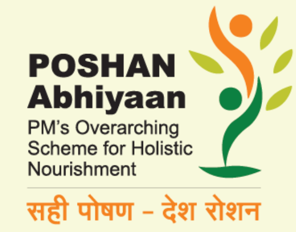
Ministry of Health and Family Welfare
Government of India



Comprehensive National Nutrition Survey

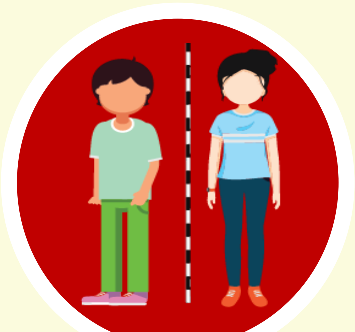
2016 – 2018

Jammu and Kashmir State Presentation

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*

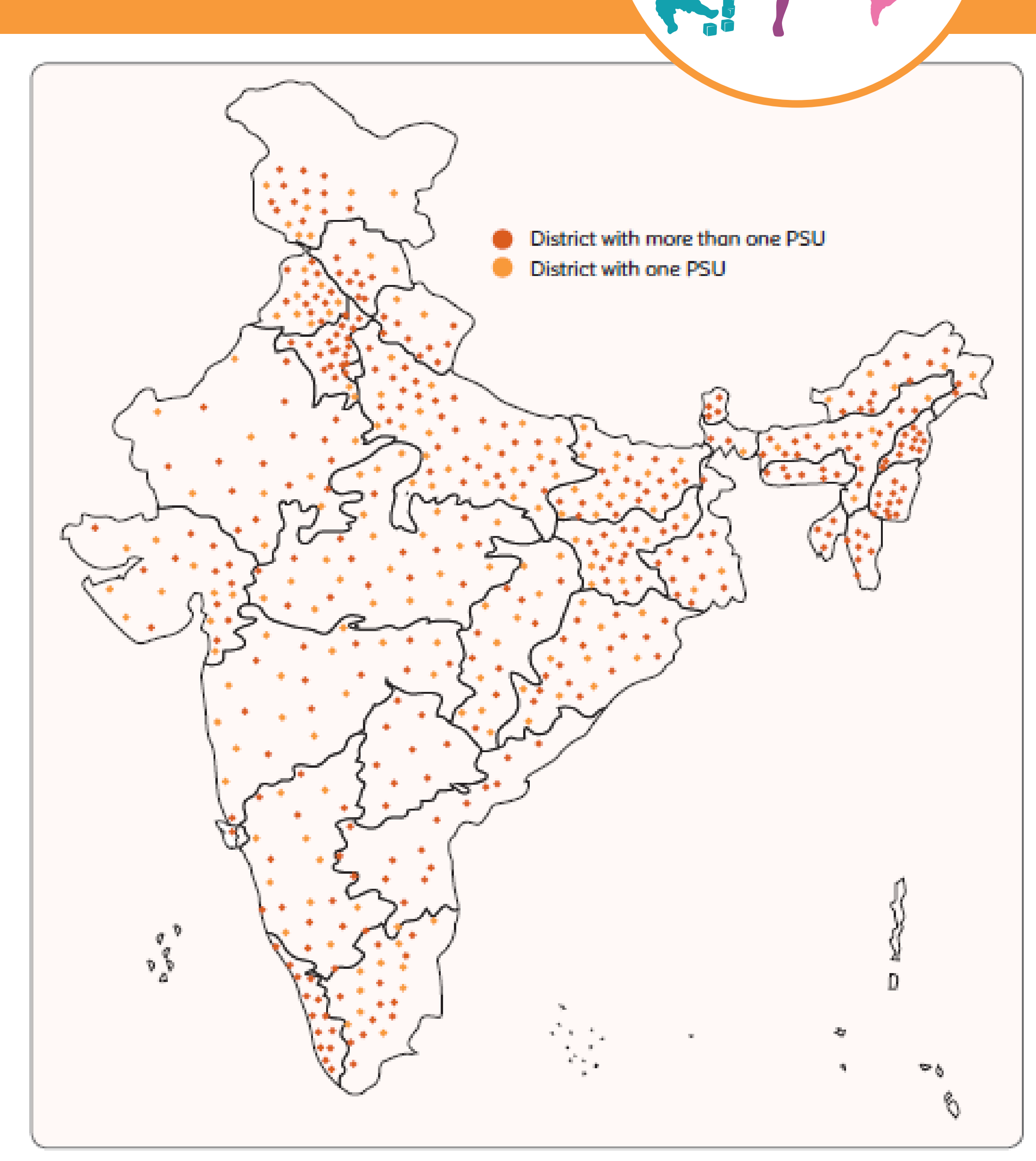
*Soumya Swaminathan, et al. (2019), The burden of child and maternal malnutrition and trends in its indicators in the states of India: the Global Burden of Disease Study 1990–2017. https://doi.org/10.1016/S2352-4642(19)30273-1

Survey Design

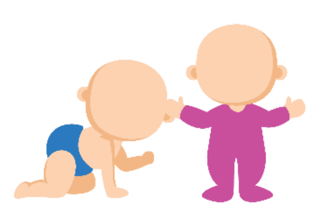
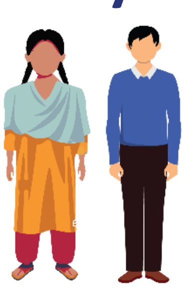
CNNS is a cross-sectional, household survey using a multi-stage sampling design.

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



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	• 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

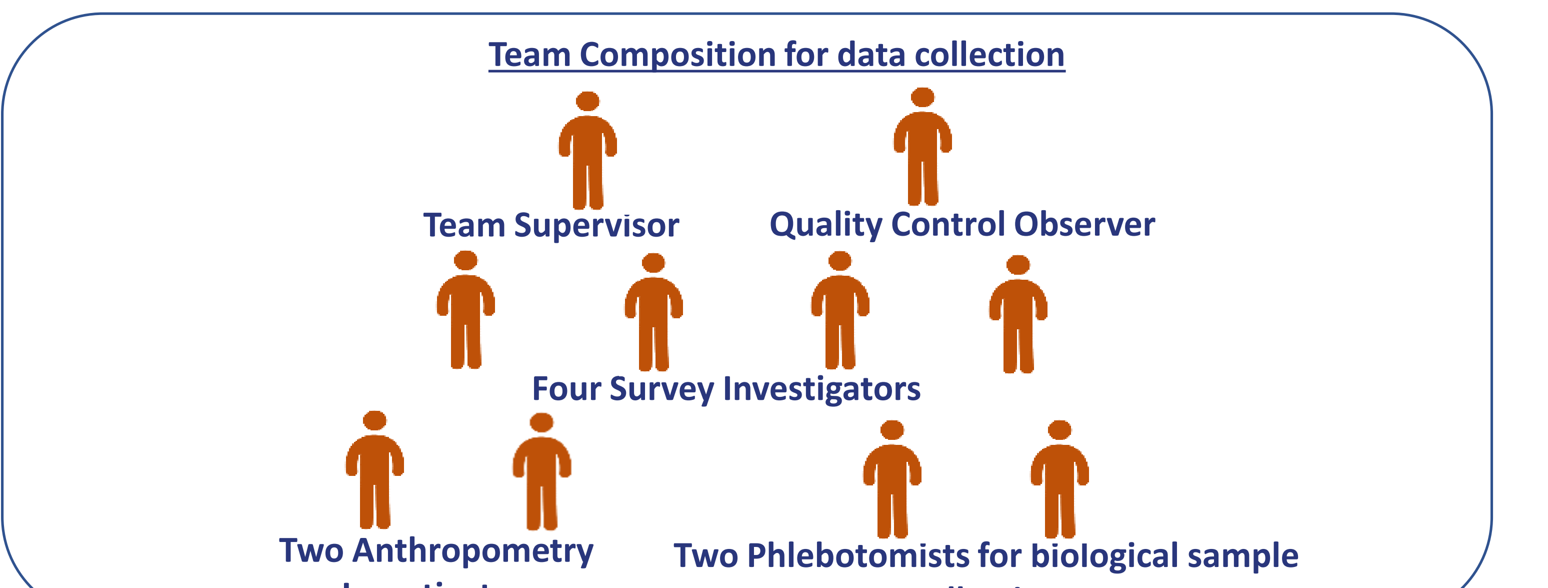
- Field work/protocol/training monitoring: by quality control team
- Biological sample quality control : by AIIMS, NIN and US CDC

Second Level

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

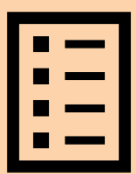
First Level

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



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

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 Jammu and Kashmir

CNNS covered 60 PSUs for data collection in Jammu and Kashmir

Achieved following sample size by age groups:

	0-4 years	5-9 years	10-19 years	Total
Household and anthropometry data	1,156	1,172	1,144	**3,472**
Biological sample	387	413	359	**1,159**

Period of data collection in Jammu and Kashmir

CNNS data collection period: May 23, 2018 to August 11, 2018

- CNNS collected data during the summer season through rainy season of 2018
- NFHS collected data during the winter through rainy season of 2016

Survey	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CNNS 2018					May to August, 2018							
NFHS 4 2016	January, 2016 to November, 2016											

Jammu and Kashmir key findings: Anthropometry (1/2)

Prevalence of stunting declined, but that of underweight and wasting unchanged among children under 5 years

	NFHS	CNNS
Stunting (Low height for age)	27.4%	15.5%
Wasting (Low weight for height)	12.1%	14.9%
Underweight (Low weight for age)	16.6%	13.1%

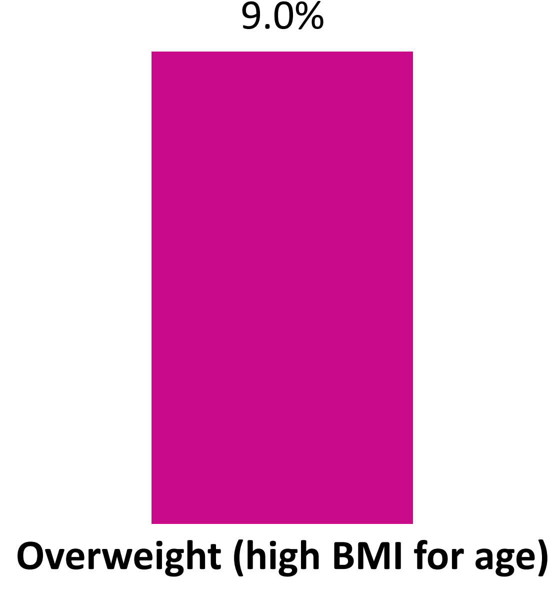
CNNS Birth to Adolescence

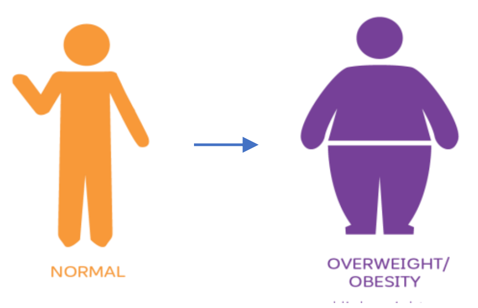
Jammu and Kashmir key findings: Anthropometry (2/2)

1/8 adolescents aged 10-19 years were thin for their age (BMI-Age <-2SD)

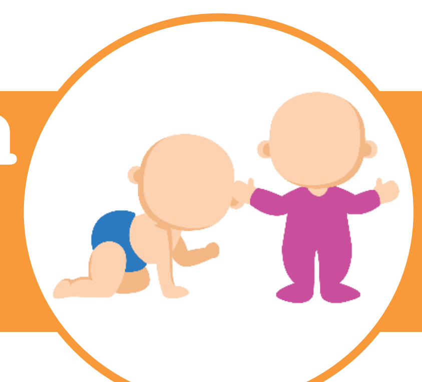
1/8 children aged 5-9 years was stunted. The school age period does not provide an opportunity for catch up growth in height.

9% of adolescents aged 10-19 years were overweight or obese.





Stunting declined among children under five



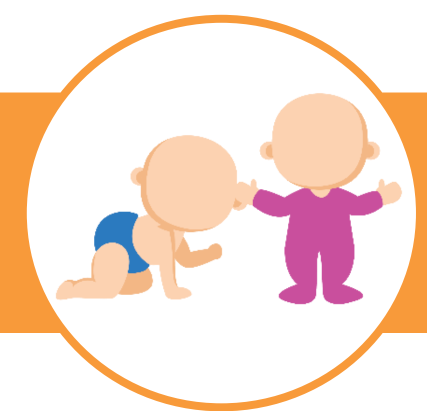
Significantly lower prevalence of stunting was observed in CNNS compared to NFHS-4 – **16%** vs **27%**

Among northern states, stunting declined significantly only in Jammu and Kashmir

	NFHS-4	CNNS
India	38.4	34.7
Delhi	31.9	28.8
Haryana	34.0	34.9
Himachal Pradesh	26.3	28.4
Jammu and Kashmir	27.4	15.5
Punjab	25.7	24.3
Rajasthan	39.1	36.8
Uttarakhand	33.5	29.9

CNNS
Birth to Adolescence

Wasting unchanged among children under five



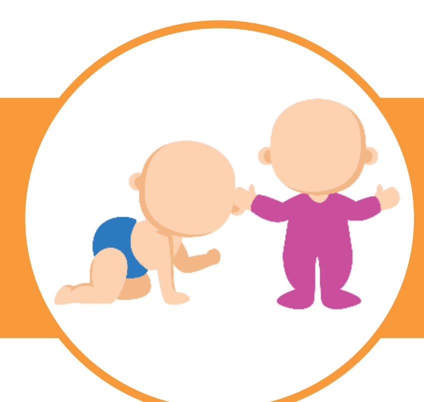
Prevalence of wasting did not change significantly in Jammu and Kashmir between NFHS-4 and CNNS – **12%** vs **15%**

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

	NFHS-4	CNNS
India	21.0	17.3
Delhi	15.9	14.8
Haryana	21.2	11.7
Himachal Pradesh	13.7	11.0
Jammu and Kashmir	12.1	14.9
Punjab	15.6	6.7
Rajasthan	23.0	14.3
Uttarakhand	19.5	5.9

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 remained unchanged between NFHS-4 and CNNS – **17%** Vs **13%**

Prevalence remained unchanged in most of the northern states; except in Uttarakhand where it declined

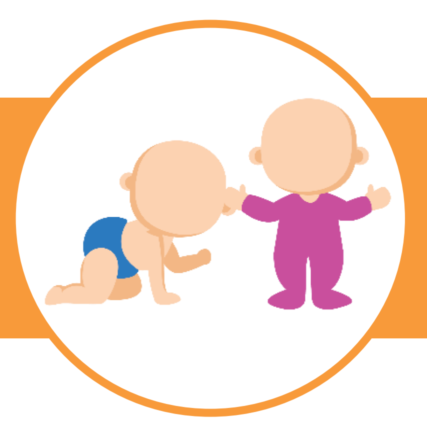
	NFHS-4	CNNS
India	35.7	33.4
Delhi	27.0	28.1
Haryana	29.4	28.8
Himachal Pradesh	21.2	22.6
Jammu and Kashmir	16.6	13.1
Punjab	21.6	19.7
Rajasthan	36.7	31.5
Uttarakhand	26.6	18.7

Triceps Skinfold Thickness (TSFT) for children under five

Low fat mass as reported by TSFT in Jammu and Kashmir (**21%**) was double the national average (**10%**) and highest among the northern states

	TSFT (-3SD to -2SD) total	TSFT (< -3SD)
India	9.7	2.4
Delhi	5.0	0.6
Haryana	7.2	2.0
Himachal Pradesh	10.7	0.9
Jammu and Kashmir	21.1	6.0
Punjab	7.3	0.9
Rajasthan	7.0	0.9
Uttarakhand	5.0	1.7

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



Thinness as reported by SSFT in Jammu and Kashmir (**16%**) was double the national average (**9%**) and higher than other northern states

	SSFT (-3SD to -2SD) total	SSFT (< -3SD)
India	8.6	1.6
Delhi	4.9	1.2
Haryana	8.3	2.2
Himachal Pradesh	10.1	0.9
Jammu and Kashmir	16.1	1.6
Punjab	4.9	1.1
Rajasthan	8.0	1.1
Uttarakhand	6.6	1.7

CNNS Birth to Adolescence

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

6% children in Jammu and Kashmir had low MUAC

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

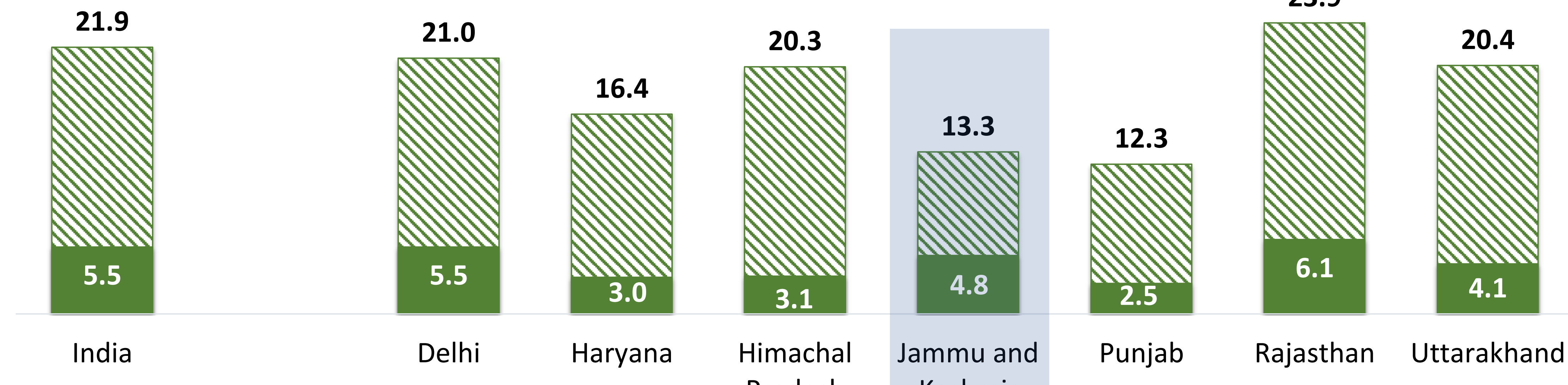
	MUAC (>=115mm & <125 mm)	MUAC (<115 mm)	Total
India		0.9	4.9
Delhi		0.3	2.4
Haryana		0.7	4.7
Himachal Pradesh		0.6	2.4
Jammu and Kashmir		2.5	6.0
Punjab		1.1	3.7
Rajasthan		1.0	5.2
Uttarakhand		0.1	0.8

CNNS Birth to Adolescence

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

1/8 of children aged 5-9 years was stunted in Jammu and Kashmir; significant proportion of children who were stunted in childhood remained stunted into their schooling age reducing their potential capacity for education

Punjab and Jammu & Kashmir had lowest prevalence of stunting among the northern states



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

More than **1/6** children aged 5-9 years was thin in Jammu and Kashmir

Prevalence of thinness in Jammu and Kashmir (**17%**) was lower than the national average (**23%**) and moderately high in the northern region

Moderate thinness (-3SD to -2SD) | Severe thinness (< -3SD)

	Total	Severe thinness (< -3SD)
India	23.0	4.9
Delhi	18.5	3.1
Haryana	20.4	3.4
Himachal Pradesh	22.2	4.6
Jammu and Kashmir	16.6	6.7
Punjab	11.9	2.2
Rajasthan	22.1	3.9
Uttarakhand	14.2	3.7

CNNS

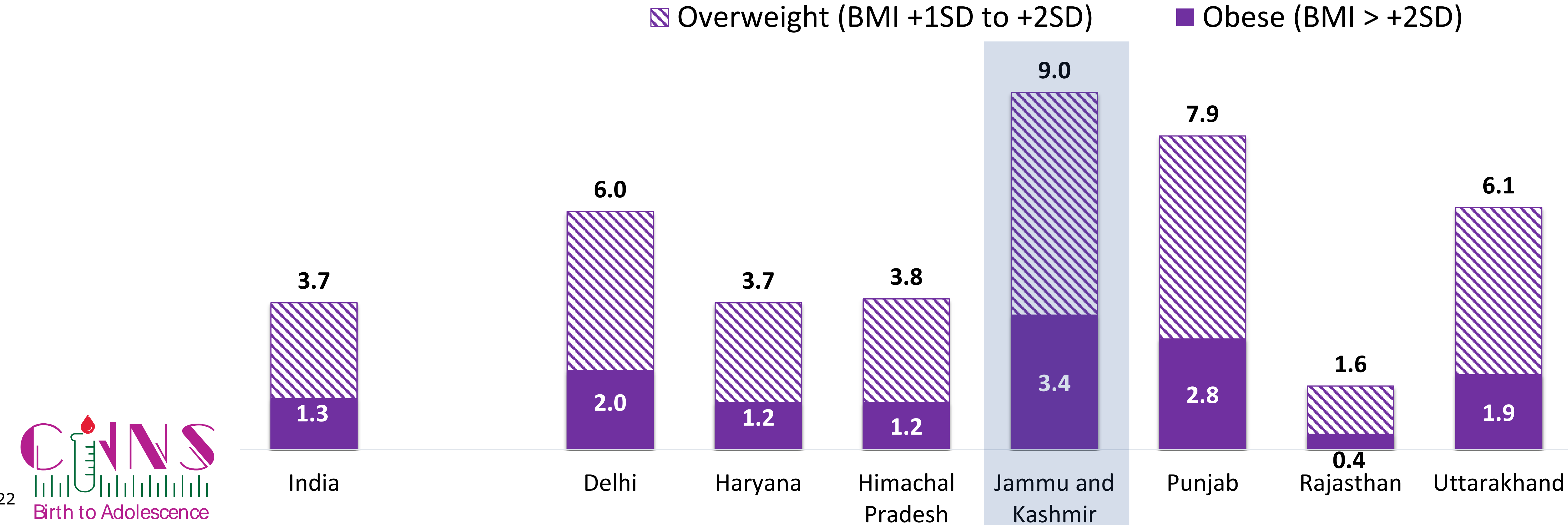
Birth to Adolescence

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 Jammu and Kashmir (**9%**) was more than double the national average (**4%**)

Among northern states, Jammu and Kashmir had the highest prevalence of overweight in this age group



Thinness among adolescents aged 10-19 years substantially high

1/8 adolescents aged 10-19 years was thin in Jammu and Kashmir (**13**%), significantly lower than national average (**24%**)

Among the northern states, Jammu and Kashmir had the lowest prevalence of thinness

Moderate thinness (-3SD to -2SD) | Severe thinness (< -3SD)

	Total	Severe thinness
India	24.1	6.5
Delhi	21.3	4.9
Haryana	20.6	5.6
Himachal Pradesh	31.2	9.9
Jammu and Kashmir	13.3	4.0
Punjab	17.8	2.9
Rajasthan	29.3	7.4
Uttarakhand	15.2	2.2

Prevalence of overweight among adolescents aged 10-19 years high

9% of adolescents were overweight in Jammu and Kashmir, was higher than national average (**5%**)

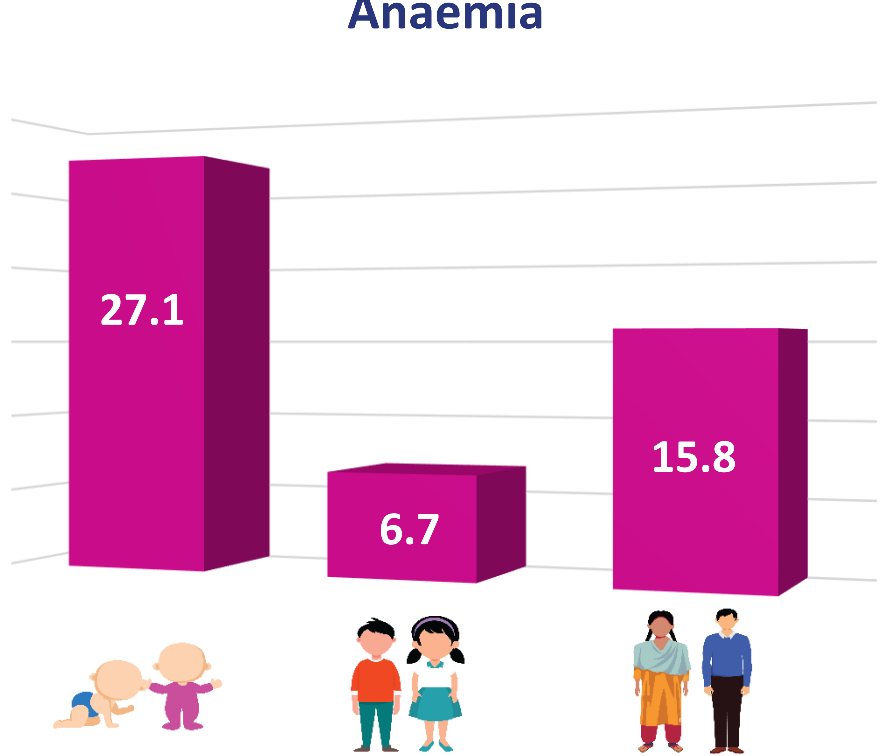
Among the northern states, Delhi (**12%**) had highest prevalence, also high in Jammu and Kashmir (**9%**) and Punjab (**9%**)

	Overweight (BMI +1SD to +2SD)	Obese (BMI > +2SD)
India	4.8	1.1
Delhi	12.3	3.3
Haryana	4.9	1.3
Himachal Pradesh	5.5	1.2
Jammu and Kashmir	9.0	1.8
Punjab	9.1	2.8
Rajasthan	2.9	0.3
Uttarakhand	5.2	1.0

CNNS Birth to Adolescence

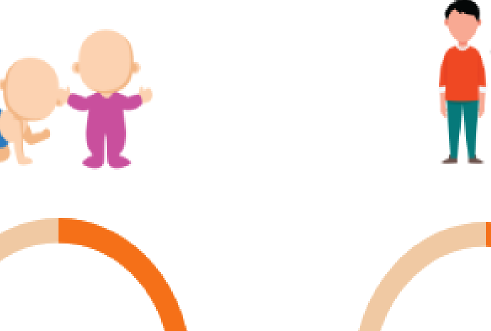
Jammu and Kashmir key findings: Anaemia and iron deficiency

Anaemia



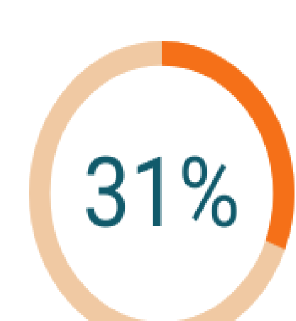
In Jammu and Kashmir, like in most states, anaemia was significantly higher among children aged 1-4 years compared to children aged 5-9 years and adolescents aged 10-19 years

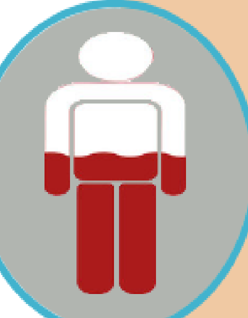
Iron deficiency



45%

18%





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

Prevalence of Anaemia among children and adolescents

More than **1/4** children aged 1-4 years were anaemic in Jammu and Kashmir (**27%**), which was 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)

	1-4 Years	5-9 Years	10-19 Years
India	40.5	23.5	28.4
Delhi	47.0	19.6	29.2
Haryana	48.3	18.3	29.9
Himachal Pradesh	29.7	13.9	16.2
Jammu and Kashmir	27.1	6.7	15.8
Punjab	39.8	12.4	25.9
Rajasthan	32.4	18.2	26.0
Uttarakhand	32.4	8.4	15.7

CNNS
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 Jammu and Kashmir, as in many other northern states, adolescent girls were significantly more likely than adolescent boys to be anaemic

	Male	Female
India	17.5	39.6
Delhi	15.6	45.1
Haryana	21.7	40.7
Himachal Pradesh	12.8	19.1
Jammu and Kashmir	6.3	23.8
Punjab	15.1	36.9
Rajasthan	11.2	40.1
Uttarakhand	11.7	20.2

Iron deficiency measured by serum ferritin among children and adolescents

Nearly **1/2** children aged 1-4 years had iron deficiency in Jammu and Kashmir (**45**%), significantly higher than the national average (**32%**); prevalence was highest among children aged 1-4 years

Among northern states, children from Punjab (**67%**) had highest 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
India	31.9	17.0	21.5
Delhi	38.3	16.1	18.4
Haryana	58.9	35.6	28.7
Himachal Pradesh	34.5	23.0	22.0
Jammu and Kashmir	44.7	17.8	30.7
Punjab	67.2	50.9	45.3
Rajasthan	44.3	39.0	35.1
Uttarakhand	51.2	18.4	19.6

CNNS Birth to Adolescence

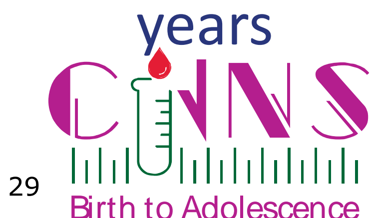
Jammu and Kashmir key findings: Vitamin A and Vitamin D deficiency

Vitamin A deficiency was moderately high (13%) in school-age children 5-9 years indicating the need for policy review

Children aged 1-4 years (9%) and adolescents (7%) were found to have lower levels of Vitamin A deficiency as children aged 5-9 years

Vitamin D deficiency ranged from 23% to 53% 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



Vitamin A deficiency among children and adolescents

7-13% children and adolescents had Vitamin A deficiency in Jammu and Kashmir, nearly half the national average (**16-22%**)

Prevalence of Vitamin A deficiency in all age groups did not show any particular pattern among northern states

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

	1-4 Years	5-9 Years	10-19 Years
India	17.6	21.5	15.6
Delhi	17.8	21.9	12.6
Haryana	26.1	24.2	8.9
Himachal Pradesh	5.9	11.4	3.3
Jammu and Kashmir	8.7	12.9	7.0
Punjab	17.2	22.9	12.8
Rajasthan		1.0	1.9
Uttarakhand	14.3	23.1	16.4

CNNS
Birth to Adolescence

Vitamin D deficiency increases with age

23-53% of children and adolescents had Vitamin D deficiency in Jammu and Kashmir; Vitamin D deficiency increased sharply with age.

In most northern states, except Himachal Pradesh, Vitamin D deficiency among children and adolescents was 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
India	13.8	18.2	23.9
Delhi	32.5	43.4	47.1
Haryana	27.6	45.5	53.8
Himachal Pradesh	4.6	15.4	17.6
Jammu and Kashmir	22.9	36.0	52.8
Punjab	52.1	76.1	68.0
Rajasthan	25.2	23.9	25.8
Uttarakhand	46.4	62.0	62.9

CNNS
Birth to Adolescence

Jammu and Kashmir key findings: Non-communicable diseases

7% of school-age children and 9% 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), **7%** of children and **9%** of adolescents had increased risk of diabetes in Jammu and Kashmir

Among all northern states, risk of diabetes among children and adolescents were highest in Haryana

	5-9 Years	10-19 Years
India	9.2	9.5
Delhi	6.3	7.3
Haryana	23.8	24.8
Himachal Pradesh	7.5	4.9
Jammu and Kashmir	6.9	8.5
Punjab	13.2	14.0
Rajasthan	14.0	12.5
Uttarakhand	8.6	6.7

High total cholesterol and high triglyceride among adolescents

Elevated risk of NCDs in Himachal Pradesh among adolescents – **1%** had high level of total cholesterol and **20%** with high level of triglycerides

Prevalence of high triglycerides were highest in Himachal Pradesh among northern states

Cut Offs:

Total cholesterol >= 200 mg/dl

Triglycerides > 130 mg/dl

	High total cholesterol	High triglycerides
India	3.7	16.1
Delhi	2.3	15.7
Haryana	2.3	12.7
Himachal Pradesh	7.3	21.1
Jammu and Kashmir	1.0	19.8
Punjab	3.8	9.8
Rajasthan	1.2	7.6
Uttarakhand	1.7	19.6

High LDL and low HDL among adolescents

Risk of NCDs among adolescents in Jammu and Kashmir – **2%** had high level of LDL and **16%** had low level of HDL

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

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

	High LDL	Low HDL
India	3.8	28.2
Delhi	1.8	39.9
Haryana	2.5	12.9
Himachal Pradesh	6.0	27.4
Jammu and Kashmir	2.0	15.7
Punjab	3.3	11.7
Rajasthan	2.7	18.3
Uttarakhand	3.2	21.5

CNNS 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.

The survey was conducted with generous financial support from

Aditya and Megha Mittal

and technical support from