सत्यमेव जयते

Ministry of Health and Family Welfare
Government of India

# Comprehensive National Nutrition Survey

2016 – 2018

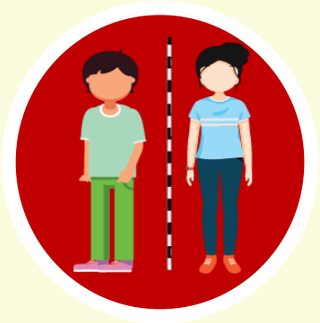
## Mizoram
## State Presentation

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
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***

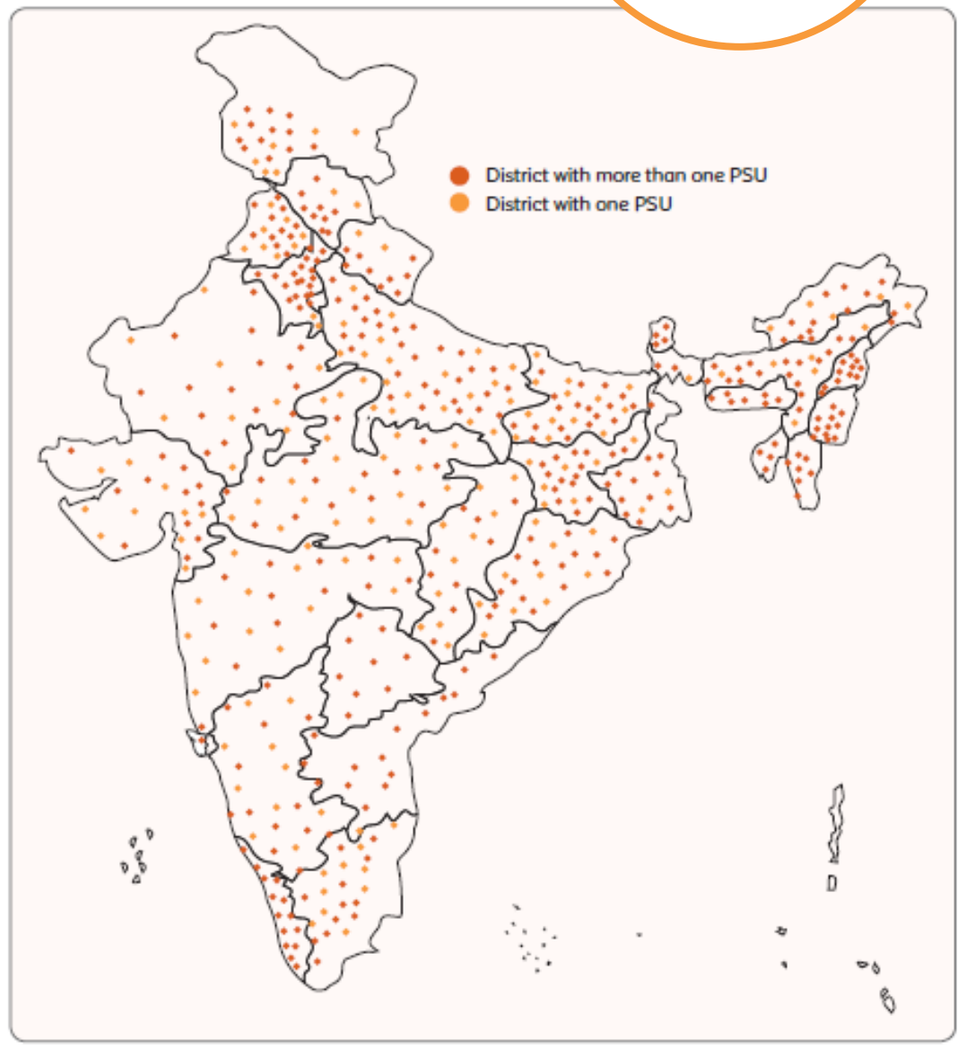
*Soumya Swaminathan, et al. (2019), The burden of child and maternal malnutrition and trends in its indicators in the states of India: the Global Burden of Disease Study 1990–2017. https://doi.org/10.1016/S2352-4642(19)30273-1

# 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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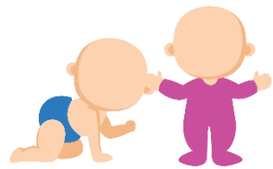
# Anthropometry data

| | 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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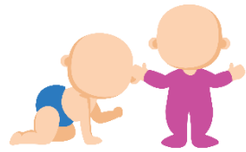
# Biochemical indicators - micronutrient deficiencies and NCDs

| 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*

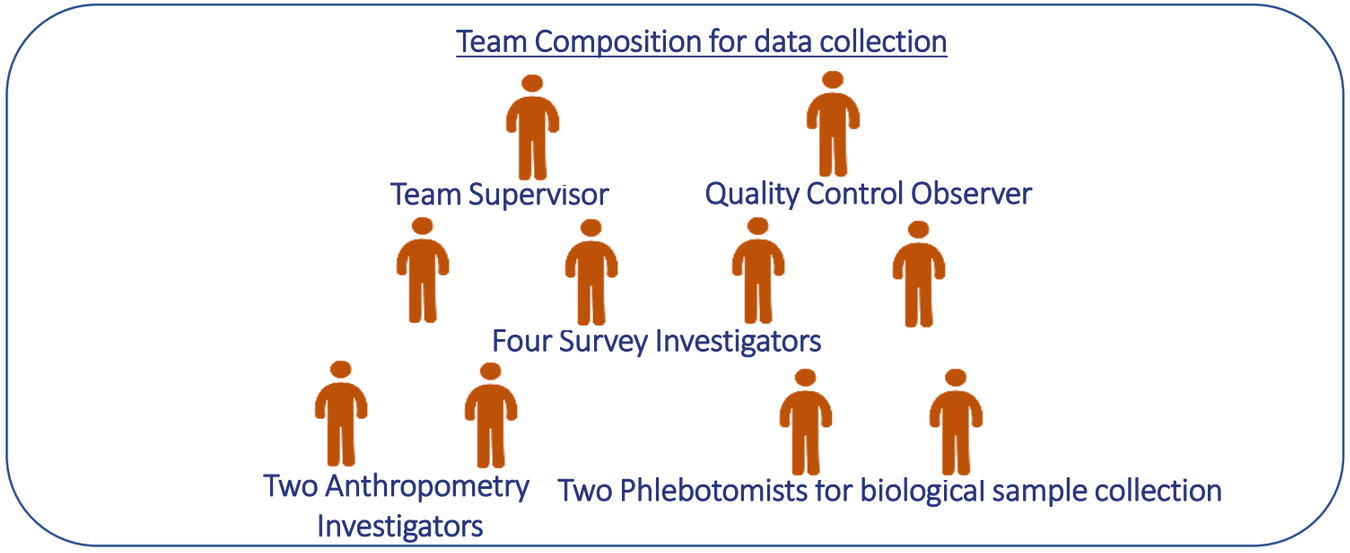
- Field work/protocol/training monitoring: by quality control team
- Biological sample quality control : by AIIMS, NIN and US CDC

*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

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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 Mizoram

CNNS covered 50 PSUs for data collection in Mizoram

Achieved following sample size by age groups:

| | 0-4 years | 5-9 years | 10-19 years | Total |
|---|---|---|---|---|
| Household and anthropometry data | 1,009 | 1,026 | 966 | **3,001** |
| Biological sample | 307 | 440 | 379 | **1,126** |



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# Period of data collection in Mizoram

## CNNS data collection period: March 28 to June 11, 2016

- CNNS collected data during the summer season of 2016, while
- NFHS collected data during all the season of the year 2016.

| Survey | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNNS 2016** | | | March to June, 2016 | | | | | | | | | |
| **NFHS 4 2016** | | February to October, 2016 | | | | | | | | | | |

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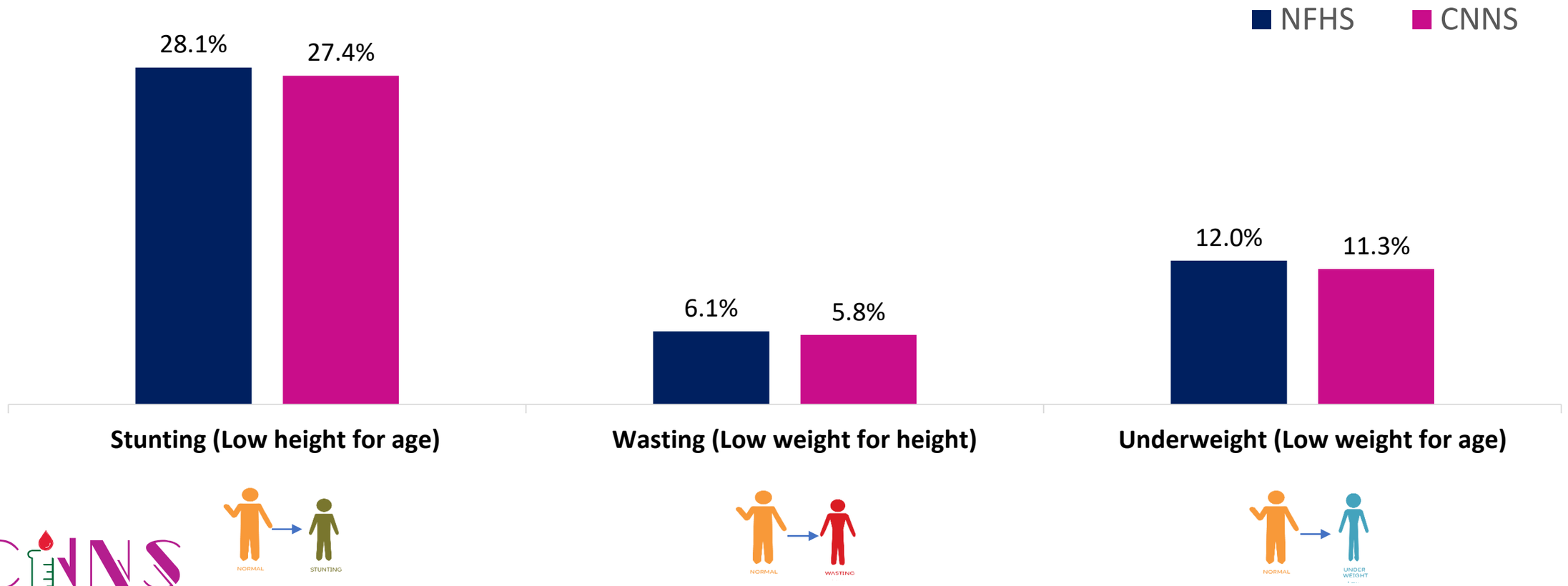
# Mizoram key findings: Anthropometry (1/2)

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

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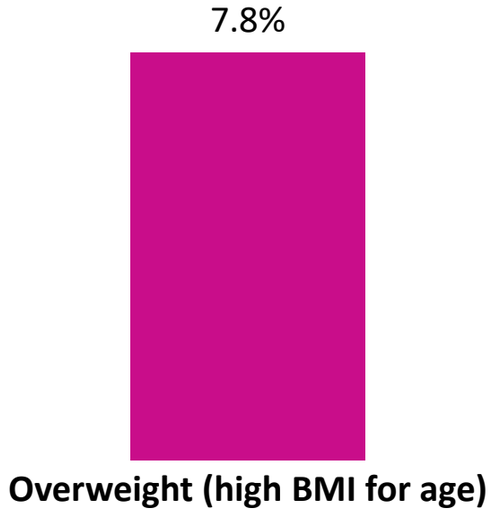
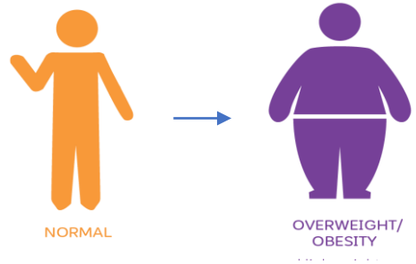
# Mizoram key findings: Anthropometry (2/2)

**6%** of adolescents aged 10-19 years were thin for their age (BMI-Age <-2SD)

**1/4** of 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.



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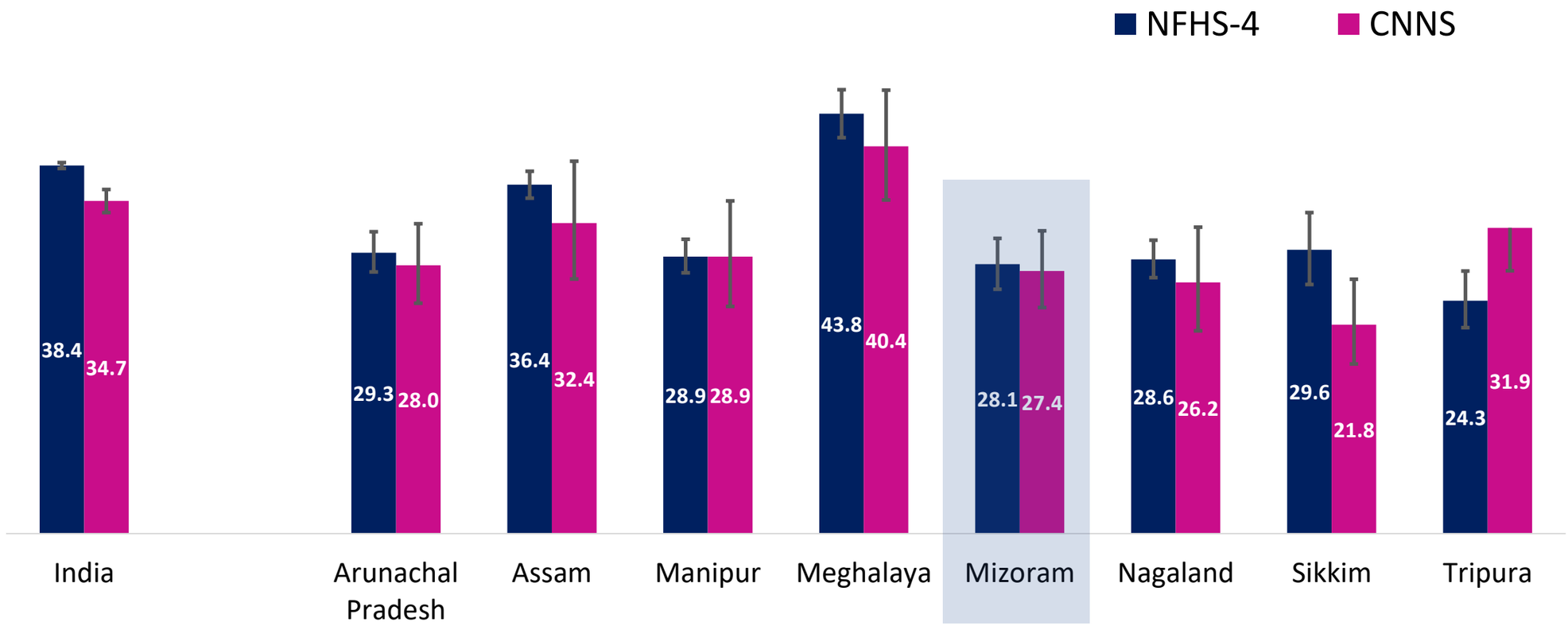
# Stunting among children under five

Prevalence of stunting remained unchanged in CNNS compared to NFHS-4 – **27%** Vs **28%** in Mizoram

In none of the northeastern states stunting declined significantly



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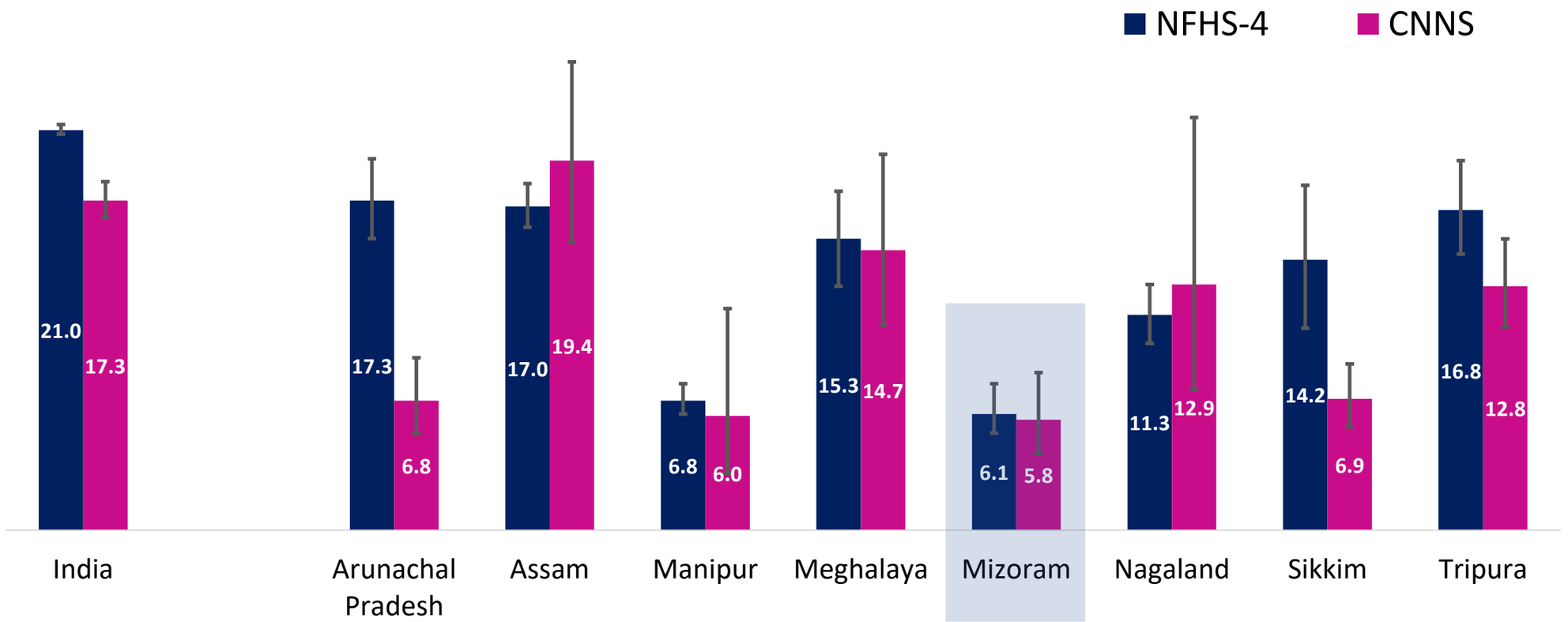
# Wasting among children

Prevalence of wasting remained unchanged in Mizoram between NFHS-4 and CNNS – **6%**

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



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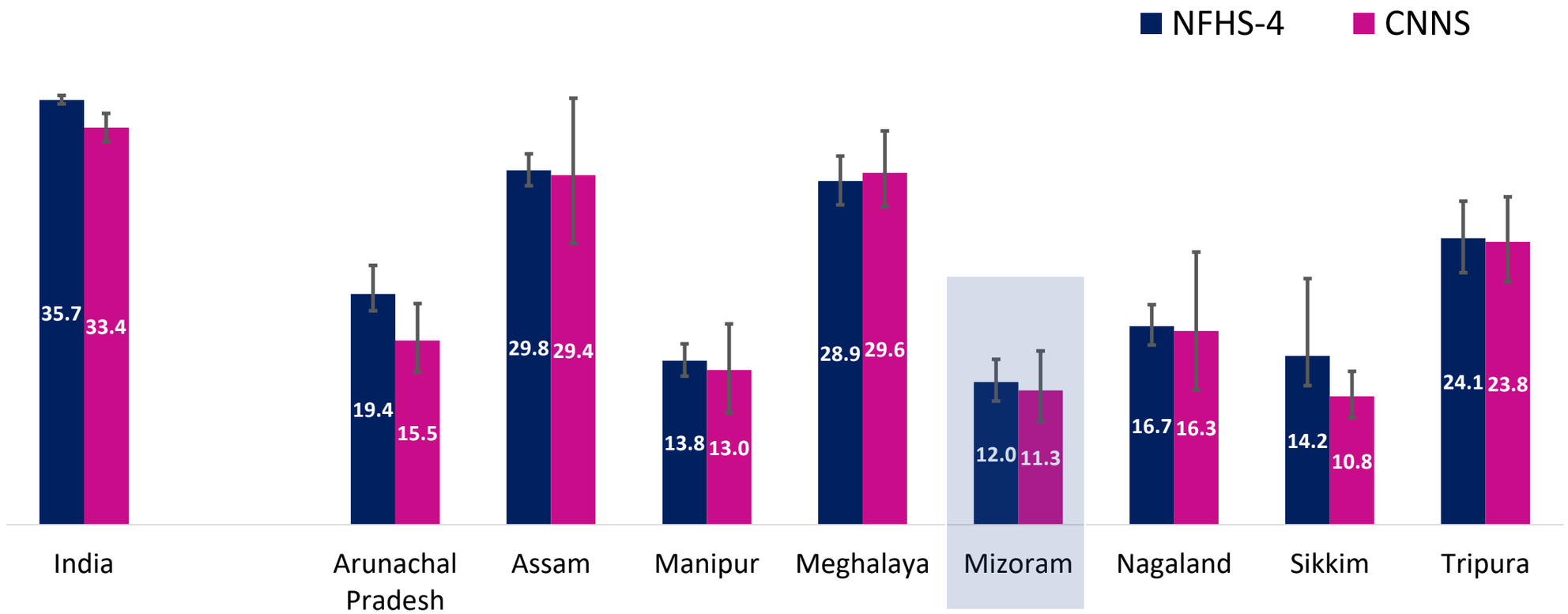
# Prevalence of underweight among children under five

Underweight is a composite measure of chronic and acute malnutrition

The prevalence of underweight remained unchanged between NFHS-4 and CNNS – **12%** Vs **11%**

Prevalence remained unchanged in most of the northeast states

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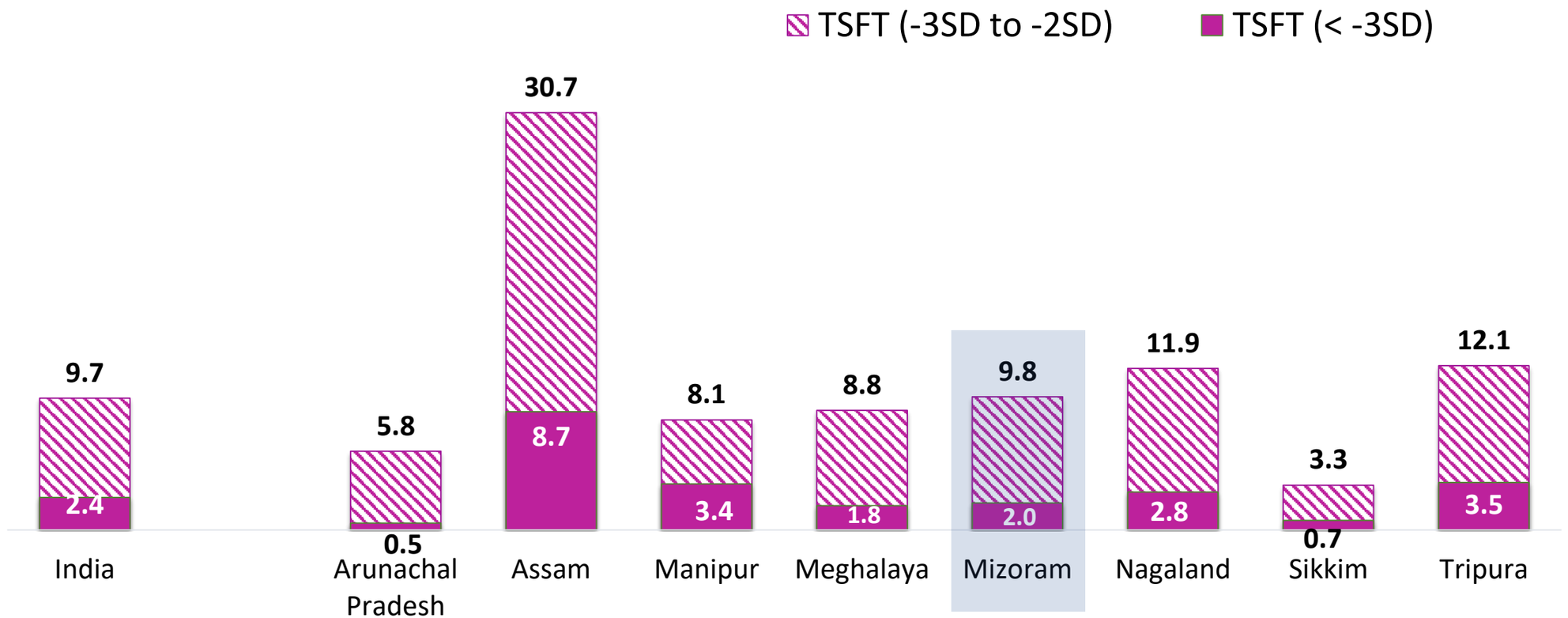
# Triceps Skinfold Thickness (TSFT) for children under five

Low fat mass as reported by TSFT in Mizoram (**10%**) was moderately high among northeast states and at similar level to the national average (**10%**); highest in Assam **(31%)** in the region



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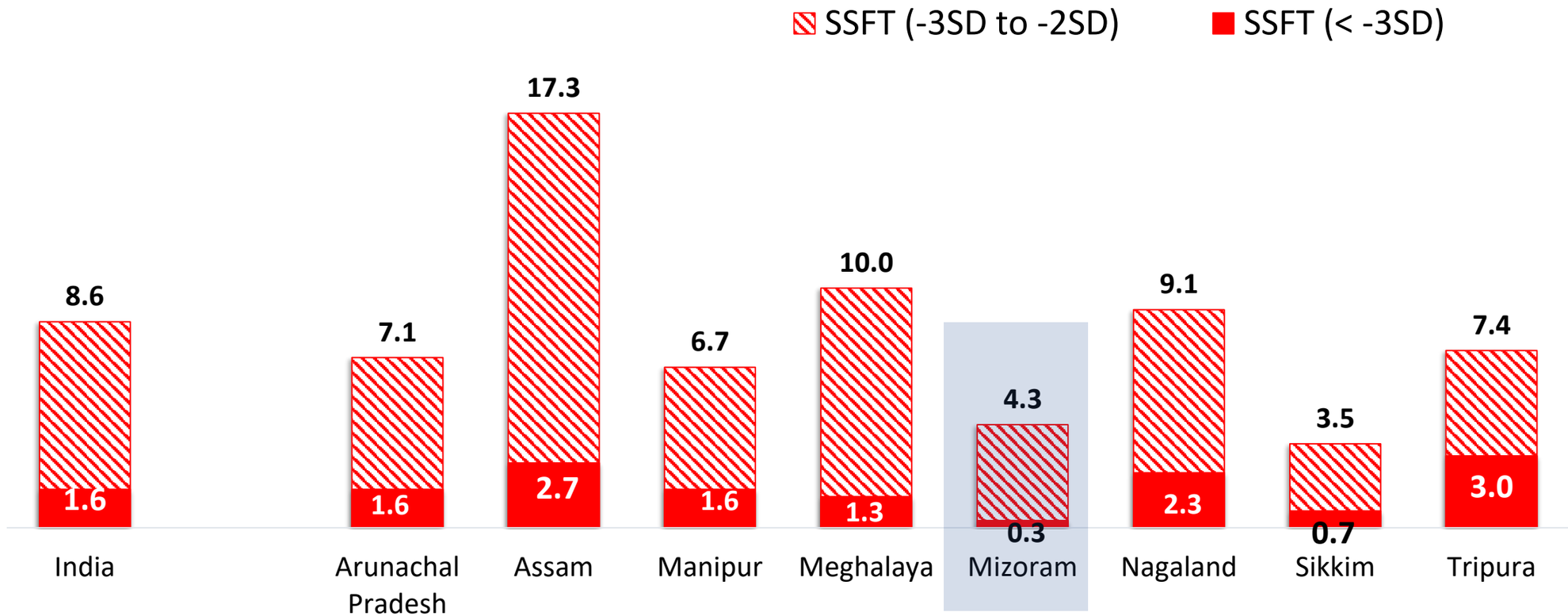
# Subscapular Skinfold Thickness (SSFT) for children aged 1-4 years

Thinness as reported by SSFT in Mizoram (**4%**) was lower among the northeast states and half of the national average (**9%**)



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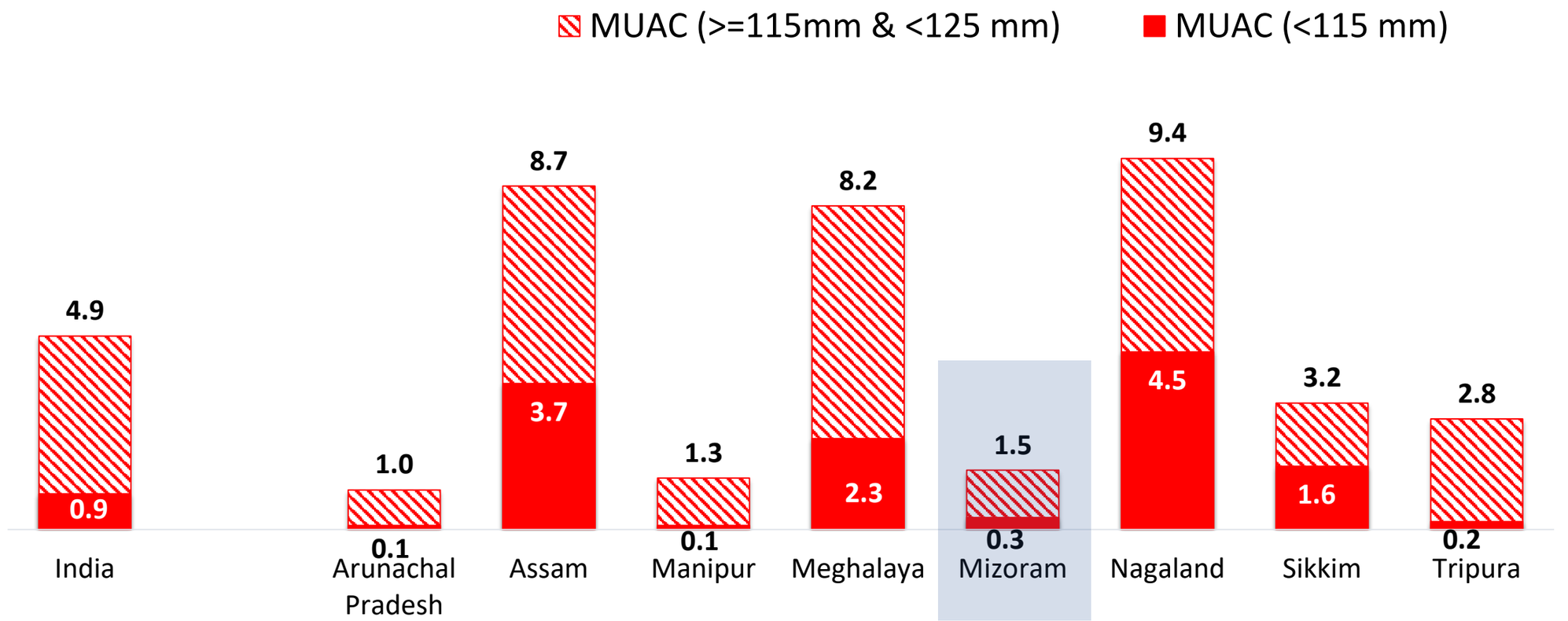
# Mid Upper Arm Circumference (MUAC) for children aged 6-59 months

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

Prevalence of low MUAC ranged between **1%** and **9%** across the northeast states



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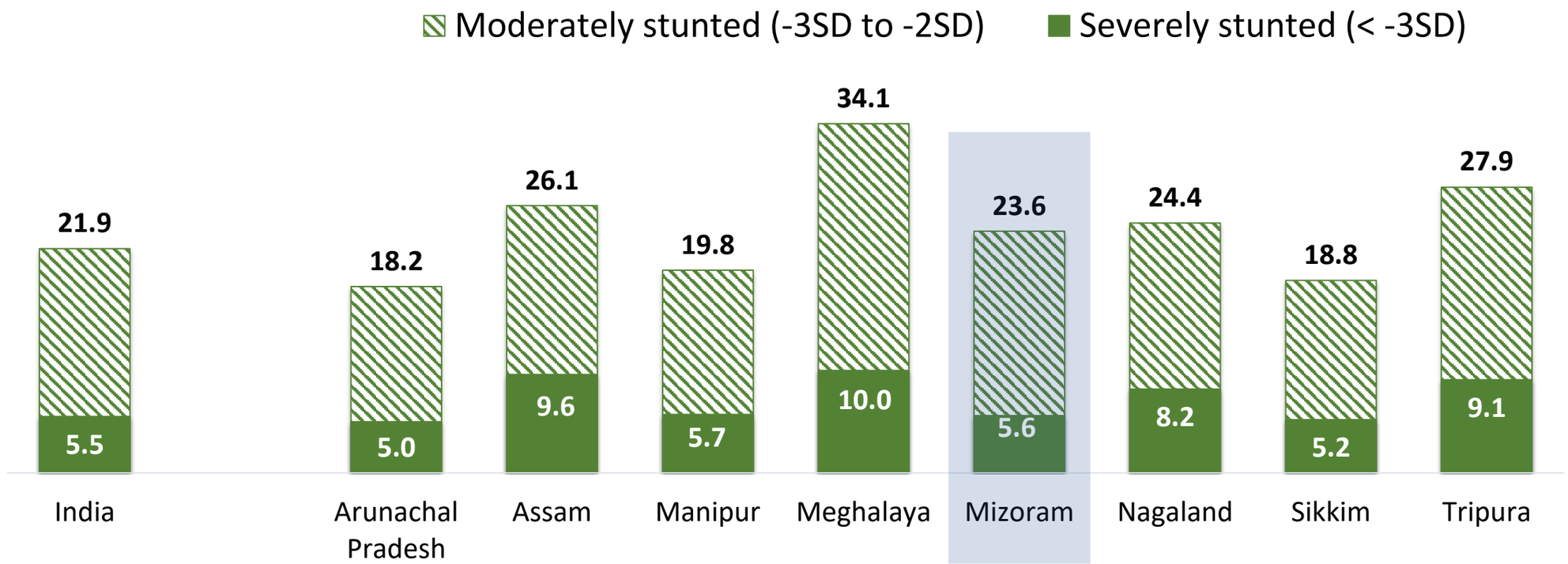
# Stunting among school-age children (5-9 years)

**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



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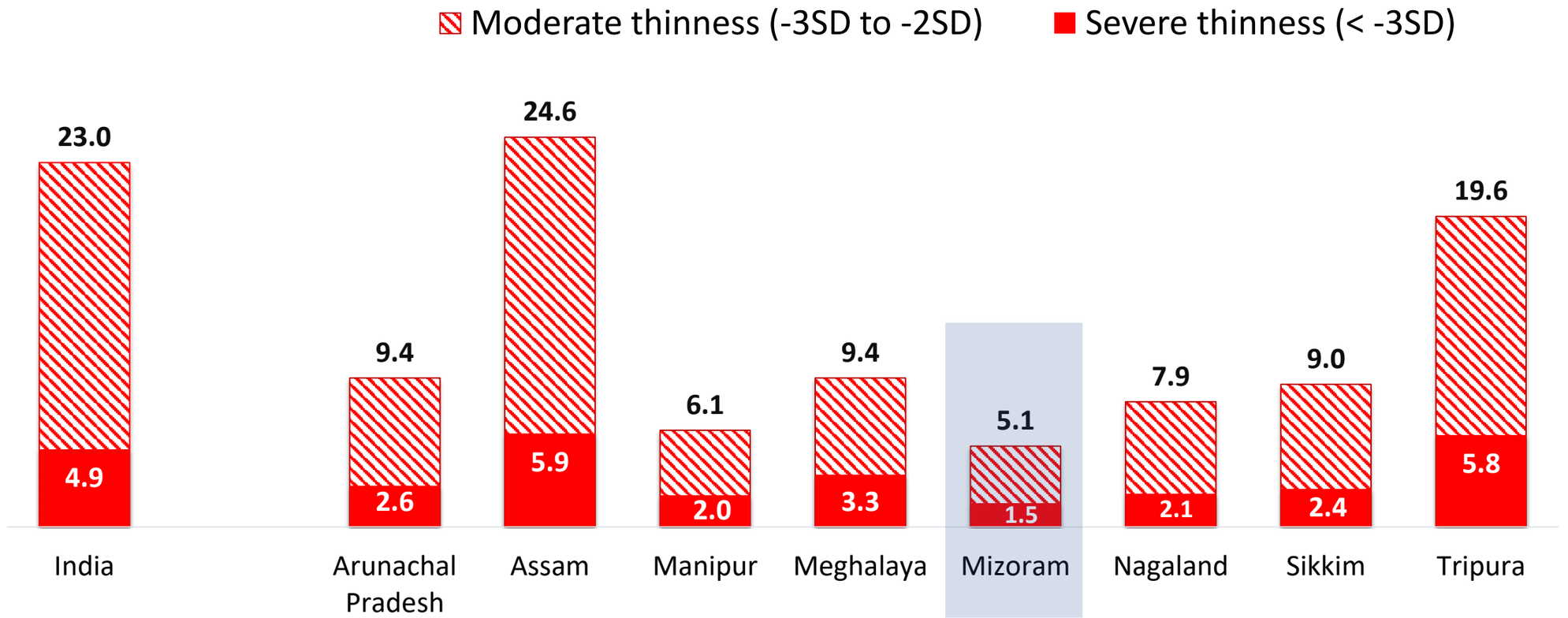
# Thinness among school-age children (5-9 years)

**5%** of children aged 5-9 years were thin in Mizoram

Prevalence of thinness in Mizoram was moderately high among northeastern states and significantly lower than national level (**23%**)



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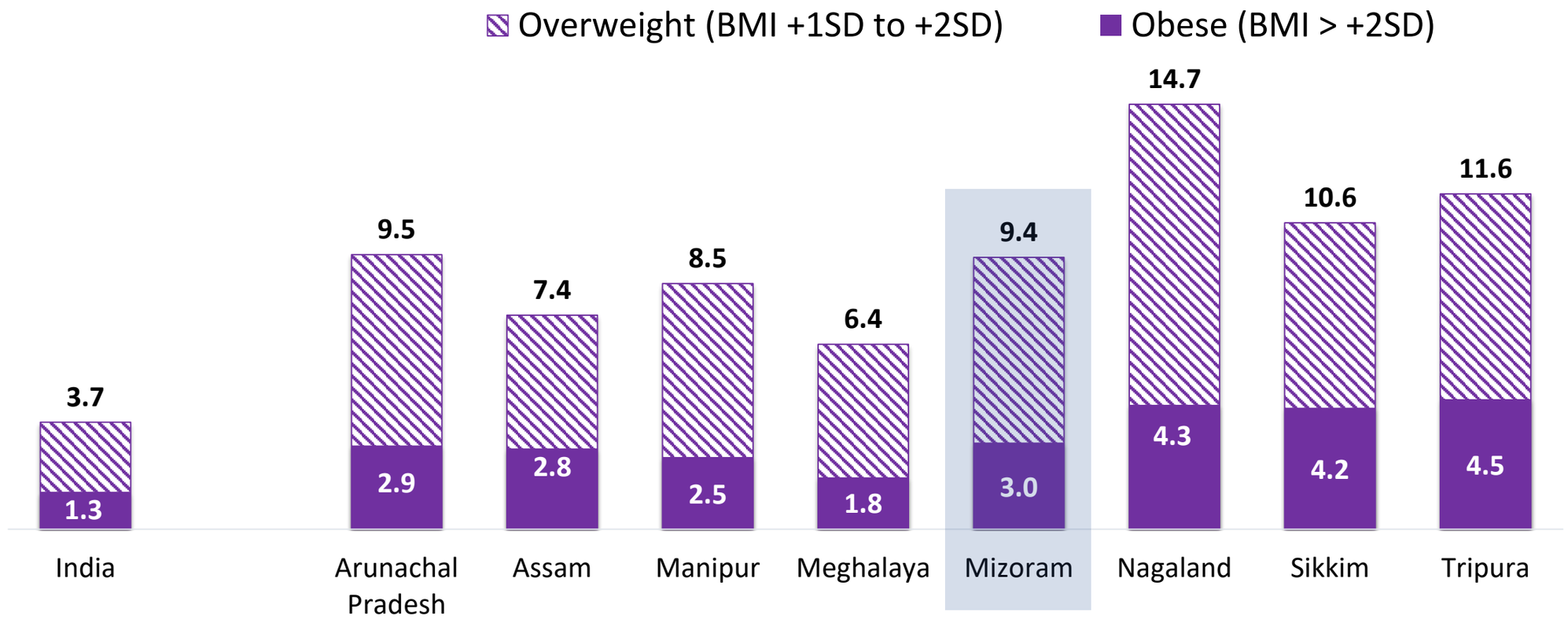
# Overweight and obesity among school-age children (5-9 years) increasing

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

Prevalence of overweight in Mizoram (**9%**) was double the national average (**4%**)

Among northeast states, Mizoram had highest prevalence of overweight in this age group



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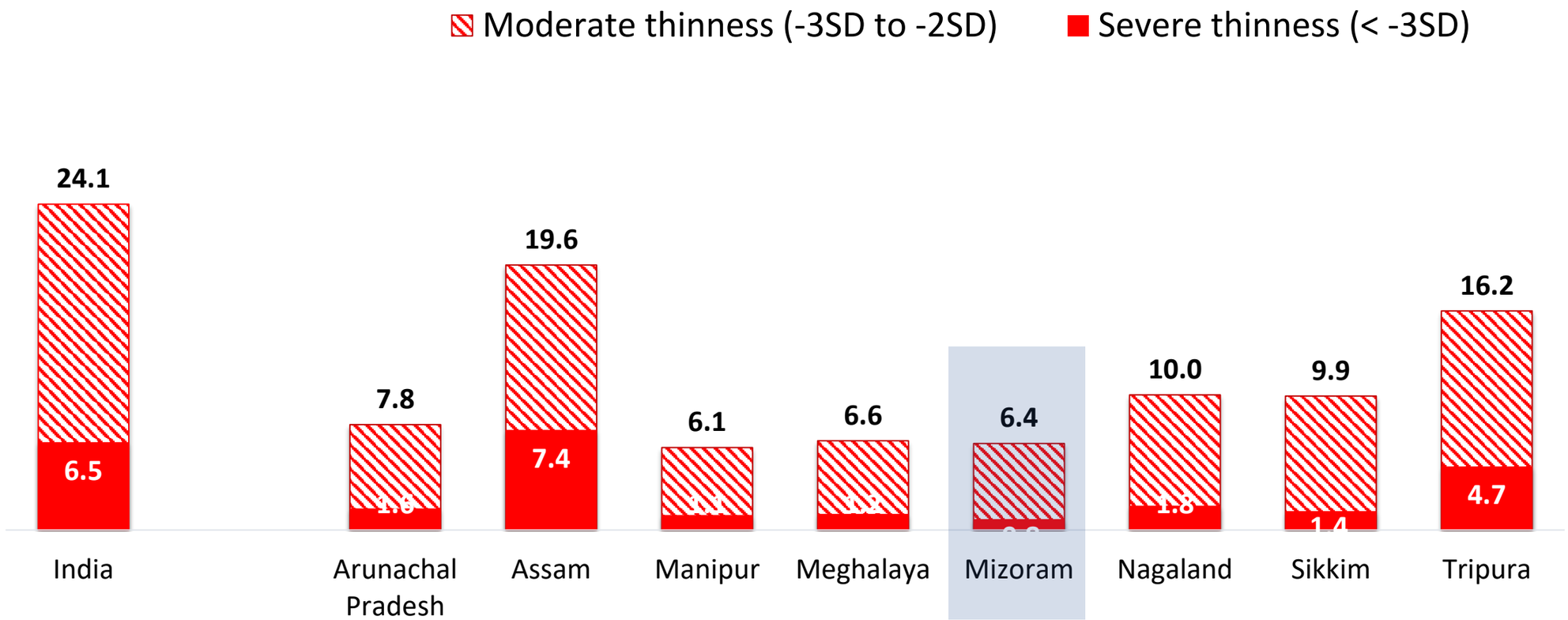
# Thinness among adolescents aged 10-19 years substantially high

**6%** of adolescents aged 10-19 years were thin in Mizoram, significantly lower than national average (**24%**)

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



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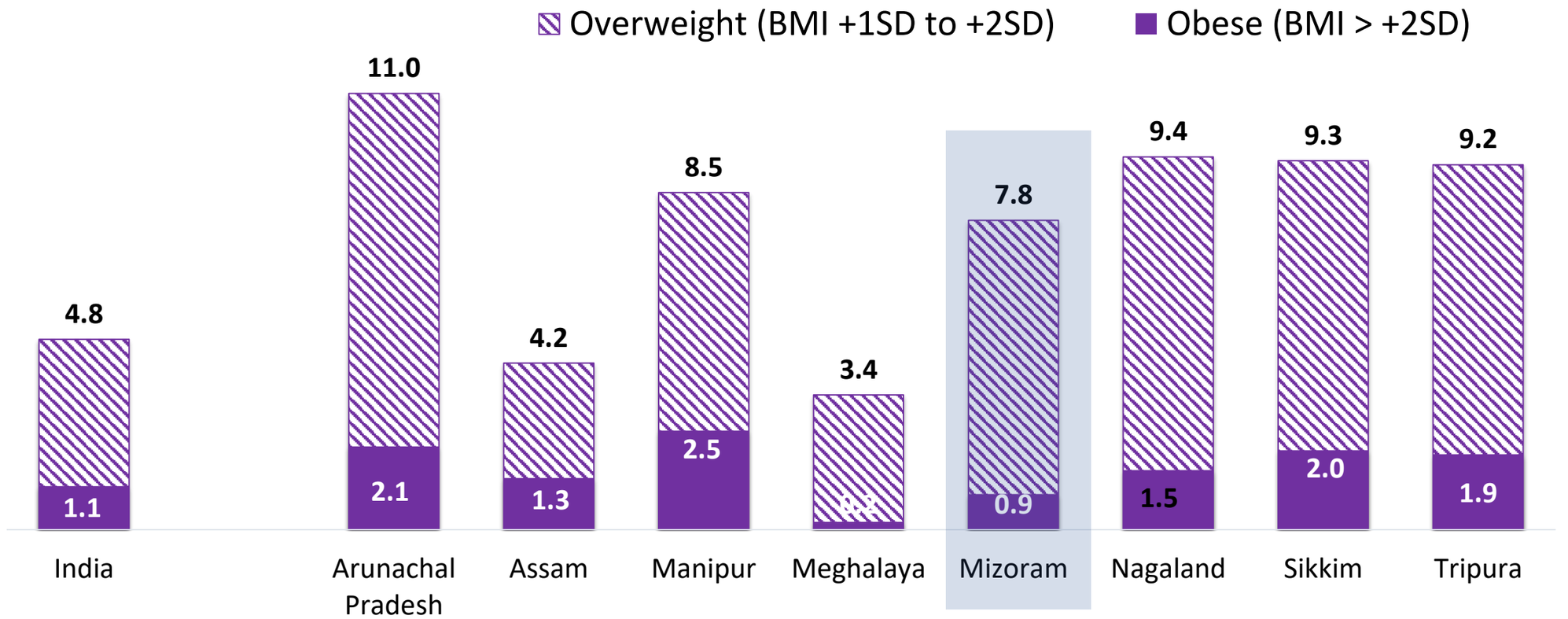
# Prevalence of overweight among adolescents aged 10-19 years high

**8%** of adolescents were overweight in Mizoram, which is higher than the national average (**5%**)

Among the northeast states, Meghalaya had lowest prevalence of overweight

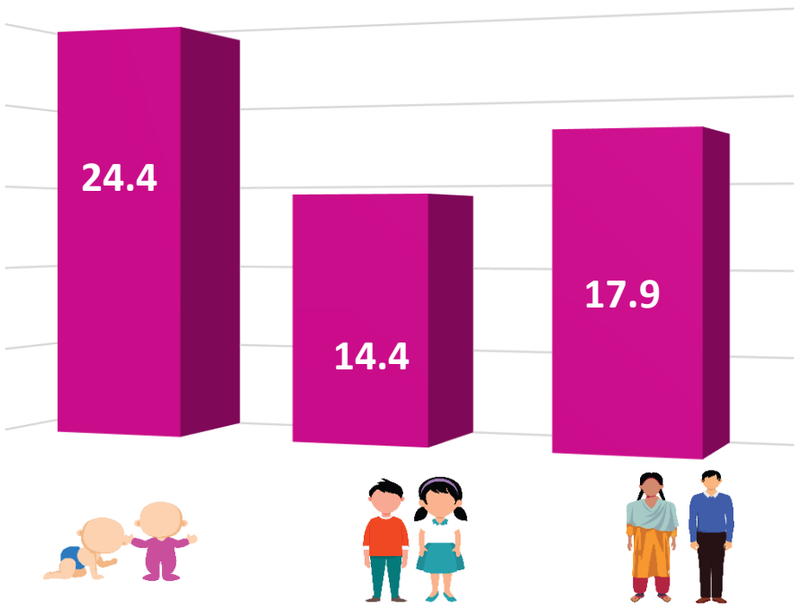





Birth to Adolescence

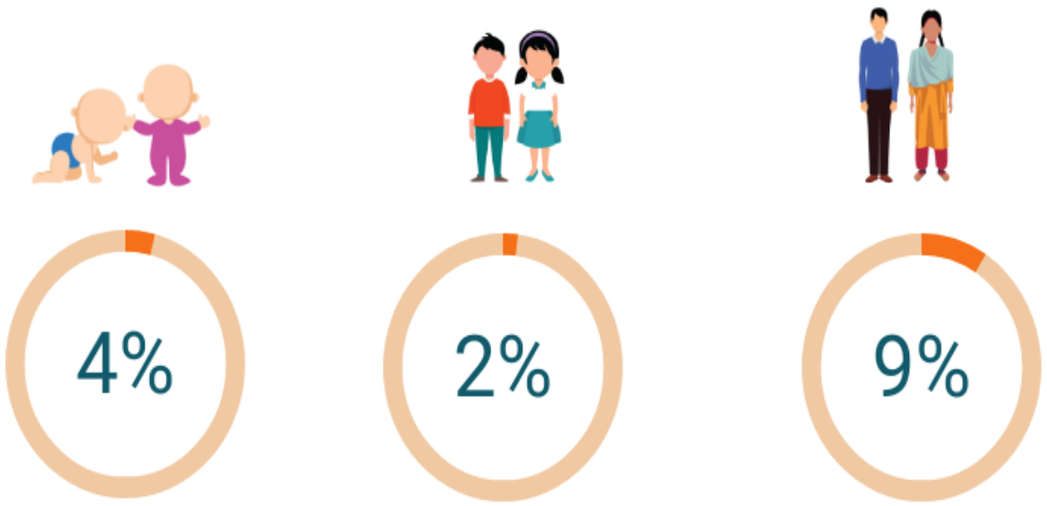
# Mizoram key findings: Anaemia and iron deficiency

## Anaemia




In Mizoram, anaemia was highest among children aged 1-4 years

## Iron deficiency




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



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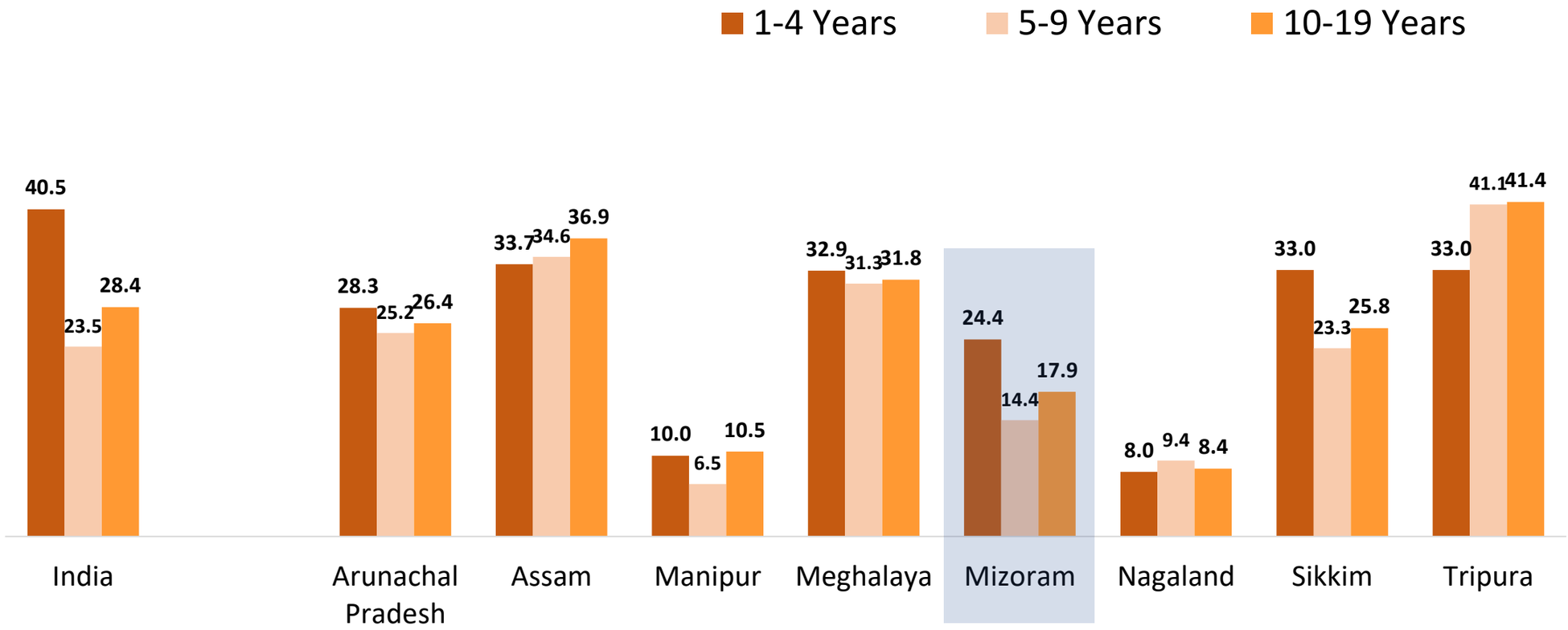
# Prevalence of Anaemia among children and adolescents

Nearly **1/4** children aged 1-4 years was anaemic in Mizoram (**24**%), 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)

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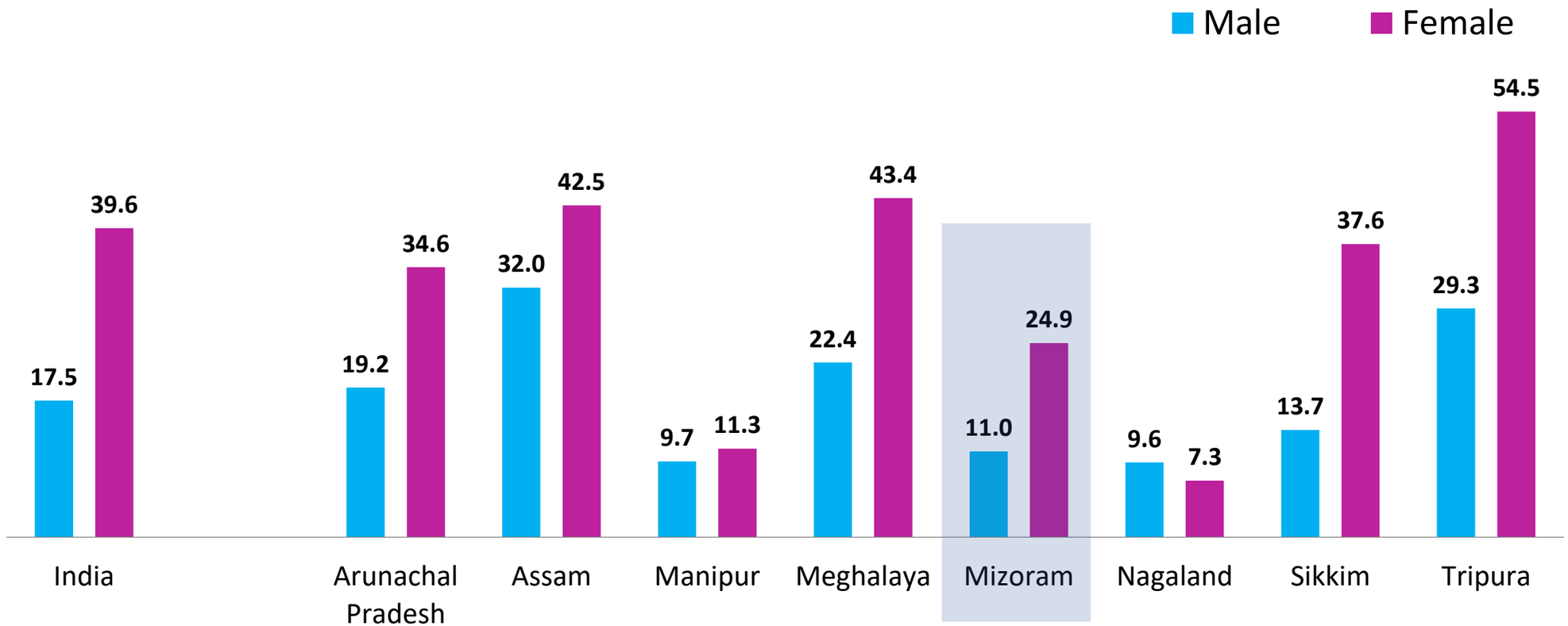
# Prevalence of Anaemia among adolescents (10-19 years)

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

In Mizoram, as in many other northeast states, adolescent girls were more likely than boys to be anaemic



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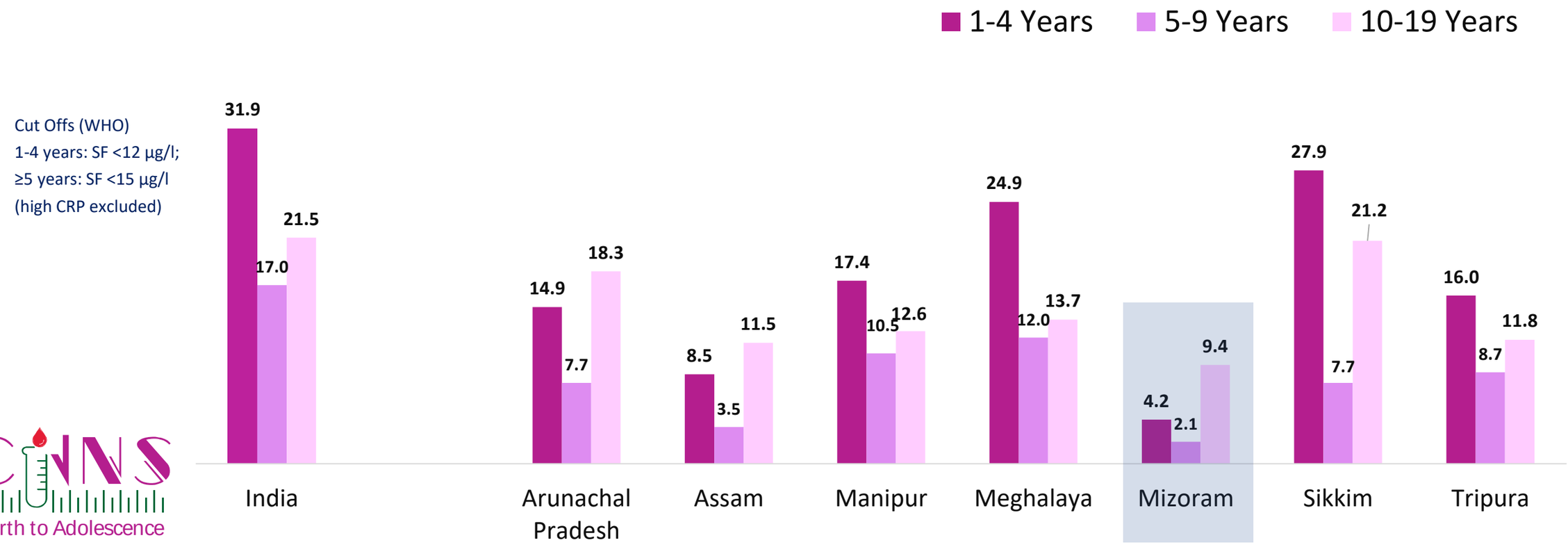
# Iron deficiency measured by serum ferritin among children and adolescents

**2-9%** of children and adolescents had iron deficiency in Mizoram, lowest among northeastern states and the national average






Birth to Adolescence

# Mizoram key findings: Vitamin A and Vitamin D deficiency


Vitamin A deficiency was very high (47%) in school-children aged 5-9 years indicating the need for policy review

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


Vitamin D deficiency varied from 6% to 13% 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



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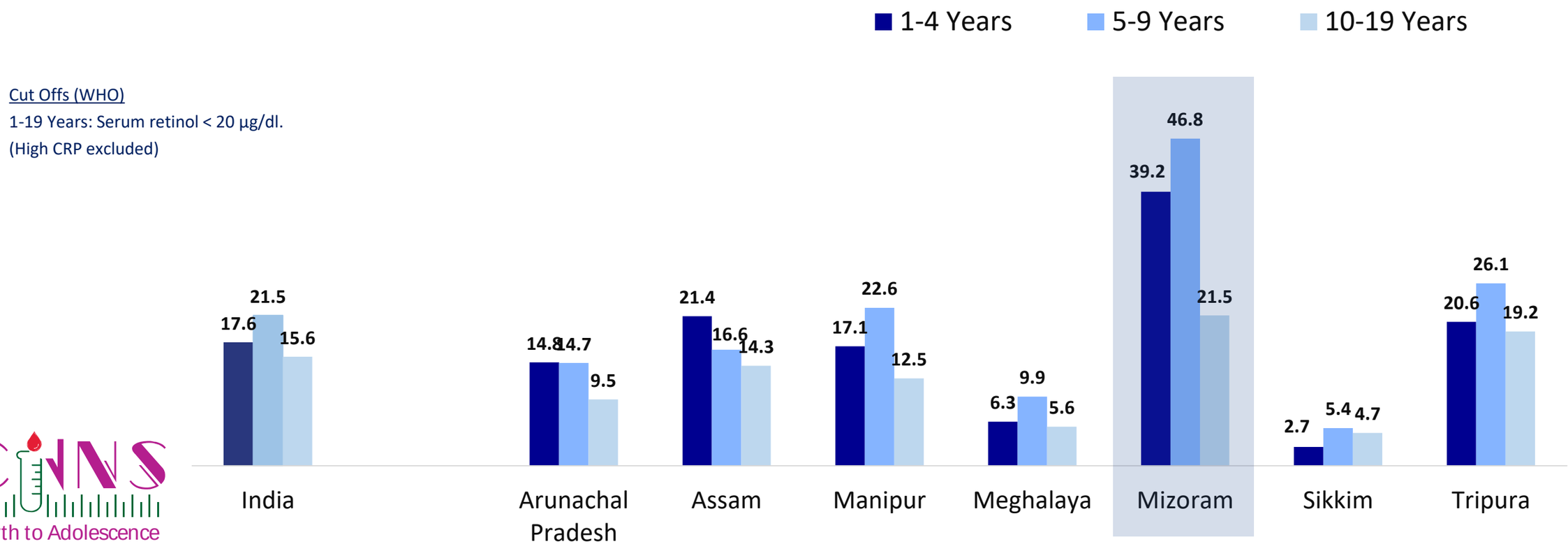
# Vitamin A deficiency among children and adolescents

**22-47%** of children and adolescents had Vitamin A deficiency in Mizoram.

Prevalence of Vitamin A deficiency was highest in Mizoram among the northeast states



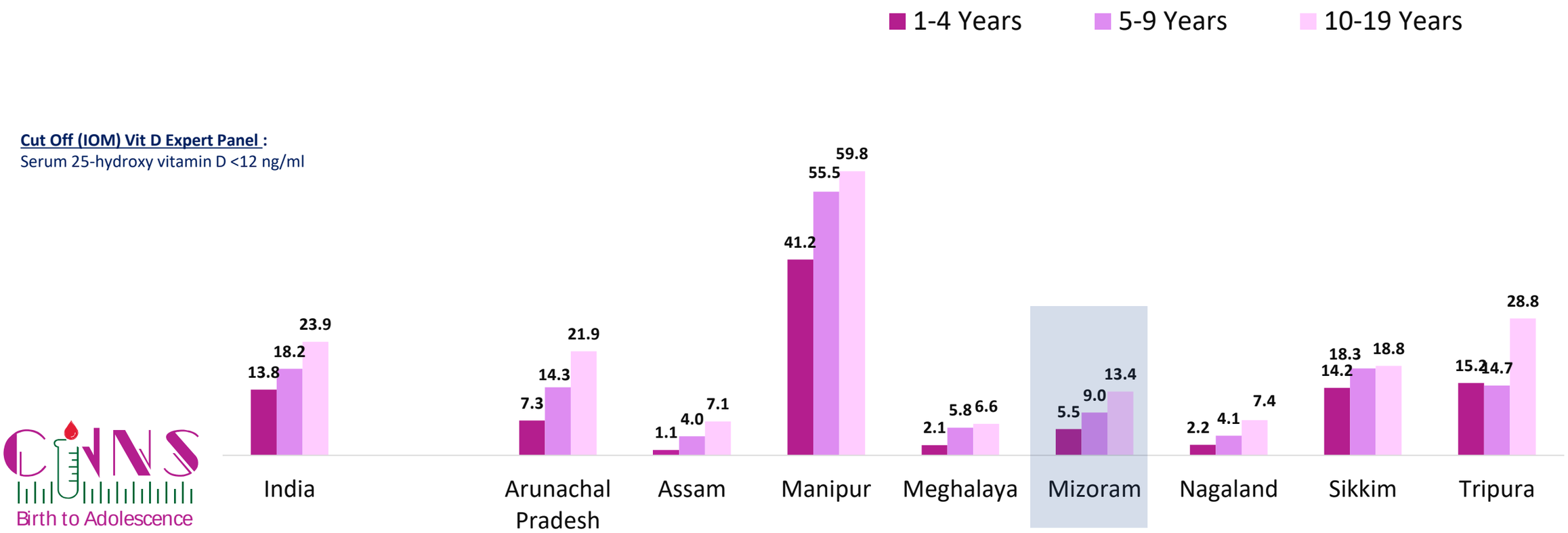



Birth to Adolescence

# Vitamin D deficiency increases with age

**6-13%** of children and adolescents had Vitamin D deficiency in Mizoram; Vitamin D deficiency increased sharply with age.

Among northeast states, Manipur had the highest Vitamin D deficiency among children and adolescents.



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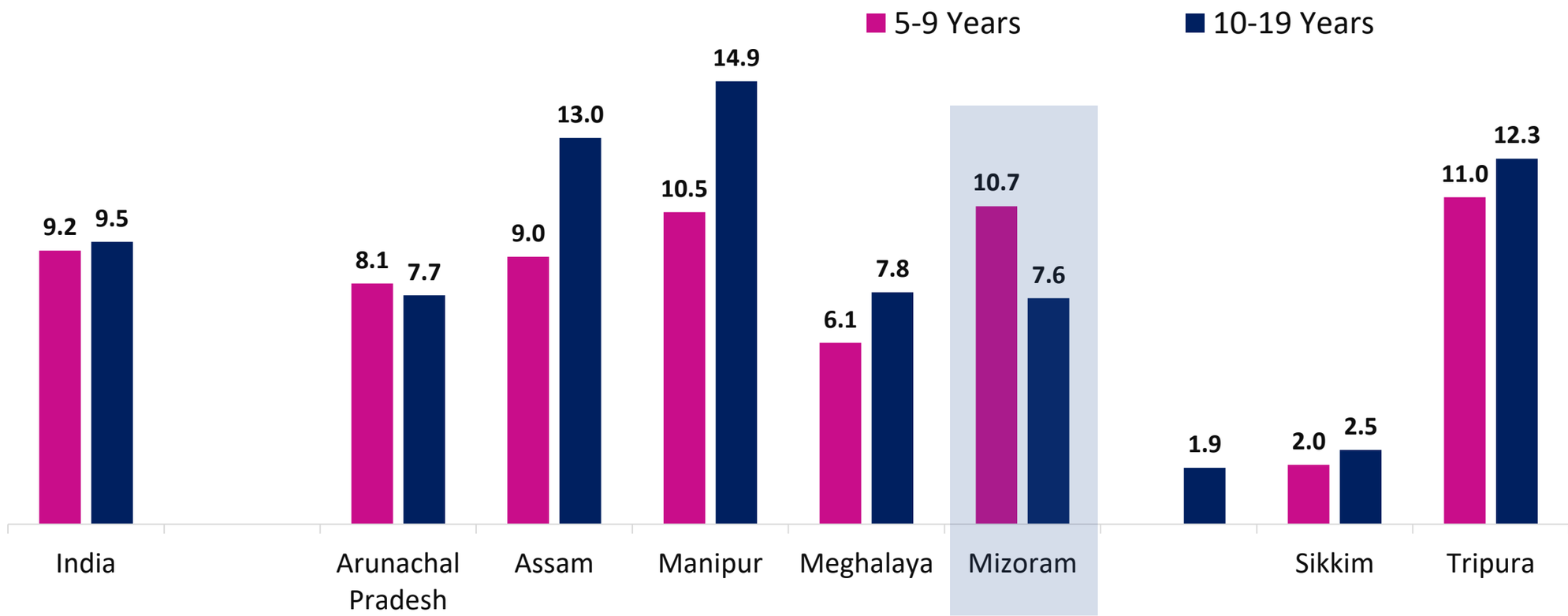
# Mizoram key findings: Non-communicable diseases

11% of school-age children and 8% 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), **11%** of children and **8%** of adolescents had increased risk of diabetes in Mizoram.



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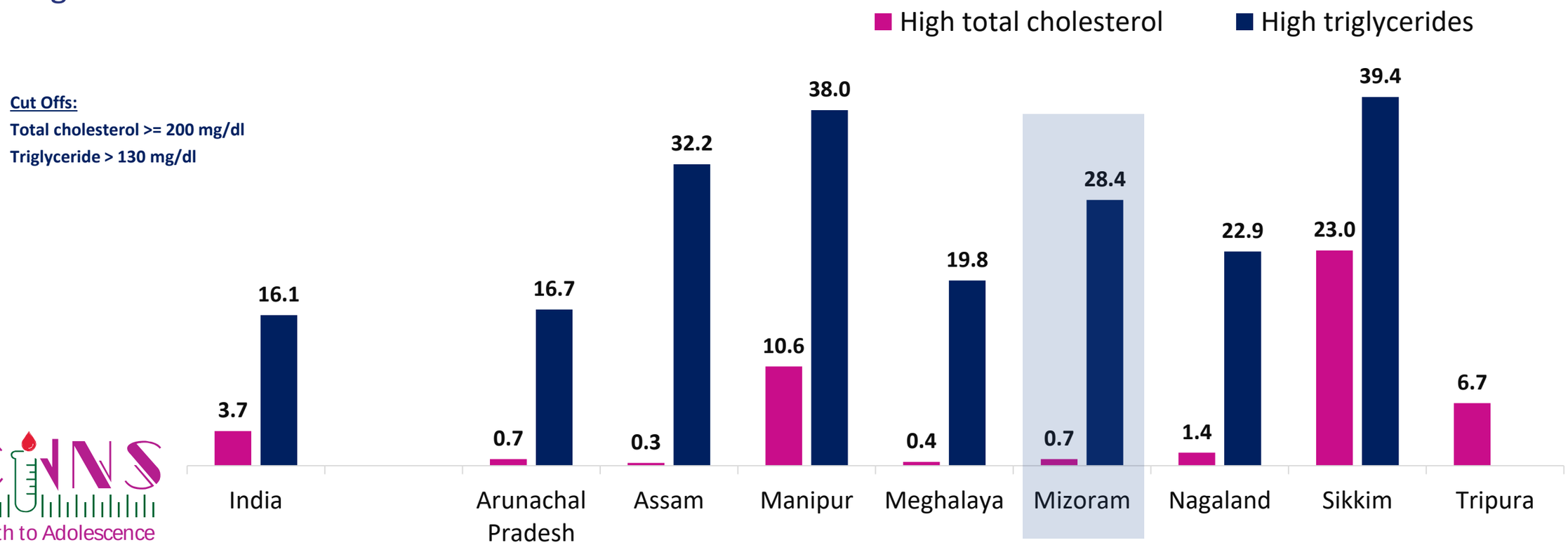
# High total cholesterol and high triglyceride among adolescents

Elevated risk of NCDs in Mizoram among adolescents – less than **1%** had high level of total cholesterol and **28%** with high level of triglycerides

Prevalence of high total cholesterol and high triglyceride were highest in Sikkim, followed by Manipur, among northeast states



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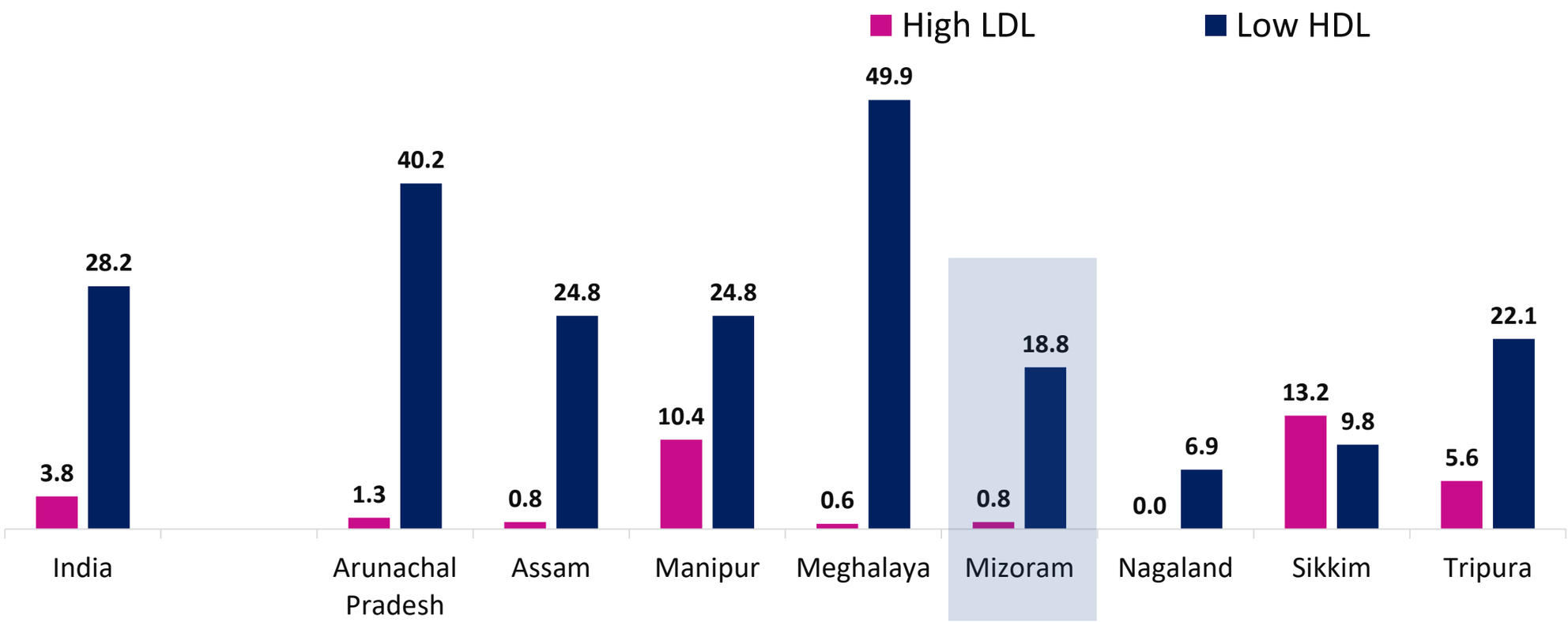
# High LDL and low HDL among adolescents

Risk of NCDs among adolescents in Mizoram– **1%** had high level of LDL and **19%** had low level of HDL

**Cut Offs:**
**LDL >= 130 mg/dl**
**HDL < 40 mg/dl**






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 very high. Policy review is warranted. 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
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The survey was conducted with generous financial support from

**Aditya and Megha Mittal**

and technical support from