

PREVALENCE OF SEVERE ACUTE MALNUTRITION SURVEY REPORT 2021

Babai Block, Hoshangabad District, Madhya Pradesh



Department of Community and Family Medicine,
RCOENNRT, CSAM Unit, AIIMS Bhopal
2021

Abbreviations

CMAM	Community Management of Acute Malnutrition
IMAM	Integrated Management of Acute Malnutrition
AWW	Aganwadi worker
ANM	Auxiliary Nurse midwife
GAM	Global Acute Malnutrition
HEBI	High-Energy Bar for Integrated management of acute malnutrition
IEC	Information, Education, and Communication
IRD	International Research and Development
IYCF	Infant and Young Child Feeding
MAM	Moderate Acute Malnutrition
WHO	World Health Organisation
WHZ	Weight for Height Z-score
MOH	Ministry of Health
MUAC	Mid-Upper Arm Circumference
NIN	National Institute of Nutrition
PEMC	Protein Energy Malnutrition Control Programme
ReSoMal	Rehydration Solution for Malnutrition
RUTF	Ready-to-Use Therapeutic Food
RUSF	Ready-to-Use Supplementary Food
SAM	Severe Acute Malnutrition SD Standard Deviation
UNICEF	United Nations Children's Fund
CDPO	Child Development Project officer
DPO	District Program officer, WCD

Acknowledgement

State Centre of Excellence – CSAM Unit would like to sincerely thank all the people and organizations that supported the study of the prevalence of severe acute malnutrition.

Our team offers sincere gratitude to Swati Nayak Meena (IAS), Former Director, Department of Women and Child Development (DWCD) Madhya Pradesh who supported to conduct SAM prevalence study in Babai block of Hoshangabad district. Along with the encouragement to us for the study, she also provided all necessary assistance during the study.

We are thankful to Mr. Lalti Dehariya, DPO, WCD Hoshangabad who provided support to conduct study in the district. He offered opportunity to meet with the front-line workers and assess their knowledge and skills to words CSAM program in Babai Block. We are also thankful to Mrs. Been Borasi, CDPO WCD, Babai block for offering all the arrangements to conduct study in her administrative tertiary and supported us to took anthropometric measurements of all children in her jurisdiction.

We are grateful to Dr. Sameer Pawar, Nutrition specialist, and Dr. Tarun Patel, Nutrition officer, UNICEF, MP. Thanks to the inspiration, encouragement and the technical and financial support to conduct study.

Last but not the least, we offer sincere gratitude to all parents of children who provided us support to take measurements and motivate us to finalize study in Babai block as well as the frontline workers at the last mile.

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Introduction

Malnutrition is a severe challenge across the world with catastrophic consequences. In the Indian state of Madhya Pradesh, the prevalence of severe acute malnutrition (SAM) among children is one of the hugely prevailing form of malnutrition. According to the NFHS-4 report, 9.2% of children of age group 0-5 years age group are severely wasted in Madhya Pradesh. Madhya Pradesh ranks second among all the States in India in terms of prevalence of severe wasting and this is a serious concern (NFHS-4). Figure 1 given below shows the reduction of wasting between NFHS-3 and NFHS-4. However, the prevalence of wasting in Madhya Pradesh still remains higher than the national average.

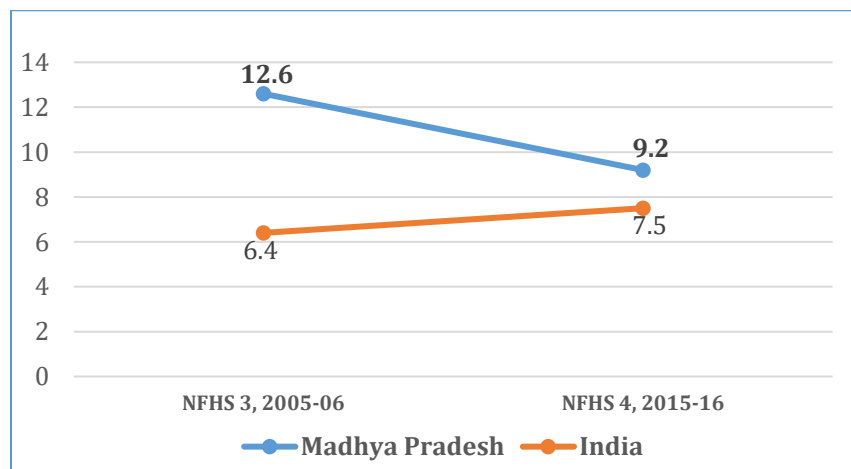


Figure 1: Number of children under 5 years of age with severe wasting (India and Madhya Pradesh)

For addressing malnutrition, Government of Madhya Pradesh has initiated different programs. One of the innovative steps taken by the DWCD Madhya Pradesh specially to address SAM is the implementation of CSAM program. Community based management of severe acute malnutrition (CSAM) is a program that involves the approach in which children with severe acute malnutrition are detected from the community and has a provision of treatment with the nutrition-dense food at home or community level. The CSAM program implemented by DWCD in coordination with

the UNICEF has AIIMS Bhopal as a centre of excellence (CoE). AIIMS Bhopal is majorly responsible to provide the technical support to the government departments mainly to DWCD and NHM.

SCoE has received fund from UNICEF to conduct the study in Babai Block of Hoshangabad. Study has been started in the month of November 2020 and covered around 4500 children. Around 20 field investigators have involved in study and visited house to house to collect data from AWC beneficiaries.

Prevalence of Severe Acute Malnutrition among children below 5 years of age in Babai Block, Hoshangabad district of Madhya Pradesh

Objective

To estimate prevalence of severe acute malnutrition among children below 5 years of age in Babai block, District Hoshangabad, Madhya Pradesh.

Methodology

Study Design & Settings

A cross sectional survey was conducted in Babai block of Hoshangabad district. The survey was conducted in community best settings. This block consists of 213 Anganwadi centres and 7 sectors.

Sampling and Sample size:

According to CNNS report, the prevalence of SAM (0-4 years) in MP is 6.6%. Sample size was calculated using the formula

$$n = (Z_{\alpha/2})^2 p*q / d^2$$

Where p is prevalence=6.6%;

q is 100-p;

d is relative precision set at 15%

Substituting the above values, we get

$$Z = 3.84 \times 6.6 \times 93.4 / (0.15 \times 6.6)^2$$

$$= 2416$$

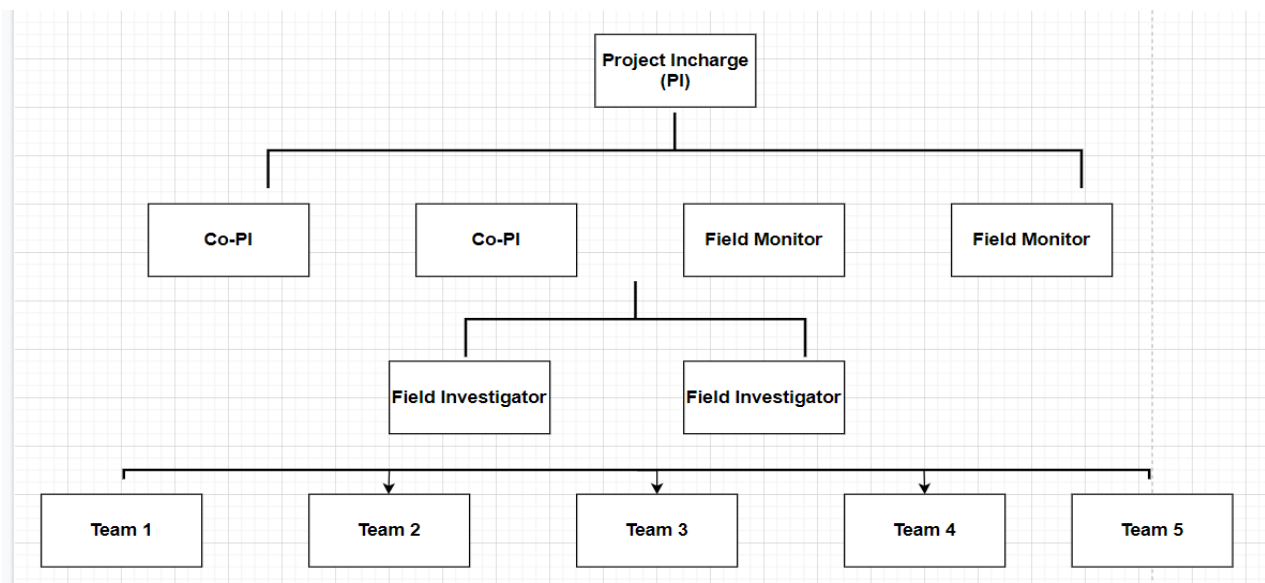
Considering the design effect of 1.5, the sample size was 3623; with Non response rate of 15%; the minimum sample size required was 4166.

For feasibility of data collection, we have adopted cluster sampling. Village comprised our cluster. Cluster were selected based PPS method after arranging list of villages within sector. Size of each cluster was decided to be 36 under five children based on team composition and logistics. A total of 120 clusters were approached.

Data collection process

Considering variation in prevalence of severe acute malnutrition with respect to seasonality and other factors it was decided to conduct rapid survey.

Therefore we have formed 5 teams comprising 2 field investigators each and 2 supervisors.



Training of field staff

Training comprising of theory and hands on practice has been conducted by Regional Centre of Excellence, (SCoE) AIIMS Bhopal. Five teams consisting of two members of each team participated. The session was basically designed to train the participants on different aspects which includes technical aspects related to SAM, MAM and Normal Children, relevance of the study, how to conduct anthropometry - Height/Length etc

Equipment

We have purposefully used the same equipment (stadiometer and weighing scales) with which Anganwadi worker of the selected village measure weight and height of the children.

Household and children selection

Field teams visited selected clusters, identified approximate center of the village, randomly selected the street and then continued to visit households until data of 36 children was completed. All the children under five years of age were included from selected household. All data collection was completed within the span of two months that is December 2020 and January 2021.

Variables

For every child we have collected date of birth, gender, measured his or her height, weight. We also retrieved the date of last anthropometry along with height and weight recorded in the corresponding on anaganwadi centre.

Data entry

Data entry was done in a tool developed on Kobo toolbox. This tool helped us for rapid data entry and ensuring valid data entry.

Data Analysis

Data analysis was done by importing data from Kobo toolbox. We have used R software for performing data analysis along with *anthro* package developed to run anthropometric analysis. We have also used online WHO Anthro Analyzer (<https://worldhealthorg.shinyapps.io/anthro/>).

WHO child growth standards were used and standard definitions of severe acute malnutrition, stunting and underweight were used. Anthropometric results are presented for primary data collected by field investigators for this survey as well as for the last anthropometry recorded in the register of anganwadi centre. Frequency of anthropometric classification recorded by anganwadi worker is also tabulated.

Results

A total of 4170 children were enrolled in the survey. Out of these height measurements were obtained for 4147 children and weight measurements were obtained for 4152 children.

Overall prevalence of severe acute malnutrition (SAM) was found to be 1.7% (95% CI 1.4 to 2.2). Prevalence in male children was 2.0% (95% CI 1.5 to 2.7) and this was higher than female children in whom it was 1.4% (95% CI 1.0 to 2.1). (Table-1)

Results of key anthropometric indicators such as stunting, wasting and underweight are summarized in Figure-1.

Outcome plots

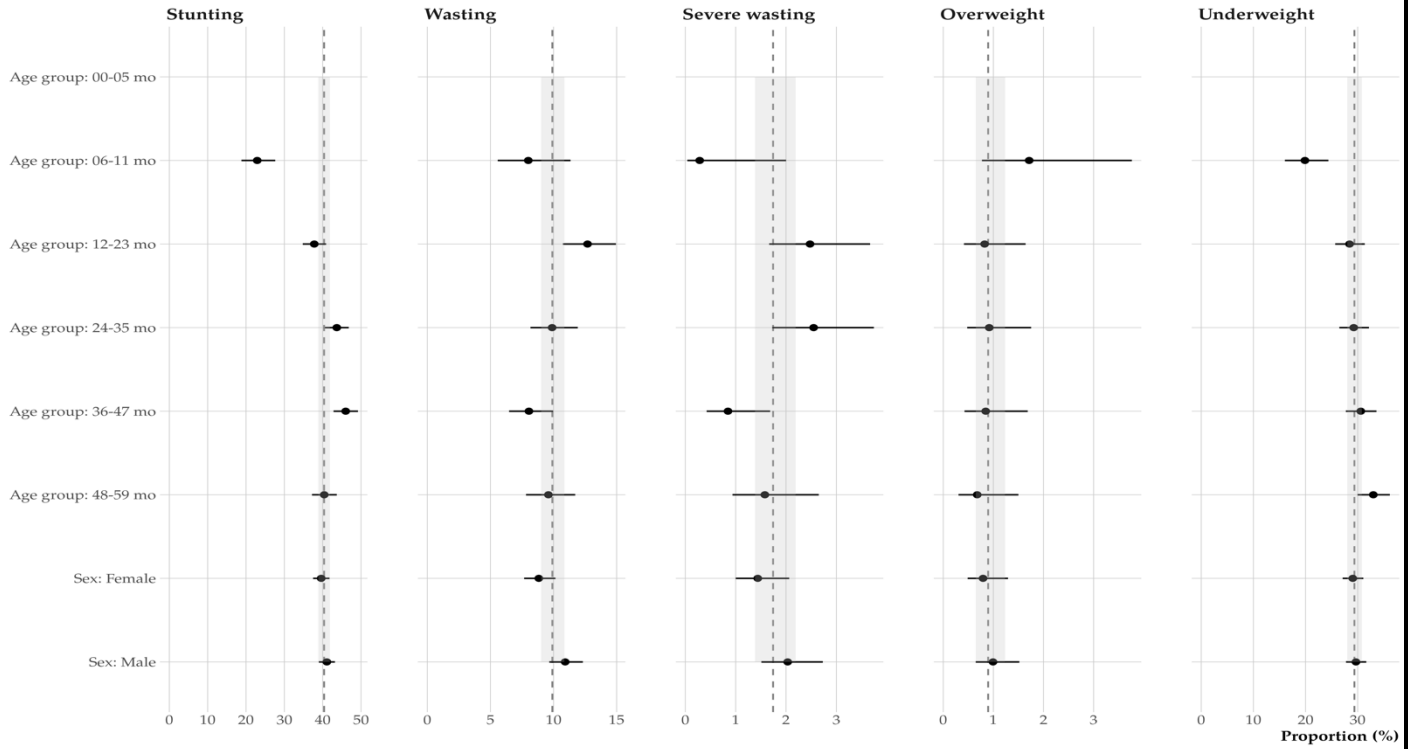


Figure 1: Nutritional status by stratification variable

Nutritional status tables

Table 1: Classification based on Weight-for-height z-scores

Group	N	-3SD (95% CI)	-2SD (95% CI)	z-score mean (95% CI)	z-score SD
All	4130	1.7 (1.4; 2.2)	9.9 (9.0; 10.9)	-0.8 (-0.8; -0.7)	1.03
Age group: 06-11 mo	350	0.3 (0.0; 2.0)	8.0 (5.6; 11.3)	-0.6 (-0.7; -0.5)	1.06
Age group: 12-23 mo	969	2.5 (1.7; 3.7)	12.7 (10.7; 14.9)	-0.8 (-0.9; -0.8)	1.10
Age group: 24-35 mo	981	2.5 (1.7; 3.7)	9.9 (8.2; 11.9)	-0.7 (-0.8; -0.7)	1.07
Age group: 36-47 mo	944	0.8 (0.4; 1.7)	8.1 (6.5; 10.0)	-0.7 (-0.8; -0.7)	0.94
Age group: 48-59 mo	886	1.6 (0.9; 2.7)	9.6 (7.8; 11.7)	-0.8 (-0.9; -0.8)	0.99
Sex: Female	2015	1.4 (1.0; 2.1)	8.8 (7.7; 10.2)	-0.7 (-0.8; -0.7)	1.00
Sex: Male	2115	2.0 (1.5; 2.7)	10.9 (9.7; 12.3)	-0.8 (-0.8; -0.7)	1.06
Age + sex: 06-11 mo.Female	178	0.6 (0.1; 3.9)	7.3 (4.3; 12.2)	-0.6 (-0.8; -0.5)	1.00
Age + sex: 12-23 mo.Female	482	1.9 (1.0; 3.5)	10.8 (8.3; 13.9)	-0.8 (-0.9; -0.7)	1.07
Age + sex: 24-35 mo.Female	486	1.6 (0.8; 3.3)	7.6 (5.6; 10.3)	-0.7 (-0.7; -0.6)	1.02
Age + sex: 36-47 mo.Female	424	0.9 (0.4; 2.5)	7.5 (5.4; 10.5)	-0.7 (-0.8; -0.6)	0.91
Age + sex: 48-59 mo.Female	445	1.6 (0.8; 3.3)	9.9 (7.4; 13.0)	-0.8 (-0.9; -0.8)	0.98
Age + sex: 06-11 mo.Male	172	0.0 (0.0; 0.0)	8.7 (5.3; 14.0)	-0.6 (-0.8; -0.5)	1.12
Age + sex: 12-23 mo.Male	487	3.1 (1.9; 5.0)	14.6 (11.7; 18.0)	-0.9 (-1.0; -0.8)	1.14
Age + sex: 24-35 mo.Male	495	3.4 (2.1; 5.5)	12.1 (9.5; 15.3)	-0.8 (-0.9; -0.7)	1.11
Age + sex: 36-47 mo.Male	520	0.8 (0.3; 2.0)	8.5 (6.4; 11.2)	-0.7 (-0.8; -0.6)	0.97
Age + sex: 48-59 mo.Male	441	1.6 (0.8; 3.3)	9.3 (6.9; 12.4)	-0.8 (-0.9; -0.7)	1.00
Geographical region: Aanchal kheda	568	3.0 (1.9; 4.8)	11.3 (8.9; 14.1)	-0.8 (-0.9; -0.7)	1.13
Geographical region: Aari	453	2.4 (1.3; 4.3)	10.6 (8.1; 13.8)	-0.8 (-0.9; -0.7)	1.05
Geographical region: Babai Urban	547	1.5 (0.7; 2.9)	7.1 (5.3; 9.6)	-0.6 (-0.7; -0.5)	1.04
Geographical region: Bagadatawa	405	1.0 (0.4; 2.6)	7.4 (5.2; 10.4)	-0.8 (-0.9; -0.7)	0.92
Geographical region: Garadiya Kala	621	1.0 (0.4; 2.1)	9.3 (7.3; 11.9)	-0.8 (-0.8; -0.7)	0.99
Geographical region: Nasirabad	414	2.4 (1.3; 4.4)	13.8 (10.8; 17.4)	-0.9 (-1.0; -0.8)	1.05
Geographical region: Sangakheda kala	533	1.3 (0.6; 2.7)	10.7 (8.3; 13.6)	-0.7 (-0.8; -0.7)	1.02
Geographical region: Sangakheda khurd	589	1.5 (0.8; 2.9)	9.5 (7.4; 12.2)	-0.7 (-0.8; -0.7)	1.03

SAM detection by Anganwadi Centers

Records of AWW were also retrieved to know how many SAM children were picked correctly by AWW based on last anthropometric examination done by themselves. Unfortunately, only 7 children i.e., 0.2% were labelled to have SAM. Similarly 138 children (3.1) were labelled to have MAM. (Table-2)

To investigate whether it is any error in classification on the part of AWW we have used same anthropometric records of AWW and classified children by using *anthro* package in R software. Results are shown in Table-3.

Thus, there seems to be problem with classification skill of Anganwadi Workers which needs correction.

Table 2 Weight-for-height classification as recorded by AWW

AWW Register Classification	Male	Female	Total
Normal	2,028 (96%)	1,945 (97%)	3,973 (97%)
MAM	72 (3.4%)	56 (2.8%)	128 (3.1%)
SAM	4 (0.2%)	3 (0.1%)	7 (0.2%)
Total	2,104 (100%)	2,004 (100%)	4,108 (100%)

Table 3 Prevalence of Malnutrition as per anthropometric data of AWW

Group	Children	SAM Prevalence (%)
All	4067	1.37
Age group: 06-11 mo	370	1.32
Age group: 12-23 mo	942	1.89
Age group: 24-35 mo	983	1.93
Age group: 36-47 mo	944	0.95
Age group: 48-59 mo	828	0.60

Conclusions

- Prevalence of SAM in Babai block of Hoshangabad district is 1.7% (95% CI 1.4 to 2.2).
- Our estimate is four times lower than that of CNNS in which SAM prevalence was documented as 6.6%
- Quality of data of our study is at par i.e., no digit heaping, least missing values and distribution of anthropometric indicators is as expected.
- Anganwadi Workers have done anthropometry of all children within 30 days of the survey indicating 100% growth monitoring.
- Prevalence of SAM as per anthropometry done by AWW was found to be 1.37% which is a bit lower than that detected by our survey. It may be ascribed to errors in weight and height measurement as well as time lapse between anthropometric measurement by AWW and current survey.
- However, although AWWs performed anthropometry, recorded height and weight they erred while performing classification based on weight-for-height score. This indicates scope for improving their capacity for anthropometric classification.
- It can be achieved by one or more of the following ways
 - Refresher training
 - Simplifying anthropometry table usage by using Simplified Field Anthropometry Tool developed by CSAM wing of RCOENNRT.
 - Providing smartphone-based application

Annexures

Table 4: Classification based on Height-for-age z-scores

Group	N	-3SD (95% CI)	-2SD (95% CI)	z-score mean (95% CI)	z-score SD
All	4124	12.2 (11.3; 13.3)	40.4 (38.9; 41.9)	-1.7 (-1.7; -1.7)	1.23
Age group: 06-11 mo	349	7.4 (5.1; 10.7)	22.9 (18.8; 27.6)	-1.2 (-1.3; -1.0)	1.36
Age group: 12-23 mo	968	12.4 (10.5; 14.6)	37.8 (34.8; 40.9)	-1.6 (-1.7; -1.5)	1.45
Age group: 24-35 mo	982	13.2 (11.3; 15.5)	43.7 (40.6; 46.8)	-1.8 (-1.9; -1.7)	1.20
Age group: 36-47 mo	939	12.0 (10.1; 14.3)	46.0 (42.8; 49.2)	-1.9 (-1.9; -1.8)	1.03
Age group: 48-59 mo	886	13.0 (10.9; 15.4)	40.4 (37.2; 43.7)	-1.8 (-1.8; -1.7)	1.06
Sex: Female	2009	11.6 (10.3; 13.1)	39.6 (37.5; 41.8)	-1.7 (-1.8; -1.6)	1.20
Sex: Male	2115	12.8 (11.5; 14.3)	41.1 (39.0; 43.2)	-1.7 (-1.8; -1.7)	1.25
Age + sex: 06-11 mo.Female	176	5.1 (2.7; 9.5)	20.5 (15.1; 27.1)	-1.0 (-1.2; -0.9)	1.27
Age + sex: 12-23 mo.Female	480	10.6 (8.2; 13.7)	35.0 (30.9; 39.4)	-1.5 (-1.7; -1.4)	1.42
Age + sex: 24-35 mo.Female	485	12.4 (9.7; 15.6)	41.4 (37.1; 45.9)	-1.8 (-1.9; -1.7)	1.15
Age + sex: 36-47 mo.Female	423	12.5 (9.7; 16.0)	47.8 (43.0; 52.5)	-1.9 (-2.0; -1.8)	1.00
Age + sex: 48-59 mo.Female	445	13.5 (10.6; 17.0)	42.5 (38.0; 47.1)	-1.8 (-1.9; -1.7)	1.03
Age + sex: 06-11 mo.Male	173	9.8 (6.2; 15.2)	25.4 (19.5; 32.4)	-1.3 (-1.5; -1.1)	1.44
Age + sex: 12-23 mo.Male	488	14.1 (11.3; 17.5)	40.6 (36.3; 45.0)	-1.7 (-1.8; -1.5)	1.48
Age + sex: 24-35 mo.Male	497	14.1 (11.3; 17.4)	45.9 (41.5; 50.3)	-1.8 (-1.9; -1.7)	1.24
Age + sex: 36-47 mo.Male	516	11.6 (9.1; 14.7)	44.6 (40.3; 48.9)	-1.8 (-1.9; -1.7)	1.05
Age + sex: 48-59 mo.Male	441	12.5 (9.7; 15.9)	38.3 (33.9; 43.0)	-1.7 (-1.8; -1.6)	1.09
Geographical region: Aanchalkheda	568	12.9 (10.3; 15.9)	42.1 (38.1; 46.2)	-1.8 (-1.9; -1.7)	1.29
Geographical region: Aari	452	14.2 (11.2; 17.7)	47.6 (43.0; 52.2)	-1.9 (-2.0; -1.8)	1.23
Geographical region: Babai Urban	545	9.4 (7.2; 12.1)	34.3 (30.4; 38.4)	-1.5 (-1.6; -1.4)	1.22
Geographical region: Bagadatawa	404	13.6 (10.6; 17.3)	45.0 (40.3; 49.9)	-1.8 (-1.9; -1.7)	1.18
Geographical region: Garadiya Kala	625	10.1 (8.0; 12.7)	34.2 (30.6; 38.1)	-1.7 (-1.7; -1.6)	1.08
Geographical region: Nasirabad	414	15.5 (12.3; 19.3)	43.7 (39.0; 48.5)	-1.8 (-1.9; -1.6)	1.31
Geographical region: Sangakheda kala	530	10.9 (8.6; 13.9)	39.6 (35.5; 43.9)	-1.7 (-1.8; -1.6)	1.13
Geographical region: Sangakheda khurd	586	13.0 (10.5; 15.9)	40.4 (36.5; 44.5)	-1.7 (-1.8; -1.6)	1.37

Table 5: Classification based on Weight-for-age z-scores

Group	N	-3SD (95% CI)	-2SD (95% CI)	z-score mean (95% CI)	z-score SD
All	4147	5.9 (5.2; 6.6)	29.4 (28.0; 30.8)	-1.5 (-1.5; -1.5)	0.99
Age group: 06-11 mo	352	2.3 (1.1; 4.5)	19.9 (16.0; 24.4)	-1.1 (-1.2; -1.0)	1.10
Age group: 12-23 mo	974	7.1 (5.6; 8.9)	28.4 (25.7; 31.4)	-1.4 (-1.5; -1.3)	1.13
Age group: 24-35 mo	985	6.6 (5.2; 8.3)	29.2 (26.5; 32.2)	-1.5 (-1.6; -1.4)	0.99
Age group: 36-47 mo	948	4.4 (3.3; 5.9)	30.6 (27.7; 33.6)	-1.6 (-1.6; -1.5)	0.83
Age group: 48-59 mo	888	6.6 (5.2; 8.5)	33.0 (30.0; 36.2)	-1.7 (-1.7; -1.6)	0.89
Sex: Female	2020	5.9 (4.9; 7.0)	29.1 (27.1; 31.1)	-1.5 (-1.5; -1.5)	1.00
Sex: Male	2127	5.8 (4.9; 6.9)	29.7 (27.8; 31.6)	-1.5 (-1.5; -1.5)	0.98
Age + sex: 06-11 mo.Female	179	2.2 (0.8; 5.8)	18.4 (13.4; 24.8)	-1.0 (-1.2; -0.8)	1.12
Age + sex: 12-23 mo.Female	482	6.2 (4.4; 8.8)	24.5 (20.8; 28.5)	-1.3 (-1.4; -1.2)	1.09
Age + sex: 24-35 mo.Female	487	5.5 (3.8; 8.0)	29.2 (25.3; 33.4)	-1.5 (-1.6; -1.4)	1.01
Age + sex: 36-47 mo.Female	425	5.4 (3.6; 8.0)	32.5 (28.2; 37.1)	-1.6 (-1.7; -1.6)	0.83
Age + sex: 48-59 mo.Female	447	7.8 (5.7; 10.7)	34.9 (30.6; 39.4)	-1.7 (-1.8; -1.6)	0.91
Age + sex: 06-11 mo.Male	173	2.3 (0.9; 6.0)	21.4 (15.9; 28.1)	-1.2 (-1.4; -1.1)	1.06
Age + sex: 12-23 mo.Male	492	7.9 (5.8; 10.7)	32.3 (28.3; 36.6)	-1.5 (-1.6; -1.4)	1.17
Age + sex: 24-35 mo.Male	498	7.6 (5.6; 10.3)	29.3 (25.5; 33.5)	-1.5 (-1.6; -1.4)	0.97
Age + sex: 36-47 mo.Male	523	3.6 (2.3; 5.6)	29.1 (25.3; 33.1)	-1.5 (-1.6; -1.5)	0.83
Age + sex: 48-59 mo.Male	441	5.4 (3.7; 8.0)	31.1 (26.9; 35.5)	-1.6 (-1.7; -1.5)	0.88
Geographical region: Aanchalkheda	573	7.0 (5.2; 9.4)	29.8 (26.2; 33.7)	-1.5 (-1.6; -1.5)	1.05
Geographical region: Aari	456	6.4 (4.5; 9.0)	31.8 (27.7; 36.2)	-1.6 (-1.7; -1.5)	0.98
Geographical region: Babai Urban	548	3.8 (2.5; 5.8)	24.5 (21.0; 28.2)	-1.3 (-1.4; -1.2)	1.02
Geographical region: Bagadatawa	405	6.9 (4.8; 9.8)	30.9 (26.6; 35.5)	-1.5 (-1.6; -1.4)	0.97
Geographical region: Garadiya Kala	626	5.3 (3.8; 7.3)	26.7 (23.4; 30.3)	-1.5 (-1.5; -1.4)	0.92
Geographical region: Nasirabad	415	8.2 (5.9; 11.2)	33.5 (29.1; 38.2)	-1.6 (-1.7; -1.5)	1.01
Geographical region: Sangakheda kala	534	3.9 (2.6; 6.0)	27.9 (24.3; 31.9)	-1.5 (-1.6; -1.4)	0.90
Geographical region: Sangakheda khurd	590	6.3 (4.6; 8.5)	31.9 (28.2; 35.7)	-1.5 (-1.6; -1.4)	1.04

Missing data

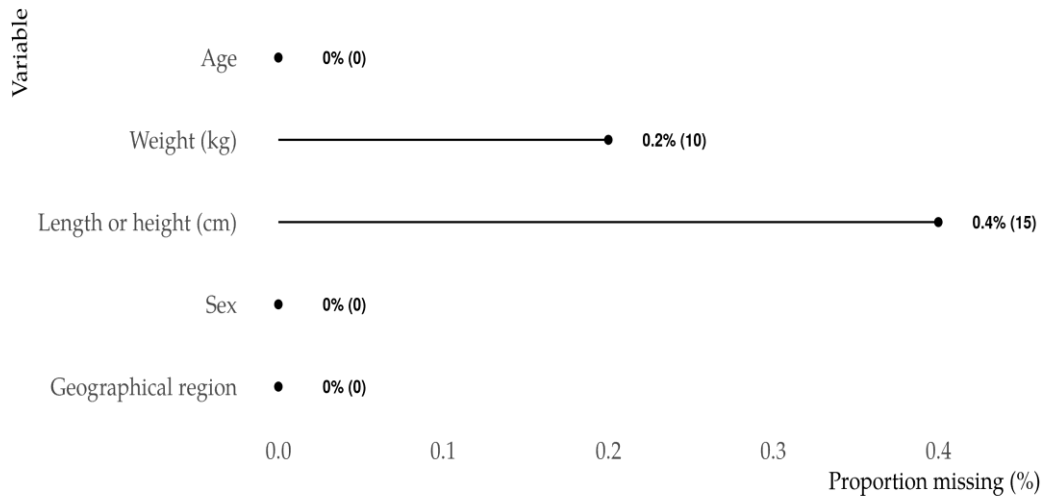


Figure 2: Missing data

Digit heaping charts (with mapping variable labels)

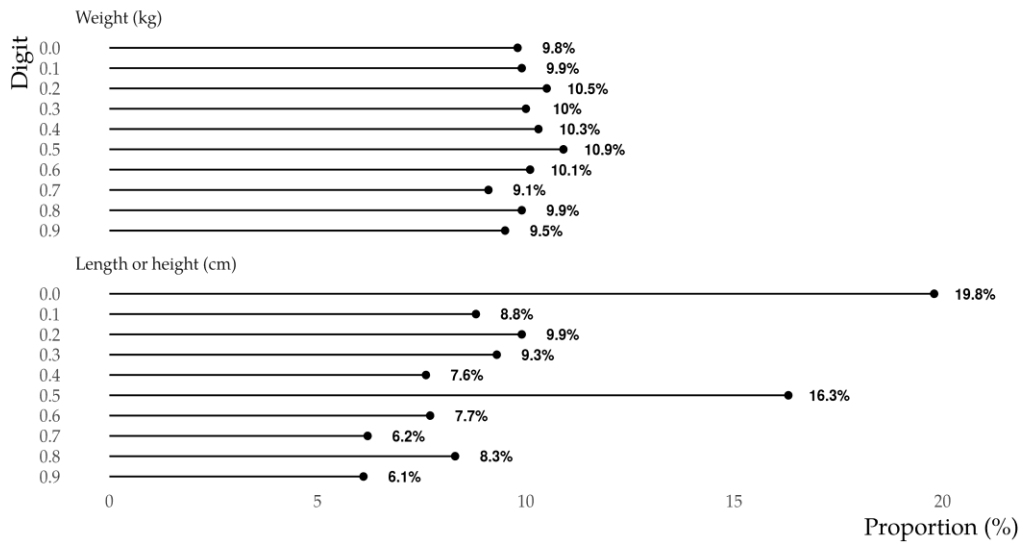
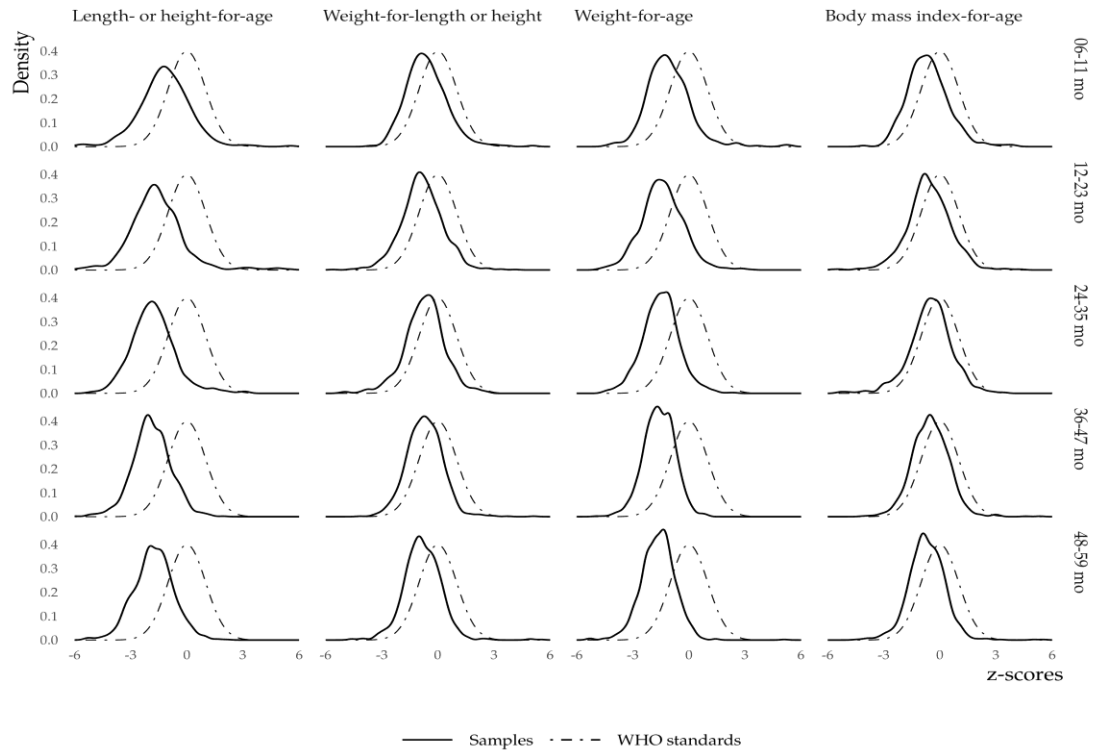


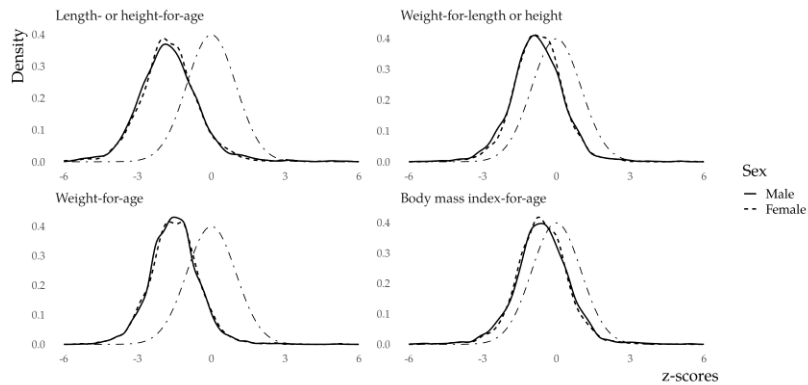
Figure 3: Digit preference for weight & height measurements

Z-score distribution issues



The standard normal density distribution curve is overlaid as a dashed-and-dotted line to provide a visual reference.

Figure 4: Z-score distributions by age group



The standard normal density distribution curve is overlaid as a dashed-and-dotted line to provide a visual reference.

Figure 5: Z-score distributions by sex

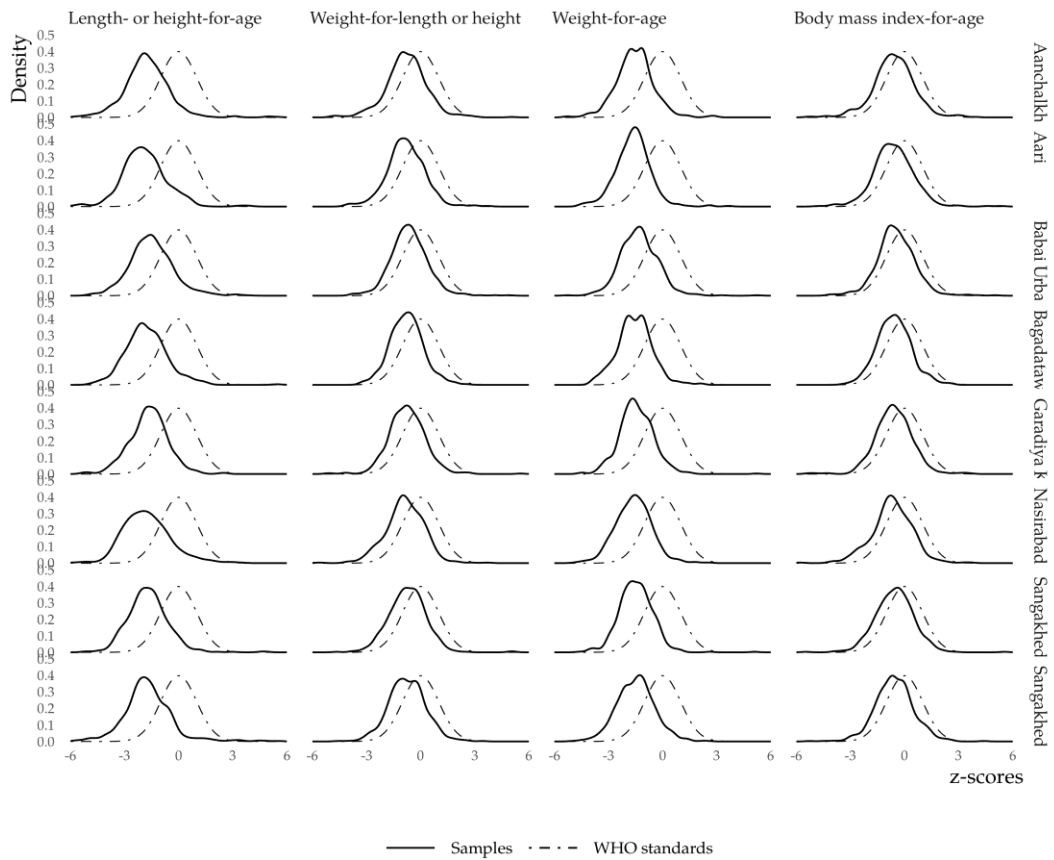


Figure 6: Z-score distributions by geographical region

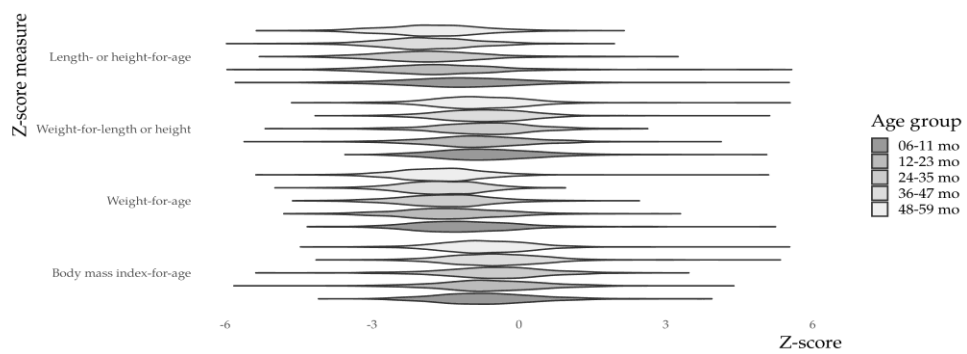


Figure 7: z-score distribution violin plot by age group

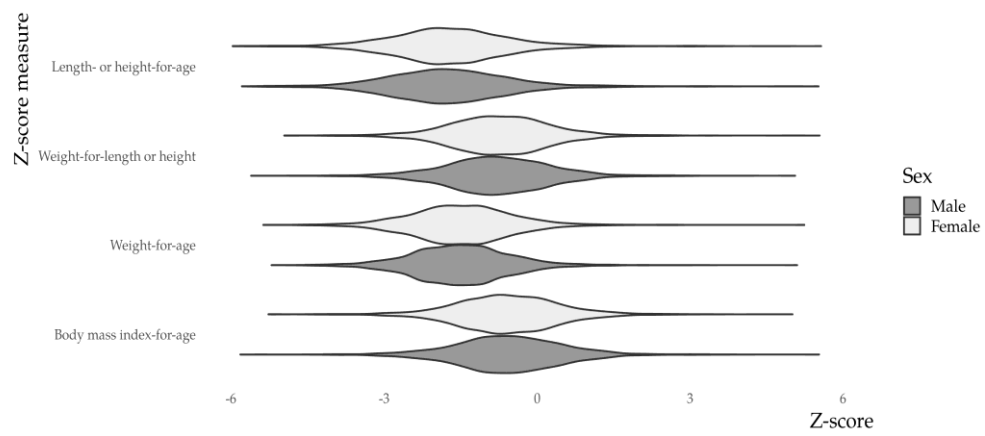


Figure 8: z-score distribution violin plot by sex



Protect the children