सत्यमेव जयते

Ministry of Health and Family Welfare
Government of India

# Comprehensive National Nutrition Survey

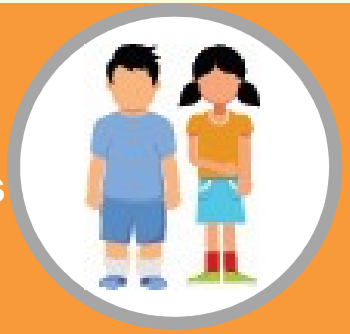
## 2016 - 2018

## Chhattisgarh
## State Presentation

Birth to Adolescence

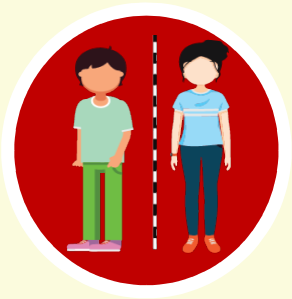
# Largest Micronutrient Survey ever conducted: CNNS 2016-18

**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

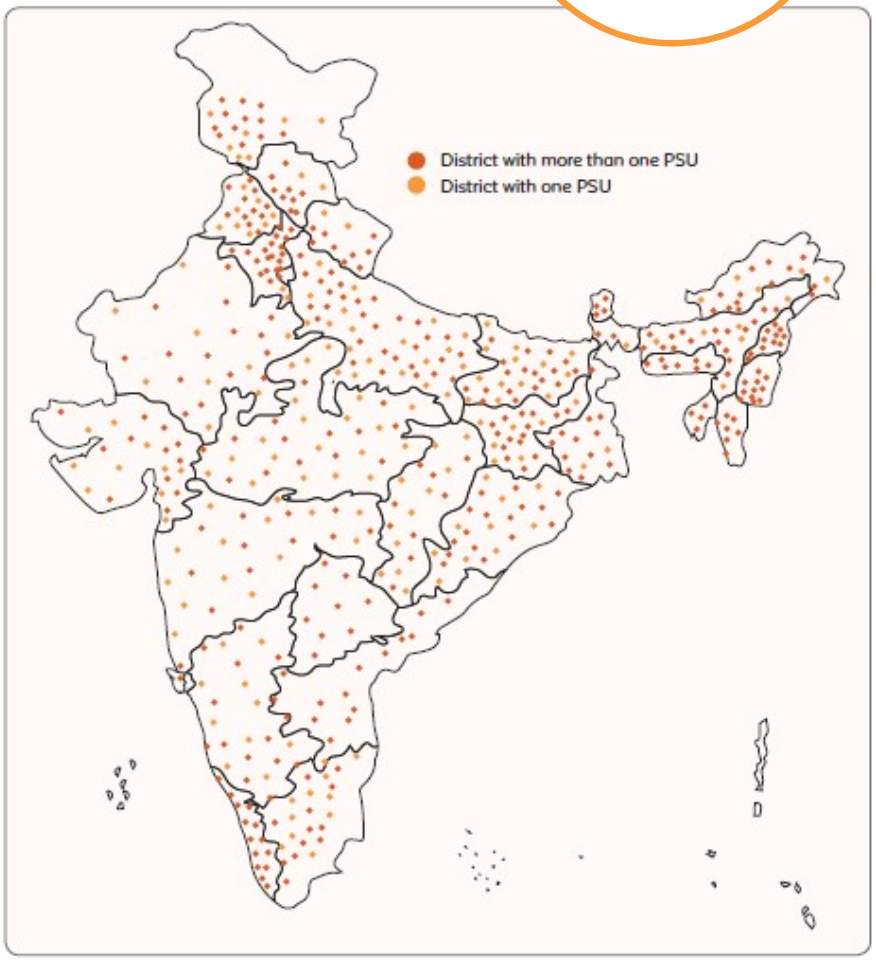
*Soumya Swaminathan, et al. (2019), The burden of child and maternal malnutrition and trends in its indicators in the states of India: the Global Burden of Disease Study 1990–2017. https://doi.org/10.1016/S2352-4642(19)30273-1

# 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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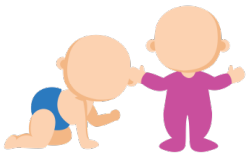
# Anthropometry data

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



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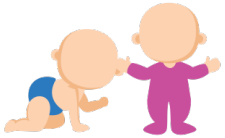
# Biochemical indicators - micronutrient deficiencies and NCDs

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

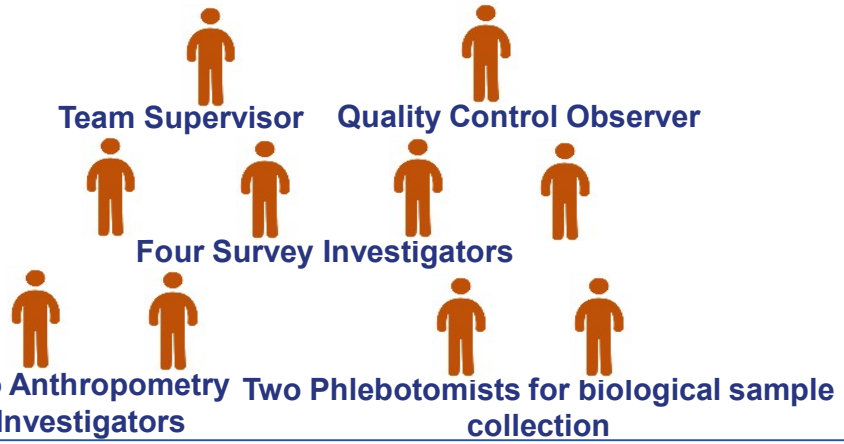
***Second Level***

- 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 |

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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 Chhattisgarh

**CNNS covered 65 PSUs for data collection in Chhattisgarh**

**Achieved following sample size by age groups:**

| | 0-4 years | 5-9 years | 10-19 years | Total |
|---|---|---|---|---|
| Household and anthropometry data | 1,200 | 1,203 | 1,085 | **3,488** |
| Biological sample | 703 | 627 | 533 | **1,863** |



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# Period of data collection in Chhattisgarh

## CNNS data collection period: September 28, 2017 to April 26, 2018

- CNNS collected data during the autumn season of 2017 through summer season of 2018, while
- NFHS collected data in the winter through autumn season and summer season of 2016

| Survey | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNNS 2017-18** | April 26, 2018 | | | | | | | | September 28, 2017 to | | | |
| **NFHS4 2016** | January to June, 2016 | | | | | | | | | | | |



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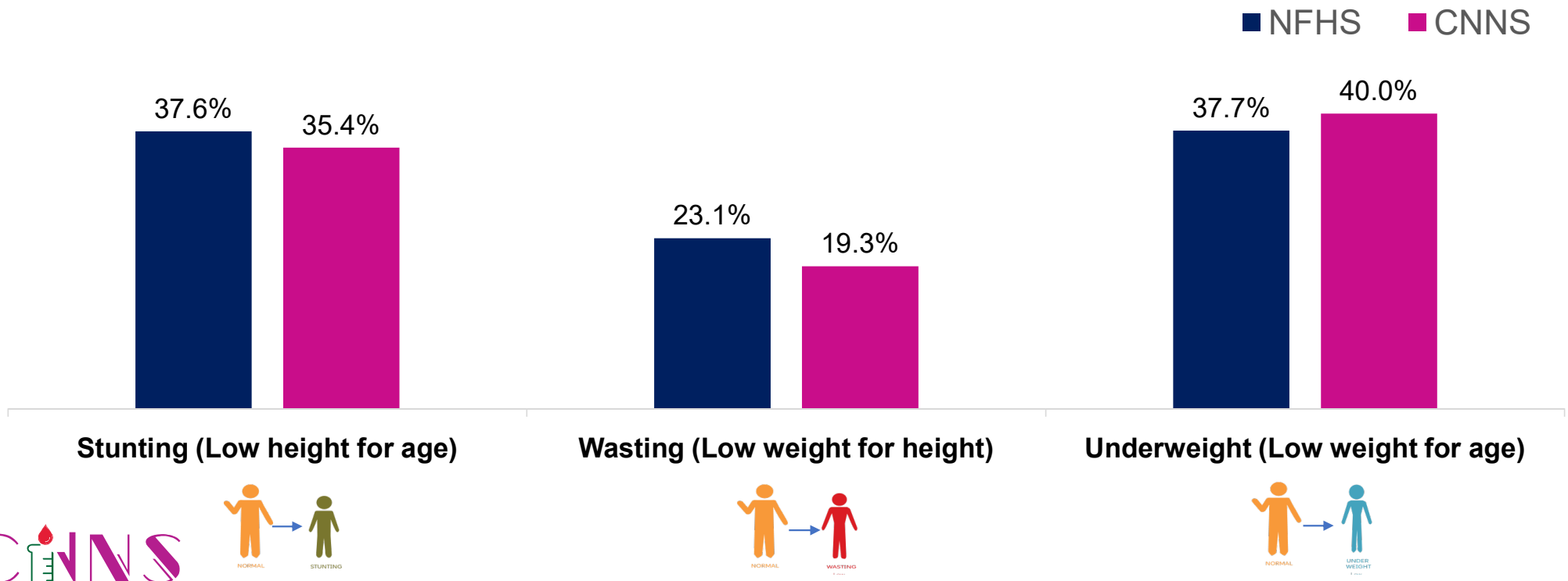
# Chhattisgarh key findings: Anthropometry (1/2)

No significant change in stunting, wasting and underweight in children under 5 years

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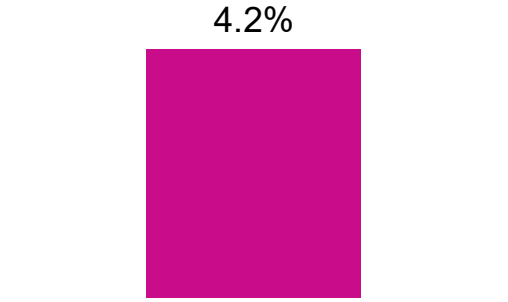
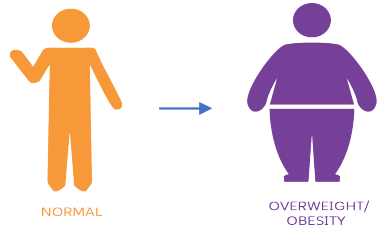
# Chhattisgarh key findings: Anthropometry (2/2)

**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.

**4%** of adolescents aged 10-19 years were overweight or obese.

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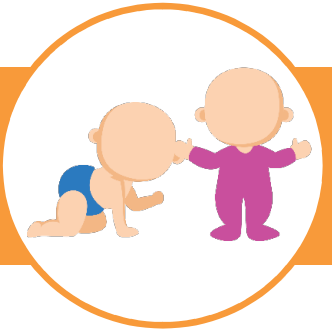
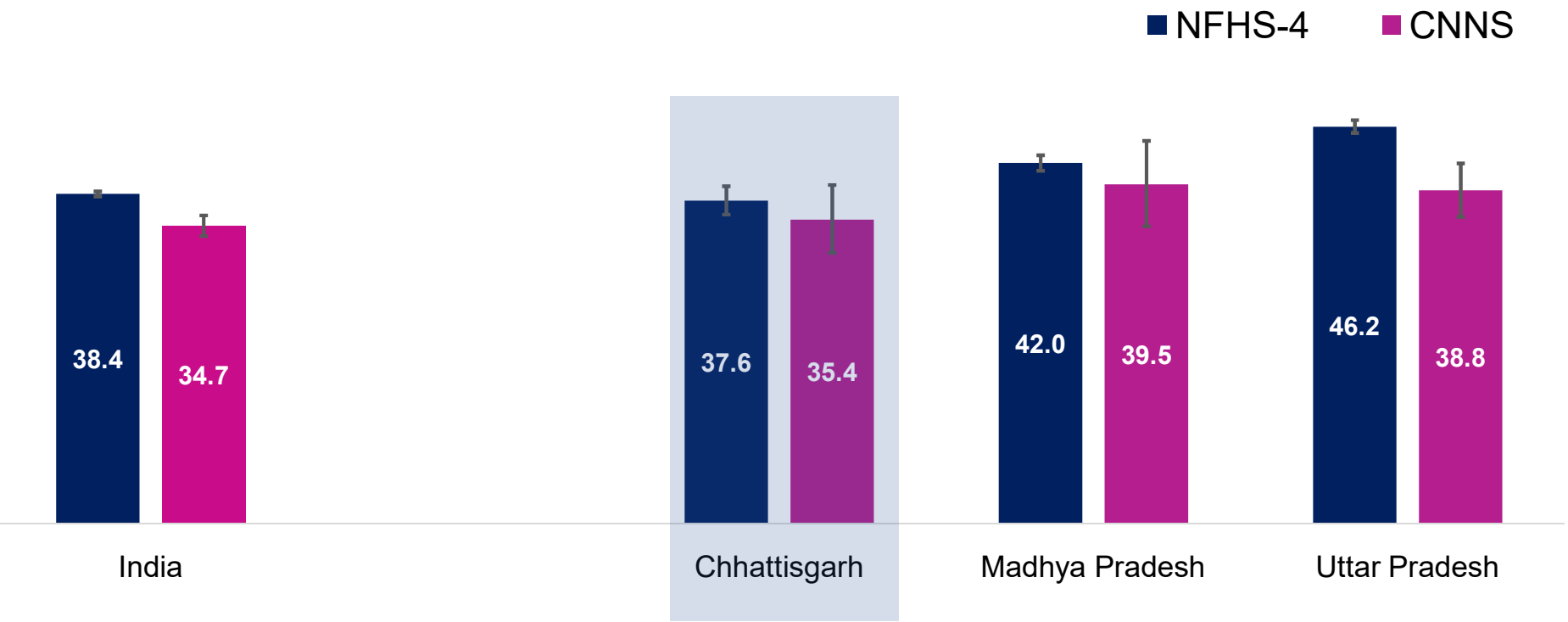
# Stunting unchanged among children under five



No discernable change in stunting was observed in CNNS compared to NFHS-4 – **35%** vs **38%** in Chhattisgarh

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



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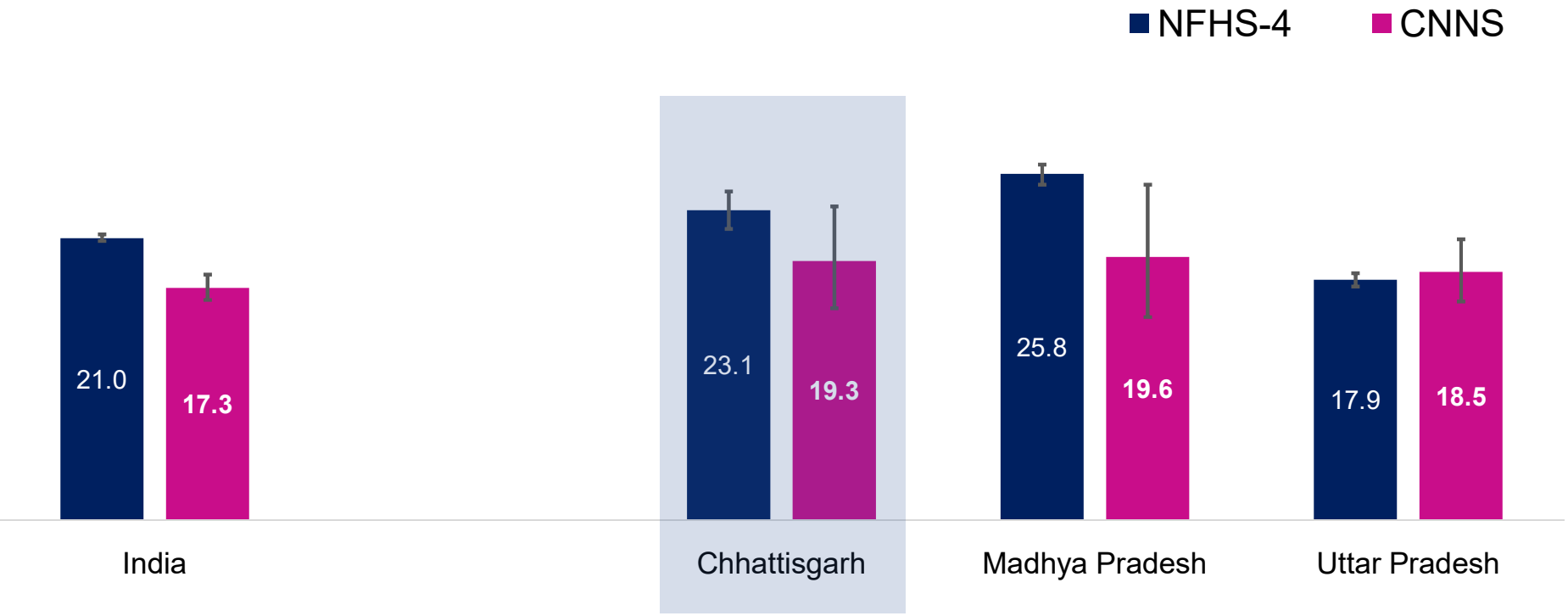
# Wasting among children under five did not decline significantly

Prevalence of wasting did not decline significantly in Chhattisgarh between NFHS-4 and CNNS – **23%** vs **19%**

Among the central region states, wasting declined significantly in Madhya Pradesh



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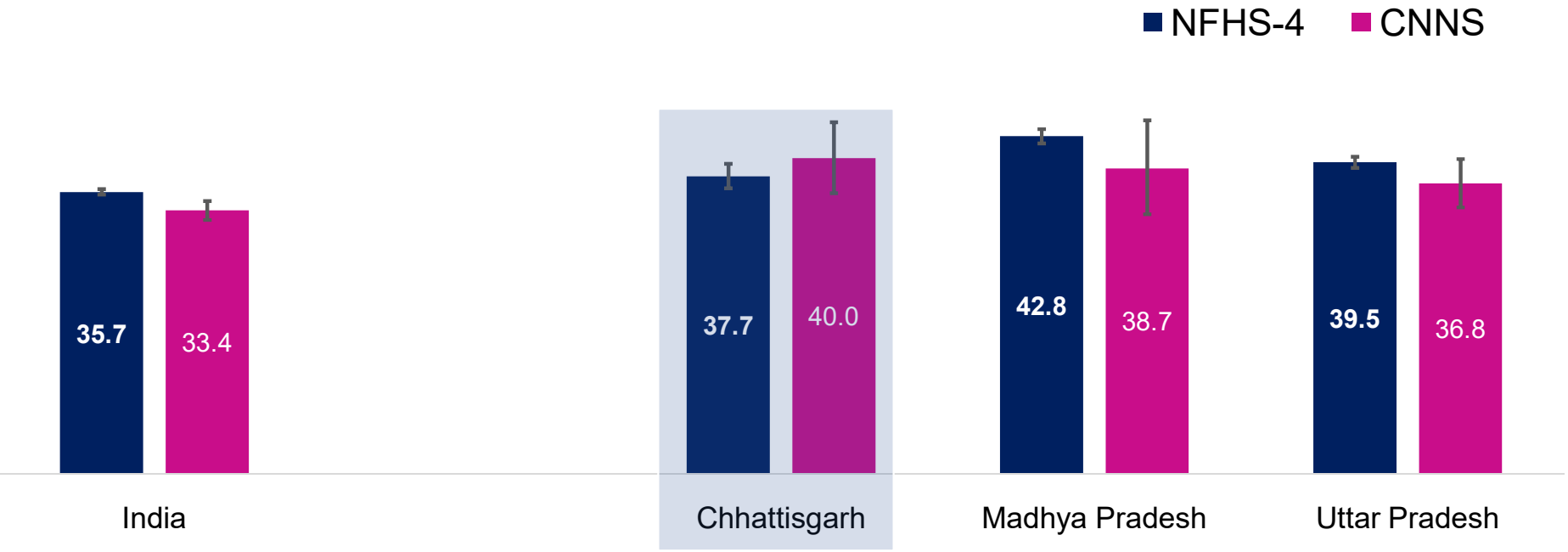
# Prevalence of underweight among children under five unchanged

Underweight is a composite measure of chronic and acute malnutrition

No significant change in prevalence of underweight between NFHS-4 and CNNS – **38%** Vs **40%** in Chhattisgarh

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

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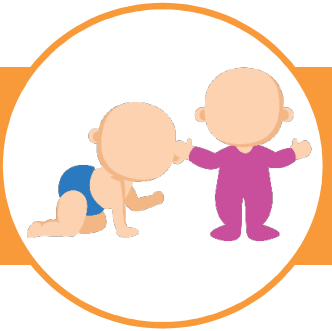
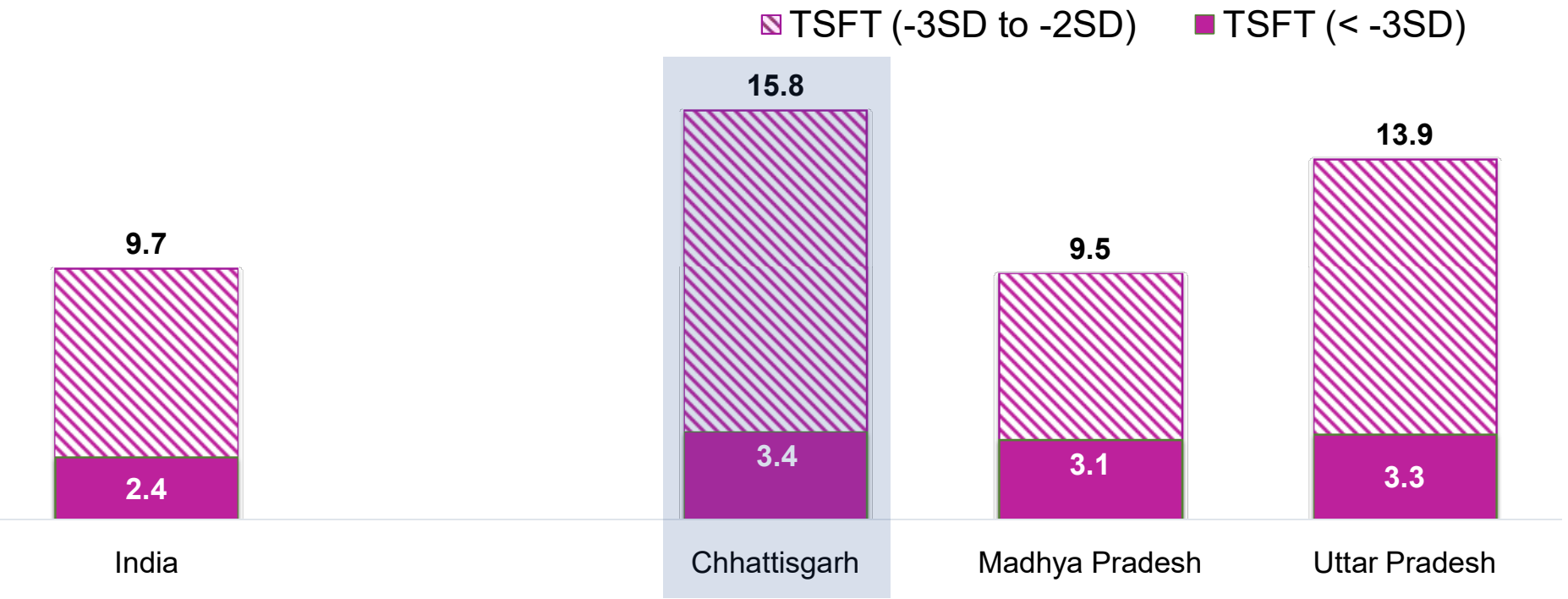
# Triceps Skinfold Thickness (TSFT) for children under five



Low fat mass as reported by TSFT in Chhattisgarh **(16%)** was significantly higher than National level **(10%)**



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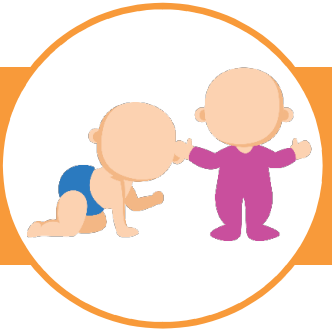
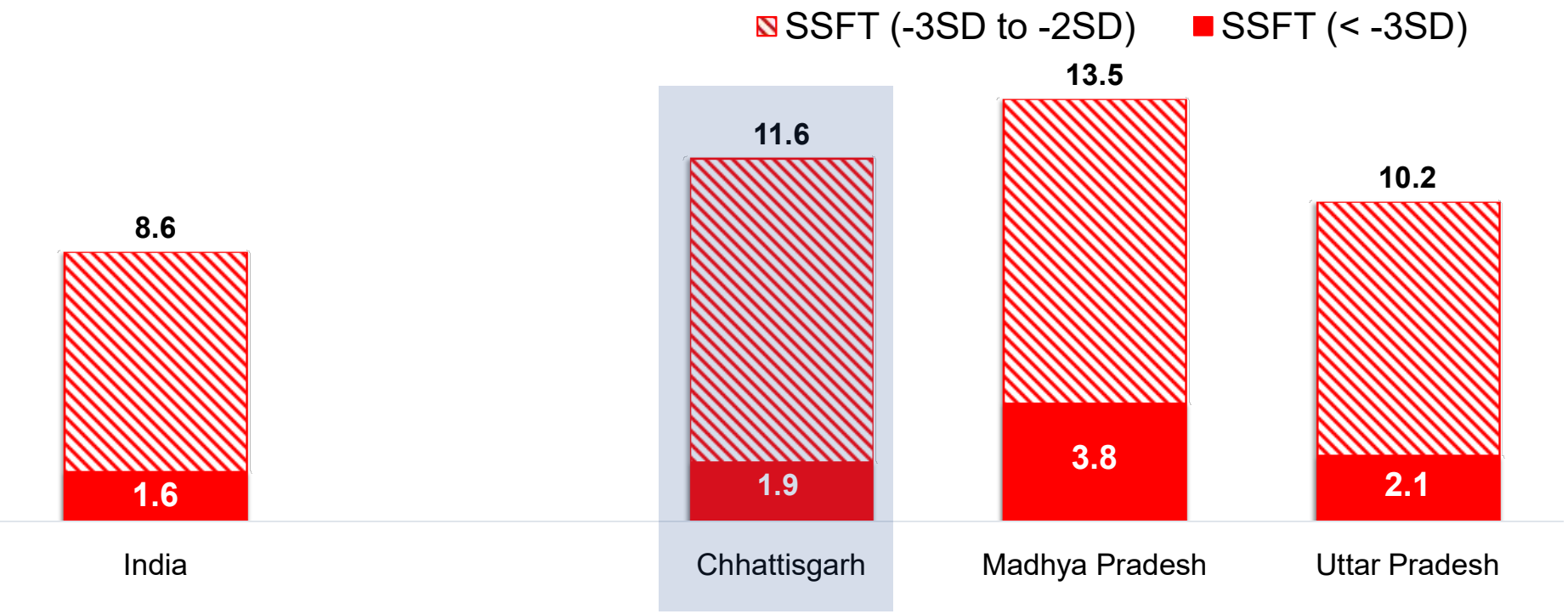
# Subscapular Skinfold Thickness (SSFT) for children aged 1-4 years



Thinness as reported by SSFT in Chhattisgarh (**12%**) was higher than national level (**9%**)



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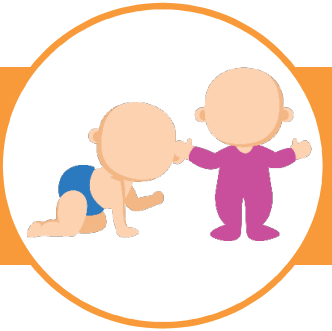
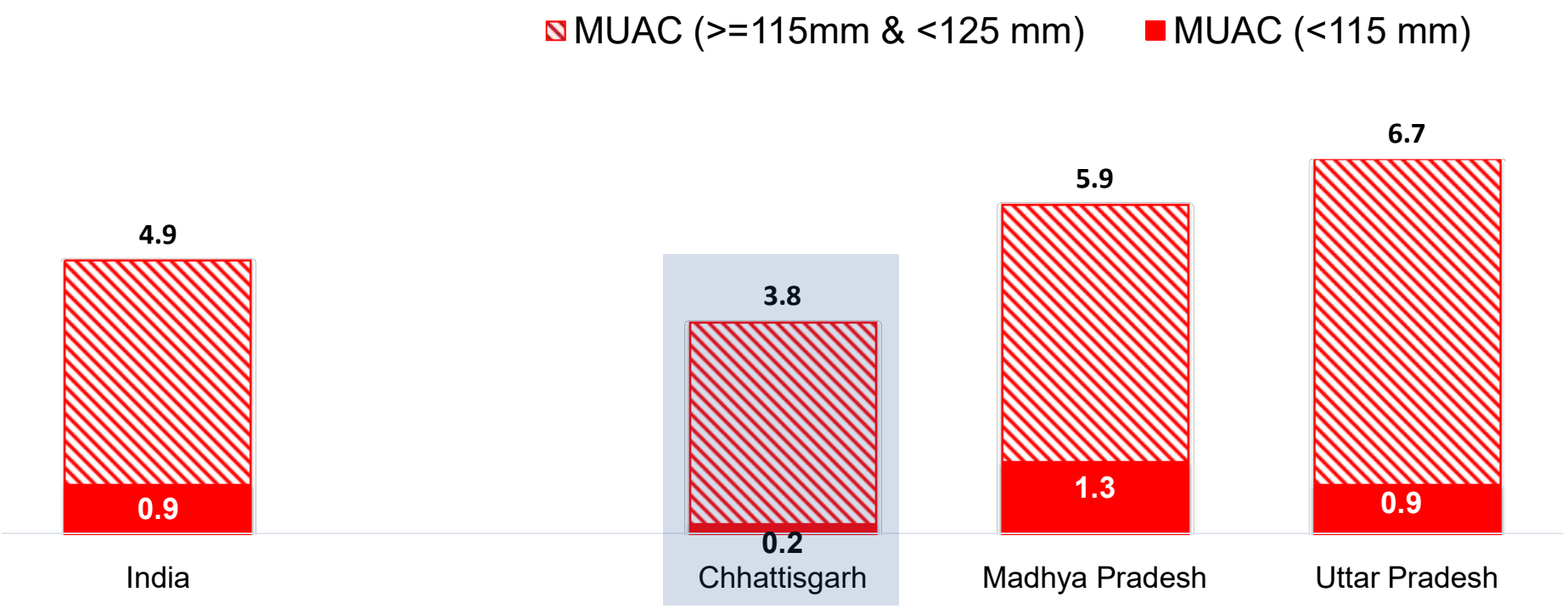
# Mid Upper Arm Circumference (MUAC) for children aged 6-59 months



About **4%** children in Chhattisgarh had low MUAC

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



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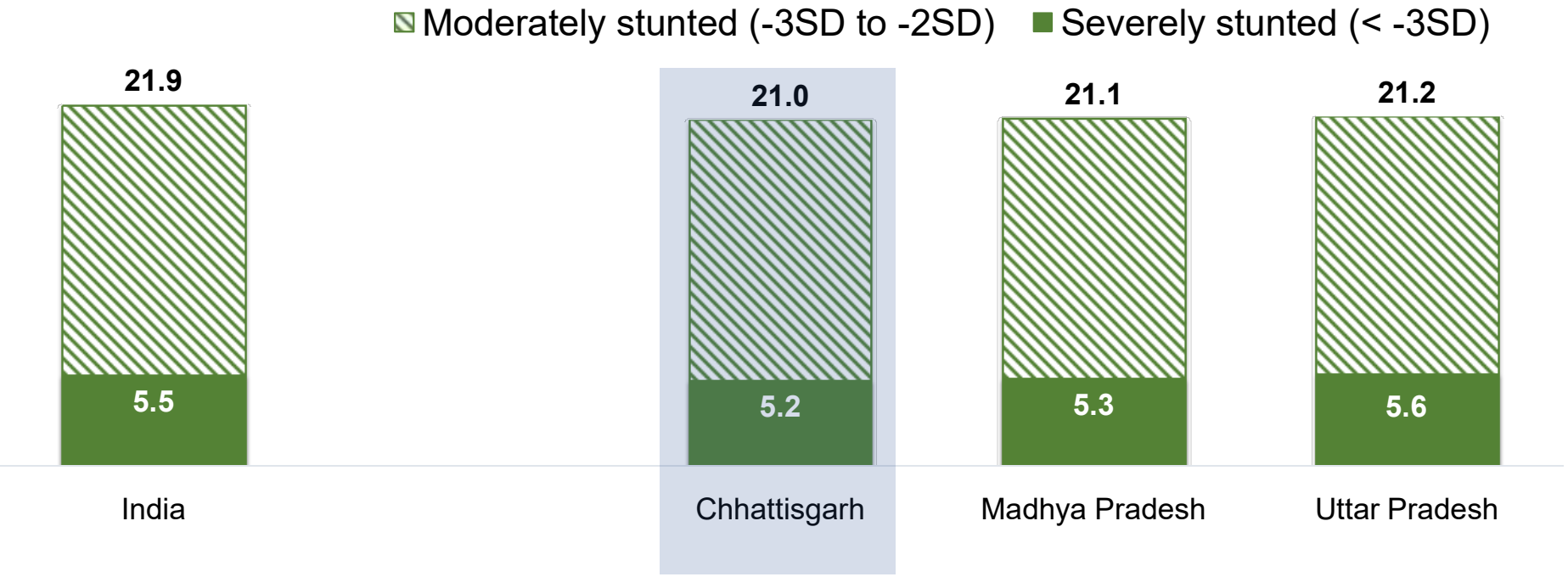
# Stunting among school-age children (5-9 years)

**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

Prevalence of stunting across the central region states is at similar level in India



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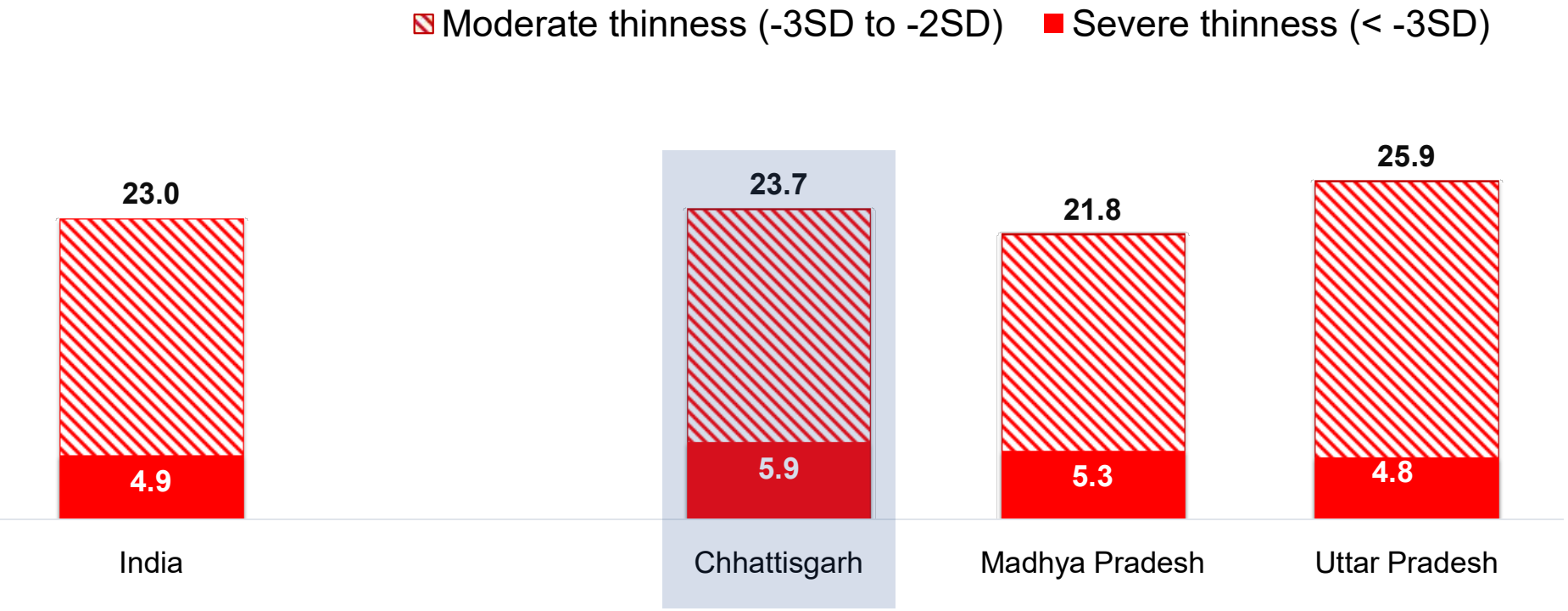
# Thinness among school-age children (5-9 years)

**1/4** children aged 5-9 years was thin in Chhattisgarh (**24%**)

Among central states, prevalence of thinness was highest in Uttar Pradesh (**26%**)





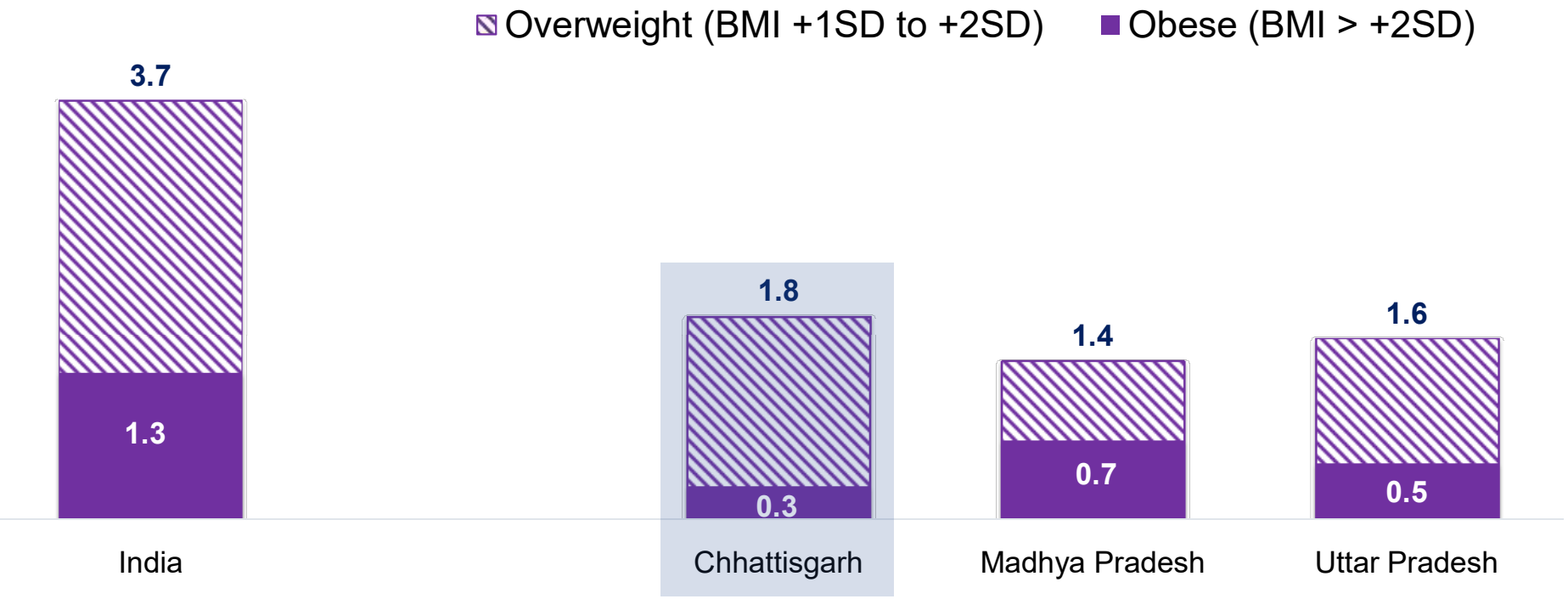

Birth to Adolescence

# 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 Chhattisgarh (**2%**) was half of national level (**4%**)

Among central states, prevalence of overweight in this age group falls at similar level



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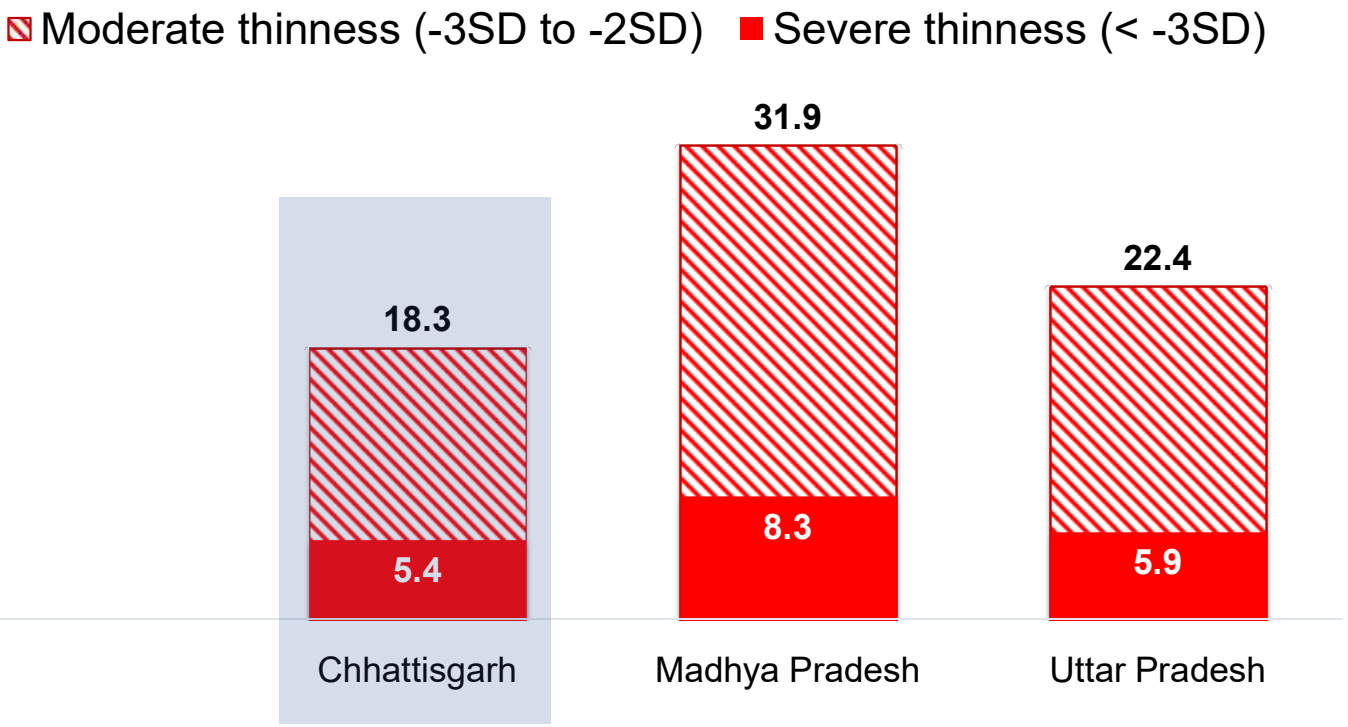
# Thinness among adolescents aged 10-19 years substantia high

**18%** of adolescents aged 10-19 years were thin in Chhattisgarh, significantly lower than national average (**24%**)

Among the central region states, Madhya Pradesh (**32%**) had very high prevalence of thinness



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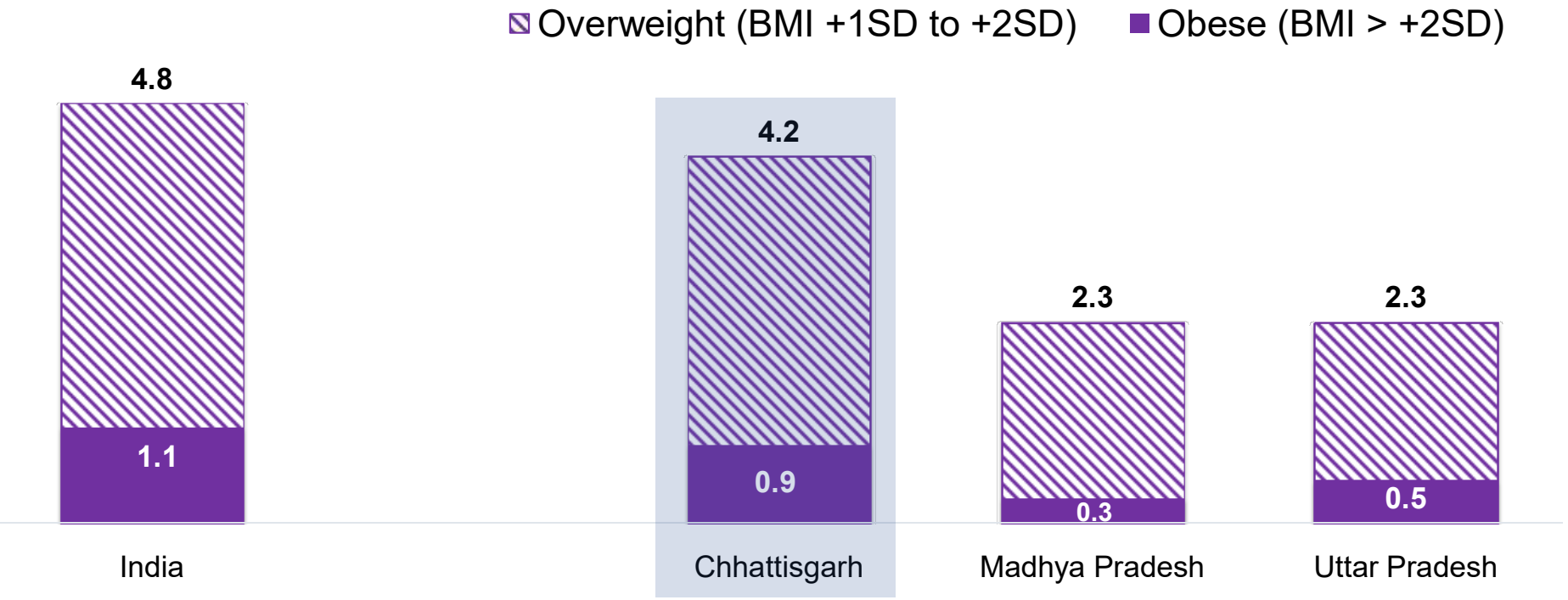
# Prevalence of overweight among adolescents aged 10-19 years high

**4%** adolescents were overweight in Chhattisgarh, similar to the national average (**5%**)

Among the central region states, Chhattisgarh had the highest prevalence of overweight

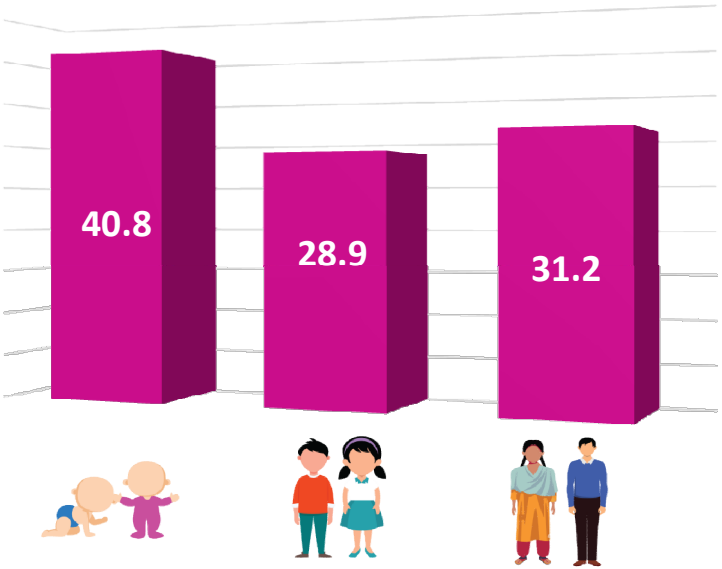





Birth to Adolescence

# Chhattisgarh key findings: Anaemia and iron deficiency

## Anaemia




**In Chhattisgarh, 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**



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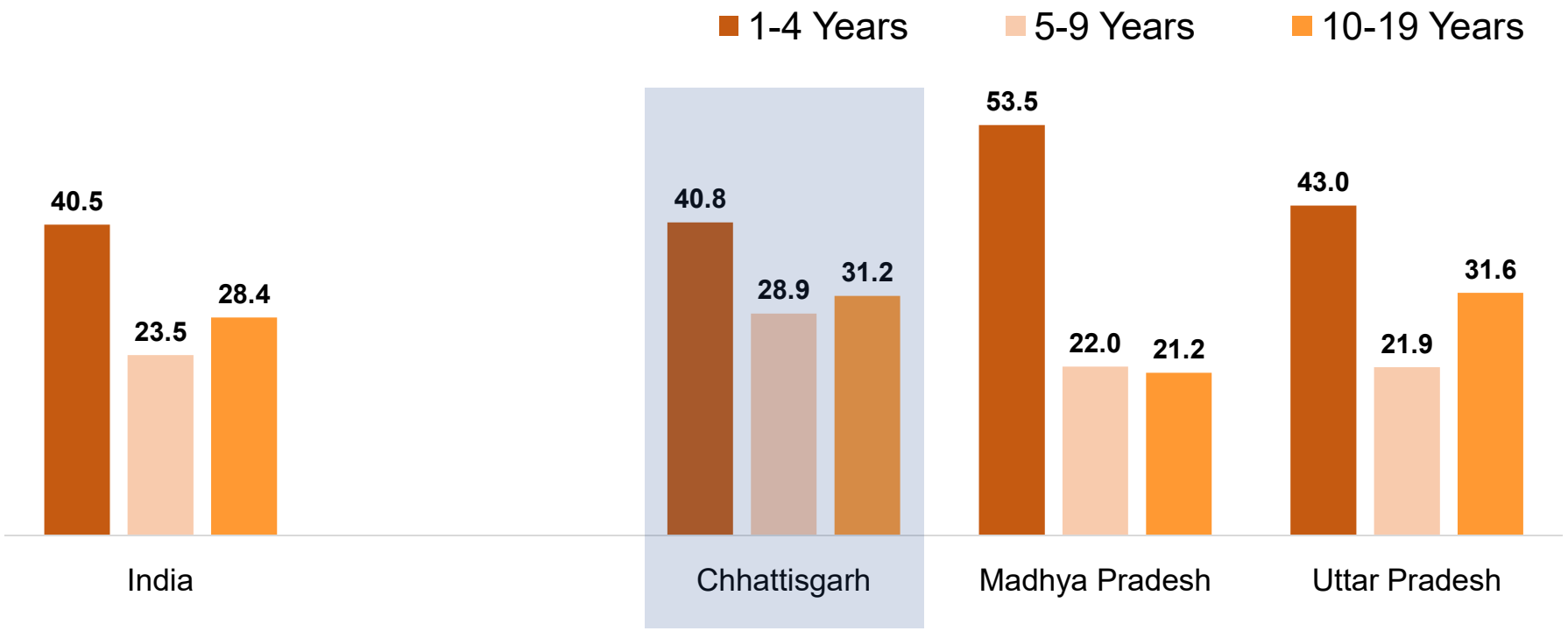
# Prevalence of Anaemia among children and adolescents

**2/5** children aged 1-4 years were anaemic in Chhattisgarh (**41%**), at similar level as the 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)

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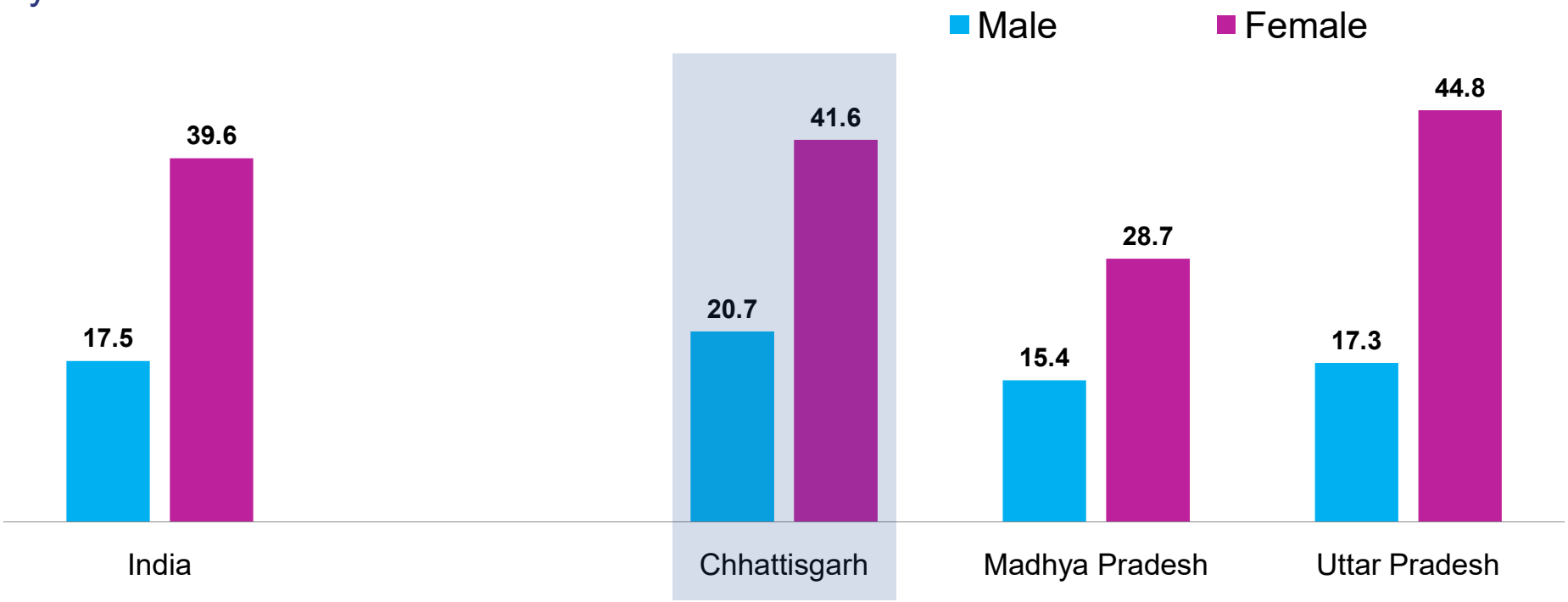
# Prevalence of Anaemia among adolescents (10-19 years)

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

In Chhattisgarh, as in other central region states, adolescent girls were twice more likely than adolescent boys to be anaemic



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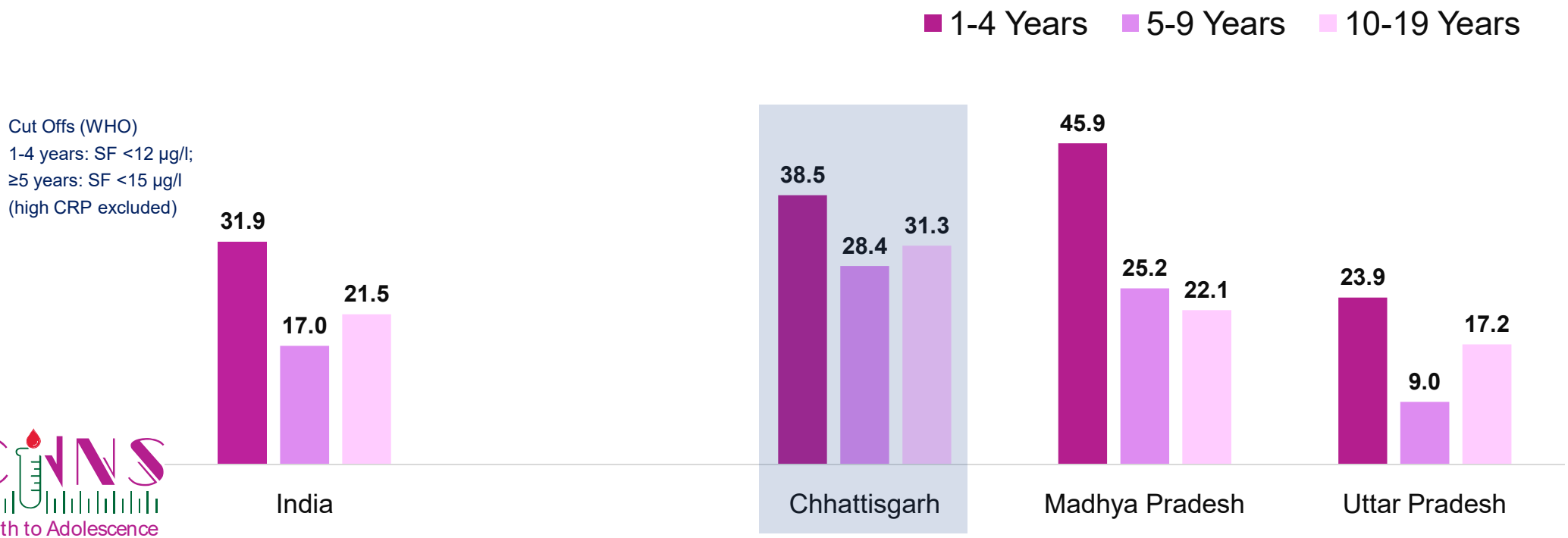
# Iron deficiency measured by serum ferritin among children and adolescents

Almost **2/5** children aged 1-4 years had iron deficiency in Chhattisgarh (**39%**), somewhat higher than the national average (**32%**);

Among central region states, prevalence was highest among children aged 1-4 years






Birth to Adolescence

# Chhattisgarh key findings: Vitamin A and Vitamin D deficiency

Vitamin A deficiency was higher (29%) in school-age children 5-9 years

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 11% to 22% 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

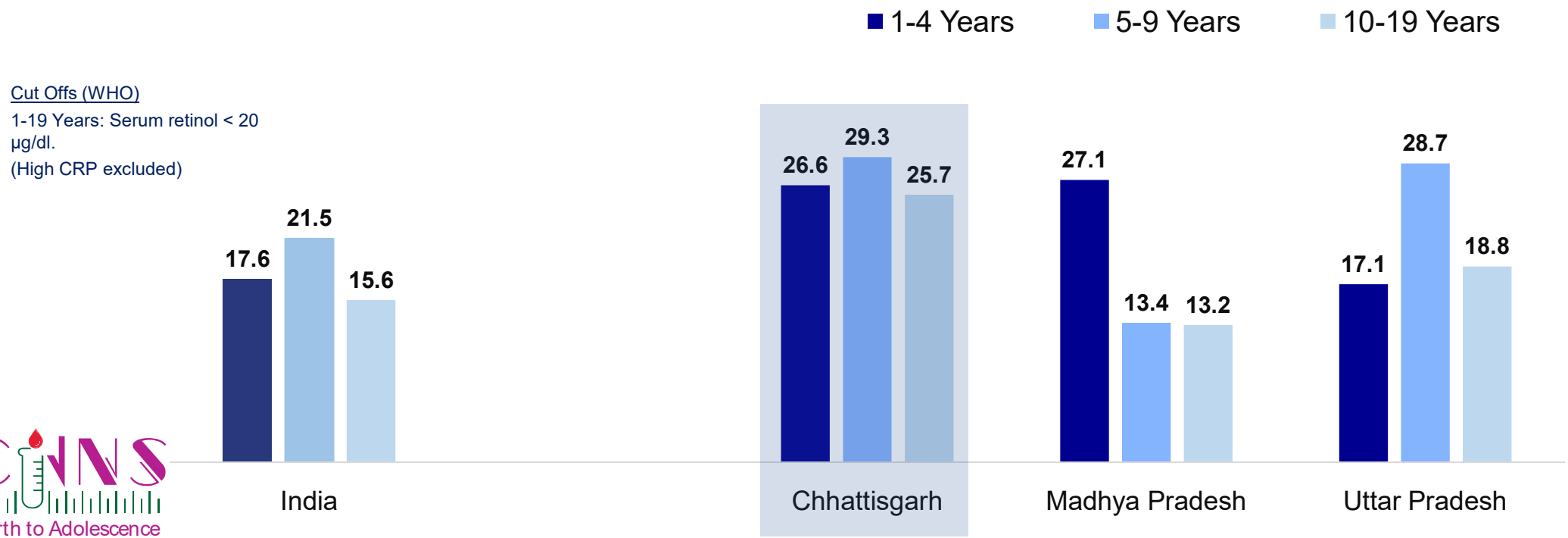


Birth to Adolescence

# Vitamin A deficiency among children and adolescents

**26-29%** of children and adolescents had Vitamin A deficiency in Chhattisgarh, significantly higher than the national average (**18-22%**)

Among central states, prevalence of Vitamin A deficiency did not show any particular pattern



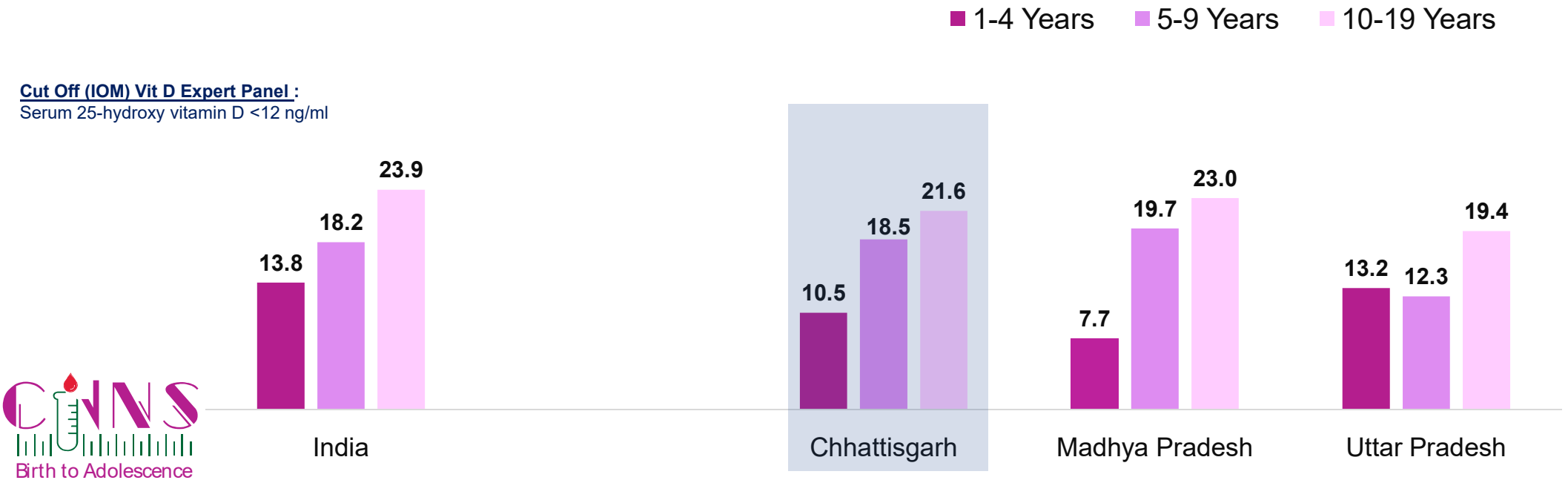



Birth to Adolescence

# Vitamin D deficiency increases with age

**11-22%** of children and adolescents had Vitamin D deficiency in Chhattisgarh, at similar level of India as a whole (**14-24%**) ; Vitamin D deficiency increased with age

Among central region states, Vitamin D deficiency among children and adolescents shows similar pattern



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# Chhattisgarh key findings: Non-communicable diseases

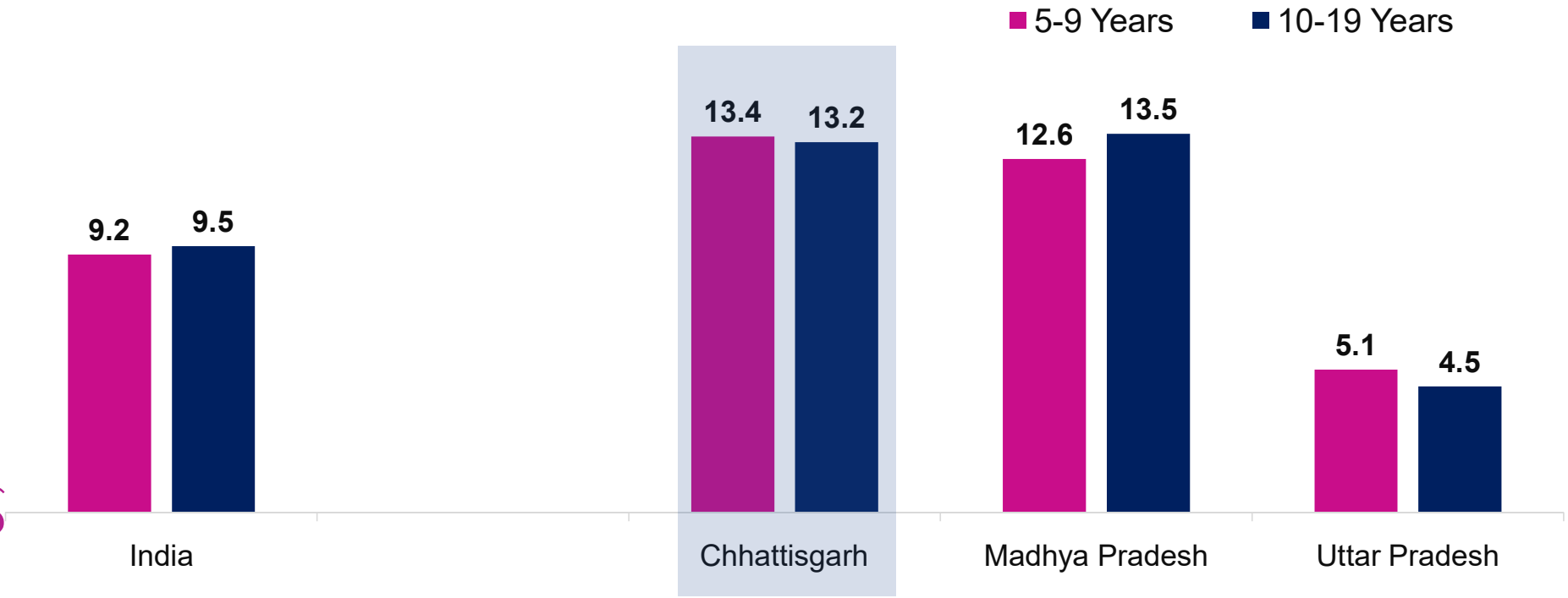
13% of school-age children and adolescents were found with high level of glycosylated haemoglobin (HbA1c).

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), **13%** of children and adolescents had increased risk of diabetes in Chhattisgarh, higher than national average

Among all central states, risk of diabetes was higher in Chhattisgarh and Madhya Pradesh compared to Uttar Pradesh



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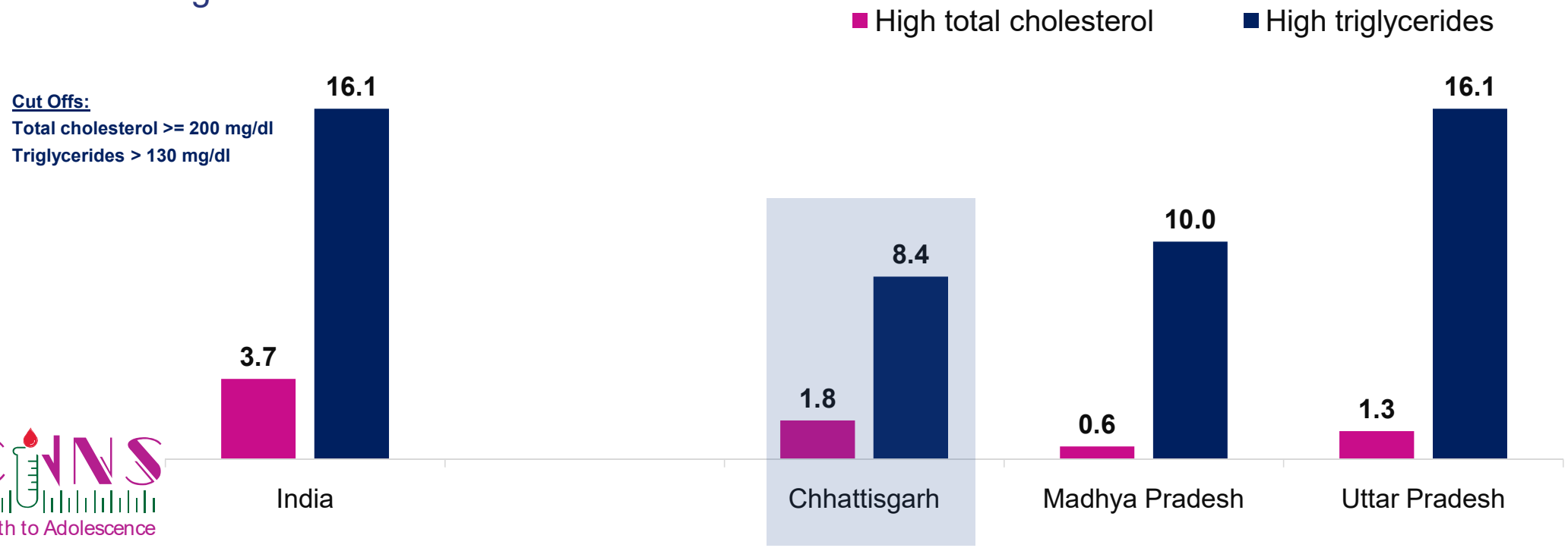
# High total cholesterol and high triglycerides among adolescents

Elevated risk of NCDs in Chhattisgarh among adolescents – **2%** of had high level of total cholesterol and **8%** had high level of triglycerides

Prevalence of total cholesterol and high triglycerides were lower in the central states than the national average



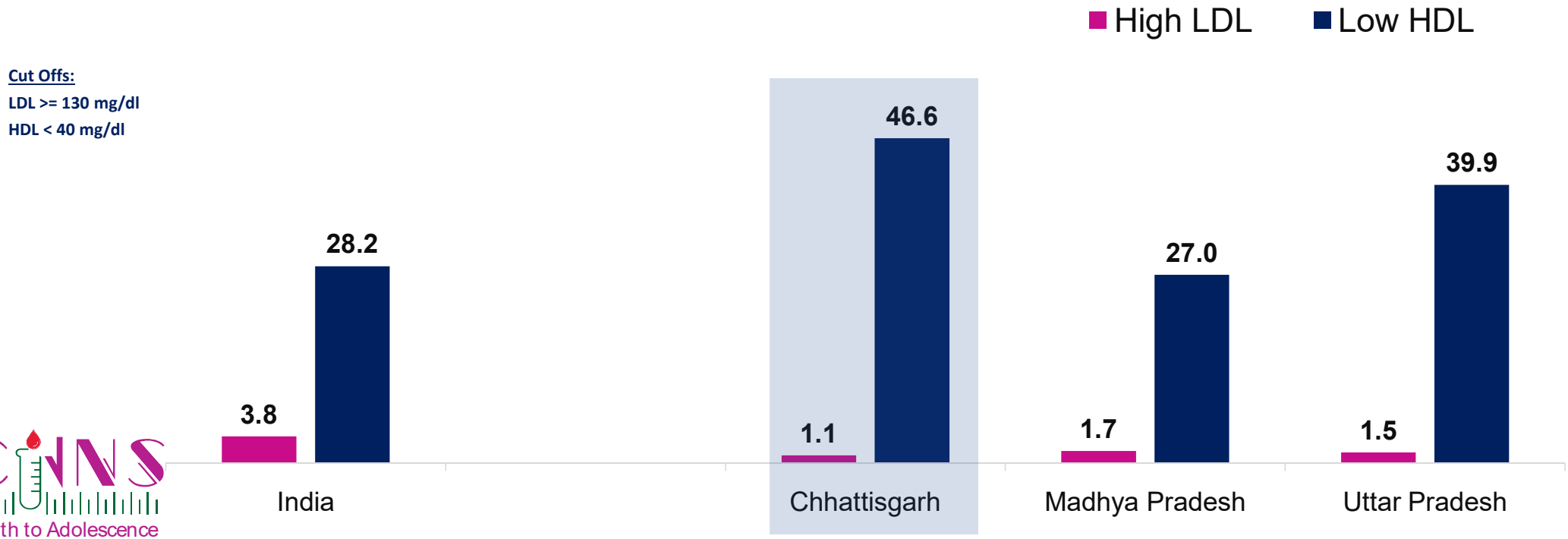



Birth to Adolescence

# High LDL and low HDL among adolescents

Risk of NCDs among adolescents in Chhattisgarh was high – **1%** had high level of LDL and **47%** had low level of HDL

Among the central region states, prevalence of low HDL was substantially high (**27-47%**)






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

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