



सत्यमेव जयते

Ministry of Health and Family Welfare
Government of India



Comprehensive National Nutrition Survey

2016 – 2018

Goa
State Presentation



Largest Micronutrient Survey ever conducted:

112,316

Children and adolescents interviewed



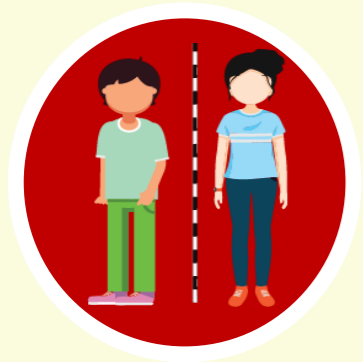
51,029

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



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](https://doi.org/10.1016/S2352-4642(19)30273-1)

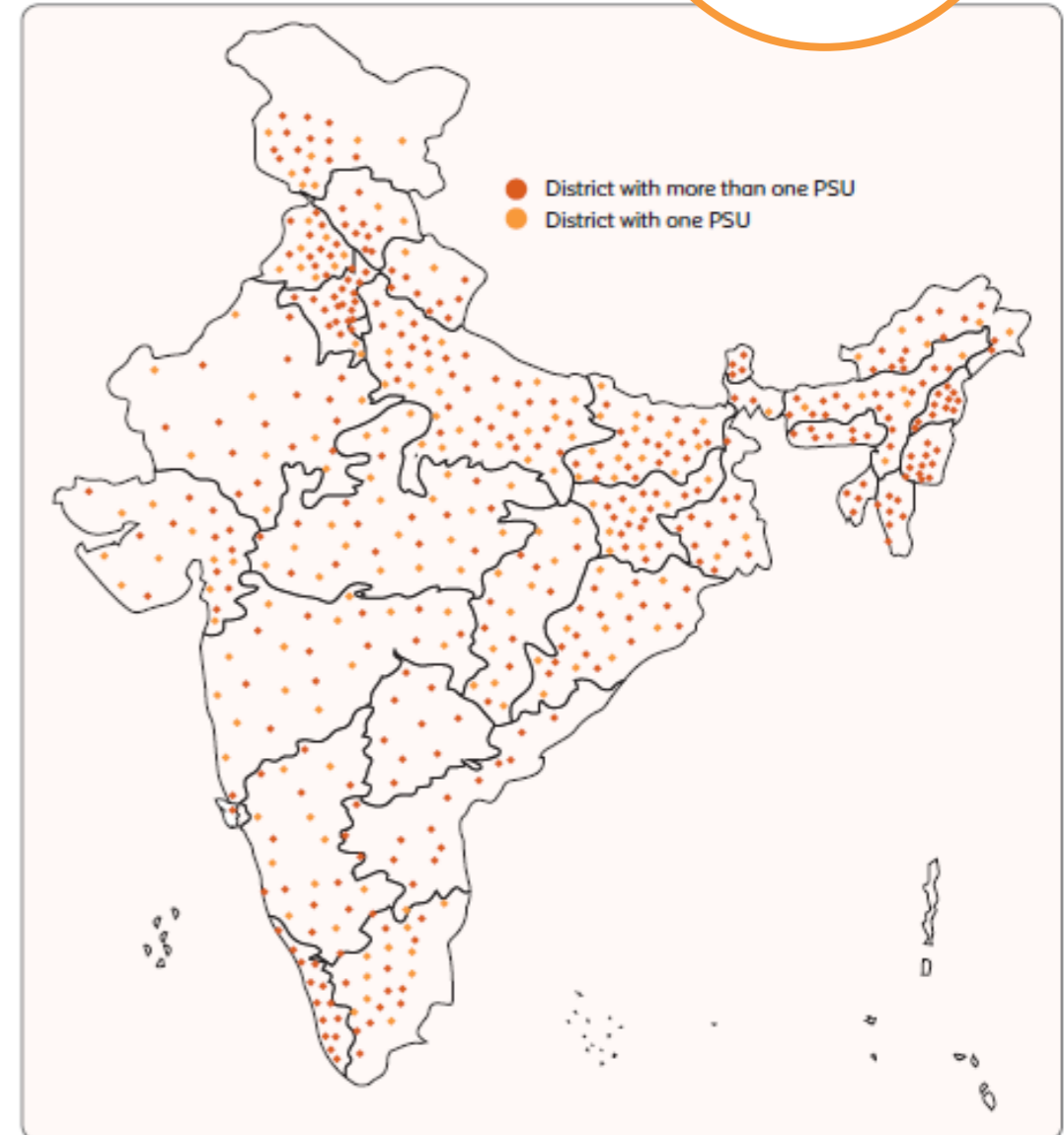
Survey Design



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:

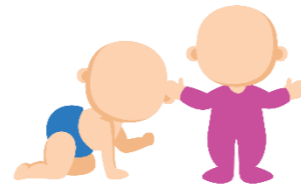
- 160 Districts- one PSU
- 356 Districts- two or more PSUs



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

Biochemical indicators – micronutrient deficiencies and NCDs



Indicator Group			
Anaemia and haemoglobinopathies	<ul style="list-style-type: none"> • Haemoglobin • Variant haemoglobins 		
Inflammatory biomarkers	<ul style="list-style-type: none"> • C-reactive protein 		
Protein	<ul style="list-style-type: none"> • Serum protein and albumin 		
Micronutrients	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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

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

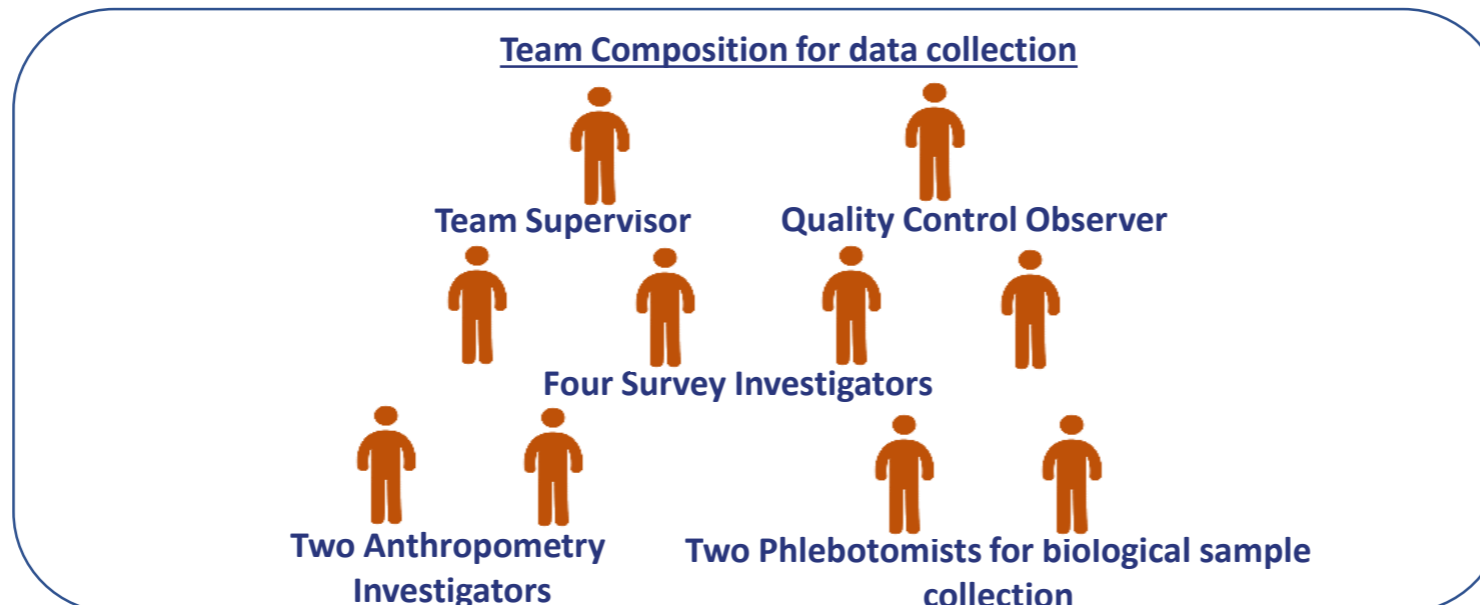
Third Level

- 3-member Data Quality Assurance (DQA) team for re-interviews & observations
- Concurrent monitoring of biological sample collection, storage and transportation by CDSA

Second Level

- Internal monitoring by the Quality Control Observer
- Daily supervision of the field work by Team Supervisor

First Level



Quality Assurance Measures for Data Quality



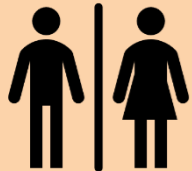
Quality Assurance Measures

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)



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

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: IIMR, Kantar Public,
Gfk Mode and Sigma Consulting

Sample size in Goa



CNNS covered 55 PSUs for data collection in Goa

Achieved following sample size by age groups:

	0-4 years	5-9 years	10-19 years	Total
Household and anthropometry data	1,036	1,063	1,021	3,120
Biological sample	339	398	393	1,130

Period of data collection in Goa



CNNS data collection period: July 6, 2016 to September 13, 2016

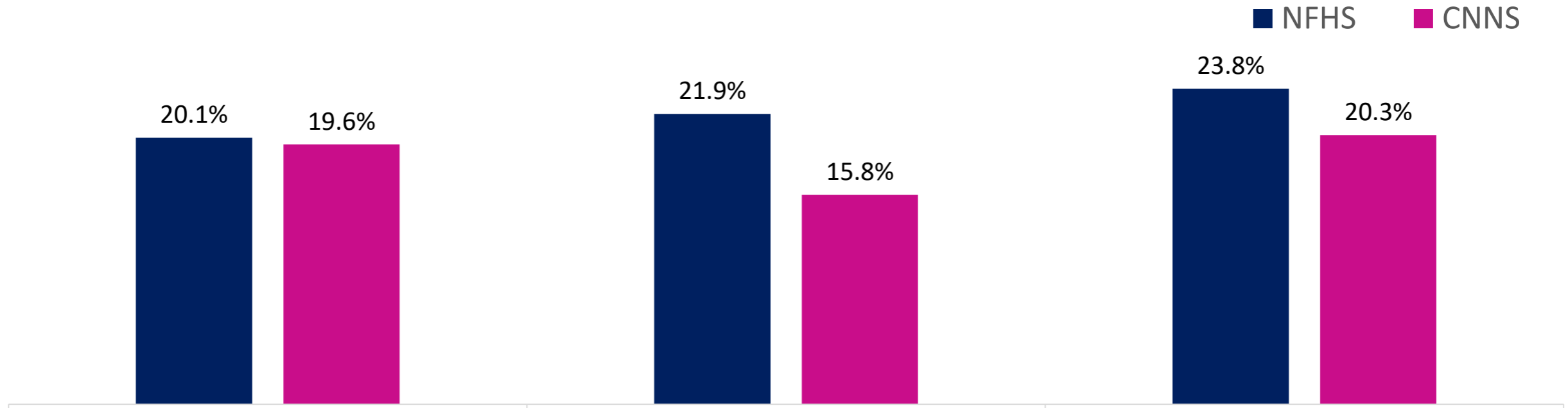
- CNNS collected data during the rainy season of 2016
- NFHS collected data during the winter season and summer season of 2015

Survey	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CNNS 2016							July to September, 2016					
NFHS 4 2015	January to April, 2015											

Goa key findings: Anthropometry (1/2)



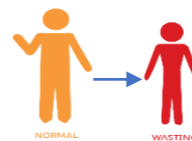
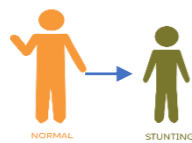
No significant reduction in stunting, wasting and underweight in children under 5 years



Stunting (Low height for age)

Wasting (Low weight for height)

Underweight (Low weight for age)



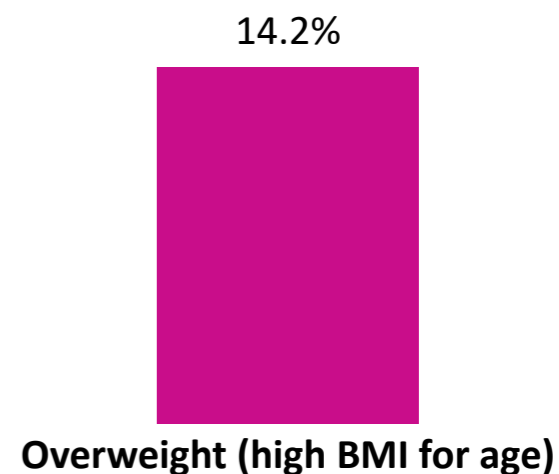
Goa key findings: Anthropometry (2/2)



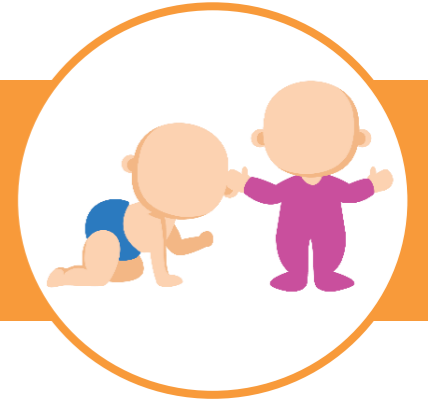
Over **1/5** adolescents aged 10-19 years was thin for their age (BMI-Age $< -2SD$)

1/7 children aged 5-9 years was stunted. The school age period does not provide an opportunity for catch up growth in height.

14% of adolescents aged 10-19 years were overweight or obese.

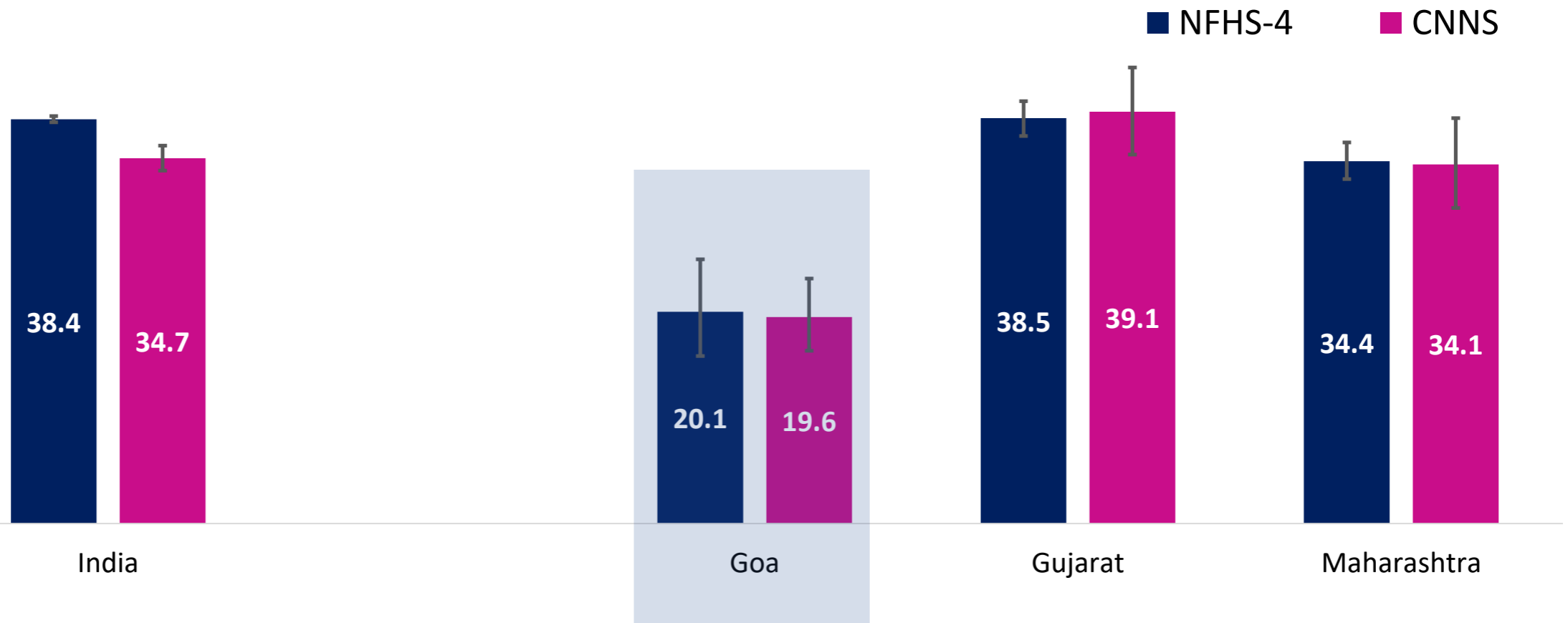


Stunting unchanged among children under five



Prevalence of stunting in Goa was unchanged between CNNS and NFHS-4 – **20%**

Prevalence of stunting remained unchanged in all western states

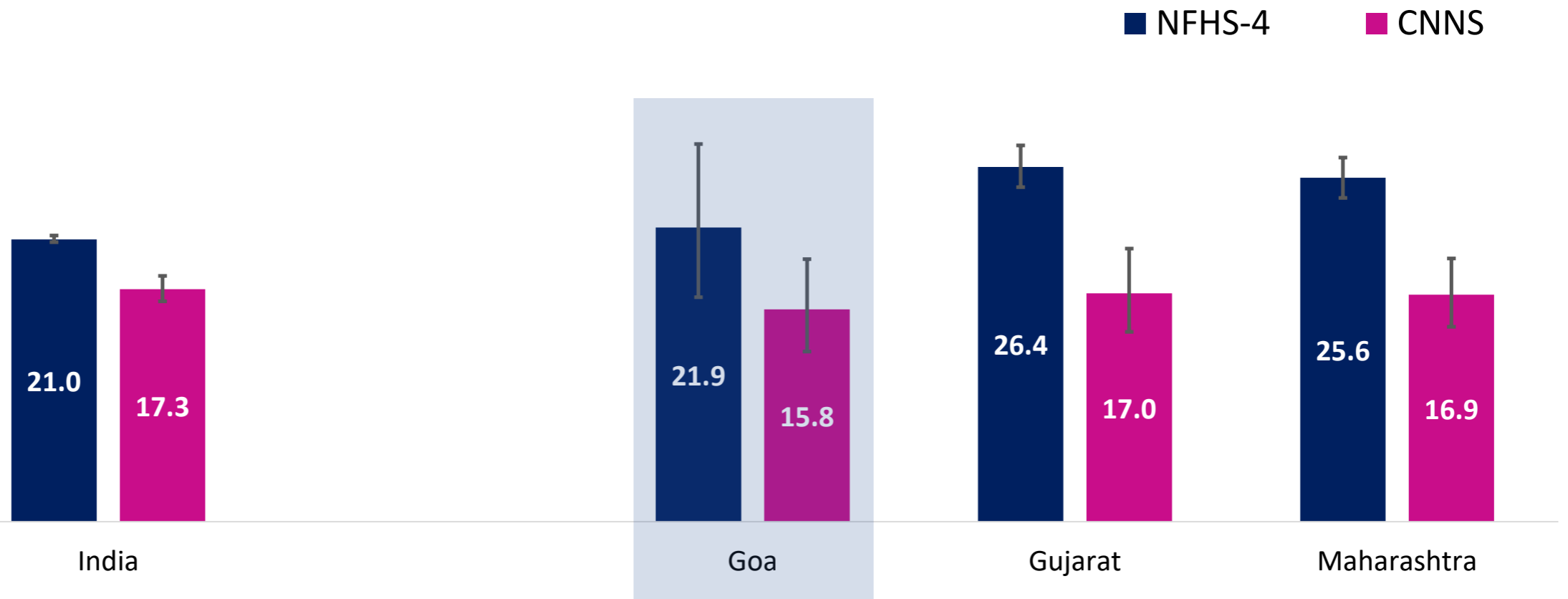


Wasting among children under five unchanged



Prevalence of wasting did not decline significantly in Goa between NFHS-4 and CNNS – **22% vs 16%**

Prevalence of wasting significantly declined in Gujarat and Maharashtra



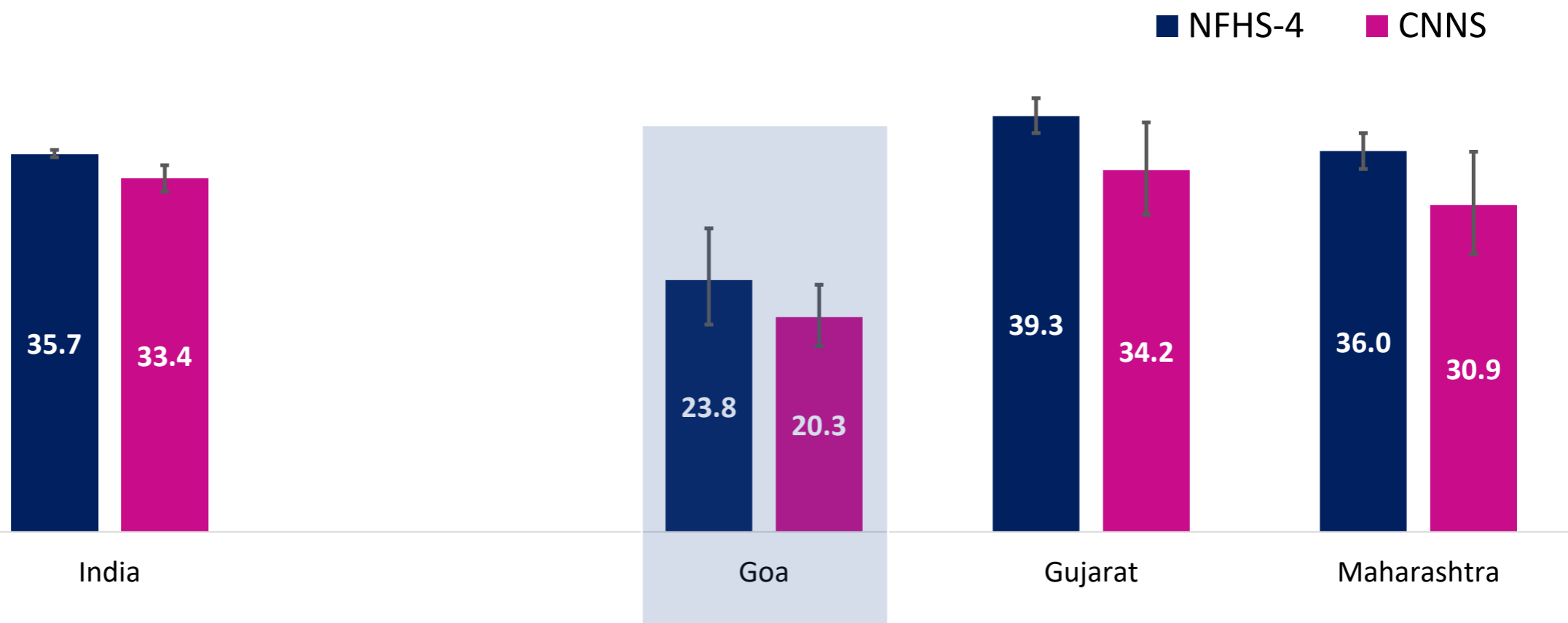
Prevalence of underweight among children under five unchanged



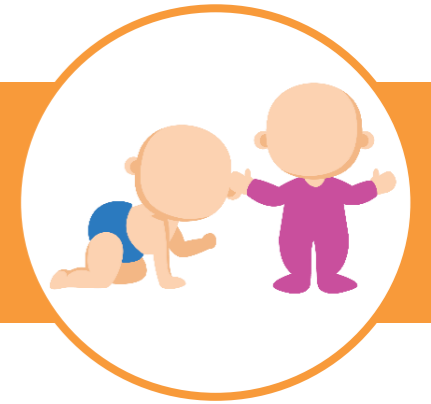
Underweight is a composite measure of chronic and acute malnutrition

The prevalence of underweight slightly declined between NFHS-4 and CNNS – **24% Vs 20%**

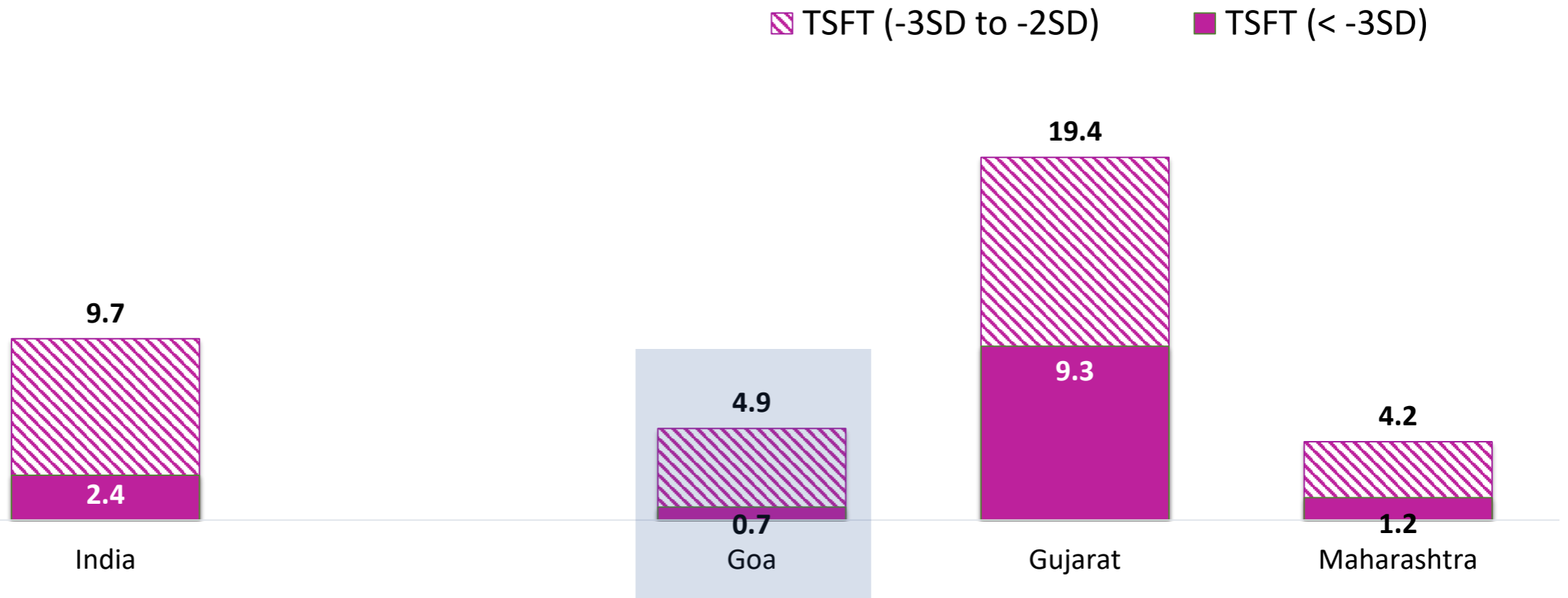
Prevalence did not significantly decline in any of the western states



Triceps Skinfold Thickness (TSFT) for children under five



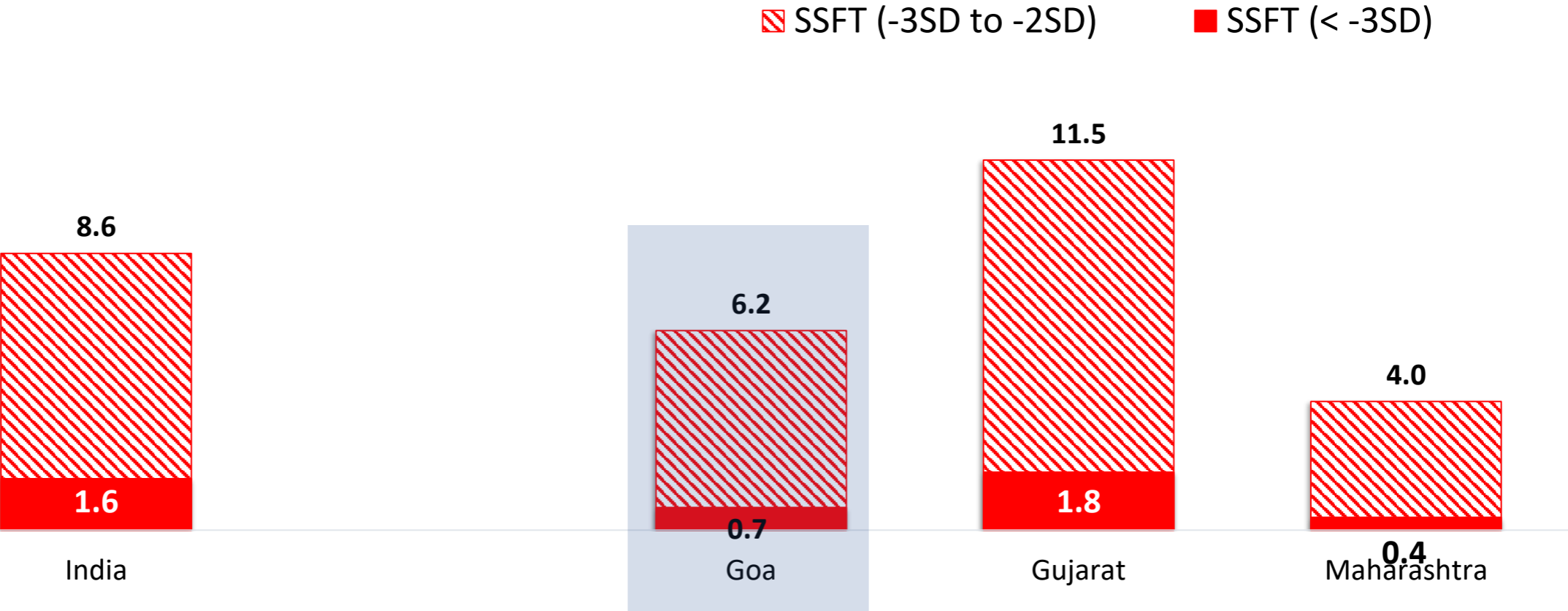
Low fat mass as reported by TSFT in Goa (5%) was much lower than Gujarat (19%) and half of the national average (10%)



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



Thinness as reported by SSFT in Goa (6%) was lower than National average (9%) and Gujarat (12%) in the western region



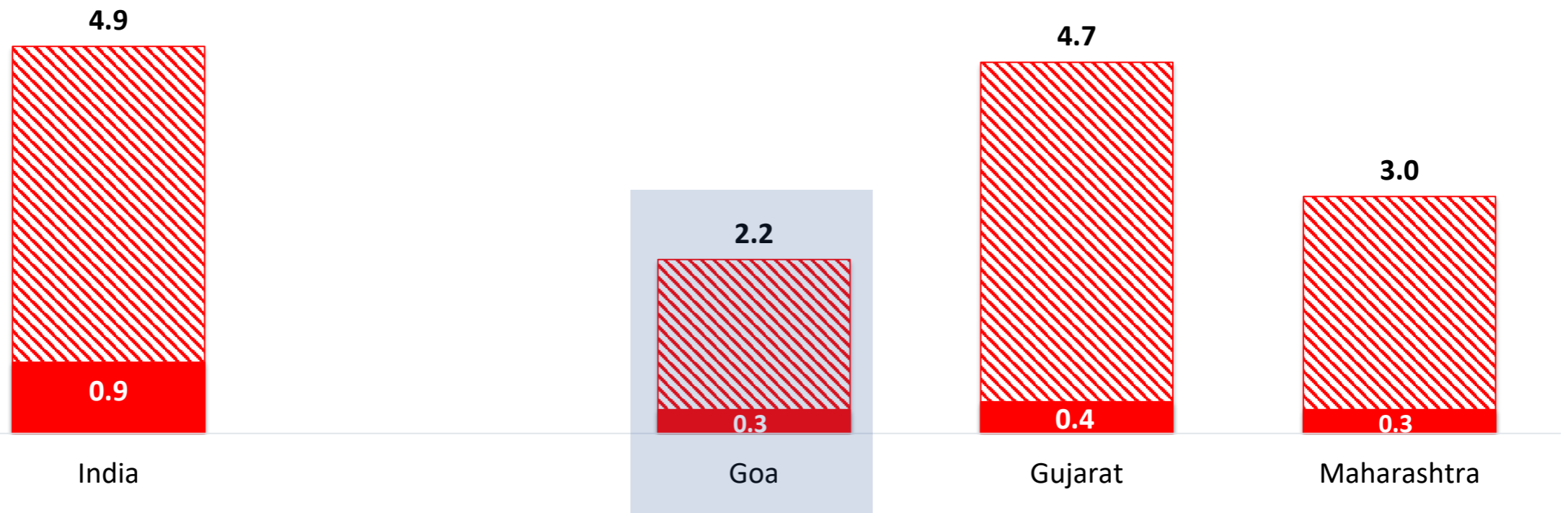
Mid Upper Arm Circumference (MUAC) for children aged 6–59 months



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

Prevalence of low MUAC ranged between **2%** and **5%** across the western states

▨ MUAC (≥ 115 mm & < 125 mm) ■ MUAC (< 115 mm)

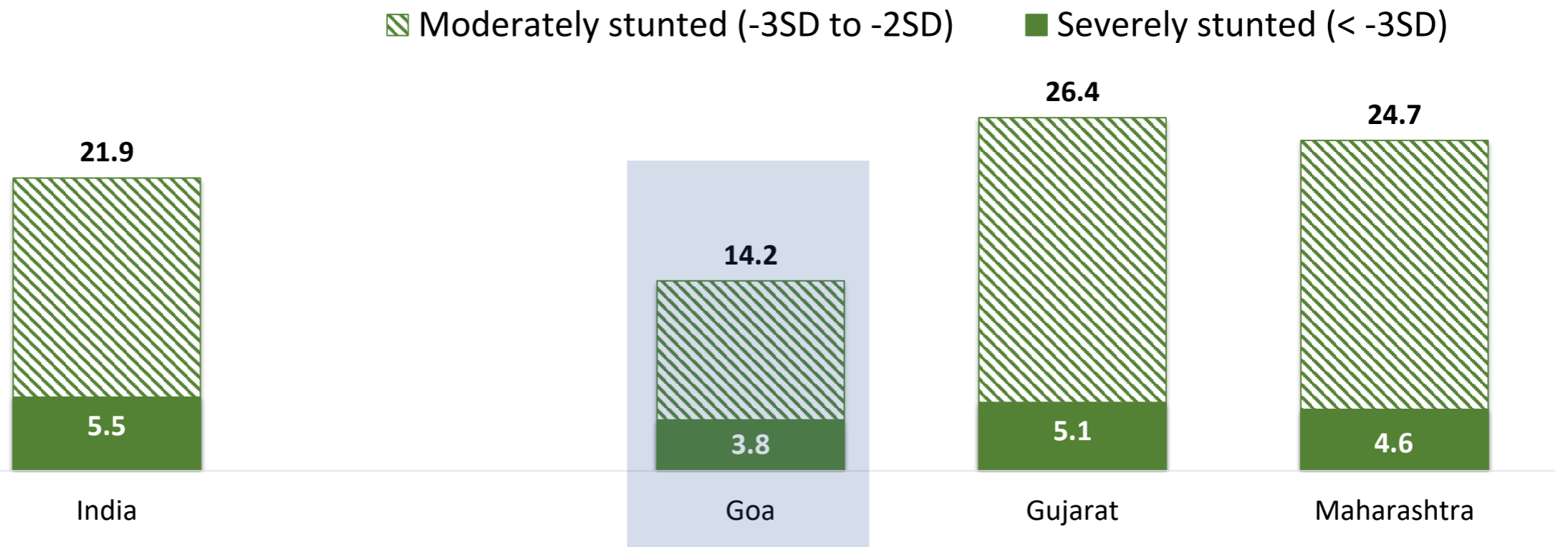


Stunting among school-age children (5-9 years)



1/7 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

Goa had lowest prevalence of stunting among western states and was also lower than national level



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

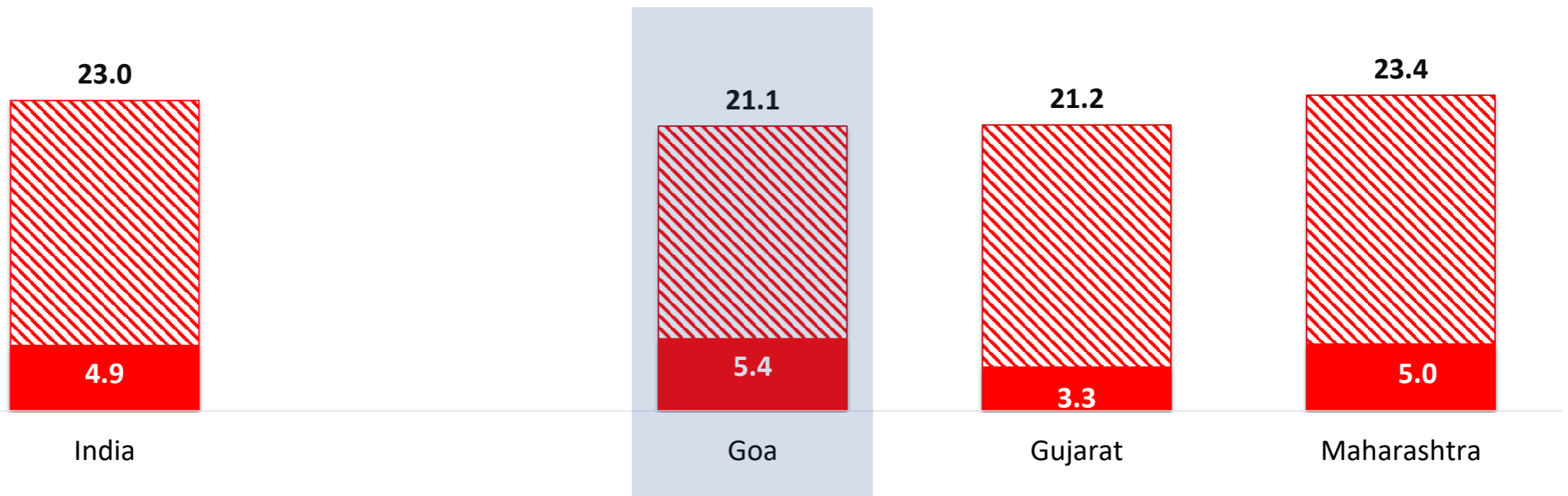


Over **1/5** children aged 5-9 years was thin in Goa

Prevalence of thinness in western states (21-23%) was similar to national average (23%)

▨ Moderate thinness (-3SD to -2SD)

■ Severe thinness (< -3SD)



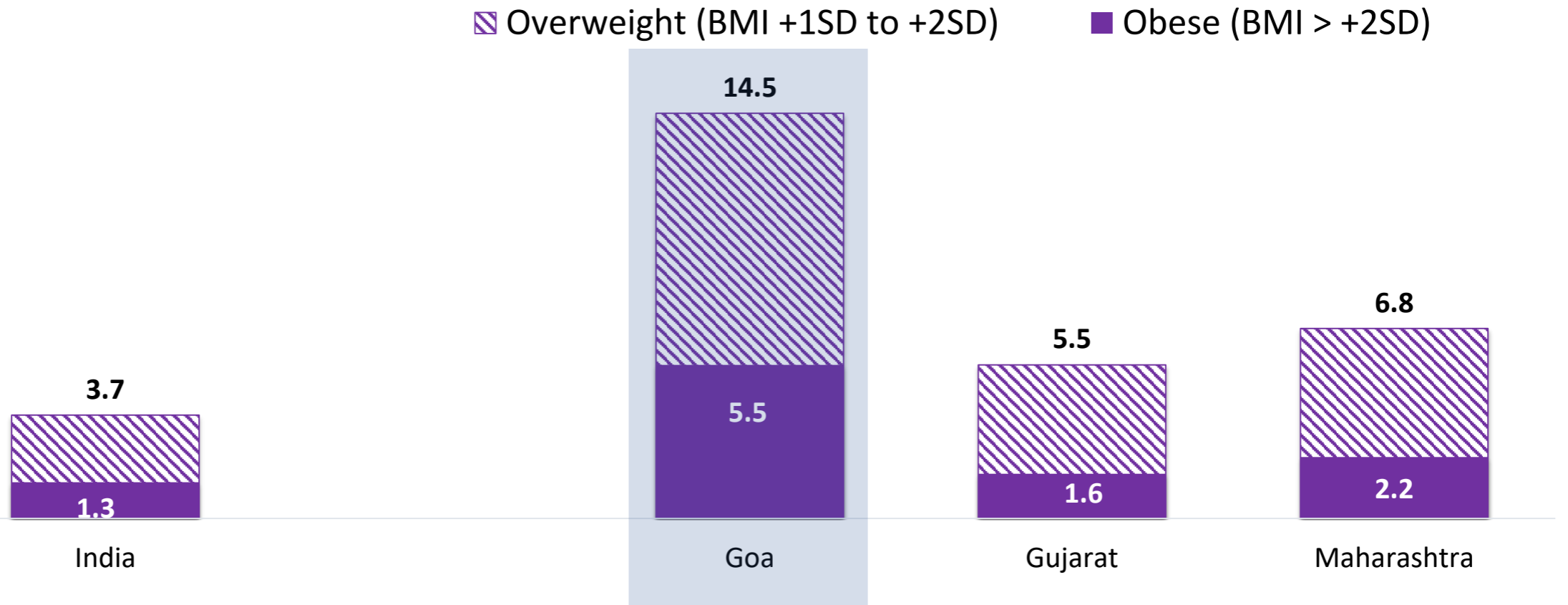
Overweight and obesity among school-age children (5-9 years) increasing



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

Prevalence of overweight in Gujarat (6%) was slightly more than the national average (4%)

Among western states, Goa was one with very high prevalence of overweight in this age group



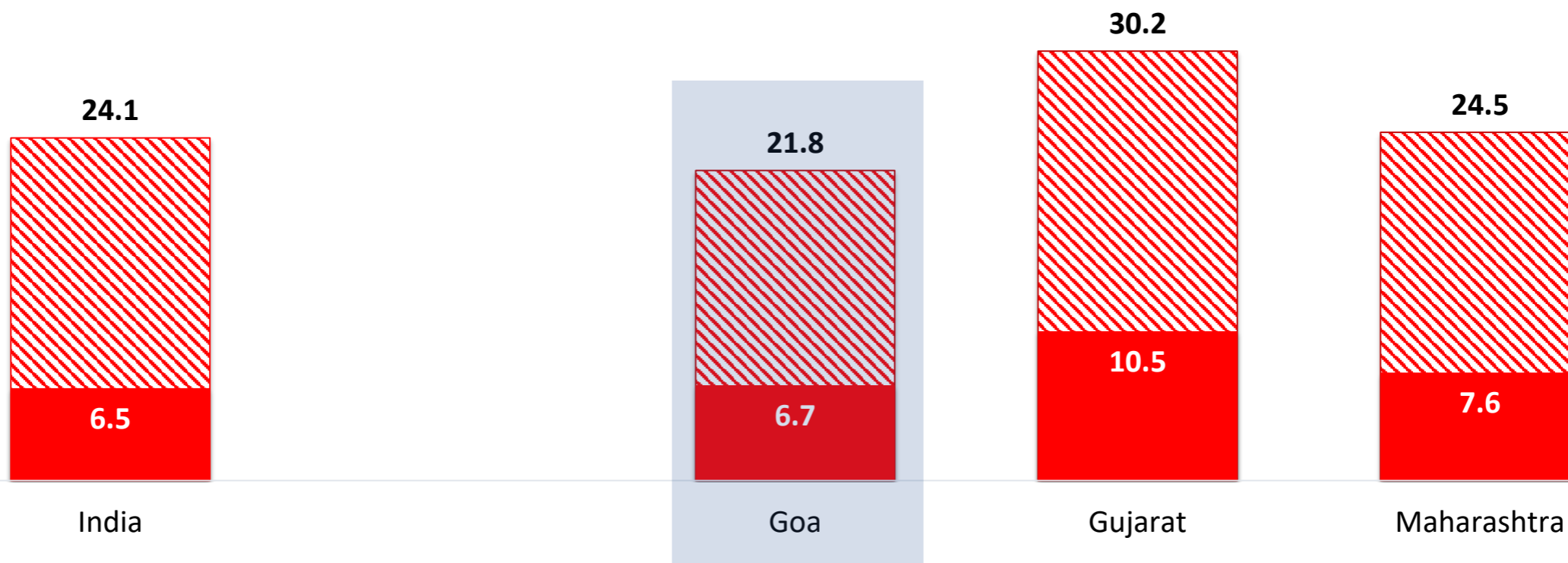
Thinness among adolescents aged 10-19 year substantially high



Over **1/5** adolescents aged 10-19 years was thin in Goa (**22%**), similar to national average (**24%**)

Among western states, Gujarat had highest prevalence of thinness (30%)

▨ Moderate thinness (-3SD to -2SD) ■ Severe thinness (< -3SD)

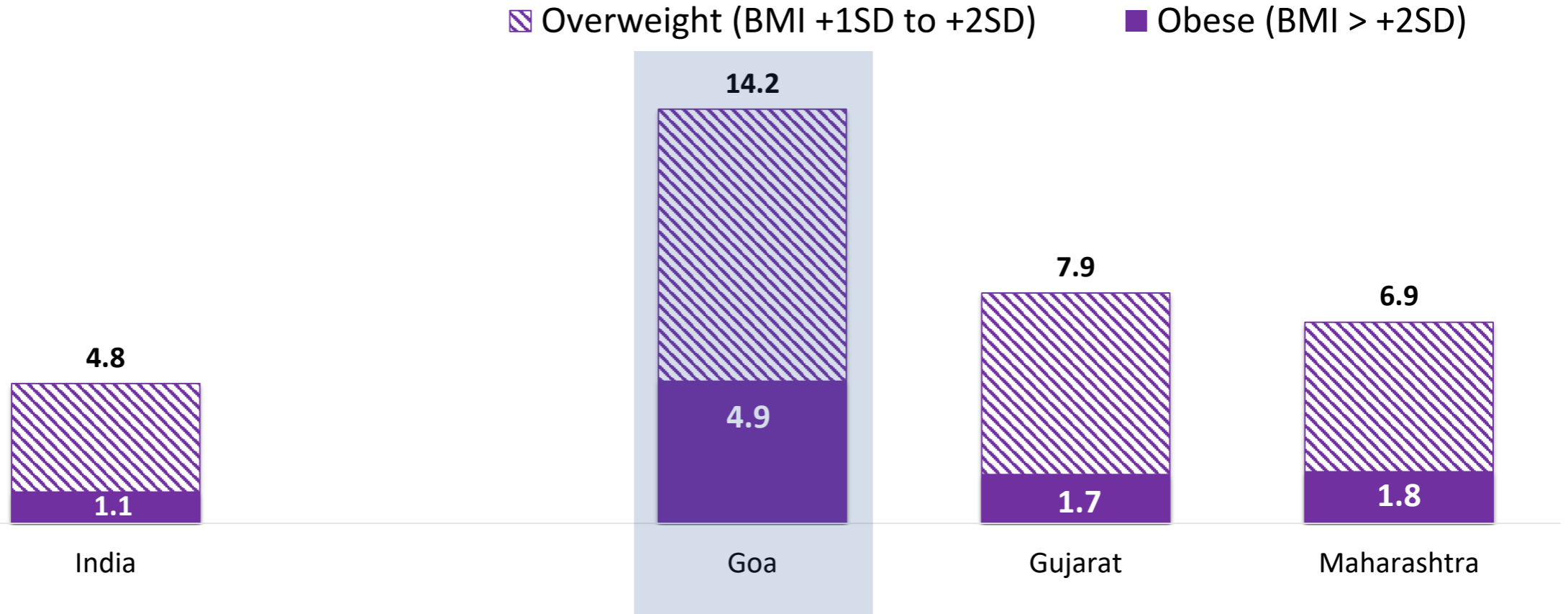


Prevalence of overweight among adolescents aged 10–19 years high



1/7 adolescents was overweight in Goa, higher than the national average (**5%**)

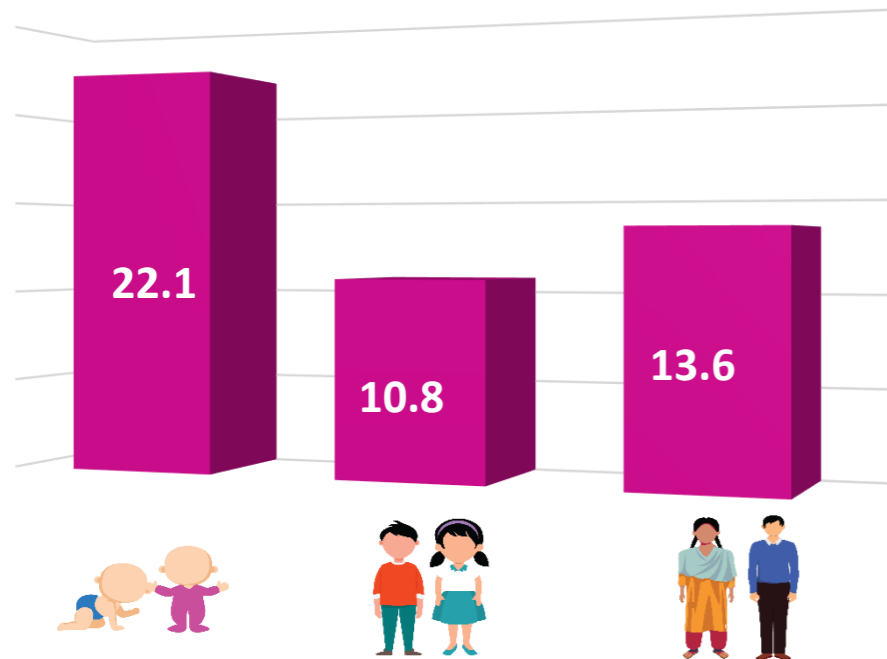
Among the western states, Goa (**14%**) had highest prevalence of overweight



Goa key findings: Anaemia and iron deficiency

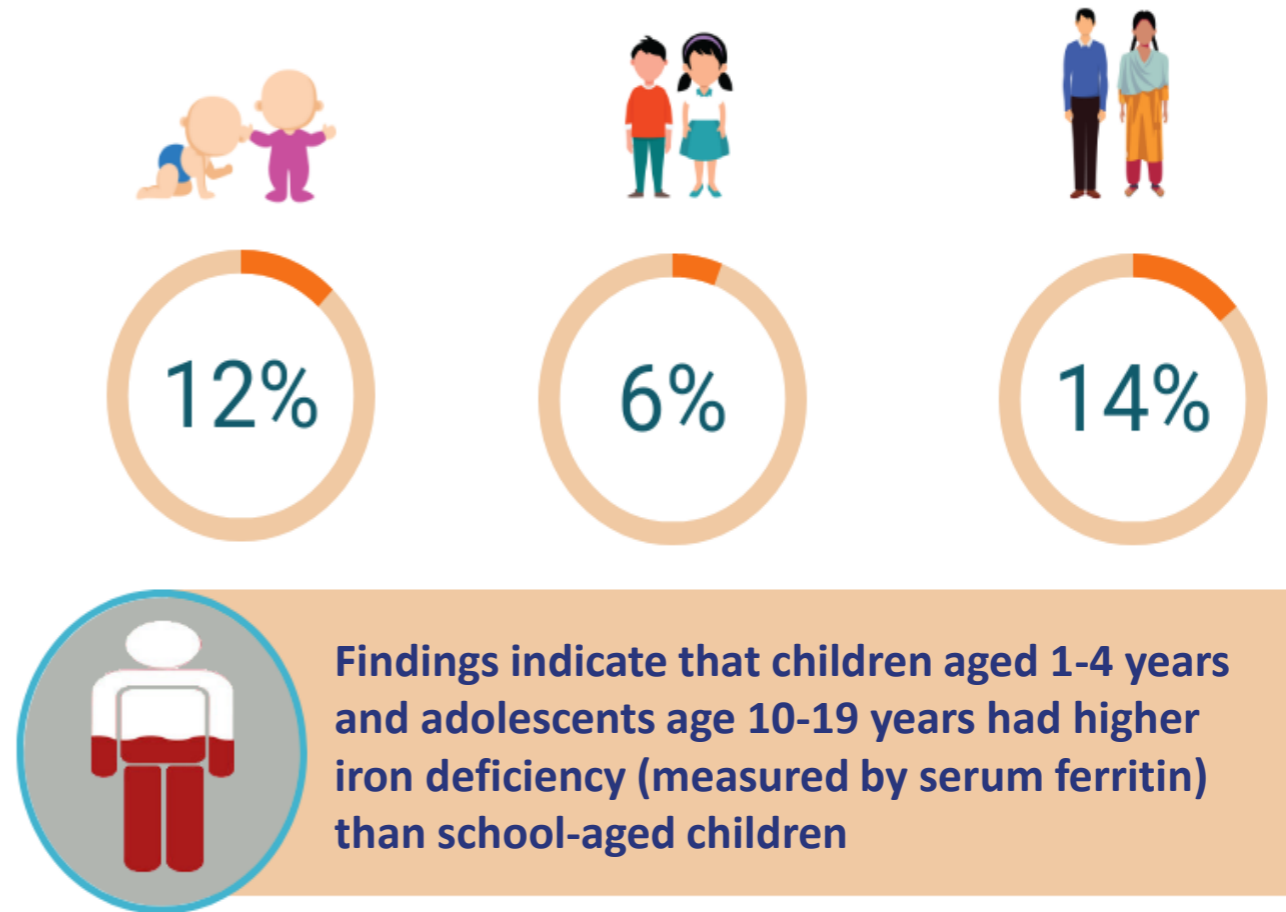


Anaemia



In Goa, 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



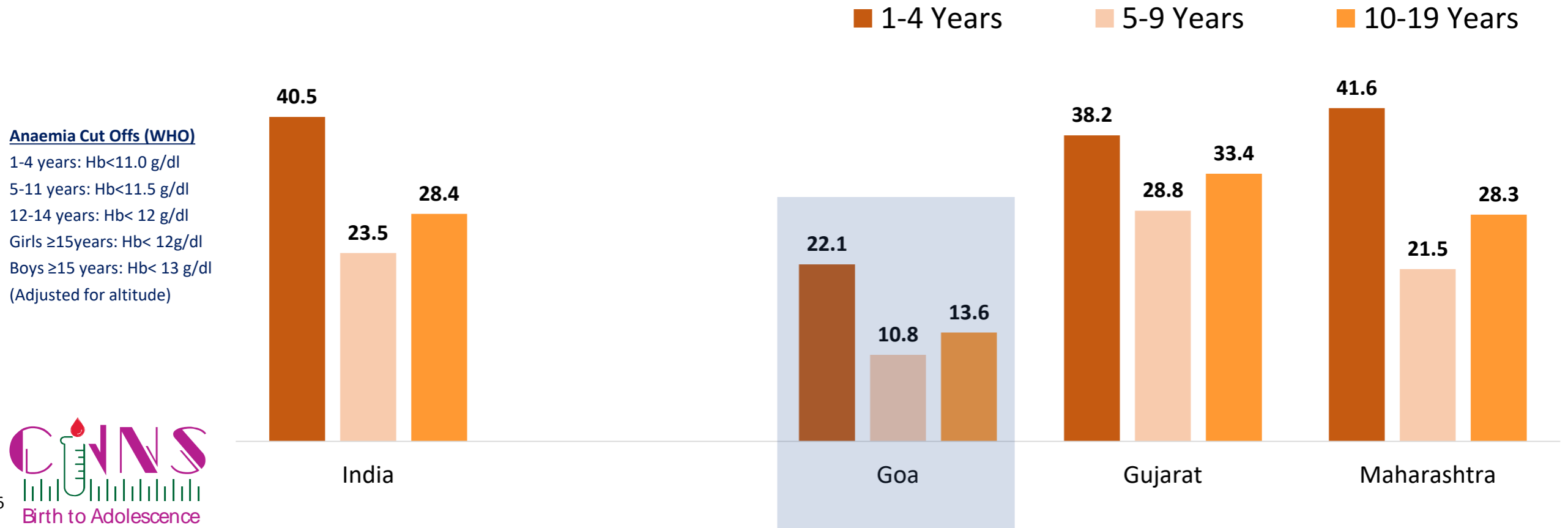
Findings indicate that children aged 1-4 years and adolescents age 10-19 years had higher iron deficiency (measured by serum ferritin) than school-aged children

Prevalence of Anaemia among children and adolescents



In Goa, prevalence of anaemia among children and adolescents was half of national level and lowest among western states.

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

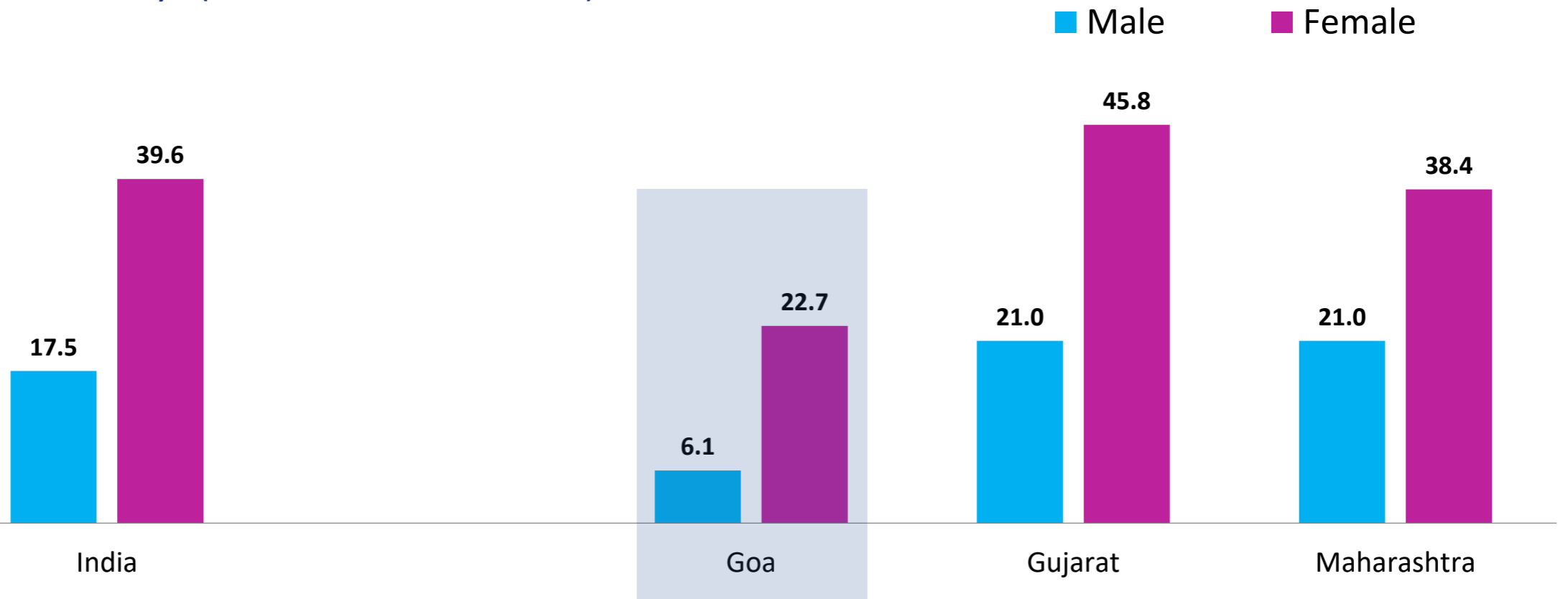


Prevalence of Anaemia among adolescents (10-19 years)



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

In Goa, as in many other western states, prevalence of anaemia among adolescent girls was significantly higher than adolescent boys (more than three times)



Iron deficiency measured by serum ferritin among children and adolescents

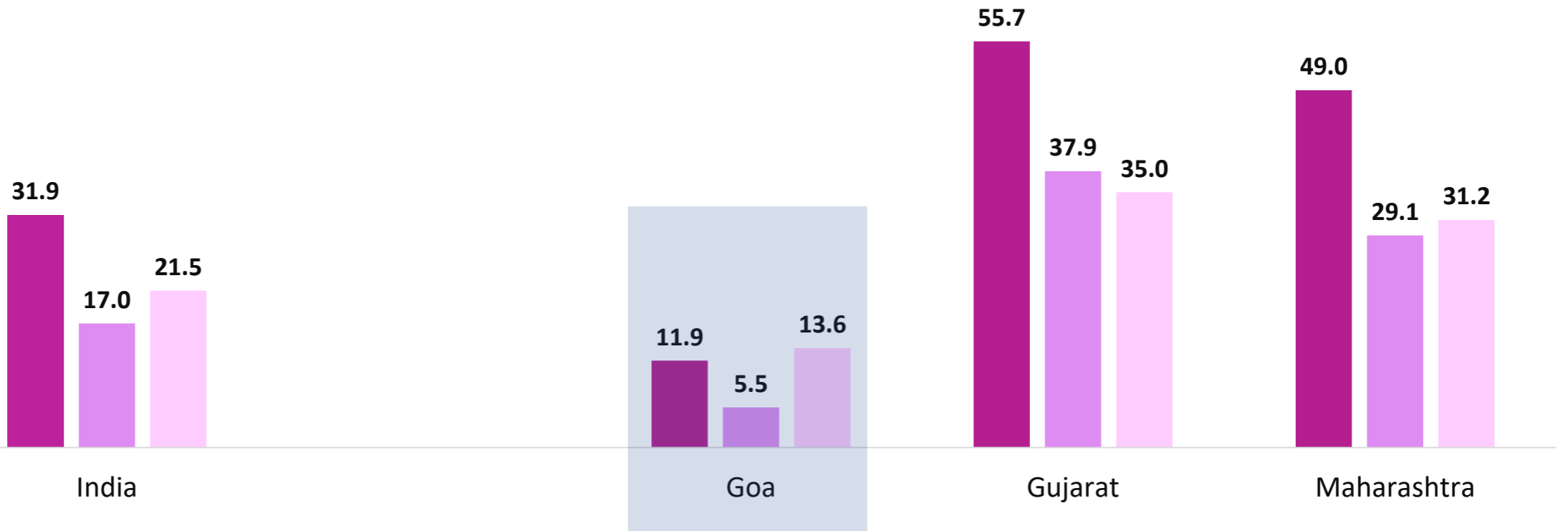


In Goa, children aged 1-4 years and adolescents aged 10-19 years had iron deficiency at similar level (12-14%) , but higher than school-aged children 5-9 years (6%)

Among western states, children and adolescents from Goa had lowest prevalence of iron deficiency

Cut Offs (WHO)
1-4 years: SF <12 µg/l;
≥5 years: SF <15 µg/l
(high CRP excluded)

■ 1-4 Years ■ 5-9 Years ■ 10-19 Years



Goa key findings: Vitamin A and Vitamin D deficiency



Vitamin A deficiency was high (7%) in school-age children 5-9 years indicating the need for policy review

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 18% to 23% in 1-19 years age group as per cut off by expert panel of IOM.

School- aged children 5-9 years were found to have higher level of Vitamin D deficiency than children aged 1-4 years and adolescents aged 10-19 years

Vitamin A deficiency among children and adolescents



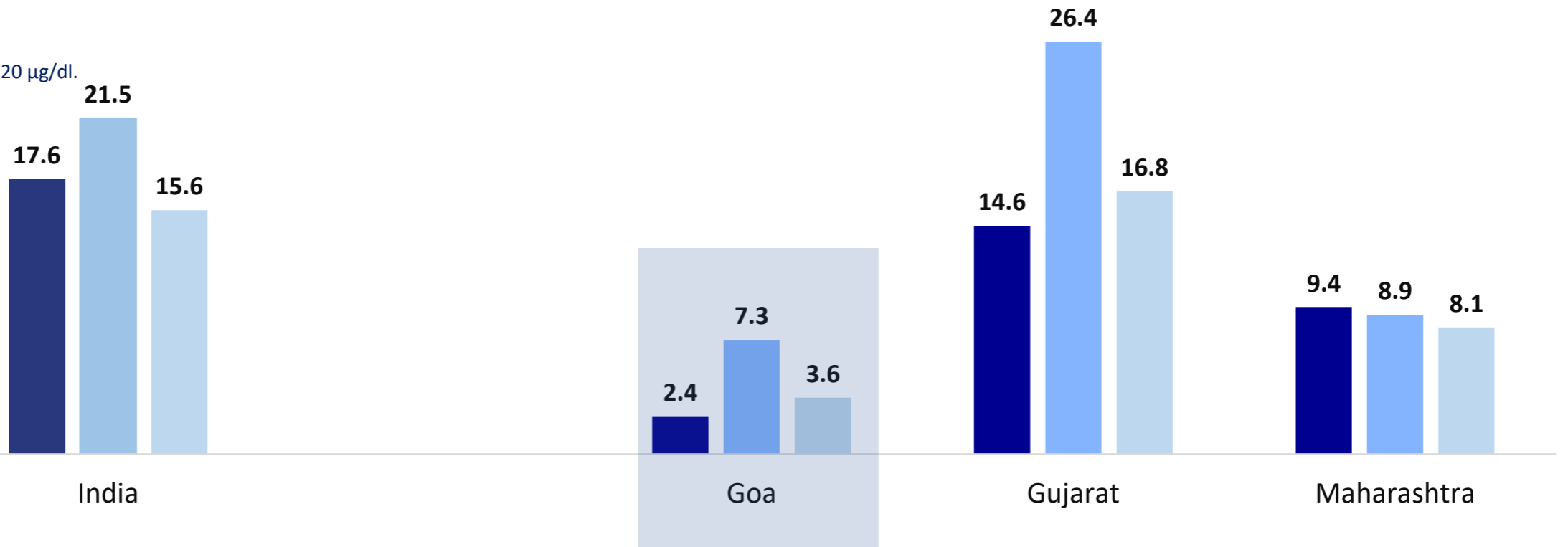
2-7% children and adolescents had Vitamin A deficiency in Goa

Gujarat had highest prevalence of Vitamin A deficiency among western states

Cut Offs (WHO)

1-19 Years: Serum retinol < 20 µg/dl.
(High CRP excluded)

■ 1-4 Years ■ 5-9 Years ■ 10-19 Years



Vitamin D deficiency increases with age

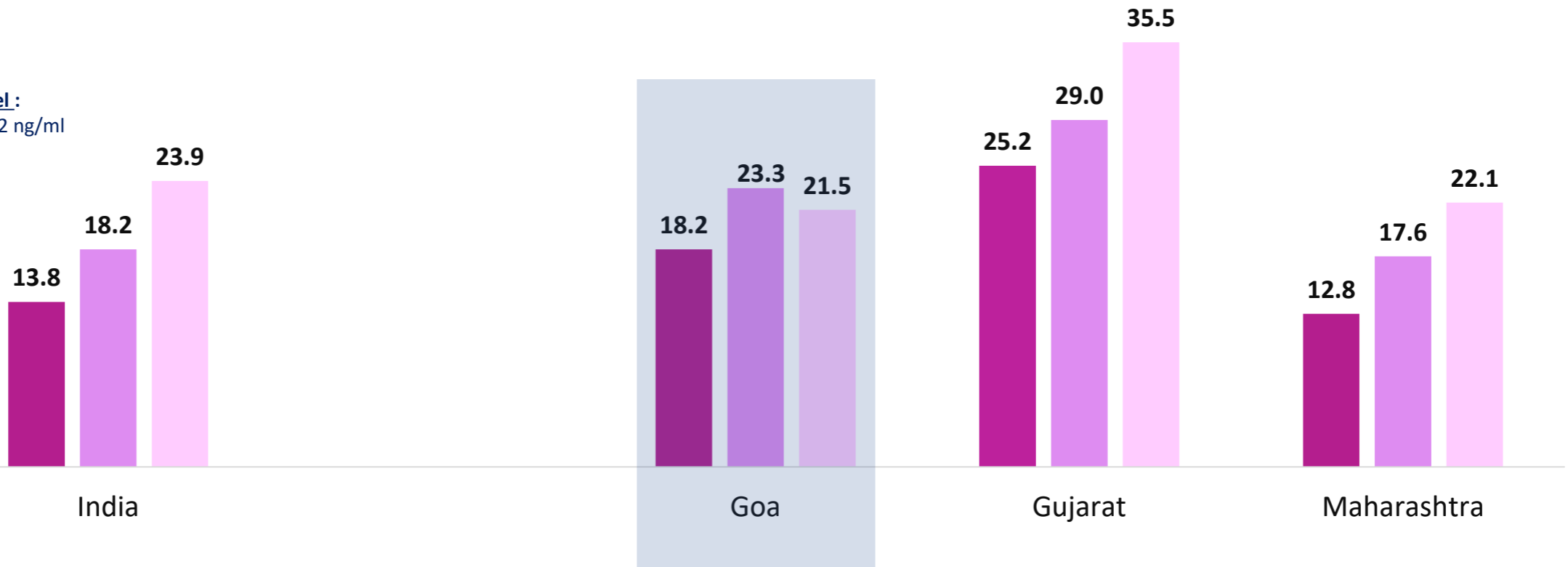


18-23% of children and adolescents had Vitamin D deficiency in Goa.

In other western states, except Maharashtra, Vitamin D deficiency among children and adolescents was similar or higher than national average.

Cut Off (IOM) Vit D Expert Panel :
Serum 25-hydroxy vitamin D <12 ng/ml

■ 1-4 Years ■ 5-9 Years ■ 10-19 Years



Goa key findings: Non-communicable diseases



1/4 school-age children and adolescents were found with high level of glycosylated haemoglobin (HbA1c).

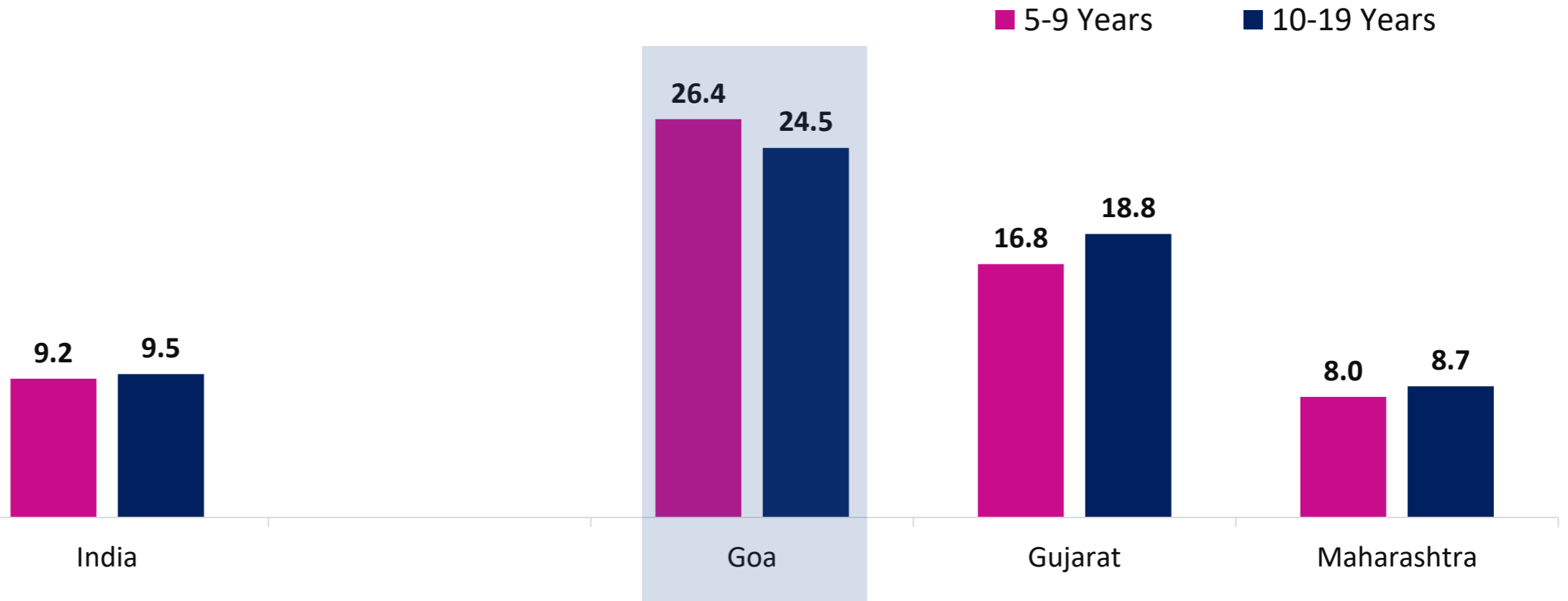
Other indicators of risks of NCDs, such as level of cholesterol, triglycerides, LDL and HDL point to increased risks of NCDs among adolescents.

Risk of diabetes among school-age children and adolescents



Based on Glycosylated hemoglobin (HbA1c), **1/4** children and adolescents had increased risk of diabetes in Goa (**25-26%**), significantly higher than country level (**9-10%**)

Among all western states, risk of diabetes was the highest in Goa



High total cholesterol and high triglycerides among adolescents



Elevated risk of NCDs in Maharashtra among adolescents – **8%** had high level of total cholesterol and **13%** with high level of triglycerides

Prevalence of high total cholesterol and high triglycerides were lowest in Maharashtra among western states

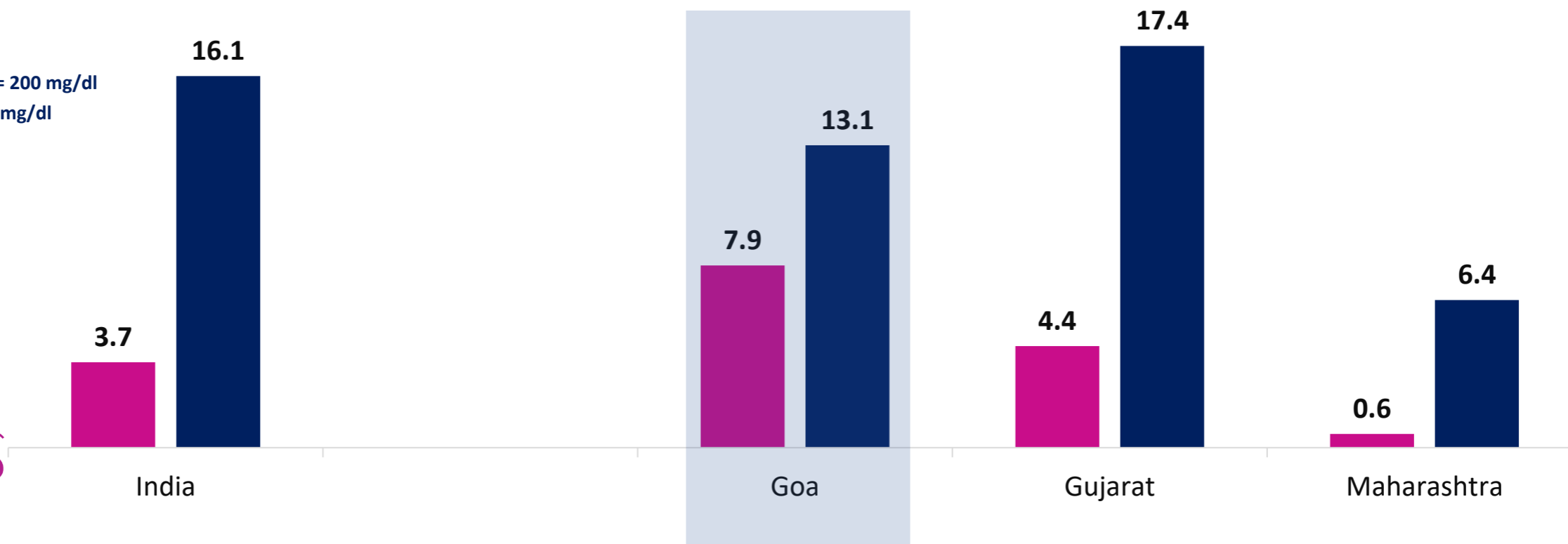
Cut Offs:

Total cholesterol \geq 200 mg/dl

Triglycerides $>$ 130 mg/dl

■ High total cholesterol

■ High triglycerides



High LDL and low HDL among adolescents

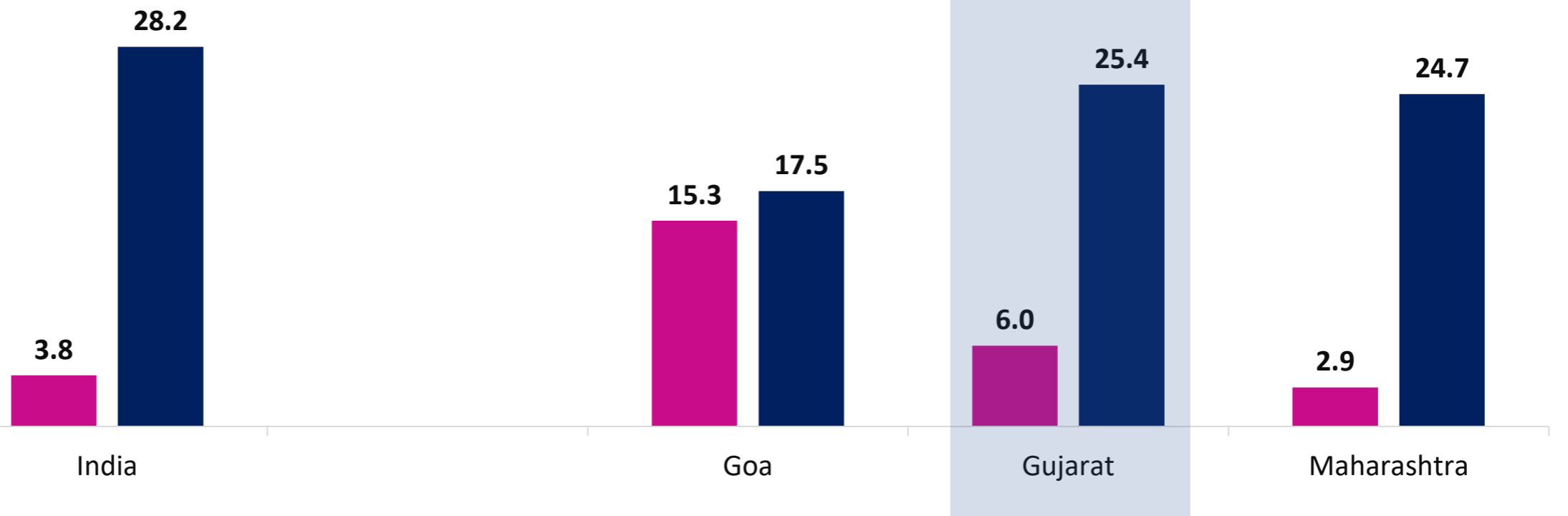


Risk of NCDs among adolescents in Goa – **15%** had high level of LDL and **18%** had low level of HDL

Among the western states, in Goa, prevalence of both high LDL and low HDL was high

Cut Offs:
LDL \geq 130 mg/dl
HDL $<$ 40 mg/dl

■ High LDL ■ Low HDL



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.

The survey was conducted with generous financial support from

Aditya and Megha Mittal

and technical support from

unicef  for every child



Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™



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