

Ministry of Health and Family Welfare  
Government of India

# Comprehensive National Nutrition Survey

**Kerala  
Factsheet  
2017-18**





# About the CNNS

The Comprehensive National Nutrition Survey (CNNS) is the first ever national nutrition survey covering 112,316 pre-schoolers, school-age children, and adolescents in rural and urban areas across 30 states of India. The CNNS provides national and state level representative data for nutritional status and micronutrient deficiencies among children and adolescents from birth to 19 years and estimates of biomarkers for non-communicable diseases (NCDs) among those aged 5-19 years.

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**CNNS captures data across three age groups – children under 5, children aged 5–9 years and adolescents aged 10–19 years.**

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**CNNS provides for the first time biomarkers of micronutrient deficiencies and non-communicable diseases across 30 states of India.**

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**Methodology:** The CNNS adopted a multi-stage, stratified, probability proportion to size cluster sampling design. Survey questions were administered at both the household and respondent levels. The household questionnaire captured information on the usual residents and visitors who stayed in the house the previous night, socio-economic characteristics and water and sanitation facilities in the households. Through the individual questionnaire data were collected on the respondent's background characteristics, hygiene practices, infant and young child feeding practices (IYCF), dietary diversity, morbidity status, and cognitive development of children. Computer Assisted Personal Interview (CAPI) tools were used to collect survey data.

**Indicators:** Several anthropometric measurements were collected from survey participants including measurements of height, weight, Mid-Upper Arm Circumference (MUAC) and Triceps Skinfold Thickness (from participants aged 0-19 years), Subscapular Skinfold Thickness (from participants aged 1-19 years) and waist circumference and handgrip strength (from participants aged 5-19 years). In order to estimate prevalence of micronutrient deficiencies, and NCDs among survey participants, biological samples were collected from about half of the survey participants aged 1-19 years. A robust quality assurance and monitoring mechanism was established to ensure data quality during fieldwork.

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**CNNS collected detailed anthropometric measurements from over 110,000 children and adolescents and biological samples (blood, urine and stool) from over 50,000 children and adolescents.**

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**CNNS measured new anthropometric indicators such as MUAC, triceps & subscapular skinfold thickness to provide an additional insight into the nutritional status of children in India.**

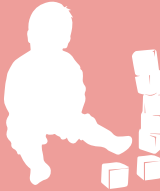
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**Stakeholders:** Under the overall leadership and guidance of the Ministry of Health and Family Welfare (MoHFW) and Technical Advisory Committee (TAC) designated by the MoHFW and in collaboration with the United Nations Children’s Fund (UNICEF), the CNNS was implemented by multiple partners. Aditya and Megha Mittal provided financial support for the survey.

Several national and international organizations provided technical and quality assurance support. The Population Council has served as the lead agency to implement the survey. The Centre for Disease Control (CDC) in Atlanta, USA, the All India Institute of Medical Sciences (AIIMS), New Delhi, the National Institute of Nutrition (NIN), Hyderabad, and Clinical Development Services Agency (CDSA), New Delhi provided quality assurance support for the biomarker component. The Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh and Kalawati Saran Children’s Hospital, New Delhi, provided concurrent monitoring support for the household survey and anthropometric measurements.

**Data:** This fact sheet provides information on key indicators for the state of Kerala where the CNNS was conducted from October 8, 2017 through April 10, 2018 and gathered household and anthropometry data from 898, 907 and 843 and biological samples from 523, 431 and 382 children aged 0-4 years (1-4 years for biological sample), 5-9 years, and adolescents aged 10-19 years, respectively. In Kerala, survey and anthropometry data were collected by SIGMA Research and Consulting Pvt Ltd and Super Religare Laboratories (SRL) Ltd collected biological samples.

## Kerala– Key Anthropometric Indicators







Anthropometric profile	Sex		Residence			
	Male	Female	Urban	Rural	Total	
<b>CHILDREN UNDER AGE 5 YEARS</b> 	Children under age 5 years who are stunted (height-for-age) <sup>1</sup> (%)	20.6	20.4	19.5	21.4	20.5
	Children under age 5 years who are severely stunted (height-for-age) <sup>2</sup> (%)	6.1	4.2	4.1	6.1	5.2
	Children under age 5 years who are wasted (weight-for-height) <sup>1</sup> (%)	14.2	10.8	10.3	14.6	12.6
	Children under age 5 years who are severely wasted (weight-for-height) <sup>2</sup> (%)	2.7	2.7	1.3	4.0	2.7
	Children under age 5 years who are underweight (weight-for-age) <sup>1</sup> (%)	20.2	17.1	16.8	20.3	18.7
	Children under age 5 years who are severely underweight (weight-for-age) <sup>2</sup> (%)	1.9	4.5	2.1	4.0	3.2
	Children aged 6-59 months with MUAC <12.5cm (%)	1.7	1.7	0.5	2.7	1.7
	Children aged 6-59 months with MUAC <11.5cm (%)	1.2	0.5	0.2	1.4	0.9
	Children aged 6-59 months with MUAC-for-age <-2 SD <sup>3</sup> (%)	4.3	3.6	3.3	4.6	4.0
	Children aged 6-59 months with MUAC-for-age <-3 SD <sup>3</sup> (%)	0.4	0.5	0.0	0.8	0.4
	Children under age 5 years with triceps skinfold thickness-for-age <-2 SD <sup>3</sup> (%)	5.0	6.7	4.3	7.1	5.8
	Children under age 5 years with triceps skinfold thickness-for-age <-3 SD <sup>3</sup> (%)	1.4	0.9	0.2	2.1	1.2
	Children under age 5 years with triceps skinfold thickness-for-age >+2 SD <sup>3</sup> (%)	1.0	1.0	0.9	1.1	1.0

<sup>1</sup>Below -2 standard deviations (SD), based on the WHO standards

<sup>2</sup>Below -3 standard deviations, based on the WHO standards

<sup>3</sup>Based on WHO standards

## Kerala – Key Anthropometric Indicators

Anthropometric profile		Sex		Residence		
						
		Male	Female	Urban	Rural	Total
<b>CHILDREN UNDER AGE 5 YEARS</b> 	Children under age 5 years with triceps skinfold thickness-for-age $>+3$ SD <sup>3</sup> (%)	0.2	0.4	0.3	0.4	0.3
	Children aged 1-4 years with subscapular skinfold thickness-for-age $<-2$ SD <sup>3</sup> (%)	17.5	13.7	13.6	17.8	15.8
	Children aged 1-4 years with subscapular skinfold thickness-for-age $<-3$ SD <sup>3</sup> (%)	2.4	1.8	1.7	2.5	2.1
	Children aged 1-4 years with subscapular skinfold thickness-for-age $>+2$ SD <sup>3</sup> (%)	0.4	0.7	0.5	0.6	0.5
	Children aged 1-4 years with subscapular skinfold thickness-for-age $>+3$ SD <sup>3</sup> (%)	0.0	0.0	0.0	0.0	0.0


Anthropometric profile		Sex		Residence		
						
		Male	Female	Urban	Rural	Total
<b>CHILDREN AGED 5-9 YEARS</b> 	Children aged 5-9 years who are stunted (height-for-age) <sup>1</sup> (%)	10.7	11.6	9.7	12.5	11.2
	Children aged 5-9 years who are severely stunted (height-for-age) <sup>2</sup> (%)	0.5	1.7	0.6	1.5	1.1
	Children aged 5-9 years who are moderate or severely thin (BMI for age) z-score $<-2$ SD <sup>3</sup> (%)	18.5	13.8	14.1	18.3	16.3
	Children aged 5-9 years who are severely thin (BMI for age) z-score $<-3$ SD <sup>3</sup> (%)	5.1	2.7	2.9	5.0	4.0
	Children aged 5-9 years who are overweight or obese (BMI for age) z-score $>+1$ standard deviations <sup>3</sup> (%)	10.7	8.3	9.9	9.2	9.6
	Children aged 5-9 years who are obese (BMI for age) z-score $>+2$ SD <sup>3</sup> (%)	6.0	1.9	5.4	2.8	4.0

<sup>1</sup>Below -2 standard deviations (SD), based on the WHO standards

<sup>2</sup>Below -3 standard deviations, based on the WHO standards




<sup>3</sup>Based on WHO standards

## Kerala – Key Anthropometric Indicators

Anthropometric profile	Sex		Residence			
	Male	Female	Urban	Rural	Total	
<b>ADOLESCENTS AGED 10-19 YEARS</b> 	Adolescents aged 10-14 years who are moderate or severely thin (BMI for age) z-score <-2 SD <sup>3</sup> (%)	20.7	20.0	18.5	21.9	20.3
	Adolescents aged 15-19 years who are moderate or severely thin (BMI for age) z-score <-2 SD <sup>3</sup> (%)	30.2	9.5	18.2	21.3	19.8
	Adolescents aged 10-19 years who are moderate or severely thin (BMI for age) z-score <-2 SD <sup>3</sup> (%)	24.8	15.5	18.3	21.6	20.1
	Adolescents aged 10-14 years who are severely thin (BMI for age) z-score <-3 SD <sup>3</sup> (%)	8.3	3.3	4.1	7.2	5.8
	Adolescents aged 15-19 years who are severely thin (BMI for age) z-score <-3 SD <sup>3</sup> (%)	9.1	3.2	6.4	5.9	6.1
	Adolescents aged 10-19 years who are severely thin (BMI for age) z-score <-3 SD <sup>3</sup> (%)	8.7	3.3	5.1	6.7	5.9
	Adolescents aged 10-14 years who are overweight or obese (BMI for age) z-score > +1 SD <sup>3</sup> (%)	8.8	9.9	11.3	7.8	9.4
	Adolescents aged 15-19 years who are overweight or obese (BMI for age) z-score > +1 SD <sup>3</sup> (%)	10.0	9.2	9.1	10.1	9.6
	Adolescents aged 10-19 years who are overweight or obese (BMI for age) z-score > +1 SD <sup>3</sup> (%)	9.3	9.6	10.3	8.7	9.5
	Adolescents aged 10-14 years who are obese (BMI for age) z-score > +2 SD <sup>3</sup> (%)	1.3	2.4	1.8	1.8	1.8
	Adolescents aged 15-19 years who are obese (BMI for age) z-score > +2 SD <sup>3</sup> (%)	3.5	2.5	0.8	4.9	3.0
	Adolescents aged 10-19 years who are obese (BMI for age) z-score > +2 SD <sup>3</sup> (%)	2.2	2.4	1.4	3.1	2.3

<sup>3</sup>Based on WHO standards

## Kerala – Key Indicators of Micronutrient Deficiencies

INDICATORS	CHILDREN AGED 1-4 YEARS  Total (95% Confidence Interval)	CHILDREN AGED 5-9 YEARS  Total (95% Confidence Interval)	ADOLESCENTS AGED 10-19 YEARS  Total (95% Confidence Interval)
	Prevalence of anaemia <sup>4,5</sup> (%)	12.6 (9.1-17.1)	3.1 (1.4-6.7)
Prevalence of anaemia- males <sup>4,5</sup> (%)	12.2 (8.1-17.8)	3.3 (1.2-8.8)	4.1 (1.8-9.2)
Prevalence of anaemia- females <sup>4,5</sup> (%)	13.1 (7.5-21.9)	2.9 (1.1-7.0)	13.7 (8.4-21.5)
Prevalence of low serum ferritin <sup>5,6</sup> (%)	35.2 (27.8-43.3)	18.0 (12.8-24.7)	25.3 (19.6-31.9)
Prevalence of folate deficiency <sup>5,7</sup> (%)	18.4 (13.3-24.9)	27.1 (20.2-35.3)	53.2 (45.5-60.8)
Prevalence of vitamin B12 deficiency <sup>5,8</sup> (%)	3.4 (1.2-9.2)	0.9 (0.2-3.7)	2.3 (0.9-5.5)
Prevalence of serum 25-hydroxy vitamin D <12ng/ml <sup>9</sup> (%)	11.8 (7.7-17.7)	22.6 (18.0-27.9)	31.6 (24.8-39.3)
Prevalence of vitamin A deficiency <sup>5,10</sup> (%)	17.1 (11.6-24.4)	26.5 (18.3-36.7)	13.2 (8.2-20.8)
Prevalence of zinc deficiency <sup>11</sup> (%)	9.0 (6.3-12.7)	4.8 (2.4-9.3)	17.2 (13.1-22.2)
Median urinary iodine concentration( $\mu\text{g/l}$ ) <sup>5</sup>	205	192	184

<sup>4</sup>CNNS estimated anaemia using the gold standard method, i.e., haemoglobin concentration in venous whole blood sample analysed by cyanmethaemoglobin method in the laboratory using automated haematology counter. These estimates cannot be directly compared with other large scale surveys in India that estimate anaemia from capillary blood using Hemo Cue analyser.

<sup>5</sup>WHO standard cut-off

<sup>6</sup>For children aged 12-59 months: serum ferritin <12  $\mu\text{g/l}$ ; for children/adolescents aged  $\geq 5$  years: serum ferritin <15  $\mu\text{g/l}$ ; all cases with C-reactive protein > 5 mg/L were excluded

<sup>7</sup>Erythrocyte folate < 151 ng/ml

<sup>8</sup>Serum vitamin B12 < 203 pg/ml



<sup>9</sup>Vitamin D deficiency; Institute of Medicine (IOM) standard cut-off

<sup>10</sup>Serum retinol < 20  $\mu\text{g/dl}$ ; all cases with C-reactive protein > 5 mg/L were excluded

<sup>11</sup>For children aged 1-9 years: serum zinc < 65  $\mu\text{g/dl}$ ; for adolescent girls: serum zinc <70  $\mu\text{g/dl}$  if fasting, < 66  $\mu\text{g/dl}$  if non-fasting; for adolescent boys: serum zinc <74  $\mu\text{g/dl}$  if fasting, <70  $\mu\text{g/dl}$  if non-fasting; International Zinc Nutrition Consultative Group cut-off



## Kerala – Key Indicators of Non-Communicable Disease Risks

		 <b>CHILDREN AGED 5-9 YEARS</b>	 <b>ADOLESCENTS AGED 10-19 YEARS</b>
		<b>Total</b> (95% Confidence Interval)	<b>Total</b> (95% Confidence Interval)
<b>INDICATORS</b>	Prevalence of high total cholesterol <sup>12</sup> (%)	15.4 (10.8-21.3)	13.9 (9.7-19.3)
	Prevalence of high LDL cholesterol <sup>13</sup> (%)	16.3 (11.3-23.0)	14.9 (10.4-20.9)
	Prevalence of low HDL cholesterol <sup>14</sup> (%)	10.8 (7.6-15.2)	20.6 (16.0-26.1)
	Prevalence of high triglycerides <sup>15</sup>	16.6 (12.2-22.1)	7.7 (5.1-11.7)
	Prevalence of high fasting plasma glucose <sup>16,17</sup> (indicative of prediabetes) (%)	18.7 (13.2-25.9)	32.2 (25.1-40.3)
	Prevalence of very high fasting plasma glucose, <sup>17,18</sup> (indicative of diabetes) (%)	2.1 (0.9-4.8)	0.5 (0.1-1.9)
	Prevalence of glycosylated haemoglobin concentration 5.7-6.4% <sup>17</sup> (indicative of prediabetes)	6.8 (4.3-10.5)	7.2 (4.2-11.9)
	Prevalence of glycosylated haemoglobin concentration $\geq$ 6.5% <sup>17</sup> (indicative of diabetes)	0.0 (0.0-0.0)	0.0 (0.0-0.0)
	Prevalence of high serum creatinine <sup>19,20</sup> (%)	0.0 (0.0-0.0)	0.5 (0.1-3.5)

<sup>12</sup>Total cholesterol  $\geq$  200 mg/dl; Cut-offs taken from National Cholesterol Education Program

<sup>13</sup>LDL  $\geq$  130 mg/dl; Cut-offs taken from National Cholesterol Education Program

<sup>14</sup>HDL < 40 mg/dl; Cut-offs taken from National Cholesterol Education Program

<sup>15</sup>For children aged 5-9 years: serum triglycerides > 100 mg/dl; and for adolescents aged 10-19 years: serum triglycerides > 130 mg/dl; cut-offs taken from National Cholesterol Education Program.

<sup>16</sup>Plasma glucose > 100 mg/dl & < 126 mg/dl, indicative of prediabetes

<sup>17</sup>Cut-off taken from Global International Diabetes Federation

<sup>18</sup>Plasma glucose  $\geq$  126 mg/dl, indicative of diabetes

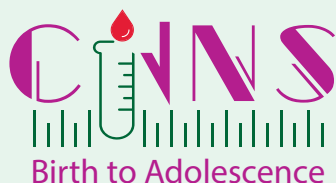
<sup>19</sup>For children aged 5-12 years: serum creatinine > 0.7 mg/dl; for adolescents aged > 12 years: serum creatinine > 1.0 mg/dl

<sup>20</sup>High serum creatinine was found clustered in few districts. Such clustering has also been reported in public health literature.





The Comprehensive National Nutrition Survey (CNNS) is the first ever national nutrition survey covering over 110,000 pre-schoolers, school-age children, and adolescents in rural and urban areas across 30 states of India.



The CNNS provides national and state level representative estimates from biological samples (blood, urine and stool) for micronutrient deficiencies and non-communicable diseases (NCDs) using best practices in training and field and gold standard laboratory methods.

See CNNS results online: [www.NutritionINDIA.info](http://www.NutritionINDIA.info)

**The survey was conducted with generous financial support from Aditya and Megha Mittal.**



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