सत्यमेव जयते

Ministry of Health and Family Welfare
Government of India

Comprehensive National Nutrition Survey

2016 – 2018

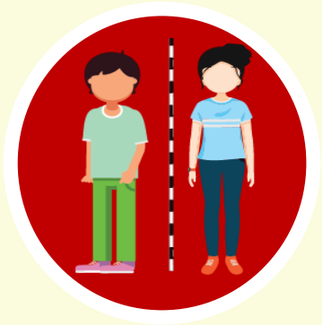
Madhya Pradesh
State Presentation

Birth to Adolescence

Largest Micronutrient Survey ever conducted:

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
Lab technicians

200
Trainers and coordinators

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*

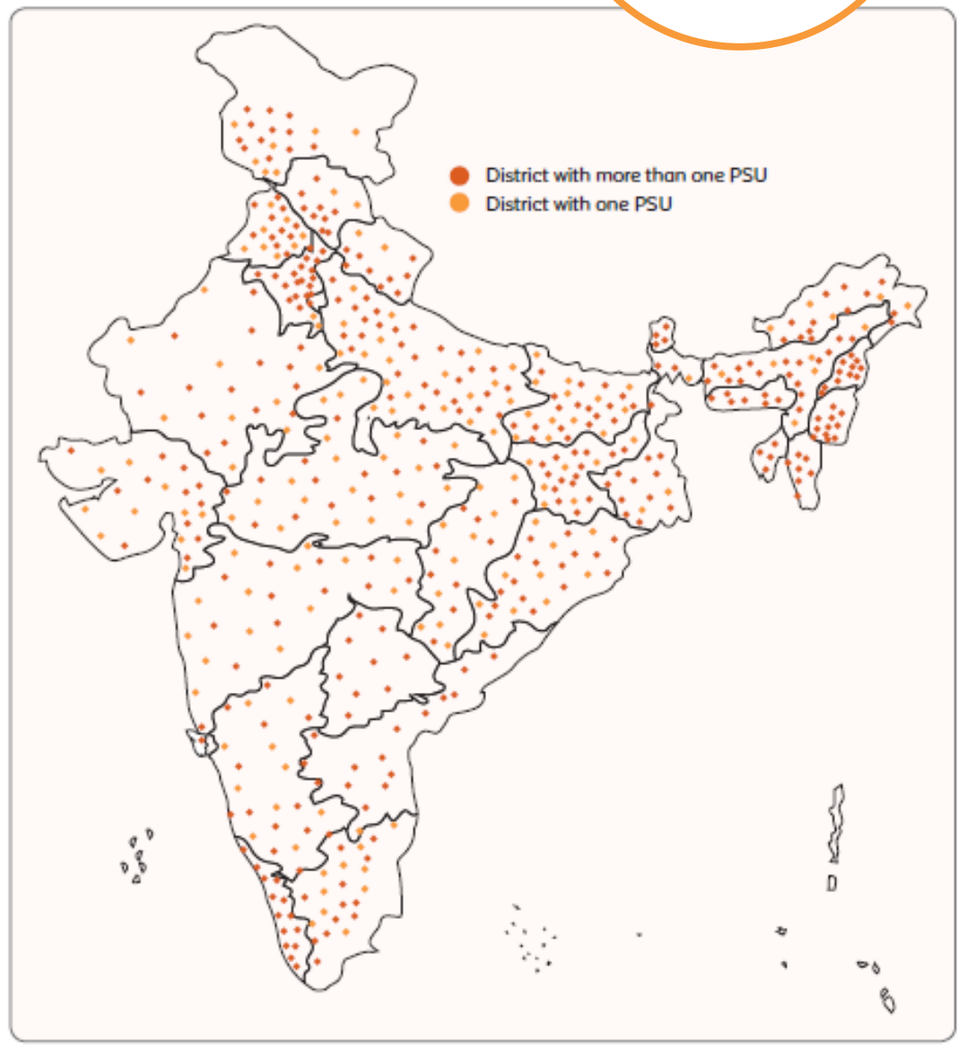
*Soumya Swaminathan, et al. (2019), The burden of child and maternal malnutrition and trends in its indicators in the states of India: the Global Burden of Disease Study 1990–2017. https://doi.org/10.1016/S2352-4642(19)30273-1

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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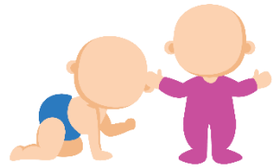
Anthropometry data

	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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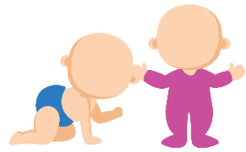
Biochemical indicators - micronutrient deficiencies and NCDs

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

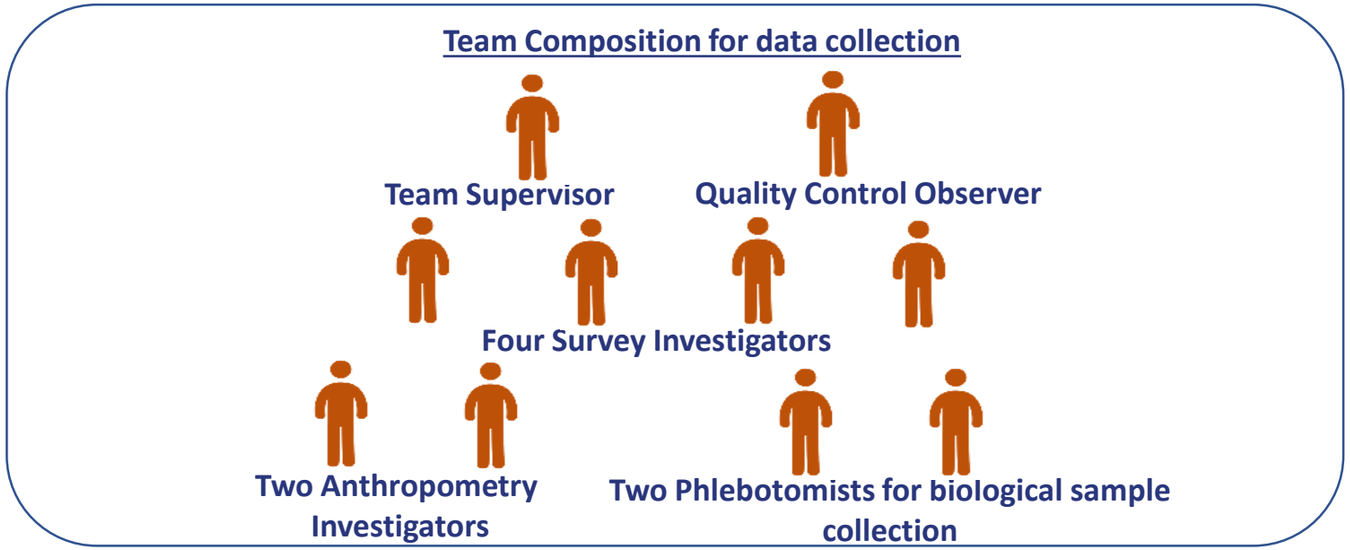
- Field work/protocol/training monitoring: by quality control team
- Biological sample quality control : by AIIMS, NIN and US CDC

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



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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

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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 Madhya Pradesh

CNNS covered 60 PSUs for data collection in Madhya Pradesh

Achieved following sample size by age groups:

	0-4 years	5-9 years	10-19 years	Total
Household and anthropometry data	1,152	1,199	1,137	**3,488**
Biological sample	455	622	592	**1,669**

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Period of data collection in Madhya Pradesh

CNNS data collection period: October 5, 2016 to February 5, 2017

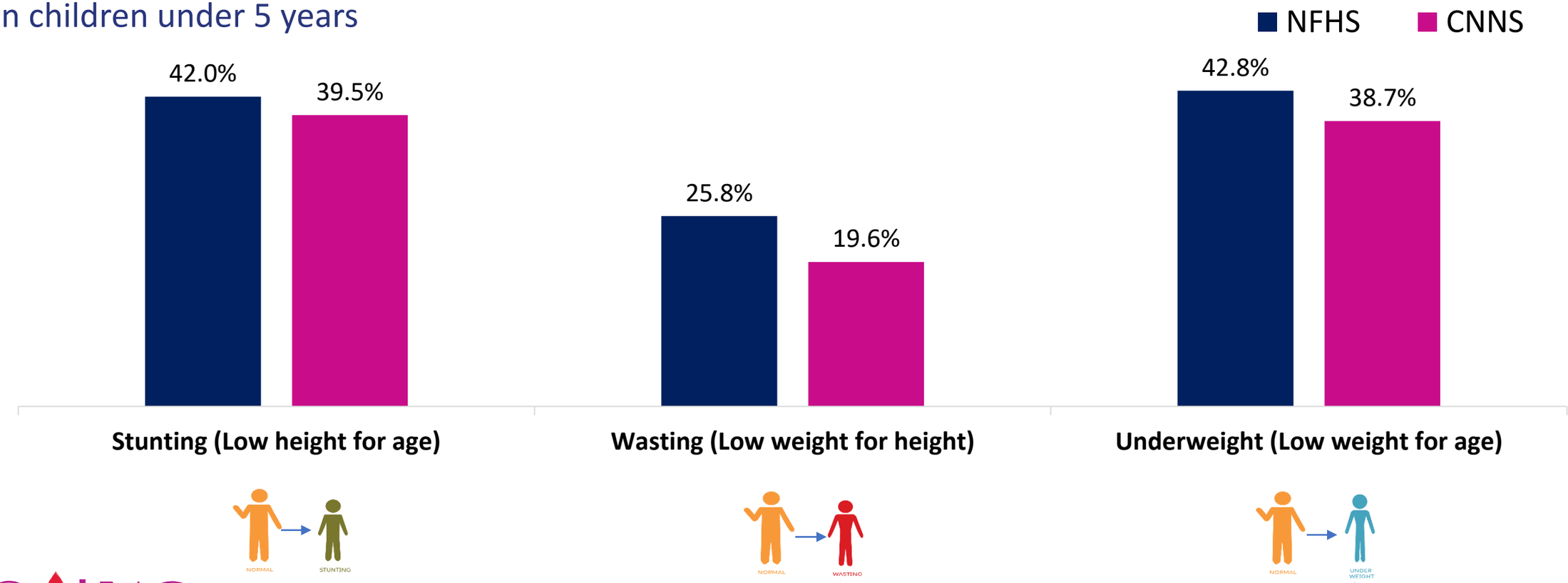
- CNNS collected data during the autumn season of 2016 through winter of 2017
- NFHS collected data during the winter season through early monsoon season of 2015

Survey	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CNNS 2016-17	February, 2017									October, 2016		
NFHS 4 2015	January to July, 2015											

CNNS
Birth to Adolescence

Madhya Pradesh key findings: Anthropometry (1/2)

Significant decline in wasting but not in stunting and underweight in children under 5 years



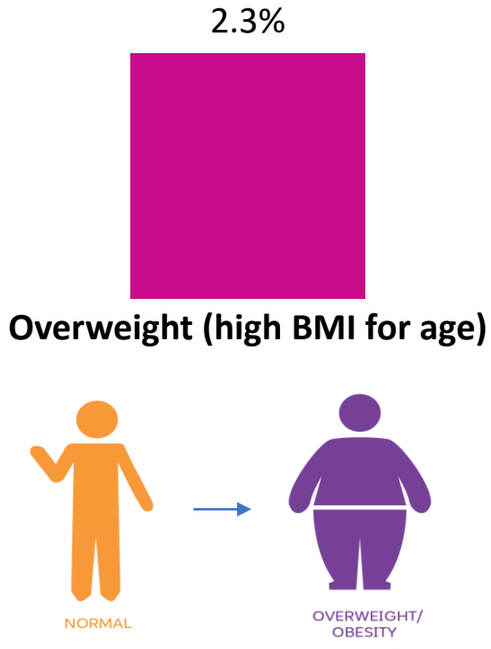
Birth to Adolescence

Madhya Pradesh key findings: Anthropometry (2/2)

1/3 adolescents aged 10-19 years was 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.

2% of adolescents aged 10-19 years were overweight or obese.

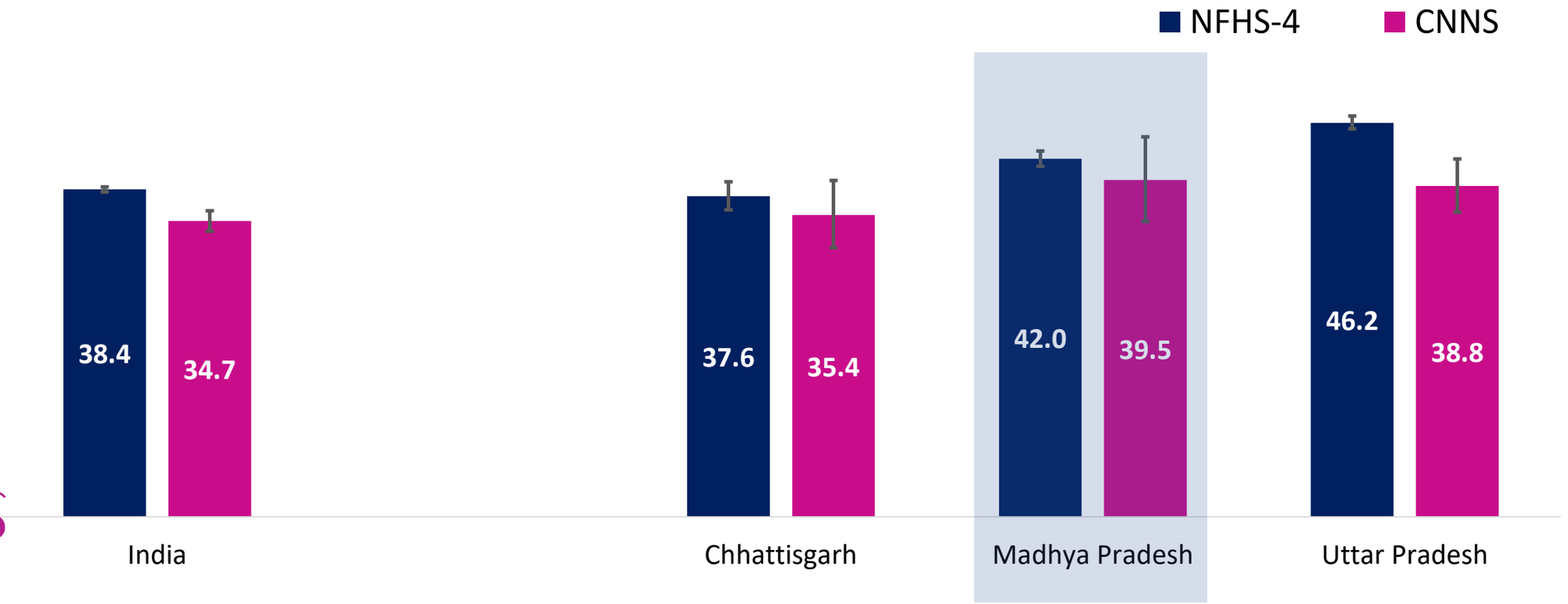


Birth to Adolescence

Stunting unchanged among children under five

No discernable change in stunting was observed in CNNS compared to NFHS-4 – **40%** vs **42%** in Madhya Pradesh

Among all central region states significant decline in stunting was only observed in Uttar Pradesh

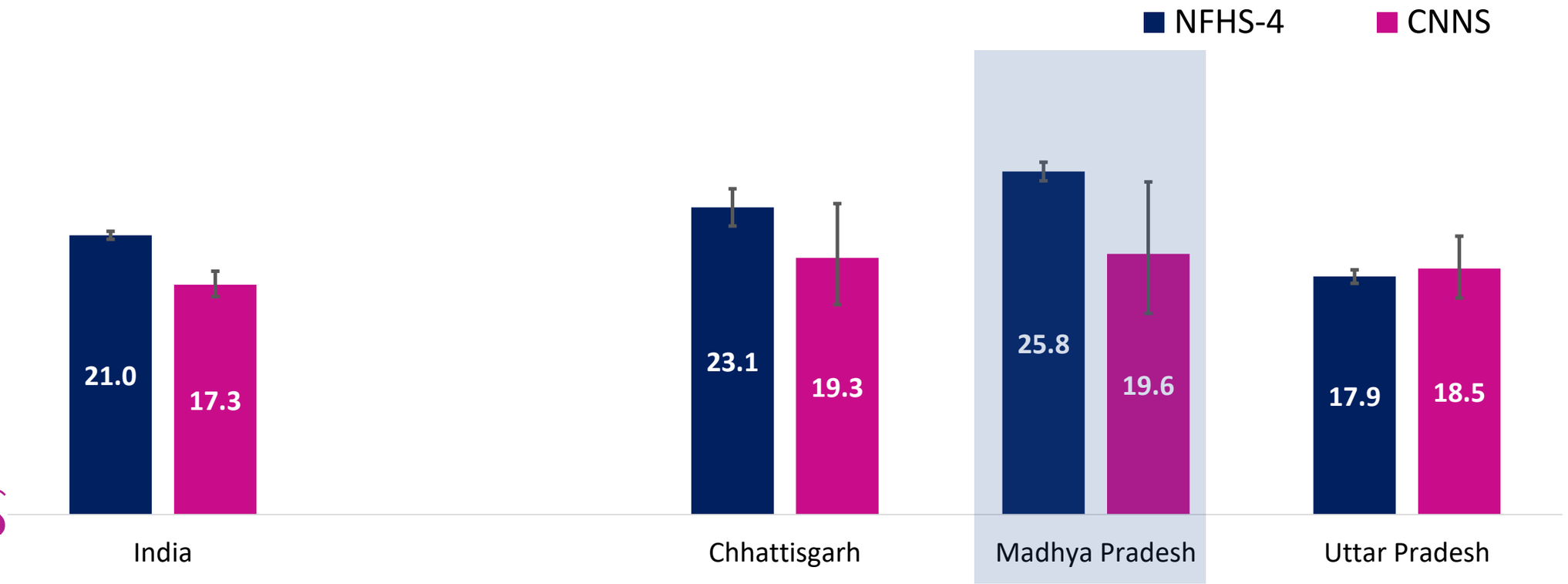


Birth to Adolescence

Wasting declined among children under five

Significant decline in wasting was observed in Madhya Pradesh between NFHS-4 and CNNS – **26%** vs **20%**

In the central region states, wasting did not change significantly in any other state

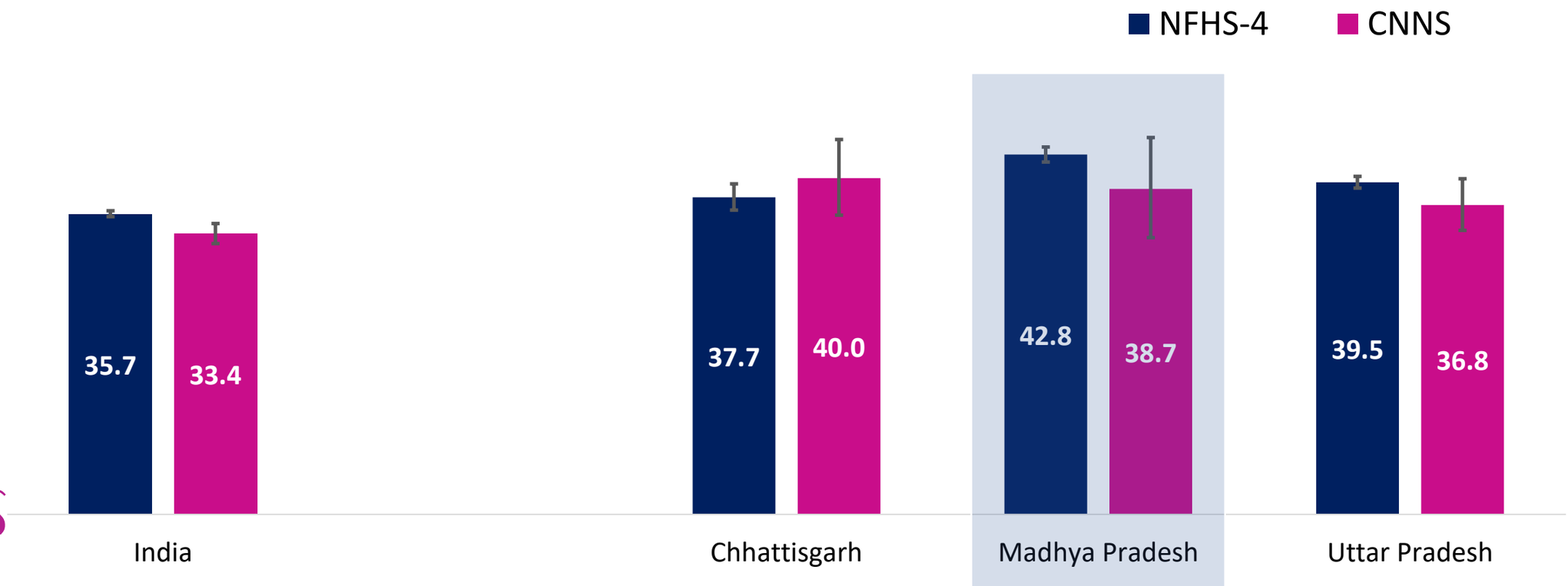


CNNS
Birth to Adolescence

Underweight nearly unchanged among children under five

Prevalence of underweight, a composite measure of chronic and acute malnutrition, remained nearly unchanged in CNNS compared to NFHS-4 - **39%** vs **43%**

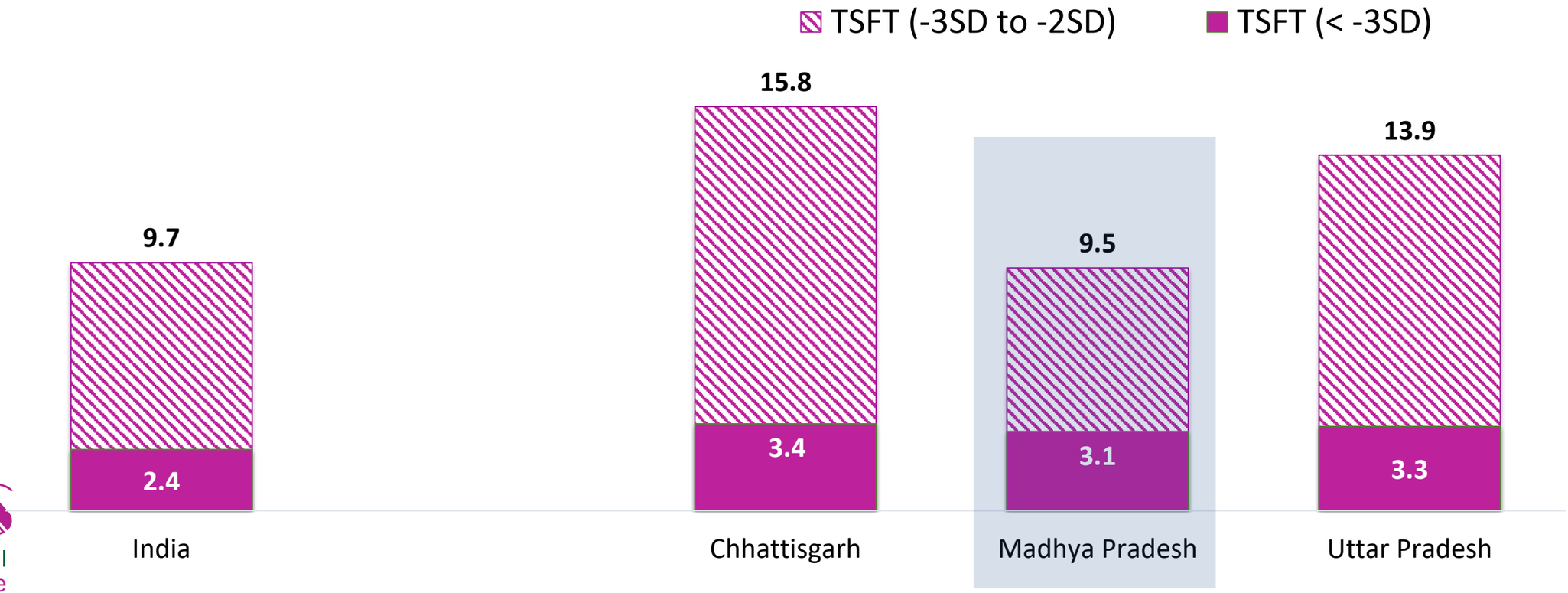
Prevalence of underweight did not decline significantly in other central region states



Birth to Adolescence

Triceps Skinfold Thickness (TSFT) for children under five

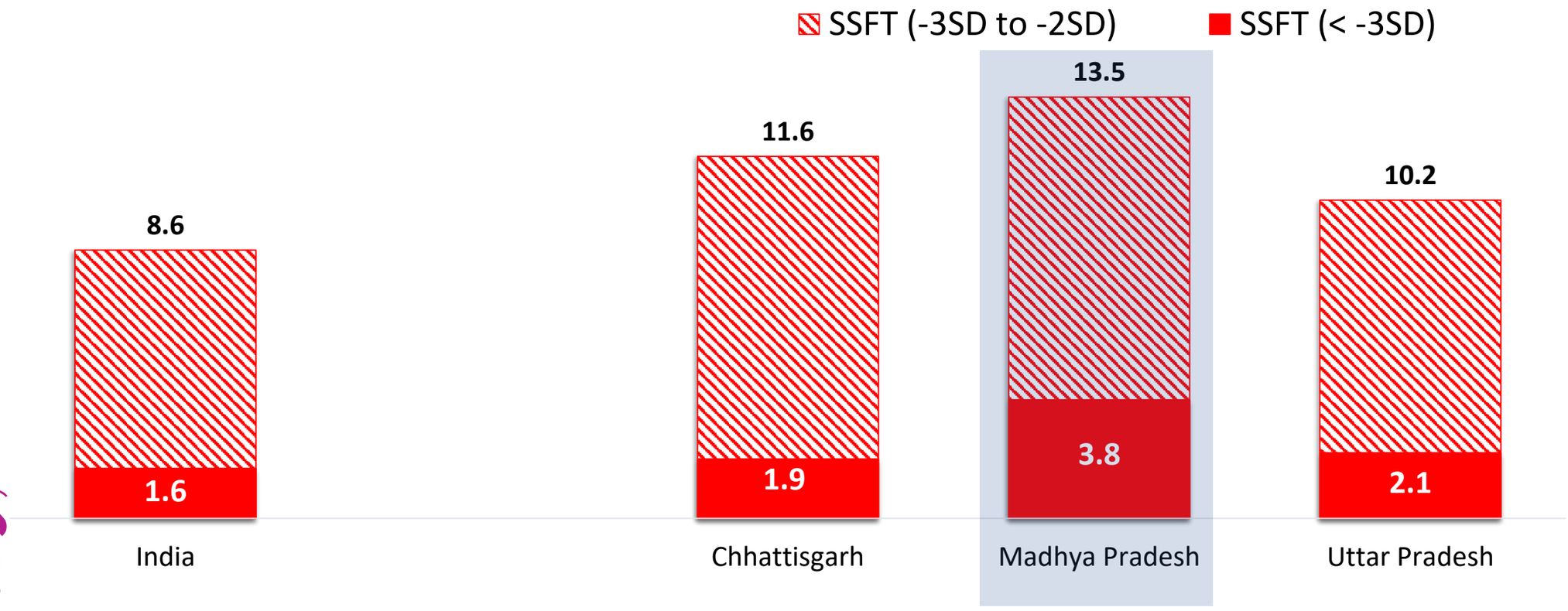
Low fat mass as reported by TSFT in Madhya Pradesh was significantly lower than other central states and at about national average



Birth to Adolescence

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

Thinness as reported by SSFT in Madhya Pradesh (14%) was higher than national level and other central states

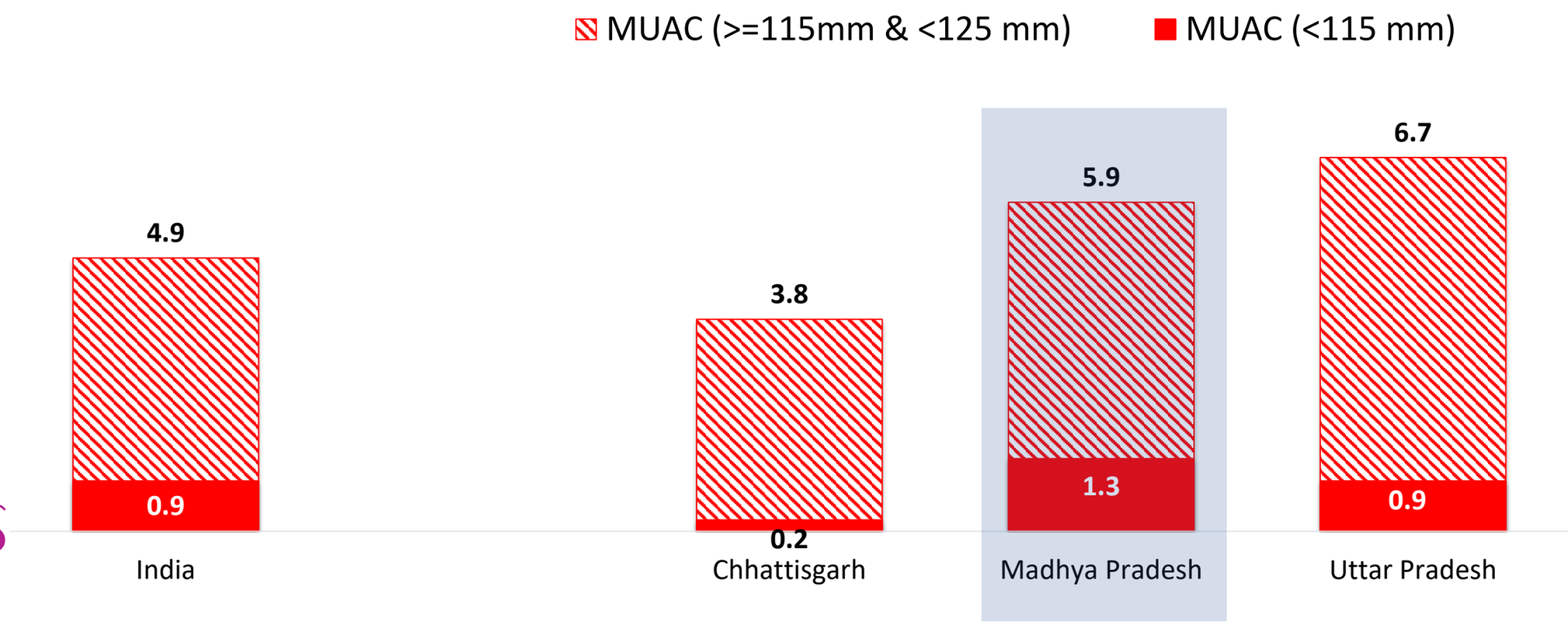


Birth to Adolescence

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

About **6%** children in Madhya Pradesh had low MUAC

Prevalence of low MUAC ranged between **4%** and **7%** across the central states

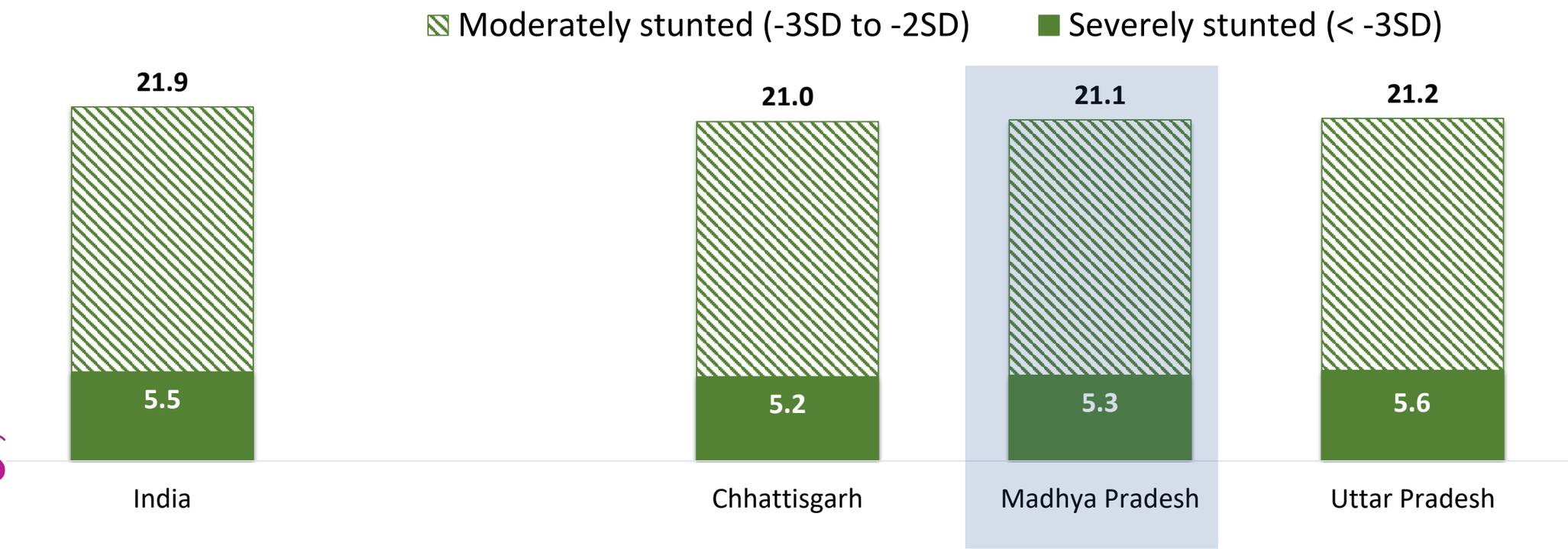


Birth to Adolescence

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

Similar levels of prevalence of stunting were observed across the central states, and nationally

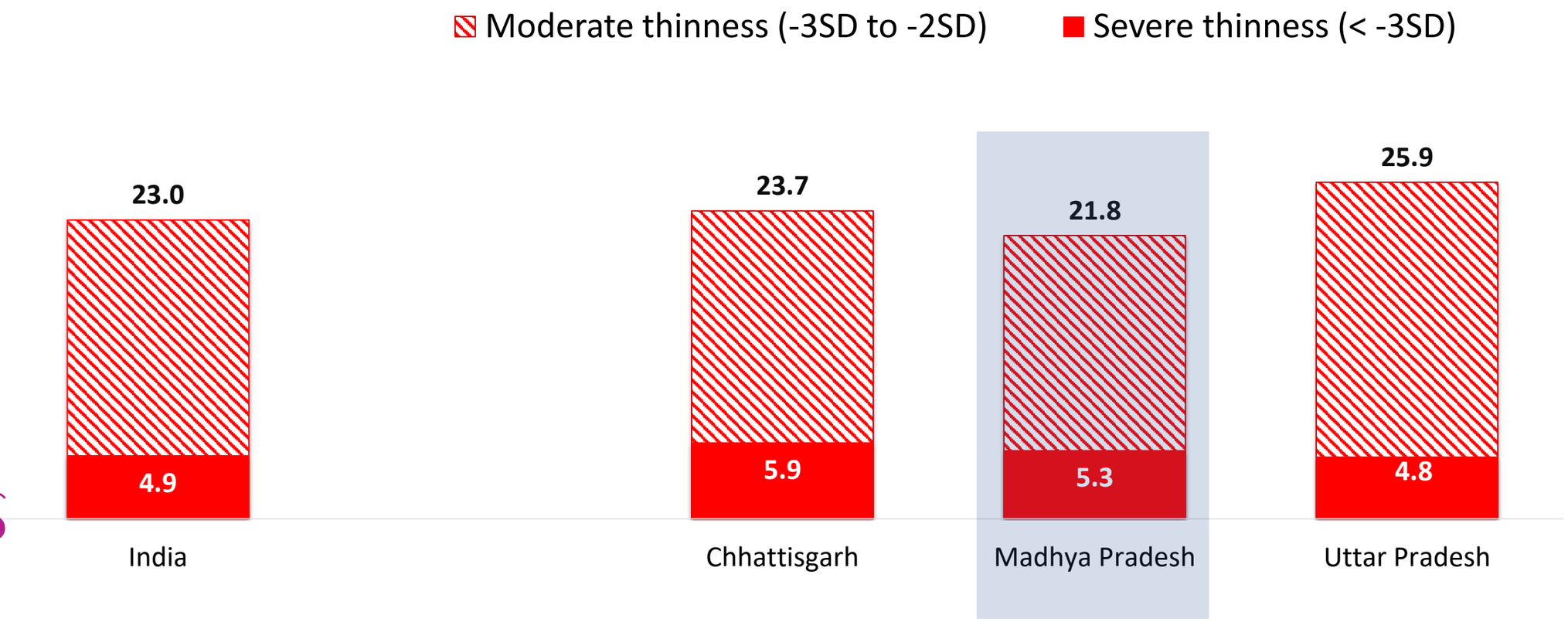


Birth to Adolescence

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

1/5 children aged 5-9 years was thin

Prevalence of thinness in Madhya Pradesh was at national average and the lowest among the central region states

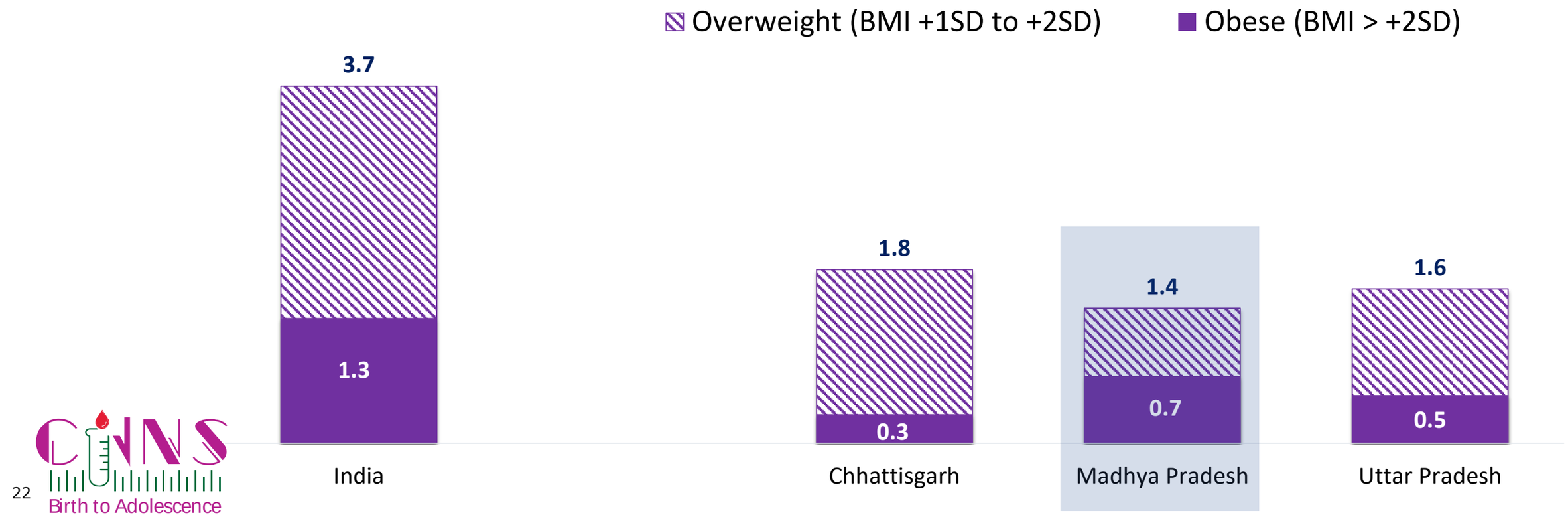


Birth to Adolescence

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

Overweight and obesity were significantly low among children aged 5-9 years, below half the national average

All the central states were at the same level

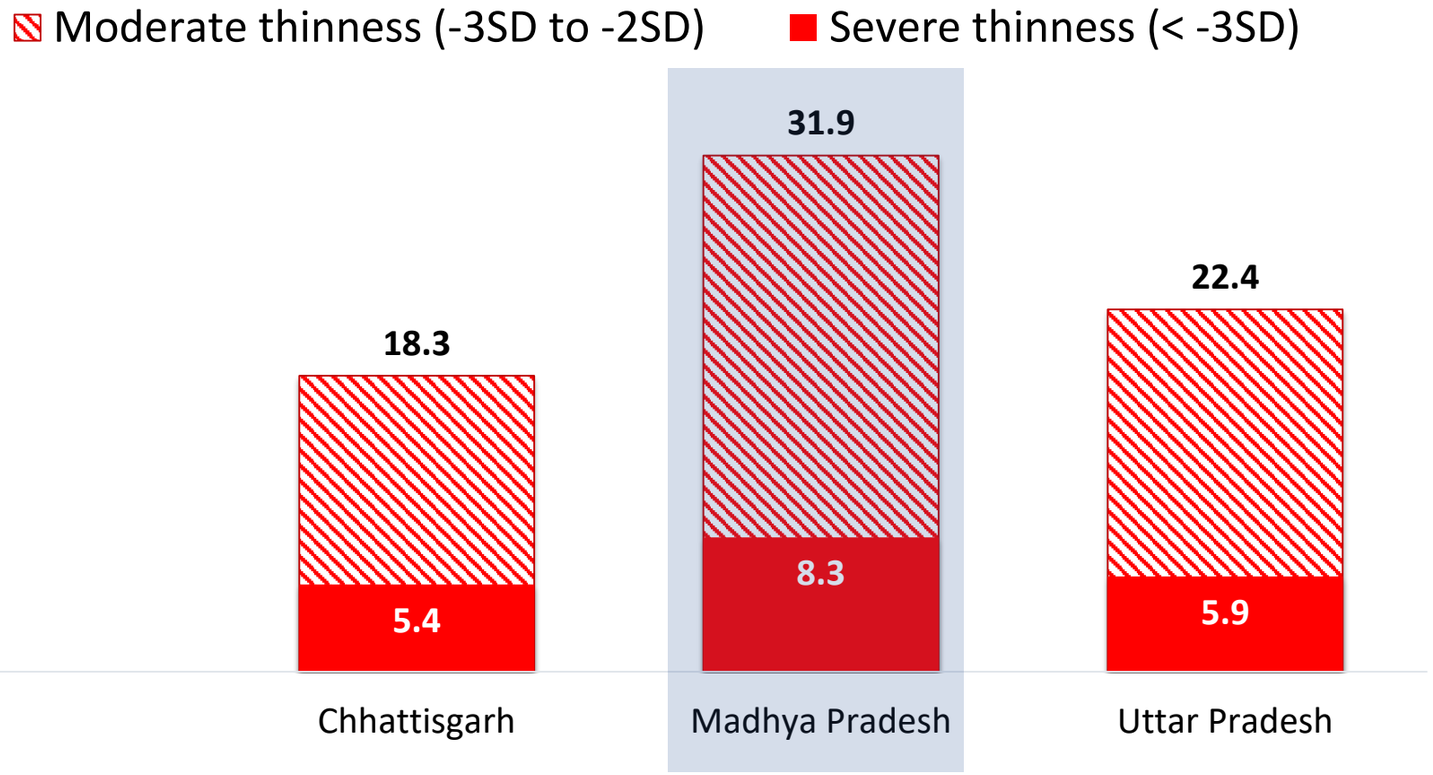


Birth to Adolescence

Thinness among adolescents aged 10-19 years substantially high

32% of adolescents were thin in Madhya Pradesh

Prevalence of thinness in Madhya Pradesh was significantly higher than national average and other central states

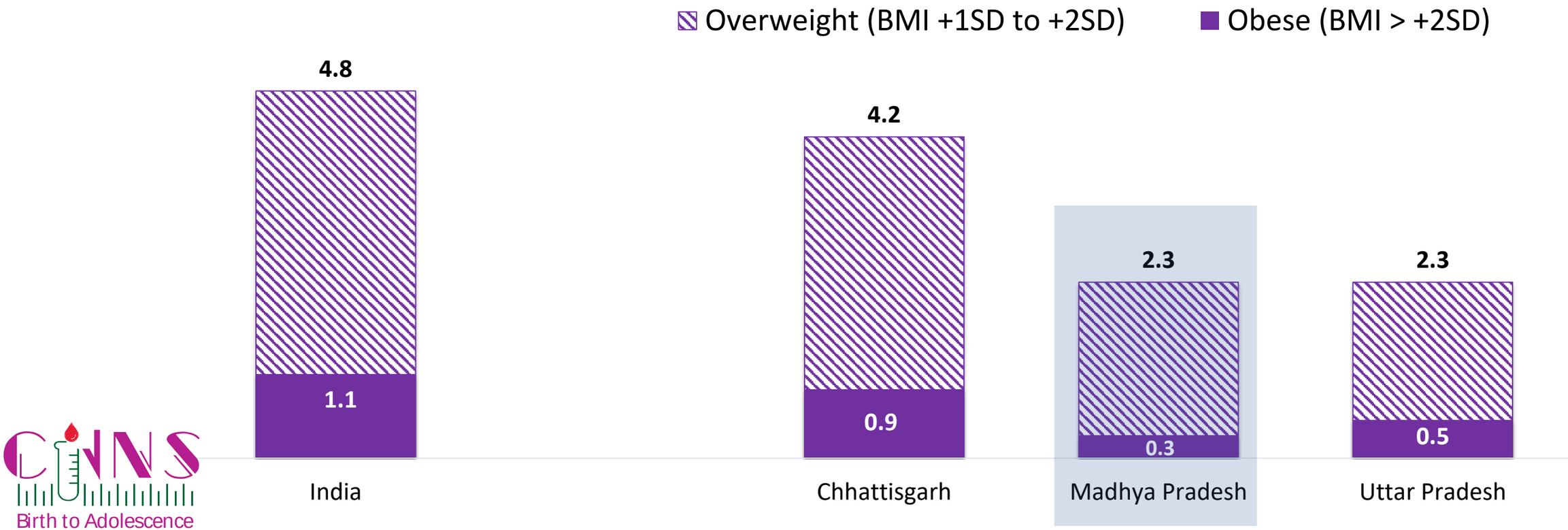


Birth to Adolescence

Prevalence of overweight among adolescents aged 10-19 years

Only **2%** of adolescents were overweight in Madhya Pradesh, half of national average

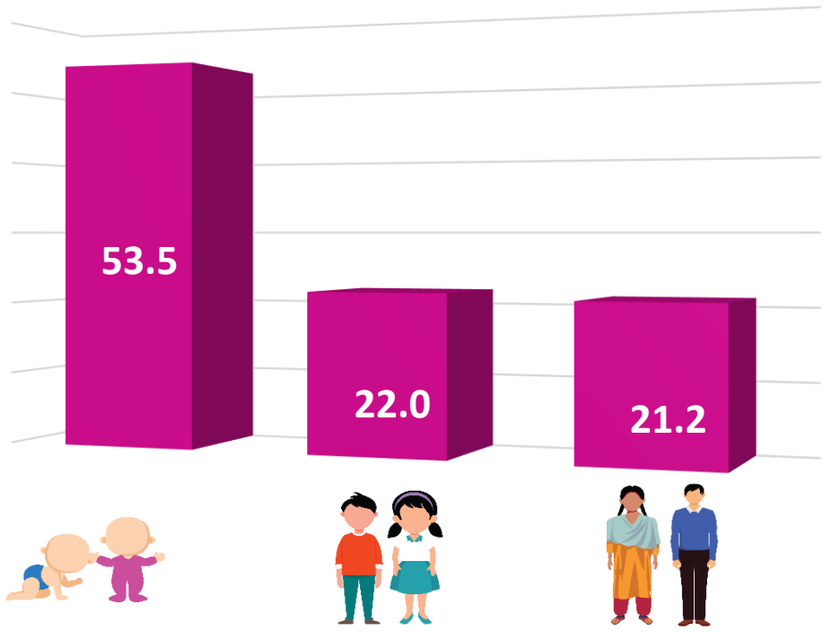
Among the central states, Madhya Pradesh had lower prevalence than Chhattisgarh (**4%**) and at same level of Uttar Pradesh (**2%**)



Birth to Adolescence

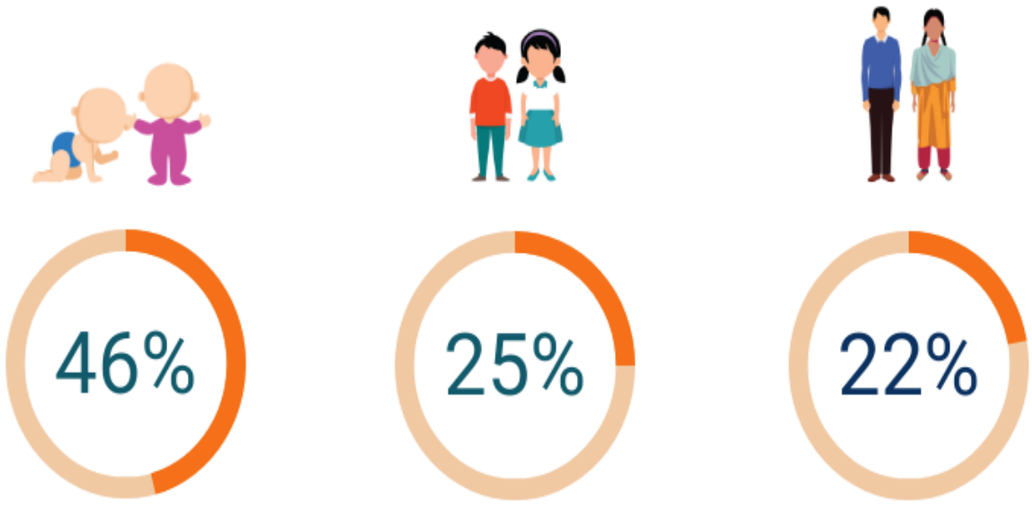
Madhya Pradesh key findings: Anemia and iron deficiency

Anaemia



In Madhya Pradesh, 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



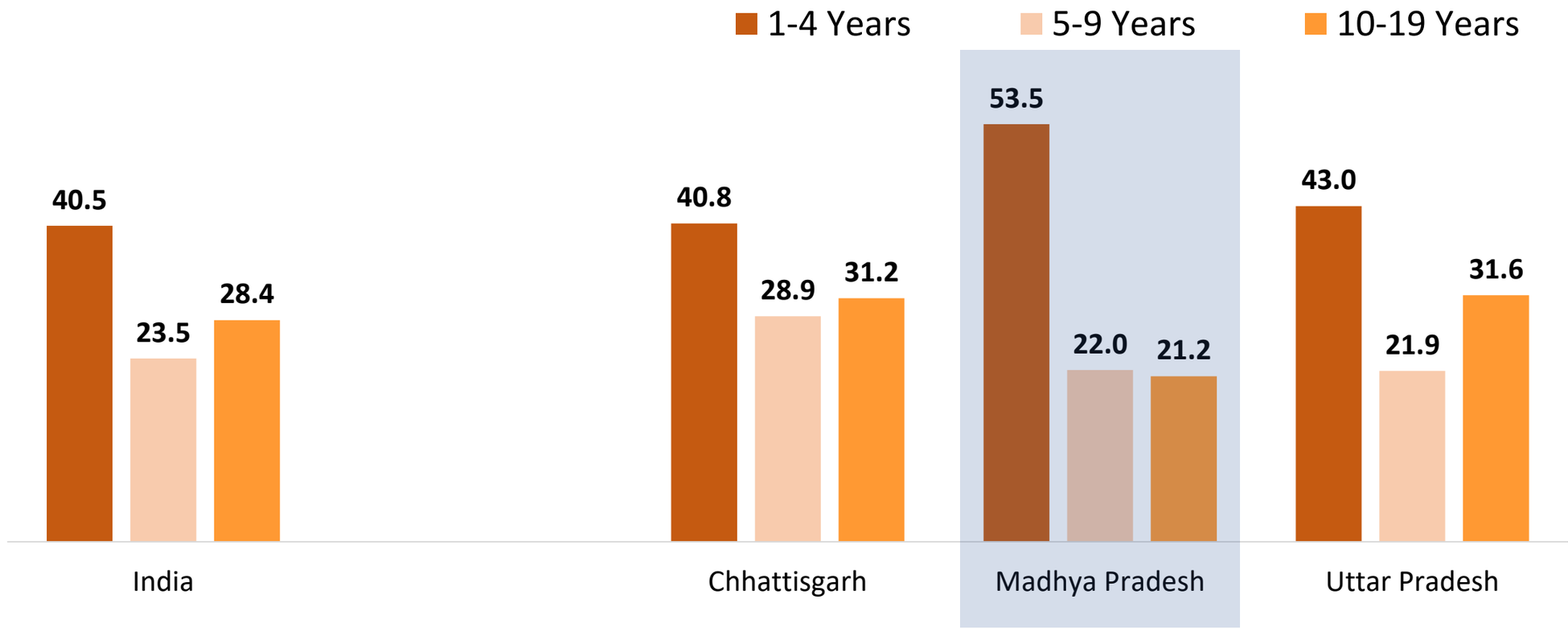
Findings indicate that children aged 1-4 years had higher iron deficiency (measured by serum ferritin) than other children or adolescents

CINNS Birth to Adolescence

Prevalence of Anaemia among children and adolescents

More than **half** of children aged 1-4 years were anaemic in Madhya Pradesh (**54%**), significantly 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)

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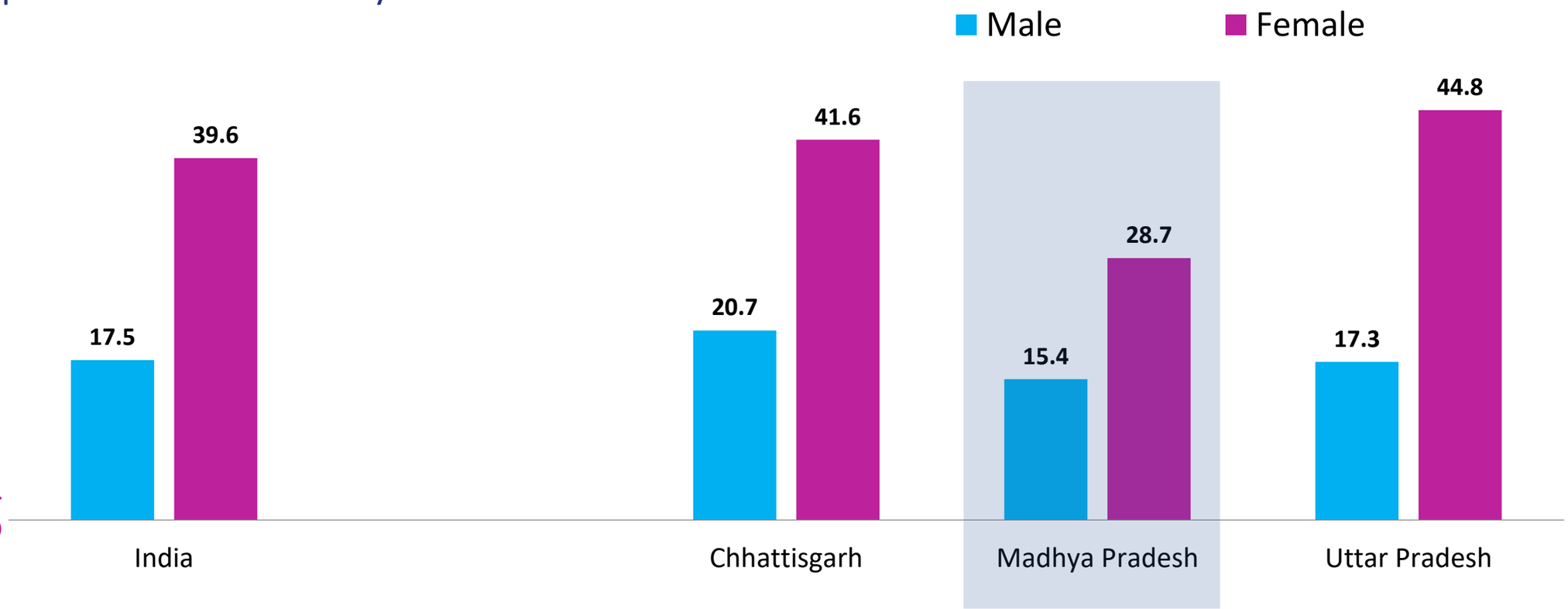
Prevalence of Anaemia among adolescents (10-19 years)

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

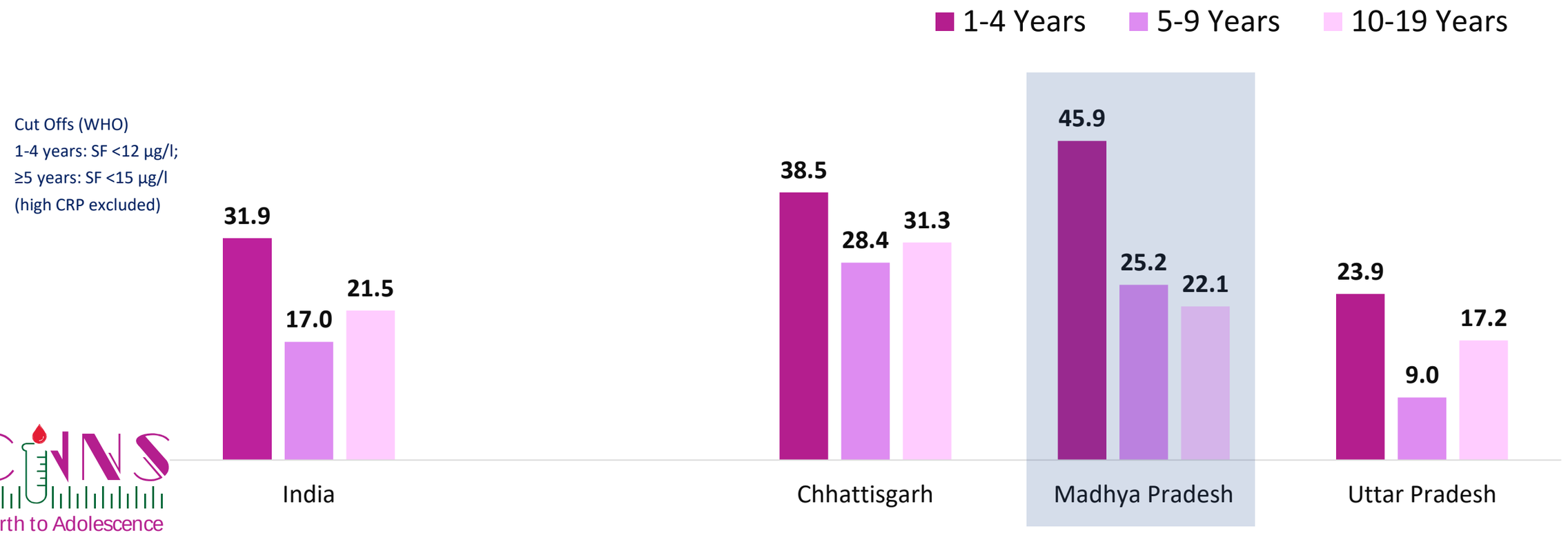
In Madhya Pradesh, as in other central states, adolescent girls were more than two times likely to be anaemic compared to adolescent boys



Birth to Adolescence

Iron deficiency measured by serum ferritin among children and adolescents

Almost **half** of children aged 1-4 years had iron deficiency in Madhya Pradesh (**46%**), higher than the national average (**32%**) and other central states; prevalence was highest among children aged 1-4 years



Birth to Adolescence

Madhya Pradesh key findings: Vitamin A and Vitamin D deficiency

Vitamin A deficiency was significantly high (27%) among children aged 1-4 years indicating the need for policy review

School-age children and adolescents were found to have similar levels of Vitamin A deficiency as children aged 1-4 years

Vitamin D deficiency ranged from 8% to 23% in 1-19 years age group as per cut off by expert panel of IOM.

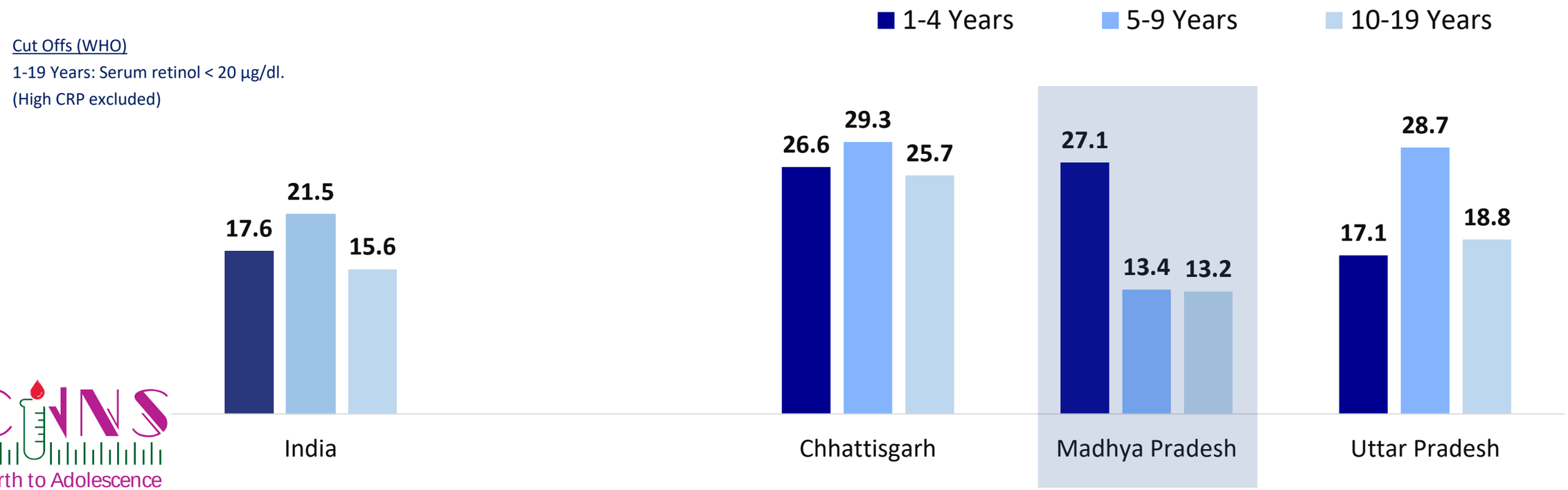
Adolescents aged 10-19 years were found to have higher level of Vitamin D deficiency than children aged 1-9 years

Birth to Adolescence

Vitamin A deficiency among children and adolescents

13-27% children and adolescents had Vitamin A deficiency in Madhya Pradesh. The deficiency was higher among children aged 1-4 years, when compared with national average.

Among central states, Chhattisgarh had highest levels of Vitamin A deficiency in all three age groups.

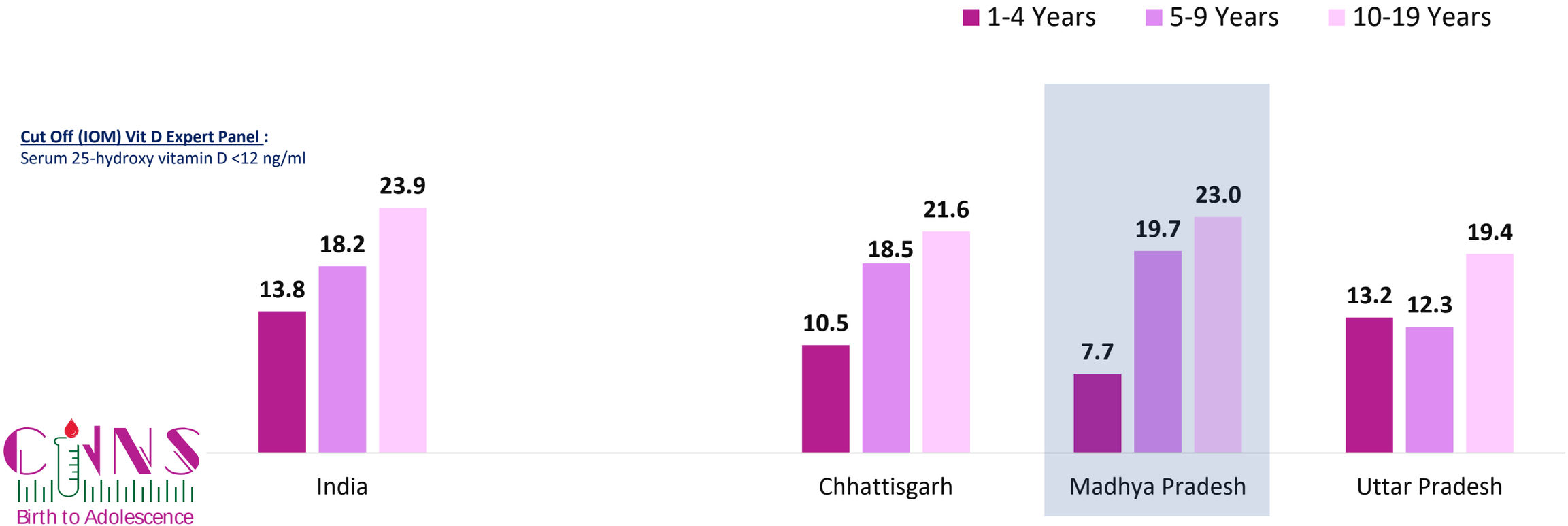


Birth to Adolescence

Vitamin D deficiency increases with age

8-23% children and adolescents had Vitamin D deficiency in Madhya Pradesh, similar to national average (**13-23%**), except in children aged 1-4 years.

Vitamin D deficiency increased sharply with age.



Birth to Adolescence

Madhya Pradesh key findings: Non-communicable diseases

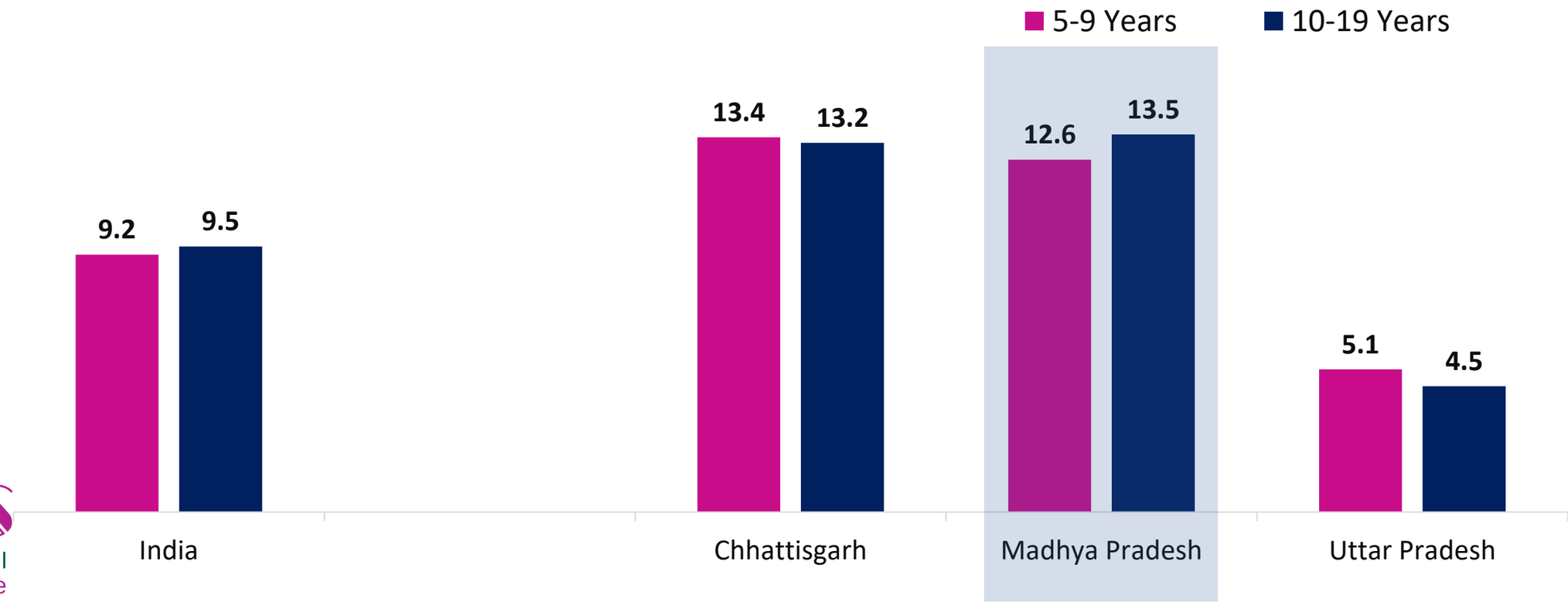
More than 10% school-age children and adolescents were found with high level of glycosylated haemoglobin (HbA1c).

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

Risk of diabetes among school-age children and adolescents

Based on Glycosylated hemoglobin (HbA1c), **13-14%** children and adolescents had increased risk of diabetes in Madhya Pradesh, which was higher than national level (**9-10%**)

Among all central states, risk of diabetes was the lowest in Uttar Pradesh

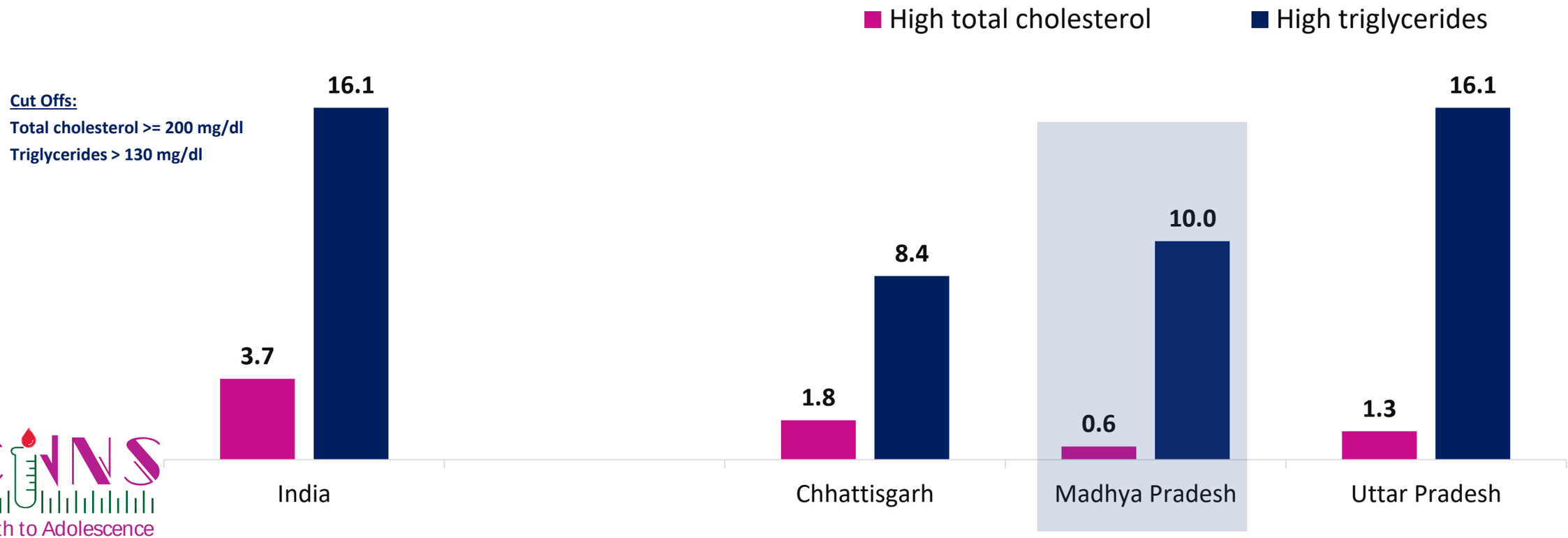


Birth to Adolescence

High total cholesterol and high triglycerides among adolescents

Elevated risks of NCDs in Madhya Pradesh among adolescents – **10%** had high level of triglycerides

In all central states, prevalence of high total cholesterol was low while that of high triglycerides was high

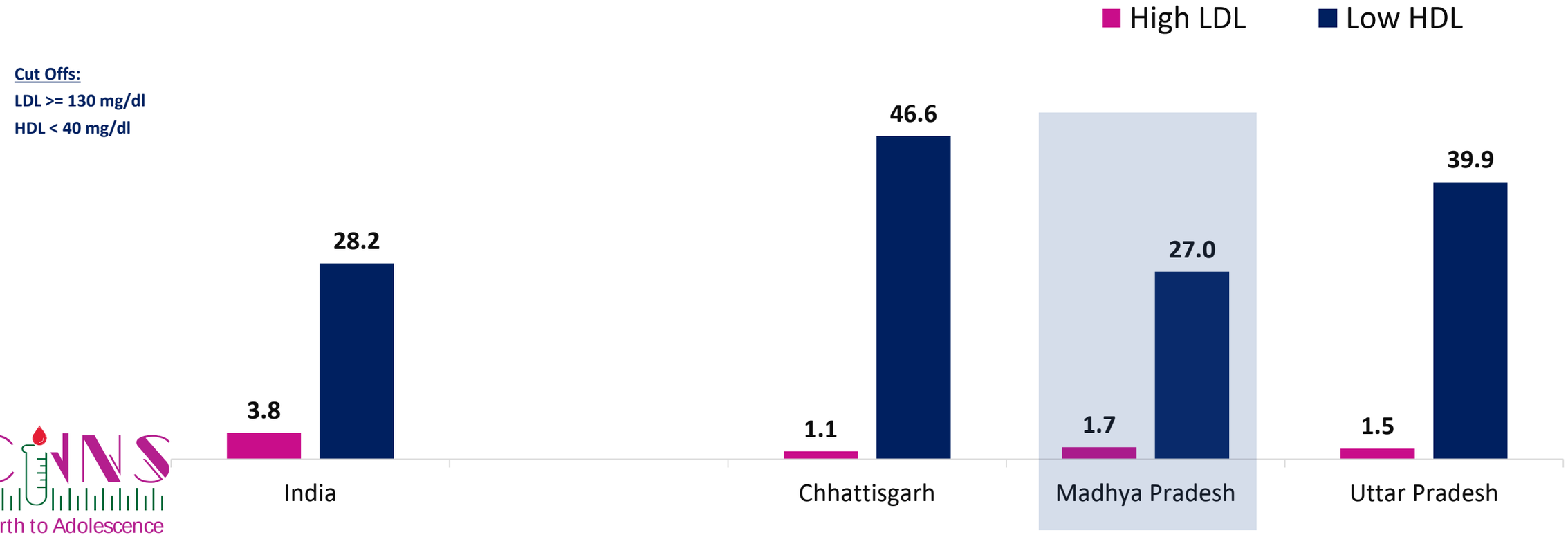


Birth to Adolescence

High LDL and low HDL among adolescents

Risk of NCDs among adolescents in Madhya Pradesh was high – **more than 1/4** had low level of HDL

In all the central states, prevalence of high LDL was low, while that of low HDL high



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 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.

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
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