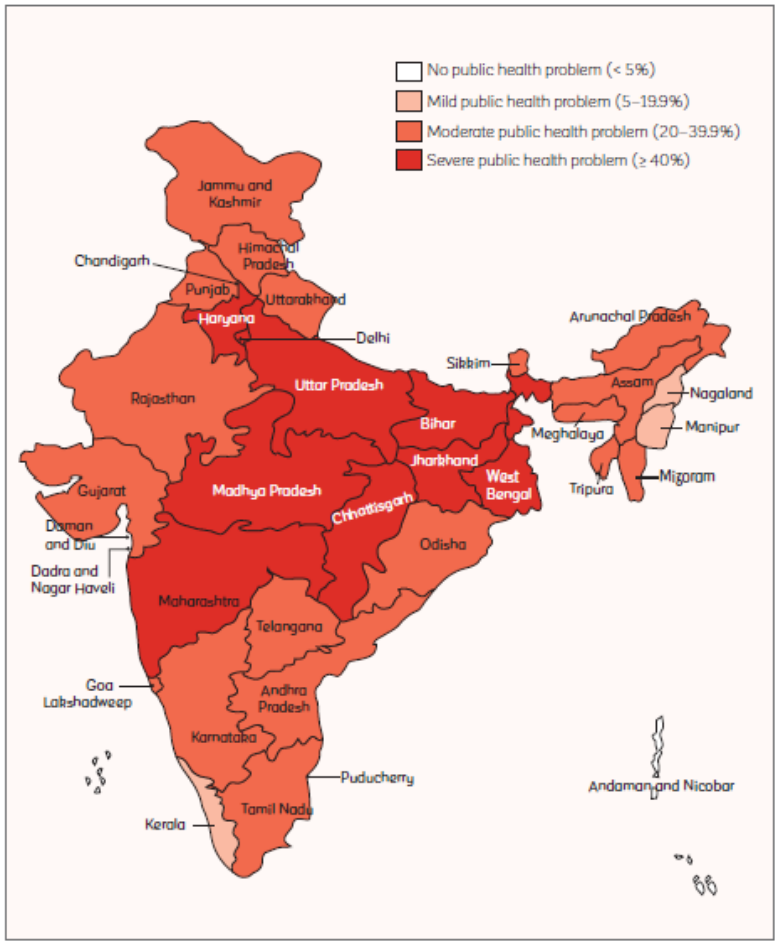


CNNS Anemia Data Collection Method : Venous blood and Cyanmethemoglobin method with Laboratory spectrophotometer

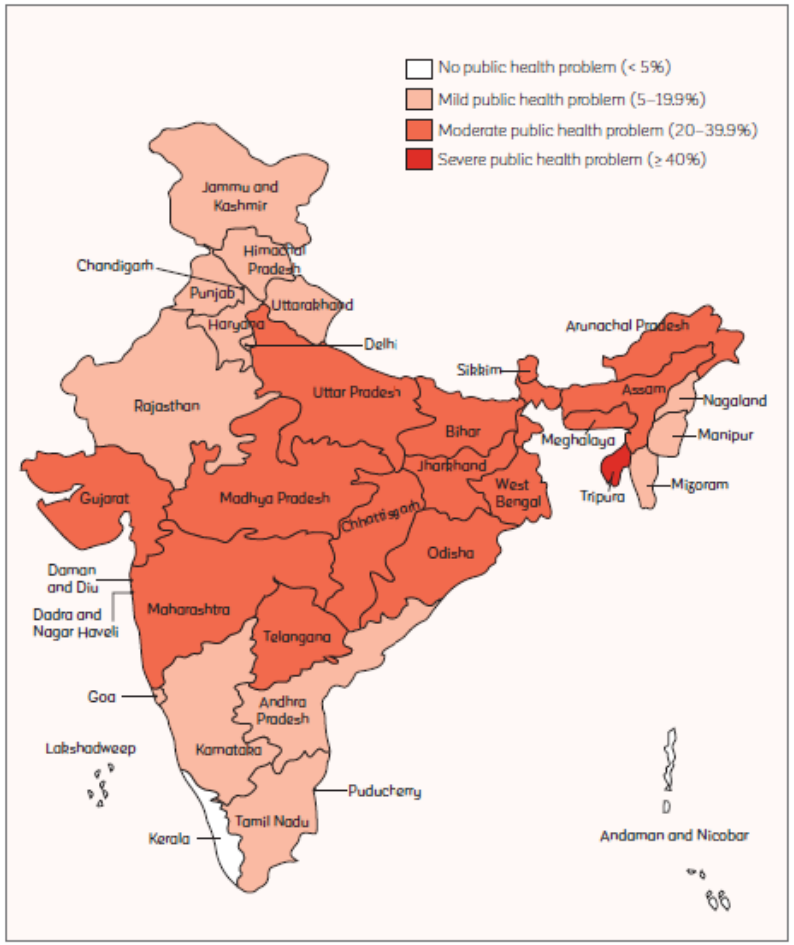
Anemia prevalence among children and adolescents

Birth to Adolescence

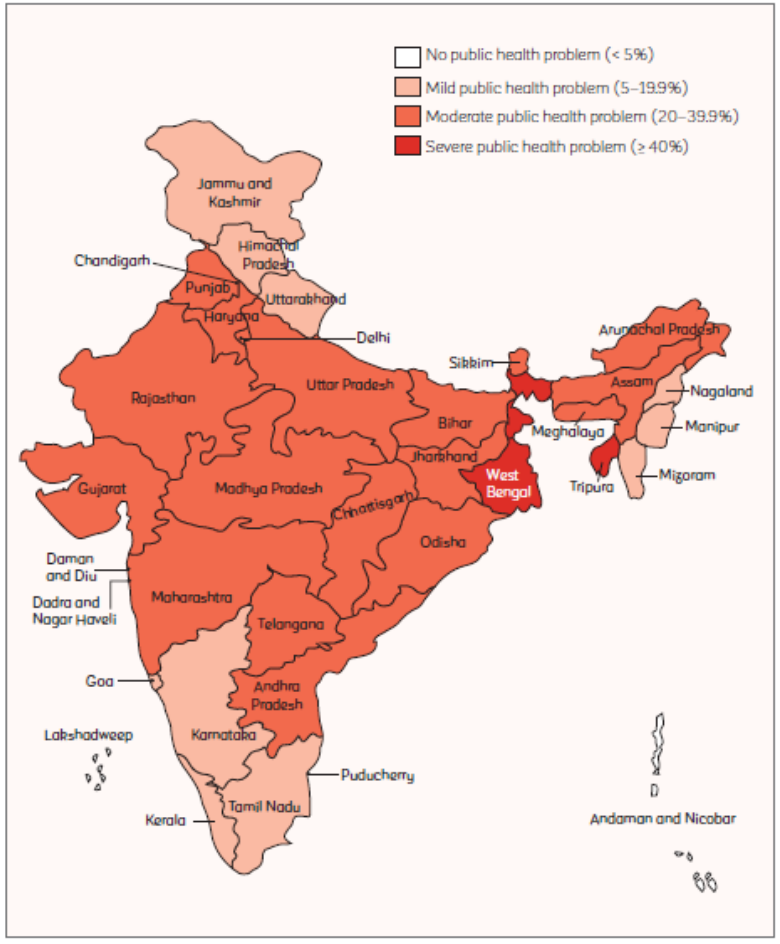
1-4 years



5-9 years



10-19 years



Anemia is considered a severe public health problem for children 1-4 years of age in 8 states

Overall, anemia prevalence among adolescent girls (10-19 years) is twice that of adolescent boys

Birth to Adolescence

Adolescents enter their second fastest growth period in height in their early teens, which increases iron needs.

Adolescent girls may triple their iron needs during puberty.

Anaemia Cut Offs (WHO)
5-11 years: Hb<11.5 g/dl
12-14 years: Hb< 12 g/dl
Girls ≥15years: Hb< 12g/dl
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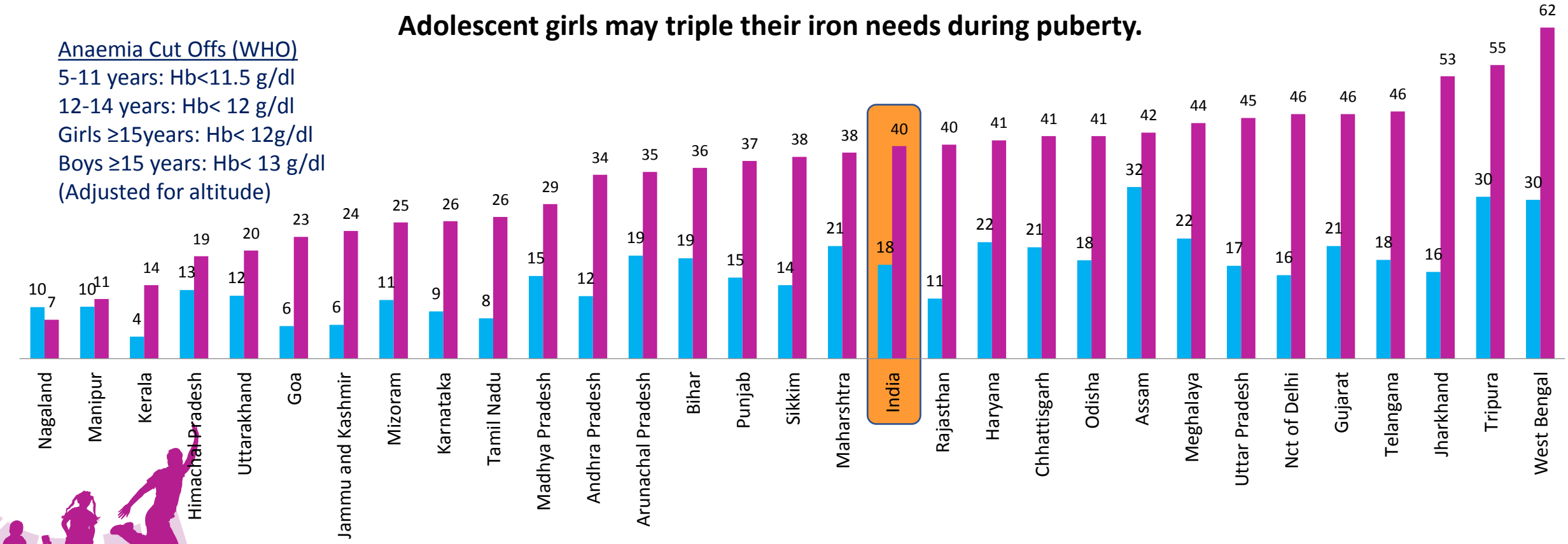
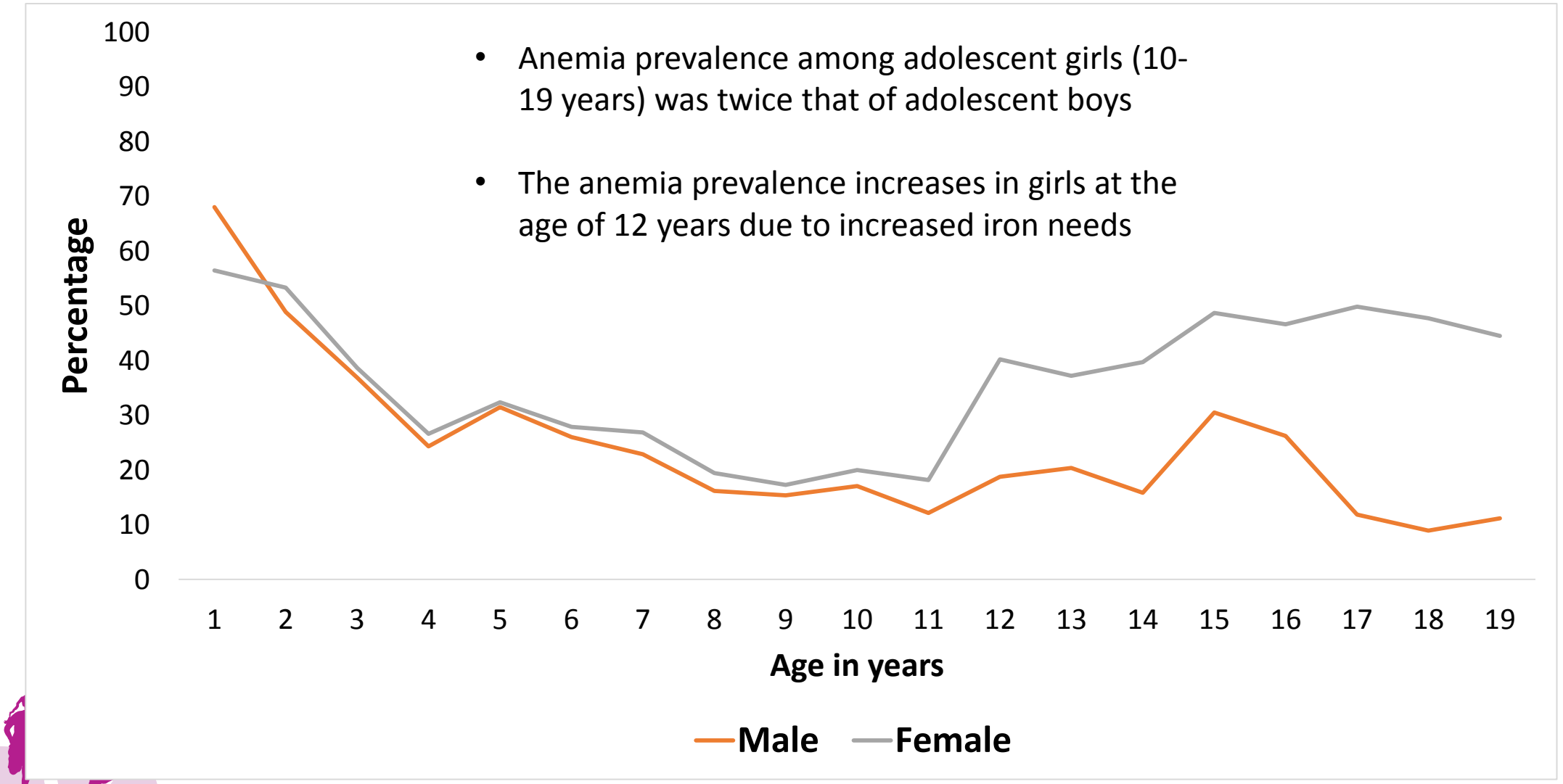


CNNS Anemia Data Collection Method : Venous blood and Cyanmethemoglobin method with Laboratory spectrophotometer

Prevalence of anaemia by sex among children and adolescents aged 1-19 years



Iron Deficiency measured by Serum Ferritin is highest in children from 1-4 years of age

Birth to Adolescence

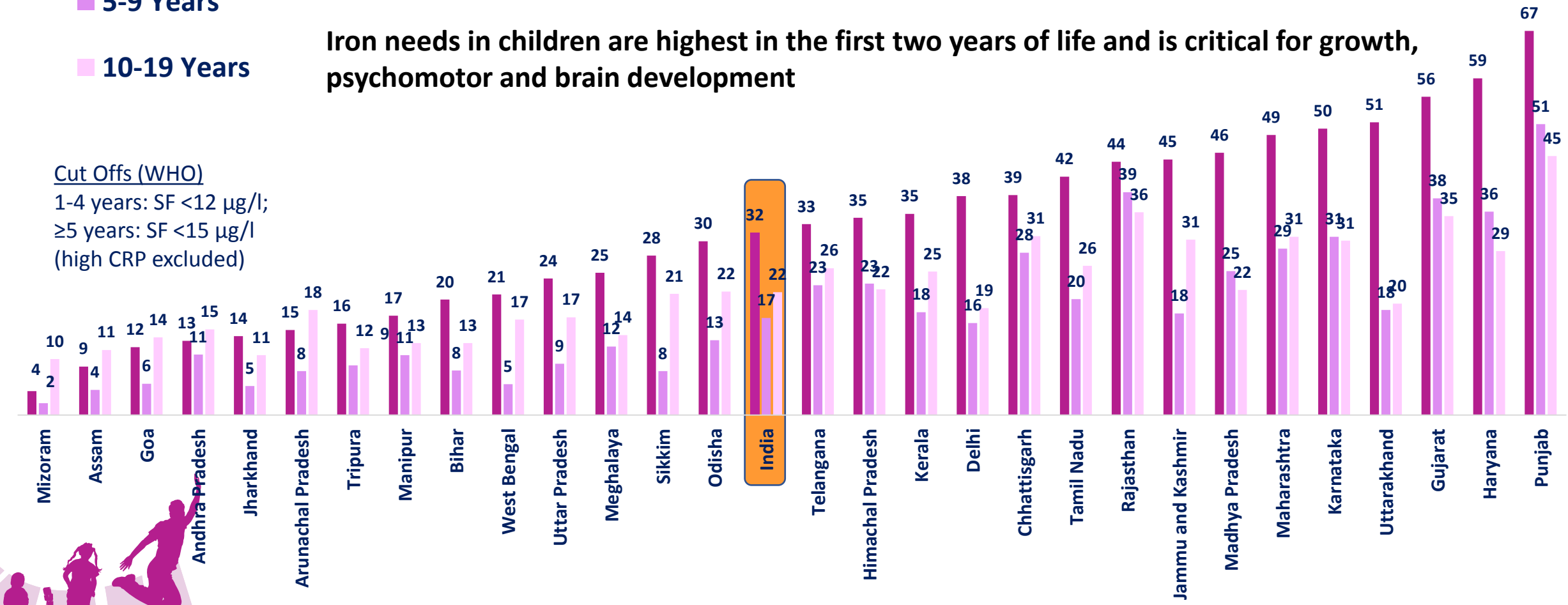
1-4 Years

5-9 Years

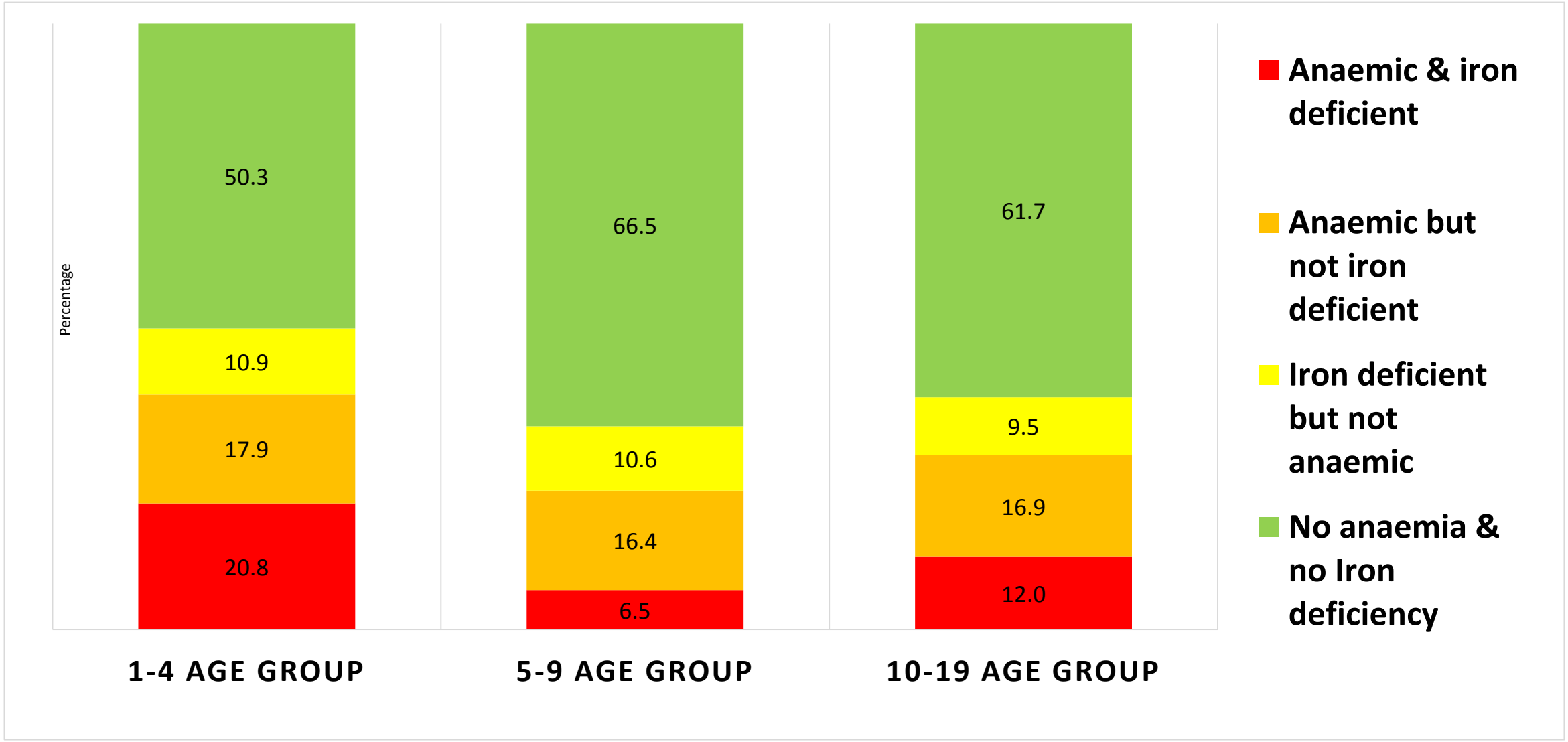
10-19 Years

Iron stores are often exhausted by 6 months of age and dietary sources of iron are needed.

Iron needs in children are highest in the first two years of life and is critical for growth, psychomotor and brain development



Prevalence of anaemia and iron deficiency among children and adolescents



Vitamin A, B12, D and Iodine deficiency

- **Vitamin A deficiency** was 18% in children from 1-4 years with geographical variations

- **Vitamin B12 deficiency** ranged from 14% to 31% in 1-19 years of age and was highest among adolescents

- **Vitamin D deficiency** varied from 14% to 24% in 1-19 years age group (following cut-off of expert panel of Institutes of Medicine). School age children aged 5-9 years were found to have higher level of vitamin D deficiency than children aged 1-4 years.

- Adequate Median Urinary Iodine level in all states indicating the success of Salt Iodization program

One in Five Children Remain Vitamin A Deficient

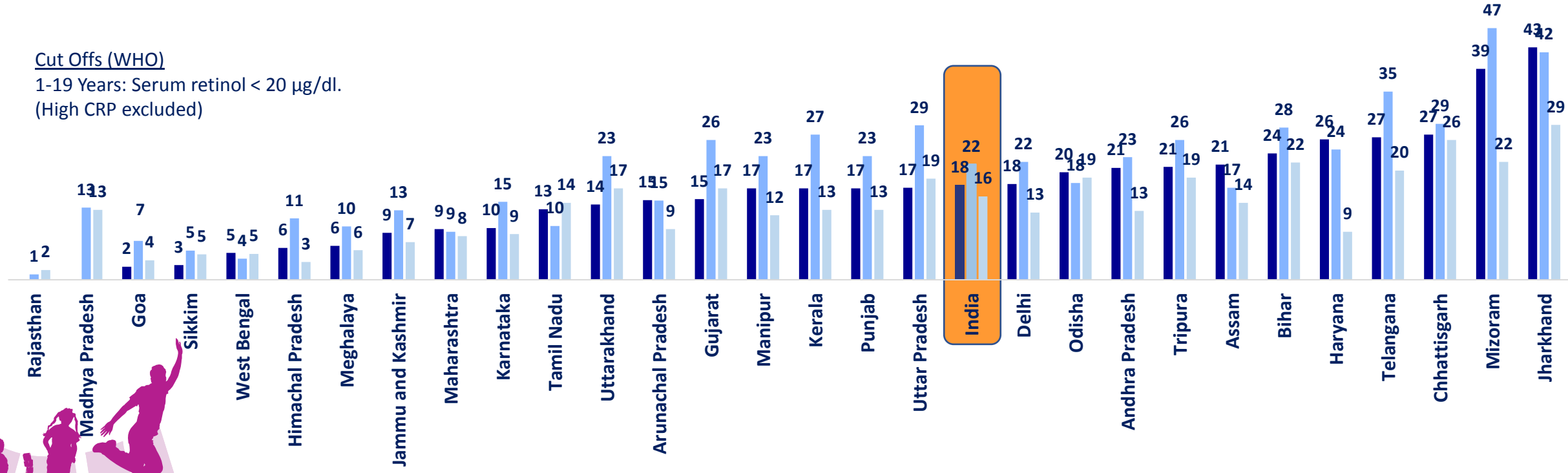
Birth to Adolescence

- 1-4 Years
- 5-9 Years
- 10-19 Years

Children aged 1-4 years and 5-9 years were found with similar levels of vitamin A deficiency.

CNNS data were collected before or after vitamin A supplementation rounds in states

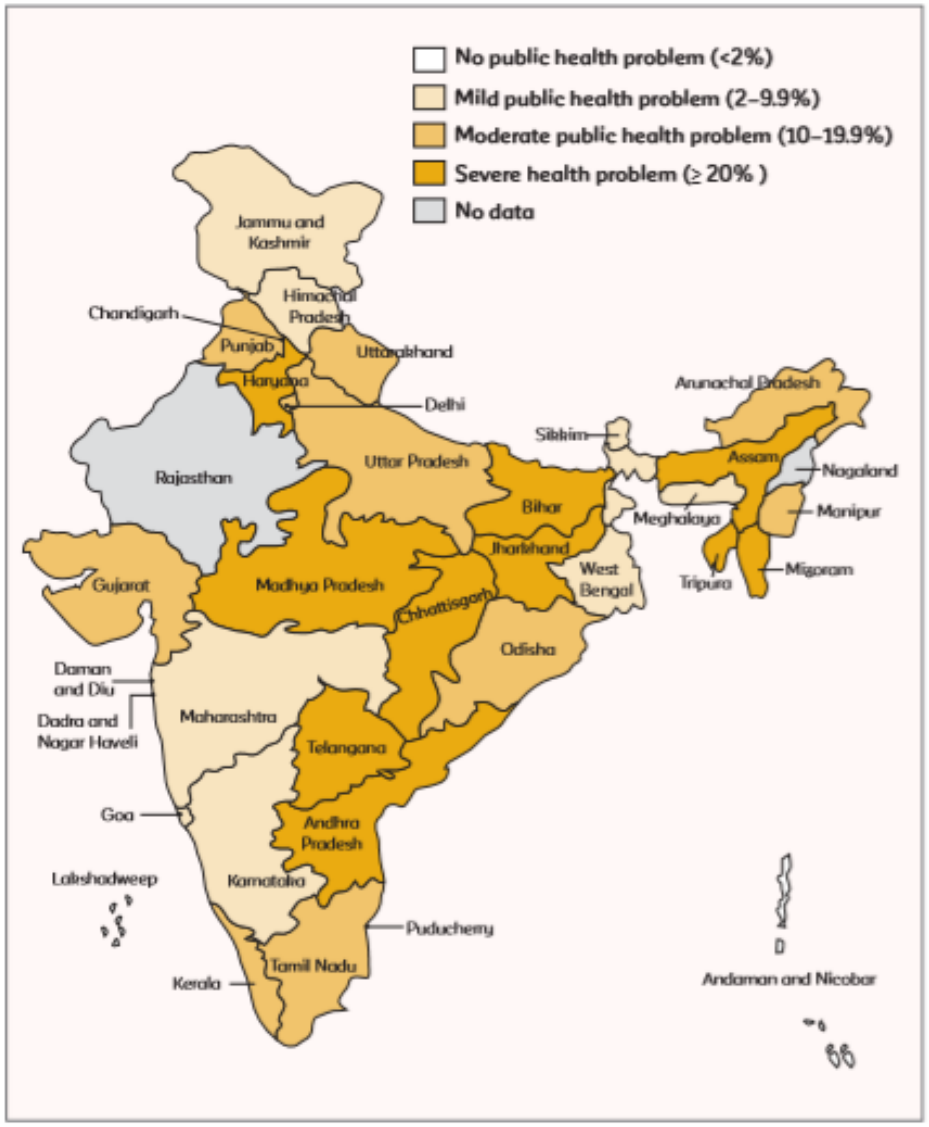
Seasonality appears to affect vitamin A deficiency estimates.



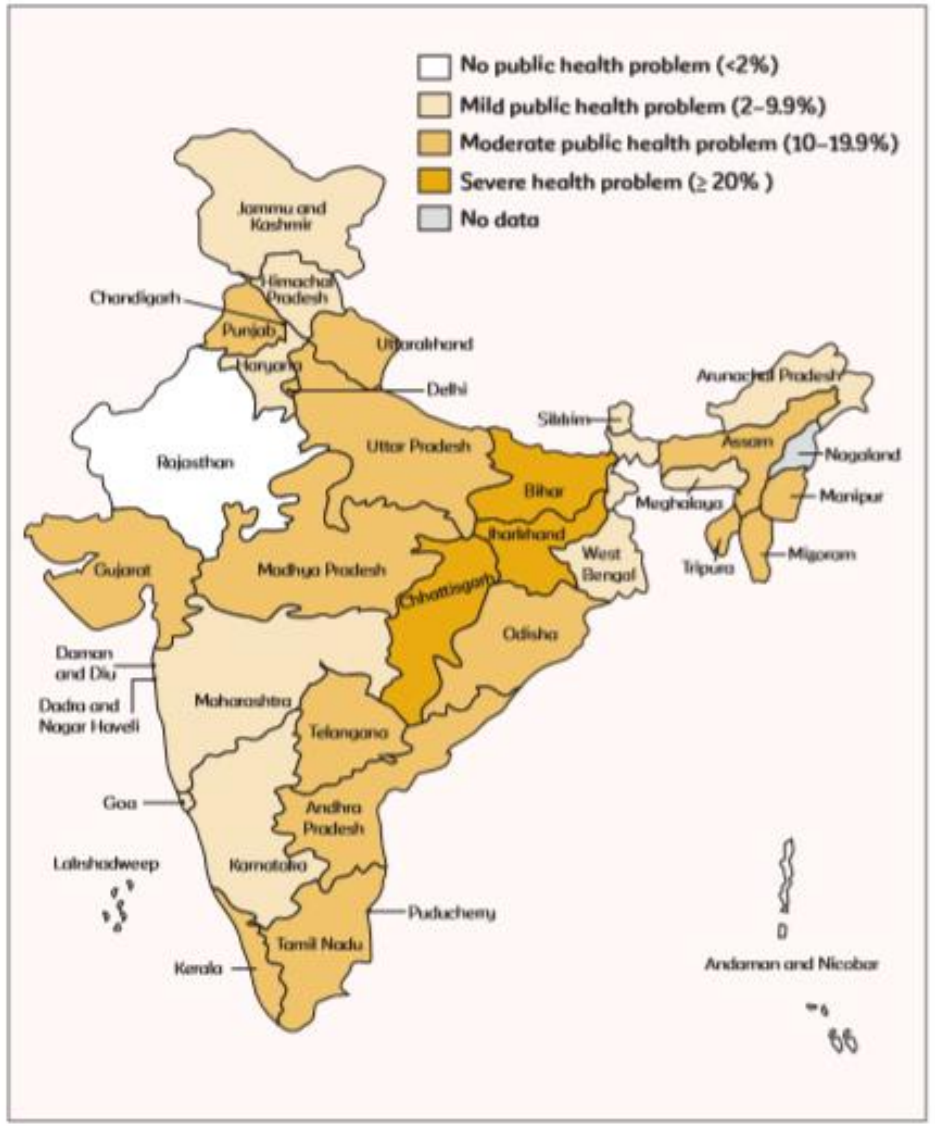
Vitamin A deficiency ≥ 20% (severe public health problem) in 10 states among 1-4 years children and 3 states for 10-19 years

Birth to Adolescence

Children aged 1-4 years



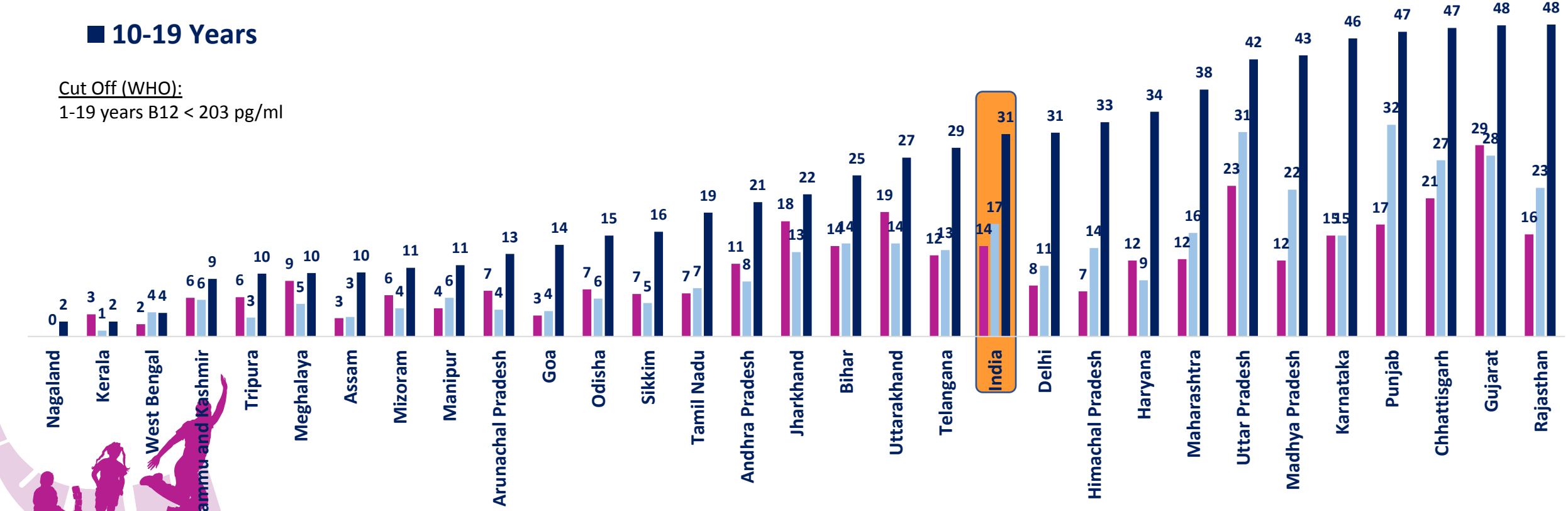
Adolescents aged 10-19 years



Prevalence of Vitamin B12 Deficiency highest in the 10-19 year old age group

Birth to Adolescence

- **B12 deficiencies are correlated to consumption of egg/fish/meat in past 24 hours in children aged 1-4 years and at least once in past week in children aged 5-9 and 10-19 year**
- **Most B12 deficiencies are caused by low intake of vitamin B12 or abnormal absorption**



Higher Vitamin D Deficiency among Children and Adolescents

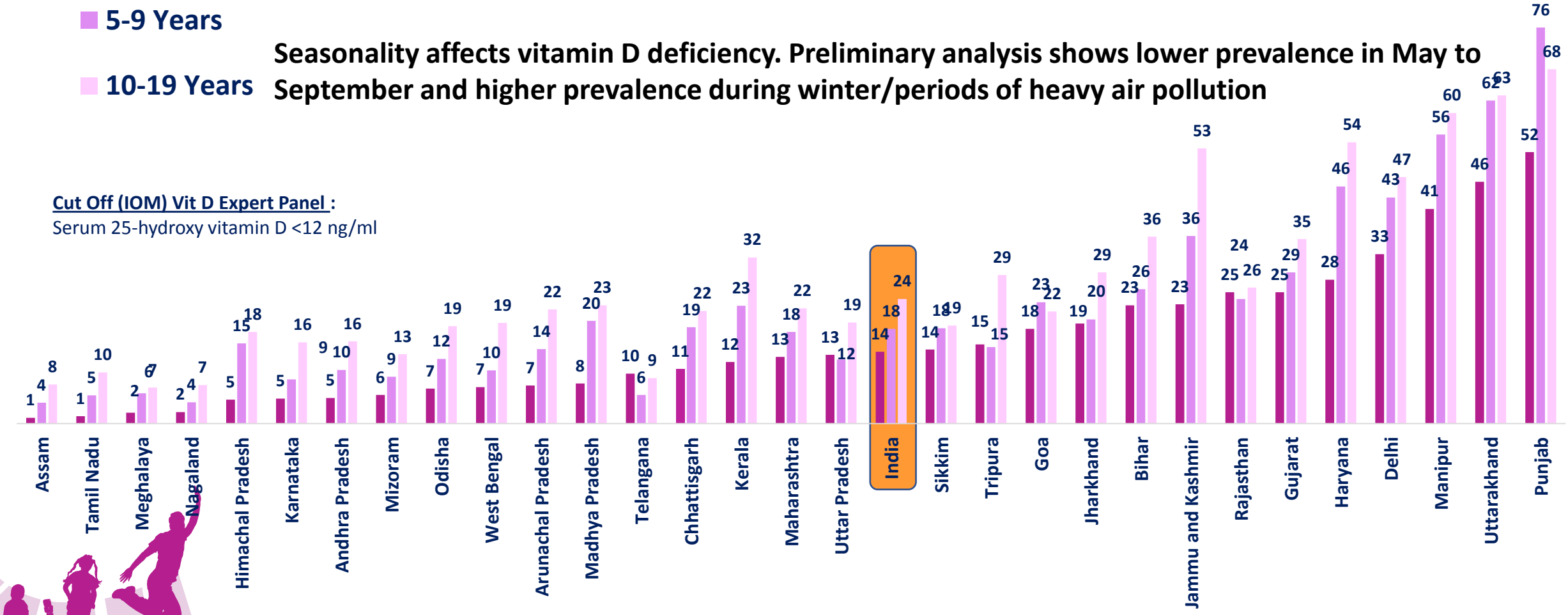
Birth to Adolescence

- 1-4 Years
- 5-9 Years
- 10-19 Years

Children aged 5-9 and adolescents aged 10-19 year had similar levels of vitamin D deficiency, higher than children aged 1-4 years

Seasonality affects vitamin D deficiency. Preliminary analysis shows lower prevalence in May to September and higher prevalence during winter/periods of heavy air pollution

Cut Off (IOM) Vit D Expert Panel :
Serum 25-hydroxy vitamin D <12 ng/ml



All States found to have Adequate Iodine Status or More

Birth to Adolescence

Urinary Iodine Adequacy (Median)

- Inadequate (<100)
- Adequate (100-199)
- More than Adequate (200-299)
- Excess (>299)

- **All states were found adequate or more than adequate except Tamil Nadu, which was found with iodine excess**
- **Further review needed to document achievements of IDD control program**

States	1-4 years		5-9 years		10-19 years
Nagaland	100		139		Not Available
Himachal Pradesh	101		168		166
Assam	132		99		100
Madhya Pradesh	132		135		189
Maharashtra	136		123		120
Goa	142		138		137
Jharkhand	150		122		121
Andhra Pradesh	150		138		131
Uttarakhand	167		183		199
Manipur	170		164		186
Gujarat	187		188		180
Punjab	188		183		190
Odisha	197		196		205
Kerala	206		192		184
Rajasthan	208		176		194
Uttar Pradesh	211		158		148
India	213		175		173
Tripura	218		150		149
Jammu & Kashmir	221		194		207
Chhattisgarh	234		234		204
West Bengal	239		238		150
Delhi	241		236		188
Mizoram	243		239		233
Haryana	252		247		292
Bihar	259		176		189
Meghalaya	264		187		208
Arunachal Pradesh	266		230		243
Sikkim	273		251		242
Karnataka	282		247		234
Telangana	299		290		254
Tamil Nadu	315		342		312

Non-Communicable Diseases

Growing threat of **Non-Communicable Diseases** found in school aged children aged 5 to 9 years and adolescents aged 10-19 years:

- 10% of children and adolescents **Pre-Diabetic** (measured by fasting serum glucose and glycosylated hemoglobin - HbA1C).
- 10% children and adolescents found with **High Triglycerides**.
- 4% adolescents with **High Cholesterol** and high LDL and 28% with low HDL
- 5% of adolescents found with **Hypertension** (high blood pressure).
- 7% of children and adolescents had risk of **Chronic Kidney Disease** (measured by high serum creatinine). Chronic kidney disease found clustered in few districts of South, East & North Eastern States.

Pre-diabetes among Children and Adolescents based on High Glycosylated Hemoglobin Concentration

Birth to Adolescence

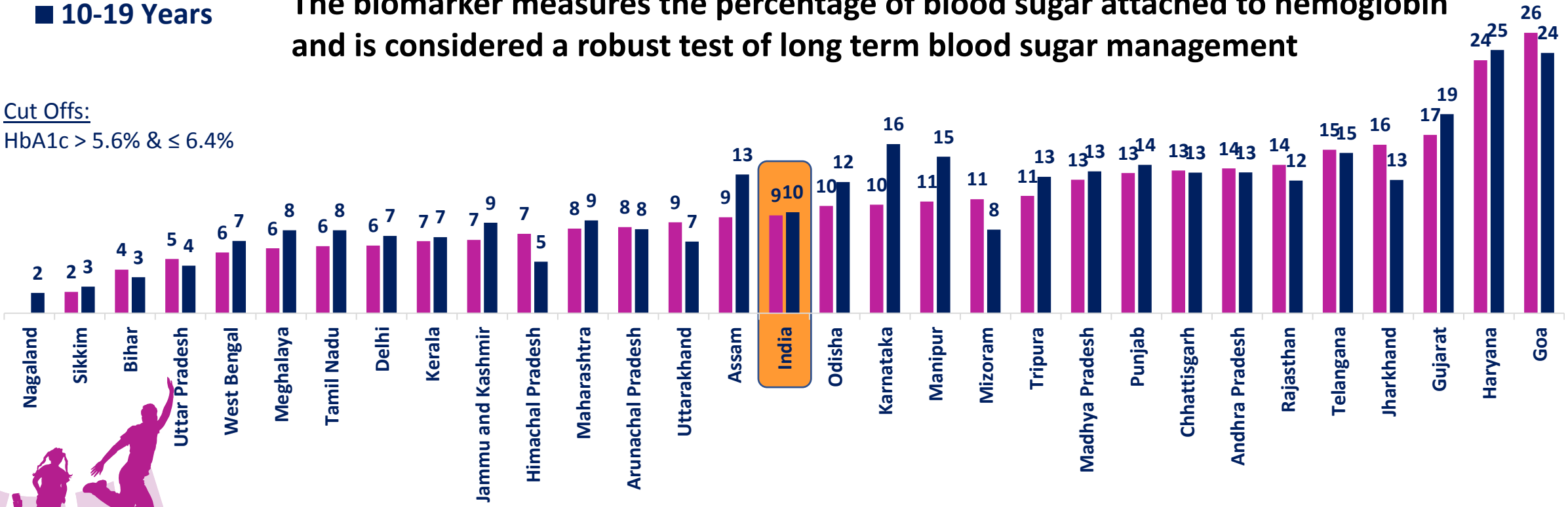
Glycosylated hemoglobin (HbA1c) measures average blood sugar level over the past 2-3 months and is not affected by fasting status.

The biomarker measures the percentage of blood sugar attached to hemoglobin and is considered a robust test of long term blood sugar management

■ 5-9 Years

■ 10-19 Years

Cut Offs:
HbA1c > 5.6% & ≤ 6.4%

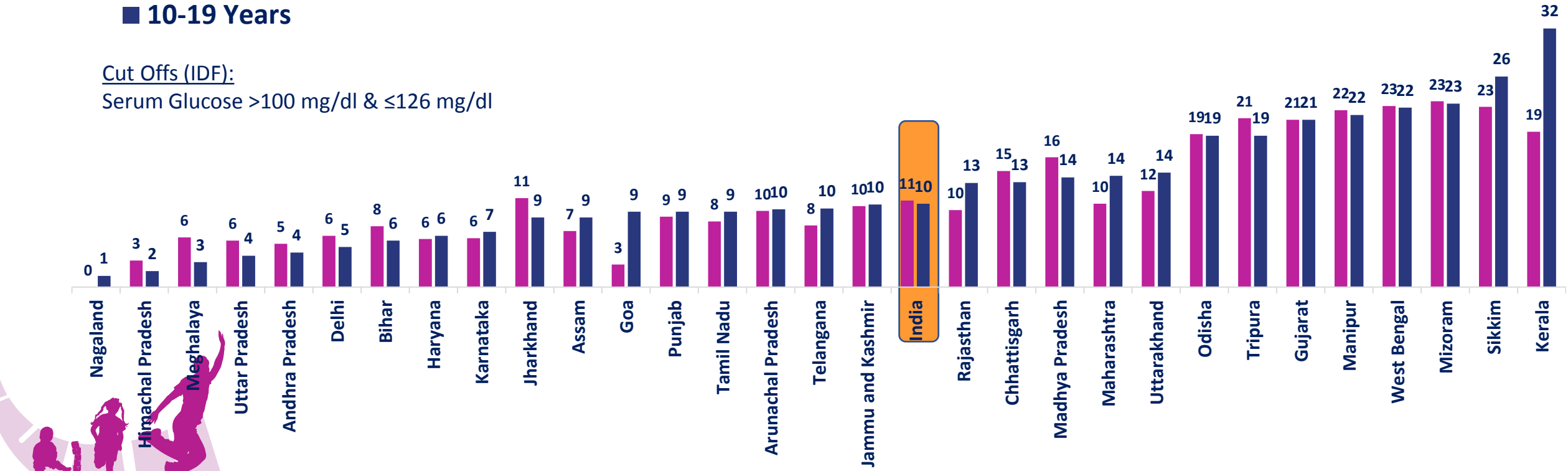


Prevalence of High Serum Glucose indicates Threat of Diabetes in School age Children and Adolescents

Birth to Adolescence

Levels of Serum Glucose are similar both in school aged children and adolescents

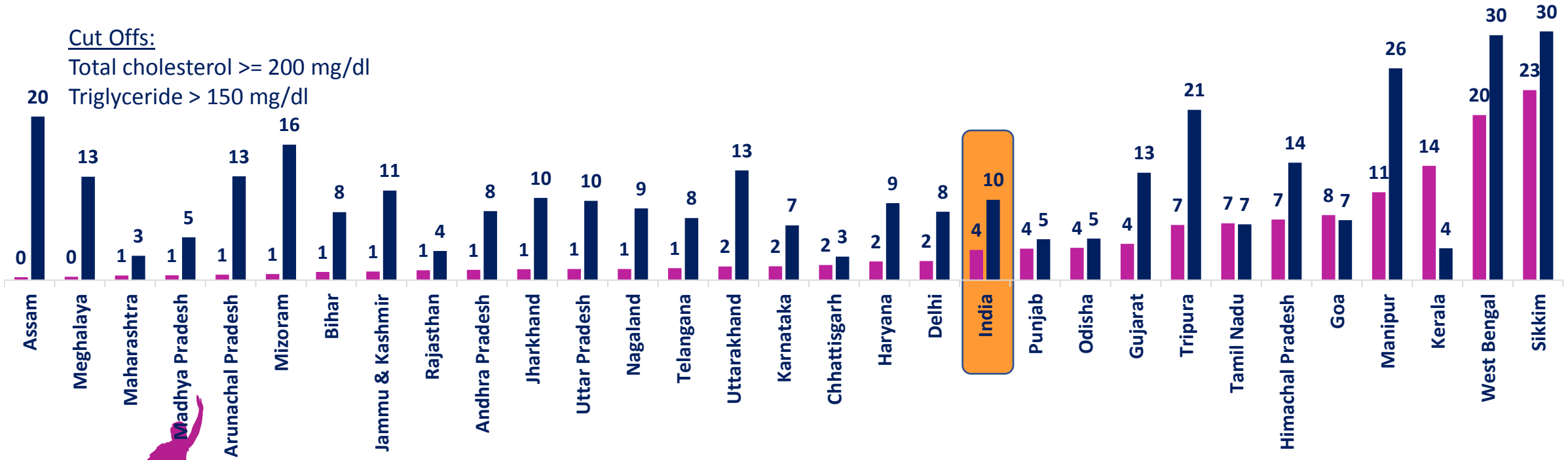
The reported prevalence is considered prediabetes



Other NCDs biomarkers among adolescents 10-19 years (High total cholesterol and High triglycerides)

Birth to Adolescence

- High total cholesterol
- High triglyceride

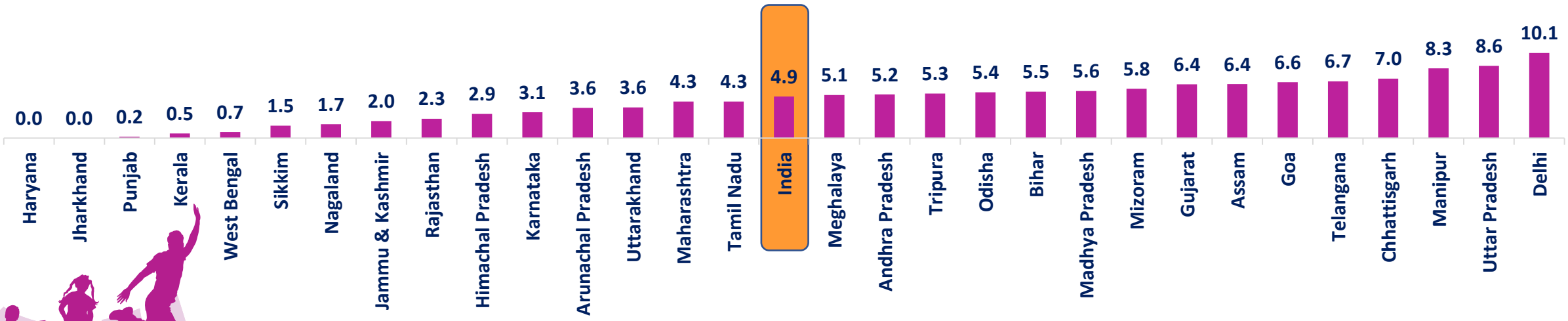


Hypertension among Adolescents aged 10-19 years

Birth to Adolescence

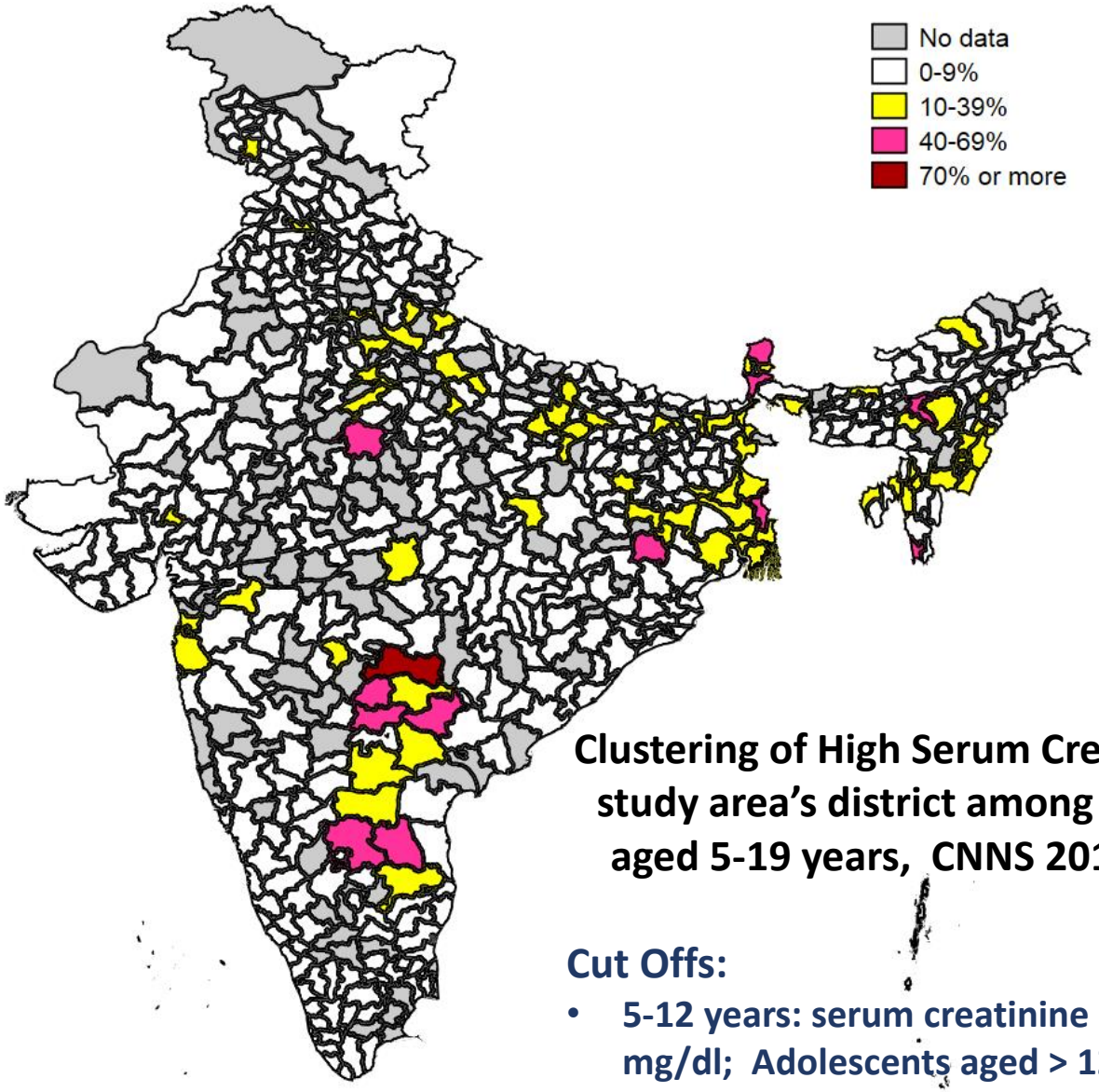
Percent Hypertensive

Cut Offs:
SBP >=140 mmHg or DBP >= 90 mmHg



Clustering of Districts for Chronic Kidney Disease Risk among children aged 5-19 years

- Highest intensity of Chronic Kidney Disease risk found in few districts of Andhra Pradesh Telangana and West Bengal
- In West Bengal, 15 out of 19 study area's districts reported with 10% or more high serum creatinine level among children aged 5-19 years
- Over one quarter districts of the study area in UP, Tripura, Mizoram Manipur, Nagaland, and Sikkim found 10% or more high serum creatinine among children aged 5-19 years



Clustering of High Serum Creatinine in study area's district among children aged 5-19 years, CNNS 2016-1018

Cut Offs:

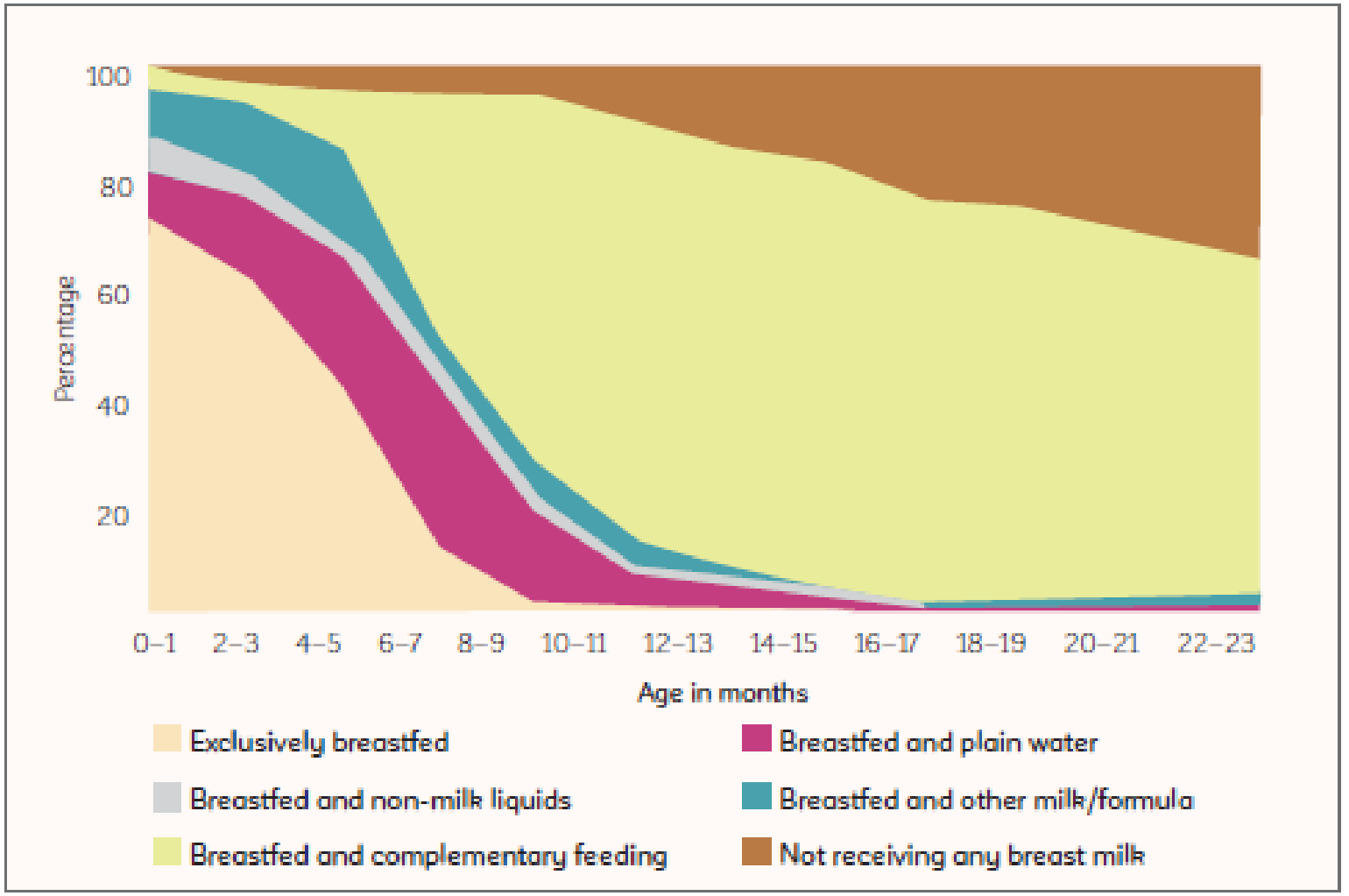
- 5-12 years: serum creatinine > 0.7 mg/dl; Adolescents aged > 12 years: serum creatinine > 1.0 mg/dl

What children and adolescents are eating?

From 4 months onwards infant feeding deteriorate

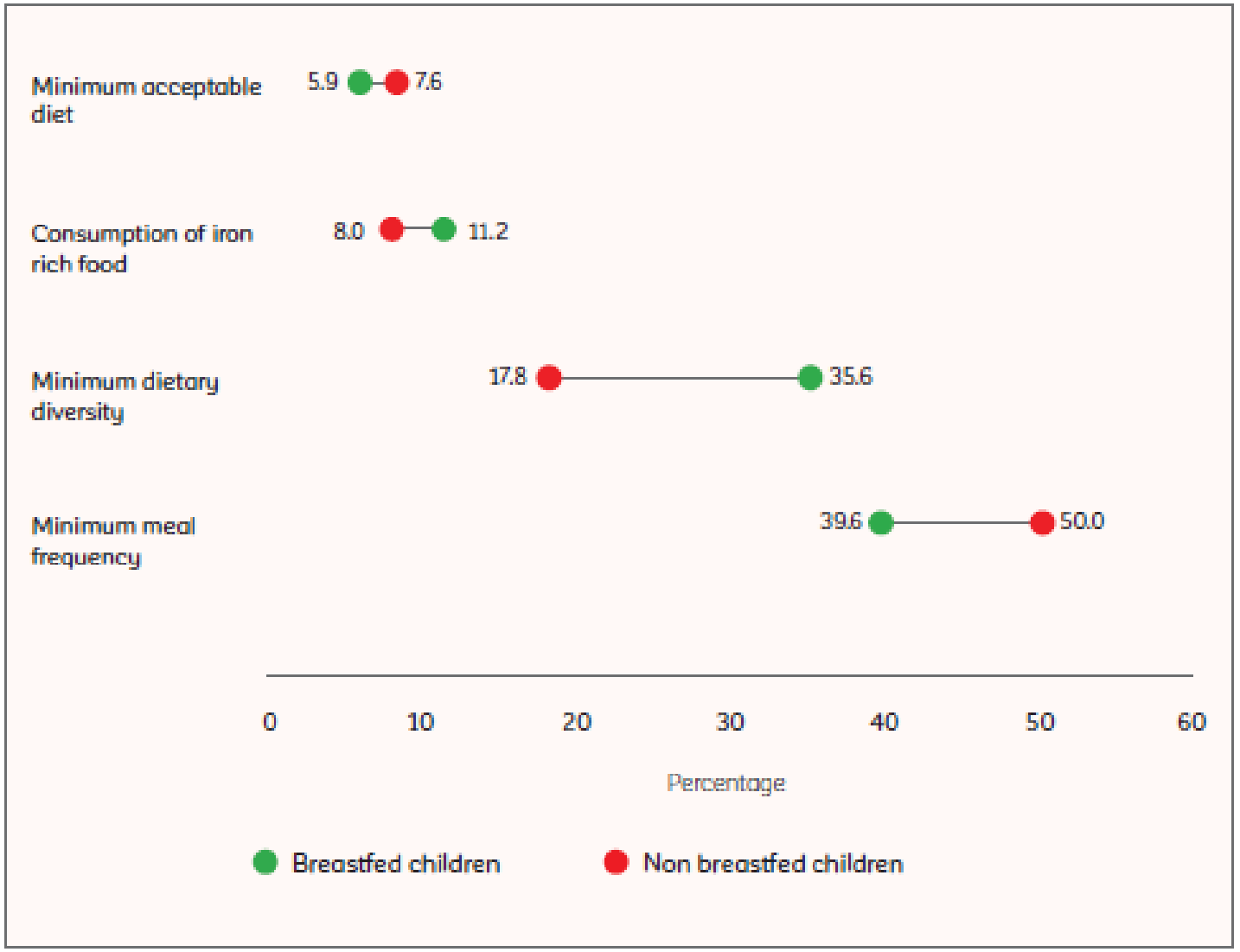
Birth to Adolescence

Figure 4.2: Infant and young child feeding practices by child age, India, CNNS 2016–18

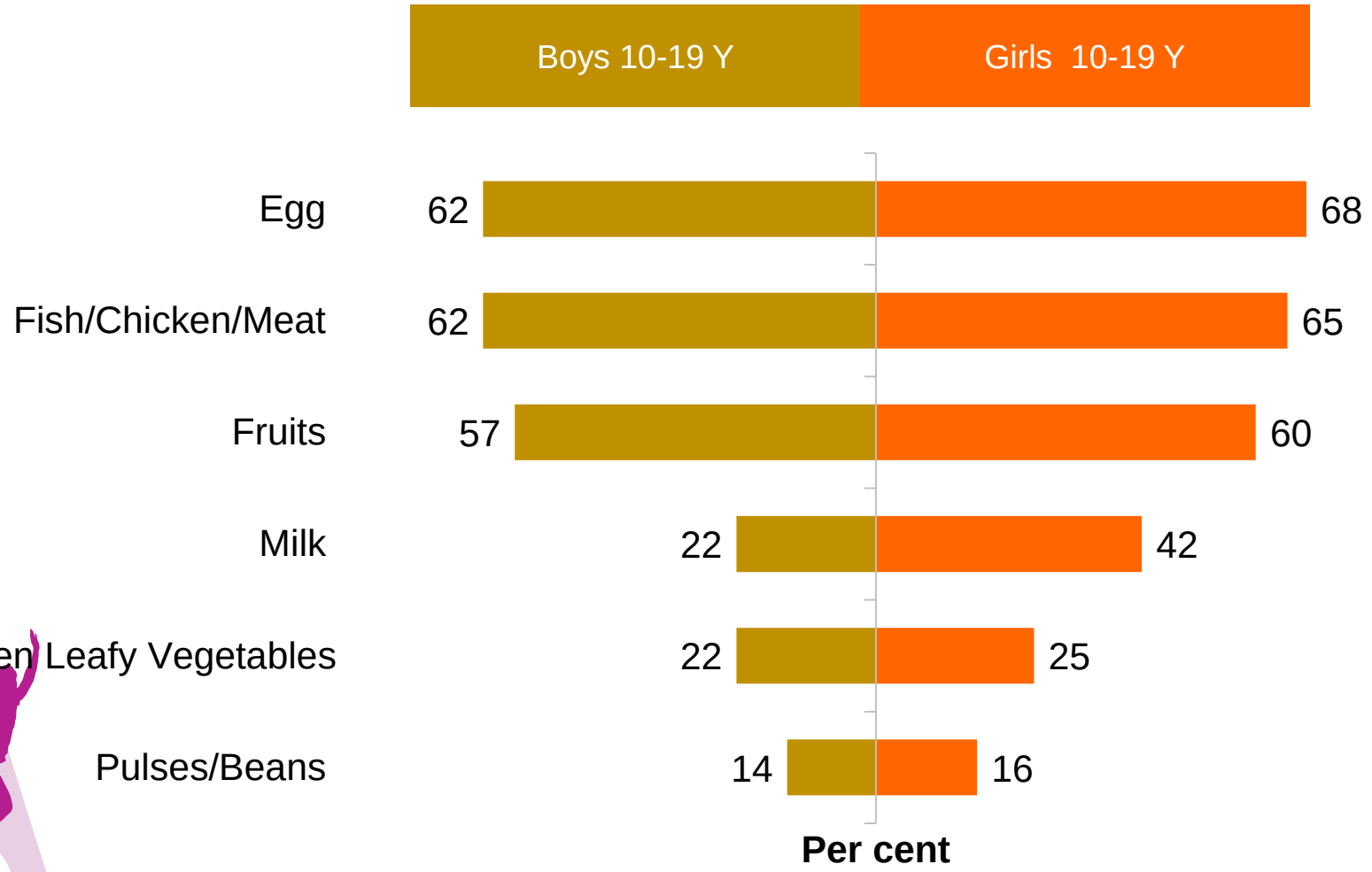


Complementary Feeding and dietary diversity remained poor

Figure 4.4: Feeding practices among breastfed and non-breastfed children aged 6–23 months, India, CNNS 2016–18

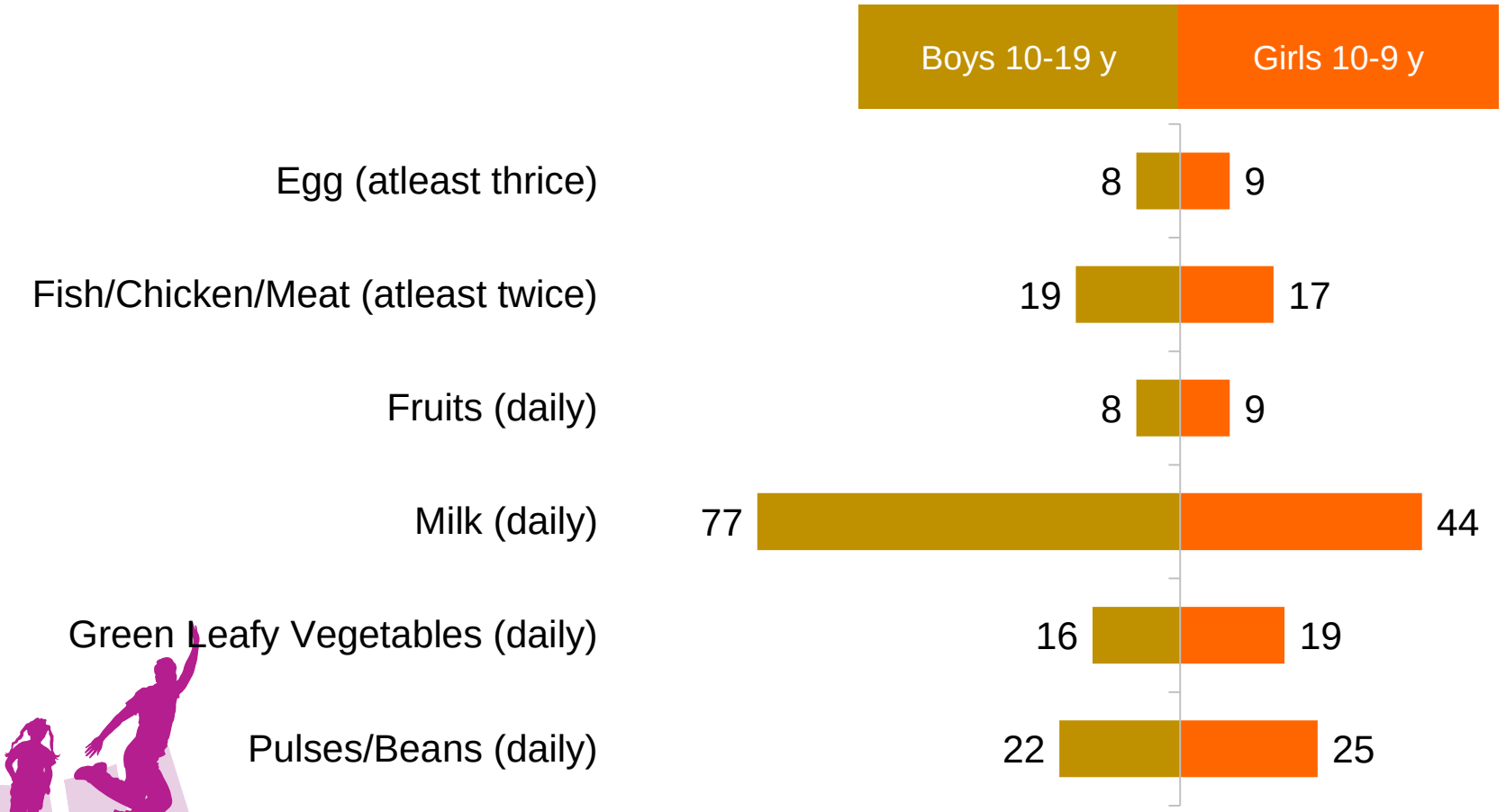


What's missing from the food plate even weekly?



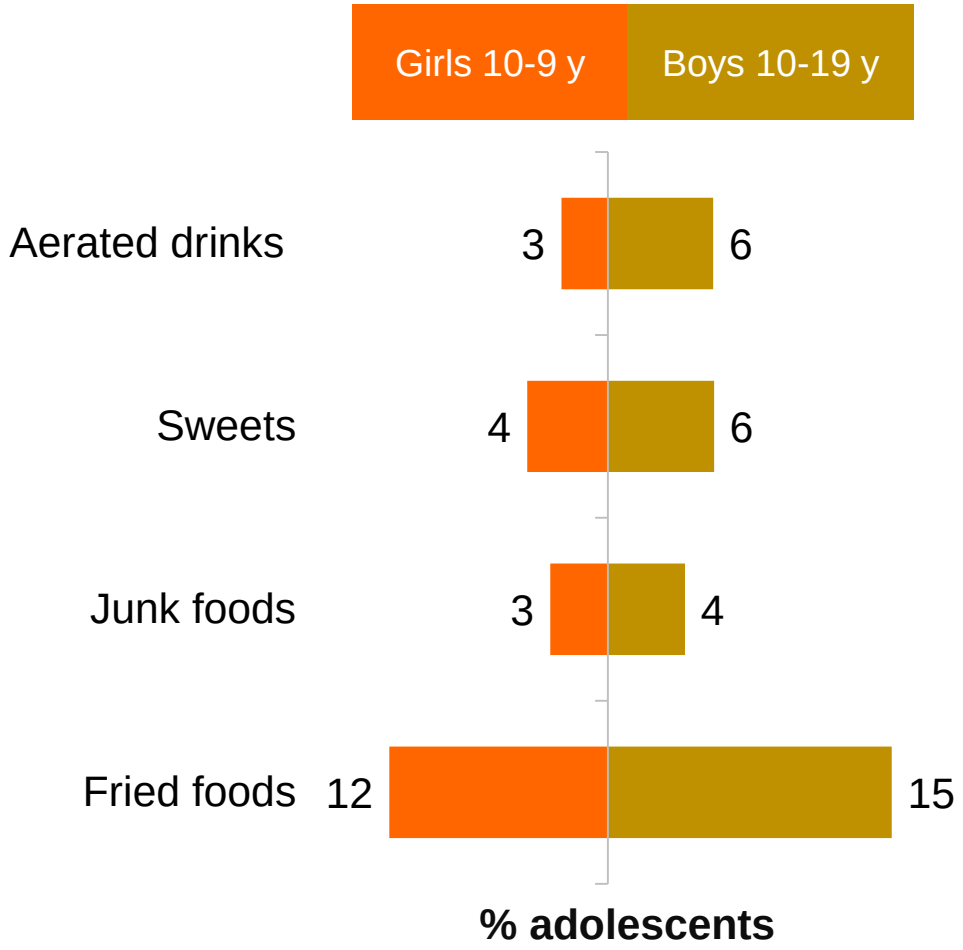
- 3 out of 5 girls and boys **did not have** fruit, greens and egg even once the past week.
- More girls missed milk.

Are Adolescents girls and boys eating as recommended?



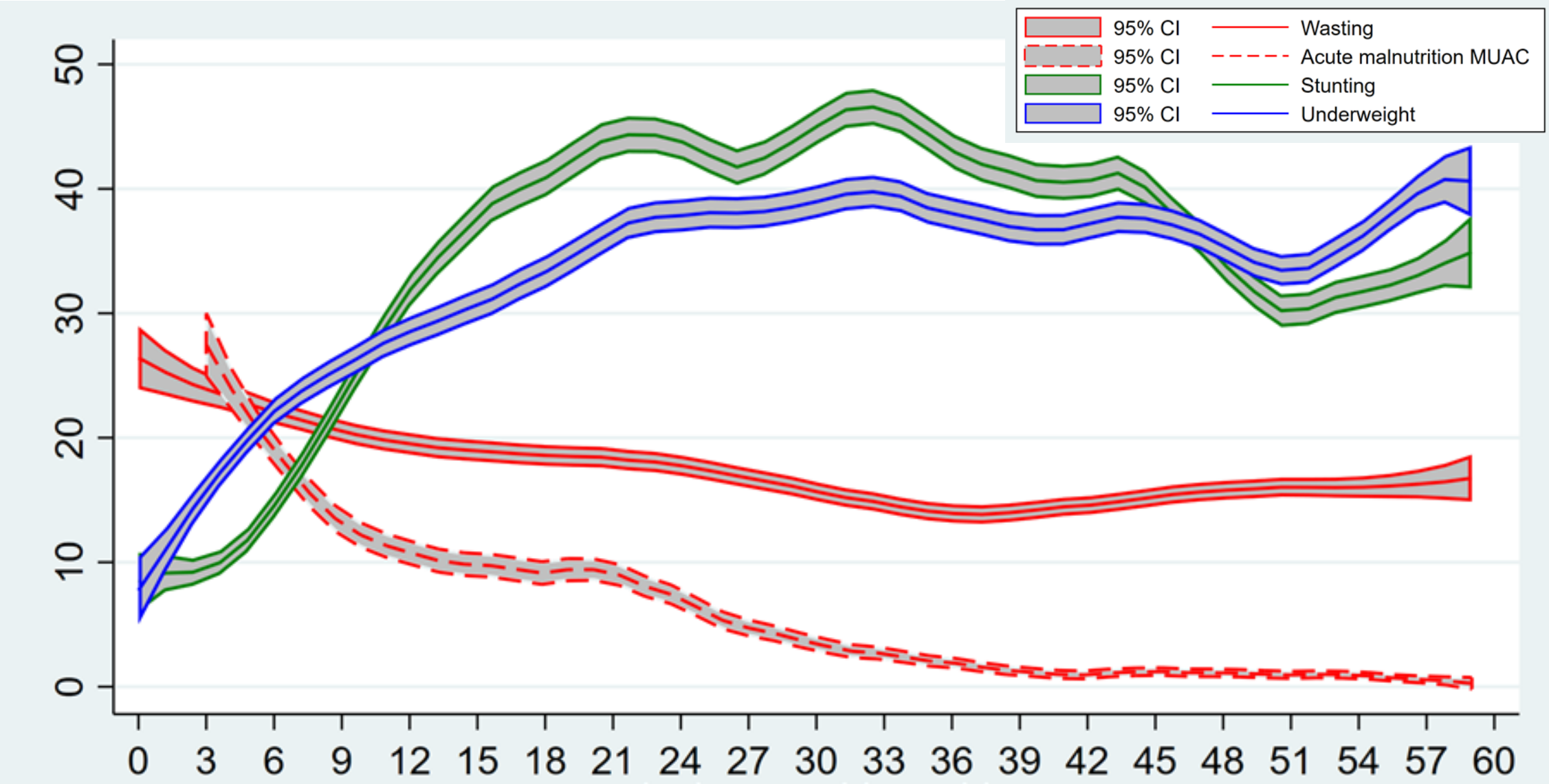
- Less than 2 out of 5 are **eating body building and protective foods as per recommendations**.
- Milk consumption is higher compared to other food items

Consumption of unhealthy foods at least three times a week



Malnutrition by age in months in children under-five

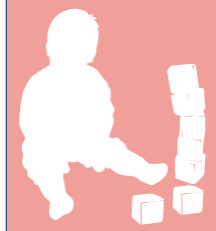
Birth to Adolescence



Overall Key Findings

Birth to Adolescence

- Stunting and Underweight trends continue to decline among children under 5 years.
- While Anemia results are lower than prior estimates due to methodological differences, treatment and prevention of anemia in children 1-4 years of age must accelerate.
- Vitamin A status is better than predicted and further analyses are needed for policy review



CHILDREN UNDER FIVE

- Overweight and obesity in children aged 5-9 years is evident in many states.
- 25% children aged 5-9 years remain thin for their age.
- Iodine status in school age children is average or above average demonstrating success of national program

CHILDREN 5 to 9 YEARS

- The triple burden of malnutrition (stunting, overweight and anemia) is present among adolescents aged 10-19 years in many states.
- Anaemia is a significant issue in adolescent girls (twice as high as adolescent boys).
- Vitamin D status is an emerging issue with deficiency increasing by age

ADOLESCENTS 10 to 19 YEARS

Preliminary Policy Implications (1)

- Half of anemia is caused by iron deficiency. Programmes need continued focus on iron supplementation among children under five and adolescent girls.
- Vitamin A deficiency is still evident in children under five with wide states differentials. Alternative interventions such as intake of Vitamin A rich diets and fortification may be considered as per State's Vitamin A deficiency status beyond universal supplementation.
- Vitamin D deficiency is emerging public health issue especially among urban children and adolescents. Fortification can be considered as one viable solution to address the Vitamin D deficiency. Further research is required to uncover the effects of pollution and other factors to design better programme.

Preliminary Policy Implications (2)

- Urinary iodine data needs to be examined in conjunction with salt consumption data for the population and level of iodine in salt at household-level
- Control of NCD programmes must start in the early ages to instill healthy lifelong habits as adult diseases start in childhood.
- In states where levels of serum creatinine are high, further research is needed to determine causes. An appropriate programming needs to be put in place to combat kidney disease.
- The double burden of malnutrition (stunting and overweight) is evident in children. The POSHAN Abhiyaan must focus on dual tasks of reducing malnutrition and preventing over nutrition.

The survey was conducted with generous financial support from

Aditya and Megha Mittal

and technical support from

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CNNS data collection period by state

CNNS
Birth to Adolescence

State	2016											2017												2018									
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Telengana	26th Feb-24th July																																
Delhi		25th March-27th Sept																															
Mizoram		28th March-11th June																															
Uttar Pradesh			6th April- 27th Sept																														
Goa						6th July-13th Sept																											
Himachal Pradesh						6th July to 17th Oct																											
Assam						12th July- 2nd Nov																											
Bihar							11 Aug-13 Dec																										
Andhra Pradesh							22nd Aug-1st Dec																										
Madhya Pradesh									5th Oct -			5th Feb																				
Rajasthan									18th October -			3rd Jan																				
Maharashtra										14th Nov-		17th May																				
Nagaland										22nd Nov-		21st May																				
Haryana														1st March - 23rd Jun																		
Jharkhand														3rd March - 4th July																		
Punjab																				20th Sept-				4th March								
Uttarakhand																				21st Sept-				28th Feb								
Chattisgarh																				28th Sept-				26th April								
Kerala																					8th Oct-			10th April								
Manipur																					15th Oct-			21st Feb								
Tripura																					21st Oct-			4th May								
Gujarat																						18th Nov-		26th March								
Odisha																						21st Nov-		21st Feb								
Arunachal Pradesh																											28th April-3rd Oct					
Tamil Nadu																												4th May-10th Aug				
Jammu and Kashmir																												23rd May-11th Aug				
West Bengal																													1st June-24th Oct			
Karnataka																													6th June-18th Sept			
Meghalaya																													16th June-21st Oct			
Sikkim																														8th July-7th Oct		

Dates of data collection for NFHS-4 and CNNS surveys and number of months between midpoints of data collection

	NFHS-4 Survey date			CNNS Survey date			Number of months between survey midpoints
State	From	To	Crude Mid point	From	To	Crude Mid point	
India	**1/15**	**12/16**	**1/16**	**3/16**	**10/18**	**7/17**	**18**
Delhi	2/16	9/16	**6/16**	3/16	9/16	**6/16**	**0**
Mizoram	2/16	10/16	**6/16**	3/16	6/16	**5/16**	**0**
Himachal Pradesh	2/16	8/16	**5/16**	6/16	10/16	**8/16**	**3**
Nagaland	3/16	10/16	**7/16**	11/16	5/17	**2/17**	**7**
Assam	11/15	3/16	**1/16**	6/16	11/16	**9/16**	**8**
Rajasthan	1/16	7/16	**4/16**	10/16	1/17	**12/16**	**8**
Uttar Pradesh	1/15	9/16	**11/15**	4/16	9/16	**7/16**	**8**
Jharkhand	4/16	12/16	**8/16**	3/17	6/17	**5/17**	**9**
Haryana	2/15	6/15	**4/16**	2/17	6/17	**4/17**	**12**
Telangana	2/15	5/15	**4/15**	2/16	6/16	**4/16**	**12**
Andhra Pradesh	5/15	8/15	**7/15**	8/16	12/16	**10/16**	**15**
Bihar	3/15	8/15	**6/15**	8/16	12/16	**10/16**	**16**
Goa	1/15	4/15	**3/15**	6/16	9/16	**8/16**	**17**
Manipur	2/15	12/15	**7/15**	10/17	2/18	**12/17**	**17**
Kerala	3/16	10/16	**7/16**	10/17	4/18	**1/18**	**18**
Maharashtra	4/15	9/15	**7/15**	11/16	5/17	**2/17**	**19**
Punjab	1/16	6/16	**4/16**	9/17	3/18	**11/17**	**19**
Madhya Pradesh	1/15	7/15	**4/15**	10/16	2/17	**12/16**	**20**
Chhattisgarh	1/16	6/16	**4/16**	9/17	4/18	**1/18**	**21**
Gujarat	1/16	6/16	**4/16**	11/17	3/18	**1/18**	**21**
Odisha	1/16	7/16	**4/16**	11/17	2/18	**1/18**	**21**
Tripura	2/15	8/15	**5/16**	10/17	5/18	**2/18**	**21**
Arunachal Pradesh	4/16	12/16	**8/16**	4/18	10/18	**7/18**	**23**
Jammu & Kashmir	1/16	11/16	**6/16**	5/18	8/18	**7/18**	25
Uttarakhand	1/15	7/15	**4/15**	9/17	2/18	**12/17**	32
Meghalaya	4/15	9/15	**7/15**	6/18	10/18	**8/18**	37
Karnataka	2/15	7/15	**5/15**	6/18	9/18	**8/18**	39
Tamil Nadu	2/15	6/15	**4/15**	5/18	8/18	**7/18**	39
West Bengal	2/15	7/15	**5/15**	6/18	11/18	**9/18**	40
Sikkim	1/15	7/15	**4/15**	7/18	10/18	**9/18**	41

Precautions in Interpretation of Results

- **Estimates of anemia that are collected with different methods cannot be directly compared (between CNNS and NFHS).**
- **Always consider the dates of data collection of the state and national level estimates when comparing to other surveys.**
- **Consider dates of data collection for indicators that may be affected by seasonality.**
- **Results should be triangulated with other corroborating information to support interpretation**
- **Estimates of biochemical indicators should be interpreted with their 95% confidence intervals**
- **Estimates of Urinary Iodine Concentration are analysed as a group median value and not a individually representative estimate**
- **Clustered rare events like risk of chronic kidney disease are found in a limited number of districts and are camouflaged when analysed only at state level.**