NATIONAL HEALTH MISSION
राष्ट्रीय स्वास्थ्य मिशन

सत्यमेव जयते
Ministry of Health and Family Welfare
Government of India

POSHAN Abhiyaan
PM's Overarching Scheme for Holistic Nourishment
सही पोषण - देश रोशन

Comprehensive National Nutrition Survey

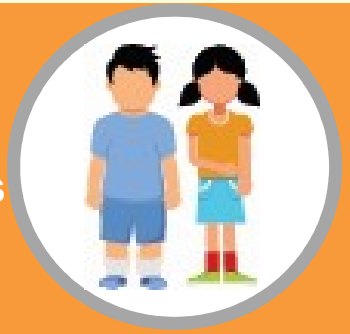
2016 - 2018

Bihar
State Presentation

CNNS
Birth to Adolescence

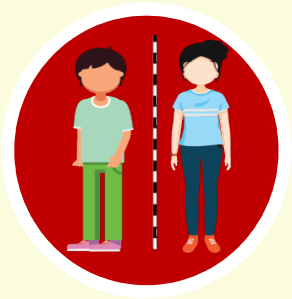
Largest Micronutrient Survey ever conducted: CNNS 2016-18

112,316
Children and adolescents interviewed



51,029
Blood, stool and urine samples collected

2500
Survey personnel in 30 states



360
Anthropometric measurers

30
Microscopists

100
Data Quality assurance monitors

200
Trainers and coordinators

200
Lab technicians

900
Interviewers

360
Phlebotomists

Justification and Objectives

- To assess the prevalence of malnutrition in both children and adolescents with special focus on assessment of micronutrient deficiencies through biochemical measures.
- To identify determinants and associations of various risk factors for anaemia in both children and adolescents.
- To assess biomarkers for hypertension, diabetes, cholesterol and kidney function and their associations with various risk factors for Non-Communicable Diseases (NCDs).

Malnutrition is responsible for 68% of total under five mortality in India*

CINNS Birth to Adolescence

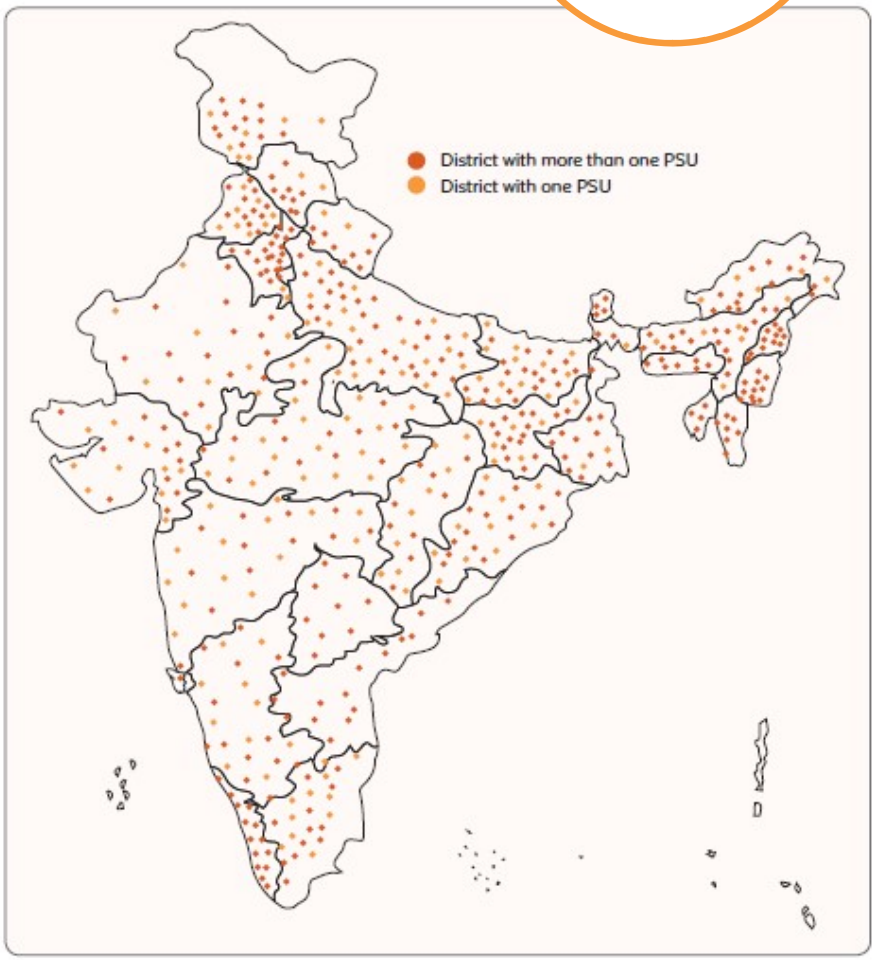
*Soumya Swaminathan, et al. (2019), The burden of child and maternal malnutrition and trends in its indicators in the states of India: the Global Burden of Disease Study 1990–2017. https://doi.org/10.1016/S2352-4642(19)30273-1

Survey Design

CNNS is a cross-sectional, household survey using a multi-stage sampling design.

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

- 160 Districts- one PSU
- 356 Districts- two or more PSUs



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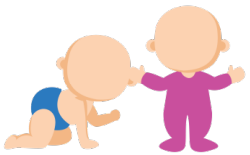
Anthropometry data

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

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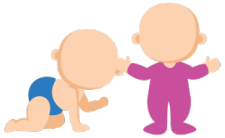
Biochemical indicators - micronutrient deficiencies and NCDs

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

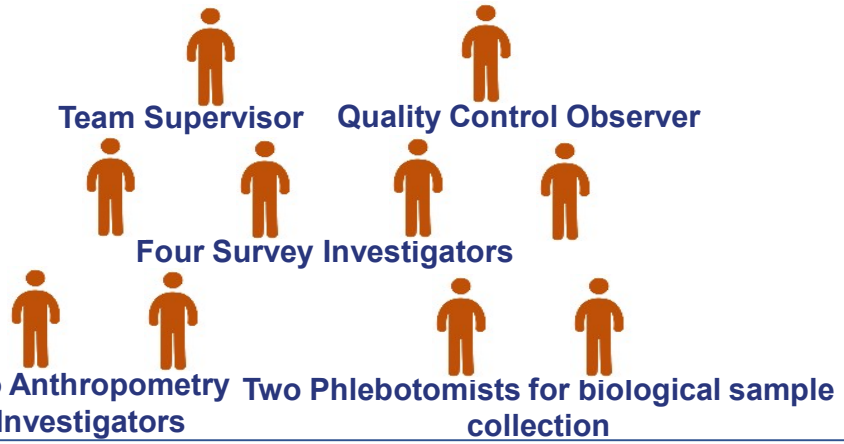
Second Level

- 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

Team Composition for data collection



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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

CNNS Birth to Adolescence

Agencies engaged in the implementation of CNNS

Survey Implementation by MoHFW, Government of India and supported by UNICEF

Technical support: US Centre for Disease Control and UNICEF	Regular review and technical guidance: Technical advisory group constituted by MoHFW
Quality assurance and external monitoring: AIIMS, PGIMER, NIN, KSCH and CDSA	Overall field coordination, training, quality monitoring, data management and analysis: Population Council
Biological sample collection, transportation & analysis: SRL Limited	Survey and anthropometric data collection: IIHMR, Kantar Public, Gfk Mode and Sigma Consulting

Sample size in Bihar

CNNS covered 70 PSUs for data collection in Bihar

Achieved following sample size by age groups:

	0-4 years	5-9 years	10-19 years	Total
Household and anthropometry data	1,407	1,422	1,379	4,208
Biological sample	623	758	713	2,094

CNNS
Birth to Adolescence

Period of data collection in Bihar

CNNS data collection period: August 11, 2016 to December 13, 2016

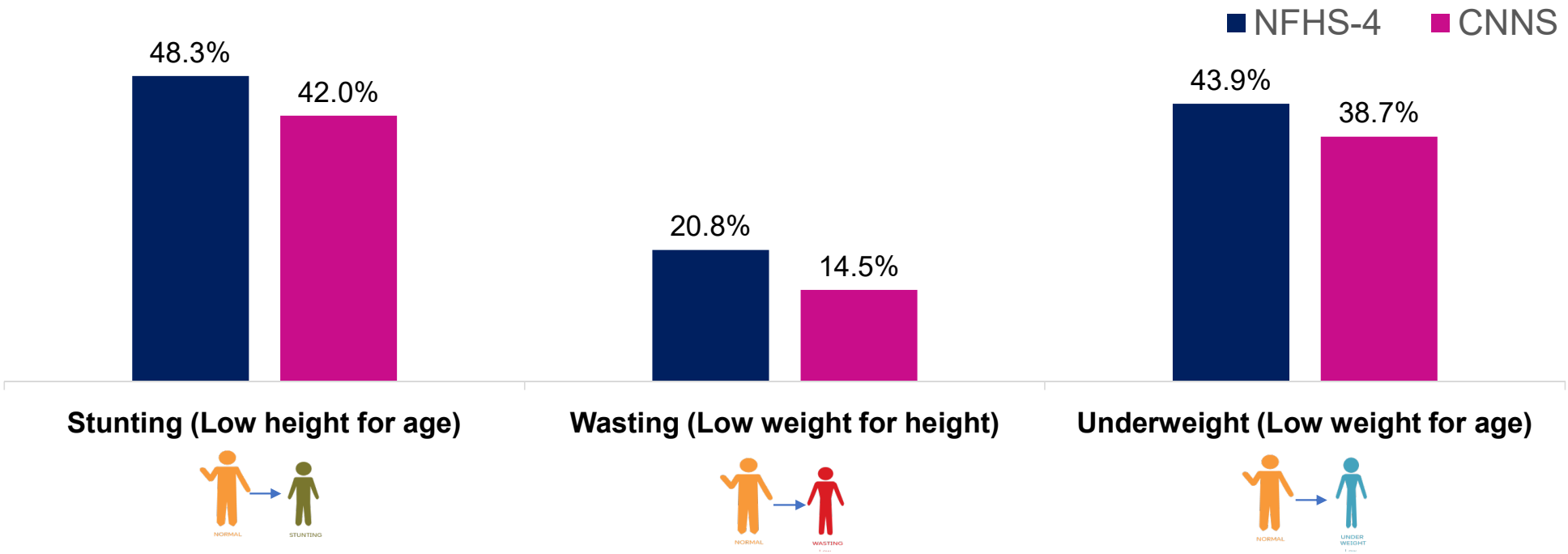
- CNNS collected data in the monsoon season through early autumn season of 2016
- NFHS data for Bihar were collected in the spring through monsoon season of 2015.

Survey	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CNNS 2016								August to December, 2016				
NFHS 4 2015			March to August, 2015									

CNNS
Birth to Adolescence

Bihar key findings: Anthropometry (1/2)

Significant declined in stunting, wasting and underweight in children under 5 years



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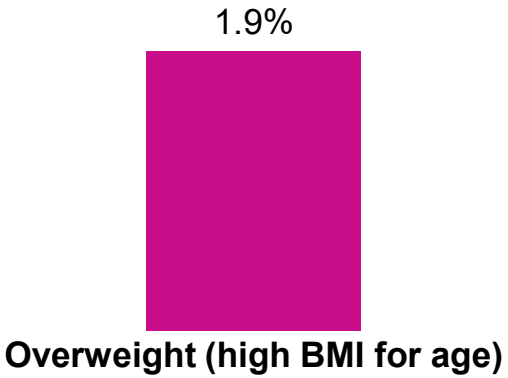
Birth to Adolescence

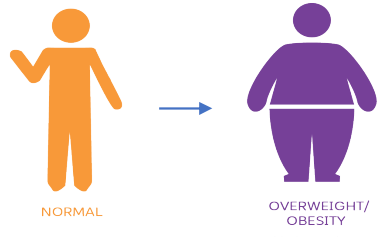
Bihar key findings: Anthropometry (2/2)

1/4 adolescents aged 10-19 years were thin for their age (BMI-Age <-2SD)

3/10 children aged 5-9 years were stunted. The school age period does not provide an opportunity for catch up growth in height.

2% of adolescents aged 15-19 years were overweight or obese.





CINNS Birth to Adolescence

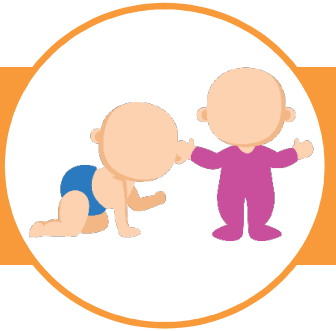
Stunting declined among children under five

Lower prevalence of stunting was observed in CNNS compared to NFHS-4 – **42%** vs **48%** in Bihar

In eastern region states decline in stunting was observed in all states except Odisha

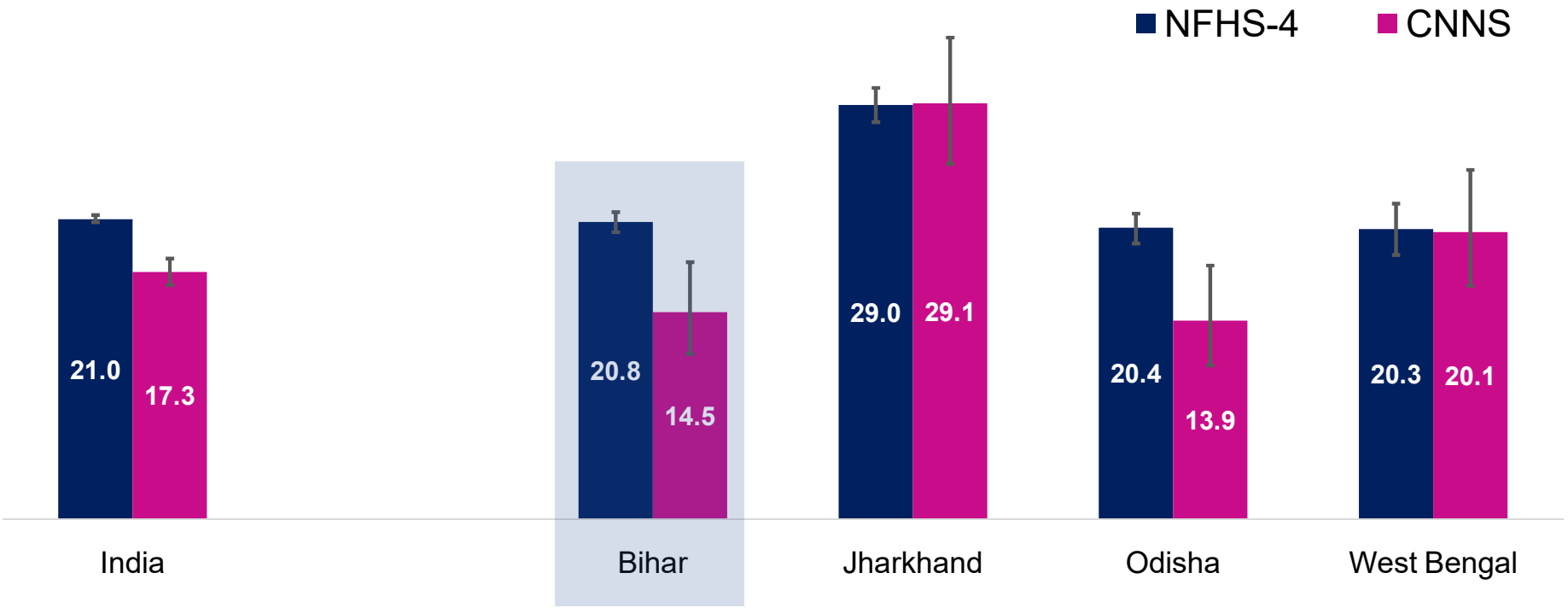
CNNS
Birth to Adolescence

Wasting among children under five declined



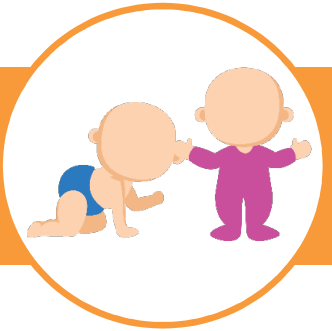
Prevalence of wasting declined significantly in Bihar between NFHS-4 and CNNS – **21%** vs **15%**

Among all eastern states wasting declined significantly in Bihar and Odisha, and did not change in Jharkhand and West Bengal



CNNS
Birth to Adolescence

Prevalence of underweight among children under five declined



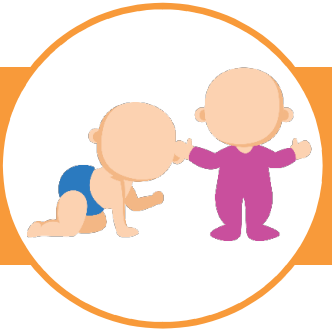
Underweight is a composite measure of chronic and acute malnutrition

The prevalence of underweight declined between NFHS-4 and CNNS – **44%** Vs **39%**

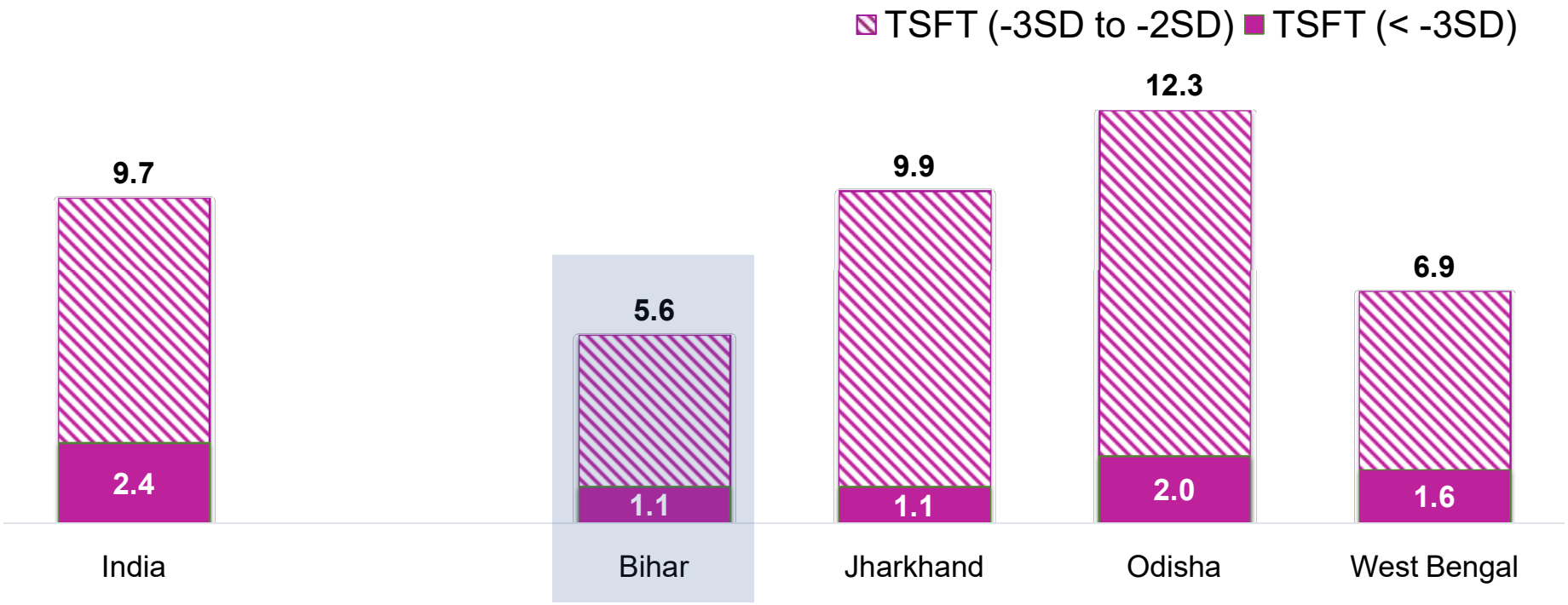
Among eastern states, prevalence of underweight declined only in Bihar

CNNS Birth to Adolescence

Triceps Skinfold Thickness (TSFT) for children under five

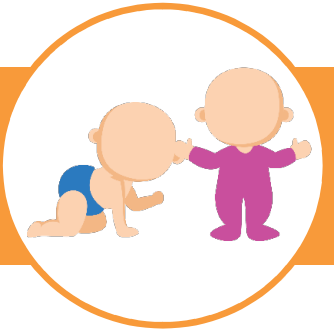


Low fat mass as reported by TSFT in Bihar was lowest among eastern states and national average

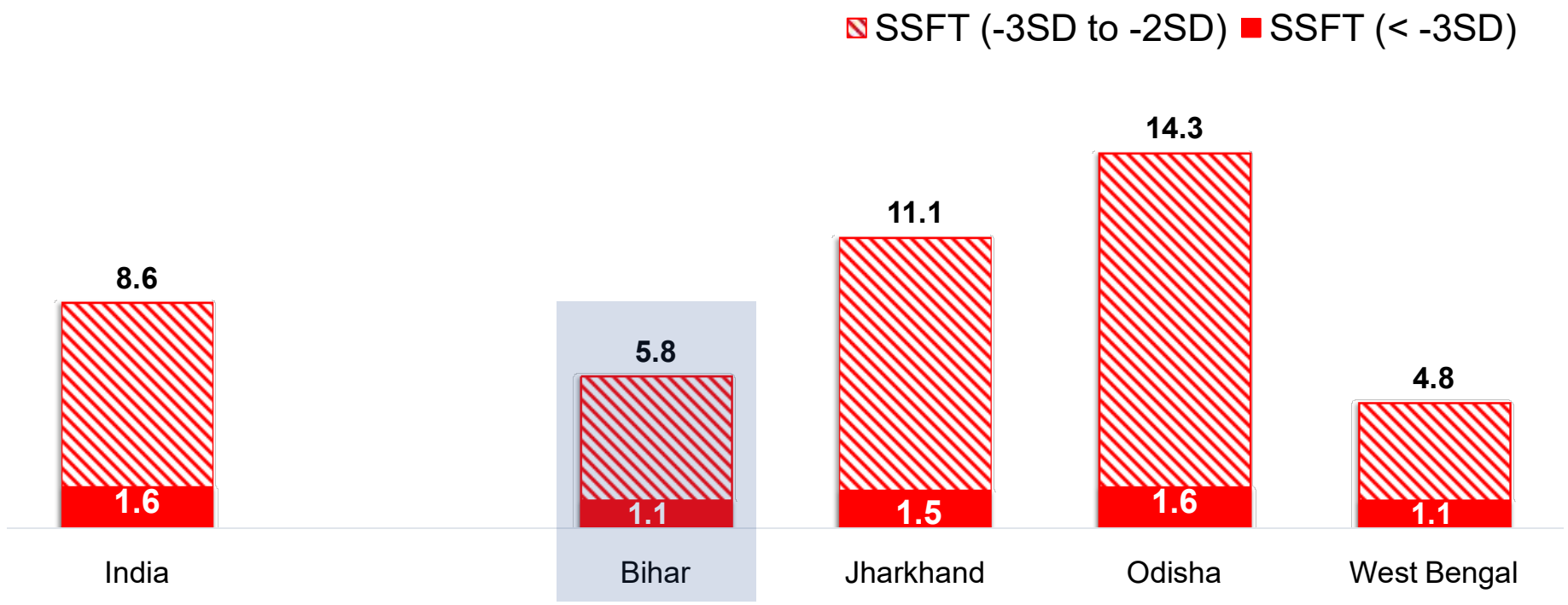


Birth to Adolescence

Subscapular Skinfold Thickness (SSFT) for children aged 1-4 years

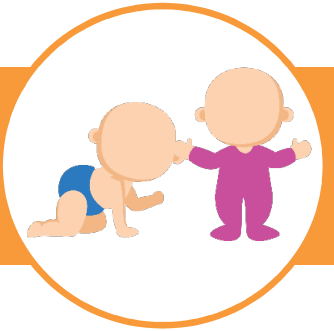


Thinness as reported by SSFT in Bihar was slightly higher than West Bengal but lower than Jharkhand, Odisha and National average



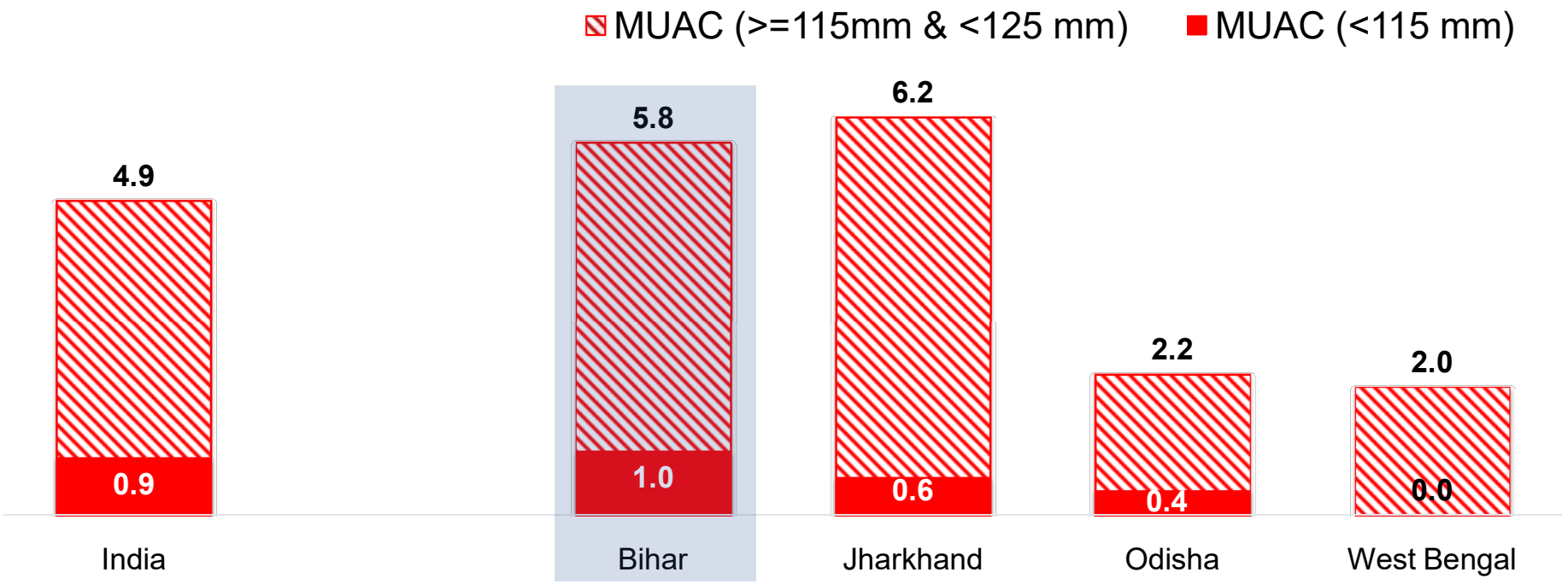
Birth to Adolescence

Mid Upper Arm Circumference (MUAC) for children aged 6-59 months



About **6%** children in Bihar had low MUAC which is at about national average (**5%)**

Prevalence of low MUAC ranged between **2%** and **6%** across the eastern states

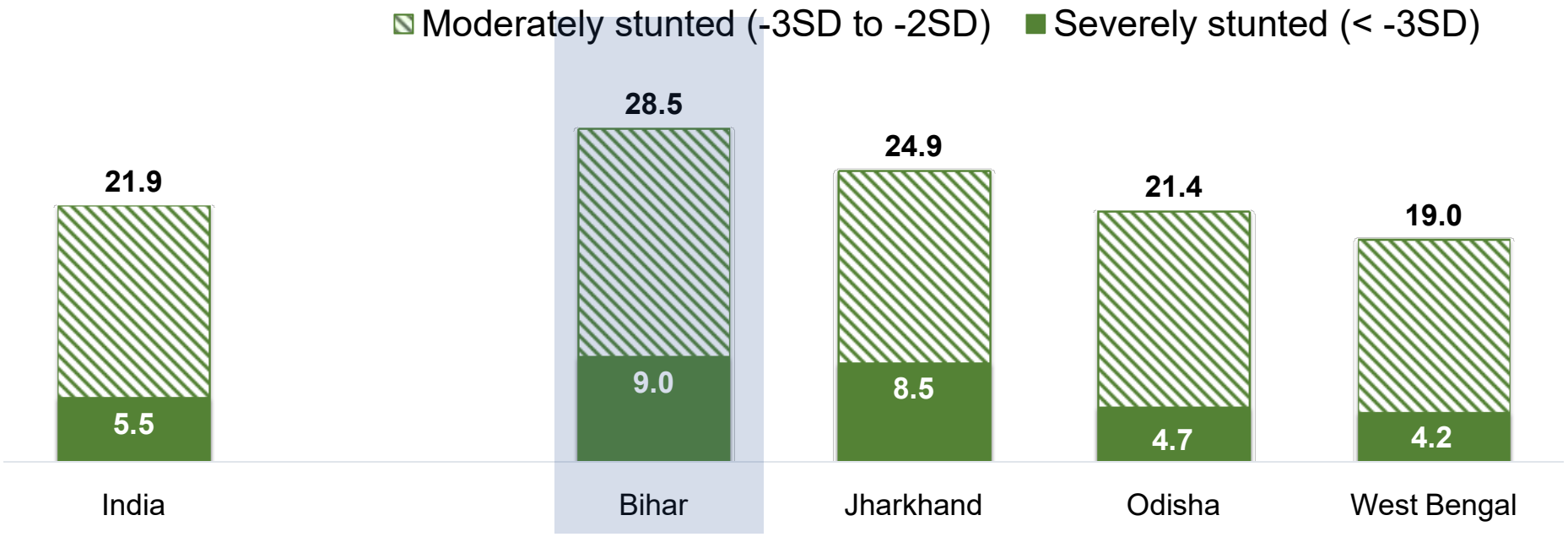


Birth to Adolescence

Stunting among school-age children (5-9 years)

3/10 of children aged 5-9 years was stunted; significant proportion of children who were stunted in childhood remained stunted into their schooling age reducing their potential capacity for education

Bihar had highest prevalence of stunting among the eastern states

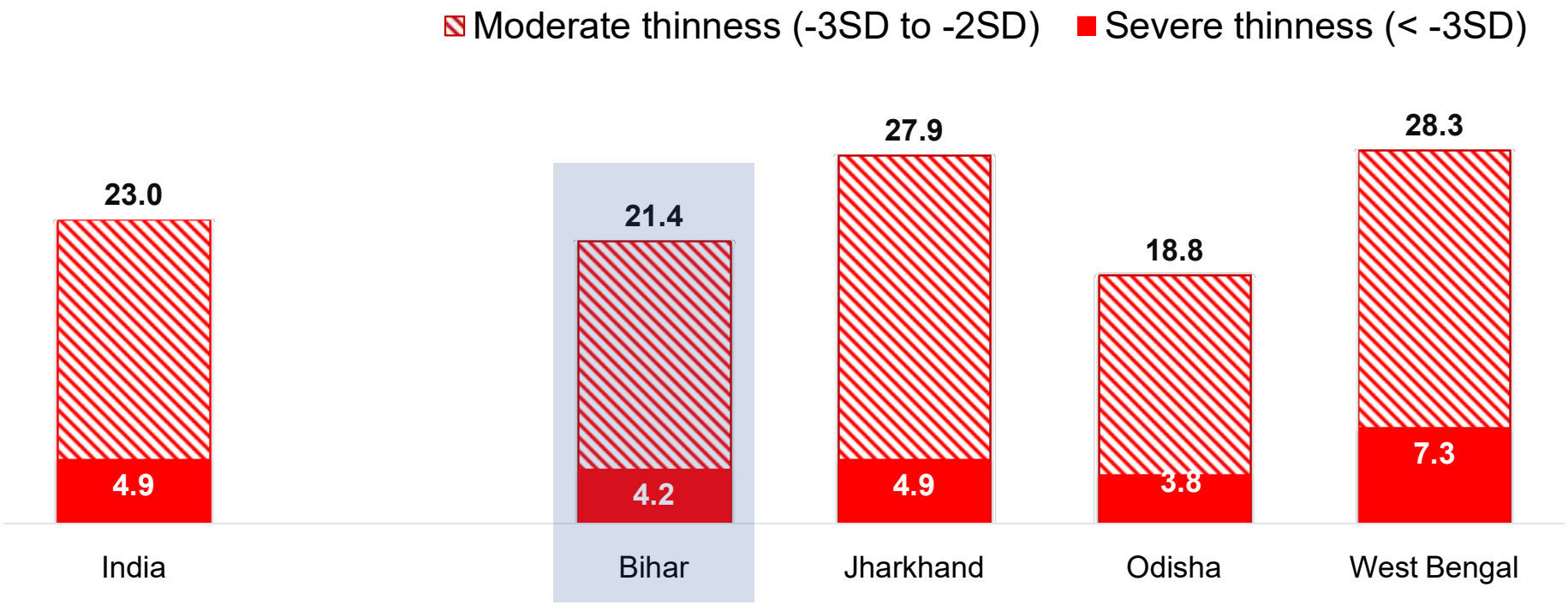


Birth to Adolescence

Thinness among school-age children (5-9 years)

1/5 children aged 5-9 years was thin

Prevalence of thinness in Bihar was slightly less than national average and significantly lower than Jharkhand and West Bengal



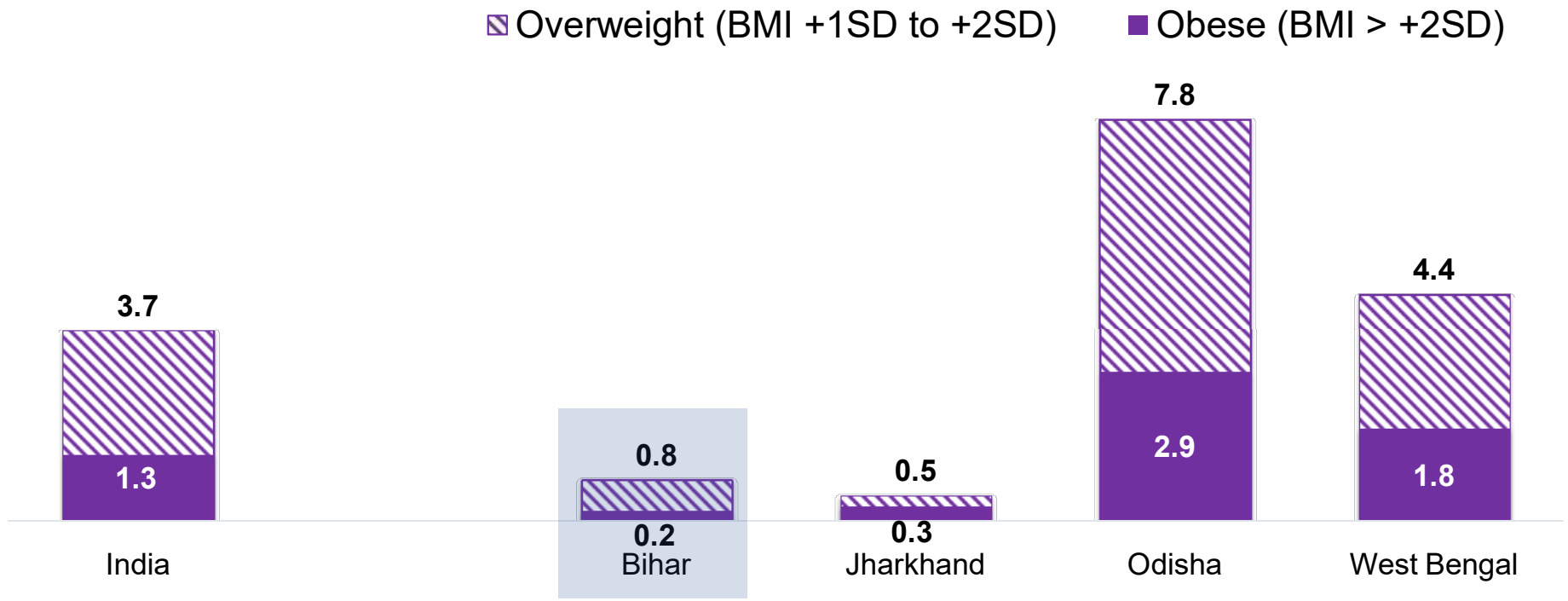
Birth to Adolescence

Overweight and obesity among school-age children (5-9 years) increasing

Overweight and obesity are on rise even among children aged 5-9 years

Prevalence of overweight in Bihar was lower than the national average

Among eastern states, Bihar and Jharkhand had low prevalence of overweight in this age group

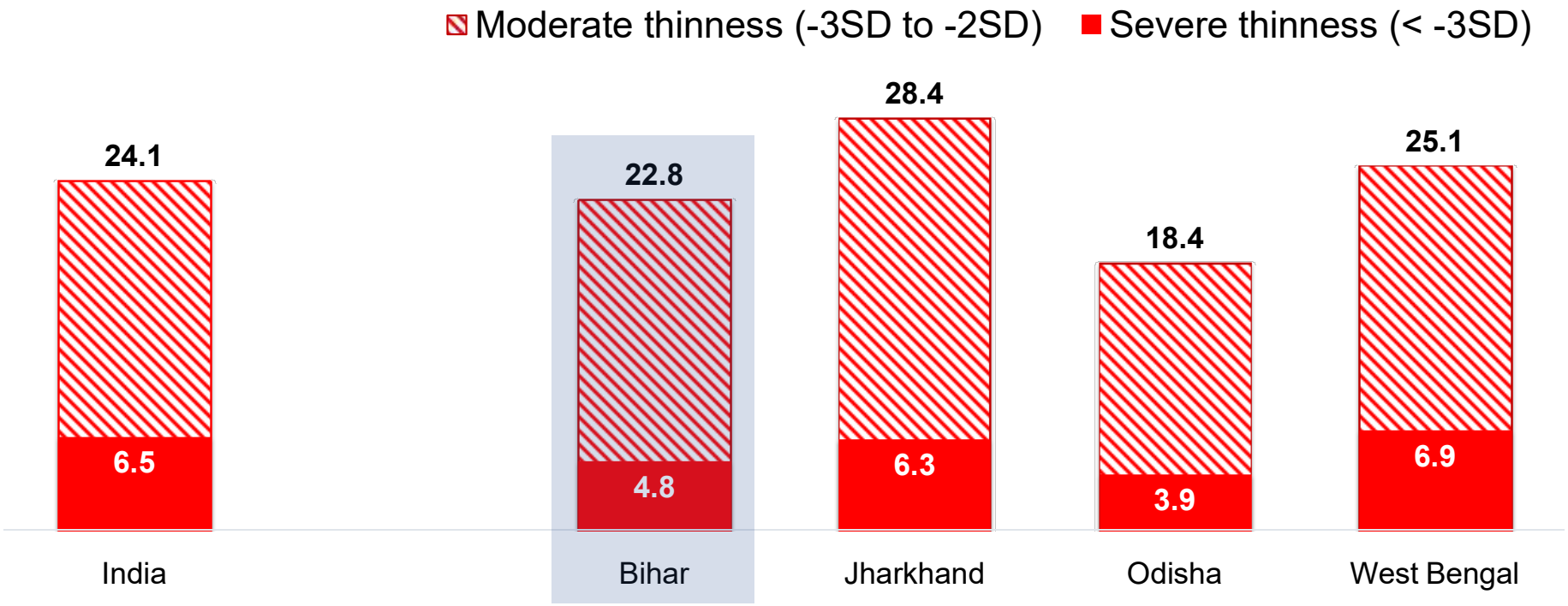


Birth to Adolescence

Thinness among adolescents aged 10-19 years substantially high

1/4 adolescents aged 10-19 years was thin in Bihar (**23%**), slightly less than national average (**24%**)

Among the eastern states, Jharkhand (**29%**) and West Bengal (**25%**) had high prevalence of thinness

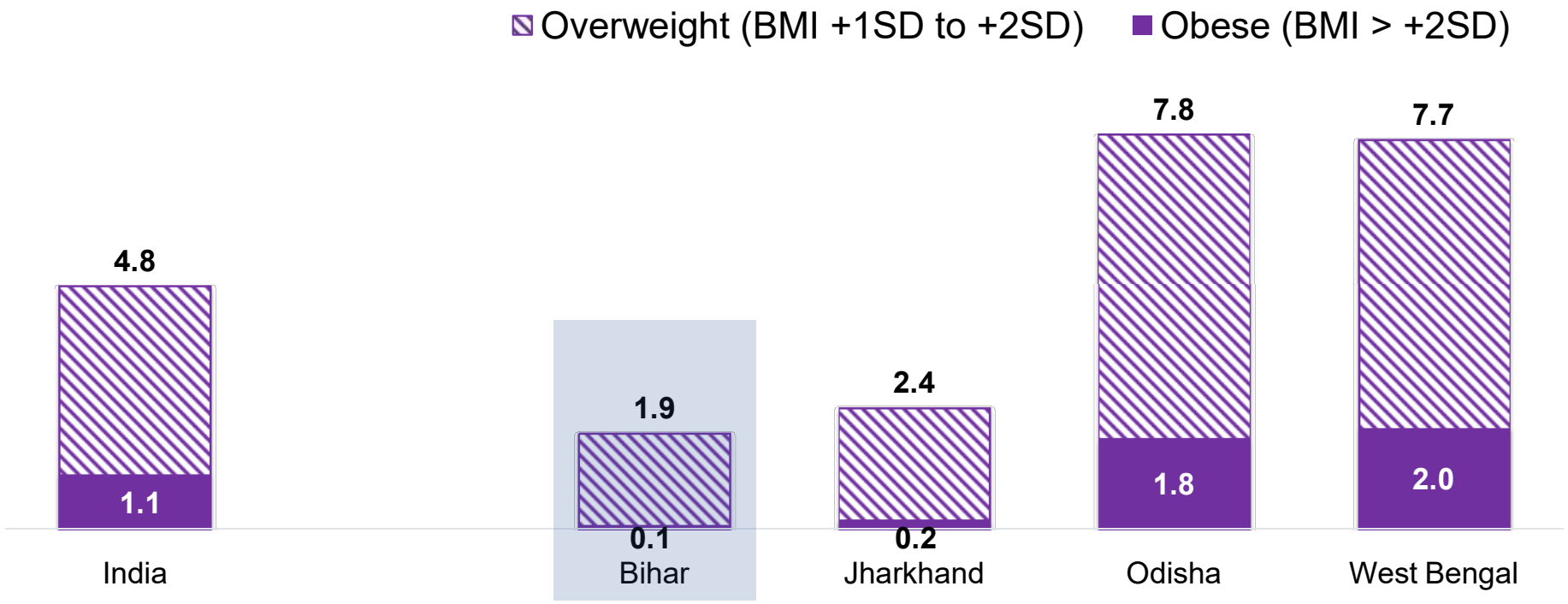


Birth to Adolescence

Prevalence of overweight among adolescents aged 10-19 years high

2% of adolescents was overweight in Bihar, almost half of the national average (**5%**)

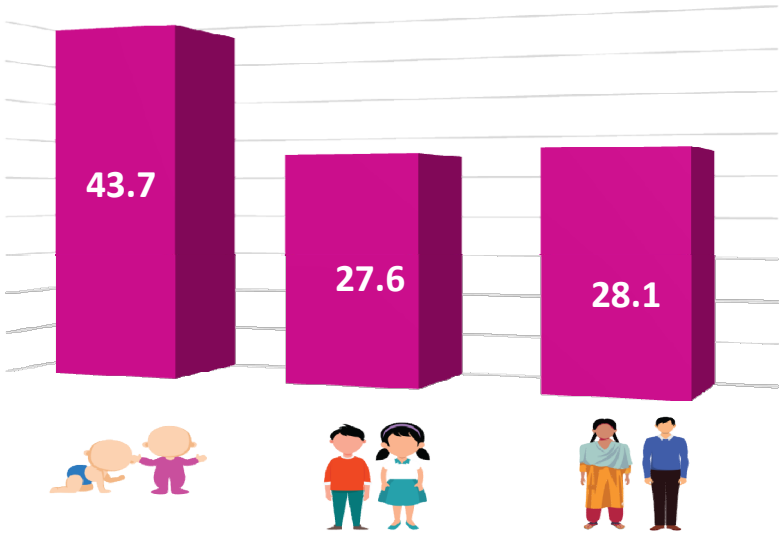
Among the eastern states, Bihar had lowest prevalence, and also low in Jharkhand (**3%**)



Birth to Adolescence

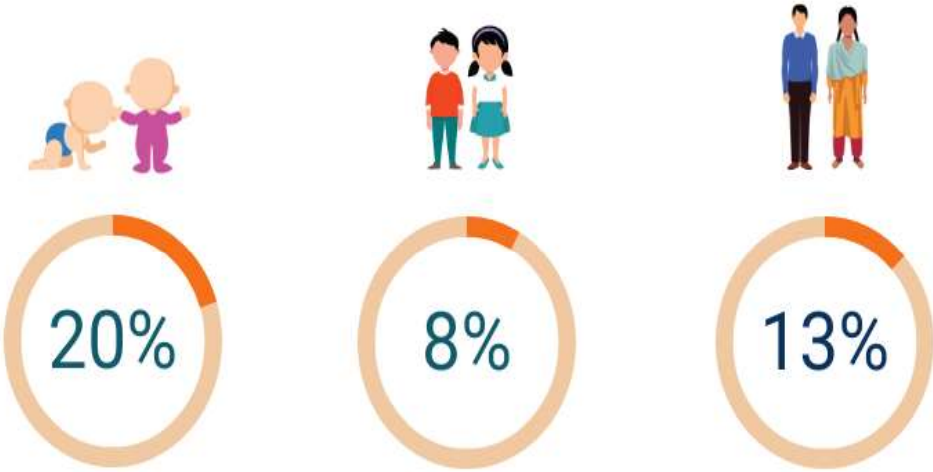
Bihar key findings: Anaemia and iron deficiency

Anaemia



In Bihar, like in most states, anaemia was significantly higher among children aged 1-4 years compared to children aged 5-9 years and adolescents aged 10-19 years

Iron deficiency



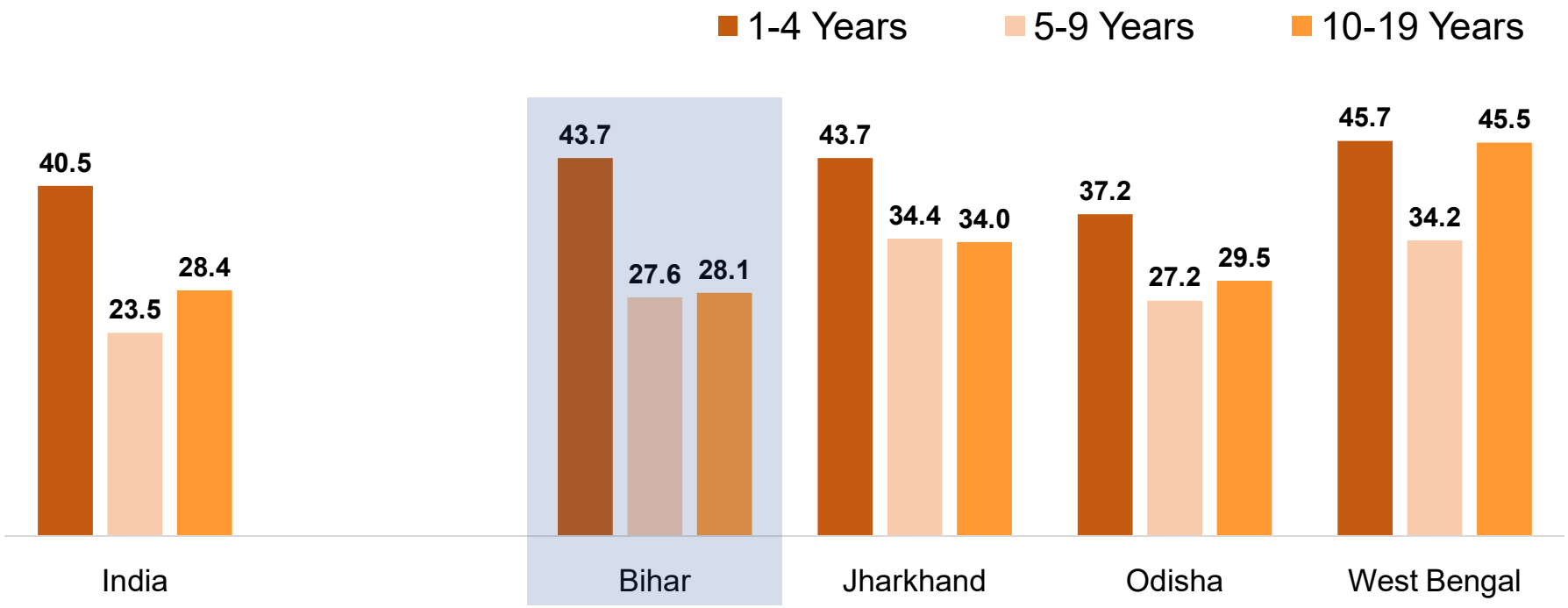
Findings indicate that children aged 1-4 years had higher iron deficiency (measured by serum ferritin) than other children or adolescents

CINNS Birth to Adolescence

Prevalence of Anaemia among children and adolescents

44% of children aged 1-4 years were anaemic in Bihar (**27%**), higher than national average (**41%**)

Prevalence of anaemia was highest among children aged 1-4 years



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

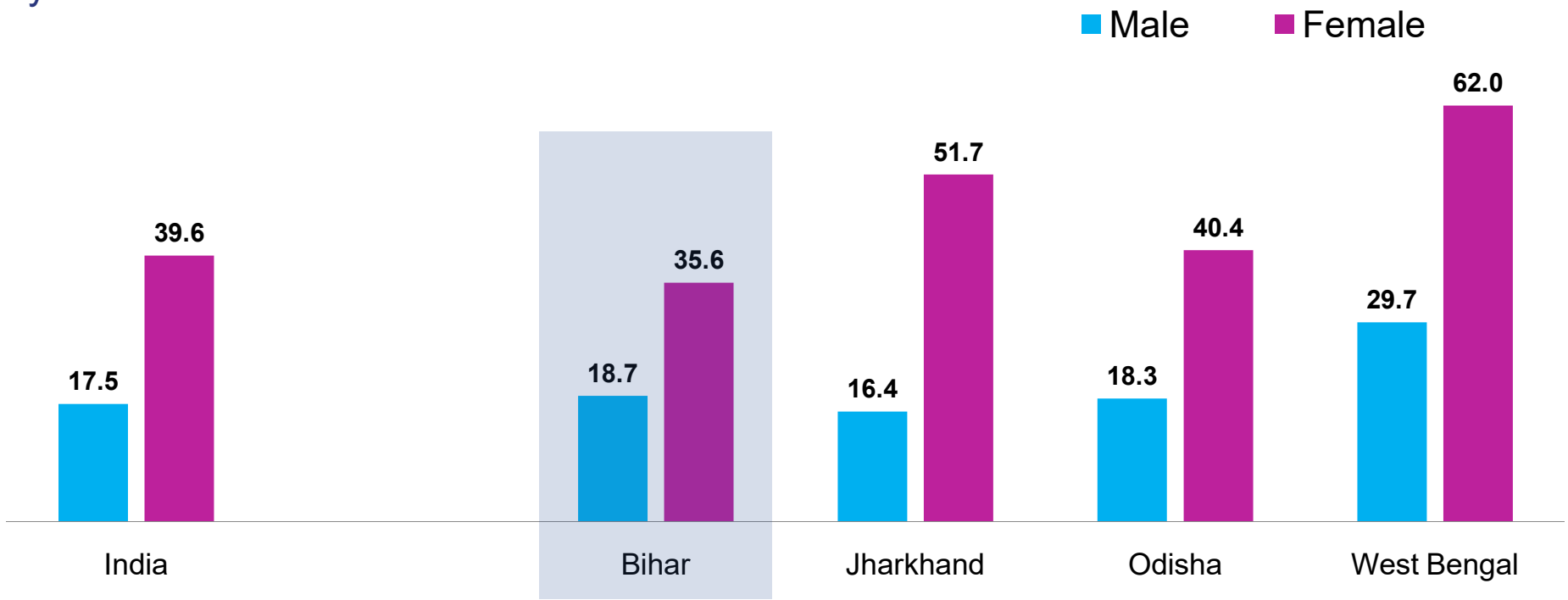
(Adjusted for altitude)

CINS
Birth to Adolescence

Prevalence of Anaemia among adolescents (10-19 years)

Overall, in the country, anaemia prevalence among adolescent girls (10-19 years) was almost twice that of adolescent boys

In Bihar, as in many other eastern states, adolescent girls were substantially higher than the adolescent boys to be anaemic

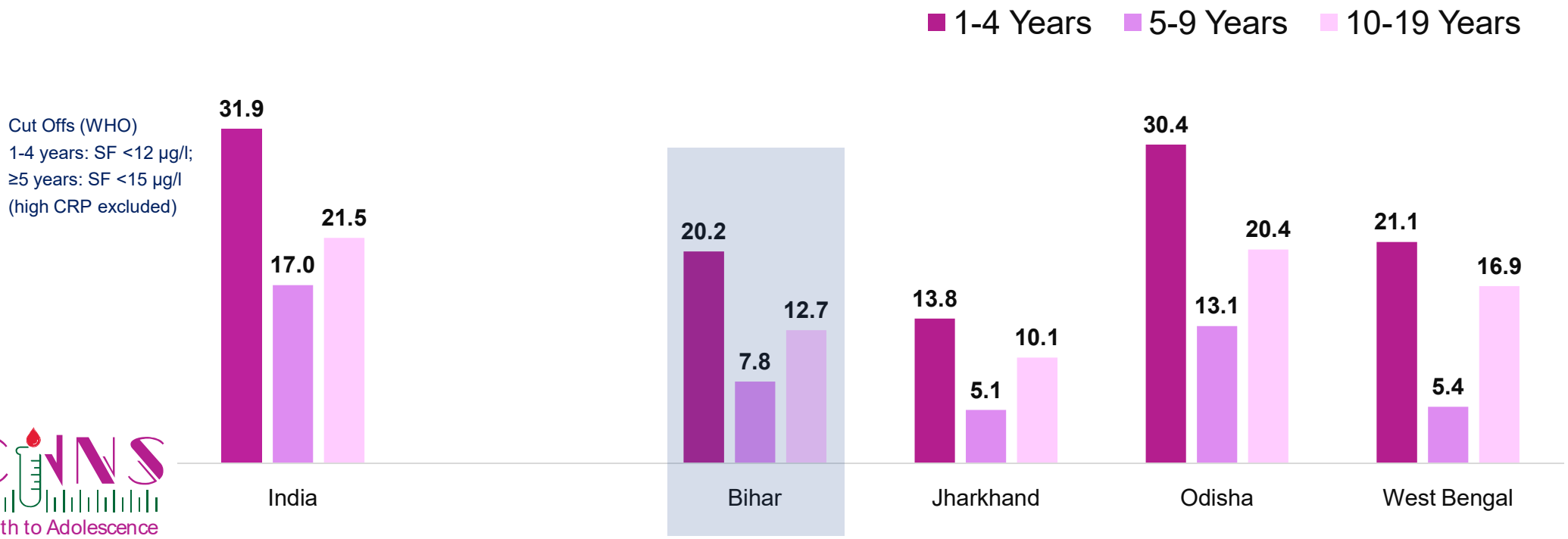


CINNS Birth to Adolescence

Iron deficiency measured by serum ferritin among children and adolescents

More than **1/5** children aged 1-4 years had iron deficiency in Tamil Nadu (**20%**), lower than the national average (**32%**); prevalence was highest among children aged 1-4 years

Among eastern states, children from Odisha had highest prevalence of iron deficiency



CINS Birth to Adolescence

Bihar key findings: Vitamin A and Vitamin D deficiency

Vitamin A deficiency was higher (28%) in school-age children

Children aged 1-4 years and adolescents were found to have similar levels of Vitamin A deficiency as children aged 5-9 years

Vitamin D deficiency ranged from 23% to 36% in 1-19 years age group as per cut off by expert panel of IOM.

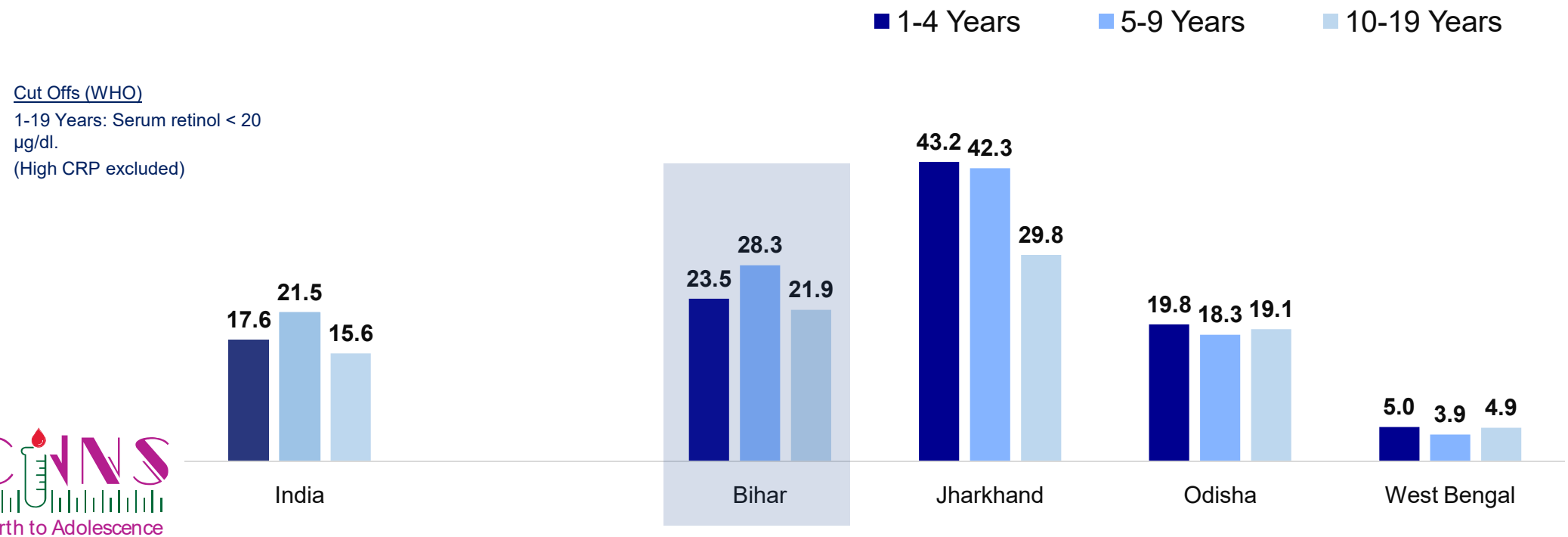
Adolescents aged 10-19 years were found to have higher level of Vitamin D deficiency than children aged 1-9 years

CINS Birth to Adolescence

Vitamin A deficiency among children and adolescents

22-28% children and adolescents had Vitamin A deficiency in Bihar, higher than national average (**18-22%**)

Among eastern states, Bihar and Jharkhand had lower prevalence of Vitamin A deficiency than other two states

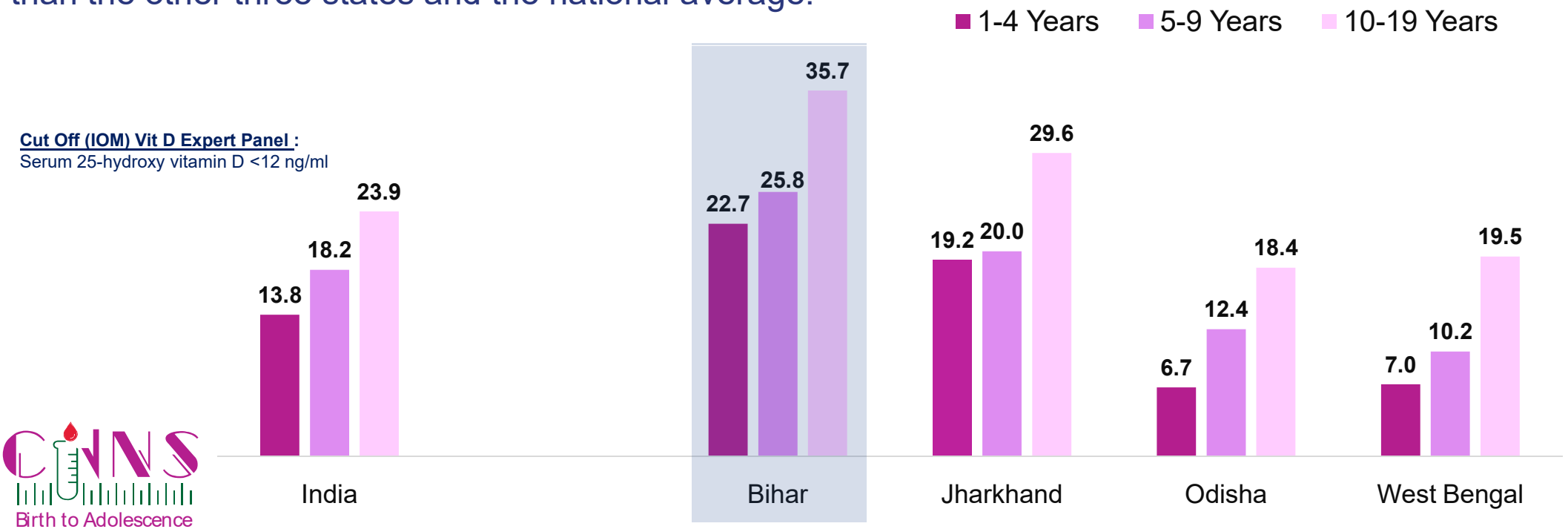


Birth to Adolescence

Vitamin D deficiency increases with age

23-36% children and adolescents had Vitamin D deficiency in Bihar, higher than the national average (**14-24%**); Vitamin D deficiency increased sharply with age.

Among eastern states, Bihar had the highest Vitamin D deficiency among children and adolescents than the other three states and the national average.



CINS Birth to Adolescence

Bihar key findings: Non-communicable diseases

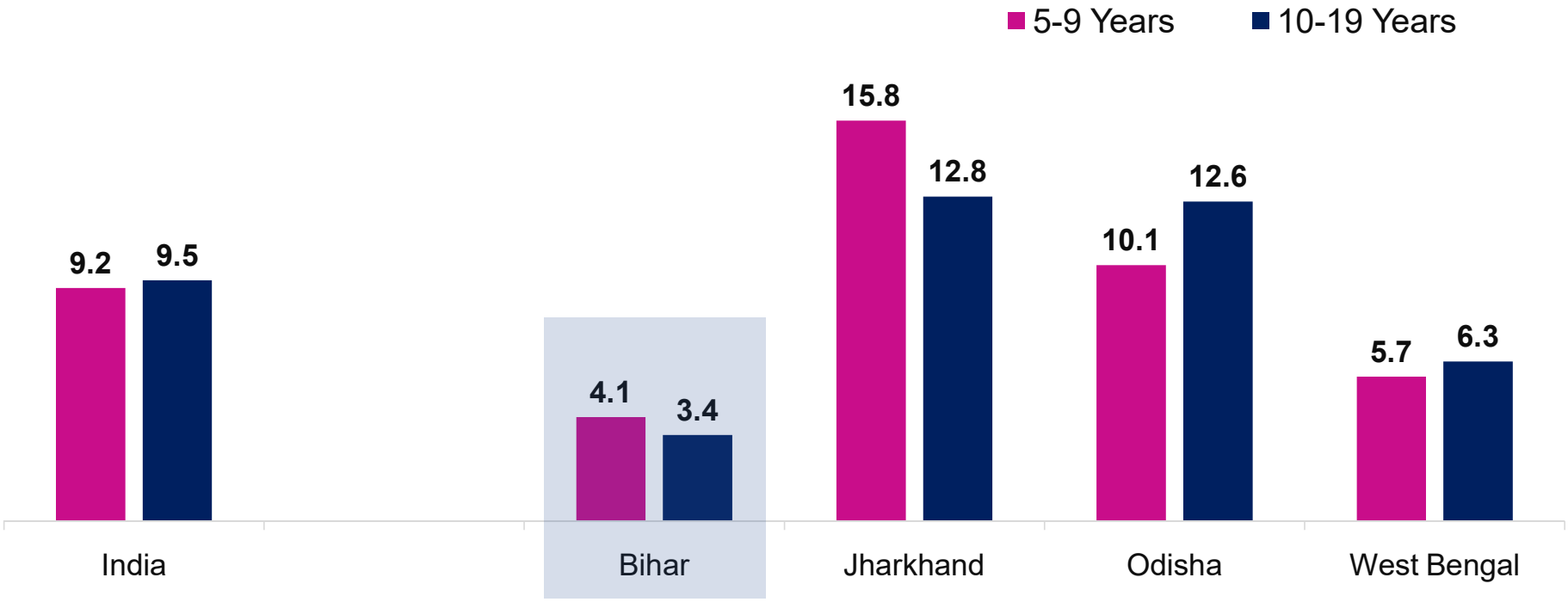
Slightly less than 5% school-age children and adolescents were found with high level of glycosylated haemoglobin (HbA1c).

Other indicators of risks of NCDs, such as level of cholesterol, triglycerides, LDL and HDL point to increased risks of NCDs among adolescents.

Risk of diabetes among school-age children and adolescents

Based on Glycosylated hemoglobin (HbA1c), slightly less than **5%** children and adolescents had increased risk of diabetes in Bihar, which is half of the national average (**9-10%**)

Among all eastern states, risk of diabetes was the lowest in Bihar

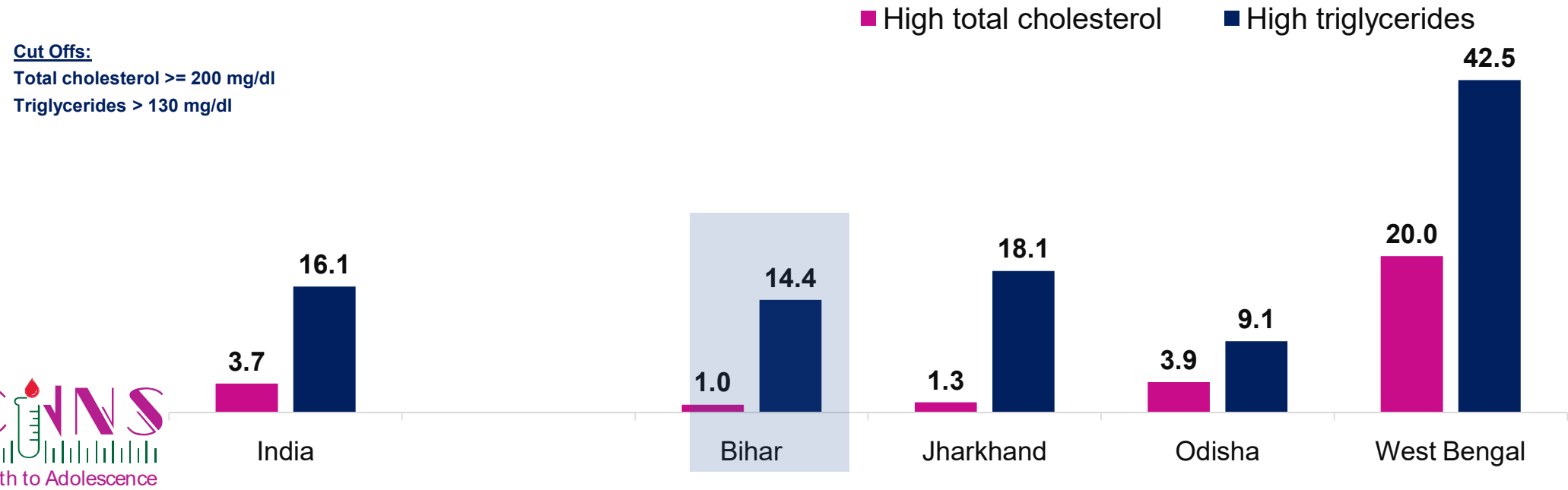


Birth to Adolescence

High total cholesterol and high triglycerides among adolescents

Elevated risk of NCDs in Bihar among adolescents – **1%** had high level of total cholesterol and **14%** with high level of triglycerides

Prevalence of high total cholesterol an high triglycerides in Bihar was the lowest among all eastern states.

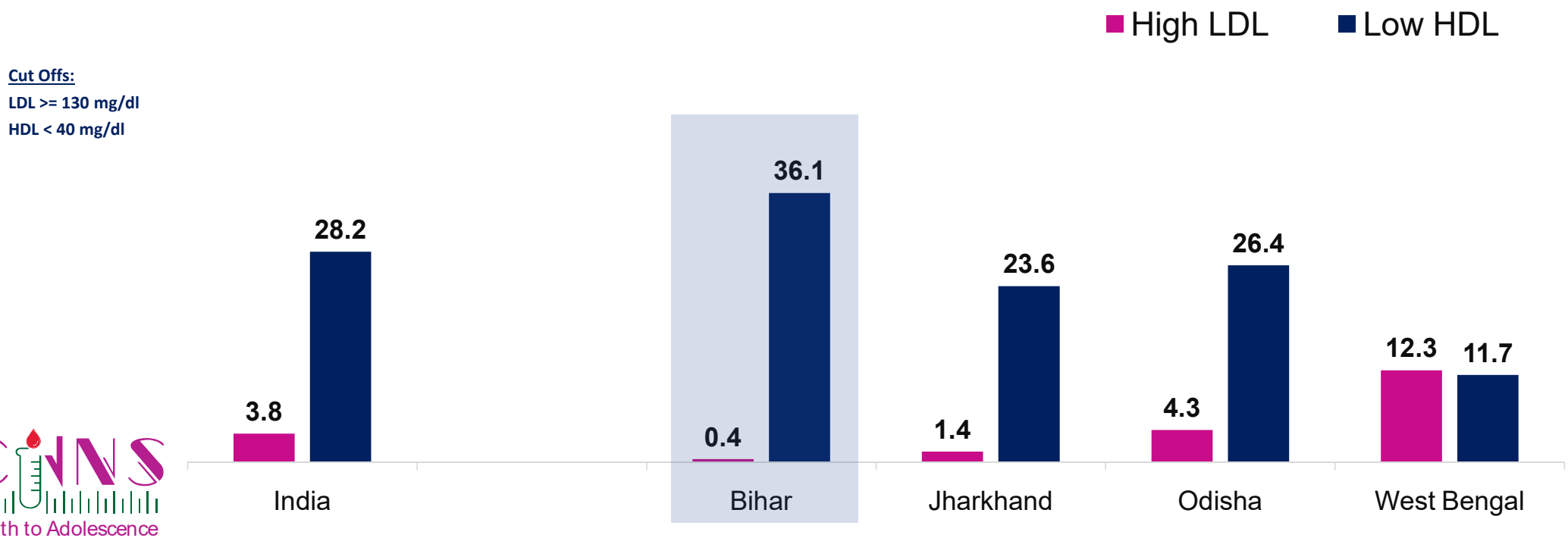


Birth to Adolescence

High LDL and low HDL among adolescents

Risk of NCDs among adolescents in Bihar – less than **1%** had high LDL an **36%** had low HDL

Among the eastern states, in Bihar, prevalence of high LDL was the lowest and low HDL was the highest.



Birth to Adolescence

Preliminary Policy Discussions from CNNS

- Only about half of anaemia is caused by iron deficiency. Programmes must address all causes of anaemia but continue to address iron deficiency in children under five and adolescent girls (population with largest burden).
- Vitamin A deficiency is still high. Along with Vitamin A supplementation, interventions such as dietary diversification and fortification can be taken to scale to address the burden.
- Vitamin D deficiency is an emerging public health issue among urban children and adolescents. Scaling up of fortification efforts can be considered. Further research is required to uncover the effects of pollution and other factors to design better programmes.
- Urinary Iodine data need to be examined in conjunction with salt consumption data for the population and level of iodine in salt at the household level.
- Control of NCDs such as diabetes and cardiovascular disease must start in the early ages to instil lifelong healthy habits as adult diseases start in childhood.

CNNS Birth to Adolescence

The survey was conducted with generous financial support from

Aditya and Megha Mittal

and technical support from

unicef | for every child

POPULATION COUNCIL
Ideas. Evidence. Impact.

AIIMS New Delhi

CDSA

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

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INDIAN COUNCIL OF MEDICAL RESEARCH
NATIONAL INSTITUTE OF NUTRITION