सत्यमेव जयते

Ministry of Health and Family Welfare
Government of India

Comprehensive National Nutrition Survey

2016 – 2018

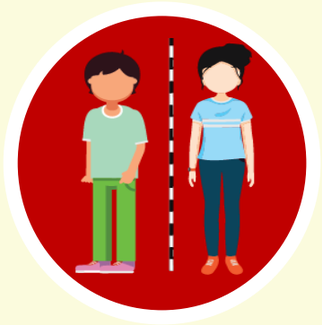
Rajasthan
State Presentation

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*

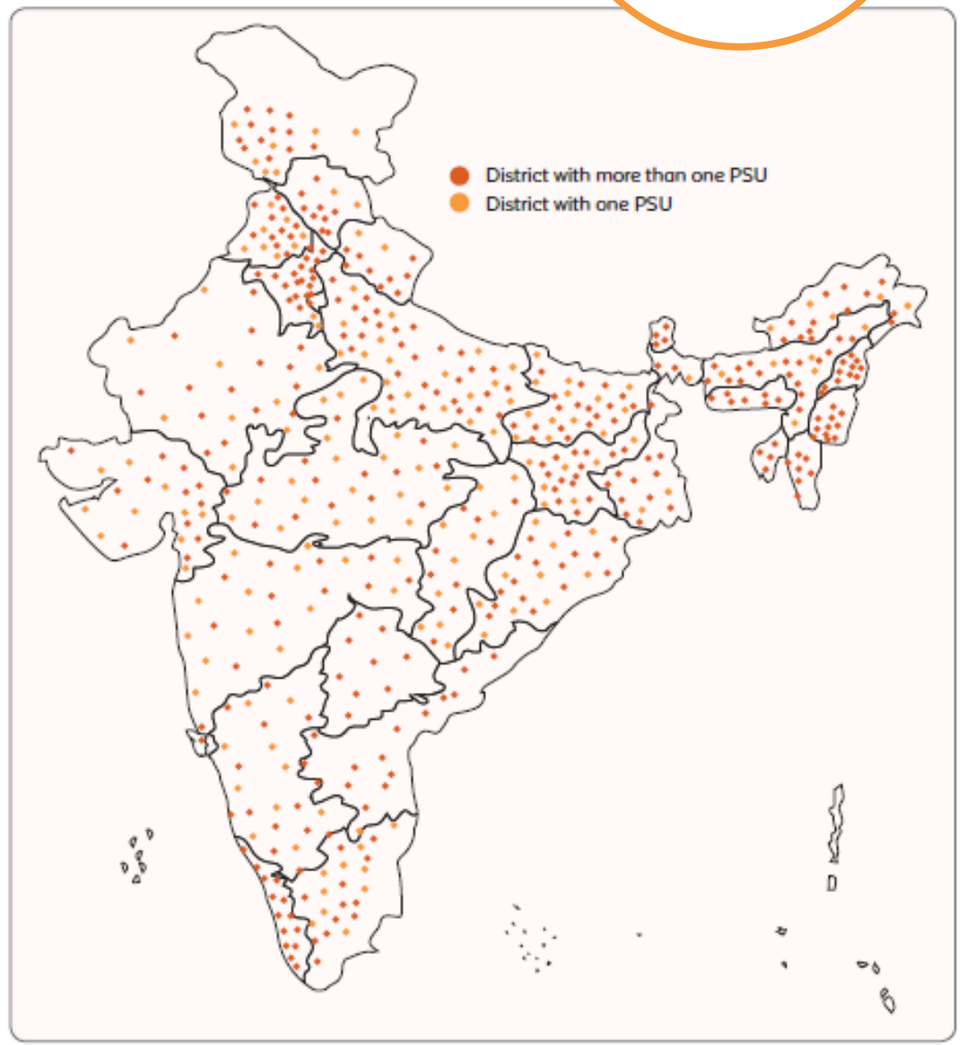
*Soumya Swaminathan, et al. (2019), The burden of child and maternal malnutrition and trends in its indicators in the states of India: the Global Burden of Disease Study 1990–2017. https://doi.org/10.1016/S2352-4642(19)30273-1

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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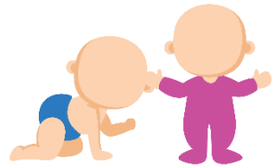
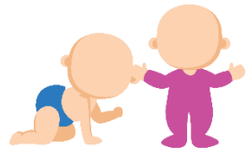
Anthropometry data

	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	

CINS Birth to Adolescence

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

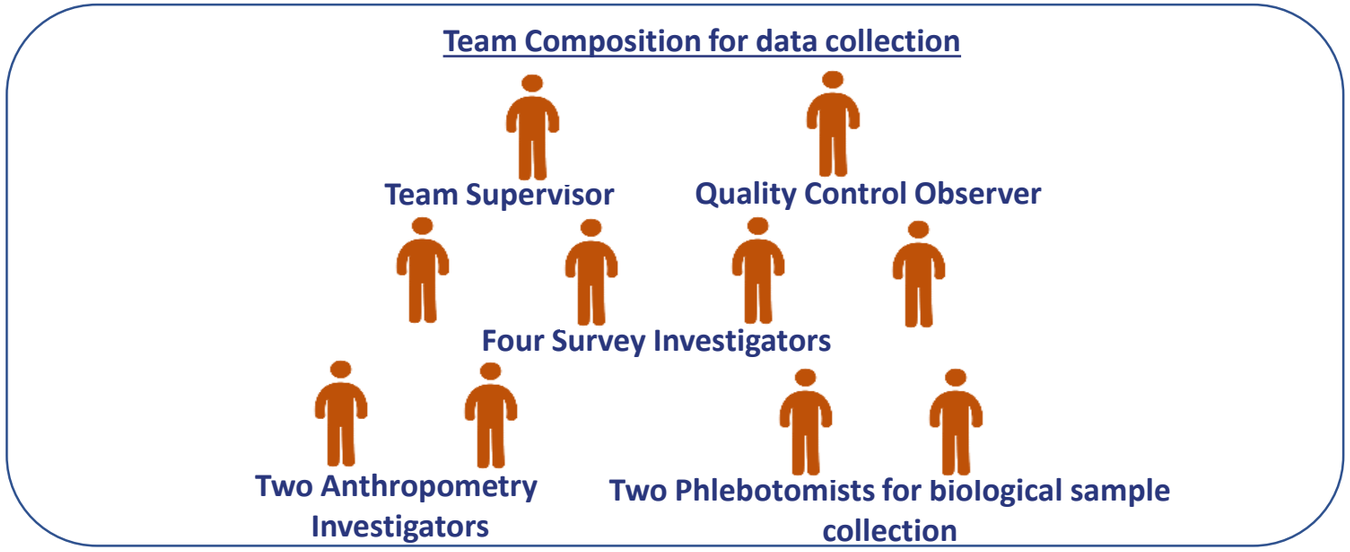
- Field work/protocol/training monitoring: by quality control team
- Biological sample quality control : by AIIMS, NIN and US CDC

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

CONNS
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 Rajasthan

CNNS covered 65 PSUs for data collection in Rajasthan

Achieved following sample size by age groups:

	0-4 years	5-9 years	10-19 years	Total
Household and anthropometry data	1,221	1,277	1,217	**3,715**
Biological sample	445	674	639	**1,758**

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Birth to Adolescence

Period of data collection in Rajasthan

CNNS data collection period: October 18, 2016 to January 3, 2017

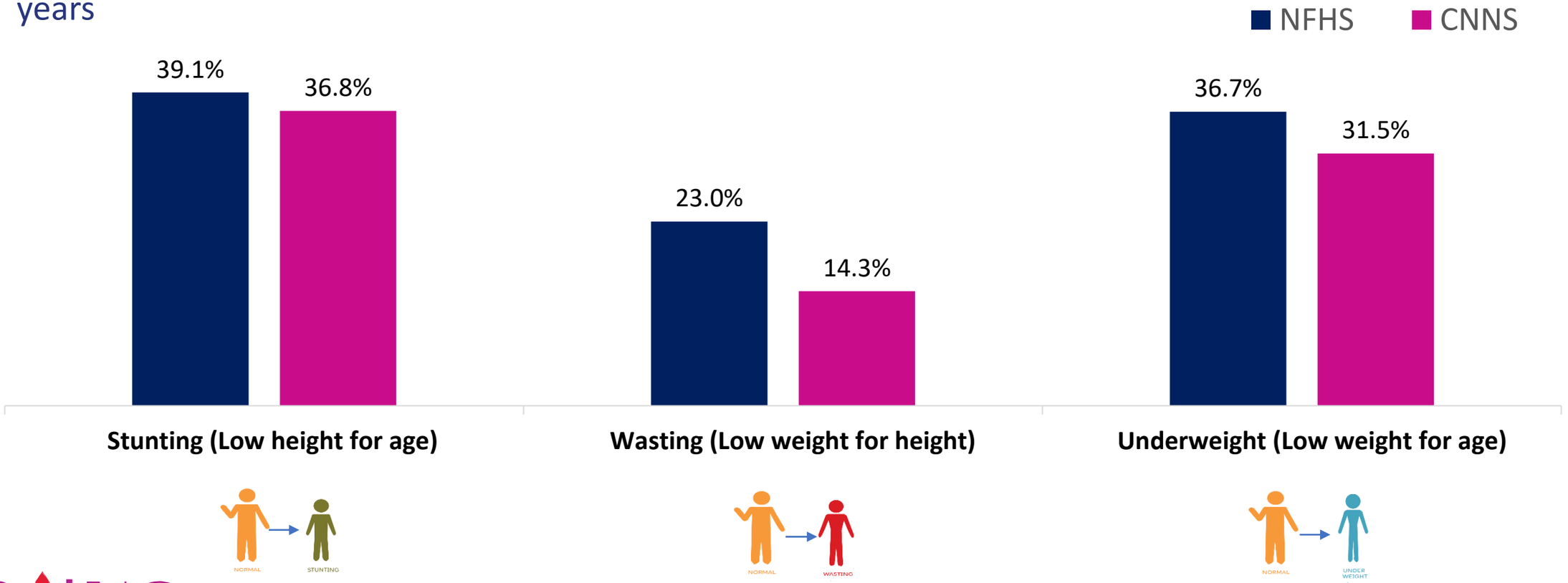
- CNNS collected data during autumn of 2016 through winter season of 2017
- NFHS collected data during the winter season through monsoon season of 2016

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

CNNS
Birth to Adolescence

Rajasthan key findings: Anthropometry (1/2)

Decline observed in wasting; no significant decline in stunting and underweight among children under 5 years



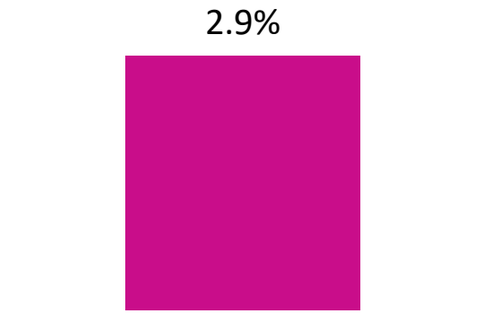
CNNS
Birth to Adolescence

Rajasthan key findings: Anthropometry (2/2)

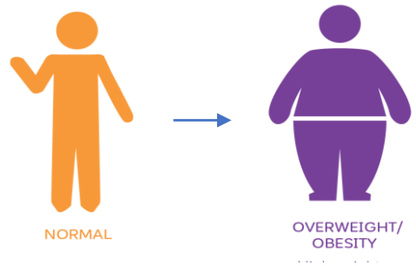
3/10 adolescents aged 10-19 years were thin for their age (BMI-Age <-2SD)

1/4 children aged 5-9 years was stunted. The school age period does not provide an opportunity for catch up growth in height.

3% of adolescents aged 10-19 years were overweight or obese.

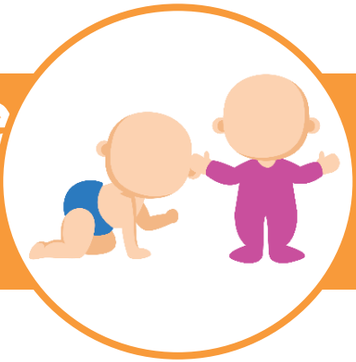


Overweight (high BMI for age)



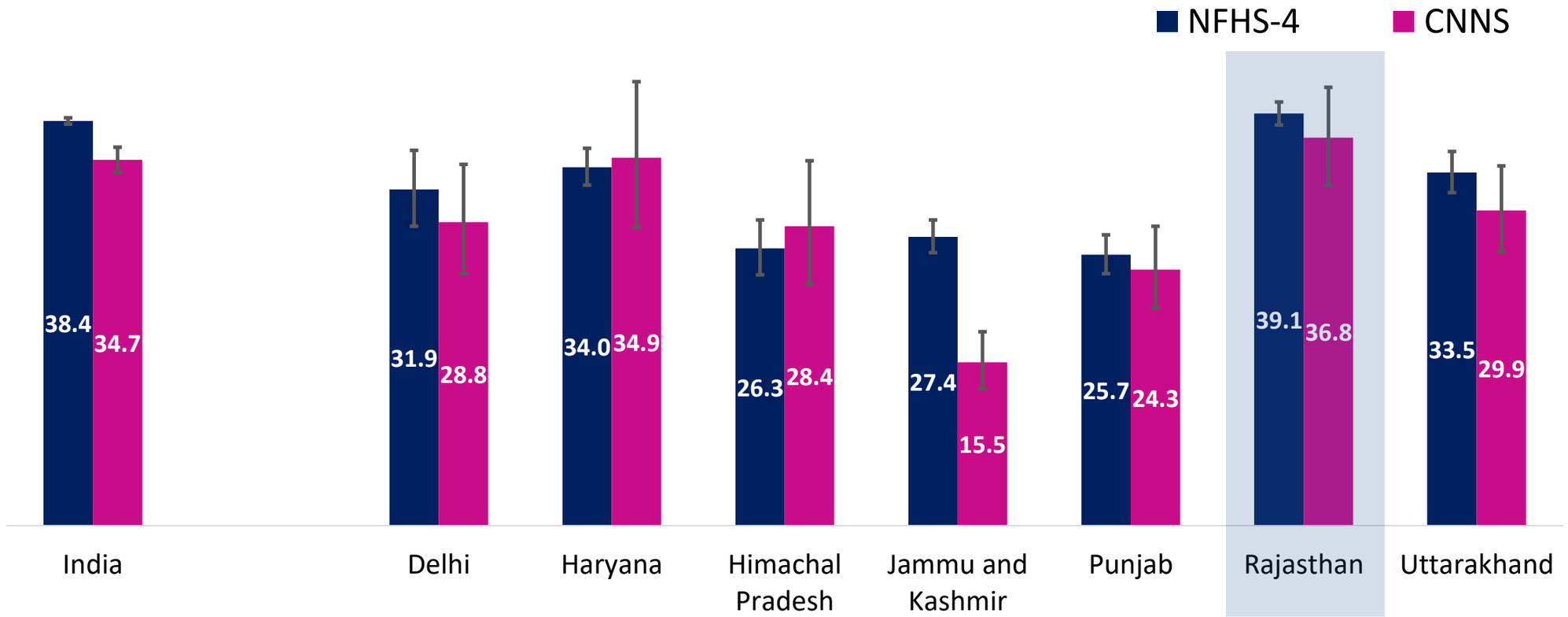
Birth to Adolescence

Stunting among children under five unchanged



No significant decline in prevalence of stunting was observed between CNNS and NFHS-4 – **37%** vs **39%** in Rajasthan

Among northern states, stunting did not decline significantly in any state except Jammu and Kashmir

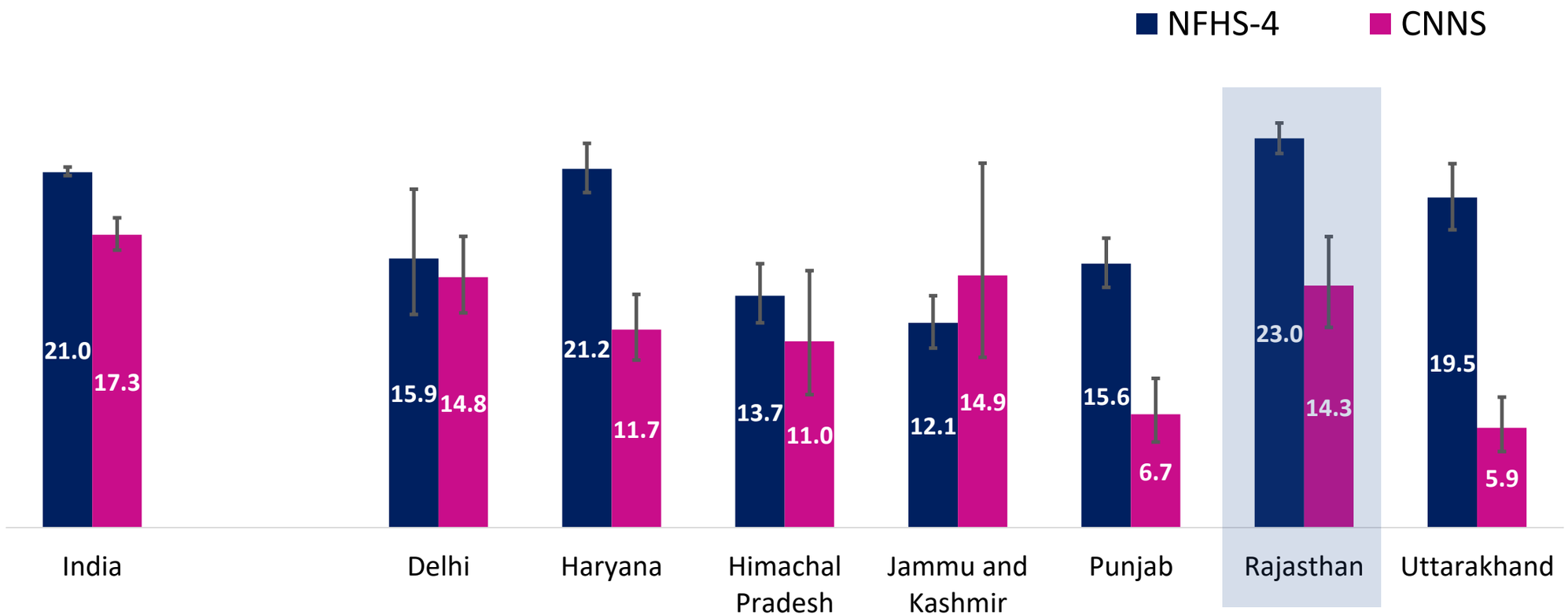


Birth to Adolescence

Wasting among children under five declined

Prevalence of wasting declined significantly in Rajasthan between NFHS-4 and CNNS – **23%** Vs **14%**

In 4/7 northern states, wasting declined; except in Jammu and Kashmir, Himachal Pradesh and Delhi



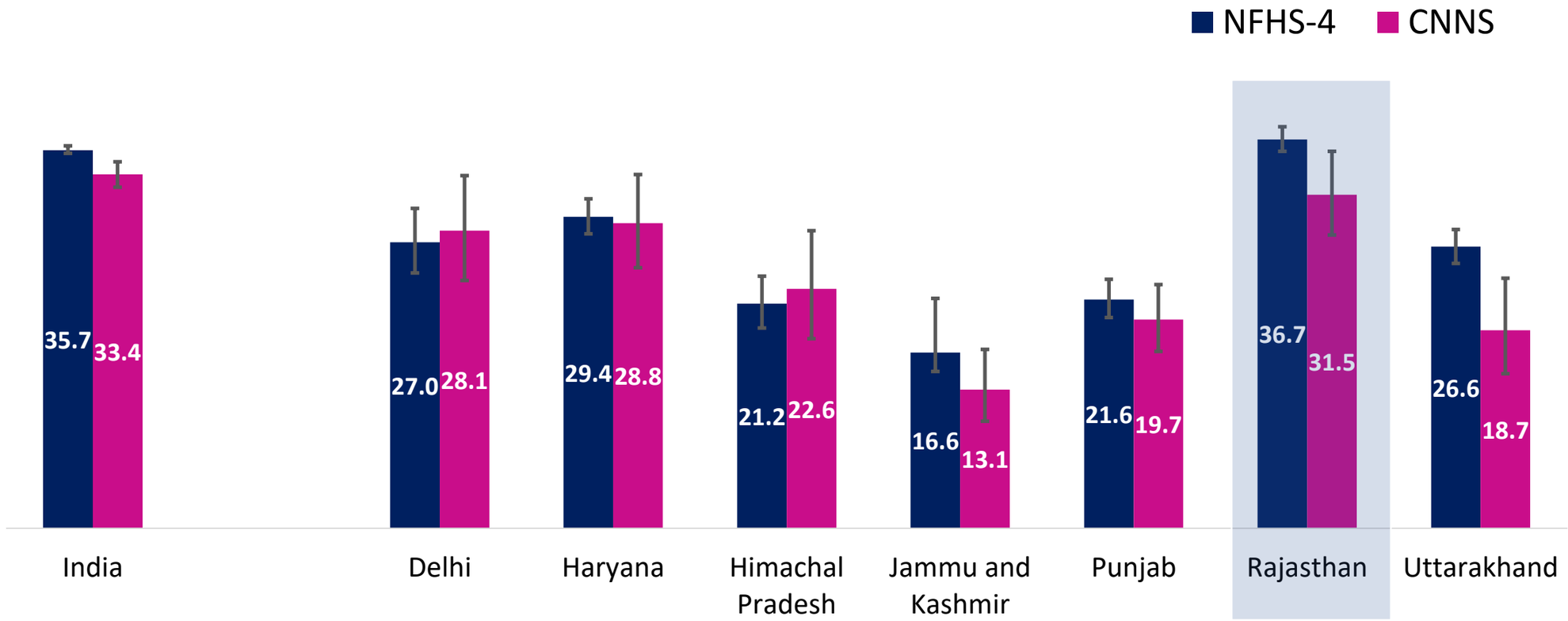
CNNS
Birth to Adolescence

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 in Rajasthan between NFHS-4 and CNNS – **37%** Vs **32%**

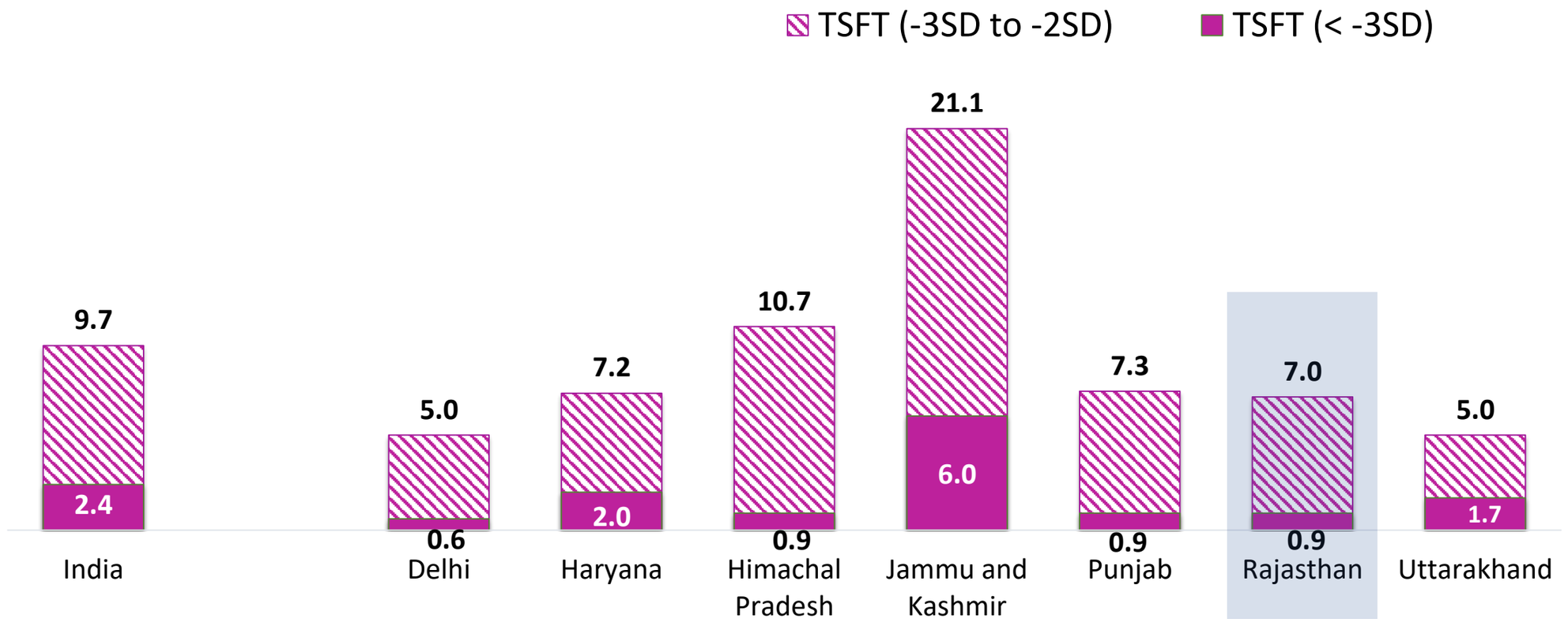
Prevalence remained unchanged in all northern states; except in Uttarakhand



Birth to Adolescence

Triceps Skinfold Thickness (TSFT) for children under five

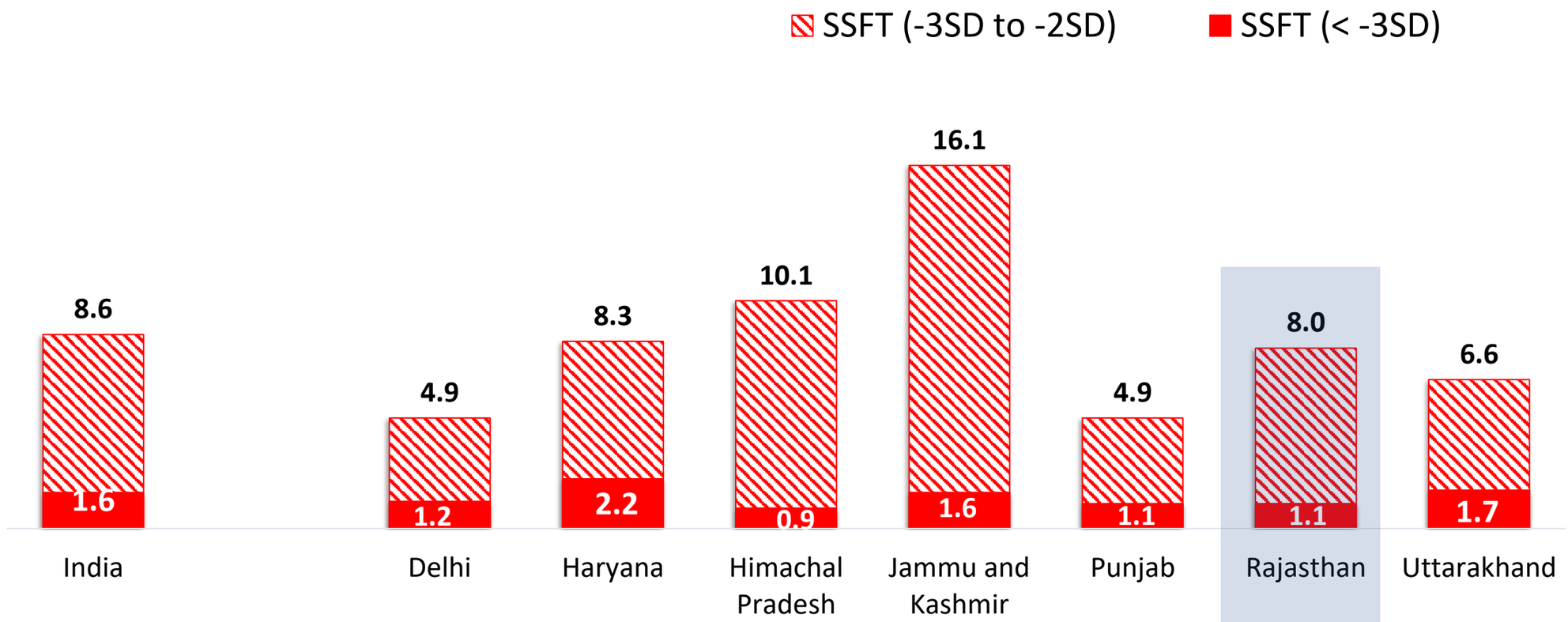
Low fat mass as reported by TSFT in Rajasthan (7%) was slightly lower than national average (10%) and about at same level of most northern states



Birth to Adolescence

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

Thinness as reported by SSFT in Rajasthan (8%) was moderately high among northern states and similar to national level

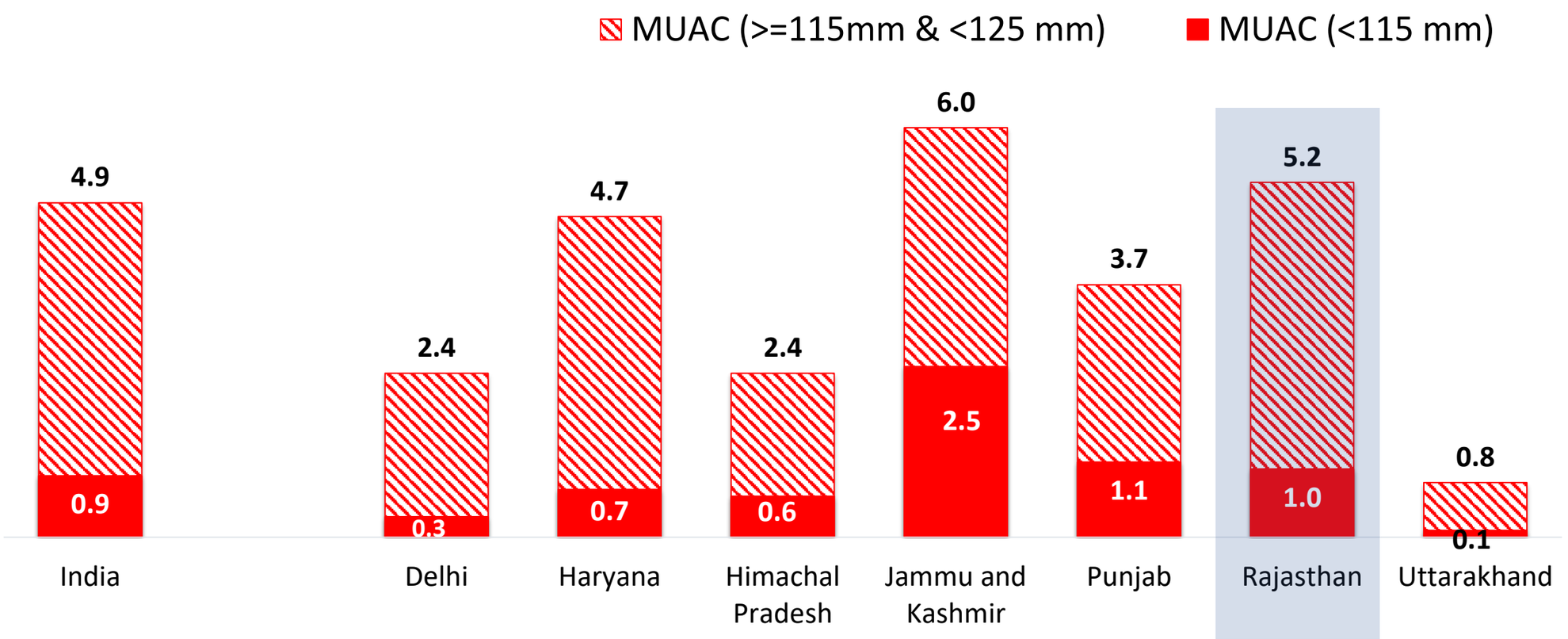


Birth to Adolescence

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

About **5%** children in Rajasthan had low MUAC

Prevalence of low MUAC ranged between **1%** and **6%** across the northern states

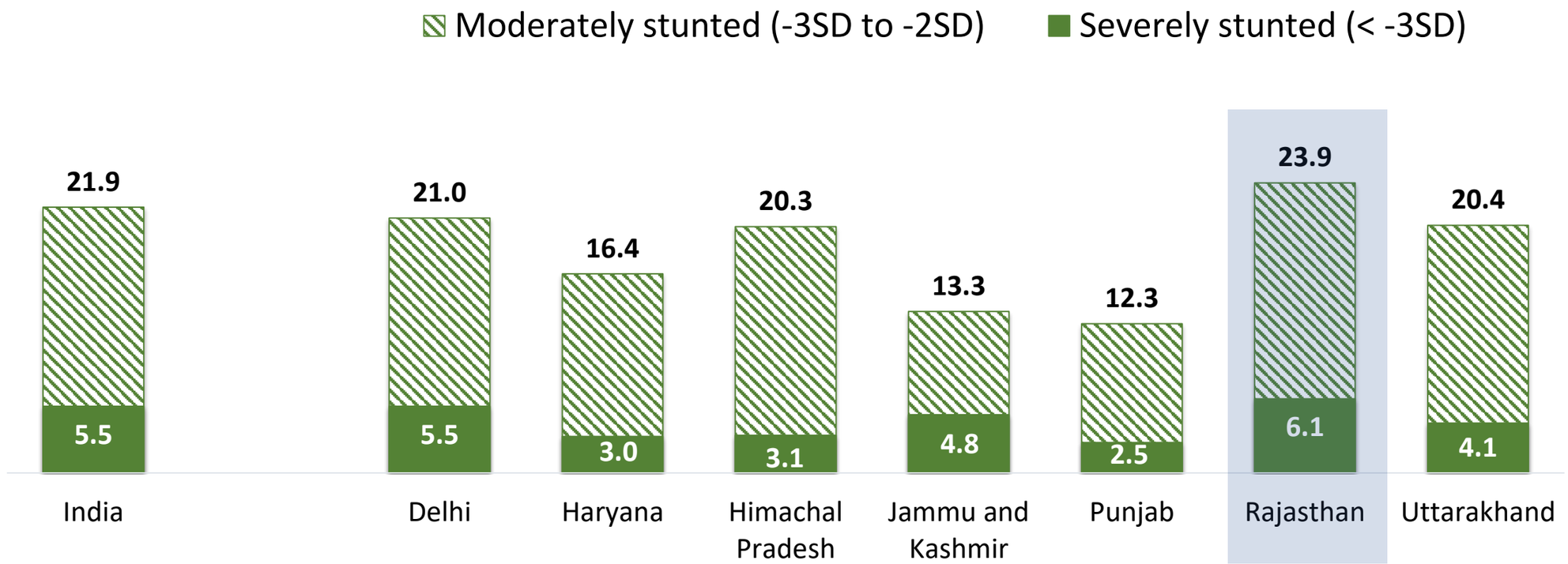


Birth to Adolescence

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

1/4 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

Rajasthan had highest prevalence of stunting among the northern states and close to national average

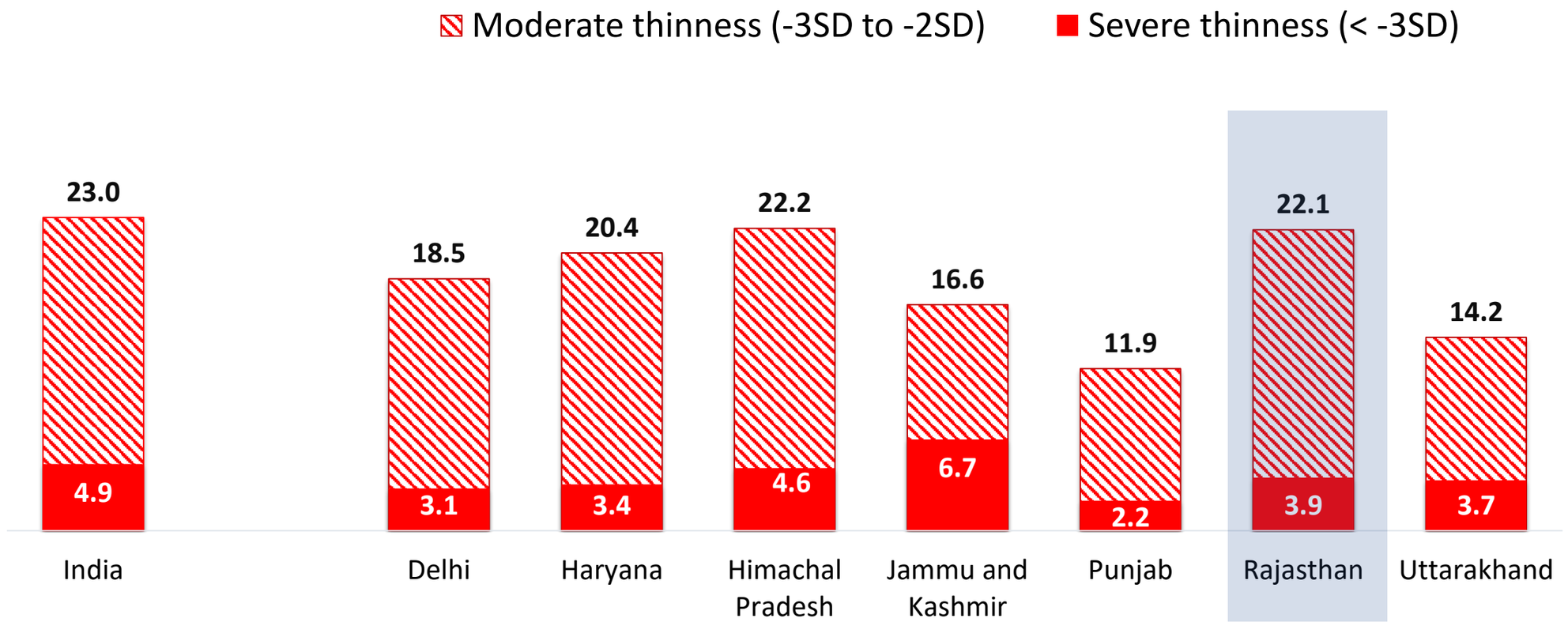


Birth to Adolescence

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

More than **1/5** children aged 5-9 years was thin in Rajasthan

Prevalence of thinness in Rajasthan and Himachal Pradesh was highest across the northern states and close to national average



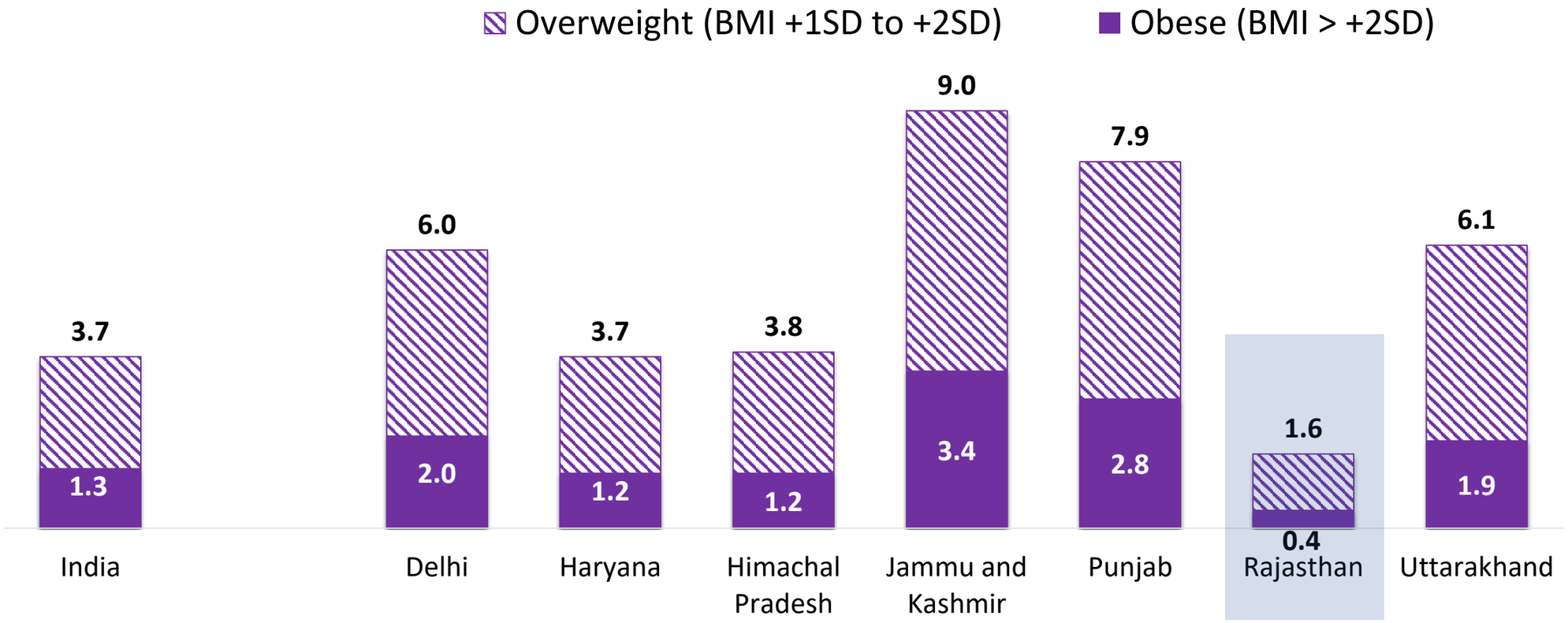
Birth to Adolescence

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 Rajasthan was half of the national average

Among northern states, Rajasthan was one with lowest prevalence of overweight in this age group

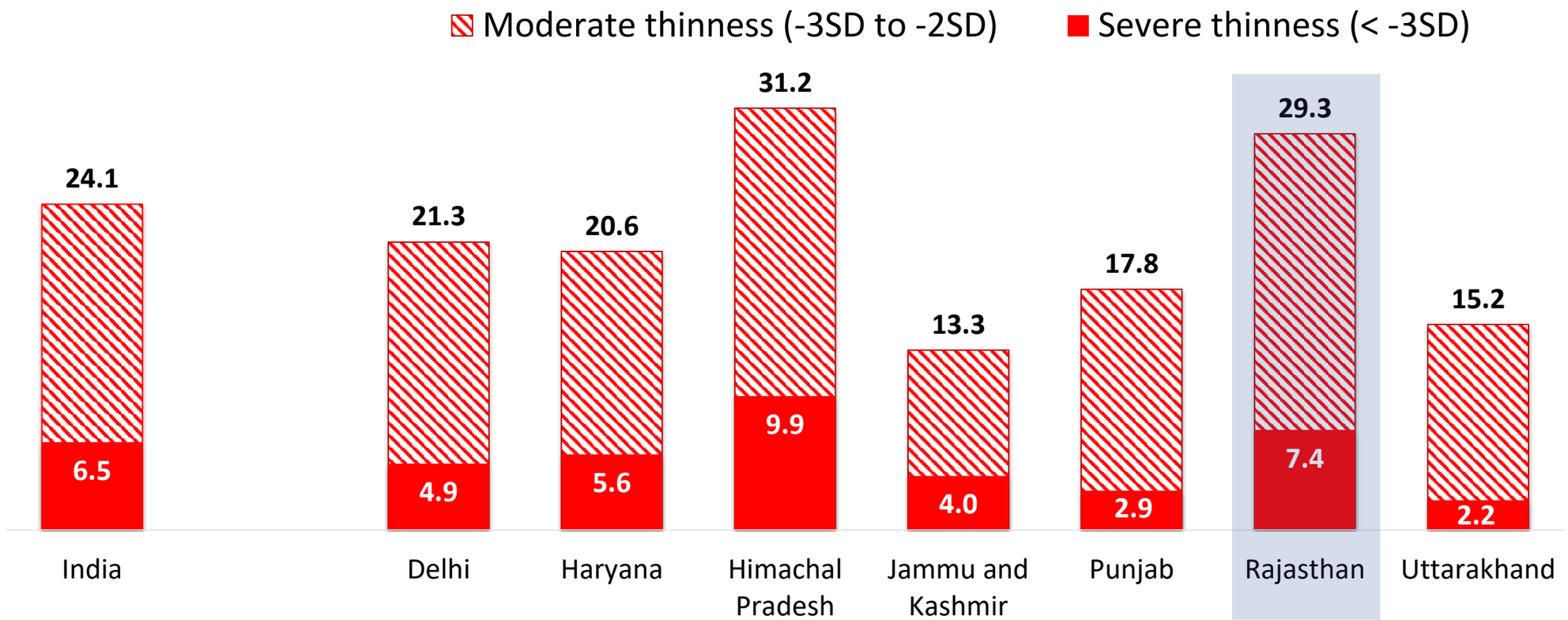


Birth to Adolescence

Thinness among adolescents aged 10-19 years substantially high

3/10 adolescents aged 10-19 years were thin in Rajasthan, higher than national average (24%)

Among the northern states, Himachal Pradesh (**31%**) and Rajasthan (**29%**) had high prevalence of thinness

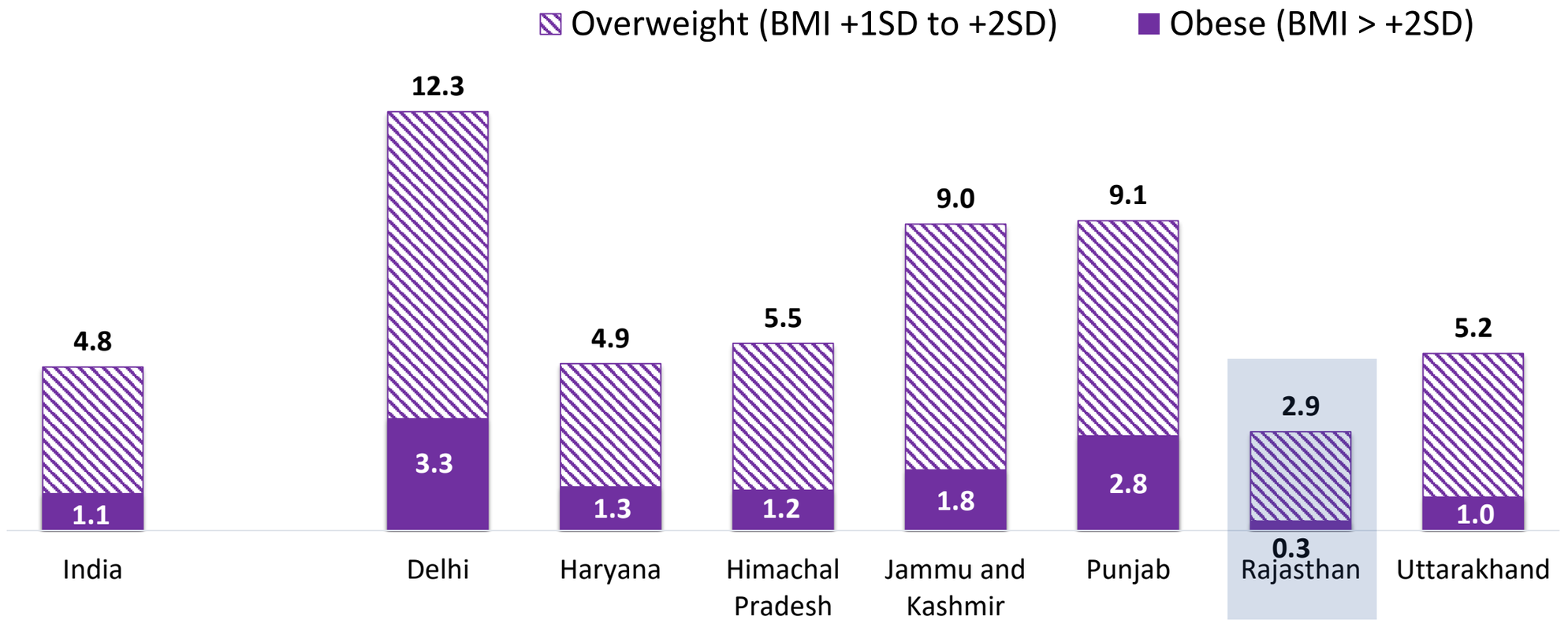


Birth to Adolescence

Prevalence of overweight among adolescents aged 10-19 years high

3% of adolescents were overweight in Rajasthan, lower than national average (**5%**)

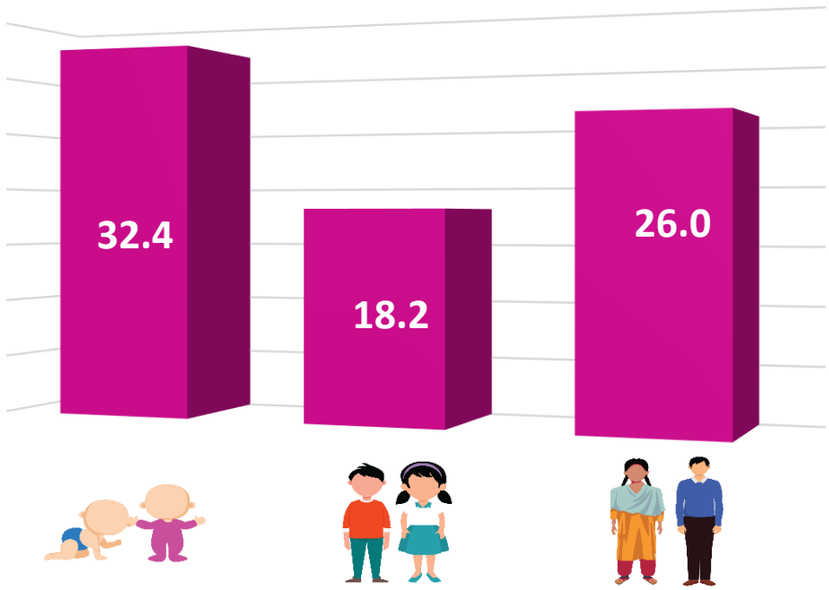
Rajasthan had lowest prevalence of overweight in adolescents among all northern states



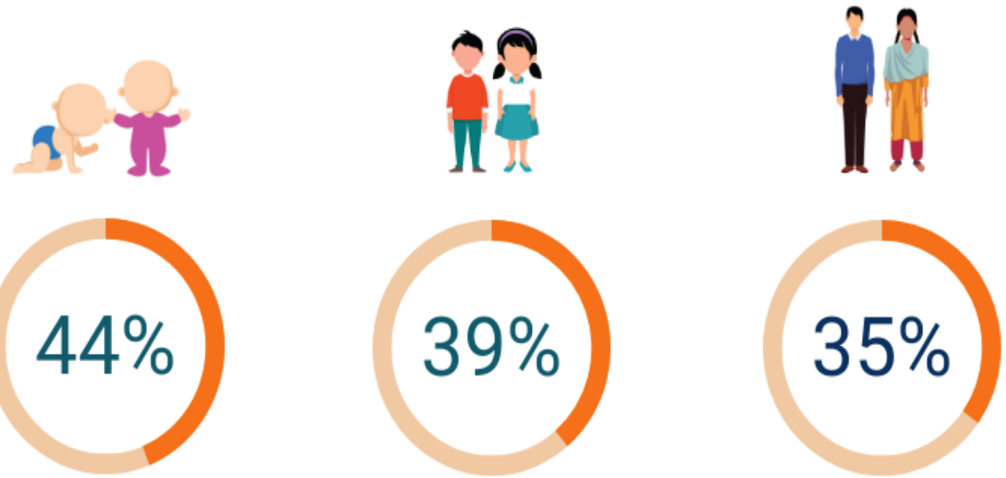
Birth to Adolescence

Rajasthan key findings: Anaemia and iron deficiency

Anaemia



Iron deficiency



In Rajasthan, 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

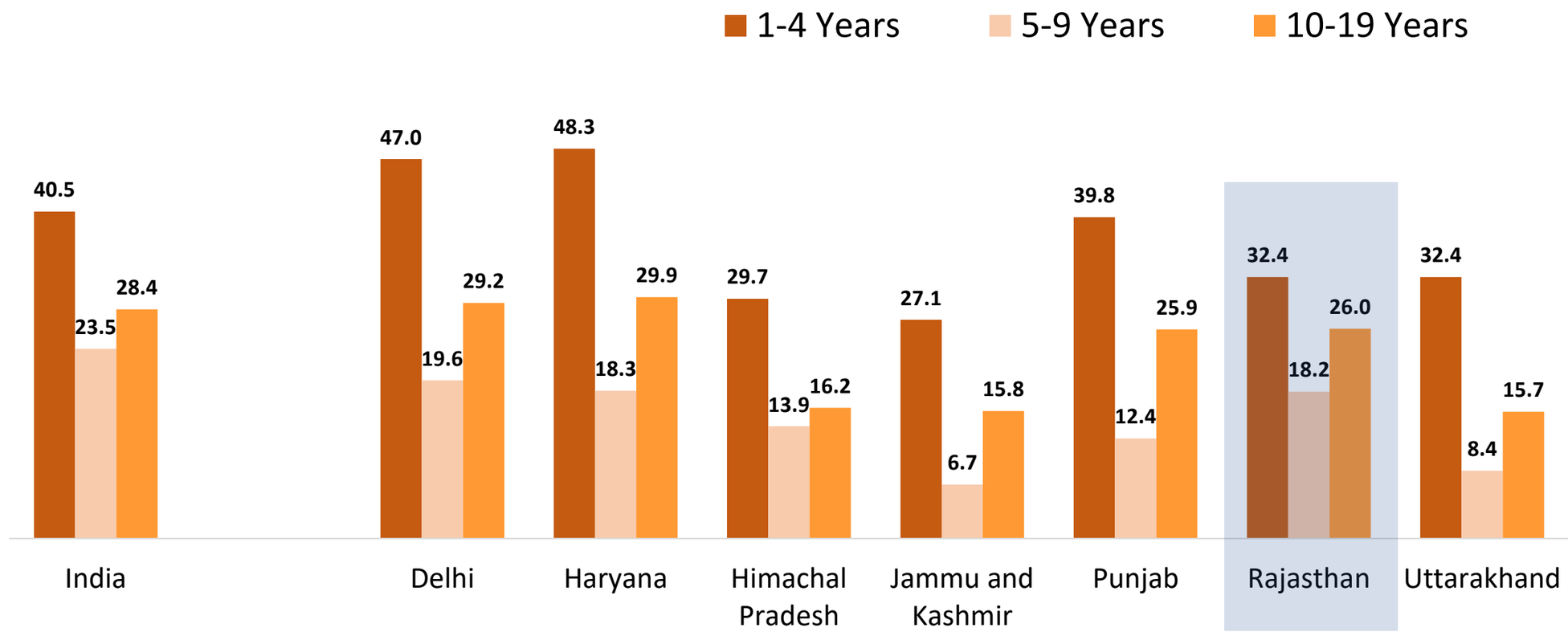
Findings indicate that children aged 1-4 years had higher iron deficiency (measured by serum ferritin) than other children or adolescents

CNNS
Birth to Adolescence

Prevalence of Anaemia among children and adolescents

1/3 children aged 1-4 years was anaemic in Rajasthan (**32%**), significantly lower than national average (**41%**)

Prevalence of anaemia was highest among children aged 1-4 years, increased again in adolescence



Anaemia Cut Offs (WHO)

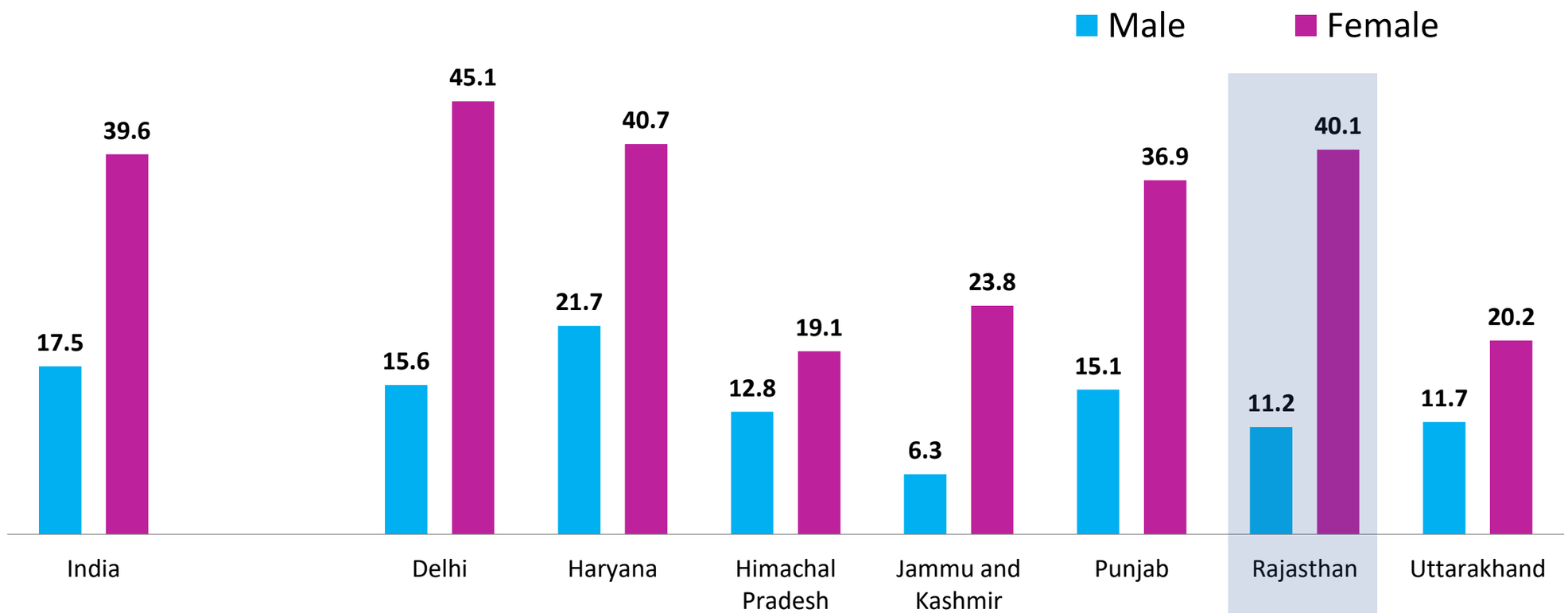
1-4 years: Hb<11.0 g/dl
5-11 years: Hb<11.5 g/dl
12-14 years: Hb< 12 g/dl
Girls ≥15years: Hb< 12g/dl
Boys ≥15 years: Hb< 13 g/dl
(Adjusted for altitude)

Birth to Adolescence

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 Rajasthan, adolescent girls were four times more likely than adolescent boys to be anaemic

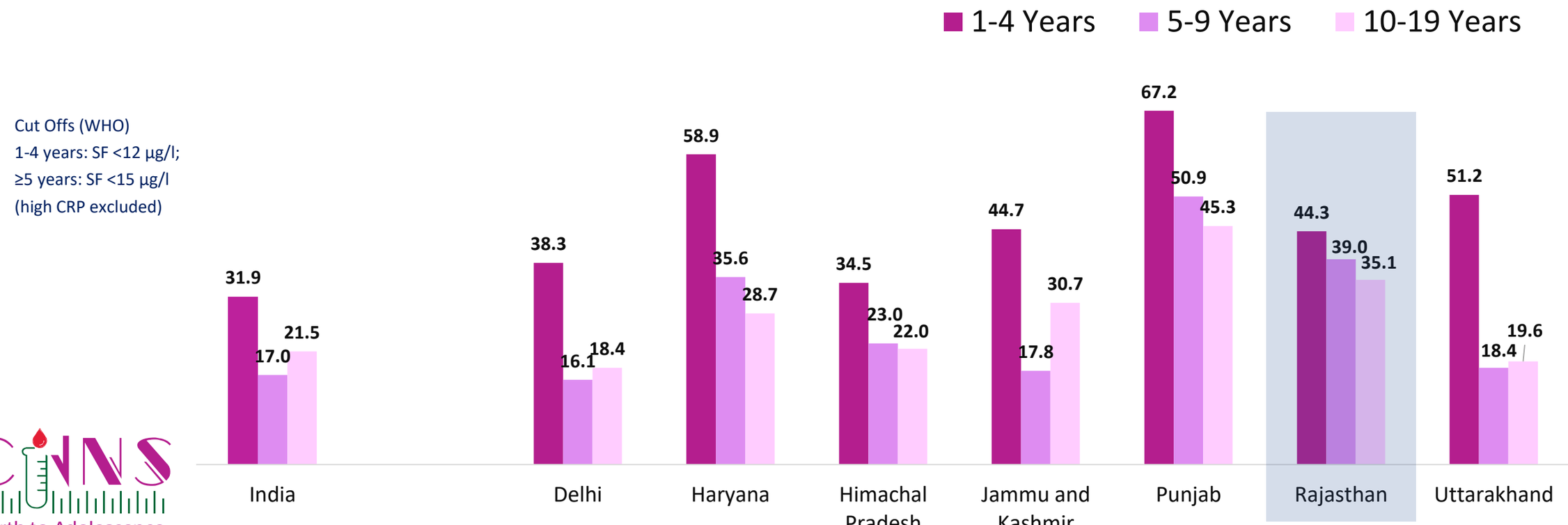


Birth to Adolescence

Iron deficiency measured by serum ferritin among children and adolescents

More than **2/5** children aged 1-4 years had iron deficiency in Rajasthan (**44%**), significantly higher than the national average (**32%**); prevalence was highest among children aged 1-4 years

Among northern states, children from Punjab had highest prevalence of iron deficiency



Birth to Adolescence

Rajasthan key findings: Vitamin A and Vitamin D deficiency

Children and adolescents were found to have very low levels of Vitamin A deficiency

Vitamin D deficiency ranged from 24% to 26% in 1-19 years age group as per cut off by expert panel of IOM.

Children and adolescents were found to have moderately high level of Vitamin D deficiency

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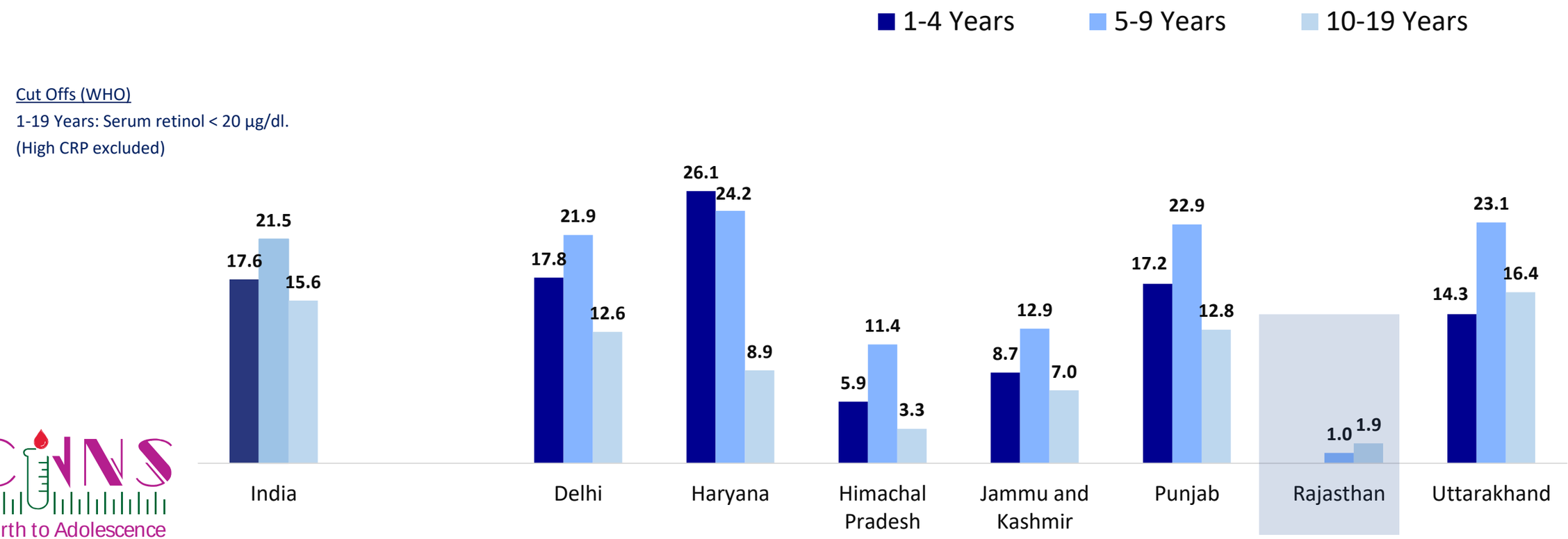
Birth to Adolescence

Vitamin A deficiency among children and adolescents

0-2% children and adolescents had Vitamin A deficiency in Rajasthan, significantly lower than national average (**16-22%**)

Among northern states, Rajasthan had lowest prevalence of Vitamin A deficiency

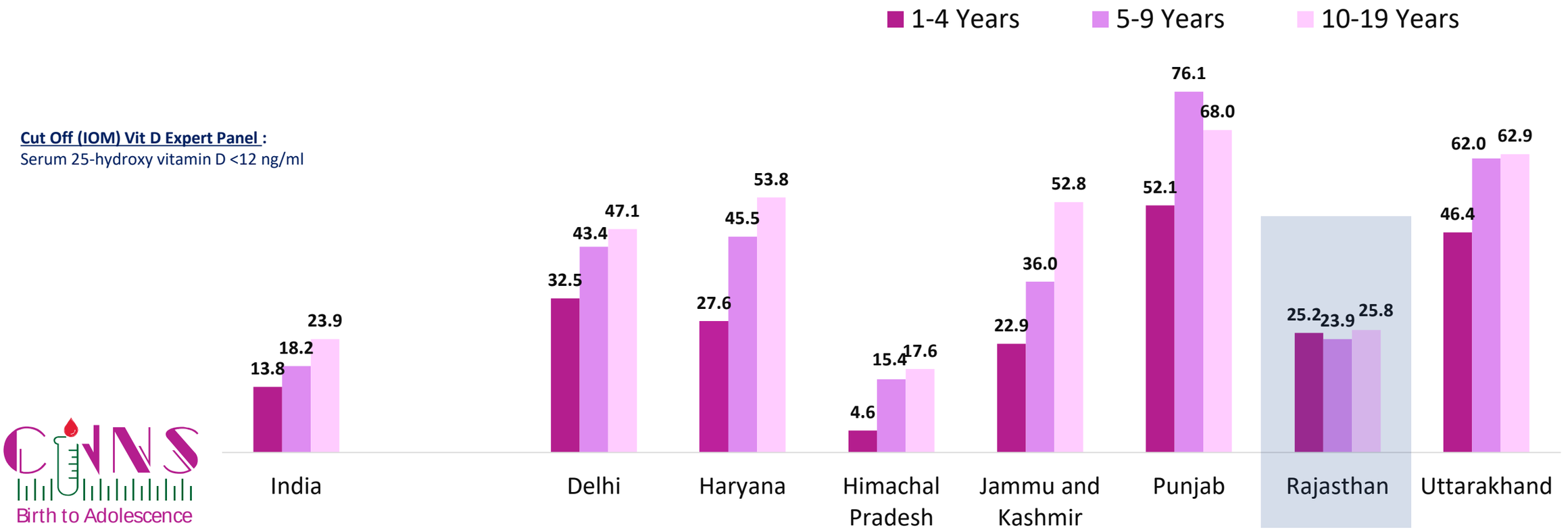


Birth to Adolescence

Vitamin D deficiency increases with age

24-26% children and adolescents had Vitamin D deficiency in Rajasthan, moderately higher than the national average (**14-24%**)

In most northern states, Vitamin D deficiency increased sharply with age, Rajasthan being exception



Birth to Adolescence

Rajasthan key findings: Non-communicable diseases

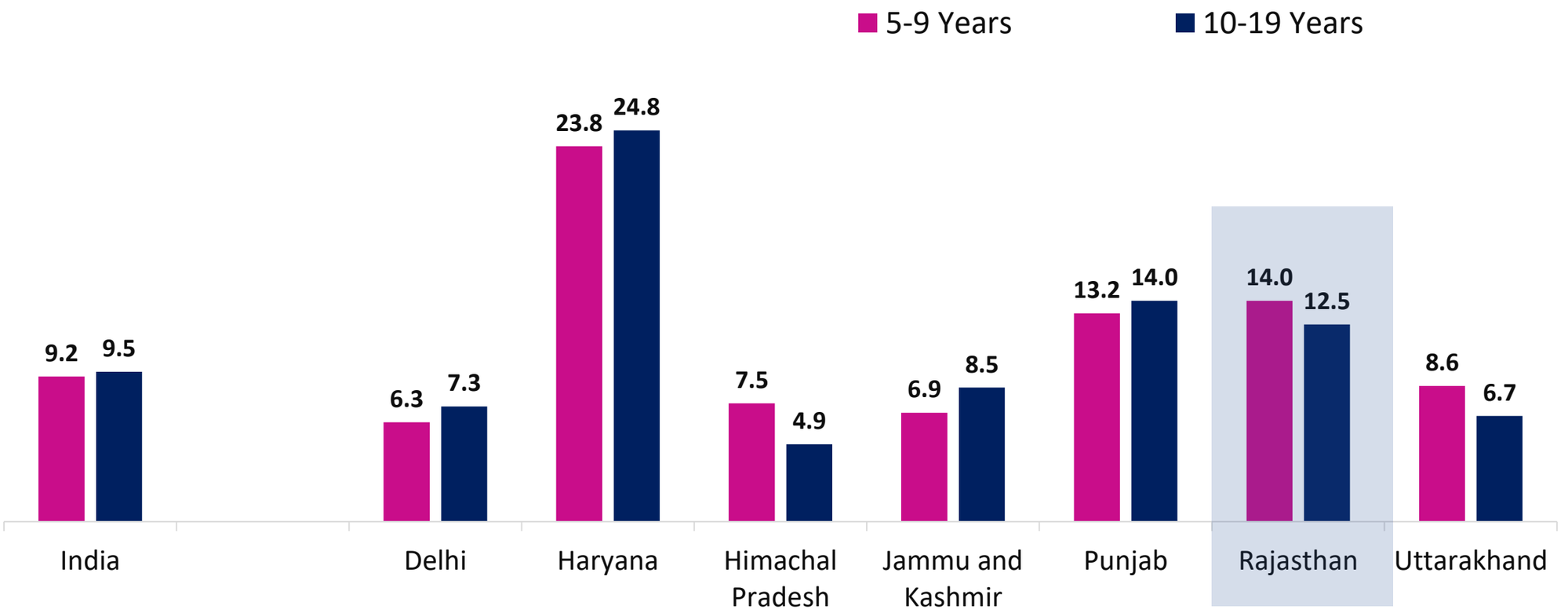
More than 10% school-age children and adolescents were found with high level of glycosylated haemoglobin (HbA1c).

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

Risk of diabetes among school-age children and adolescents

Based on Glycosylated hemoglobin (HbA1c), more than **12%** children and adolescents had increased risk of diabetes in Rajasthan, which is higher than national average (**9-10%**)

Among all northern states, risk of diabetes was the highest in Haryana (**24-25%**)

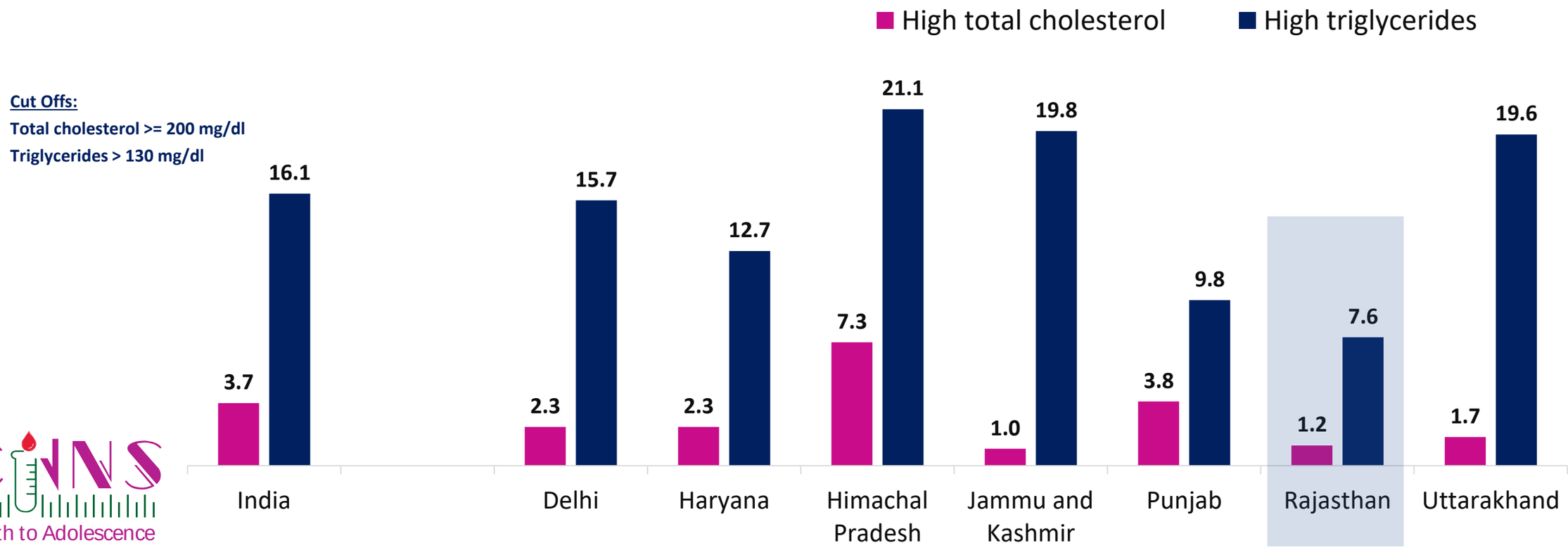


Birth to Adolescence

High total cholesterol and high triglycerides among adolescents

Elevated risk of NCDs in Rajasthan among adolescents – **1%** had high level of total cholesterol and **8%** with high level of triglycerides

Prevalence of high total cholesterol and high triglycerides did not show any particular pattern in northern states

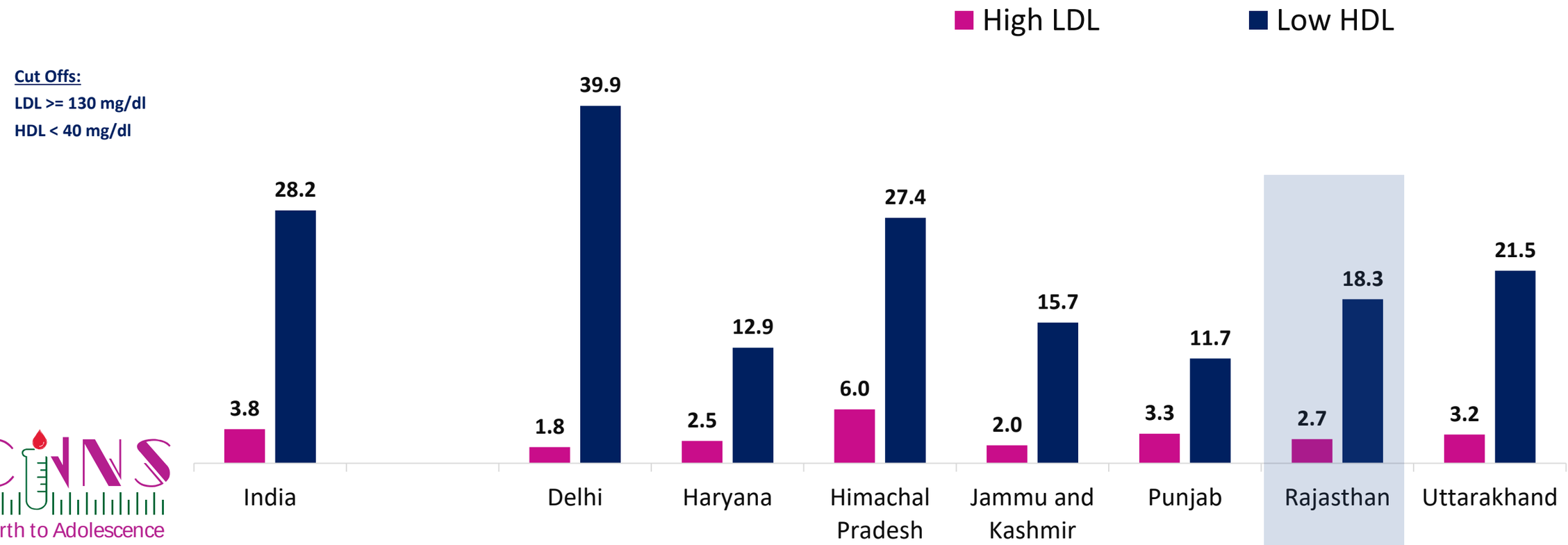


Birth to Adolescence

High LDL and low HDL among adolescents

Risk of NCDs among adolescents in Rajasthan was moderately high – **3%** had high level of LDL and **18%** had low level of HDL

Among the northern states, prevalence of low HDL was very high in Delhi (**40%**)



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