सत्यमेव जयते

Ministry of Health and Family Welfare
Government of India

Comprehensive National Nutrition Survey

2016 – 2018

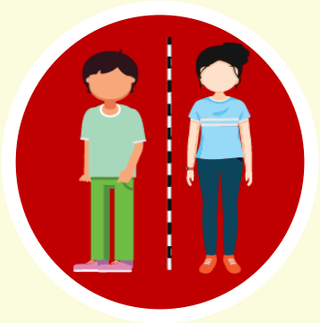
Assam
State Presentation

Birth to Adolescence

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
Lab technicians

900
Interviewers

200
Trainers and coordinators

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*

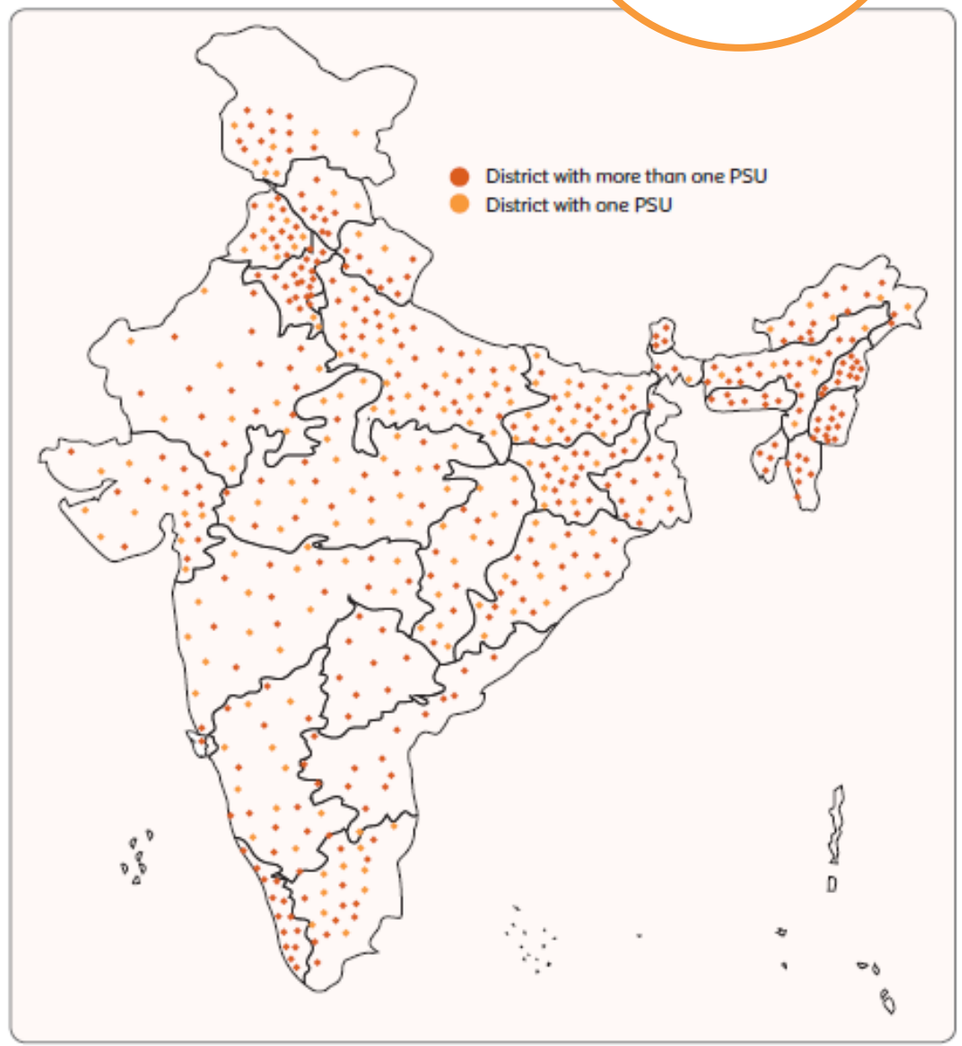
*Soumya Swaminathan, et al. (2019), The burden of child and maternal malnutrition and trends in its indicators in the states of India: the Global Burden of Disease Study 1990–2017. https://doi.org/10.1016/S2352-4642(19)30273-1

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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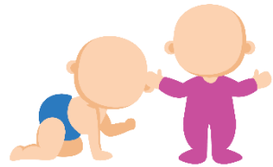
Anthropometry data

	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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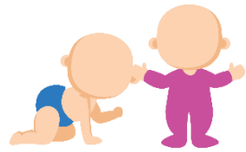
Biochemical indicators - micronutrient deficiencies and NCDs

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

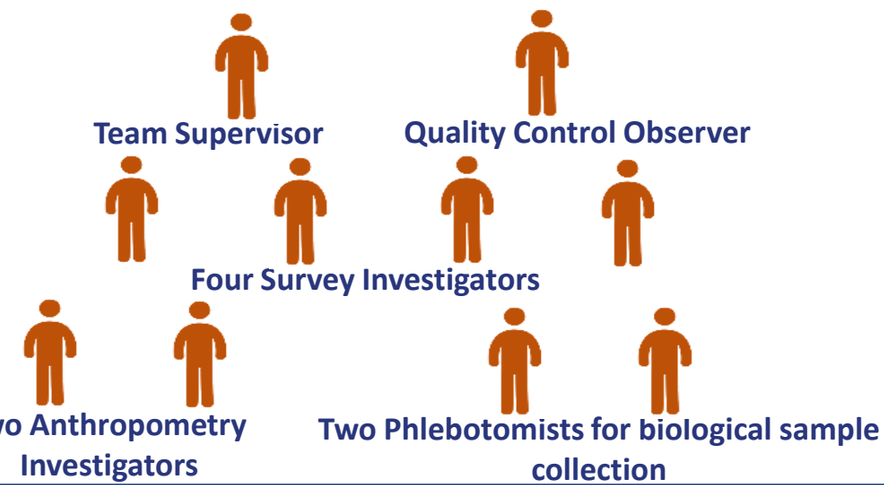
Second Level

- 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

Team Composition for data collection



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Quality Assurance Measures for Dat 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 Assam

CNNS covered 70 PSUs for data collection in Assam

Achieved following sample size by age groups:

	0-4 years	5-9 years	10-19 years	Total
Household and anthropometry data	1,452	1,455	1,386	**4,293**
Biological sample	419	536	495	**1,450**

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Period of data collection in Assam

CNNS data collection period: July 12, 2016 to November 2, 2016

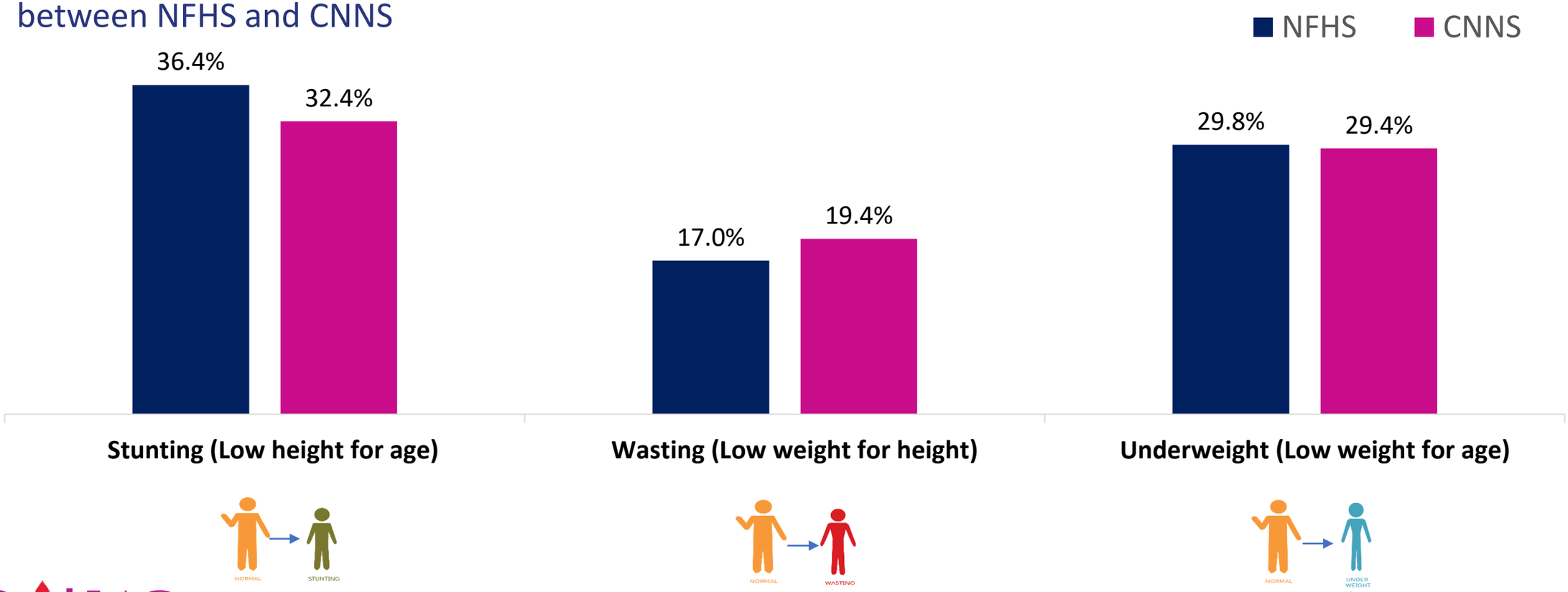
- CNNS collected data during the monsoon season through autumn season of 2016.
- NFHS collected data during the autumn season of 2015 through early spring of 2016.

Survey	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CNNS 2016							July to November, 2016					
NFHS 4 2015-16	March, 2016										November, 2015	

CNNS
Birth to Adolescence

Assam key findings: Anthropometry (1/2)

No discernable change in prevalence of stunting, wasting and underweight in children under 5 years between NFHS and CNNS



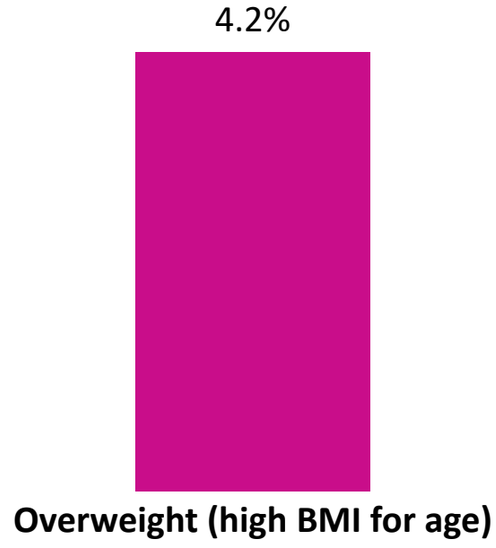
CNNS
Birth to Adolescence

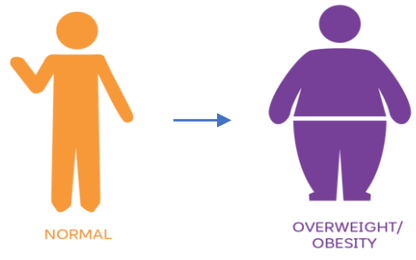
Assam key findings: Anthropometry (2/2)

1/5 adolescents aged 10-19 years was 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.

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



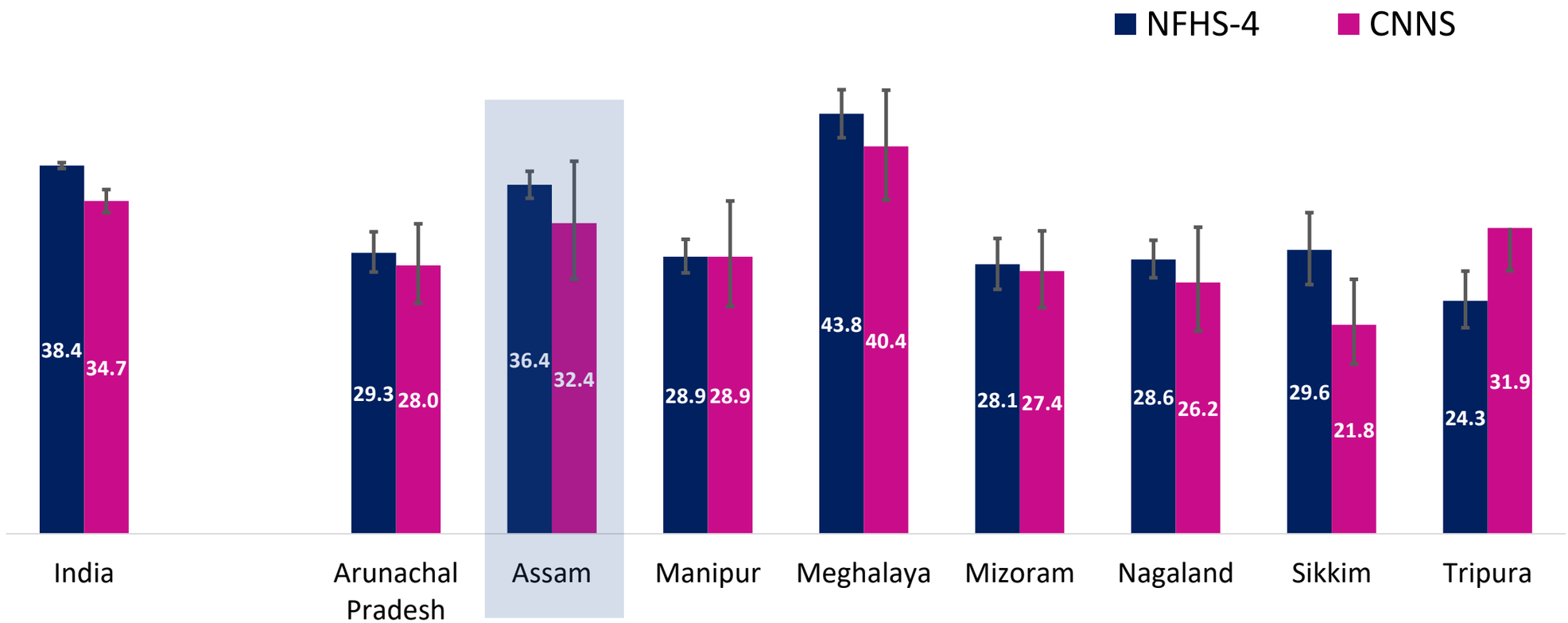


Birth to Adolescence

Stunting among children under five

No significant decline in prevalence of stunting was observed in CNNS (**32%**) compared to NFHS-4 (**36%**) in Assam

In none of the northeastern states stunting declined significantly

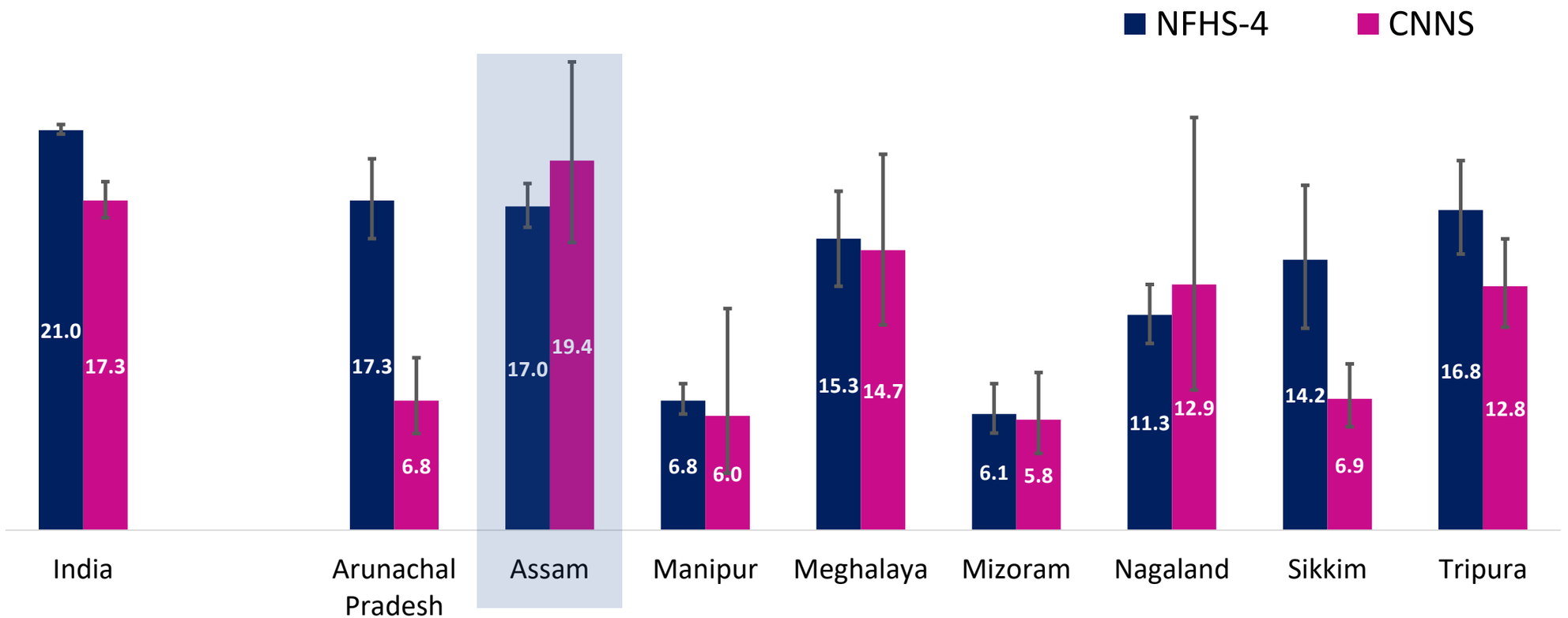


Birth to Adolescence

Wasting among children under five

Prevalence of wasting did not change significantly in Assam between NFHS-4 (**17%**) and CNNS (**19%**)

Except in Arunachal Pradesh and Sikkim, wasting remained nearly at the same level in the region



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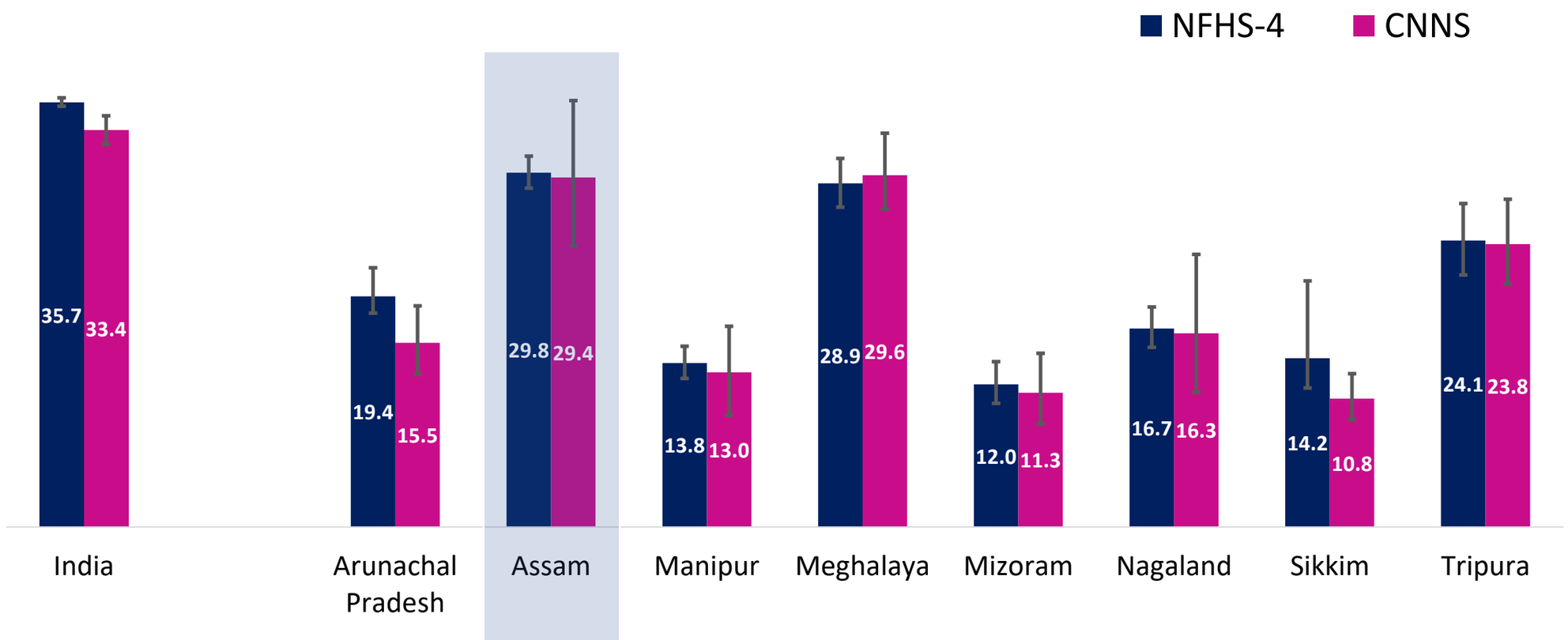
Prevalence of underweight among children under five

Underweight is a composite measure of chronic and acute malnutrition

The prevalence of underweight did not change between NFHS-4 and CNNS – **30%** Vs **29%**

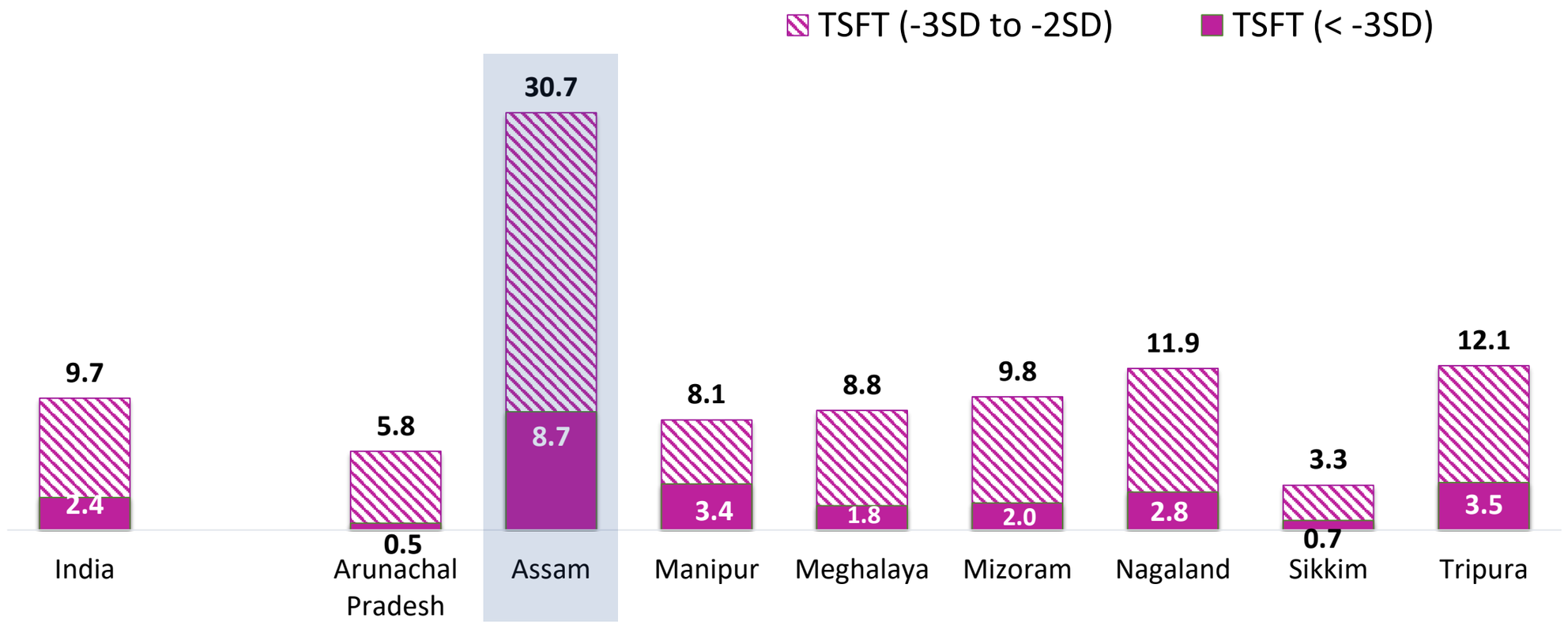
Prevalence remained at the same level in most of the northeastern states



Birth to Adolescence

Triceps Skinfold Thickness (TSFT) for children under five

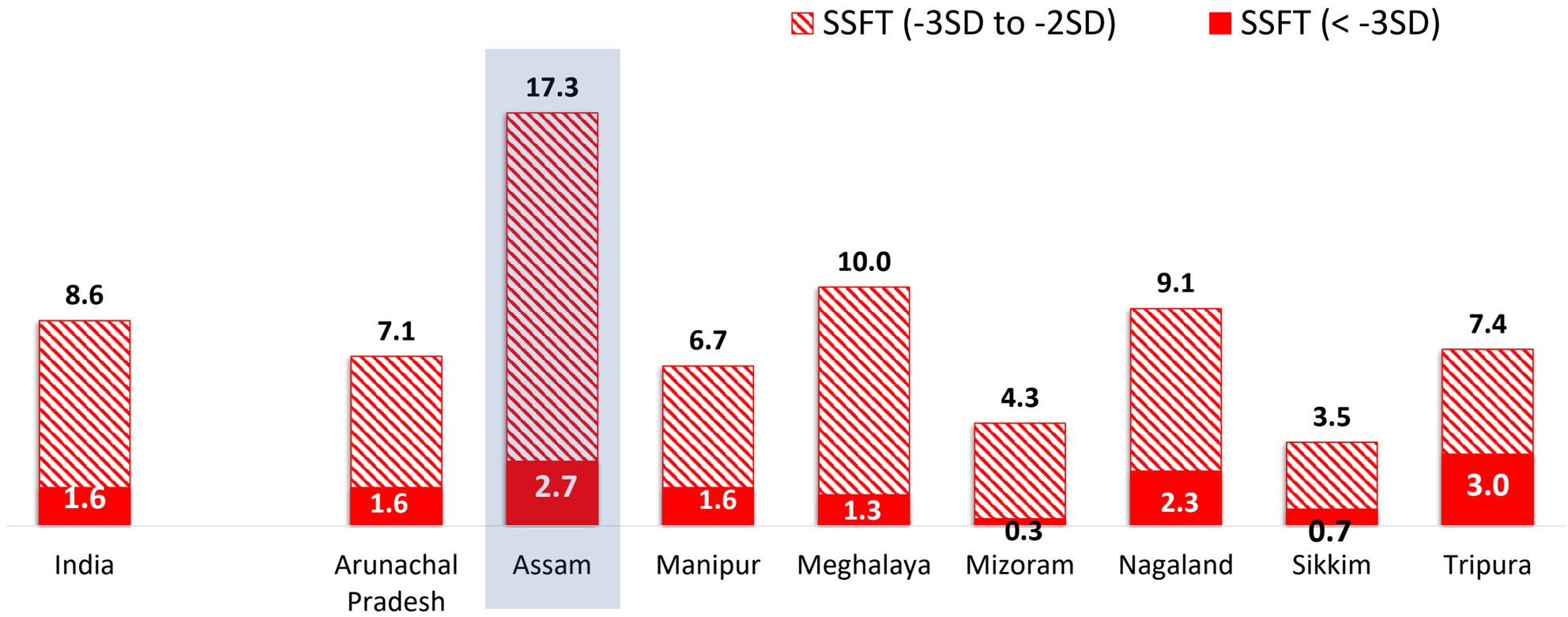
Low fat mass as reported by TSFT in Assam was the highest among the northern states and three times the national average



Birth to Adolescence

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

Thinness as reported by SSFT in Assam (**17%**) was the highest among northeastern states and double the national average

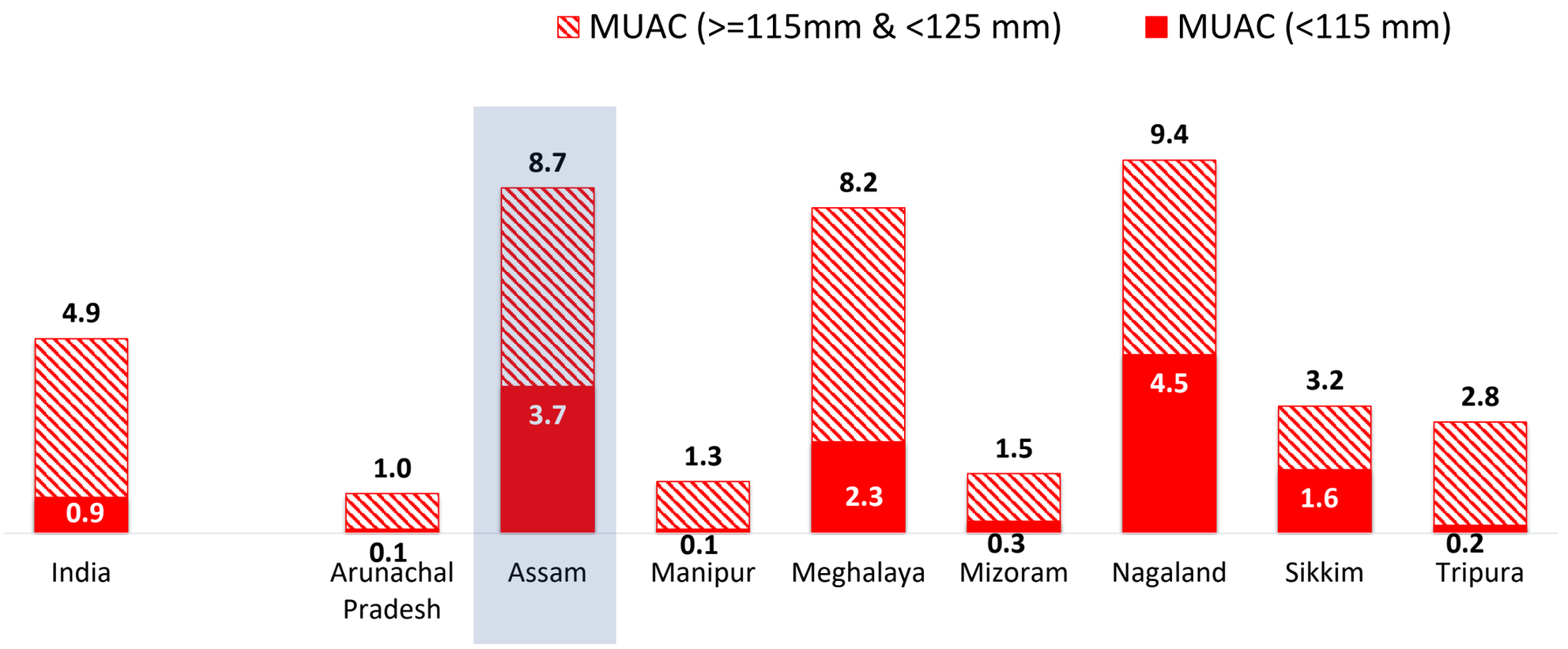


Birth to Adolescence

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

About **9%** children in Assam had low MUAC, nearly double the national average

Prevalence of low MUAC varied widely (ranged between **1%** and **9%**) across the northeastern states

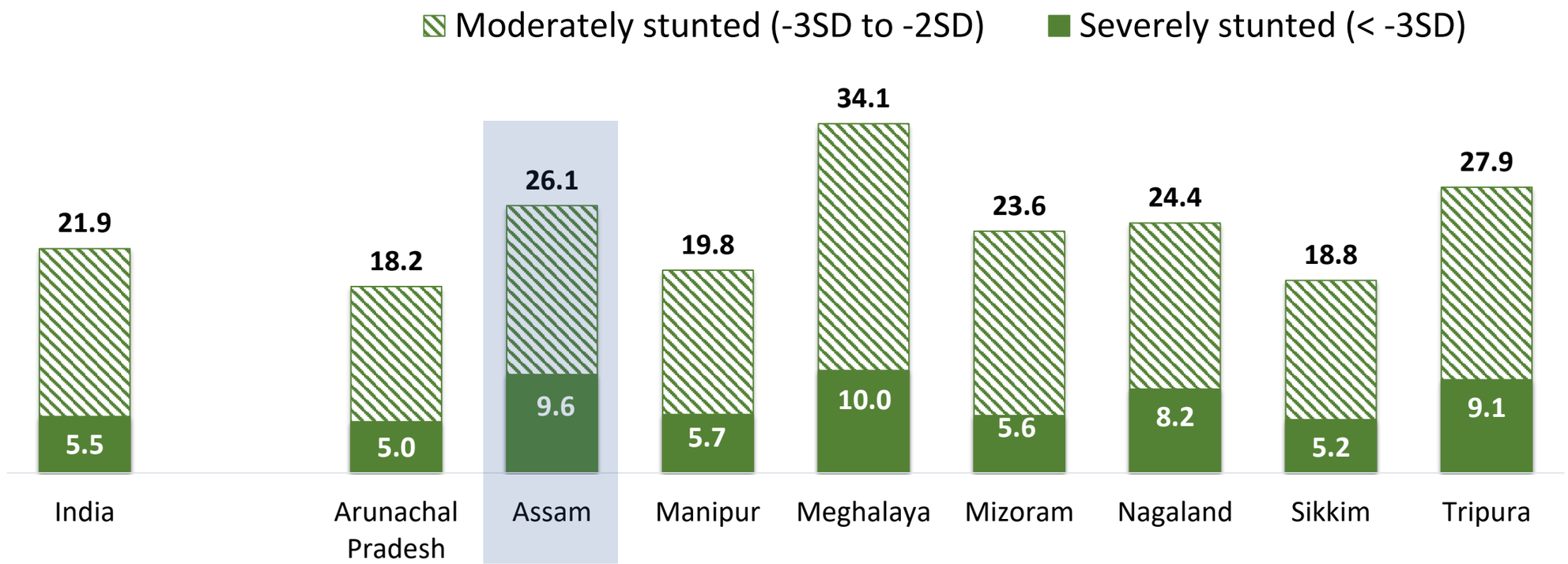


Birth to Adolescence

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

1/4 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 among the northeast states varied, Assam, Meghalaya, Mizoram, Nagaland, Tripura were above national average

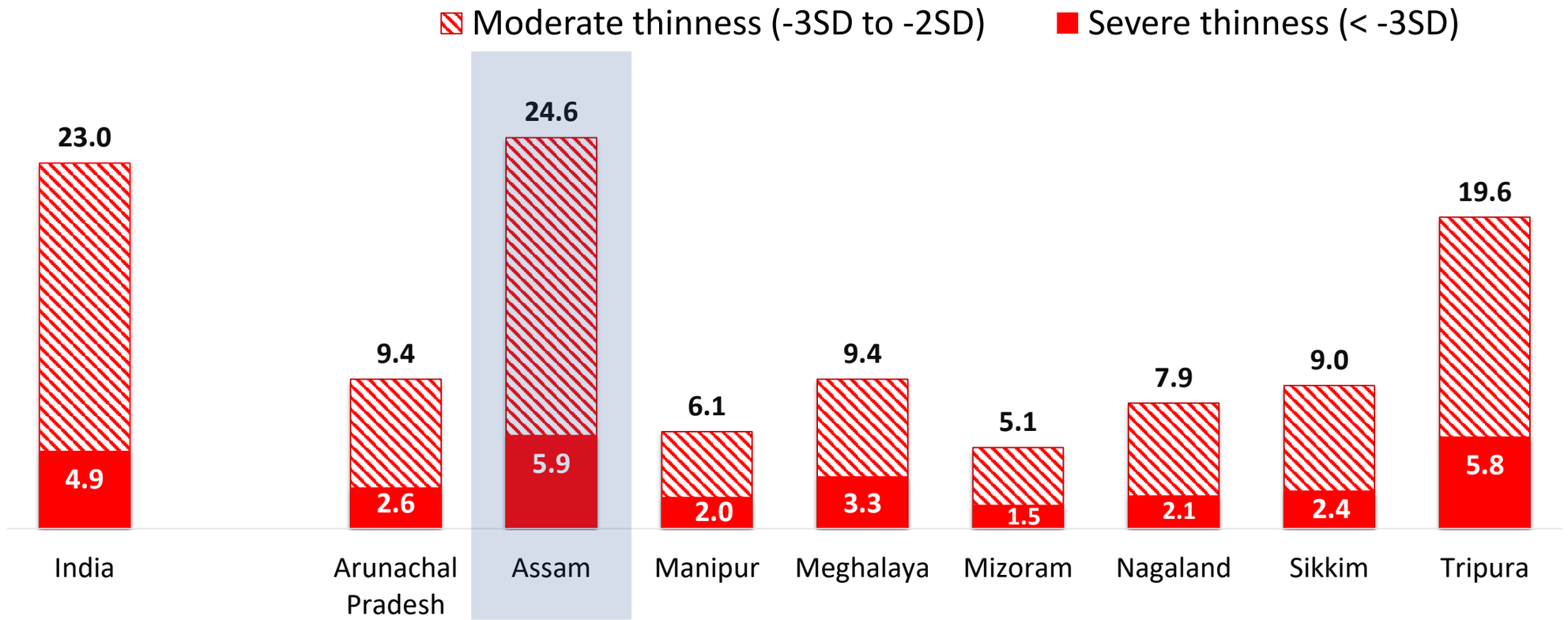


Birth to Adolescence

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

1/4 children aged 5-9 years was thin in Assam

Prevalence of thinness in Assam was the highest among northeastern states and also, at the same level of national average



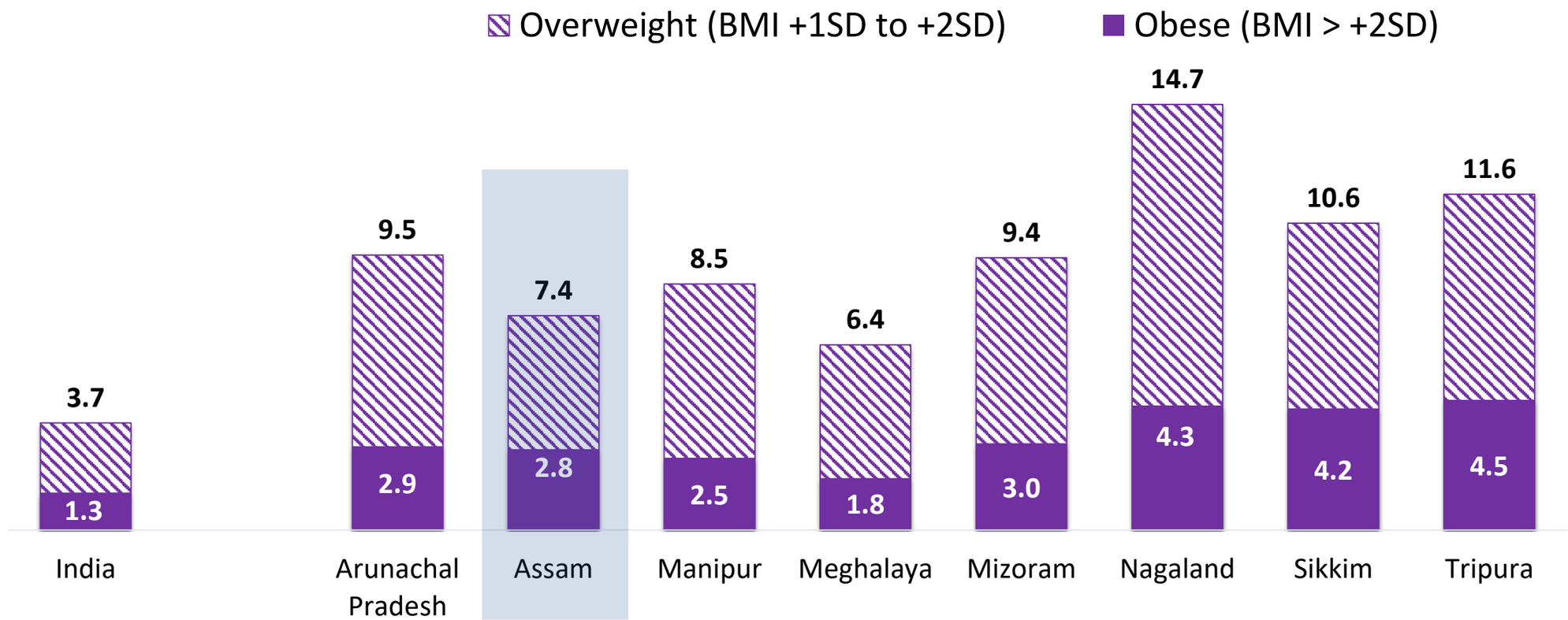
Birth to Adolescence

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 Assam (**7%)** was nearly double the national average (**4%**)

Among northeastern states, Nagaland had very high prevalence (**15%**) of overweight

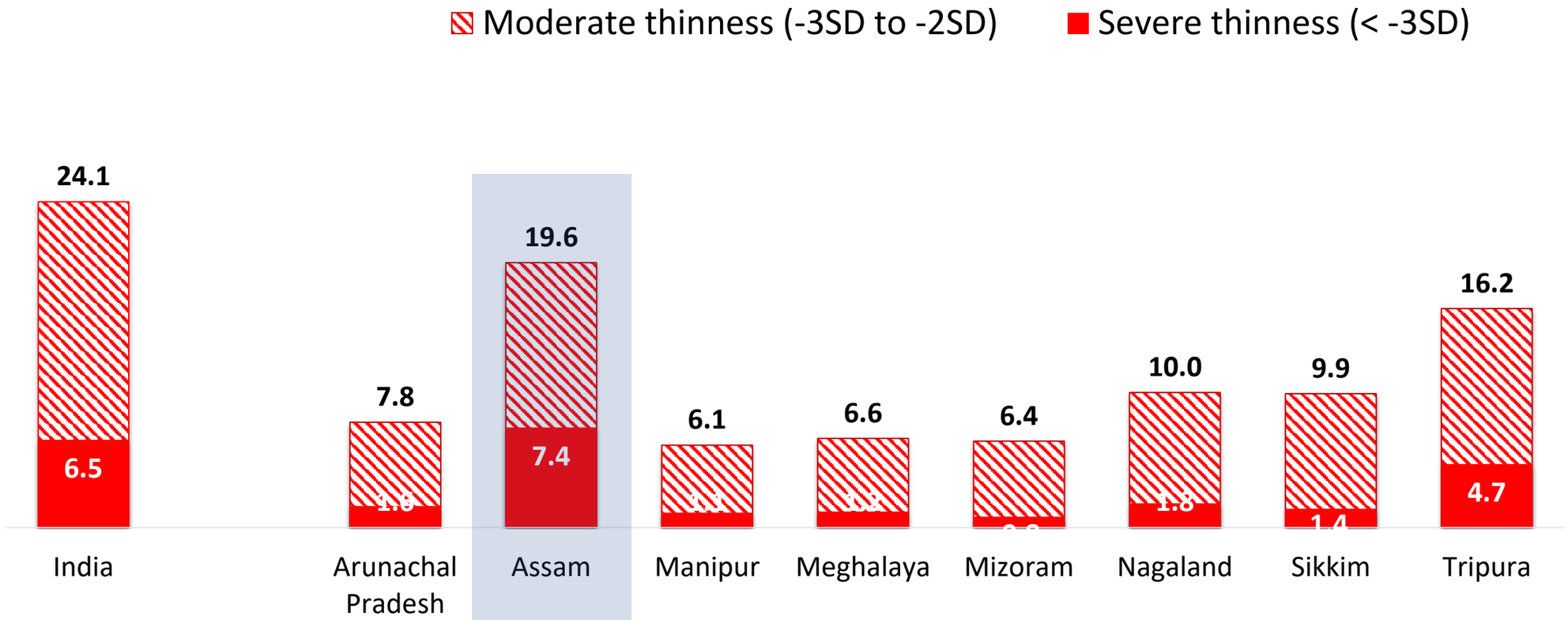


Birth to Adolescence

Thinness among adolescents aged 10-19 years substantially high

1/5 adolescents aged 10-19 years was thin in Assam (**20%**), which is less than national average (**24%**)

Among the northeastern states, Assam had the highest prevalence of thinness, followed by Tripura

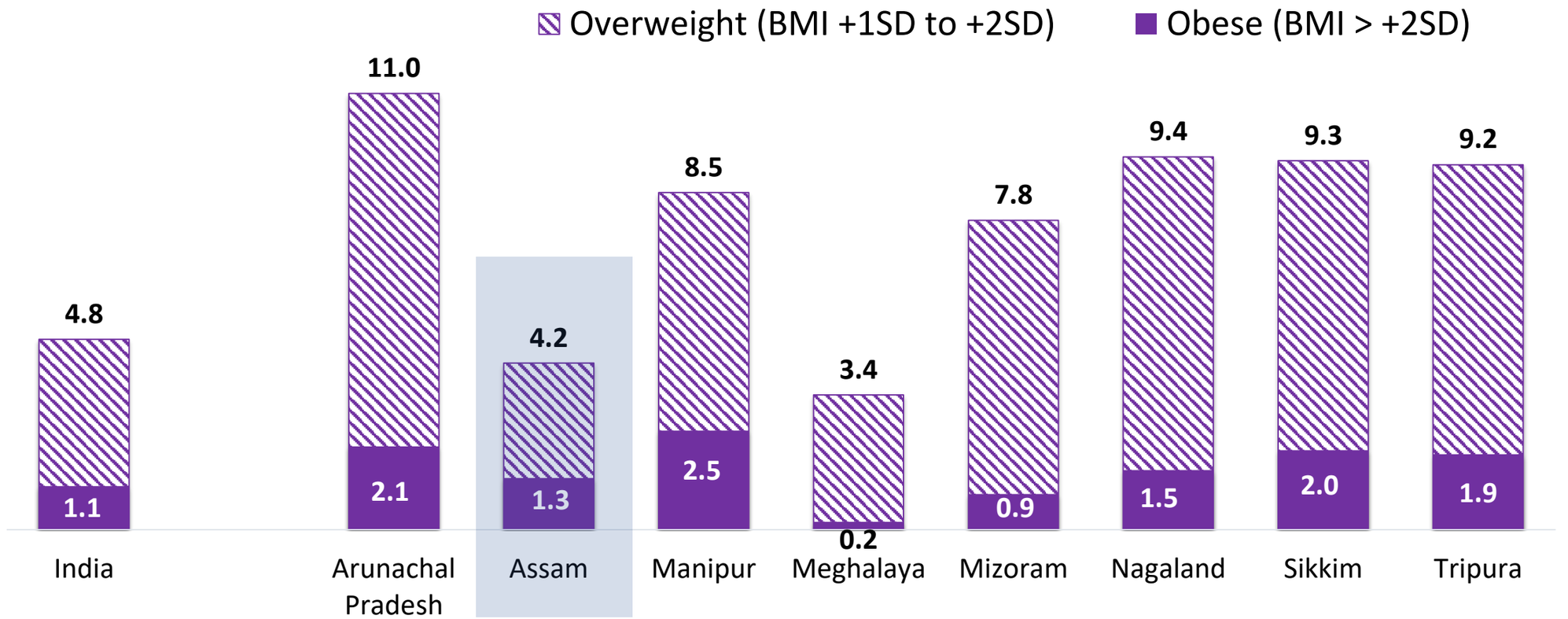


Birth to Adolescence

Prevalence of overweight among adolescents aged 10-19 years high

4% of adolescents were overweight in Assam, at about similar level of India as a whole

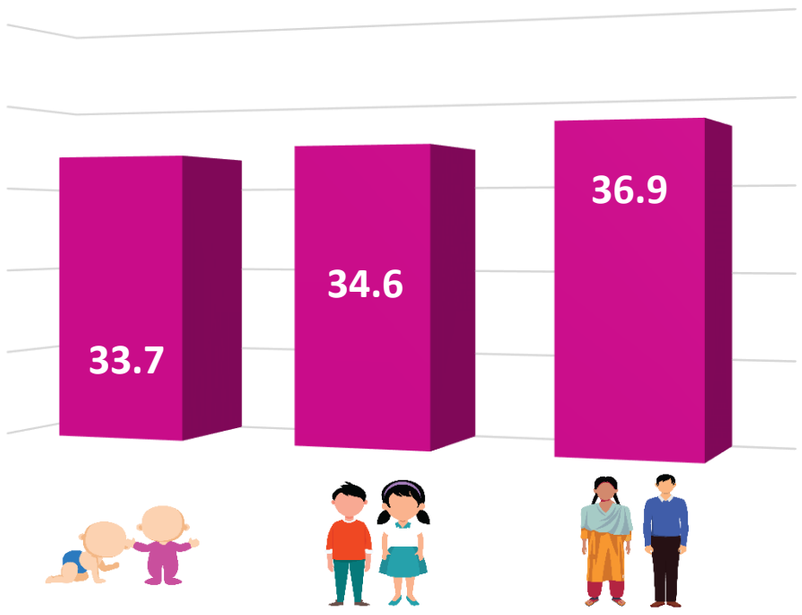
In most of the northeastern states, prevalence of overweight was significantly high, except in Assam and Meghalaya.



Birth to Adolescence

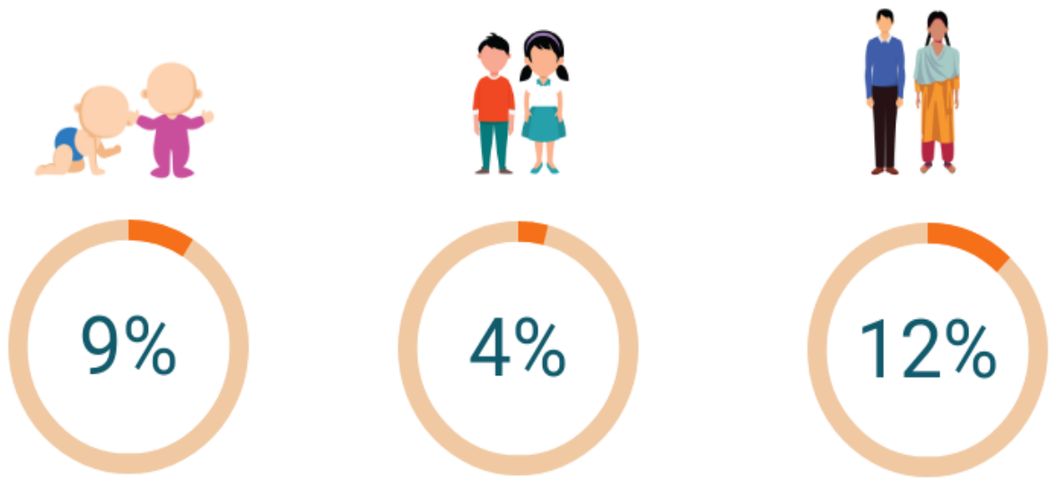
Assam key findings: Anaemia and iron deficiency

Anaemia



In Assam, anaemia was higher among adolescents aged 10-19 years, compared to children aged 1-9 years

Iron deficiency



Findings indicate that adolescents aged 10-19 years had higher iron deficiency(12%) (measured by serum ferritin) than children aged 1-9 years (4-9%)

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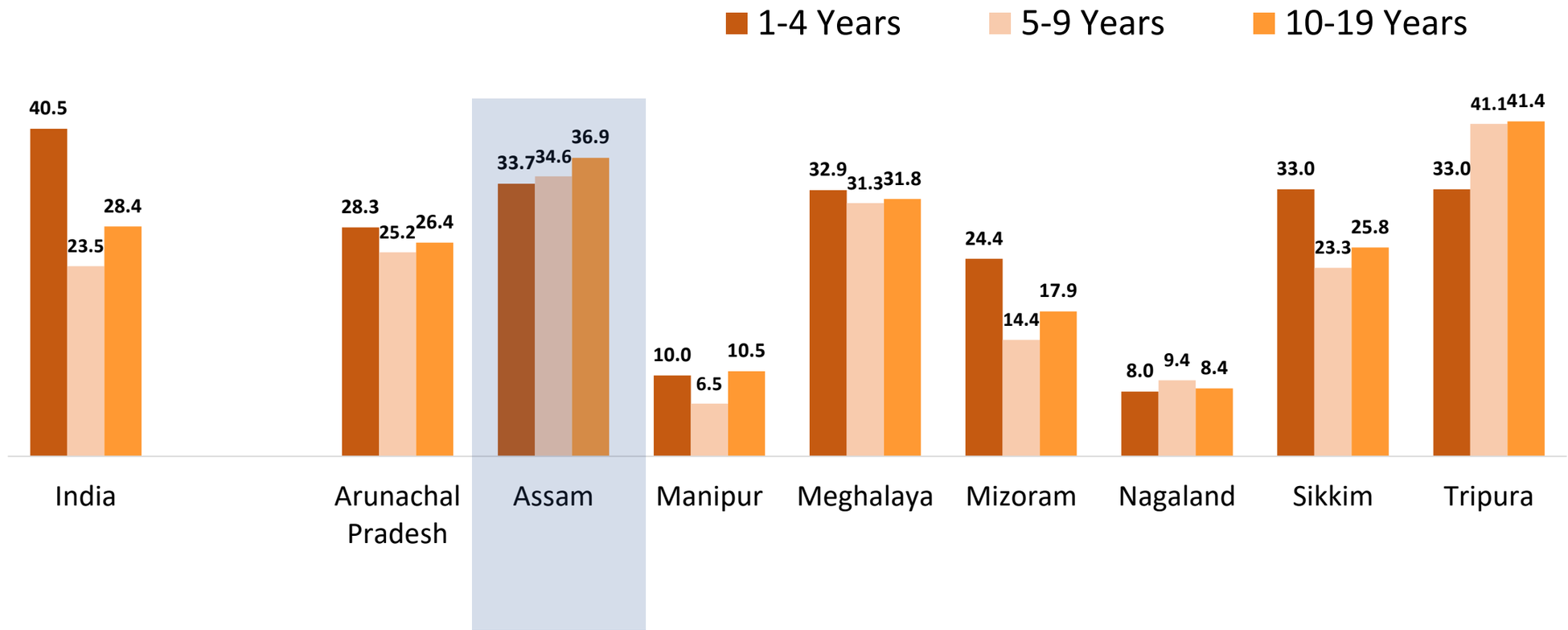
Birth to Adolescence

Prevalence of Anaemia among children and adolescents

1/3 children aged 1-4 years was anaemic in Assam (**34%**), lower than national average (**41%**)

Prevalence of anaemia was higher among adolescents aged 10-19 years (**37%**) than the children aged 1-9 years (**34-35%**)



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

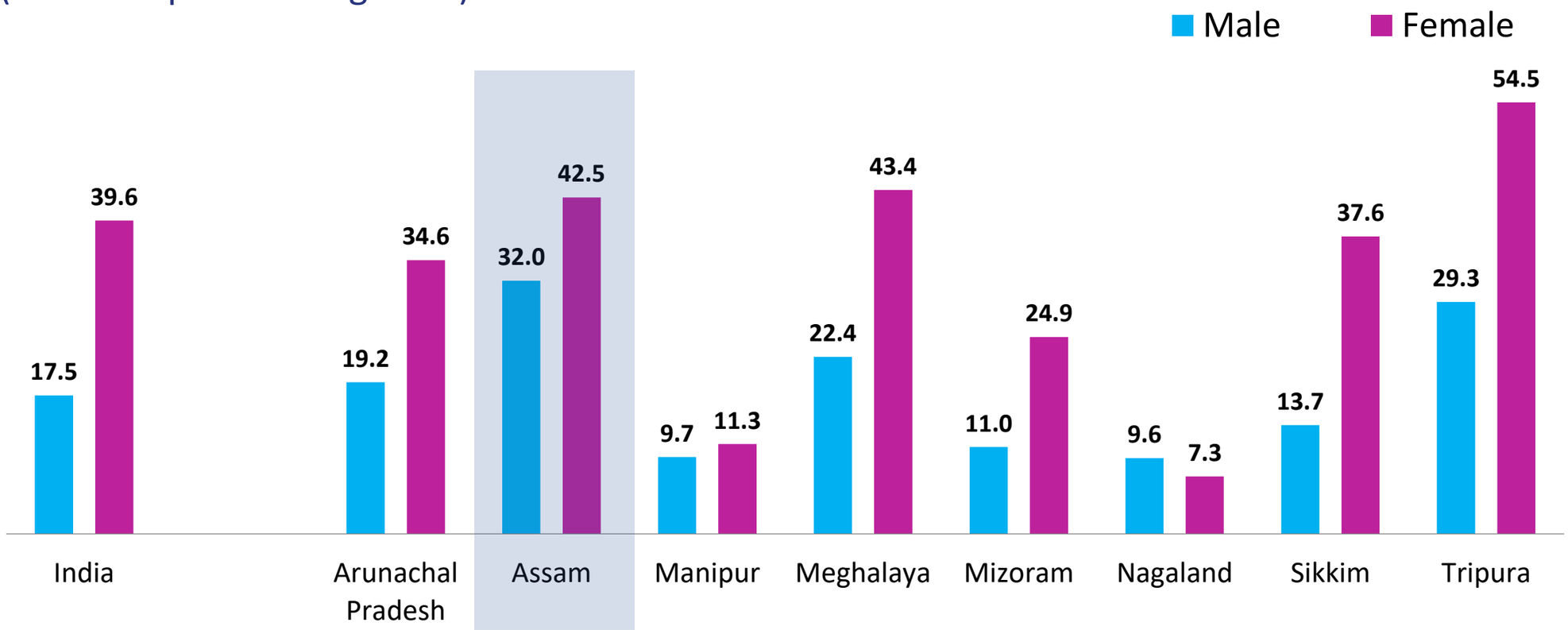
(Adjusted for altitude)

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 twice that of adolescent boys

In Assam, as in many other northern states, significantly higher proportion of adolescent girls than boys were anaemic (with exception in Nagaland)

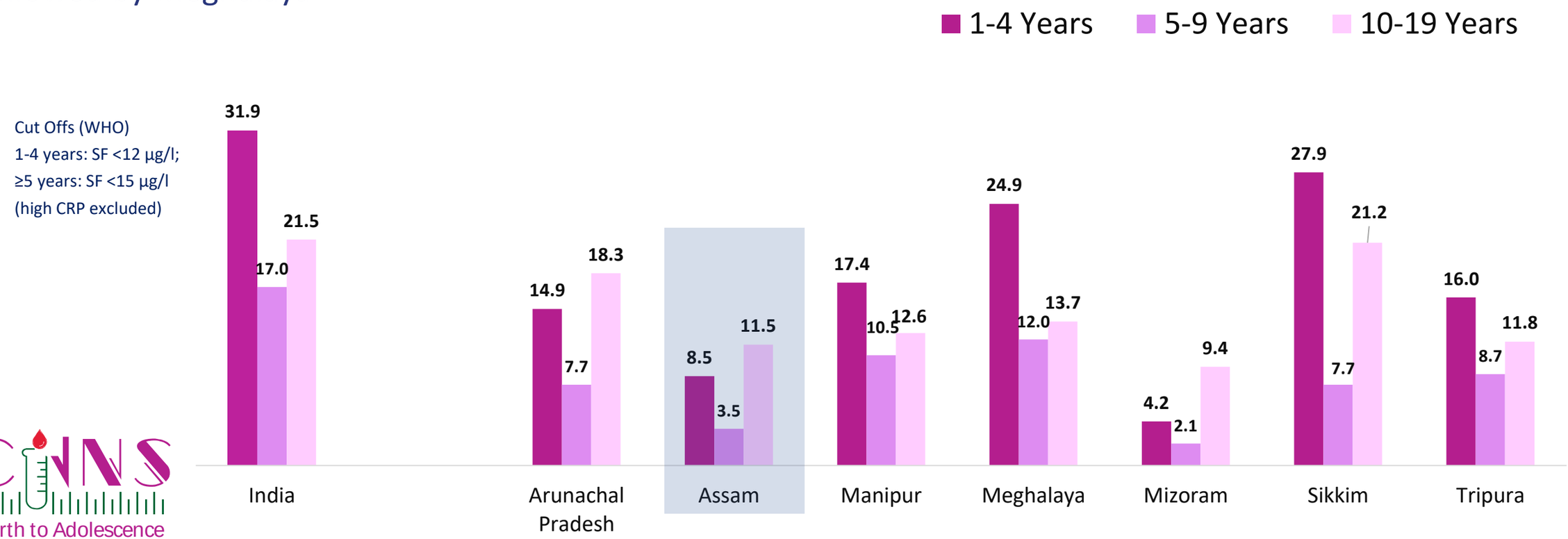


Birth to Adolescence

Iron deficiency measured by serum ferritin among children and adolescents

9% of children aged 1-4 years had iron deficiency in Assam, significantly lower than the national average (**32%**); highest among adolescents aged 10-19 years (**12%**)

Among northeastern states, children and adolescents from Sikkim had highest prevalence of iron deficiency, followed by Meghalaya



Birth to Adolescence

Assam key findings: Vitamin A and Vitamin D deficiency

A

Vitamin A deficiency was moderately high (17%) in school-age children 5-9 years indicating the need for policy review

Children aged 1-4 years (21%) were found to have higher levels of Vitamin A deficiency than children aged 5-9 years

D

Vitamin D deficiency ranged from 1% to 7% in 1-19 years as per cut off by expert panel of IOM.

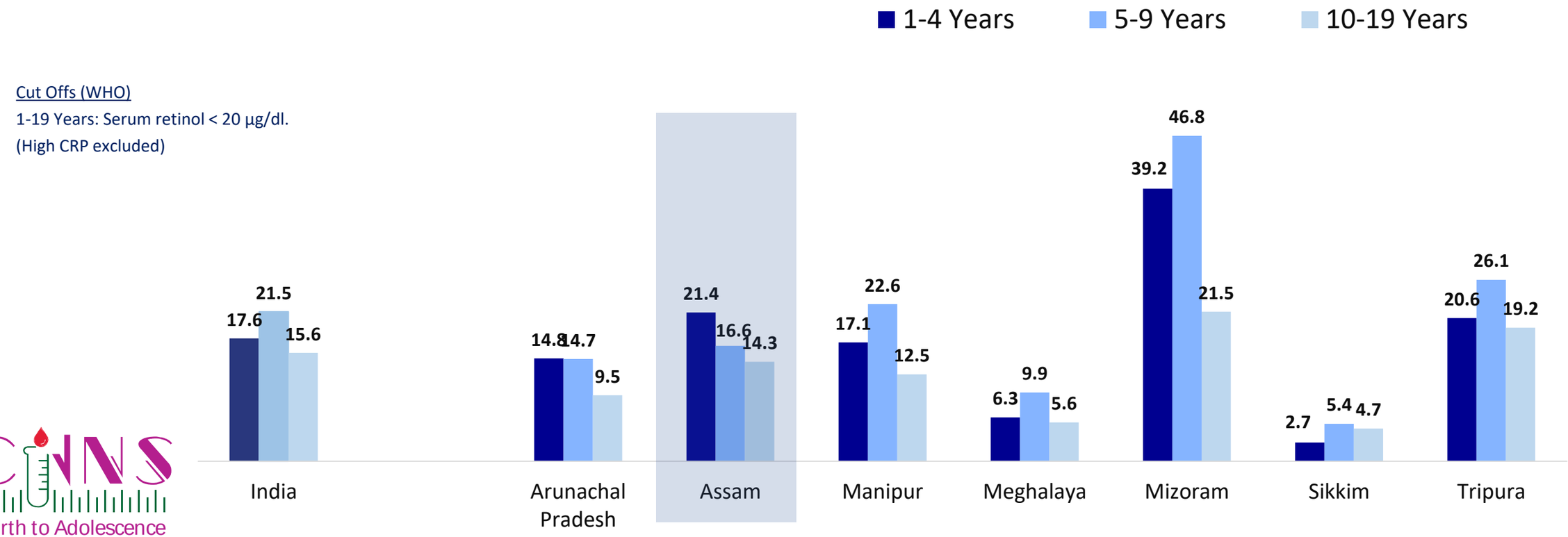
Adolescents aged 10-19 years were found to have higher level of Vitamin D deficiency (7%) than children aged 1-9 years (1-4%)

CINS Birth to Adolescence

Vitamin A deficiency among children and adolescents

14-21% children and adolescents had Vitamin A deficiency in Assam, at similar level to the national average (**16-22%**)

Prevalence of Vitamin A deficiency in all age group did not show any particular pattern among northeastern states, highest deficiency in Mizoram in all age groups

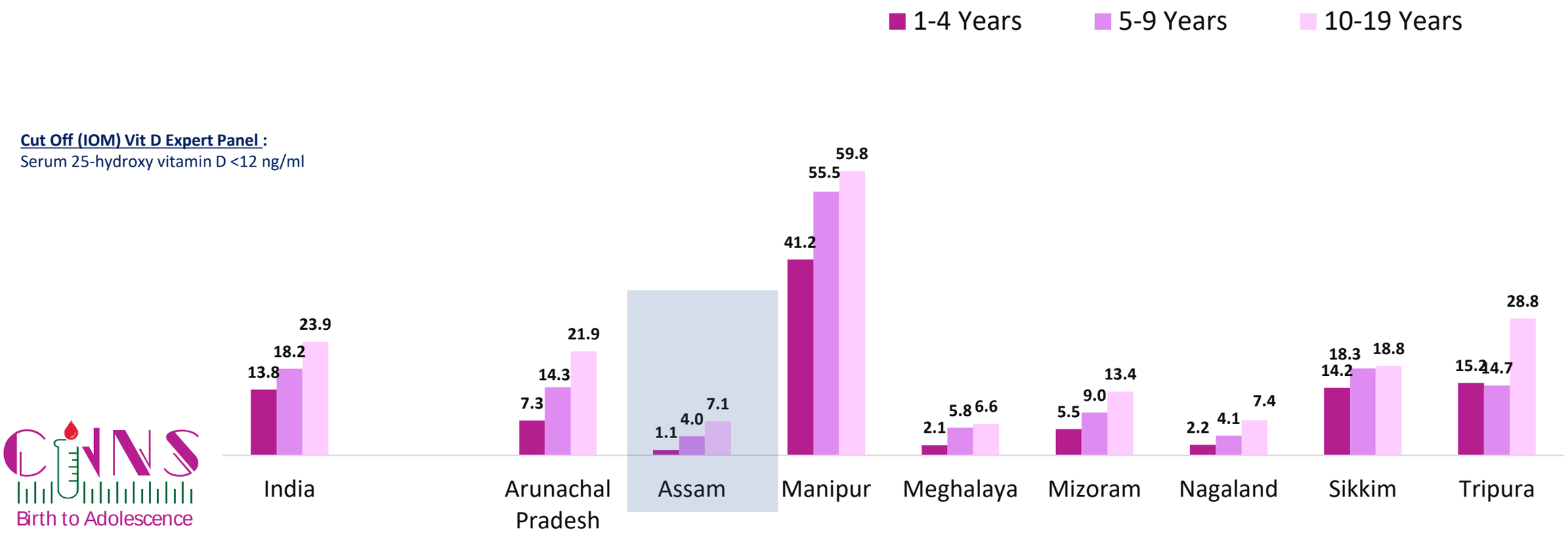


Birth to Adolescence

Vitamin D deficiency increases with age

1-7% children and adolescents had Vitamin D deficiency in Assam, much lower than the national average (**14-24%**); Vitamin D deficiency increased sharply with age.

While Vitamin D deficiency was low in most northeastern states, that in Manipur was very high (**41-60%**)



Birth to Adolescence

Assam key findings: Non-communicable diseases

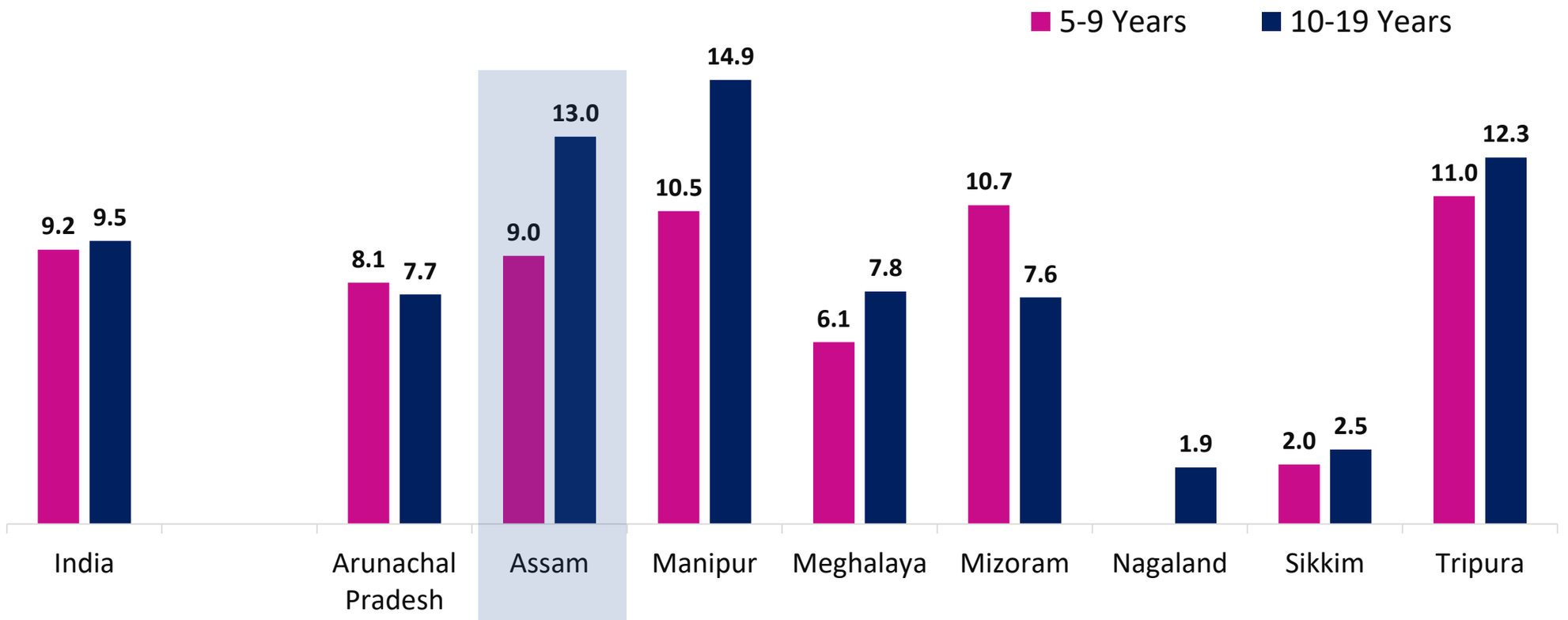
9% of school-age children and 13% of adolescents were found with high level of glycosylated haemoglobin (HbA1c).

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), **9%** of children and **13%** of adolescents had increased risk of diabetes in Assam, at about similar level of national average (**9-10%**)

Among all northeastern states, risk of diabetes among children and adolescents did not show any particular pattern

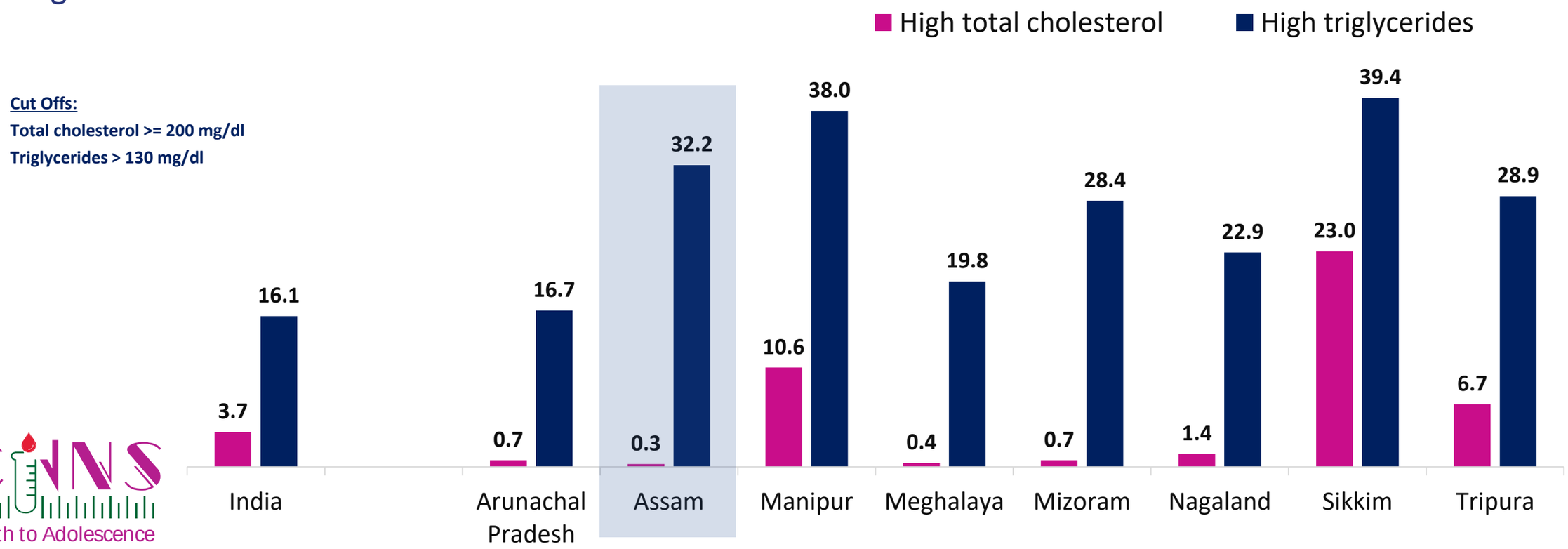


Birth to Adolescence

High total cholesterol and high triglycerides among adolescents

Risk of NCDs in Assam among adolescents – less than **1%** had high level of total cholesterol and **32%** with high level of triglycerides

Prevalence of high total cholesterol and high triglycerides was highest in Sikkim, followed by Manipur among northeastern states

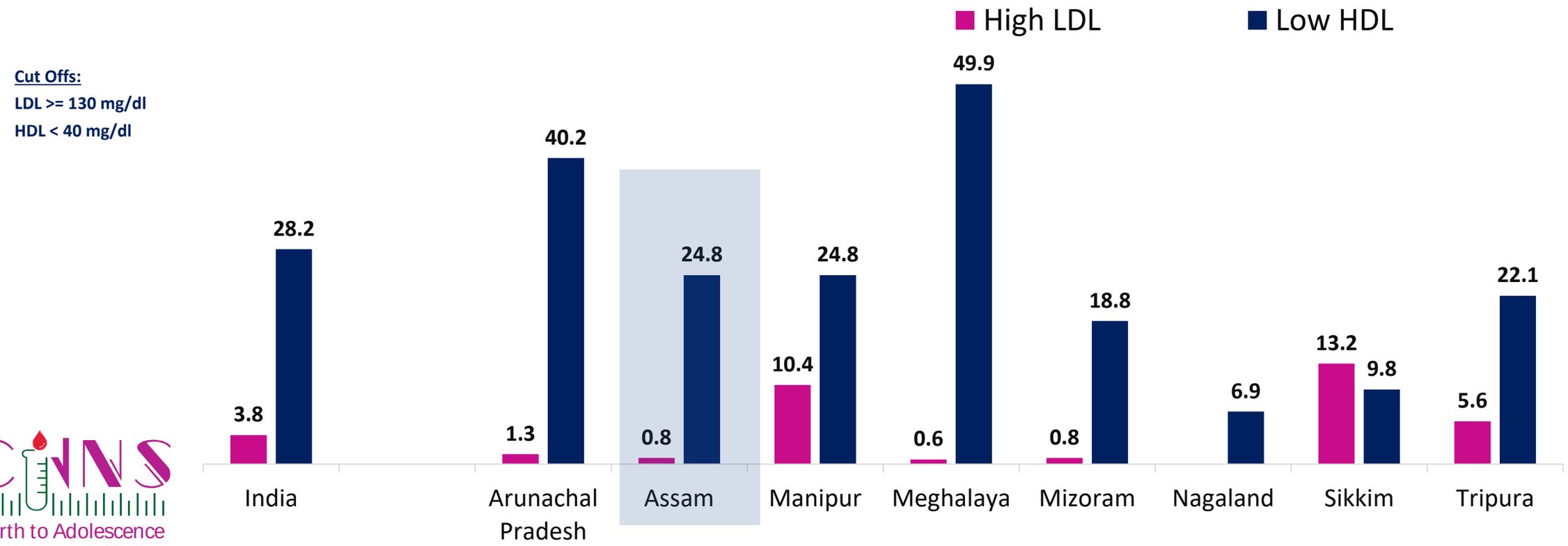


Birth to Adolescence

High LDL and low HDL among adolescents

Risk of NCDs among adolescents in Assam – **1%** had high level of LDL and **25%** had low level of HDL

Among northeastern states, prevalence of low HDL was highest in Meghalaya (50%), followed by Arunachal Pradesh (**40%**), Assam and Manipur (**25%**)



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
CDC 24/7: Saving Lives, Protecting People™

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