On-line Supplementary Material – Supplementary Tables 1-8

Accuracy of a hand-held 3D imaging system for child anthropometric measurements in population-based household surveys and surveillance platforms: an effectiveness validation study in Guatemala, Kenya, and China

Bougma et al 2022

Supplementary Table 1. Child sex, manual anthropometry measurement first, child calm during measurement by 6-month or 12-month age categories in Guatemala, Kenya and China for 3D body imaging evaluation

Supplementary Table 2. Percentage of missing data by age and sex for manual and scan anthropometric measurements for the reference anthropometrist "Expert" and by team anthropometrists in Guatemala, Kenya and China for 3D body imaging evaluation

Supplementary Table 3. Digit preference for first measurement of length/height, mid-upper arm circumference (MUAC), and head circumference in Guatemala, Kenya and China for 3D body imaging evaluation

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Supplementary Table 6. Inter-rater & inter-method accuracy for length or height, mid-upper arm circumference (MUAC), and head circumference (HC): Mean, standard deviation, mean absolute difference, inter-technical error measurement (inter-TEM), relative TEM and intraclass correlation coefficient (ICC) by country and 6 month age breakdown, in Guatemala, Kenya and China for 3D body imaging evaluation

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Supplementary Table 8. Prevalence of stunting and wasting based on WHO 2006 Growth standards by age for manual measurements by reference anthropometrist "Expert" and for scan

measurement by team anthropometrists in Guatemala, Kenya and China for 3D body imaging

evaluation

Supplementary Table 1. Child sex, manual anthropometry measurement first, child calm during measurement by 6-month or 12-month age categories in Guatemala, Kenya and China for 3D body imaging evaluation

Descriptive by age group (mo)	Guatemala (N=641)		Kenya (N=548)		China (N=301)	
	N	% (95%CI)	N	% (95%CI)	N	% (95%CI)
Sex (female)						
0.0-5.9	76	40.8 (29.7, 52.7)	18	46.2 (30.1, 62.8)	28	54.9 (40.3, 68.9)
6.0-11.9	73	46.6 (34.8, 58.6)	36	43.4 (32.5, 54.7)	34	46.6 (34.8, 58.6)
12.0-23.9	158	44.3 (36.4, 52.4)	83	52.9 (44.8, 60.9)	92	48.0 (40.5, 55.6)
24.0-35.9	103	48.5 (38.6, 58.6)	50	58.8 (47.6, 69.4)	-	-
36.0-47.9	120	53.3 (44.0, 62.5)	55	56.1 (45.7, 66.1)	-	-
48.0-59.9	111	47.8 (38.2, 57.4)	48	55.8 (44.7, 66.5)	-	-
Order of measurement (Manual measurement first)						
0.0-5.9	76	69.7 (58.1, 79.8)	24	61.5 (44.6, 76.6)	11	21.6 (11.3, 35.3)
6.0-11.9	73	60.3 (48.1, 71.6)	39	47.0 (35.9, 58.3)	32	43.8 (32.2, 56.0)
12.0-23.9	158	53.8 (45.7, 61.8)	81	51.6 (43.5, 59.6)	82	46.3 (38.8, 54.0)
24.0-35.9	103	51.5 (41.4, 61.4)	39	45.9 (35.0, 57.0)	-	-
36.0-47.9	120	51.7 (42.4, 60.1)	48	49.0 (38.7, 59.3)	-	-
48.0-59.9	111	53.2 (43.5, 62.7)	41	47.7 (36.8, 58.7)	-	-
Expert reported child calm during manual measurement of length or height						
0.0-5.9	76	15.8 (8.4, 26.0)	26	66.7 (49.8, 80.9)	40	78.4 (64.7, 88.9)
6.0-11.9	73	24.7 (15.3, 36.1)	36	43.4 (32.5, 54.7)	49	67.1 (5.51, 77.7)
12.0-23.9	158	27.2 (20.5, 34.9)	72	45.9 (37.9, 54.0)	130	73.5 (66.3, 79.8)
24.0-35.9	103	53.4 (43.3, 63.3)	70	82.4 (72.6, 89.8)	-	-
36.0-47.9	120	80.0 (71.7, 86.8)	96	98.0 (92.8, 99.8)	-	-
48.0-59.9	111	94.6 (88.6, 98.0)	85	98.8 (93.7, 100.0)	-	-
Expert reported child calm during manual measurement of mid-upper arm circumference						
0.0-5.9	51	67.1 (55.4, 77.5)	35	89.7 (75.8, 97.1)	43	84.3 (71.4, 93.0)
6.0-11.9	40	54.8 (42.7, 66.5)	72	86.8 (77.5, 93.2)	47	64.4 (52.3, 75.3)
12.0-23.9	79	50.0 (42.0, 58.1)	106	67.5 (59.6, 74.8)	113	63.8 (56.3, 70.9)
24.0-35.9	73	70.9 (61.1, 79.4)	76	89.4 (80.9, 95.0)	-	-
36.0-47.9	109	90.8 (84.2, 95.3)	97	99.0 (94.5, 100.0)	-	-
48.0-59.9	105	94.6 (88.6, 98.0)	86	100.0 (95.8, 100.0)	-	-
Expert reported child calm during manual measurement of head circumference						
0.0-5.9	-	-	-	-	48	94.1 (83.8, 98.8)
6.0-11.9	-	-	-	-	55	75.3 (63.9, 84.7)
12.0-23.9	-	-	-	-	125	70.6 (63.3, 77.2)

Supplementary Table 2. Percentage of missing data by age and sex for manual and scan anthropometric measurements for the reference anthropometrist "Expert" and by team anthropometrists in Guatemala, Kenya and China for 3D body imaging evaluation

Variable	Guatemala[1]				Kenya[1]				China[1]			
	Manual		Scan		Manual		Scan		Manual		Scan	
	N	% (95%CI)	N	% (95%CI)	N	% (95%CI)	N	%(95%CI)	N	%(95%CI)	N	%(95%CI)
Age and Sex												
Expert												
Age	728	0.0 (0.0, 0.0)	726	2.2 (1.3, 3.6)	624	0.0 (0.0, 0.0)	611	0.5 (0.1, 1.4)	305	0.0 (0.0, 0.0)	306	0.3 (0.0, 1.8)
Sex	728	-	726	2.2 (1.3, 3.6)	624	-	611	0.5 (0.1, 1.4)	305	-	306	0.0 (0.0, 0.0)
Anthropometrists												
Age	974	0.7 (0.3, 1.5)	971	0.7 (0.3, 1.5)	664	0.0 (0.0, 0.0)	664	2.0 (1.1, 0.0)	311	0.0 (0.0, 0.0)	310	0.3 (0.0, 1.8)
Sex	974	0.4 (0.1, 1.1)	971	0.7 (0.3, 1.5)	664	0.0 (0.0, 0.0)	664	2.0 (1.1, 0.0)	311	0.0 (0.0, 0.0)	310	0.0 (0.0, 0.0)
Length and Height												
Expert												
All	728	0.0 (0.0, 0.0)	726	3.2 (2.0, 4.7)	624	0.0 (0.0, 0.0)	611	2.6 (1.5, 4.2)	305	0.0 (0.0, 0.0)	306	0.7 (0.1, 2.3)
0.0-23.9	363	0.0 (0.0, 0.0)	350	0.6 (0.1, 2.1)	306	0.0 (0.0, 0.0)	302	1.7 (0.5, 3.8)	305	0.0 (0.0, 0.0)	306	0.7 (0.1, 2.3)
24.0-59.9	365	0.0 (0.0, 0.0)	360	1.4 (0.5, 3.2)	318	0.0 (0.0, 0.0)	306	2.6 (1.1, 4.4)	-	-	-	-
0.0-5.9	85	0.0 (0.0, 0.0)	82	0.0 (0.0, 0.0)	43	0.0 (0.0, 0.0)	43	2.3 (0.1, 12.3)	52	0.0 (0.0, 0.0)	52	0.0 (0.0, 0.0)
6.0-11.9	86	0.0 (0.0, 0.0)	85	1.2 (0.0, 6.4)	92	0.0 (0.0, 0.0)	91	4.4 (1.2, 10.9)	75	0.0 (0.0, 0.0)	75	0.0 (0.0, 0.0)
12.0-23.9	192	0.0 (0.0, 0.0)	183	0.6 (0.0, 3.0)	171	0.0 (0.0, 0.0)	168	0.0 (0.0, 0.0)	178	0.0 (0.0, 0.0)	178	1.1 (0.1, 4.0)
24.0-35.9	107	0.0 (0.0, 0.0)	103	1.9 (0.2, 6.8)	111	0.0 (0.0, 0.0)	106	7.6 (3.3, 14.3)	-	-	-	-
36.0-47.9	129	0.0 (0.0, 0.0)	129	1.6 (0.2, 5.5)	114	0.0 (0.0, 0.0)	110	0.0 (0.0, 0.0)	-	-	-	-
48.0-59.9	129	0.0 (0.0, 0.0)	128	0.8 (0.0, 4.3)	93	0.0 (0.0, 0.0)	90	0.0 (0.0, 0.0)	-	-	-	-
Boys	-	-	373	0.8 (0.2, 2.3)	-	-	293	2.1 (0.8, 4.4)	-	-	157	0.0 (0.0, 0.0)
Girls	-	-	337	1.2 (0.3, 3.0)	-	-	315	2.2 (0.9, 4.5)	-	-	149	1.3 (0.2, 4.8)
Anthropometrists												
All	974	1.3 (0.7, 2.3)	971	6.0 (4.6, 7.7)	664	0.0 (0.0, 0.0)	664	8.1 (6.2, 10.5)	311	0.3 (0.0, 1.8)	310	1.3 (0.4, 3.3)
0.0-23.9	458	0.4 (0.1, 1.6)	454	6.2 (4.1, 8.8)	326	0.0 (0.0, 0.0)	321	4.4 (2.4, 7.2)	311	0.3 (0.0, 1.8)	310	1.3 (0.4, 3.3)
24.0-59.9	509	1.6 (0.7, 3.1)	510	4.5 (2.9, 6.7)	338	0.0 (0.0, 0.0)	330	8.2 (5.5, 11.7)	-	-	-	-
0.0-5.9	101	1.0 (0.0, 5.4)	103	3.9 (1.1, 9.7)	48	0.0 (0.0, 0.0)	47	4.3 (0.5, 14.5)	52	0.0 (0.0-0.0)	52	1.9 (0.1-10.3)
6.0-11.9	113	0.0 (0.0, 0.0)	114	5.3 (2.0, 11.1)	94	0.0 (0.0, 0.0)	93	3.2 (0.7, 9.1)	76	0.0 (0.0-0.0)	76	2.6 (0.3-9.2)
12.0-23.9	244	0.4 (0.0, 2.3)	237	7.6 (4.6, 11.7)	184	0.0 (0.0, 0.0)	181	5.0 (2.3, 9.2)	183	0.6 (0.0-3.0)	181	0.6 (0.0-3.0)
24.0-35.9	157	0.6 (0.0, 3.5)	158	6.3 (3.1, 11.3)	114	0.0 (0.0, 0.0)	110	11.8 (6.5, 19.4)	-	-	-	-
36.0-47.9	176	1.1 (0.1, 4.0)	173	2.9 (0.9, 6.6)	126	0.0 (0.0, 0.0)	122	8.2 (4.0, 15.6)	-	-	-	-
48.0-59.9	176	2.8 (0.9, 6.5)	179	4.5 (2.0, 8.8)	98	0.0 (0.0, 0.0)	98	4.1 (1.1, 10.1)	-	-	-	-
Boys	501	1.2 (0.4, 2.6)	500	5.0 (3.3, 7.3)	324	0.0 (0.0, 0.0)	317	7.9 (4.9, 11.4)	159	0.0 (0.0, 0.0)	159	1.9 (0.4, 5.4)
Girls	469	1.1 (0.4, 2.5)	464	5.6 (3.7, 8.1)	340	0.0 (0.0, 0.0)	334	4.8 (2.8, 7.7)	152	0.7 (0.0, 3.6)	151	0.7 (0.0, 3.6)
Mid-upper arm circumference												
Expert												

All	728	0.0 (0.0, 0.0)	726	3.2 (2.0, 4.7)	624	0.0 (0.0, 0.0)	611	2.6 (1.5, 4.2)	305	0.0 (0.0, 0.0)	306	0.7 (0.1, 2.3)
0.0-23.9	363	0.0 (0.0, 0.0)	350	0.6 (0.1, 2.1)	306	0.0 (0.0, 0.0)	302	1.7 (0.5, 3.8)	305	0.0 (0.0, 0.0)	306	0.7 (0.1, 2.3)
24.0-59.9	365	0.0 (0.0, 0.0)	360	1.4 (0.5, 3.2)	318	0.0 (0.0, 0.0)	306	2.6 (1.1, 4.4)	-	-	-	-
0.0-5.9	85	0.0 (0.0, 0.0)	82	0.0 (0.0, 0.0)	43	0.0 (0.0, 0.0)	43	2.3 (0.1, 12.3)	52	0.0 (0.0, 0.0)	52	0.0 (0.0, 0.0)
6.0-11.9	86	0.0 (0.0, 0.0)	85	1.2 (0.0, 6.4)	92	0.0 (0.0, 0.0)	91	4.4 (1.2, 10.9)	75	0.0 (0.0, 0.0)	75	0.0 (0.0, 0.0)
12.0-23.9	192	0.0 (0.0, 0.0)	183	0.6 (0.0, 3.0)	171	0.0 (0.0, 0.0)	168	0.0 (0.0, 0.0)	178	0.0 (0.0, 0.0)	178	1.1 (0.1, 4.0)
24.0-35.9	107	0.0 (0.0, 0.0)	103	1.9 (0.2, 6.8)	111	0.0 (0.0, 0.0)	106	7.6 (3.3, 14.3)	-	-	-	-
36.0-47.9	129	0.0 (0.0, 0.0)	129	1.6 (0.2, 5.5)	114	0.0 (0.0, 0.0)	110	0.0 (0.0, 0.0)	-	-	-	-
48.0-59.9	129	0.0 (0.0, 0.0)	128	0.8 (0.0, 4.3)	93	0.0 (0.0, 0.0)	90	0.0 (0.0, 0.0)	-	-	-	-
Boys	-	-	373	0.8 (0.2, 2.3)	-	-	293	2.1 (0.8, 4.4)	-	-	157	0.0 (0.0, 0.0)
Girls	-	-	337	1.2 (0.3, 3.0)	-	-	315	2.2 (0.9, 4.5)	-	-	149	1.3 (0.2, 4.8)
Anthropometrists												
All	974	1.0 (0.5, 1.9)	971	6.0 (4.6, 7.7)	664	0.0 (0.0, 0.0)	664	8.1 (6.2, 10.5)	311	1.0 (0.2, 2.8)	310	1.3 (0.4, 3.3)
0.0-23.9	458	0.4 (0.1, 1.6)	454	6.2 (4.1, 8.8)	326	0.0 (0.0, 0.0)	321	4.4 (2.4, 7.2)	311	1.0 (0.2, 2.8)	310	1.3 (0.4, 3.3)
24.0-59.9	509	1.0 (0.3, 2.3)	510	4.5 (2.9, 6.7)	338	0.0 (0.0, 0.0)	330	8.2 (5.5, 11.7)	-	-	-	-
0.0-5.9	101	1.0 (0.0, 5.4)	103	3.9 (1.1, 9.7)	48	0.0 (0.0, 0.0)	47	4.3 (0.5, 14.5)	52	0.0 (0.0, 0.0)	52	1.9 (0.1, 10.3)
6.0-11.9	113	0.0 (0.0, 0.0)	114	5.3 (2.0, 11.1)	94	0.0 (0.0, 0.0)	93	3.2 (0.7, 9.1)	76	1.3 (0.0, 7.1)	76	2.6 (0.3, 9.2)
12.0-23.9	244	0.4 (0.0, 2.3)	237	7.6 (4.6, 11.7)	184	0.0 (0.0, 0.0)	181	5.0 (2.3, 9.2)	183	0.6 (0.0, 3.0)	181	0.6 (0.0, 3.0)
24.0-35.9	157	0.0 (0.0, 0.0)	158	6.3 (3.1, 11.3)	114	0.0 (0.0, 0.0)	110	11.8 (6.5, 19.4)	-	-	-	-
36.0-47.9	176	1.1 (0.1, 4.0)	173	2.9 (0.9, 6.6)	126	0.0 (0.0, 0.0)	122	8.2 (4.0, 15.6)	-	-	-	-
48.0-59.9	176	1.7 (0.4, 4.9)	179	4.5 (2.0, 8.8)	98	0.0 (0.0, 0.0)	98	4.1 (1.1, 10.1)	-	-	-	-
Boys	501	0.8 (0.2, 2.0)	500	5.0 (3.3, 7.3)	324	0.0 (0.0, 0.0)	317	7.9 (4.9, 11.4)	159	0.6 (0.0, 3.5)	159	1.9 (0.4, 5.4)
Girls	469	0.9 (0.2, 2.2)	464	5.6 (3.7, 8.1)	340	0.0 (0.0, 0.0)	334	4.8 (2.8, 7.7)	152	1.3 (0.2, 4.7)	151	0.7 (0.0, 3.6)
Head Circumference												
Expert												
All	-	-	726	3.2 (2.0, 4.7)	-	-	611	2.6 (1.5, 4.2)	305	0.0 (0.0, 0.0)	306	0.7 (0.1, 2.3)
0.0-23.9	-	-	350	0.6 (0.1, 2.1)	-	-	302	1.7 (0.5, 3.8)	305	0.0 (0.0, 0.0)	306	0.7 (0.1, 2.3)
24.0-59.9	-	-	360	1.4 (0.5, 3.2)	-	-	306	2.6 (1.1, 4.4)	-	,	,	,
0.0-5.9	-	-	82	0.0 (0.0, 0.0)	-	-	43	2.3 (0.1, 12.3)	52	0.0 (0.0, 0.0)	52	0.0 (0.0, 0.0)
6.0-11.9	-	-	85	1.2 (0.0, 6.4)	-	-	91	4.4 (1.2, 10.9)	75	0.0 (0.0, 0.0)	75	0.0 (0.0, 0.0)
12.0-23.9	-	-	183	0.6 (0.0, 3.0)	-	-	168	0.0 (0.0, 0.0)	178	0.0 (0.0, 0.0)	178	1.1 (0.1, 4.0)
24.0-35.9	-	-	103	1.9 (0.2, 6.8)	-	-	106	7.6 (3.3, 14.3)	-	-	-	-
36.0-47.9	-	-	129	1.6 (0.2, 5.5)	-	-	110	0.0 (0.0, 0.0)	-	-	-	-
48.0-59.9	-	-	128	0.8 (0.0, 4.3)	-	-	90	0.0 (0.0, 0.0)	-	-	-	-
Boys	-	-	373	0.8 (0.2, 2.3)	-	-	293	2.1 (0.8, 4.4)	-	-	157	0.0 (0.0, 0.0)
Girls	-	-	337	1.2 (0.3, 3.0)	-	-	315	2.2 (0.9, 4.5)	-	-	149	1.3 (0.2, 4.8)
Anthropometrists												
All	-	-	971	6.0 (4.6, 7.7)	-	-	664	8.1 (6.2, 10.5)	311	1.0 (0.2, 2.8)	310	1.3 (0.4, 3.3)
0.0-23.9	-	-	454	6.2 (4.1, 8.8)	-	-	321	4.4 (2.4, 7.2)	311	1.0 (0.2, 2.8)	310	1.3 (0.4, 3.3)
24.0-59.9	-	-	510	4.5 (2.9, 6.7)	-	-	330	8.2 (5.5, 11.7)	-	,	,	,

0.0-5.9	-	-	103	3.9 (1.1, 9.7)	-	-	47	4.3 (0.5, 14.5)	52	0.0 (0.0, 0.0)	52	1.9 (0.110.3)
6.0-11.9	-	-	114	5.3 (2.0, 11.1)	-	-	93	3.2 (0.7, 9.1)	76	0.0 (0.0, 7.1)	76	2.6 (0.3, 9.2)
12.0-23.9	-	-	237	7.6 (4.6, 11.7)	-	-	181	5.0 (2.3, 9.2)	183	1.1 (0.1, 3.9)	181	0.6 (0.0, 3.0)
24.0-35.9	-	-	158	6.3 (3.1, 11.3)	-	-	110	11.8 (6.5, 19.4)	-	-	-	-
36.0-47.9	-	-	173	2.9 (0.9, 6.6)	-	-	122	8.2 (4.0, 15.6)	-	-	-	-
48.0-59.9	-	-	179	4.5 (2.0, 8.8)	-	-	98	4.1 (1.1, 10.1)	-	-	-	-
Boys	-	-	500	5.0 (3.3, 7.3)	-	-	317	7.9 (4.9, 11.4)	159	0.6 (0.0, 3.5)	159	1.9 (0.4, 5.4)
Girls	-	-	464	5.6 (3.7, 8.1)	-	-	334	4.8 (2.8, 7.7)	152	1.3 (0.2, 4.7)	151	0.7 (0.0, 3.6)

[1]Sample sizes: Observations missing age not included in age missing results. Observations missing sex not included in sex missing results. The scan sample sizes include children with partially completed session, less than 12 scans per session. Results were generated for some children with partial scans and these were treated as non-missing. Missing results include scans that are unavailable due to technical errors during upload.

Supplementary Table 3. Digit preference for first measurement of length/height, mid-upper arm circumference (MUAC), and head circumference in Guatemala, Kenya and China for 3D body imaging evaluation

Terminal digit (tenth)	Guatemala (N=641)			Kenya (N=548)			China (N=301)		
	% Observed	%Observed - %Expected[1]	p-value[2]	% Observed	%Observed - %Expected	p-value	% Observed	%Observed - %Expected	p-value
Length/height[3]									
Expert Manual									
0	5.2	-4.8	0.00	16.4	6.4	0.00	23.3	13.3	0.00
1	7.0	-3.0	0.01	7.3	-2.7	0.04	6.0	-4.0	0.02
2	14.0	4.0	0.00	8.9	-1.1	0.41	11.0	1.0	0.58
3	11.2	1.2	0.30	9.9	-0.1	0.91	7.0	-3.0	0.08
4	12.8	2.8	0.02	8.9	-1.1	0.41	11.6	1.6	0.35
5	7.3	-2.7	0.02	14.2	4.2	0.00	13.6	3.6	0.04
6	12.3	2.3	0.05	7.5	-2.5	0.05	9.0	-1.0	0.55
7	13.4	3.4	0.00	8.2	-1.8	0.16	7.6	-2.4	0.17
8	11.1	1.1	0.36	11.0	1.0	0.46	6.3	-3.7	0.03
9	5.6	-4.4	0.00	7.7	-2.3	0.07	4.7	-5.3	0.00
Expert scan									
0	9.5	-0.5	0.68	5.1	-4.9	0.00	6.3	-3.7	0.03
1	9.7	-0.3	0.78	9.7	-0.3	0.80	8.6	-1.4	0.43
2	10.5	0.5	0.70	9.9	-0.1	0.91	10.6	0.6	0.72
3	10.6	0.6	0.61	12.0	2.0	0.11	10.3	0.3	0.86
4	10.1	0.1	0.91	11.5	1.5	0.24	10.3	0.3	0.86
5	9.8	-0.2	0.88	10.4	0.4	0.75	9.6	-0.4	0.83
6	8.7	-1.3	0.29	8.4	-1.6	0.21	12.3	2.3	0.18
7	10.6	0.6	0.61	11.0	1.0	0.46	12.6	2.6	0.13
8	11.4	1.4	0.24	10.4	0.4	0.75	10.0	0.0	0.98
9	9.1	-0.9	0.42	11.7	1.7	0.19	9.3	-0.7	0.69
Anthropometrist manual									
0	10.9	0.9	0.43	22.5	12.5	0.00	21.6	11.6	0.00
1	7.0	-3.0	0.01	7.9	-2.1	0.09	7.3	-2.7	0.12
2	12.0	2.0	0.09	9.9	-0.1	0.91	7.6	-2.4	0.17
3	10.6	0.6	0.60	8.8	-1.2	0.33	7.6	-2.4	0.17
4	8.4	-1.6	0.19	8.6	-1.4	0.27	9.3	-0.7	0.69
5	16.1	6.1	0.00	14.6	4.6	0.00	15.3	5.3	0.00
6	10.6	0.6	0.60	8.0	-2.0	0.12	9.3	-0.7	0.69
7	10.6	0.6	0.60	9.5	-0.5	0.69	9.0	-1.0	0.55
8	8.9	-1.1	0.36	7.1	-2.9	0.02	8.0	-2.0	0.24
9	4.7	-5.3	0.00	3.3	-6.7	0.00	5.0	-5.0	0.00
Anthropometrist scan									

0	9.8	-0.2	0.88	10.4	0.4	0.75	13.3	3.3	0.06
1	11.1	1.1	0.36	10.8	0.8	0.55	10.0	0.0	0.98
2	9.7	-0.3	0.78	9.7	-0.3	0.80	12.0	2.0	0.26
3	9.7	-0.3	0.78	10.0	0.0	0.98	11.0	1.0	0.58
4	10.6	0.6	0.61	9.3	-0.7	0.59	10.3	0.3	0.86
5	9.8	-0.2	0.88	11.0	1.0	0.46	10.0	0.0	0.98
6	7.3	-2.7	0.02	9.9	-0.1	0.91	9.6	-0.4	0.83
7	10.1	0.1	0.91	10.0	0.0	0.98	7.0	-3.0	0.08
8	10.9	0.9	0.44	10.8	0.8	0.55	8.0	-2.0	0.24
9	10.9	0.9	0.44	8.2	-1.8	0.16	9.0	-1.0	0.55
MUAC[4]									
Expert Manual									
0	6.1	-3.9	0.00	14.1	4.1	0.00	14.0	4.0	0.02
1	12.2	2.2	0.07	8.8	-1.2	0.34	7.3	-2.7	0.12
2	14.1	4.1	0.00	7.9	-2.1	0.10	10.6	0.6	0.72
3	8.3	-1.7	0.15	10.2	0.2	0.85	5.3	-4.7	0.01
4	9.2	-0.8	0.51	10.1	0.1	0.97	12.3	2.3	0.18
5	7.5	-2.5	0.04	11.7	1.7	0.19	11.3	1.3	0.45
6	17.5	7.5	0.00	9.1	-0.9	0.50	7.0	-3.0	0.08
7	12.0	2	0.09	10.6	0.6	0.64	11.0	1.0	0.58
8	6.4	-3.6	0.00	9.3	-0.7	0.60	8.6	-1.4	0.43
9	6.7	-3.3	0.01	8.2	-1.8	0.17	12.6	2.6	0.13
Expert Scan									
0	9.8	-0.2	0.88	8.9	-1.1	0.41	9.6	-0.4	0.83
1	10.5	0.5	0.70	10.2	0.2	0.86	6.6	-3.4	0.05
2	10.0	0.0	0.99	11.7	1.7	0.19	8.6	-1.4	0.43
3	9.4	-0.6	0.59	8.6	-1.4	0.27	9.3	-0.7	0.69
4	7.8	-2.2	0.06	9.5	-0.5	0.69	11.0	1.0	0.58
5	11.4	1.4	0.24	11.7	1.7	0.19	13.0	3.0	0.09
6	10.5	0.5	0.70	10.6	0.6	0.65	11.6	1.6	0.35
7	12.6	2.6	0.03	10.2	0.2	0.86	8.6	-1.4	0.43
8	9.1	-0.9	0.42	11.0	1.0	0.46	10.0	0.0	0.98
9	9.1	-0.9	0.42	7.7	-2.3	0.07	11.6	1.6	0.35
Anthropometrist manual									
0	9.8	-0.2	0.90	9.9	-0.1	0.91	11.6	1.6	0.35
1	9.2	-0.8	0.51	8.0	-2.0	0.12	9.6	-0.4	0.83
2	13.6	3.6	0.00	10.8	0.8	0.55	9.0	-1.0	0.55
3	9.7	-0.3	0.79	8.9	-1.1	0.41	8.6	-1.4	0.43
4	11.4	1.4	0.24	10.0	0.0	0.98	10.0	0.0	0.98
5	9.5	-0.5	0.69	13.0	3.0	0.02	9.3	-0.7	0.69
6	9.7	-0.3	0.79	11.9	1.9	0.15	8.0	-2.0	0.24

7	7.7	-2.3	0.05	8.6	-1.4	0.27	8.6	-1.4	0.43
8	10.5	0.5	0.69	11.3	1.3	0.31	13.6	3.6	0.18
9	8.9	-1.1	0.36	7.7	-2.3	0.07	11.6	1.6	0.35
Anthropometrist Scan									
0	9.8	-0.2	0.88	11.1	1.1	0.38	10.3	0.3	0.86
1	10.5	0.5	0.70	9.9	-0.1	0.91	7.6	-2.4	0.17
2	9.1	-0.9	0.42	8.9	-1.1	0.41	7.6	-2.4	0.17
3	11.5	1.5	0.19	10.4	0.4	0.75	11.3	1.3	0.45
4	9.5	-0.5	0.68	10.8	0.8	0.55	11.6	1.6	0.35
5	9.4	-0.6	0.59	9.1	-0.9	0.49	13.0	3.0	0.09
6	9.5	-0.5	0.68	10.0	0.0	0.98	10.0	0.0	0.98
7	12.3	2.3	0.05	8.9	-1.1	0.41	11.6	1.6	0.35
8	8.6	-1.4	0.23	9.1	-0.9	0.49	7.6	-2.4	0.17
9	9.8	-0.2	0.88	11.7	1.7	0.19	9.3	-0.7	0.69
HC									
Expert Manual									
0	-	-	-	-	-	-	14.0	4.0	0.02
1	-	-	-	-	-	-	6.3	-3.7	0.03
2	-	-	-	-	-	-	8.6	-1.4	0.43
3	-	-	-	-	-	-	5.7	-4.3	0.01
4	-	-	-	-	-	-	8.0	-2.0	0.24
5	-	-	-	-	-	-	16.9	6.9	0.00
6	-	-	-	-	-	-	6.0	-4.0	0.02
7	-	-	-	-	-	-	12.0	2.0	0.26
8	-	-	-	-	-	-	9.0	-1.0	0.55
9	-	-	-	-	-	-	13.6	3.6	0.04
Expert Scan									
0	8.6	-1.4	0.23	10.2	0.2	0.86	9.6	-0.4	0.83
1	12.6	2.6	0.03	9.7	-0.3	0.80	10.0	0.0	0.98
2	11.9	1.9	0.12	11.0	1.0	0.46	11.0	1.0	0.58
3	9.4	-0.6	0.59	10.6	0.6	0.65	9.0	-1.0	0.55
4	10.6	0.6	0.61	10.8	0.8	0.55	12.6	2.6	0.13
5	9.1	-0.9	0.42	11.9	1.9	0.15	12.0	2.0	0.26
6	8.6	-1.4	0.23	8.2	-1.8	0.16	7.0	-3.0	0.08
7	11.5	1.5	0.19	6.8	-3.2	0.01	10.6	0.6	0.72
8	8.0	-2.0	0.08	11.1	1.1	0.38	10.0	0.0	0.98
9	9.8	-0.2	0.88	9.9	-0.1	0.91	8.3	-1.7	0.33
Anthropometrists manual									
0	-	-	-	-	-	-	12.6	2.6	0.13
1	-	-	-	-	-	-	10.6	0.6	0.72
2	-	-	-	-	-	-	9.3	-0.7	0.69

3	-	-	-	-	-	-	8.0	-2.0	0.24
4	-	-	-	-	-	-	11.6	1.6	0.35
5	-	-	-	-	-	-	13.3	3.3	0.06
6	-	-	-	-	-	-	8.3	-1.7	0.33
7	-	-	-	-	-	-	7.6	-2.4	0.17
8	-	-	-	-	-	-	8.6	-1.4	0.43
9	-	-	-	-	-	-	10.0	0.0	0.98
Anthropometrists Scan									
0	10.0	0.0	0.99	11.0	1.0	0.46	10.0	0.0	0.98
1	10.3	0.3	0.80	11.5	1.5	0.24	10.6	0.6	0.72
2	9.7	-0.3	0.78	9.1	-0.9	0.49	8.6	-1.4	0.43
3	10.6	0.6	0.61	8.9	-1.1	0.41	10.0	0.0	0.98
4	8.6	-1.4	0.23	9.9	-0.1	0.91	9.3	-0.7	0.69
5	9.2	-0.8	0.50	11.7	1.7	0.19	9.3	-0.7	0.69
6	11.7	1.7	0.15	7.9	-2.1	0.09	10.0	0.0	0.98
7	9.7	-0.3	0.78	9.1	-0.9	0.49	10.3	0.3	0.86
8	9.8	-0.2	0.88	8.8	-1.2	0.33	11.6	1.6	0.35
9	10.5	0.5	0.70	12.2	2.2	0.08	10.3	0.3	0.86

[1]Expected prevalence of each digit is 10.0%.

[2]Binomial test was used to check if the observed prevalence was statistically different from the expected prevalence

[3]For anthropometrist manual anthropometry, Guatemala is missing one length/height observation where two digits were entered instead of one.

[4]For expert manual anthropometry, Guatemala and Kenya are each missing one MUAC observation where two digits were entered instead of one. For anthropometrist manual anthropometry, Guatemala is missing one MUAC observation because two digits were entered.

Supplementary Table 4. Percentage of biological implausible values (BIV) for length-for-age Z scores (LAZ) or height-for-age Z scores (HAZ), weight-for-length Z scores (WLZ) or weight-for-height Z scores (WHZ), mid-upper arm circumference-for-age Z scores (MUACZ), head circumference-for-age Z scores (HCZ), and body mass index-for-age Z scores (BMIZ) based on WHO 2006 Growth standards[1] in Guatemala, Kenya and China for 3D body imaging evaluation

Age group (mo)	Guatemala			Kenya			China		
	N	Manual (%)	Scan (%)	N	Manual (%)	Scan (%)	N	Manual (%)	Scan (%)
LAZ or HAZ									
Expert									
All	641	0.3	1.3	548	0.2	0.2	301	0.0	1.0
0.0-23.9	307	0.3	2.6	279	0.4	0.4	301	0.0	1.0
24.0-59.9	334	0.6	0.0	269	0.0	0.0	-	-	-
0.0-5.9	76	0.0	7.9	39	0.0	2.6	51	0.0	3.9
6.0-11.9	73	1.4	1.4	83	0.0	0.0	73	0.0	1.4
12.0-23.9	158	0.0	0.6	157	0.6	0.0	177	0.0	0.0
24.0-35.9	103	0.0	0.0	85	0.0	0.0	-	-	-
36.0-47.9	120	0.8	0.0	98	0.0	0.0	-	-	-
48.0-59.9	111	0.0	0.0	86	0.0	0.0	-	-	-
Anthropometrist									
All	641	0.0	0.3	548	0.0	0.6	301	0.0	0.3
0.0-23.9	307	0.0	0.7	279	0.0	1.1	301	0.0	0.3
24.0-59.9	334	0.0	0.0	269	0.0	0.0	-	-	-
0.0-5.9	76	0.0	1.3	39	0.0	0.0	51	0.0	0.0
6.0-11.9	73	0.0	0.0	83	0.0	1.2	73	0.0	0.0
12.0-23.9	158	0.0	0.6	157	0.0	1.3	177	0.0	0.6
24.0-35.9	103	0.0	0.0	85	0.0	0.0	-	-	-
36.0-47.9	120	0.0	0.0	98	0.0	0.0	-	-	-
48.0-59.9	111	0.0	0.0	86	0.0	0.0	-	-	-
WLZ or WHZ									
Expert (Weight measured by Expert)									
All	641	0.2	1.6	547[2]	0.2	0.6	301	0.0	3.7
0.0-23.9	307	0.3	3.3	279	0.4	1.1	301	0.0	3.7
24.0-59.9	334	0.0	0.0	268	0.0	0.0	-	-	-
0.0-5.9	76	0.0	13.2	39	0.0	2.6	51	0.0	3.9
6.0-11.9	73	1.4	0.0	83	0.0	0.0	73	0.0	4.1
12.0-23.9	158	0.0	0.0	157	0.6	1.3	177	0.0	3.4
24.0-35.9	103	0.0	0.0	85	0.0	0.0	-	-	-
36.0-47.9	120	0.0	0.0	98	0.0	0.0	-	-	-
48.0-59.9	111	0.0	0.0	85	0.0	0.0	-	-	-

Anthropometrist (Weight measured by Anthropometrist)									
All	641[3]	0.0	1.3	547	0.0	0.9	301	0.0	4.7
0.0-23.9	307	0.0	2.6	279	0.0	1.8	301	0.0	4.7
24.0-59.9	334	0.0	0.0	268	0.0	0.0	-	-	-
0.0-5.9	76	0.0	10.5	39	0.0	0.0	51	0.0	5.9
6.0-11.9	73	0.0	0.0	83	0.0	2.4	73	0.0	4.1
12.0-23.9	158	0.0	0.0	157	0.0	1.9	177	0.0	4.5
24.0-35.9	103	0.0	0.0	85	0.0	0.0	-	-	-
36.0-47.9	120	0.0	0.0	98	0.0	0.0	-	-	-
48.0-59.9	111	0.0	0.0	85	0.0	0.0	-	-	-
MUACZ									
Expert									
All	611	0.0	0.0	535	0.0	0.0	279	0.0	0.0
3.0-23.9	277	0.0	0.0	266	0.0	0.0	279	0.0	0.0
24.0-59.9	334	0.0	0.0	269	0.0	0.0	-	-	-
3.0-5.9	46	0.0	0.0	26	0.0	0.0	29	0.0	0.0
6.0-11.9	73	0.0	0.0	83	0.0	0.0	73	0.0	0.0
12.0-23.9	158	0.0	0.0	157	0.0	0.0	177	0.0	0.0
24.0-35.9	103	0.0	0.0	85	0.0	0.0	-	-	-
36.0-47.9	120	0.0	0.0	98	0.0	0.0	-	-	-
48.0-59.9	110	0.0	0.0	86	0.0	0.0	-	-	-
Anthropometrist									
All	611	0.0	0.0	535	0.0	0.0	279	0.0	0.0
3.0-23.9	277	0.0	0.0	266	0.0	0.0	279	0.0	0.0
24.0-59.9	334	0.0	0.0	269	0.0	0.0	-	-	-
3.0-5.9	46	0.0	0.0	26	0.0	0.0	29	0.0	0.0
6.0-11.9	73	0.0	0.0	83	0.0	0.0	73	0.0	0.0
12.0-23.9	158	0.0	0.0	157	0.0	0.0	177	0.0	0.0
24.0-35.9	103	0.0	0.0	85	0.0	0.0	-	-	-
36.0-47.9	120	0.0	0.0	98	0.0	0.0	-	-	-
48.0-59.9	111	0.0	0.0	86	0.0	0.0	-	-	-
HC									
Expert									
All	641	-	28.2	548	-	13.7	301	0.0	28.9
0.0-23.9	307	-	42.0	279	-	22.2	301	0.0	28.9
24.0-59.9	334	-	15.6	269	-	4.8	-	-	-
0.0-5.9	76	-	57.9	39	-	56.4	51	0.0	76.5
6.0-11.9	73	-	46.6	83	-	32.5	73	0.0	49.3
12.0-23.9	158	-	32.3	157	-	8.3	177	0.0	6.8
24.0-35.9	103	-	16.5	85	-	2.4	-	-	-

36.0-47.9	120	-	20.8	98	-	5.1	-	-	-
48.0-59.9	111	-	9.0	86	-	7.0	-	-	-
Anthropometrist									
All	641	-	12.3	548	-	13.1	301	0.0	14.3
0.0-23.9	307	-	13.0	279	-	17.9	301	0.0	14.3
24.0-59.9	334	-	11.7	269	-	8.2	-	-	-
0.0-5.9	76	-	31.6	39	-	43.6	51	0.0	49.0
6.0-11.9	73	-	12.3	83	-	30.1	73	0.0	20.6
12.0-23.9	158	-	4.4	157	-	5.1	177	0.0	1.7
24.0-35.9	103	-	14.6	85	-	12.9	-	-	-
36.0-47.9	120	-	10.8	98	-	5.1	-	-	-
48.0-59.9	111	-	9.9	86	-	7.0	-	-	-
BMIZ									
Expert (Weight measured by Expert)									
All	641	0.2	1.4	548	0.2	0.9	301	0.0	5.0
0.0-23.9	307	0.3	2.6	279	0.4	1.8	301	0.0	5.0
24.0-59.9	334	0.0	0.3	269	0.0	0.0	-	-	-
0.0-5.9	76	0.0	9.2	39	0.0	0.0	51	0.0	0.0
6.0-11.9	73	1.4	0.0	83	0.0	0.0	73	0.0	4.1
12.0-23.9	158	0.0	0.6	157	0.6	3.2	177	0.0	6.8
24.0-35.9	103	0.0	0.0	85	0.0	0.0	-	-	-
36.0-47.9	120	0.0	0.8	98	0.0	0.0	-	-	-
48.0-59.9	111	0.0	0.0	86	0.0	0.0	-	-	-
Anthropometrist (Weight measured by Anthropometrist)									
All	641[3]	0.0	0.6	548	0.0	2.0	301	0.0	5.3
0.0-23.9	307	0.0	1.3	279	0.0	3.9	301	0.0	5.3
24.0-59.9	334	0.0	0.0	269	0.0	0.0	-	-	-
0.0-5.9	76	0.0	1.3	39	0.0	0.0	51	0.0	2.0
6.0-11.9	73	0.0	0.0	83	0.0	2.4	73	0.0	4.1
12.0-23.9	158	0.0	1.9	157	0.0	5.7	177	0.0	6.8
24.0-35.9	103	0.0	0.0	85	0.0	0.0	-	-	-
36.0-47.9	120	0.0	0.0	98	0.0	0.0	-	-	-
48.0-59.9	111	0.0	0.0	86	0.0	0.0	-	-	-

[1] Body mass index (BMI) = weight, kg/height or length, m^2 by age. Z-scores calculated from the mean of 2 measurements for length, height, MUAC, HC, and BMI. Biologically implausible values (BIV) are Z-score extreme values that fall out of designated cuts offs. WHO calculates MUACZ for children starting at 3.0 mo of age. BIV for each indicator are flagged according to the following cut-offs: LAZ and HAZ: <-6 or >6; WLZ and WHZ: <-5 or >5; MUACZ: <-5 or >5; HCZ: <-5 or >5; BMIZ: <-5 or >5

[2] One child height >120 cm, which is beyond the WHO cut-off for generating WHZ, so no WHZ calculated for this child.

[3] One child had only one weight measurement (from anthropometrists) so it was not possible to calculate mean the single weight value was used instead.

Supplementary Table 5. Standard deviation (SD) for length-for-age Z scores (LAZ), height-for-age Z scores (HAZ), weight-for-length Z scores (WLZ), weight-for-height Z scores (WHZ), mid-upper arm circumference-for-age Z scores (MUACZ), head circumference-for-age Z scores (HCZ), and body mass index-for-age Z scores (BMIZ) based on WHO 2006 Growth standards[1] in Guatemala, Kenya and China for 3D body imaging evaluation.

Age group (mo)	Guatemala				Kenya				China			
	Manual		Scan		Manual		Scan		Manual		Scan	
	N	SD	N	SD	N	SD	N	SD	N	SD	N	SD
LAZ/HAZ												
Expert												
All	639	1.22	633	1.78	547	1.19	547	1.57	301	1.05	298	4.71
0.0-23.9	306	1.26	299	2.26	278	1.18	278	1.88	301	1.05	298	4.71
24.0-59.9	333	1.11	334	1.06	269	1.18	269	1.08	-	-	-	-
0.0-5.9	76	1.14	70	2.45	39	1.21	38	1.57	51	1.13	49	1.67
6.0-11.9	72	1.30	72	1.77	83	1.11	83	1.57	73	0.96	72	1.23
12.0-23.9	158	1.20	157	1.59	156	1.15	157	1.42	177	1.04	177	1.27
24.0-35.9	103	1.02	103	1.07	85	1.09	85	0.97	-	-	-	-
36.0-47.9	119	1.14	120	1.04	98	1.26	98	1.15	-	-	-	-
48.0-59.9	111	1.16	111	1.02	86	1.20	86	1.07	-	-	-	-
Anthropometrists												
All	641	1.24	639	1.62	548	1.22	545	1.59	301	1.09	300	1.66
0.0-23.9	307	1.31	305	2.05	279	1.23	276	1.90	301	1.09	300	1.66
24.0-59.9	334	1.13	334	1.04	269	1.19	269	1.14	-	-	-	-
0.0-5.9	76	1.11	75	2.27	39	1.12	39	2.15	51	1.21	51	2.19
6.0-11.9	73	1.36	73	1.43	83	1.23	82	1.70	73	1.04	73	1.24
12.0-23.9	158	1.28	157	1.12	157	1.16	155	1.36	177	1.04	176	1.12
24.0-35.9	103	1.03	103	1.12	85	1.06	85	1.08	-	-	-	-
36.0-47.9	120	1.18	120	0.99	98	1.28	98	1.07	-	-	-	-
48.0-59.9	111	1.16	111	0.99	86	1.22	86	1.19	-	-	-	-
WLZ/WHZ												
Expert (Weight measured by Expert)												
All	640	0.95	631	1.53	546	1.04	545	1.49	301	1.06	290	1.43
0.0-23.9	306	1.02	297	1.89	278	1.10	276	1.71	301	1.06	290	1.43

24.0-59.9	334	0.89	334	1.12	268	0.97	269	1.13	-	-	-	-
0.0-5.9	76	0.91	66	2.09	39	1.07	38	1.90	51	0.84	49	1.85
6.0-11.9	72	1.05	73	1.99	83	1.13	83	1.69	73	1.17	70	1.26
12.0-23.9	158	0.91	158	1.67	156	1.08	155	1.52	177	0.99	171	1.32
24.0-35.9	103	0.87	103	1.14	85	0.95	85	1.05	-	-	-	-
36.0-47.9	120	0.87	120	1.14	98	0.98	98	1.14	-	-	-	-
48.0-59.9	111	0.93	111	1.09	86	0.90	86	1.04	-	-	-	-
Anthropometrists (Weight measured by Anthropometrist)												
All	641	0.97	633	1.45	547	1.05	542	1.52	301	1.06	287	1.46
0.0-23.9	307	1.03	299	1.77	279	1.12	274	1.73	301	1.06	287	1.46
24.0-59.9	334	0.91	334	1.08	268	0.97	268	1.19	-	-	-	-
0.0-5.9	76	1.01	68	2.10	39	1.10	39	2.06	51	0.88	48	2.08
6.0-11.9	73	1.02	73	1.83	83	1.20	81	1.60	73	1.16	70	1.46
12.0-23.9	158	0.91	158	1.54	157	1.08	154	1.63	177	1.01	169	1.23
24.0-35.9	103	0.93	103	1.21	85	0.93	85	1.08	-	-	-	-
36.0-47.9	120	0.87	120	1.04	98	0.99	98	1.19	-	-	-	-
48.0-59.9	111	0.93	111	1.01	86	0.90	86	1.10	-	-	-	-
MUACZ												
Expert												
All	611	0.79	611	0.84	535	0.84	535	1.10	279	0.94	279	0.62
3.0-23.9	277	0.83	277	0.73	266	0.86	266	0.63	279	0.94	279	0.62
24.0-59.9	334	0.70	334	0.91	269	0.80	269	0.96	-	-	-	-
3.0-5.9	46	0.75	46	0.64	26	0.79	26	0.52	29	0.78	29	0.34
6.0-11.9	73	0.82	73	0.42	83	0.86	83	0.42	73	0.99	73	0.43
12.0-23.9	158	0.76	158	0.52	157	0.86	157	0.55	177	0.84	177	0.49
24.0-35.9	103	0.68	103	0.90	85	0.81	85	1.00	-	-	-	-
36.0-47.9	120	0.70	120	0.99	98	0.81	98	0.91	-	-	-	-
48.0-59.9	111	0.74	111	0.84	86	0.64	86	0.97	-	-	-	-
Anthropometrists												
All	611	0.80	611	0.86	535	0.85	535	1.02	279	0.93	279	0.56
3.0-23.9	277	0.84	277	0.65	266	0.87	266	0.70	279	0.93	279	0.56
24.0-59.9	334	0.72	334	0.97	269	0.80	269	0.92	-	-	-	-
3.0-5.9	46	0.74	46	0.53	26	0.85	26	0.71	29	0.77	29	0.36

6.0-11.9	73	0.80	73	0.41	83	0.92	83	0.50	73	0.94	73	0.41
12.0-23.9	158	0.80	158	0.44	157	0.84	157	0.62	177	0.84	177	0.42
24.0-35.9	103	0.69	103	1.05	85	0.80	85	0.97	-	-	-	-
36.0-47.9	120	0.72	120	0.94	98	0.77	98	0.89	-	-	-	-
48.0-59.9	111	0.76	111	0.90	86	0.66	86	0.90	-	-	-	-
HCZ												
Expert												
All	-		460	2.87		-	473	2.45	301	0.95	214	1.64
0.0-23.9	-		178	1.88		-	217	1.79	301	0.95	214	1.64
24.0-59.9	-		282	2.15		-	256	2.27	-	-	-	-
0.0-5.9	-		32	1.30		-	17	0.88	51	0.97	12	1.61
6.0-11.9	-		39	1.54		-	56	1.52	73	0.94	37	1.48
12.0-23.9	-		107	1.95		-	144	1.76	177	0.90	165	1.51
24.0-35.9	-		86	2.26		-	83	2.06	-	-	-	-
36.0-47.9	-		95	2.11		-	93	2.28	-	-	-	-
48.0-59.9	-		101	2.10		-	80	2.31	-	-	-	-
Anthropometrists												
All	-		562	2.46		-	476	2.39	301	0.98	258	1.93
0.0-23.9	-		267	1.92		-	229	1.78	301	0.98	258	1.93
24.0-59.9	-		295	2.07		-	247	2.08	-	-	-	-
0.0-5.9	-		52	2.13		-	22	2.09	51	1.02	26	1.76
6.0-11.9	-		64	1.80		-	58	1.66	73	0.98	58	1.74
12.0-23.9	-		151	1.70		-	149	1.75	177	0.92	174	1.50
24.0-35.9	-		88	2.09		-	74	2.07	-	-	-	-
36.0-47.9	-		107	1.94		-	93	2.00	-	-	-	-
48.0-59.9	-		100	2.15		-	80	2.00	-	-	-	-
BMIZ												
Expert (Weight measured by Expert)												
All	640	0.93	632	1.60	547	1.03	543	1.55	301	1.06	286	1.46
0.0-23.9	306	0.96	299	2.00	278	1.08	274	1.78	301	1.06	286	1.46
24.0-59.9	334	0.89	333	1.12	269	0.98	269	1.16	-	-	-	-
0.0-5.9	76	1.00	69	1.86	39	1.12	39	1.73	51	0.83	51	1.64
6.0-11.9	72	1.04	73	2.04	83	1.13	83	1.74	73	1.16	70	1.32

12.0-23.9	158	0.89	157	1.87	156	1.03	152	1.60	177	0.99	165	1.37
24.0-35.9	103	0.89	103	1.22	85	0.97	85	1.08	-	-	-	-
36.0-47.9	120	0.89	119	1.08	98	0.99	98	1.17	-	-	-	-
48.0-59.9	111	0.89	111	1.06	86	0.85	86	1.02	-	-	-	-
Anthropometrists (Weight measured by Anthropometrist)												
All	641	0.95	637	1.51	548	1.05	537	1.55	301	1.06	285	1.45
0.0-23.9	307	0.99	303	1.86	279	1.11	268	1.75	301	1.06	285	1.45
24.0-59.9	334	0.91	334	1.11	269	0.97	269	1.23	-	-	-	-
0.0-5.9	76	1.10	75	1.97	39	1.14	39	1.68	51	0.85	50	1.67
6.0-11.9	73	1.01	73	1.83	83	1.20	81	1.66	73	1.15	70	1.50
12.0-23.9	158	0.91	155	1.59	157	1.04	148	1.68	177	1.01	165	1.32
24.0-35.9	103	0.95	103	1.29	85	0.95	85	1.14	-	-	-	-
36.0-47.9	120	0.88	120	1.06	98	1.00	98	1.21	-	-	-	-
48.0-59.9	111	0.90	111	0.97	86	0.86	86	1.06	-	-	-	-

[1] Body mass index (BMI) = weight, kg/height or length, m^2 by age. Z-scores calculated from the mean of 2 measurements for length, height, MUAC, HC, and BMI. Biological implausible values of Z-scores were excluded so n's vary per each measurement thus scan vs manual n's might vary. WHO (1) expects a SD of 1.0 and values larger than 1.5 SD suggests poor anthropometry quality. WHO (40) calculates MUAC starting at 3 mo of age and MUACZ limited to children 3.0-59.9 mo. Anthropometric indices computed using weight: (WHZ/WLZ, BMIZ): in the body of paper, the results reported for WHZ/WLZ, BMIZ for the expert were computed using the weight of children measured by the expert and WHZ/WLZ, BMIZ for the anthropometrists were computed using the weight of children measured by the anthropometrists

Supplementary Table 6. Inter-rater & inter-method accuracy for length or height, mid-upper arm circumference (MUAC), and head circumference (HC): Mean, standard deviation, mean absolute difference, inter-technical error measurement (inter-TEM), relative TEM and intraclass correlation coefficient (ICC) by country and 6 month age breakdown, in Guatemala, Kenya and China for 3D body imaging evaluation

Age groups (mo)	N	Mean[1] (SD) (Cm)		Mean (SD) absolute difference[2] (Cm)	Inter-TEM (95%CI) (Cm)	Relative inter-TEM (%)	ICC (95%CI)[3]
		Manual	Scan				
Length or height							
Guatemala (N=641 children)							
0.0-5.9	76	58.4 (4.7)	61.5 (5.5)	4.3 (3.6)	4.0 (3.3, 4.6)	6.7	0 (., .)
6.0-11.9	73	66.8 (4.0)	66.8 (3.5)	3.2 (2.7)	3.0 (2.2, 3.6)	4.4	0.23 (-0.01, 0.32)
12.0-23.9	158	76.4 (4.7)	73.8 (3.8)	3.8 (3.4)	3.6 (3.1, 4.1)	4.8	0 (., .)
24.0-35.9	103	83.5 (4.5)	83.4 (4.4)	2.2 (2.2)	2.2 (1.6, 2.6)	2.6	0.66 (0.63, 0.67)
36.0-47.9	120	91.0 (5.2)	90.7 (4.4)	2.0 (1.6)	1.8 (1.6, 2.1)	2.0	0.83 (0.83, 0.84)
48.0-59.9	111	97.8 (5.6)	97.7 (4.9)	1.8 (1.4)	1.6 (1.4, 1.8)	1.7	0.89 (0.89, 0.89)
Kenya (N=548 children)							
0.0-5.9	39	61.1 (4.7)	61.5 (4.7)	3.0 (2.2)	2.6 (1.8, 3.2)	4.3	0.44 (0.22, 0.50)
6.0-11.9	83	69.5 (3.2)	69.1 (5.0)	3.2 (3.8)	3.5 (1.3, 4.8)	5.0	0.15 (-0.13, 0.25)
12.0-23.9	157	79.4 (5.3)	74.4 (3.9)	5.6 (4.0)	4.9 (4.3, 5.4)	6.3	0.0 (., .)
24.0-35.9	85	87.7 (3.8)	85.9 (4.0)	2.7 (1.6)	2.2 (1.9, 2.4)	2.5	0.65 (0.62, 0.67)
36.0-47.9	98	95.7 (5.1)	94.9 (4.6)	2.7 (1.8)	2.3 (2.0, 2.6)	2.4	0.76 (0.75, 0.77)
48.0-59.9	86	102.8 (5.3)	103.0 (5.5)	2.2 (1.8)	2.0 (1.6, 2.3)	1.9	0.85 (0.85, 0.86)
China (N=301 children)							
0.0-5.9	51	61.1 (4.4)	59.2 (6.0)	3.7 (2.5)	3.1 (2.6, 3.6)	5.2	0.08 (-0.56, 0.22)
6.0-11.9	73	71.5 (3.5)	67.1 (3.5)	4.9 (2.9)	4.0 (3.4, 4.5)	5.7	0.0 (., .)
12.0-23.9	177	81.6 (4.6)	73.4 (3.5)	8.2 (3.9)	6.4 (6.0, 6.8)	8.3	0.0 (., .)
MUAC							
Guatemala (N=641 children)							
0.0-5.9	76	13.8 (1.2)	14.9 (0.7)	1.1 (1.0)	1.1 (0.8, 1.3)	7.5	0 (., .)
6.0-11.9	73	14.4 (0.9)	14.9 (0.4)	1.0 (0.6)	0.8 (0.7, 0.9)	5.6	0 (., .)
12.0-23.9	158	14.6 (0.9)	14.7 (0.4)	0.8 (0.6)	0.7 (0.6, 0.8)	4.8	0 (., .)
24.0-35.9	103	15.0 (0.9)	16.5 (1.4)	1.6 (1.2)	1.4 (1.2, 1.6)	9.0	0 (., .)
36.0-47.9	120	15.5 (0.9)	16.8 (1.3)	1.4 (0.9)	1.2 (1.1-1.3)	7.5	0.16 (-0.04, 0.25)
48.0-59.9	111	16.0 (1.1)	17.1 (1.4)	1.2 (0.9)	1.1 (0.9-1.2)	6.5	0.39 (0.29, 0.43)
Kenya (N=548 children)							
0.0-5.9	39	13.9 (1.0)	14.8 (0.7)	1.2 (0.7)	1.0 (0.8, 1.1)	6.8	0.0 (., .)

Age (months)	N	Mean manual (SD)	Mean scan (SD)	Avg abs difference (SD)	(95%CI)	%	ICC (95%CI)
6.0-11.9	83	14.4 (1.0)	15.0 (0.5)	1.0 (0. 8)	0.9 (0.7, 1.0)	6.1	0.0 (., .)
12.0-23.9	157	15.0 (1.1)	14.7 (0.6)	1.0 (0.8)	0.9 (0.7, 1.0)	6.1	0.0 (., .)
24.0-35.9	85	15.6 (1.0)	17.2 (1.3)	1.7 (1.2)	1.5 (1.3, 1.7)	9.2	0.0 (., .)
36.0-47.9	98	15.9 (1.0)	18.4 (1.4)	2.5 (1.2)	2.0 (1.8, 2.1)	11.4	0.0 (., .)
48.0-59.9	86	15.8 (0.9)	18.8 (1.5)	3.0 (1.4)	2.3 (2.1, 2.5)	13.4	0.0 (., .)
China (N=301 children)							
0.0-5.9	51	14.9 (1.1)	14.6 (0.6)	0.8 (0.6)	0.7 (0.6, 0.9)	5.1	0.0 (., .)
6.0-11.9	73	15.7 (1.2)	14.9 (0.4)	1.1 (0.9)	1.0 (0.8, 1.2)	6.7	0.0 (., .)
12.0-23.9	177	15.5 (1.0)	14.6 (0.3)	1.1 (0.9)	1.0 (0.9, 1.1)	6.4	0.0 (., .)
HC							
Guatemala (N=641 children)							
0.0-5.9	76	-	44.1 (4.2)	-	-	-	-
6.0-11.9	73	-	47.0 (3.0)	-	-	-	-
12.0-23.9	158	-	47.7 (2.8)	-	-	-	-
24.0-35.9	103	-	44.9 (3.3)	-	-	-	-
36.0-47.9	120	-	46.4 (3.2)	-	-	-	-
48.0-59.9	111	-	48.0 (3.9)	-	-	-	-
Kenya (N=548 children)							
0.0-5.9	39	-	45.1 (3.8)	-	-	-	-
6.0-11.9	83	-	48.4 (3.3)	-	-	-	-
12.0-23.9	157	-	48.9 (2.7)	-	-	-	-
24.0-35.9	85	-	45.4 (3.7)	-	-	-	-
36.0-47.9	98	-	47.6 (3.3)	-	-	-	-
48.0-59.9	86	-	49.0 (3.6)	-	-	-	-
China (N=301 children)							
0.0-5.9	51	39.8 (2.4)	45.3 (3.3)	5.7 (2.6)	4.4 (4.0, 4.8)	10.4	0.0 (., .)
6.0-11.9	73	44.3 (1.4)	48.3 (2.8)	4.3 (2.3)	3.4 (3.0, 3.8)	7.4	0.0 (., .)
12.0-23.9	177	46.3 (1.5)	47.2 (1.9)	1.9 (1.5)	1.7 (1.5, 1.9)	3.7	0.03 (-0.18, 0.13)

[1] Based on repeated manual measurement by reference anthropometrist "Expert" (mean of 2 manual measurements) vs. repeated scan measurements by team anthropometrists (mean of 2 scan measurements).   Mean manual=$\Sigma_{i=1}^{N} M_{ei}$/N and Mean scan=$\Sigma_{i=1}^{N} S_{ai}$/N where M_{ei} = Mean manual measurement value of child i (Expert), S_{ai}= Mean scan measurement value of child i (Anthropometrist) and N=sample size ;

[2] Average absolute difference = $\Sigma_{i=1}^{N} (|M_{ei} - S_{ai}|)$/N where M_{ei} = Mean manual measurement value of child i (Expert), S_{ai}= Mean scan measurement value of child i (Anthropometrist) and N=sample size.

[3] ICC (95%CI): When ICC=0.0, there is no variance and the CI cannot be calculated

Supplementary Table 7. Inter-rater & inter-method accuracy, Bland Altman bias and upper and lower limits of agreement, for length or height, mid-upper arm circumference, and head circumference by country and 6 month age breakdown in Guatemala, Kenya and China for 3D body imaging evaluation

Age group (mo)	N	Mean (SD) Absolute difference[1] (Cm)	Average Bias[2] (Cm)	Bland Altman 95% upper and lower limits of agreement	Pitman's test -p-value[3]
Length or Height					
Guatemala (N=641 children)					
0.0-5.9	76	4.3 (3.6)	3.1	-6.5, 12.6	0.000
6.0-11.9	73	3.2 (2.7)	0.1	-8.3, 8.5	0.870
12.0-23.9	158	3.8 (3.4)	-2.7	-11.4, 6.1	0.000
24.0-35.9	103	2.2 (2.2)	-0.1	-6.2, 6.0	0.890
36.0-47.9	120	2.0 (1.6)	-0.3	-5.5, 4.9	0.600
48.0-59.9	111	1.8 (1.4)	-0.1	-4.7, 4.5	0.860
Kenya (N=548 children)					
0.0-5.9	39	3.0 (2.2)	0.4	-7.1, 7.8	0.737
6.0-11.9	83	3.2 (3.8)	-0.4	-10.3, 9.4	0.500
12.0-23.9	157	5.6 (4.0)	-5.0	-14.5, 4.5	0.000
24.0-35.9	85	2.7 (1.6)	-1.8	-6.9, 3.3	0.003
36.0-47.9	98	2.7 (1.8)	-0.8	-7.1, 5.5	0.253
48.0-59.9	86	2.2 (1.8)	0.2	-5.4, 5.8	0.805
China (N=301 children)					
0.0-5.9	51	3.7 (2.5)	-2.0	-10.0, 6.1	0.06
6.0-11.9	73	4.9 (2.9)	-4.4	-11.5, 2.7	0.000
12.0-23.9	177	8.2 (3.9)	-8.2	-16.2, -0.2	0.000
Mid-upper arm circumference					
Guatemala (N=641 children)					
0.0-5.9	76	1.1 (1.0)	1.0	-1.3, 3.3	0.000
6.0-11.9	73	1.0 (0.6)	0.5	-1.6, 2.6	0.000
12.0-23.9	158	0.8 (0.6)	0.1	-1.9, 2.1	0.420
24.0-35.9	103	1.6 (1.2)	1.5	-1.3, 4.2	0.000
36.0-47.9	120	1.4 (0.9)	1.3	-0.8, 3.5	0.000
48.0-59.9	111	1.2 (0.9)	1.1	-1.0, 3.2	0.000
Kenya (N=548 children)					
0.0-5.9	39	1.2 (0.7)	0.9	-1.3, 3.1	0.000
6.0-11.9	83	1.0 (0. 8)	0.7	-1.5, 2.8	0.000
12.0-23.9	157	1.0 (0.8)	-0.3	-2.8, 2.2	0.006
24.0-35.9	85	1.7 (1.2)	1.6	-1.3, 4.4	0000

36.0-47.9	98	2.5 (1.2)	2.4	-0.2, 5.0	0.000
48.0-59.9	86	3.0 (1.4)	3.0	0.2, 5.7	0.000
China (N=301 children)					
0.0-5.9	51	0.8 (0.6)	-0.3	-2.4, 1.7	0.053
6.0-11.9	73	1.1 (0.9)	-0.8	-3.2, 1.6	0.000
12.0-23.9	177	1.1 (0.9)	-0.9	-3.0, 1.2	0.000
Head Circumference (cm)					
China (N=301 children)					
0.0-5.9	51	5.7 (2.6)	5.5	-0.4, 11.4	0.000
6.0-11.9	73	4.3 (2.3)	4.0	-1.6, 9.6	0.000
12.0-23.9	177	1.9 (1.5)	0.9	-3.6, 5.4	0.000

[1]Average absolute difference $= \Sigma_{i=1}^{N} (|M_{ei} - S_{ai}|)/N$ where $M_{ei} =$ Mean manual measurement value of child i (Expert), $S_{ai} =$ Mean scan measurement value of child i (Anthropometrist) and N = sample size.

[2] $Average\ Bias = \Sigma_{i=1}^{N} (S_{ai} - M_{ei})/N$

[3]Pitman's test to examine variance

Supplementary Table 8. Prevalence of stunting and wasting based on WHO 2006 Growth standards[1] by age for manual measurements by reference anthropometrist "Expert" and for scan measurement by team anthropometrists in Guatemala, Kenya and China for 3D body imaging evaluation

Age group (mo)	Guatemala				Kenya				China			
	Manual		Scan		Manual		Scan		Manual		Scan	
	N	%(95%CI)	N	%(95%CI)	N	%(95%CI)	N	%(95%CI)	N	%(95%CI)	N	%(95%CI)
Stunting: Length-for-age Z scores (LAZ) and/or height-for-age Z scores (HAZ) <-2												
All	639	42.6(38.7, 46.4)	639	50.6(46.6, 54.5)	547	10.2(7.8, 13.1)	545	30.1(26.3, 34.1)	301	0.3(0.1, 1.8)	300	50.7(44.9, 56.5)
0.0-23.9	306	32.7(27.5, 38.3)	305	49.5(43.8, 55.3)	278	7.6(4.7, 11.3)	276	42.0(36.1, 48.1)	301	0.3(0.0, 1.8)	300	50.7(44.9, 56.5)
24.0-59.9	333	51.7(46.1, 57.1)	334	51.5(46.0, 57.0)	269	13.0(9.2, 17.6)	269	17.8(13.5, 23.0)	-	-	-	-
0.0-5.9	76	18.4(10.5, 29.0)	75	10.7(4.7, 19.9)	39	5.1(0.6, 17.3)	39	10.3(2.9, 24.2)	51	0.0(0.0, 0.0)	51	25.5(14.3, 39.6)
6.0-11.9	72	31.9(21.4, 44.0)	73	37.0(26.0, 49.1)	83	6.0(2.0, 13.5)	82	23.2(14.6, 33.8)	73	0.0(0.0, 0.0)	73	30.1(19.9, 42.0)
12.0-23.9	158	39.9(32.2, 48.0)	157	73.9(66.3, 80.6)	156	9.0(5.0, 14.6)	155	60.0(51.8, 67.8)	177	0.6(0.0, 3.1)	176	66.5(59.0, 73.4)
24.0-35.9	103	64.1(54.0, 73.3)	103	61.2(51.1, 70.6)	85	10.6(5.0, 19.2)	85	27.1(18.0, 37.8)	-	-	-	-
36.0-47.9	119	46.2(37.0, 55.6)	120	49.2(39.9, 58.5)	98	17.4(10.4, 26.3)	98	16.3(9.6, 25.2)	-	-	-	-
48.0-59.9	111	46.0(36.5, 56.7)	111	45.1(35.6, 54.8)	86	10.5(4.9, 18.9)	86	10.5(4.9, 18.9)	-	-	-	-
Wasting: Weight-for-length Z scores (WLZ) and/or weight-for- height Z scores (WHZ) <-2 (Manual results used weight measured by Expert, Scan results used weight measured by anthropoemtrists)												
All	640	0.8(0.3, 1.8)	633	6.0(4.3, 8.2)	547	1.8(0.9, 3.3)	542	4.2(2.7, 6.3)	301	1.3(0.4, 3.4)	287	0.7(0.1, 2.5)
0.0-23.9	306	1.0(0.2, 2.8)	299	10.0(6.9, 14.0)	278	2.2(0.8, 4.6)	274	6.6(3.9, 10.2)	301	1.3(0.4, 3.4)	287	0.7(0.1, 2.5)
24.0-59.9	334	0.6(0.1, 2.2)	334	2.4(1.0, 4.7)	269	1.5(0.4, 3.8)	268	1.9(0.6, 4.3)	-	-	-	-
0.0-5.9	76	0.0(0.0, 0.0)	68	22.1(12.9, 33.8)	39	0.0(0.0, 0.0)	39	18.0(7.5, 33.5)	51	0.0(0.0, 0.0)	48	4.2(0.5, 14.3)
6.0-11.9	72	1.4(0.0, 7.5)	73	9.6(3.9, 18.8)	83	3.6(0.8, 10.2)	81	8.6(3.6, 17.0)	73	2.7(0.3, 9.6)	70	0.0(0.0, 0.0)
12.0-23.9	158	1.3(0.2, 4.5)	158	5.1(2.2, 9.7)	156	1.9(0.4, 5.5)	154	2.6(0.7, 6.5)	177	1.1(0.1, 4.0)	169	0.0(0.0, 0.0)
24.0-35.9	103	1.0(0.0, 5.3)	103	4.9(1.6, 11.0)	85	0.0(0.0, 0.0)	85	0.0(0.0, 0.0)	-	-	-	-
36.0-47.9	120	0.8(0.0, 4.6)	120	2.5(0.5, 7.1)	98	1.0(0.0, 5.6)	98	0.0(0.0, 0.0)	-	-	-	-
48.0-59.9	111	0.0(0.0, 0.0)	111	0.0(0.0, 0.0)	86	3.5(0.7, 9.9)	85	5.9(1.9, 13.2)	-	-	-	-

[1]Z-scores calculated from the mean of 2 measurements for length and height. Biological implausible values of Z-scores were excluded so n's vary.