



सत्यमेव जयते

Ministry of Health and Family Welfare
Government of India



Comprehensive National Nutrition Survey

2016 – 2018

Odisha
State Presentation



Largest Micronutrient Survey ever conducted: CNNS 2016-

112,316

Children and adolescents interviewed



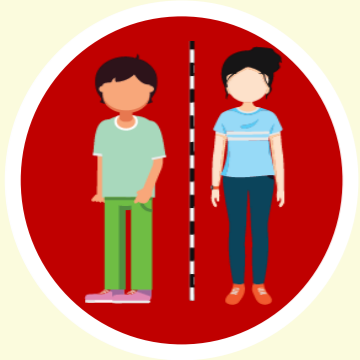
51,029

Blood, stool and urine samples collected



360

Anthropometric measurers



2500

Survey personnel in 30 states



30

Microscopists



100

Data Quality assurance monitors



200

Trainers and coordinators



200

Lab technicians



360

Phlebotomists



900

Interviewers



Justification and Objective



- 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*

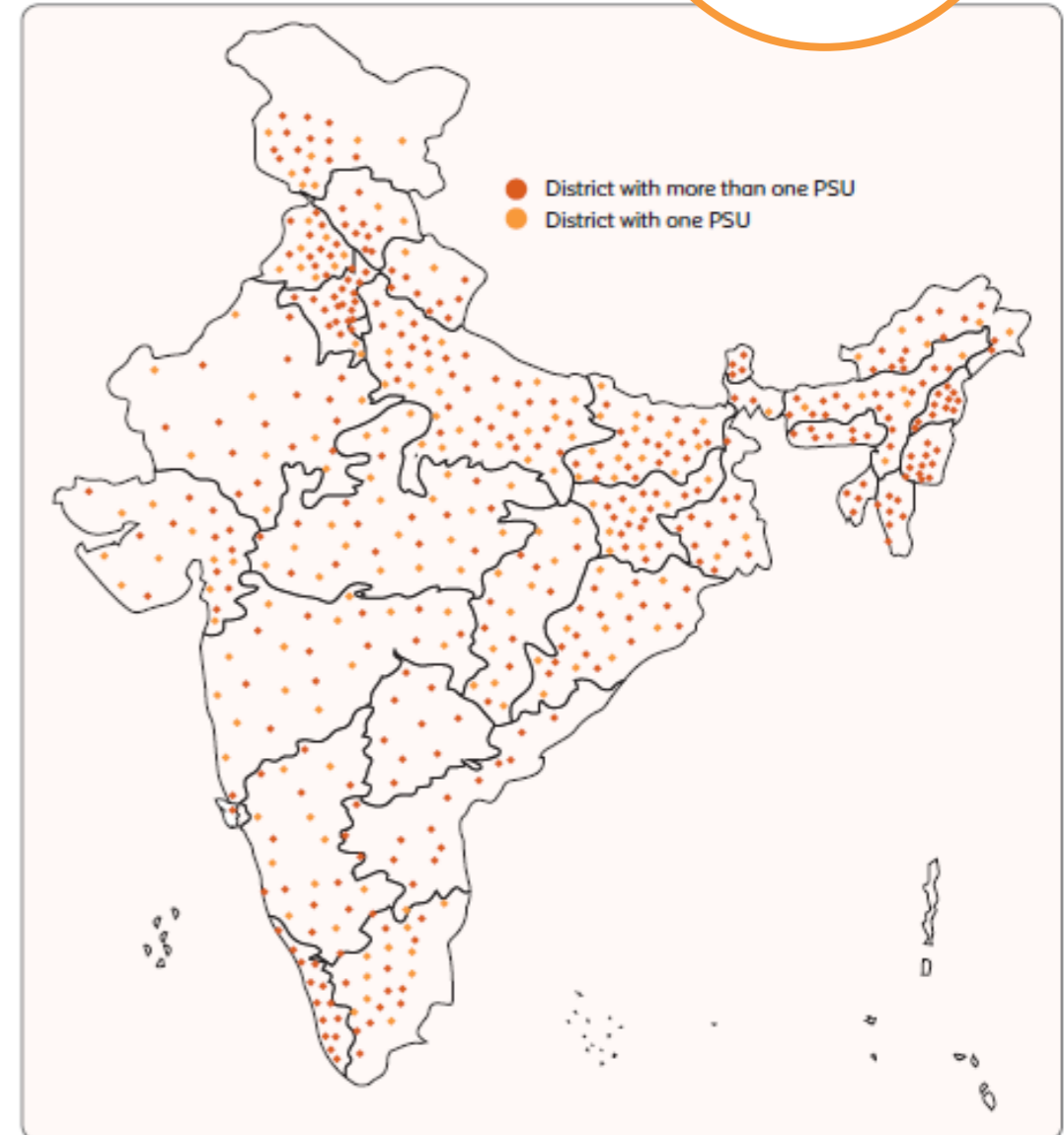
Survey Design



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:

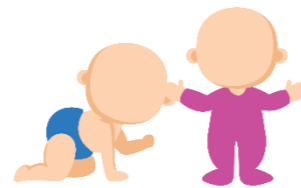
- 160 Districts- one PSU
- 356 Districts- two or more PSUs



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

Biochemical indicators - micronutrient deficiencies and NCDs



Indicator Group			
Anaemia and haemoglobinopathies	<ul style="list-style-type: none"> • Haemoglobin • Variant haemoglobins 		
Inflammatory biomarkers	<ul style="list-style-type: none"> • C-reactive protein 		
Protein	<ul style="list-style-type: none"> • Serum protein and albumin 		
Micronutrients	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Blood Pressure • Blood glucose, HbA1c • Lipid profile: Serum cholesterol, LDL, HDL, and triglycerides • Renal function: Serum creatinine, urinary protein creatinine ratio 		

Monitoring and Supervision



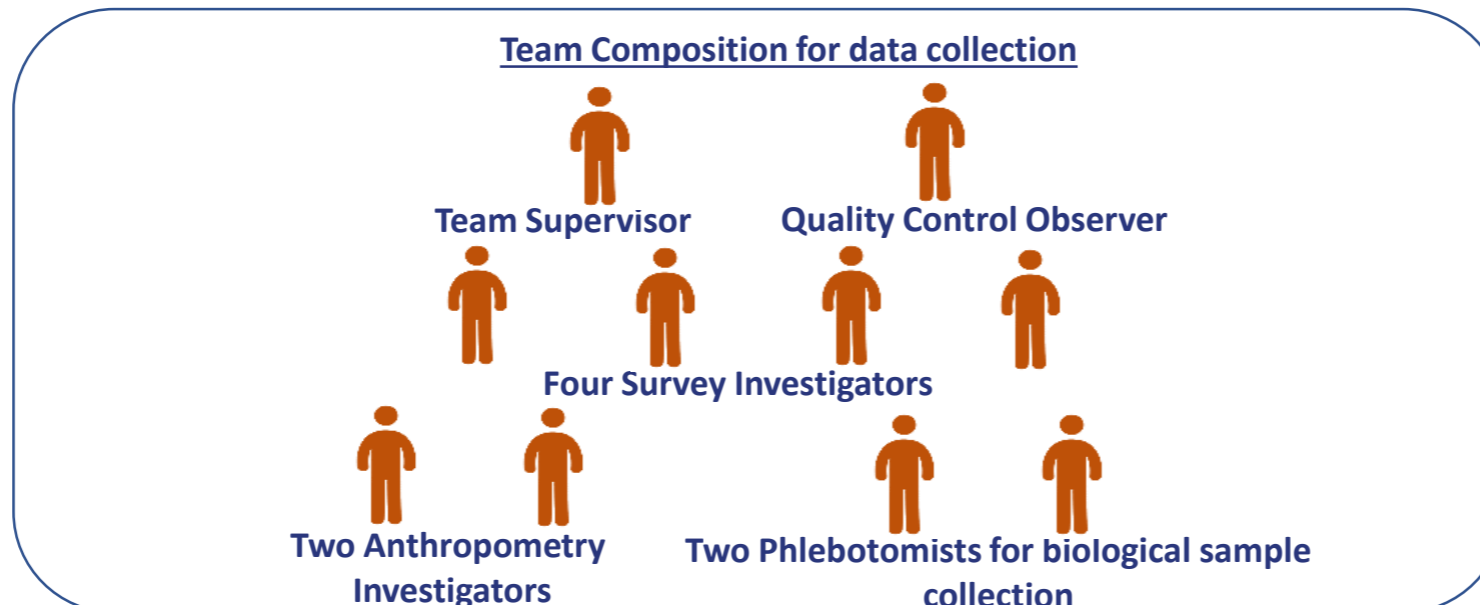
Three-tiers of Data Quality Assurance

- Field work/protocol/training monitoring: by quality control team
 - Biological sample quality control : by AIIMS, NIN and US CDC
-
- 3-member Data Quality Assurance (DQA) team for re-interviews & observations
 - Concurrent monitoring of biological sample collection, storage and transportation by CDSA
-
- Internal monitoring by the Quality Control Observer
 - Daily supervision of the field work by Team Supervisor

Third Level

Second Level

First Level



Quality Assurance Measures for Data Quality

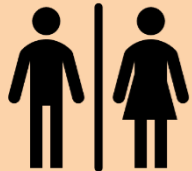


Evaluation of Interviewers prior to employment



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

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: IIMR, Kantar Public,
Gfk Mode and Sigma Consulting

Sample size in Odisha



CNNS covered 65 PSUs for data collection in Odisha

Achieved following sample size by age groups:

	0-4 years	5-9 years	10-19 years	Total
Household and anthropometry data	1,313	1,343	1,271	3,927
Biological sample	927	790	764	2,481

Period of data collection in Odisha



CNNS data collection period: November 21, 2017 to February 21, 2018

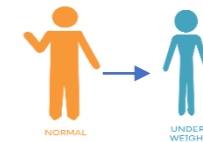
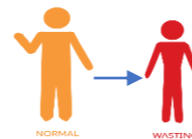
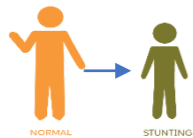
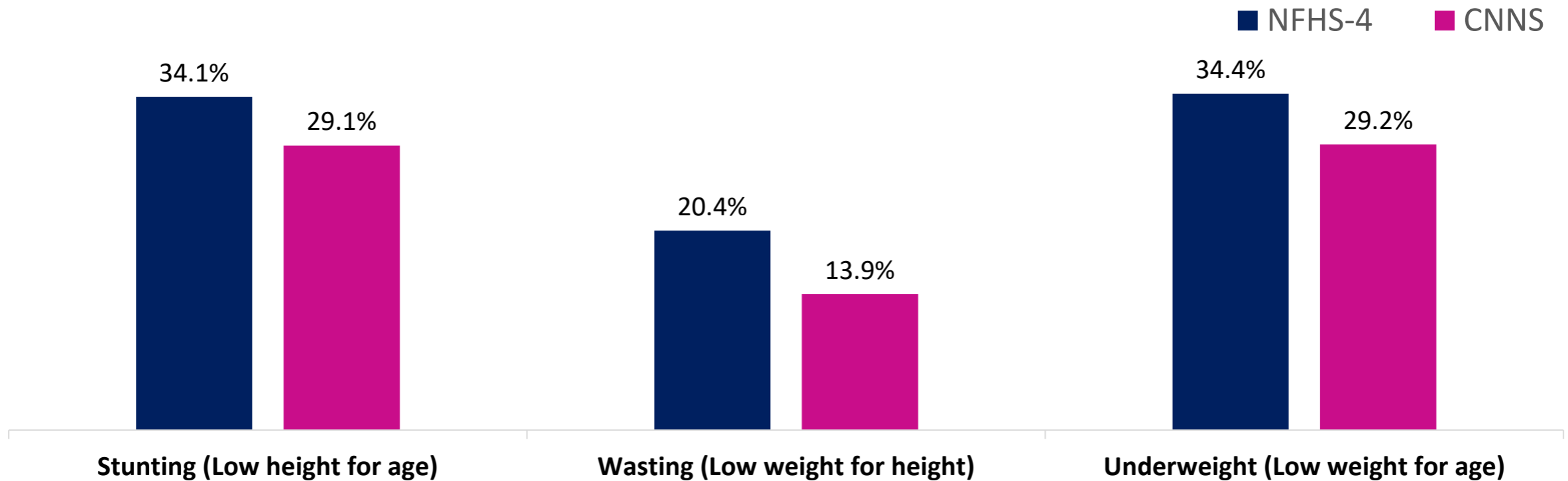
- CNNS collected data during the winter season of 2017-18
- NFHS collected data during the winter season through rainy season of 2016.

Survey	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CNNS 2017-18	February, 2018										November, 2017 to	
NFHS 4 2016	January to July, 2016											

Odisha key findings: Anthropometry (1/2)



Significant decline in wasting; stunting and underweight unchanged in children under 5 years



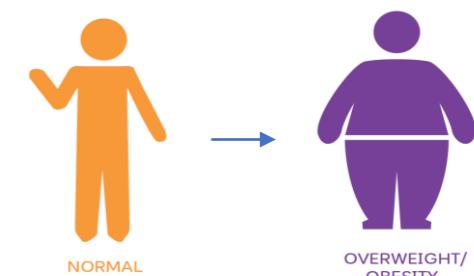
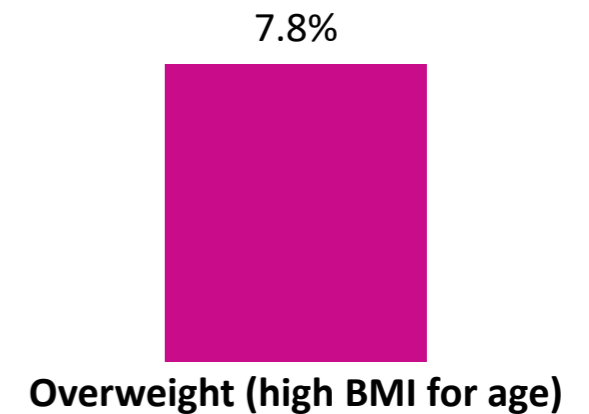
Odisha key findings: Anthropometry (2/2)



18% of adolescents aged 10-19 years were thin for their age (BMI-Age <-2SD)

1/5 children aged 5-9 years was stunted. The school age period does not provide an opportunity for catch up growth in height.

8% of adolescents aged 10-19 years were overweight or obese.

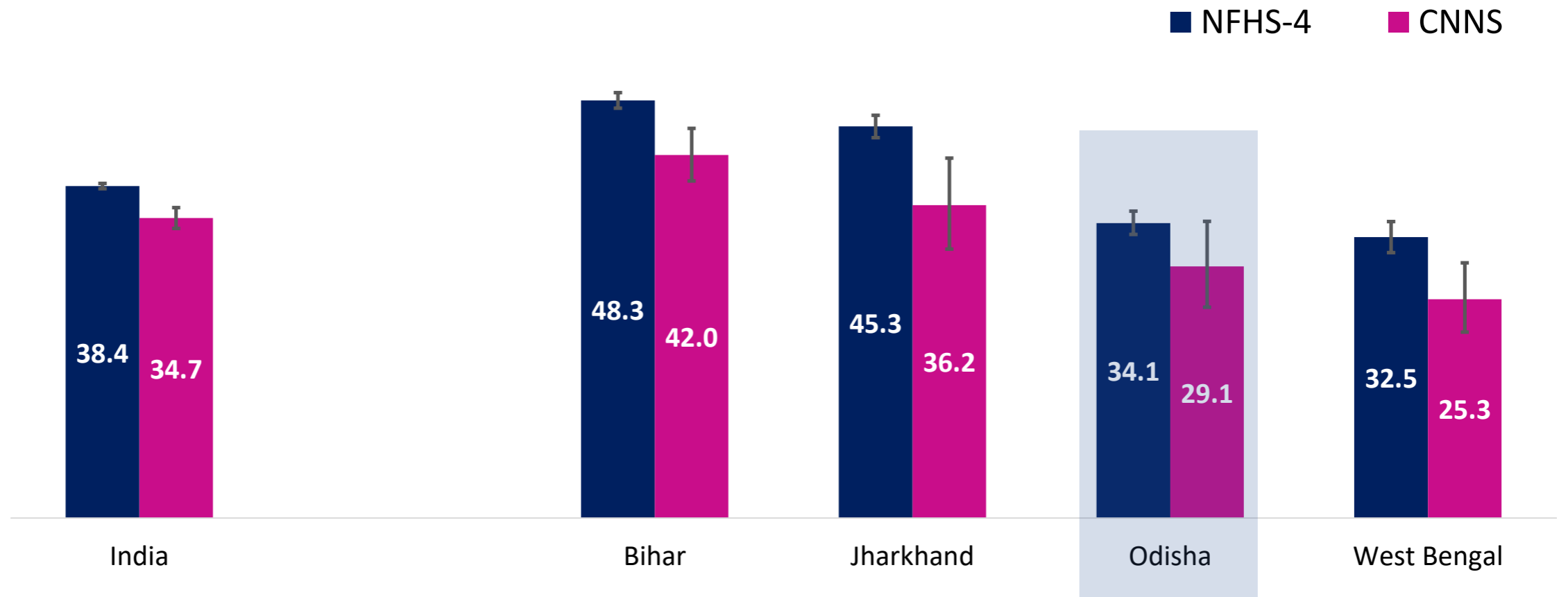


Stunting unchanged among children under five



No significant decline in stunting was observed in CNNS compared to NFHS-4 – **29%** Vs **34%** in Odisha

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

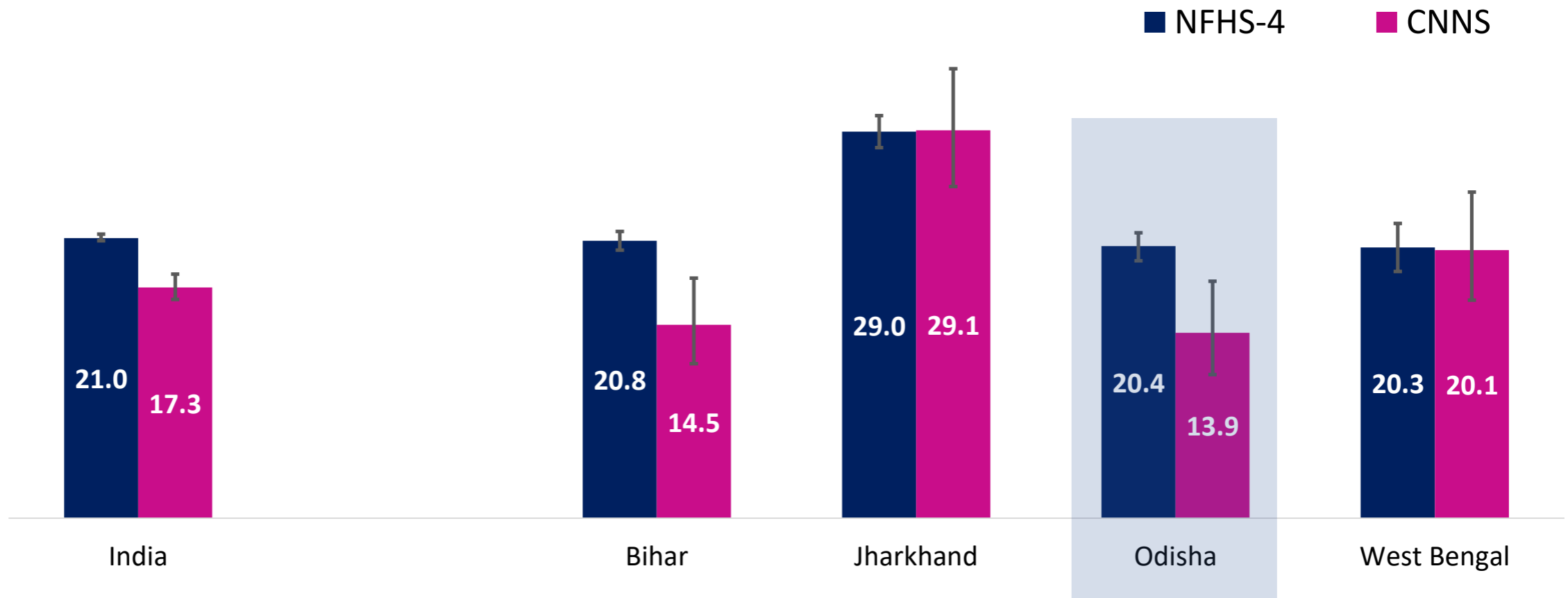


Wasting among children under five declined

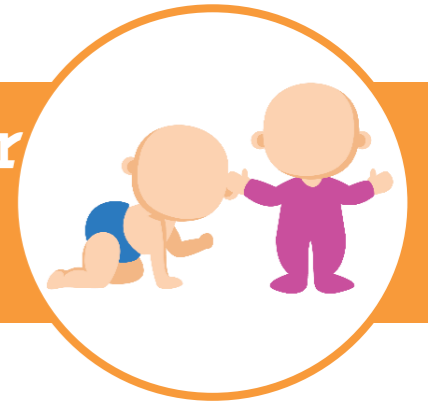


Prevalence of wasting declined significantly in Odisha between NFHS-4 and CNNS – **20% Vs 14%**

Among all eastern states wasting declined in Bihar and Odisha, and no change observed in Jharkhand and West Bengal



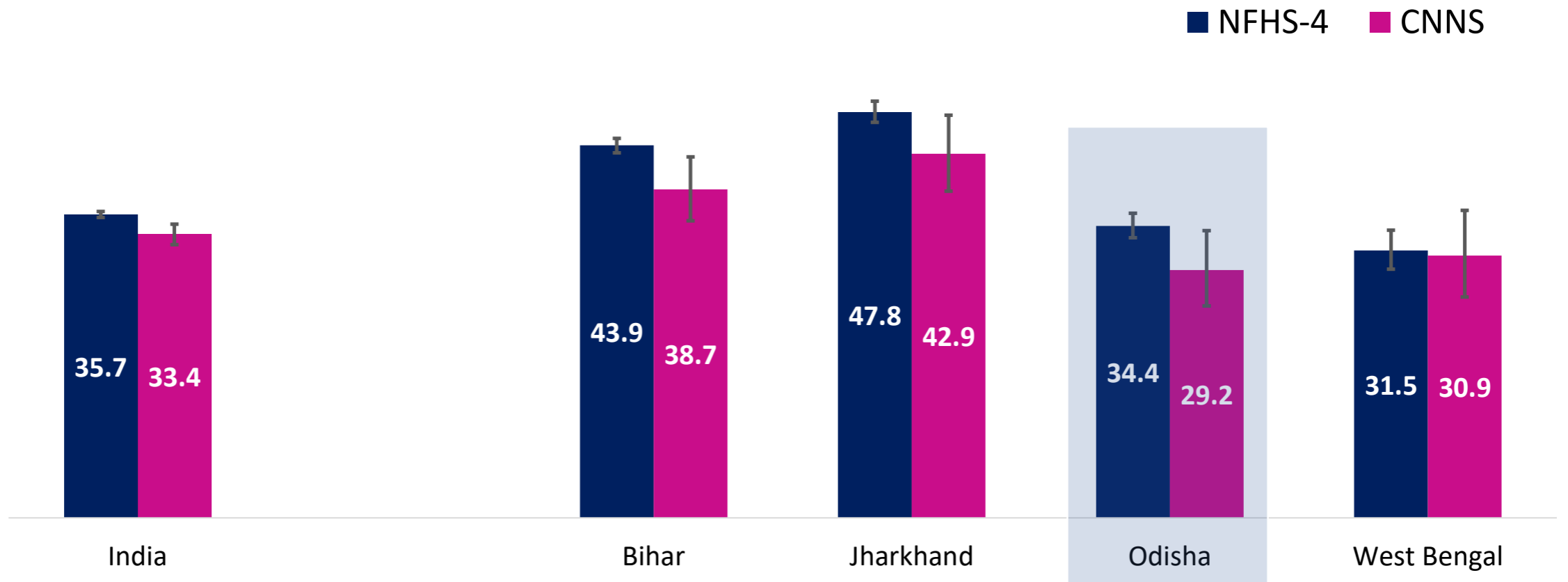
Prevalence of underweight among children under five unchanged



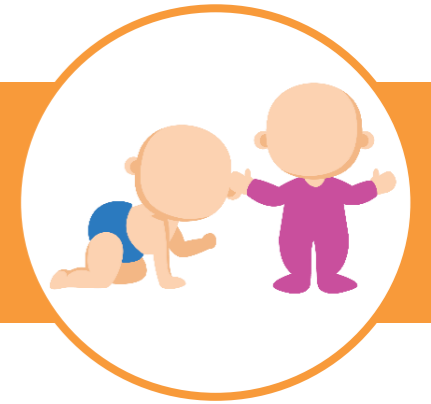
Underweight is a composite measure of chronic and acute malnutrition

The prevalence of underweight did not decline significantly between NFHS-4 and CNNS – **34% Vs 29%**

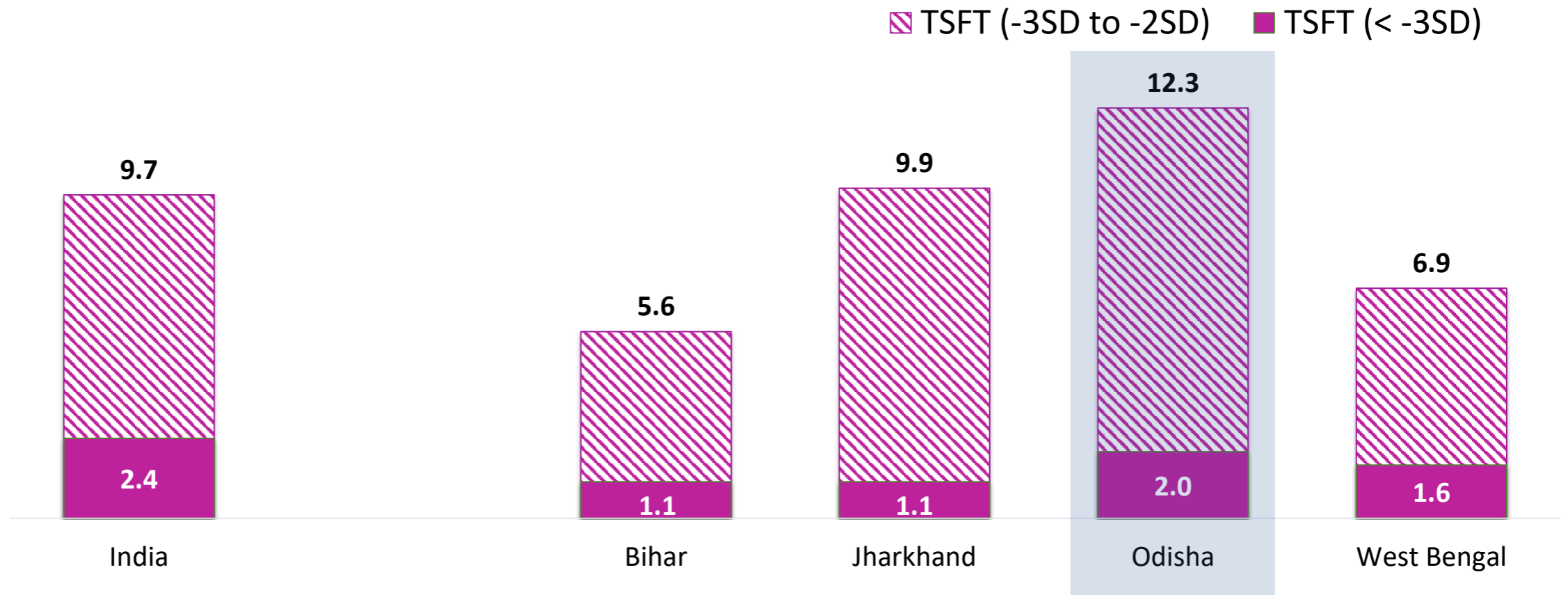
Among eastern states, prevalence of underweight declined only in Bihar



Triceps Skinfold Thickness (TSFT) for children under five



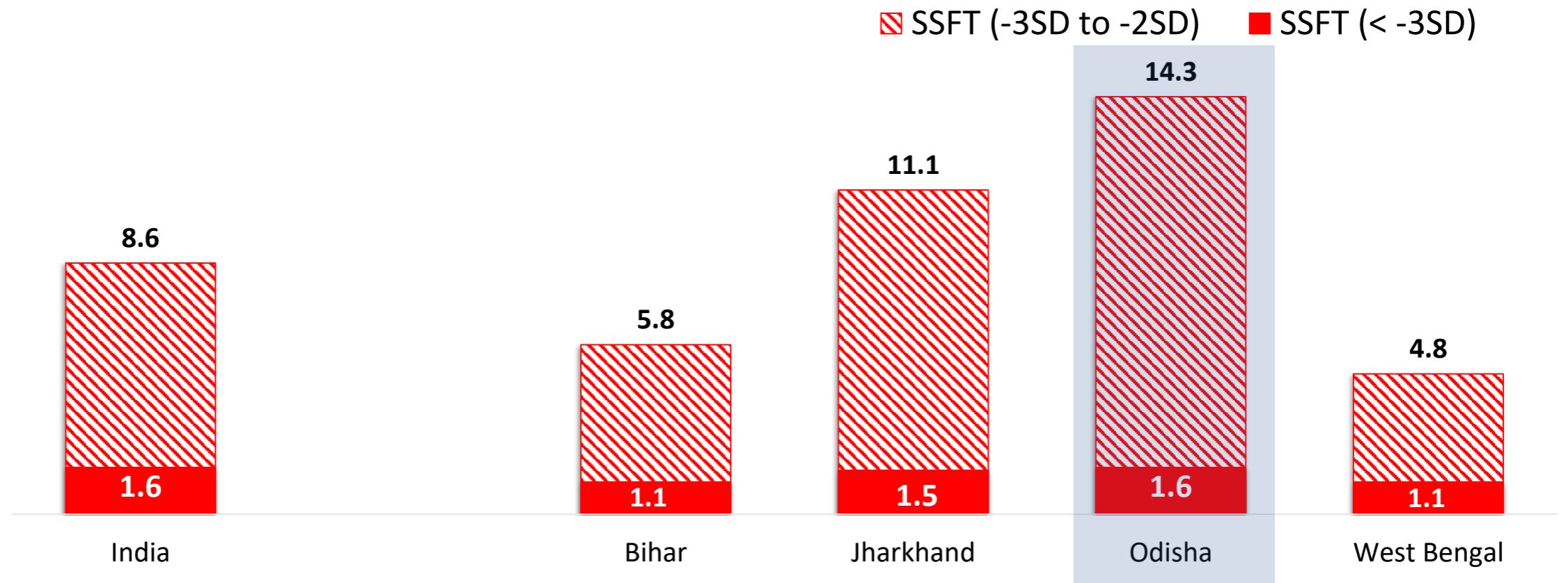
Low fat mass as reported by TSFT in Odisha (12%) was highest among eastern states and slightly higher than national average (10%)



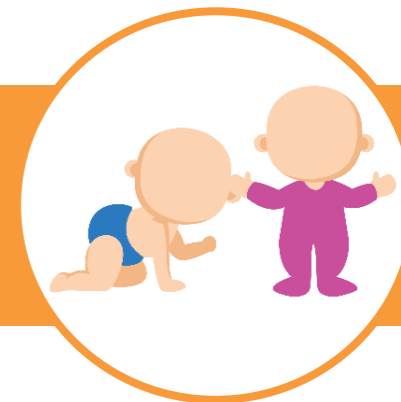
Subscapular Skinfold Thickness (SSFT) for children aged 1-4 years



Thinness as reported by SSFT in Odisha (14%) was highest among eastern states and was also higher than national average (9%)

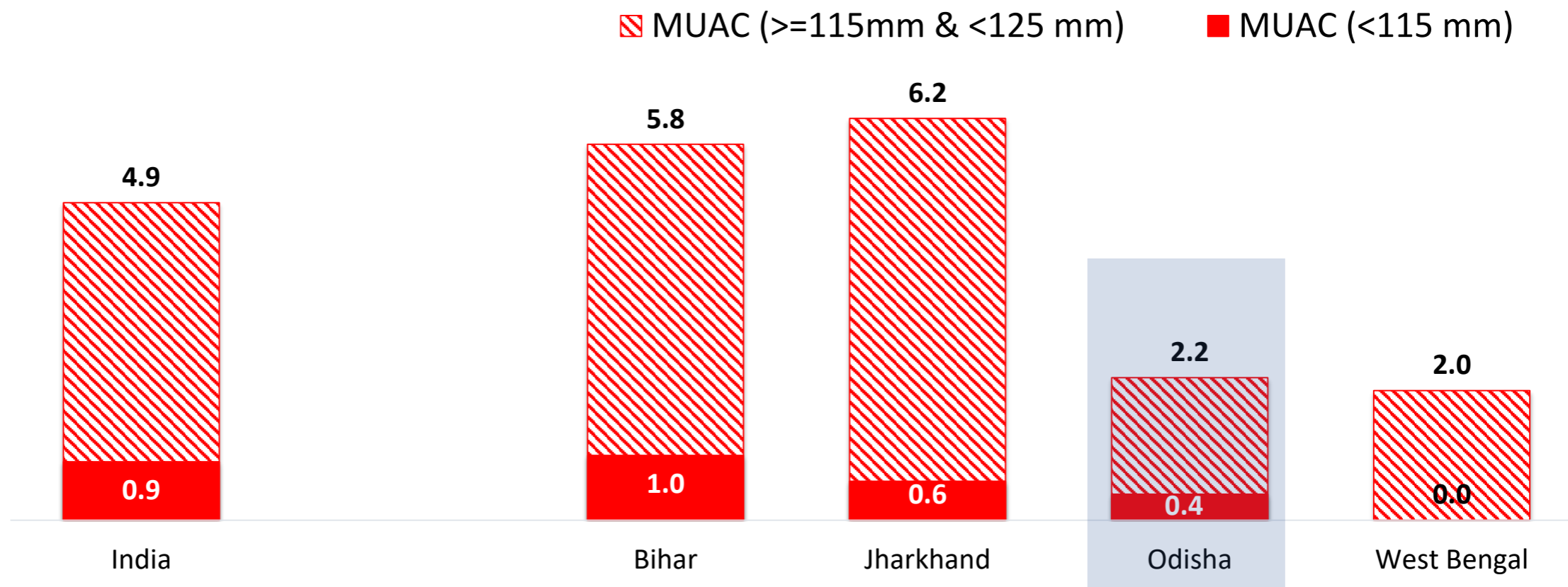


Mid Upper Arm Circumference (MUAC) for children aged 6–59 months



About **2%** children in Odisha had low MUAC

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

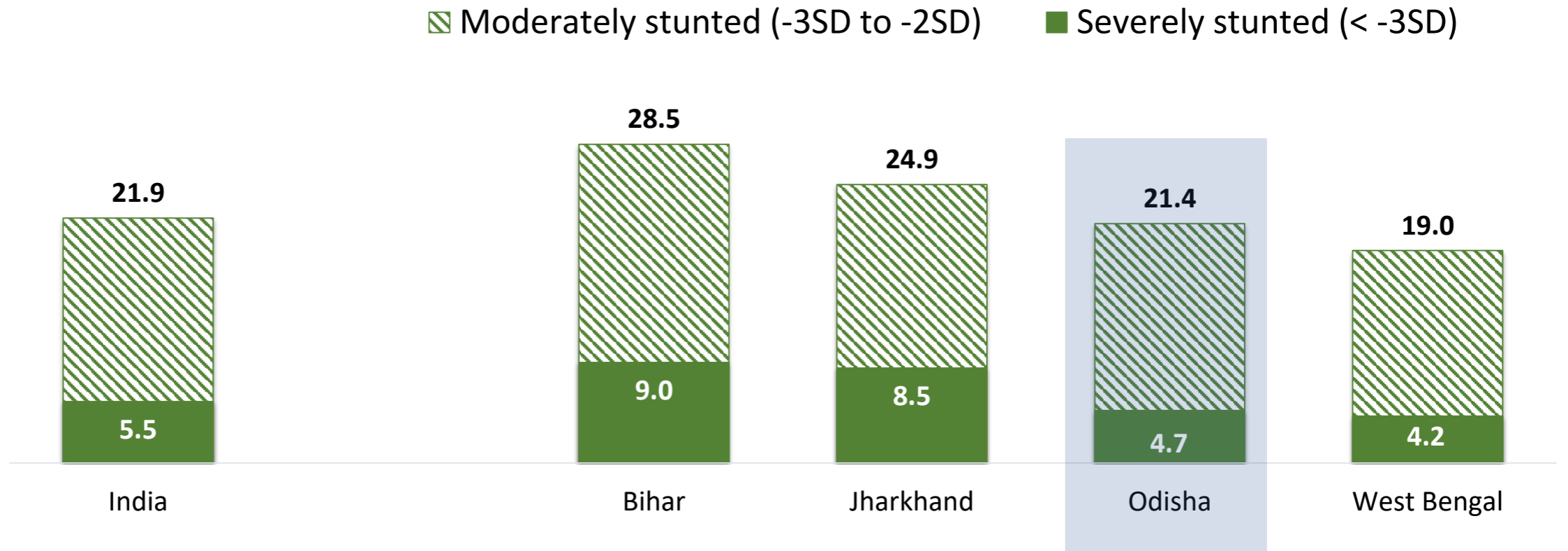


Stunting among school-age children (5-9 years)



1/5 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

Among the eastern states, Bihar had highest prevalence of stunting



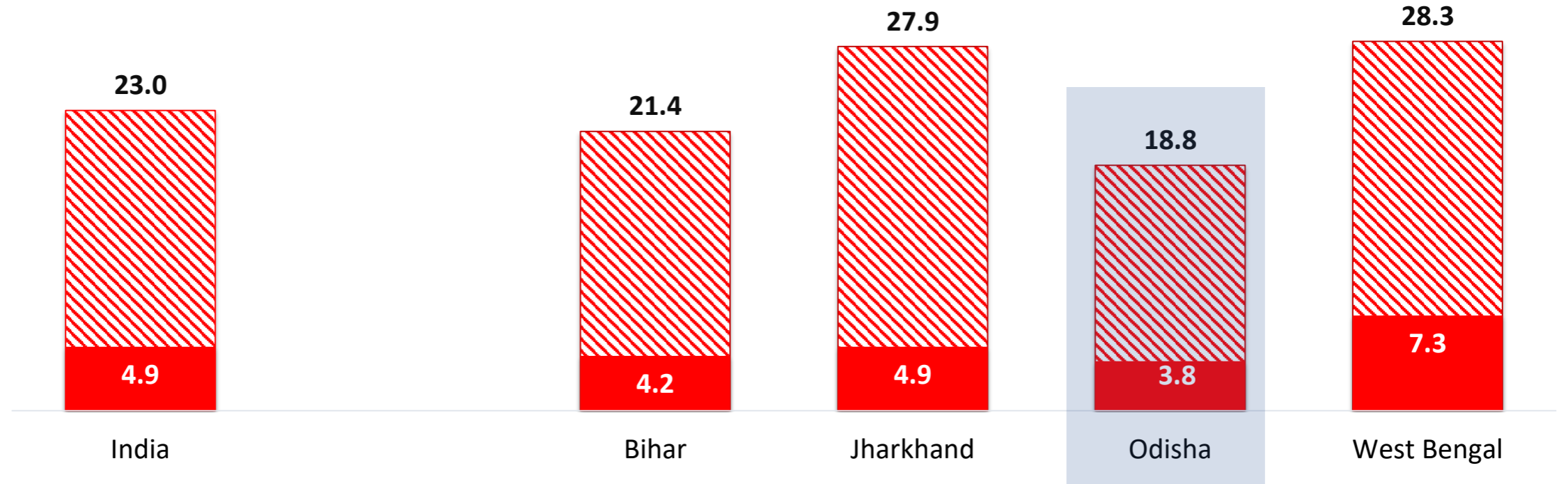
Thinness among school-age children (5-9 years)



Nearly **1/5** children aged 5-9 years was thin in Odisha

Prevalence of thinness in Jharkhand (**28%**) and West Bengal (**28%**) was higher than other eastern states and national average

▨ Moderate thinness (-3SD to -2SD) ■ Severe thinness (< -3SD)

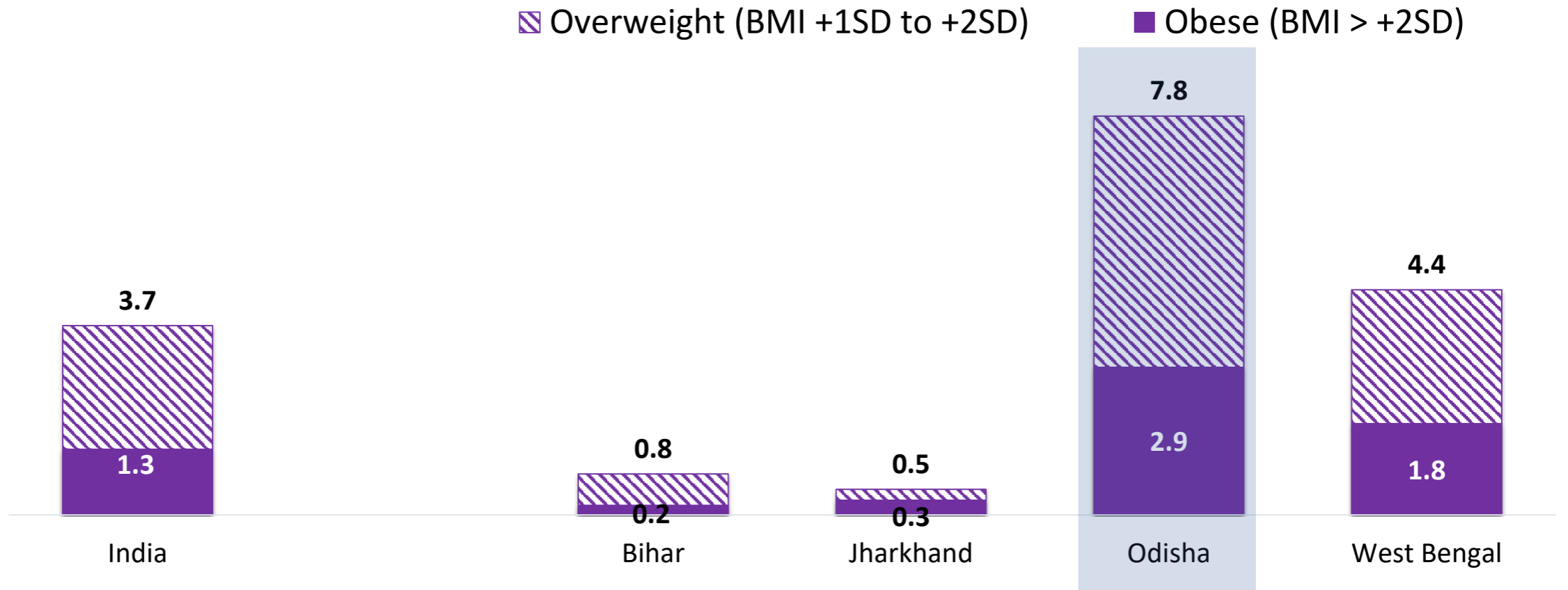


Overweight and obesity among school-age children (5-9 years)



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

Prevalence of overweight in Odisha (**8%**) was highest in the eastern region and double the national average (**4%**)



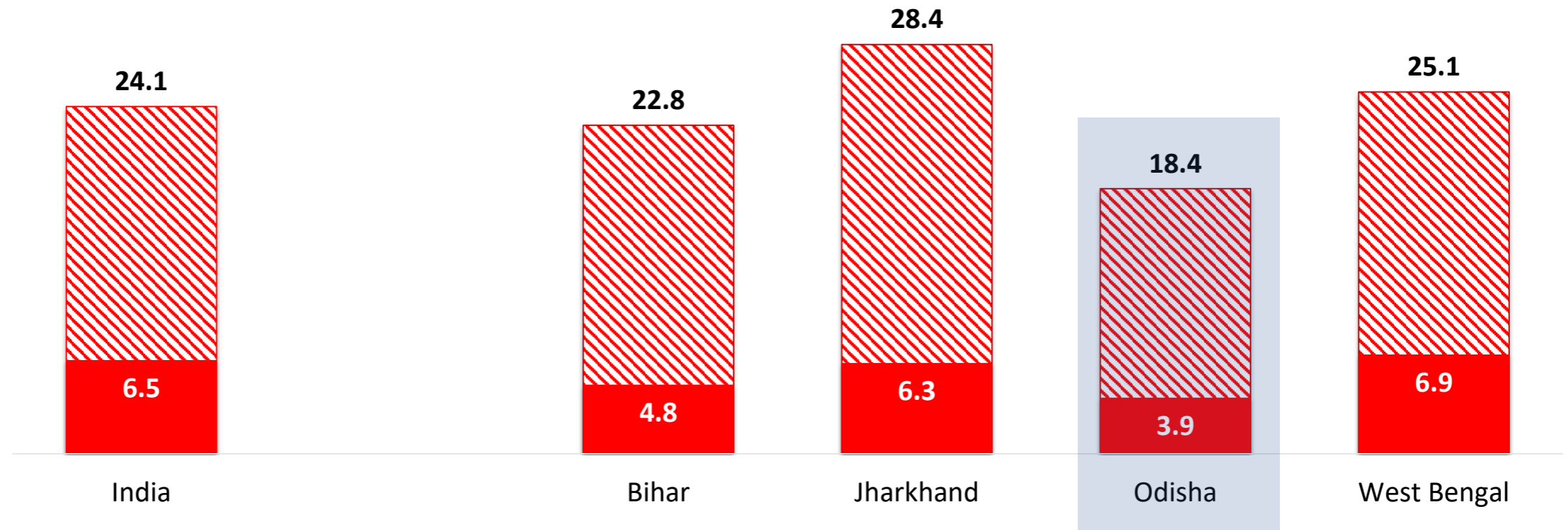
Thinness among adolescents aged 10-19 years substantially high



18% of adolescents aged 10-19 years were thin in Odisha

Odisha had the lowest prevalence of thinness among eastern states and also lower than national average

▨ Moderate thinness (-3SD to -2SD) ■ Severe thinness (< -3SD)



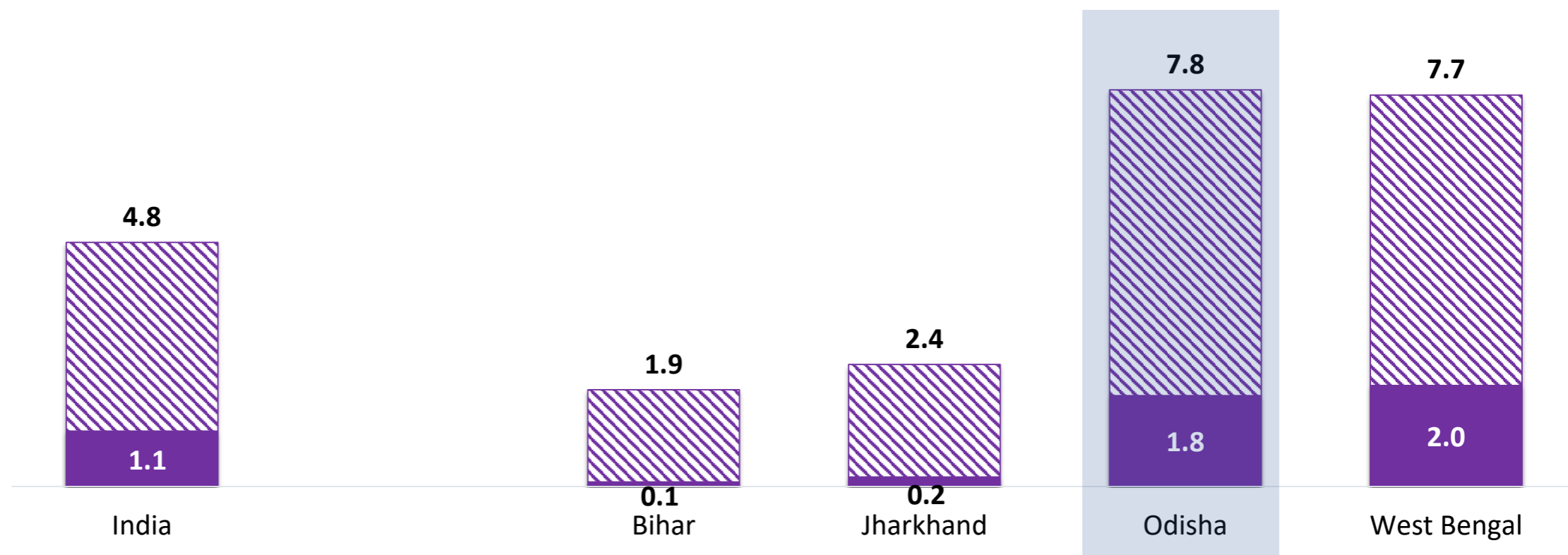
Prevalence of overweight among adolescents aged 10-19 years high



8% of adolescents were overweight in Odisha, significantly higher than the national average (5%)

Among the eastern states, Odisha and West Bengal had similar level of prevalence of overweight (8%) and much higher than Bihar and Jharkhand (2%)

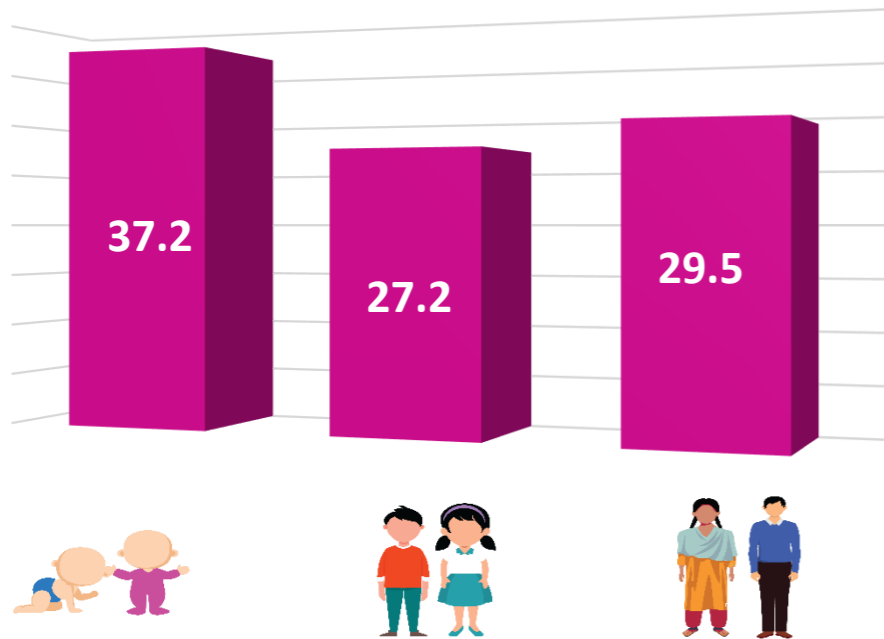
Overweight (BMI +1SD to +2SD) Obese (BMI > +2SD)



Odisha key findings: Anaemia and iron deficiency

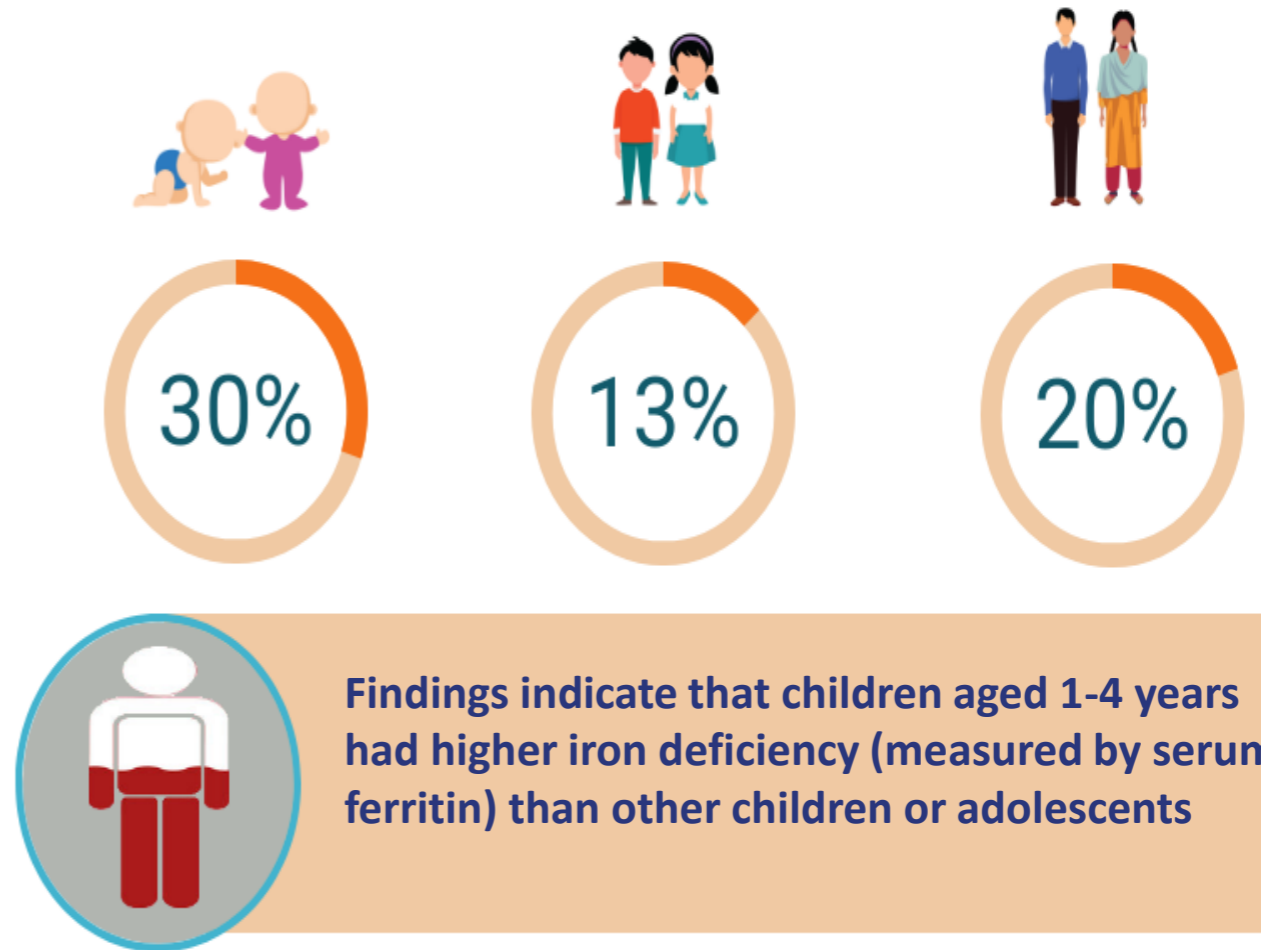


Anaemia



In Odisha, 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



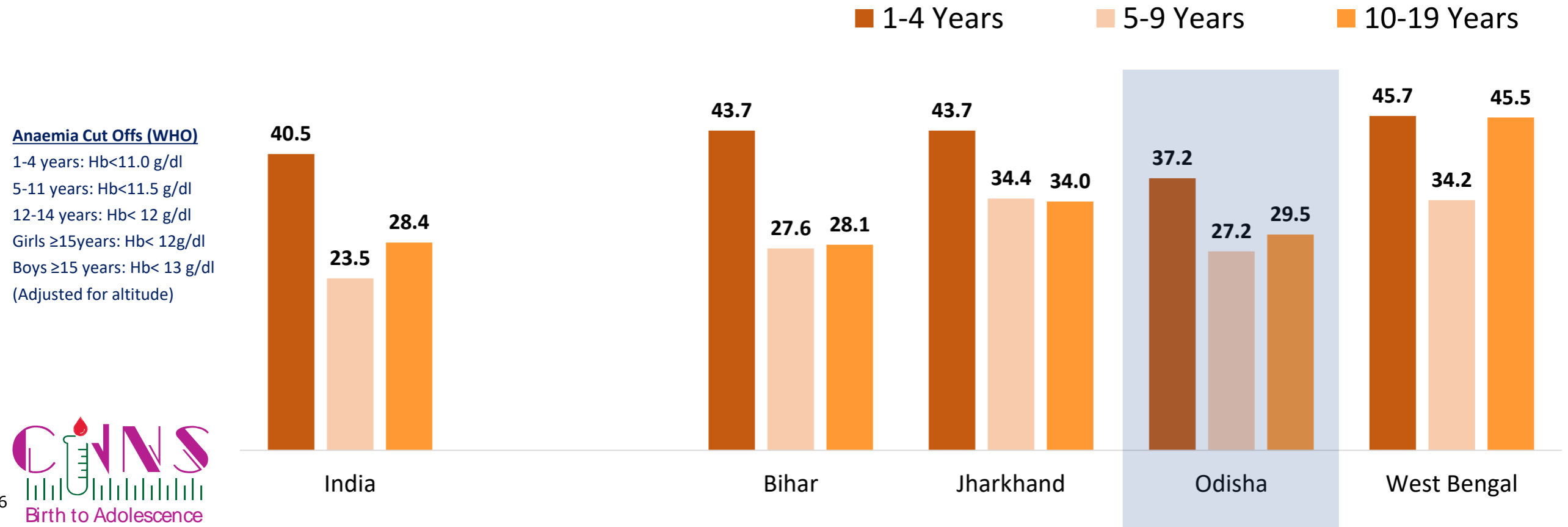
Findings indicate that children aged 1-4 years had higher iron deficiency (measured by serum ferritin) than other children or adolescents

Prevalence of Anaemia among children and adolescents



37% of children aged 1-4 years were anaemic in Odisha, slightly lower than national level (41%)

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

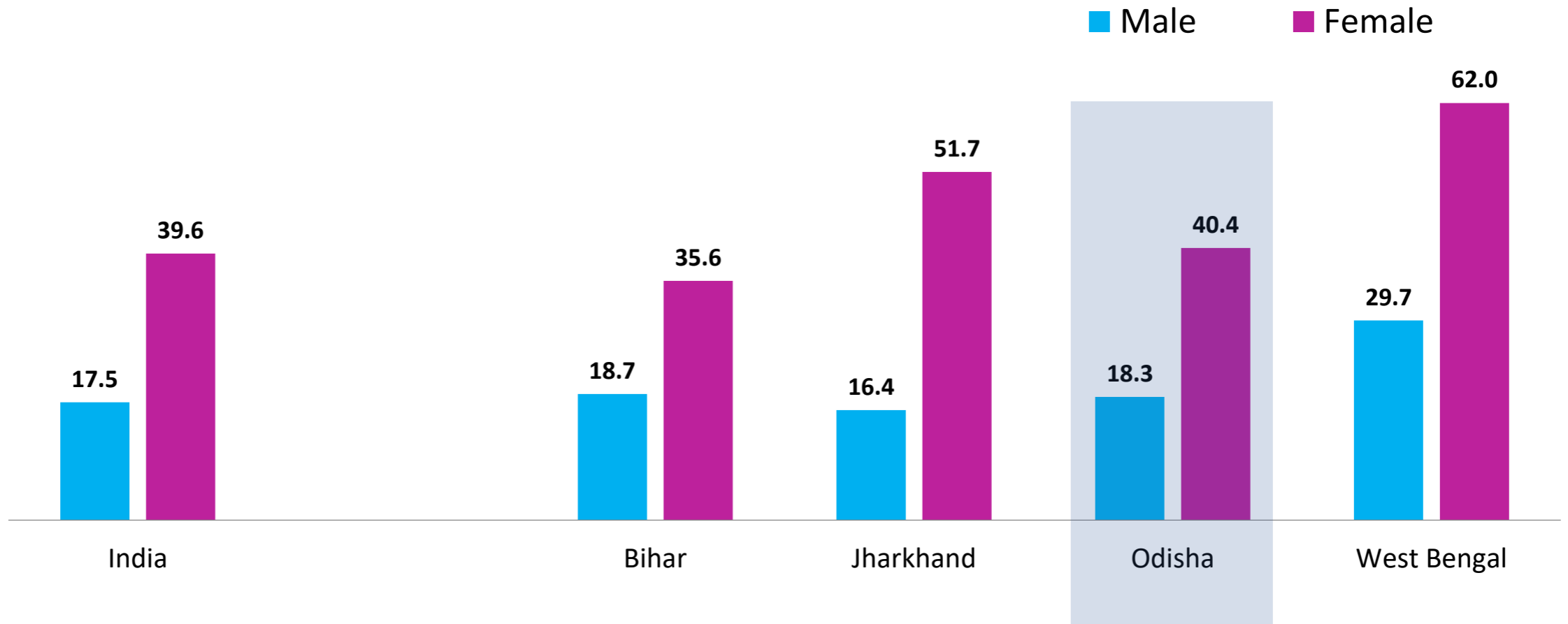


Prevalence of Anaemia among adolescents (10-19 years)



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

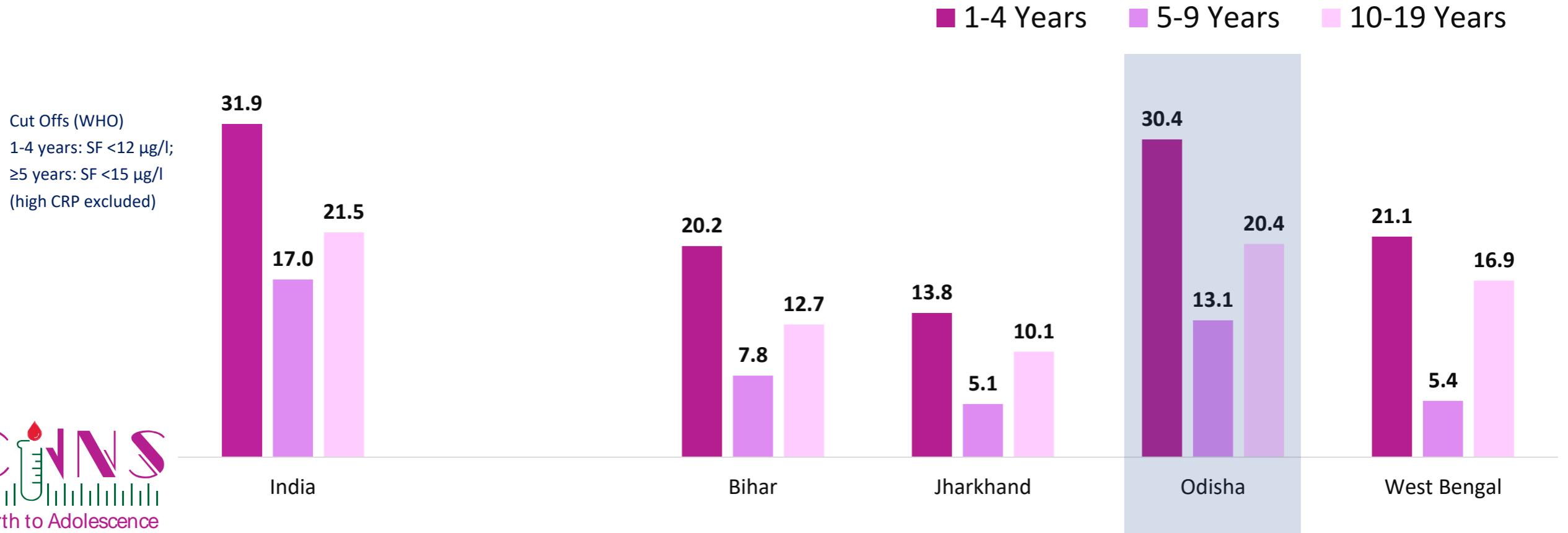
In Odisha, like in most of the other states, adolescent girls were double more likely than adolescent boys to be anaemic



Iron deficiency measured by serum ferritin among children and adolescents



Odisha had highest prevalence of iron deficiency compared to other eastern states among children and adolescents, but slightly lower than national level



Odisha key findings: Vitamin A and Vitamin D deficiency



Vitamin A deficiency was at similar level among children as well as adolescents in Odisha – almost at the same level of India as a whole



Vitamin D deficiency ranged from 7% to 18% 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

Vitamin A deficiency among children and adolescents



Vitamin A deficiency in Odisha was at similar level among children and adolescents

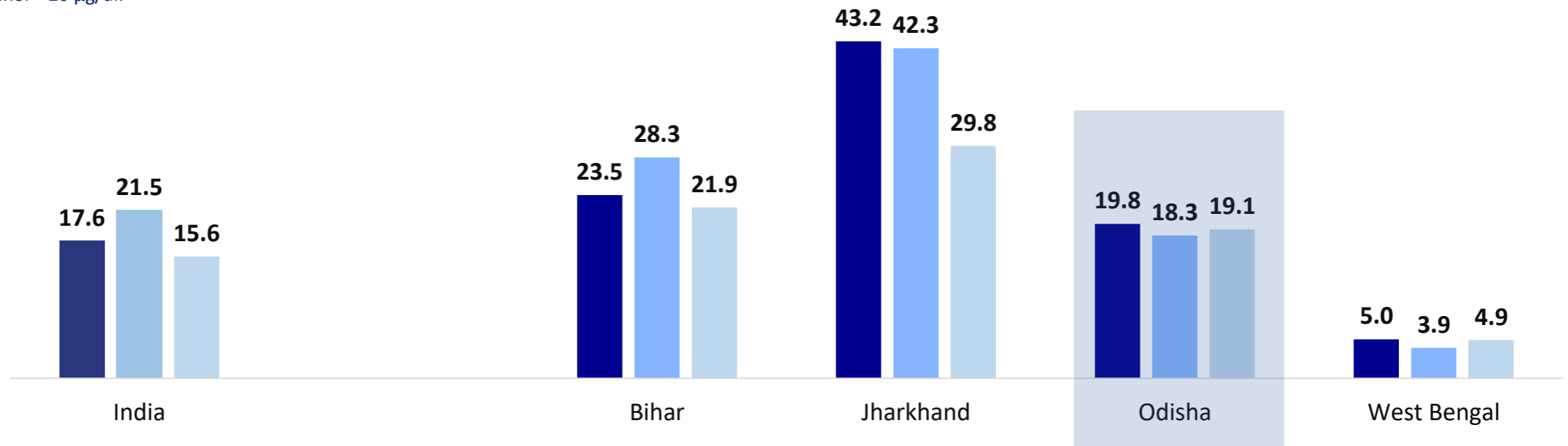
Among eastern states, Jharkhand had highest prevalence of Vitamin A deficiency

Cut Offs (WHO)

1-19 Years: Serum retinol < 20 µg/dl.

(High CRP excluded)

■ 1-4 Years ■ 5-9 Years ■ 10-19 Years



Vitamin D deficiency increases with age

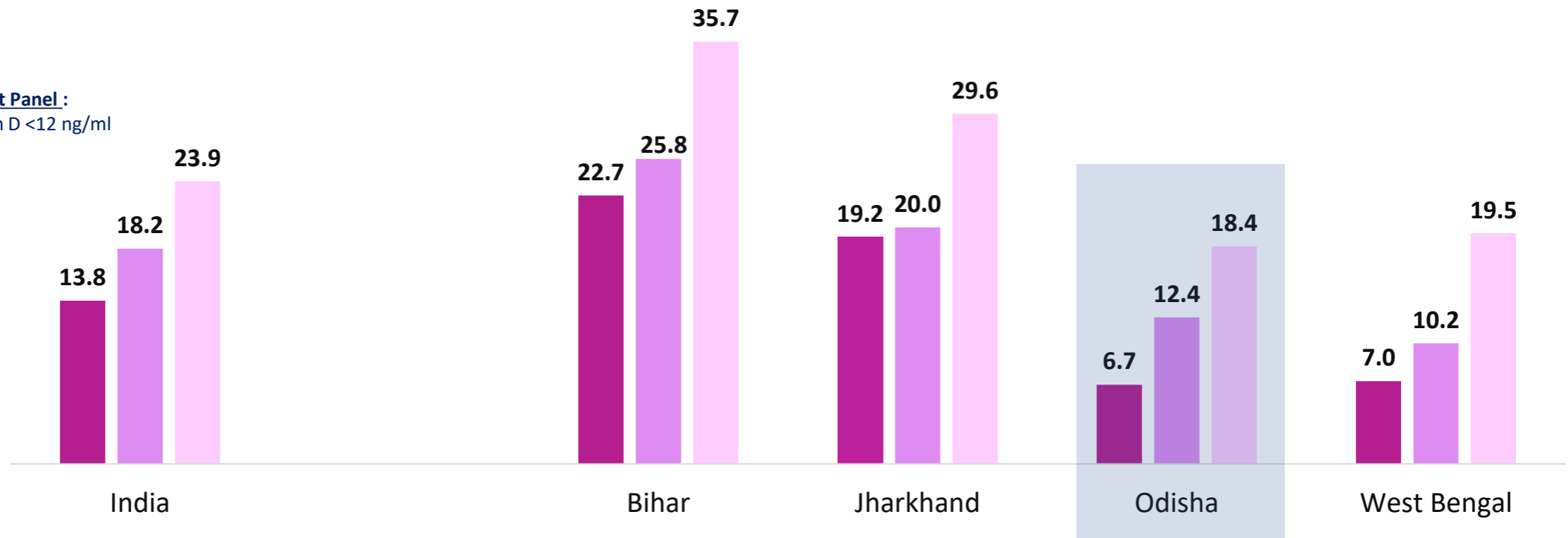


7-18% of children and adolescents had Vitamin D deficiency in Odisha, significantly lower than the national average (14-24%); Vitamin D deficiency increased with age.

In eastern states, Bihar and Jharkhand had high Vitamin D deficiency among children and adolescents

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

■ 1-4 Years ■ 5-9 Years ■ 10-19 Years



Odisha key findings: Non-communicable diseases



Around 10% of school-aged children and over 10% of adolescents were found with high level of glycosylated haemoglobin (HbA1c).

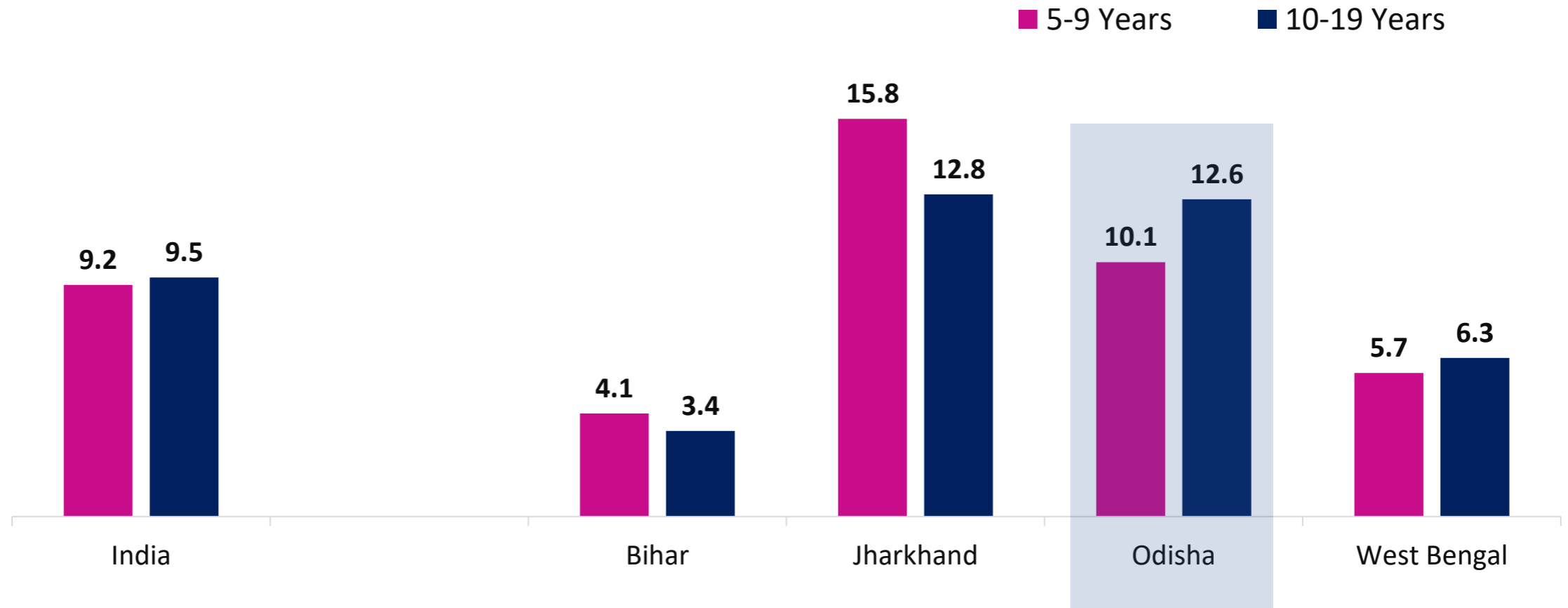
Other indicators of risks of NCDs, such as level of cholesterol, triglycerides, LDL and HDL point to increased risks of NCDs among adolescents.

Risk of diabetes among school-age children and adolescents



Based on Glycosylated hemoglobin (HbA1c), around **10%** of children and **13%** of adolescents had increased risk of diabetes in Odisha, which was slightly higher than the country (**9-10%**)

Among all eastern states, risk of diabetes was the highest in Jharkhand



High total cholesterol and high triglycerides among adolescents



Elevated risk of NCDs in Odisha among adolescents – **4%** had high level of total cholesterol and **9%** with high level of triglycerides

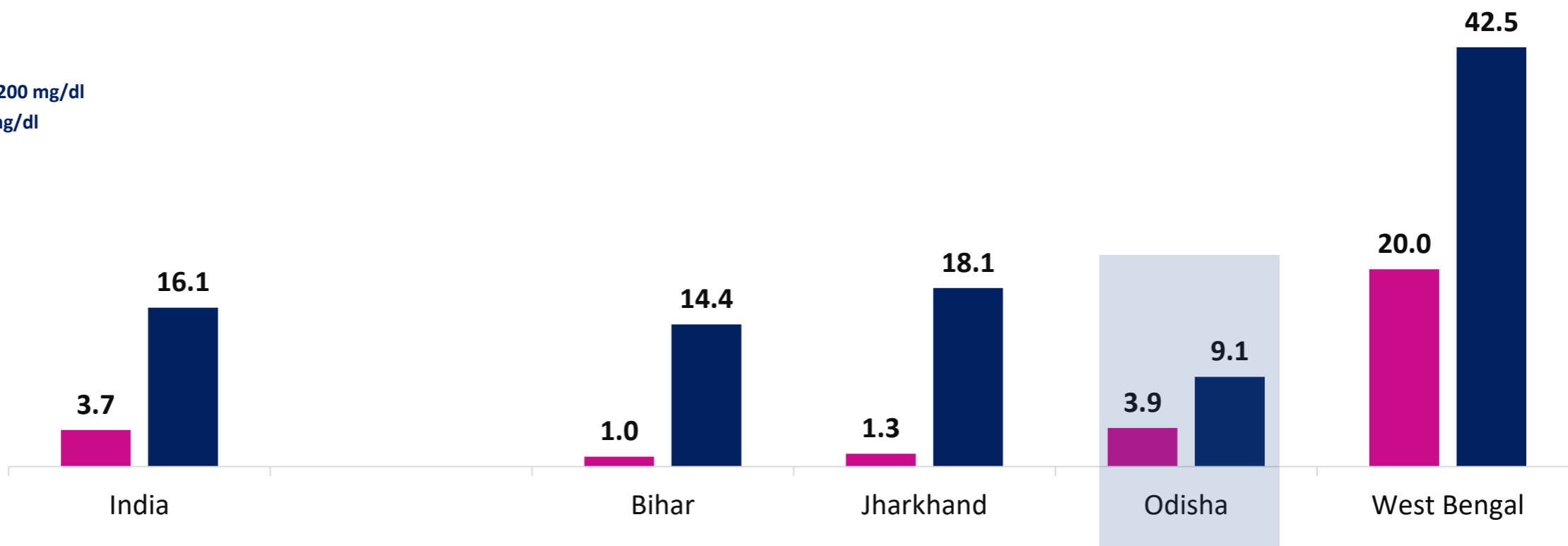
In eastern region, West Bengal had highest prevalence of total cholesterol and high triglycerides

Cut Offs:

Total cholesterol ≥ 200 mg/dl

Triglycerides > 130 mg/dl

■ High total cholesterol ■ High triglycerides



High LDL and low HDL among adolescents



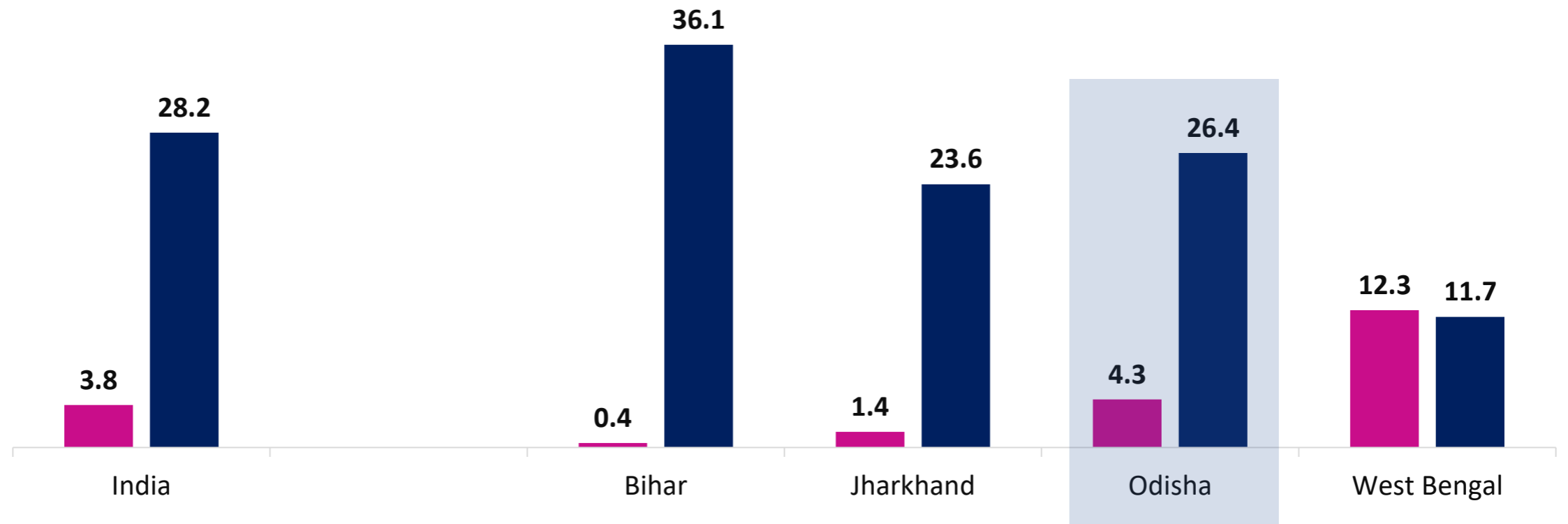
Risk of NCDs among adolescents in Odisha was high – 4% had high level of LDL and 26% had low level of HDL, close to national average

Cut Offs:

LDL \geq 130 mg/dl

HDL < 40 mg/dl

■ High LDL ■ Low HDL



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 less prevalent than expected. Policy review is warranted. Interventions such as dietary diversification and fortification can be taken to scale to address the remaining 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.

The survey was conducted with generous financial support from

Aditya and Megha Mittal

and technical support from

unicef  for every child



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



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