

Characterisation and correlates of stunting in a Malaysian children aged 6-19 years

Online supplemental material

Table S1. Distribution of anthropometric indicators among the study population using the WHO 2007 and the CDC 2000 references.

	Overall	Boys	Girls	<i>P</i>
WHO				
Height-for-age				
	(80.9	(79.8	(81.9	
Normal height-for-age	5465)	2660)	2805)	
	(19.1	(20.2	(18.1	
Stunted	1294)	675)	619)	0.024
BMI-for-age				
Underweight				
	390 (5.8)	194 (5.8)	196 (5.7)	
	(63.5	(60.7	(66.2	
Normal	4291)	2023)	2268)	
	(16.6	(16.8	(16.3	
Overweight	1119)	561)	558)	
	(14.2	(16.7	(11.7	
Obese	959)	557)	402)	<0.001
Weight-for-age¹				
Low weight-for-age				
	199 (9.0)	100 (8.9)	99 (9.2)	
	(78.2	(76.0	(80.4	
Normal weight-for-age	1721)	854)	867)	
	(12.8	(15.0	(10.5	
High weight-for-age	282)	169)	113)	0.006
CDC				
Height-for-age				
	(70.8	(71.2	(70.5	
Normal height-for-age	4788)	2374)	2414)	
	(29.2	(28.8	(29.5	
Stunted	1971)	961)	1010)	0.537
BMI-for-age				
Underweight				
	646 (9.6)	323 (9.7)	323 (9.4)	
Normal	4327 (64.0	2044 (61.3	2283 (66.7	

)))	
	(12.8	(13.4	(12.3	
Overweight	867)	446)	421)	
	(13.6	(15.7	(11.6	
Obese	919)	522)	397)	<0.001
Weight-for-age				
	(17.4	(17.6	(17.3	
Low weight-for-age	1179)	586)	593)	
	(74.0	(72.2	(75.7	
Normal weight-for-age	5000)	2407)	2593)	
		(10.3		
High weight-for-age	580 (8.6)	342)	238 (7.0)	<0.001

Differences in distributions across categories between males and females were compared using Pearson's Chi squared test.

*Weight-for-age is calculated only up to and including age 10 years in the WHO 2007 growth reference (N = 2202 in this dataset).

Table S2. Clustering of height-for-age and stunting among children in the study population.

	Unadjusted intraclass correlation coefficient (95% confidence interval)			
	Household (N = 6680)		Sub-district (N = 4739)	
<u>CDC reference</u>				
Height-for-age z-score	0.39	(0.36, 0.42)	0.00	(0.00, 0.01)
Stunting	0.27	(0.23, 0.30)	0.00	(0.00, 0.01)
<u>WHO reference</u>				
Height-for-age z-score	0.39	(0.36, 0.42)	0.00	(0.00, 0.01)
Stunting	0.29	(0.25, 0.32)	0.01	(0.00, 0.02)

Table S3. Sociodemographic characteristics of population excluded from analyses versus those included.

	N	Excluded	Included	P
N (%)	6759	2968 (43.9)	3791 (56.1)	
Stunted, n (%) ¹	6759	892 (30.1)	1079 (28.5)	0.153
Sex, n (%)	6759			
Male		1465 (49.4)	1870 (49.3)	
Female		1503 (50.6)	1921 (50.7)	0.979
Age, years, mean (SD)	6759	12.7 (3.9)	12.6 (3.9)	0.457
Ethnicity, n (%)	6759			
Malay		1962 (66.1)	2586 (68.2)	
Indian		257 (8.7)	405 (10.7)	
Chinese		650 (21.9)	694 (18.3)	
Bumiputera/Orang Asli		57 (1.9)	65 (1.7)	
Other		42 (1.4)	41 (1.1)	<0.001
BMI-for-age ¹ , n (%)	6759			
Underweight		158 (5.3)	232 (6.1)	
Normal		1831 (61.7)	2460 (64.9)	
Overweight or obese		979 (33.0)	1099 (29.0)	0.001
Birth order, n (%)	5821			
1		881 (43.4)	1604 (42.3)	
2		603 (29.7)	1150 (30.3)	
3		332 (16.4)	635 (16.8)	
4 +		214 (10.5)	402 (10.6)	0.880
Maternal height (cm) category, n (%)	5038			
160 +		260 (20.9)	613 (16.2)	
155 - 159		282 (22.6)	886 (23.4)	
150 - 154		372 (29.8)	1204 (31.8)	
145-149		235 (18.9)	758 (20.0)	
< 145		98 (7.9)	330 (8.7)	0.006
Maternal current underweight, n (%)	4985	31 (2.6)	92 (2.4)	0.742
Rooms per household member, mean (SD)				
Bedrooms	5904	0.6 (0.3)	0.6 (0.3)	0.301
Bathrooms	5898	0.4 (0.2)	0.4 (0.2)	0.566
Living areas ²	5934	0.3 (0.2)	0.3 (0.2)	0.375
Type of toilet, n (%)	4945			
None, bucket or hanging latrine		5 (0.4)	10 (0.3)	
Bore hole toilet ³		44 (3.8)	110 (2.9)	
Pour flush toilet		350 (30.3)	1017 (26.8)	
Flush toilet with septic tank		472 (40.9)	1548 (40.8)	
Flush toilet connected with sewerage system		283 (24.5)	1106 (29.2)	0.007
Toilet shared with other household, n (%)	4949	7 (0.6)	17 (0.5)	0.503
Main source of drinking water, n (%)	4949			
Unprotected source ⁴		2 (0.2)	3 (0.1)	
Public standpipe or other protected source ⁵		19 (1.6)	96 (2.5)	
Piped into yard		37 (3.2)	133 (3.5)	
Piped into house		1100 (95.0)	3559 (93.9)	0.193

Table S3. Sociodemographic characteristics of population excluded from analyses versus those included.

	N	Excluded	Included	P
Main method of garbage disposal, n (%)	4875			
Buried, burned or thrown		311 (28.7)	1042 (27.5)	
Collected and thrown for recycling		42 (3.9)	250 (6.6)	
Collected irregularly by local authority		27 (2.5)	133 (3.5)	
Collected regularly by local authority		704 (64.9)	2366 (62.4)	0.002

Differences in distributions across categories between normal height and stunted were compared using Pearson's Chi squared test, or Fisher's exact test for variables with cell frequencies < 5.

¹Stunting and BMI-for-age were classified using the CDC 2000 reference. ²Living areas include dining rooms but not kitchens; ³Bore hole toilet both with or without cover; ⁴Unprotected sources: unprotected dug well, or water taken directly from pond or stream; ⁵Protected sources: protected dug well or spring, or water from bottles or tanker truck.

Table S4. Relative risk of stunting¹ associated with sociodemographic indices (compressed categories).

	Risk ratio (95% confidence interval)			<i>P</i>
Female sex (versus male)	1.10	(1.00, 1.22)		0.052
Age	1.08	(1.06, 1.09)		<0.001
Ethnicity				
Malay	1.00			
Indian	0.69	(0.54, 0.88)		0.002
Chinese	0.72	(0.59, 0.88)		0.001
Bumiputera/Orang Asli	0.97	(0.66, 1.42)		0.858
Other	0.91	(0.43, 1.91)		0.807
BMI-for-age status¹, n (%)				
Underweight	1.19	(1.02, 1.39)		0.030
Normal	1.00			
Overweight or obese	0.79	(0.68, 0.90)		0.001
Birth order				
1	1.00			
2	1.03	(0.92, 1.14)		0.651
3	0.99	(0.84, 1.16)		0.876
4 +	1.03	(0.82, 1.29)		0.819
Maternal height (cm) category				
160 +	1.00			
150 - 159	1.05	(0.87, 1.26)		0.628
< 150	1.45	(1.20, 1.75)		<0.001
Maternal current underweight (versus BMI \geq 18.5)	0.86	(0.58, 1.27)		0.440
Rooms per household member				
Bedrooms	1.08	(0.83, 1.41)		0.563
Bathrooms	0.65	(0.45, 0.94)		0.023
Living areas²	1.07	(0.68, 1.70)		0.770
Type of toilet				
None, bucket or hanging latrine	1.00			
Bore hole toilet³	0.58	(0.26, 1.31)		0.188
Pour flush toilet	0.41	(0.19, 0.89)		0.023
Flush toilet with septic tank or sewerage system	0.41	(0.19, 0.88)		0.023
Toilet shared with other household (versus not shared)	1.77	(1.09, 2.86)		0.020
Main source of drinking water				
Unprotected source⁴	1.00			
Public standpipe or other protected source⁵	0.53	(0.39, 0.73)		<0.001
Piped into yard or house	0.36	(0.32, 0.40)		<0.001
Main method of garbage disposal				

Buried, burned or thrown	1.00			
Collected and thrown for recycling	1.10	(0.87,	1.39)	0.428
Collected irregularly by local authority	1.33	(0.98,	1.80)	0.070
Collected regularly by local authority	1.23	(1.06,	1.42)	0.008

Estimates based on mixed-effects Poisson regression models adjusted for all other variables above, and for clustering at the household level.

¹Stunting and BMI-for-age were classified using the CDC 2000 reference. ²Living areas include dining rooms but not kitchens;

³Bore hole toilet both with or without cover; ⁴Unprotected sources: unprotected dug well, or water taken directly from pond or stream; ⁵Protected sources: protected dug well or spring, or water from bottles or tanker truck.

Table S5. Associations between height-for-age¹ and sociodemographic indices.

	β (95% confidence interval)			<i>P</i>
Female sex (versus male)	-0.05	(-0.12, 0.03)		0.223
Age	-0.09	(-0.10, -0.08)		<0.001
Ethnicity				
Malay	1.00			
Indian	0.32	(0.16, 0.49)		<0.001
Chinese	0.31	(0.17, 0.46)		<0.001
Bumiputera/Orang Asli	0.17	(-0.21, 0.56)		0.376
Other	0.20	(-0.21, 0.61)		0.338
BMI-for-age status¹, n (%)				
Underweight	0.03	(-0.09, 0.16)		0.599
Normal	1.00			
Overweight or obese	0.32	(0.23, 0.41)		<0.001
Birth order				
1	1.00			
2	-0.04	(-0.13, 0.04)		0.348
3	-0.03	(-0.14, 0.08)		0.617
4 +	-0.09	(-0.24, 0.06)		0.253
Maternal height (cm) category				
160 +	1.00			
155 - 159	-0.11	(-0.26, 0.05)		0.168
150 - 154	-0.19	(-0.33, -0.04)		0.011
145-149	-0.36	(-0.51, -0.20)		<0.001
< 145	-0.59	(-0.79, -0.39)		<0.001
Maternal current underweight (versus BMI \geq 18.5)	0.08	(-0.22, 0.38)		0.597
Rooms per household member				
Bedrooms	-0.02	(-0.24, 0.19)		0.834
Bathrooms	0.22	(-0.10, 0.53)		0.174
Living areas ²	0.06	(-0.31, 0.43)		0.750
Type of toilet				
None, bucket or hanging latrine	1.00			
Bore hole toilet ³	0.57	(-0.38, 1.52)		0.241
Pour flush toilet	0.89	(-0.02, 1.79)		0.055
Flush toilet with septic tank	0.93	(0.03, 1.83)		0.042
Flush toilet connected with sewerage system	0.93	(0.03, 1.83)		0.043
Toilet shared with other household (versus not shared)	-0.67	(-1.34, 0.00)		0.050
Main source of drinking water				
Unprotected source ⁴	1.00			
Public standpipe or other protected source ⁵	0.36	(-1.20, 1.92)		0.653
Piped into yard	0.88	(-0.67, 2.43)		0.267
Piped into house	0.66	(-0.87, 2.20)		0.396
Main method of garbage disposal				

Buried, burned or thrown	1.00			
Collected and thrown for recycling	0.05	(-0.16, 0.25)		0.641
Collected irregularly by local authority	-0.14	(-0.40, 0.13)		0.315
Collected regularly by local authority	-0.20	(-0.32, -0.08)		0.001

Estimates based on mixed-effects linear regression models adjusted for all other variables above, and for clustering at the household level.

¹Height-for-age and BMI-for-age were expressed using the CDC 2000 reference. ²Living areas include dining rooms but not kitchens; ³Bore hole toilet both with or without cover; ⁴Unprotected sources: unprotected dug well, or water taken directly from pond or stream; ⁵Protected sources: protected dug well or spring, or water from bottles or tanker truck.

Table S6. Exploration of interactions between sex and other variables of interest in the study population.

Variable of interest	N	P¹
Age	6680	0.075
Ethnicity	6680	0.144
BMI-for-age status	3791	0.422
Birth order	3791	0.966
Maternal height (cm) category	3791	0.121
Maternal current underweight	3791	0.473
Bedrooms per household member	3791	0.754
Bathrooms per household member	3791	0.474
Living areas per household member	3791	0.544
Type of toilet	3791	0.705
Toilet shared with other household	3791	0.624
Main source of drinking water	3791	0.318
Main method of garbage disposal	3791	0.571

Stunting and BMI-for-age were classified using the CDC reference.

¹P for likelihood ratio test comparing models with and without terms for interaction between child's sex and the variable of interest.

Models for age were additionally adjusted for ethnicity, and vice versa. Models for all other variables were additionally adjusted for age and ethnicity, and all models were adjusted for clustering at the household level.

Table S7. Sensitivity analysis: associations between stunting or height-for-age¹ and sociodemographic indices (WHO reference).

	Poisson regression			Linear regression			
	Risk ratio (95% confidence interval)		<i>P</i>	β (95% confidence interval)			<i>P</i>
Female sex (versus male)	0.94	(0.82, 1.08)	0.394	-0.03	(-0.11, 0.04)		0.385
Age	1.07	(1.05, 1.09)	<0.001	-0.09	(-0.11, -0.08)		<0.001
Ethnicity							
Malay	1.00			1.00			
Indian	0.62	(0.45, 0.85)	0.003	0.32	(0.15, 0.49)		<0.001
Chinese	0.68	(0.52, 0.90)	0.006	0.33	(0.18, 0.47)		<0.001
Bumiputera/Orang Asli	0.98	(0.55, 1.72)	0.933	0.19	(-0.19, 0.58)		0.327
Other	1.04	(0.43, 2.53)	0.932	0.21	(-0.20, 0.63)		0.311
BMI-for-age¹ status							
Underweight	1.13	(0.87, 1.46)	0.377	0.16	(0.00, 0.32)		0.047
Normal	1.00			1.00			
Overweight or obese	0.85	(0.72, 1.01)	0.060	0.31	(0.23, 0.40)		<0.001
Birth order							
1	1.00			1.00			
2	1.00	(0.87, 1.16)	0.969	-0.04	(-0.12, 0.05)		0.382
3	0.91	(0.73, 1.14)	0.407	-0.03	(-0.15, 0.08)		0.590
4 +	0.95	(0.70, 1.30)	0.761	-0.10	(-0.25, 0.05)		0.191
Maternal height (cm) category							
160 +	1.00			1.00			
155 - 159	0.90	(0.69, 1.18)	0.449	-0.10	(-0.25, 0.05)		0.203
150 - 154	0.88	(0.69, 1.12)	0.306	-0.19	(-0.33, -0.04)		0.011
145-149	1.14	(0.88, 1.46)	0.325	-0.36	(-0.51, -0.20)		<0.001
< 145	1.45	(1.09, 1.92)	0.011	-0.58	(-0.78, -0.38)		<0.001
Maternal current underweight (versus BMI \geq 18.5)	0.87	(0.48, 1.57)	0.638	0.06	(-0.24, 0.36)		0.684
Rooms per household member							
Bedrooms	0.93	(0.65, 1.34)	0.716	-0.03	(-0.25, 0.19)		0.803
Bathrooms	0.74	(0.45, 1.22)	0.238	0.24	(-0.08, 0.56)		0.138
Living areas²	1.41	(0.75, 2.63)	0.284	0.03	(-0.35, 0.41)		0.872
Type of toilet							
None, bucket or hanging latrine	1.00			1.00			
Bore hole toilet³	0.40	(0.13, 1.28)	0.124	0.48	(-0.48, 1.44)		0.325
Pour flush toilet	0.29	(0.10, 0.87)	0.026	0.82	(-0.09, 1.73)		0.078
Flush toilet with septic tank	0.30	(0.10, 0.87)	0.026	0.87	(-0.04, 1.77)		0.062
Flush toilet connected with sewerage system	0.34	(0.11, 1.00)	0.049	0.86	(-0.05, 1.77)		0.063
Toilet shared with other household (versus not shared)	2.43	(1.47, 4.02)	0.001	-0.71	(-1.38, -0.03)		0.040
Main source of drinking water							
Unprotected source⁴	1.00			1.00			
Public standpipe or other protected source⁵	0.83	(0.20, 3.52)	0.803	0.31	(-1.26, 1.89)		0.697

Piped into yard	0.41	(0.09, 1.76)	0.228	0.85	(-0.72, 2.41)	0.291
Piped into house	0.47	(0.12, 1.89)	0.286	0.63	(-0.92, 2.18)	0.424
Main method of garbage disposal						
Buried, burned or thrown	1.00			1.00		
Collected and thrown for recycling	0.95	(0.67, 1.33)	0.763	0.05	(-0.16, 0.25)	0.659
Collected irregularly by local authority	1.21	(0.78, 1.89)	0.397	-0.12	(-0.39, 0.15)	0.371
Collected regularly by local authority	1.29	(1.04, 1.59)	0.018	-0.21	(-0.34, -0.09)	0.001

Estimates based on mixed-effects Poisson regression models adjusted for all other variables above, and for clustering at the household level.

¹Stunting or height-for-age and BMI-for-age were classified using the WHO 2007 reference. ²Living areas include dining rooms but not kitchens; ³Bore hole toilet both with or without cover; ⁴Unprotected sources: unprotected dug well, or water taken directly from pond or stream; ⁵Protected sources: protected dug well or spring, or water from bottles or tanker truck.

Table S8. Sensitivity analysis: effect of consideration of maternal age on relative risk of stunting¹ associated with sociodemographic indices (N=3337).

	Maternal age excluded (main analysis)			Maternal age included			
	Risk ratio (95% confidence interval)		P	Risk ratio (95% confidence interval)		P	
Female sex (versus male)	1.07	(0.94, 1.21)	0.318	1.07	(0.94, 1.21)	0.317	
Age	1.08	(1.06, 1.10)	<0.001	1.09	(1.06, 1.11)	<0.001	
Ethnicity							
Malay	1.00			1.00			
Indian	0.65	(0.51, 0.84)	0.001	0.65	(0.50, 0.84)	0.001	
Chinese	0.62	(0.50, 0.78)	<0.001	0.62	(0.50, 0.77)	0.000	
Bumiputera/Orang Asli	0.98	(0.59, 1.64)	0.951	0.97	(0.58, 1.62)	0.917	
Other	1.01	(0.54, 1.91)	0.963	1.01	(0.54, 1.90)	0.970	
BMI-for-age¹ status							
Underweight	1.17	(0.96, 1.44)	0.123	1.18	(0.96, 1.44)	0.117	
Normal	1.00			1.00			
Overweight or obese	0.79	(0.67, 0.93)	0.005	0.79	(0.67, 0.93)	0.005	
Birth order							
1	1.00			1.00			
2	1.05	(0.89, 1.22)	0.579	1.05	(0.90, 1.23)	0.528	
3	1.03	(0.83, 1.27)	0.809	1.04	(0.84, 1.29)	0.715	
4+	1.17	(0.90, 1.53)	0.243	1.20	(0.91, 1.57)	0.190	
Maternal height (cm) category							
160 +	1.00			1.00			
155 - 159	1.00	(0.81, 1.24)	0.991	1.00	(0.81, 1.24)	0.988	
150 - 154	1.02	(0.83, 1.25)	0.861	1.02	(0.84, 1.25)	0.824	
145-149	1.45	(1.18, 1.79)	<0.001	1.47	(1.19, 1.81)	<0.001	
< 145	1.62	(1.24, 2.11)	<0.001	1.66	(1.27, 2.18)	<0.001	
Maternal current underweight (versus BMI ≥ 18.5)	0.94	(0.60, 1.47)	0.794	0.94	(0.60, 1.47)	0.790	
Rooms per household member							
Bedrooms	0.90	(0.65, 1.25)	0.533	0.93	(0.67, 1.30)	0.683	
Bathrooms	0.78	(0.49, 1.24)	0.289	0.80	(0.50, 1.27)	0.342	
Living areas²	1.46	(0.86, 2.48)	0.157	1.46	(0.86, 2.48)	0.159	
Type of toilet							
None, bucket or hanging latrine	1.00			1.00			
Bore hole toilet³	0.91	(0.28, 3.03)	0.884	0.90	(0.27, 2.97)	0.858	
Pour flush toilet	0.65	(0.21, 2.03)	0.455	0.64	(0.20, 2.01)	0.444	
Flush toilet with septic tank	0.61	(0.20, 1.92)	0.403	0.61	(0.19, 1.90)	0.392	
Flush toilet connected with sewerage system	0.76	(0.24, 2.38)	0.634	0.75	(0.24, 2.35)	0.618	
Toilet shared with other household (versus	1.69	(0.83, 3.41)	0.145	1.69	(0.84, 3.42)	0.143	

Table S8. Sensitivity analysis: effect of consideration of maternal age on relative risk of stunting¹ associated with sociodemographic indices (N=3337).

	Maternal age excluded (main analysis)			Maternal age included		
	Risk ratio (95% confidence interval)		<i>P</i>	Risk ratio (95% confidence interval)		<i>P</i>
not shared)						
Main source of drinking water						
Unprotected source ⁴	1.00			1.00		
Public standpipe or other protected source ⁵	0.45 (0.06, 3.37)		0.436	0.44 (0.06, 3.33)		0.430
Piped into yard	0.24 (0.03, 1.85)		0.172	0.24 (0.03, 1.84)		0.172
Piped into house	0.31 (0.04, 2.29)		0.253	0.31 (0.04, 2.27)		0.250
Main method of garbage disposal						
Buried, burned or thrown	1.00			1.00		
Collected and thrown for recycling	1.06 (0.84, 1.34)		0.603	1.15 (0.88, 1.51)		0.313
Collected irregularly by local authority	1.39 (1.02, 1.89)		0.036	1.39 (0.97, 2.01)		0.073
Collected regularly by local authority	1.22 (1.05, 1.41)		0.011	1.22 (1.03, 1.44)		0.020
Maternal age		N/A		0.99 (0.98, 1.01)		0.306

Estimates based on mixed-effects Poisson regression models adjusted for all other variables above, and for clustering at the household level.

¹Stunting and BMI-for-age were classified using the CDC 2000 reference. ²Living areas include dining rooms but not kitchens;

³Bore hole toilet both with or without cover; ⁴Unprotected sources: unprotected dug well, or water taken directly from pond or stream; ⁵Protected sources: protected dug well or spring, or water from bottles or tanker truck.

Table S9. Sensitivity analysis: effect of consideration of head of household's, maternal, and paternal education on risk of stunting¹ associated with sociodemographic indices.

	Head of household education (N = 3782)															
	No education (N = 3791)				3782				Maternal education (N = 3625)				Paternal education (N = 2704)			
	Risk ratio (95% confidence interval)		<i>P</i>		Risk ratio (95% confidence interval)		<i>P</i>		Risk ratio (95% confidence interval)		<i>P</i>		Risk ratio (95% confidence interval)		<i>P</i>	
Female sex (versus male)	1.10	(0.98, 1.24)	0.117		1.11	(0.98, 1.25)	0.103		1.08	(0.96, 1.22)	0.215		1.11	(0.97, 1.28)	0.138	
Age	1.08	(1.06, 1.10)	<0.001		1.07	(1.05, 1.09)	<0.001		1.08	(1.06, 1.10)	<0.001		1.07	(1.05, 1.10)	<0.001	
Ethnicity																
Malay	1.00				1.00				1.00				1.00			
Indian	0.66	(0.52, 0.84)	0.001		0.67	(0.52, 0.85)	0.001		0.67	(0.52, 0.86)	0.001		0.65	(0.50, 0.86)	0.002	
Chinese	0.68	(0.56, 0.83)	<0.001		0.69	(0.56, 0.84)	<0.001		0.67	(0.55, 0.82)	<0.001		0.66	(0.52, 0.84)	0.001	
Bumiputera/Orang Asli	0.96	(0.59, 1.56)	0.857		0.99	(0.60, 1.66)	0.984		1.03	(0.59, 1.79)	0.915		0.89	(0.41, 1.96)	0.775	
Other	0.91	(0.48, 1.70)	0.756		0.92	(0.49, 1.73)	0.802		0.93	(0.49, 1.75)	0.827		0.63	(0.26, 1.52)	0.303	
BMI-for-age¹ status																
Underweight	1.19	(0.99, 1.43)	0.068		1.18	(0.98, 1.42)	0.082		1.20	(0.99, 1.45)	0.059		1.09	(0.87, 1.37)	0.460	
Normal	1.00				1.00				1.00				1.00			
Overweight or obese	0.79	(0.67, 0.92)	0.003		0.79	(0.68, 0.92)	0.003		0.79	(0.67, 0.92)	0.003		0.78	(0.65, 0.93)	0.007	
Birth order																
1	1.00				1.00				1.00				1.00			
2	1.03	(0.89, 1.19)	0.718		1.02	(0.89, 1.18)	0.752		1.03	(0.89, 1.20)	0.689		1.04	(0.88, 1.23)	0.661	
3	0.99	(0.82, 1.21)	0.947		0.99	(0.81, 1.20)	0.893		0.99	(0.81, 1.21)	0.899		0.97	(0.77, 1.22)	0.774	
4+	1.05	(0.82, 1.34)	0.728		1.03	(0.81, 1.33)	0.795		1.04	(0.80, 1.34)	0.765		1.12	(0.85, 1.49)	0.424	
Maternal height (cm) category																
160 +	1.00				1.00				1.00				1.00			
155 - 159	1.03	(0.84, 1.27)	0.759		1.04	(0.84, 1.28)	0.718		1.07	(0.86, 1.33)	0.537		1.12	(0.89, 1.42)	0.342	
150 - 154	1.06	(0.87, 1.29)	0.580		1.07	(0.88, 1.30)	0.522		1.10	(0.90, 1.35)	0.354		1.14	(0.91, 1.43)	0.260	
145-149	1.44	(1.18, 1.76)	<0.001		1.46	(1.19, 1.79)	<0.001		1.54	(1.25, 1.90)	<0.001		1.53	(1.21, 1.94)	<0.001	
< 145	1.53	(1.20, 1.94)	0.001		1.55	(1.22, 1.97)	<0.001		1.61	(1.24, 2.08)	<0.001		1.79	(1.33, 2.40)	<0.001	
Maternal current underweight (versus BMI ≥ 18.5)	0.86	(0.56, 1.30)	0.463		0.85	(0.56, 1.29)	0.453		0.95	(0.62, 1.44)	0.801		0.80	(0.49, 1.32)	0.387	

Table S9. Sensitivity analysis: effect of consideration of head of household's, maternal, and paternal education on risk of stunting¹ associated with sociodemographic indices.

	Head of household education (N =															
	No education (N = 3791)				3782)				Maternal education (N = 3625)				Paternal education (N = 2704)			
	Risk ratio (95% confidence interval)		<i>P</i>	Risk ratio (95% confidence interval)		<i>P</i>	Risk ratio (95% confidence interval)		<i>P</i>	Risk ratio (95% confidence interval)		<i>P</i>				
Rooms per household member																
Bedrooms	1.04	(0.77, 1.40)	0.808	1.03	(0.76, 1.39)	0.832	1.07	(0.79, 1.46)	0.653	1.00	(0.69, 1.45)	0.996				
Bathrooms	0.67	(0.44, 1.04)	0.074	0.69	(0.44, 1.06)	0.090	0.68	(0.43, 1.06)	0.090	0.76	(0.45, 1.26)	0.284				
Living areas²	1.16	(0.70, 1.92)	0.553	1.20	(0.73, 1.98)	0.477	1.09	(0.65, 1.82)	0.752	1.16	(0.63, 2.11)	0.635				
Type of toilet																
None, bucket or hanging latrine	1.00			1.00			1.00			1.00						
Bore hole toilet³	0.57	(0.24, 1.36)	0.206	0.57	(0.24, 1.37)	0.209	0.55	(0.23, 1.31)	0.177	0.86	(0.26, 2.87)	0.801				
Pour flush toilet	0.41	(0.18, 0.92)	0.030	0.41	(0.18, 0.93)	0.032	0.41	(0.18, 0.93)	0.033	0.68	(0.22, 2.14)	0.511				
Flush toilet with septic tank	0.38	(0.17, 0.87)	0.021	0.39	(0.17, 0.87)	0.022	0.38	(0.17, 0.86)	0.021	0.64	(0.21, 2.02)	0.452				
Flush toilet connected with sewerage system	0.46	(0.20, 1.04)	0.062	0.46	(0.20, 1.04)	0.062	0.47	(0.21, 1.05)	0.066	0.84	(0.27, 2.64)	0.763				
Toilet shared with other household (versus not shared)	1.72	(0.88, 3.32)	0.110	1.73	(0.89, 3.35)	0.105	1.65	(0.85, 3.20)	0.140	1.70	(0.84, 3.45)	0.140				
Main source of drinking water																
Unprotected source⁴	1.00			1.00			1.00			1.00						
Public standpipe or other protected source⁵	0.52	(0.13, 2.18)	0.375	0.53	(0.13, 2.22)	0.385	0.48	(0.11, 2.05)	0.325	0.46	(0.10, 2.05)	0.308				
Piped into yard	0.25	(0.06, 1.04)	0.057	0.25	(0.06, 1.07)	0.062	0.23	(0.05, 0.98)	0.047	0.21	(0.05, 0.98)	0.047				
Piped into house	0.35	(0.09, 1.41)	0.140	0.36	(0.09, 1.44)	0.147	0.32	(0.08, 1.31)	0.113	0.32	(0.08, 1.38)	0.128				
Main method of garbage disposal																
Buried, burned or thrown	1.00			1.00			1.00			1.00						
Collected and thrown for recycling	1.06	(0.82, 1.39)	0.646	1.08	(0.83, 1.40)	0.582	1.06	(0.81, 1.38)	0.666	1.03	(0.76, 1.40)	0.851				
Collected irregularly by local authority	1.39	(1.00, 1.92)	0.047	1.37	(0.99, 1.89)	0.056	1.42	(1.03, 1.97)	0.034	1.39	(0.96, 2.00)	0.081				
Collected regularly by local authority	1.22	(1.04, 1.42)	0.014	1.22	(1.04, 1.42)	0.014	1.23	(1.04, 1.44)	0.013	1.19	(0.99, 1.43)	0.067				
Head of household/maternal/paternal education																
None				1.00			1.00			1.00						

Table S9. Sensitivity analysis: effect of consideration of head of household's, maternal, and paternal education on risk of stunting¹ associated with sociodemographic indices.

	No education (N = 3791)		Head of household education (N = 3782)				Maternal education (N = 3625)		Paternal education (N = 2704)			
	Risk ratio (95% confidence interval)	<i>P</i>	Risk ratio (95% confidence interval)		<i>P</i>	Risk ratio (95% confidence interval)		<i>P</i>	Risk ratio (95% confidence interval)		<i>P</i>	
Primary			0.52	(0.12, 2.17)	0.369	1.04	(0.70, 1.54)	0.865	1.25	(0.52, 3.00)	0.625	
Secondary			0.64	(0.16, 2.62)	0.532	1.15	(0.78, 1.70)	0.477	1.47	(0.61, 3.55)	0.387	
Tertiary/Diploma			0.67	(0.16, 2.77)	0.581	1.14	(0.69, 1.87)	0.611	1.95	(0.78, 4.89)	0.153	

Estimates based on Poisson regression models adjusted for all other variables above. Models were not adjusted for clustering at the household level in order to facilitate convergence.

¹Stunting and BMI-for-age were classified using the CDC 2000 reference. ²Living areas include dining rooms but not kitchens; ³Bore hole toilet both with or without cover; ⁴Unprotected sources: unprotected dug well, or water taken directly from pond or stream; ⁵Protected sources: protected dug well or spring, or water from bottles or tanker truck.

Table S10. Sensitivity analysis: effect of consideration of maternal and paternal height on risk of stunting¹ associated with sociodemographic indices (I).

	Maternal height (N = 3791)								Paternal height (N = 2719)							
	Excluding maternal height				Including maternal height				Excluding paternal height				Including paternal height			
	Risk ratio (95% confidence interval)			<i>P</i>	Risk ratio (95% confidence interval)			<i>P</i>	Risk ratio (95% confidence interval)			<i>P</i>	Risk ratio (95% confidence interval)			<i>P</i>
Female sex (versus male)	1.11	(1.00, 1.22)		0.049	1.10	(1.00, 1.22)		0.054	1.10	(0.98, 1.24)		0.090	1.09	(0.97, 1.22)		0.139
Age	1.07	(1.06, 1.09)		<0.001	1.08	(1.06, 1.09)		<0.001	1.07	(1.05, 1.09)		<0.001	1.07	(1.05, 1.09)		<0.001
Ethnicity																
Malay	1.00				1.00				1.00				1.00			
Indian	0.64	(0.51, 0.81)		<0.001	0.65	(0.51, 0.82)		<0.001	0.63	(0.48, 0.82)		0.001	0.64	(0.49, 0.84)		0.001
Chinese	0.66	(0.54, 0.81)		<0.001	0.67	(0.54, 0.82)		<0.001	0.62	(0.48, 0.79)		<0.001	0.62	(0.48, 0.79)		<0.001
Bumiputera/Orang Asli	1.06	(0.71, 1.58)		0.782	0.97	(0.66, 1.43)		0.886	0.72	(0.39, 1.34)		0.301	0.68	(0.37, 1.23)		0.203
Other	0.90	(0.41, 1.96)		0.793	0.90	(0.43, 1.91)		0.792	0.64	(0.26, 1.54)		0.320	0.63	(0.26, 1.53)		0.309
BMI-for-age¹ status																
Underweight	1.19	(1.02, 1.40)		0.028	1.19	(1.02, 1.39)		0.029	1.09	(0.90, 1.33)		0.369	1.10	(0.91, 1.33)		0.343
Normal	1.00				1.00				1.00				1.00			
Overweight or obese	0.78	(0.68, 0.90)		<0.001	0.78	(0.68, 0.90)		0.001	0.80	(0.69, 0.94)		0.008	0.80	(0.69, 0.94)		0.007
Birth order																
1	1.00				1.00				1.00				1.00			
2	1.01	(0.91, 1.13)		0.790	1.03	(0.92, 1.14)		0.649	1.03	(0.91, 1.16)		0.660	1.03	(0.91, 1.17)		0.620
3	0.97	(0.82, 1.14)		0.714	0.99	(0.84, 1.16)		0.867	1.00	(0.83, 1.20)		0.978	1.01	(0.84, 1.22)		0.900
4+	1.01	(0.80, 1.26)		0.956	1.03	(0.82, 1.29)		0.809	1.06	(0.83, 1.36)		0.628	1.07	(0.83, 1.37)		0.596
Maternal or paternal height		N/A			0.98	(0.97, 0.99)		<0.001		N/A			0.98	(0.97, 0.99)		<0.001
Maternal current underweight (versus BMI ≥ 18.5)	0.85	(0.56, 1.28)		0.436	0.86	(0.57, 1.30)		0.484	0.80	(0.48, 1.34)		0.399	0.82	(0.50, 1.35)		0.435
Rooms per household member																
Bedrooms	1.08	(0.82, 1.41)		0.599	1.04	(0.80, 1.36)		0.779	1.01	(0.72, 1.43)		0.949	1.00	(0.72, 1.40)		0.988
Bathrooms	0.68	(0.47, 1.00)		0.051	0.68	(0.47, 0.99)		0.042	0.73	(0.46, 1.16)		0.188	0.75	(0.48, 1.17)		0.208
Living areas²	1.08	(0.67, 1.72)		0.759	1.16	(0.73, 1.85)		0.530	1.13	(0.64, 1.98)		0.669	1.03	(0.59, 1.81)		0.912

Table S10. Sensitivity analysis: effect of consideration of maternal and paternal height on risk of stunting¹ associated with sociodemographic indices (I).

	Maternal height (N = 3791)								Paternal height (N = 2719)							
	Excluding maternal height				Including maternal height				Excluding paternal height				Including paternal height			
	Risk ratio (95% confidence interval)			P	Risk ratio (95% confidence interval)			P	Risk ratio (95% confidence interval)			P	Risk ratio (95% confidence interval)			P
Type of toilet																
None, bucket or hanging latrine	1.00				1.00				1.00				1.00			
Bore hole toilet ³	0.55	(0.26,	1.15)	0.112	0.56	(0.25,	1.22)	0.146	0.82	(0.47,	1.42)	0.478	0.82	(0.48,	1.41)	0.474
Pour flush toilet	0.41	(0.20,	0.81)	0.011	0.40	(0.19,	0.85)	0.017	0.68	(0.45,	1.04)	0.074	0.70	(0.46,	1.05)	0.087
Flush toilet with septic tank	0.38	(0.19,	0.76)	0.006	0.39	(0.18,	0.81)	0.012	0.62	(0.41,	0.94)	0.025	0.65	(0.43,	0.98)	0.038
Flush toilet connected with sewerage system	0.45	(0.22,	0.89)	0.023	0.46	(0.22,	0.96)	0.040	0.83	(0.54,	1.26)	0.376	0.87	(0.57,	1.33)	0.520
Toilet shared with other household (versus not shared)	1.86	(1.15,	2.98)	0.011	1.75	(1.09,	2.80)	0.020	1.92	(1.14,	3.22)	0.014	1.96	(1.19,	3.22)	0.008
Main source of drinking water																
Unprotected source ⁴	1.00				1.00				1.00				1.00			
Public standpipe or other protected source ⁵	0.47	(0.32,	0.67)	<0.001	0.56	(0.40,	0.78)	0.001	0.52	(0.32,	0.84)	0.008	0.59	(0.37,	0.94)	0.026
Piped into yard	0.23	(0.14,	0.37)	<0.001	0.27	(0.17,	0.43)	<0.001	0.24	(0.14,	0.43)	<0.001	0.26	(0.15,	0.44)	<0.001
Piped into house	0.32	(0.26,	0.40)	<0.001	0.38	(0.32,	0.43)	<0.001	0.37	(0.27,	0.51)	<0.001	0.40	(0.29,	0.55)	<0.001
Main method of garbage disposal																
Buried, burned or thrown	1.00				1.00				1.00				1.00			
Collected and thrown for recycling	1.06	(0.84,	1.35)	0.608	1.05	(0.83,	1.32)	0.688	1.03	(0.78,	1.37)	0.825	1.00	(0.75,	1.33)	0.990
Collected irregularly by local authority	1.37	(1.02,	1.84)	0.039	1.38	(1.01,	1.87)	0.042	1.50	(1.07,	2.10)	0.020	1.39	(1.01,	1.92)	0.044
Collected regularly by local authority	1.20	(1.03,	1.40)	0.018	1.23	(1.06,	1.43)	0.007	1.21	(1.01,	1.45)	0.038	1.22	(1.02,	1.46)	0.026

Estimates based on mixed-effects Poisson regression models adjusted for all other variables above, and for clustering at the household level.

¹Stunting and BMI-for-age were classified using the CDC 2000 reference. ²Living areas include dining rooms but not kitchens; ³Bore hole toilet both with or without cover; ⁴Unprotected sources: unprotected dug well, or water taken directly from pond or stream; ⁵Protected sources: protected dug well or spring, or water from bottles or tanker truck.

Table S11. Sensitivity analysis: effect of consideration of maternal and paternal height on risk of stunting¹ associated with sociodemographic indices (II).

	Maternal height (N = 3791)		Maternal height (N = 2719)		Paternal height (N = 2719)		Maternal + paternal height (N = 2719)	
	Risk ratio (95% confidence interval)	<i>P</i>	Risk ratio (95% confidence interval)	<i>P</i>	Risk ratio (95% confidence interval)	<i>P</i>	Risk ratio (95% confidence interval)	<i>P</i>
Female sex (versus male)	1.10 (1.00, 1.22)	0.054	1.10 (0.95, 1.26)	0.195	1.09 (0.95, 1.25)	0.226	1.09 (0.95, 1.25)	0.240
		<0.00		<0.00		<0.00		
Age	1.08 (1.06, 1.09)	1	1.07 (1.05, 1.10)	1	1.07 (1.05, 1.09)	1	1.07 (1.05, 1.09)	<0.001
Ethnicity								
Malay	1.00	<0.00	1.00		1.00		1.00	
Indian	0.65 (0.51, 0.82)	1	0.62 (0.47, 0.81)	0.001	0.64 (0.49, 0.85)	0.002	0.64 (0.48, 0.83)	0.001
		<0.00		<0.00		<0.00		
Chinese	0.67 (0.54, 0.82)	1	0.61 (0.48, 0.77)	1	0.62 (0.49, 0.78)	1	0.61 (0.48, 0.78)	<0.001
Bumiputera/Orang Asli	0.97 (0.66, 1.43)	0.886	0.67 (0.32, 1.41)	0.291	0.68 (0.32, 1.42)	0.304	0.65 (0.31, 1.37)	0.255
Other	0.90 (0.43, 1.91)	0.792	0.62 (0.26, 1.51)	0.292	0.63 (0.26, 1.54)	0.311	0.62 (0.26, 1.51)	0.293
BMI-for-age¹ status								
Underweight	1.19 (1.02, 1.39)	0.029	1.09 (0.87, 1.37)	0.431	1.10 (0.88, 1.37)	0.421	1.10 (0.88, 1.38)	0.415
Normal	1.00		1.00		1.00		1.00	
Overweight or obese	0.78 (0.68, 0.90)	0.001	0.80 (0.67, 0.96)	0.014	0.80 (0.67, 0.96)	0.016	0.80 (0.67, 0.96)	0.015
Birth order								
1	1.00		1.00		1.00		1.00	
2	1.03 (0.92, 1.14)	0.649	1.04 (0.88, 1.23)	0.649	1.03 (0.87, 1.22)	0.715	1.04 (0.88, 1.23)	0.643
3	0.99 (0.84, 1.16)	0.867	1.02 (0.81, 1.28)	0.861	1.01 (0.81, 1.27)	0.918	1.03 (0.82, 1.29)	0.818
4+	1.03 (0.82, 1.29)	0.809	1.10 (0.83, 1.45)	0.518	1.07 (0.81, 1.41)	0.640	1.09 (0.83, 1.45)	0.532
		<0.00		<0.00				
Maternal height	0.98 (0.97, 0.99)	1	0.98 (0.97, 0.99)	1	N/A		0.98 (0.97, 0.99)	0.002
						<0.00		
Paternal height	N/A		N/A		0.98 (0.97, 0.99)	1	0.98 (0.97, 0.99)	0.001

Table S11. Sensitivity analysis: effect of consideration of maternal and paternal height on risk of stunting¹ associated with sociodemographic indices (II).

	Maternal height (N = 3791)				Maternal height (N = 2719)				Paternal height (N = 2719)				Maternal + paternal height (N = 2719)			
	Risk ratio (95% confidence interval)			<i>P</i>	Risk ratio (95% confidence interval)			<i>P</i>	Risk ratio (95% confidence interval)			<i>P</i>	Risk ratio (95% confidence interval)			<i>P</i>
Maternal current underweight (versus BMI ≥ 18.5)	0.86	(0.57, 1.30)		0.484	0.80	(0.47, 1.37)		0.421	0.82	(0.48, 1.40)		0.472	0.82	(0.48, 1.40)		0.465
Rooms per household member																
Bedrooms	1.04	(0.80, 1.36)		0.779	0.96	(0.66, 1.39)		0.825	1.00	(0.69, 1.45)		0.989	0.96	(0.67, 1.39)		0.845
Bathrooms	0.68	(0.47, 0.99)		0.042	0.74	(0.45, 1.23)		0.250	0.75	(0.45, 1.25)		0.269	0.75	(0.45, 1.25)		0.269
Living areas²	1.16	(0.73, 1.85)		0.530	1.22	(0.67, 2.21)		0.513	1.03	(0.57, 1.88)		0.917	1.12	(0.62, 2.03)		0.713
Type of toilet																
None, bucket or hanging latrine	1.00				1.00				1.00				1.00			
Bore hole toilet³	0.56	(0.25, 1.22)		0.146	0.85	(0.25, 2.86)		0.796	0.82	(0.24, 2.74)		0.747	0.84	(0.25, 2.82)		0.781
Pour flush toilet	0.40	(0.19, 0.85)		0.017	0.68	(0.22, 2.13)		0.506	0.70	(0.22, 2.19)		0.535	0.69	(0.22, 2.16)		0.522
Flush toilet with septic tank	0.39	(0.18, 0.81)		0.012	0.64	(0.20, 2.01)		0.447	0.65	(0.21, 2.03)		0.458	0.66	(0.21, 2.06)		0.471
Flush toilet connected with sewerage system	0.46	(0.22, 0.96)		0.040	0.87	(0.28, 2.73)		0.808	0.87	(0.28, 2.74)		0.814	0.89	(0.28, 2.81)		0.844
Toilet shared with other household (versus not shared)	1.75	(1.09, 2.80)		0.020	1.75	(0.87, 3.55)		0.118	1.96	(0.97, 3.96)		0.061	1.83	(0.90, 3.69)		0.094
Main source of drinking water																
Unprotected source⁴	1.00				1.00				1.00				1.00			
Public standpipe or other protected source⁵	0.56	(0.40, 0.78)		0.001	0.55	(0.07, 4.11)		0.557	0.59	(0.08, 4.41)		0.604	0.59	(0.08, 4.44)		0.608
Piped into yard	0.27	(0.17, 0.43)		1	0.25	(0.03, 1.88)		0.177	0.26	(0.03, 1.95)		0.189	0.26	(0.03, 1.95)		0.189
Piped into house	0.38	(0.32, 0.43)		1	0.37	(0.05, 2.71)		0.328	0.40	(0.05, 2.92)		0.366	0.39	(0.05, 2.88)		0.359
Main method of garbage disposal																

Table S11. Sensitivity analysis: effect of consideration of maternal and paternal height on risk of stunting¹ associated with sociodemographic indices (II).

	Maternal height (N = 3791)				Maternal height (N = 2719)				Paternal height (N = 2719)				Maternal + paternal height (N = 2719)			
	Risk ratio (95% confidence interval)			<i>P</i>	Risk ratio (95% confidence interval)			<i>P</i>	Risk ratio (95% confidence interval)			<i>P</i>	Risk ratio (95% confidence interval)			<i>P</i>
Buried, burned or thrown	1.00				1.00				1.00				1.00			
Collected and thrown for recycling	1.05	(0.83,	1.32)	0.688	1.00	(0.73,	1.36)	0.990	1.00	(0.73,	1.36)	0.991	0.98	(0.72,	1.34)	0.905
Collected irregularly by local authority	1.38	(1.01,	1.87)	0.042	1.48	(1.02,	2.16)	0.040	1.39	(0.96,	2.03)	0.084	1.40	(0.96,	2.05)	0.077
Collected regularly by local authority	1.23	(1.06,	1.43)	0.007	1.23	(1.03,	1.48)	0.024	1.22	(1.02,	1.47)	0.029	1.24	(1.03,	1.48)	0.022

Estimates based on mixed-effects Poisson regression models adjusted for all other variables above, and for clustering at the household level.

¹Stunting and BMI-for-age were classified using the CDC 2000 reference. ²Living areas include dining rooms but not kitchens; ³Bore hole toilet both with or without cover; ⁴Unprotected sources: unprotected dug well, or water taken directly from pond or stream; ⁵Protected sources: protected dug well or spring, or water from bottles or tanker truck.

Table S12. Sensitivity analysis: relative risk of stunting¹ associated with sociodemographic indices and theoretically uncorrelated variables (N = 3434).

	Risk ratio (95% confidence interval)			<i>P</i>
Orthogonal variables				
Maternal heart rate	1.00	(0.99, 1.01)		0.888
Maternal diastolic blood pressure	1.00	(1.00, 1.01)		0.547
Household Streamyx internet	1.02	(0.86, 1.20)		0.860
Motorcycles per household member	1.15	(0.84, 1.59)		0.380
Female sex (versus male)	1.11	(1.00, 1.23)		0.046
Age	1.08	(1.06, 1.10)		<0.001
Ethnicity				
Malay	1.00			
Indian	0.68	(0.53, 0.87)		0.003
Chinese	0.65	(0.52, 0.81)		<0.001
Bumiputera/Orang Asli	0.93	(0.61, 1.43)		0.741
Other	0.96	(0.42, 2.17)		0.913
BMI-for-age¹ status				
Underweight	1.19	(1.01, 1.41)		0.036
Normal	1.00			
Overweight or obese	0.81	(0.70, 0.93)		0.003
Birth order				
1	1.00			
2	1.02	(0.91, 1.15)		0.720
3	1.01	(0.85, 1.21)		0.868
4 +	1.11	(0.88, 1.41)		0.378
Maternal height (cm) category				
160 +	1.00			
155 - 159	1.02	(0.82, 1.28)		0.834
150 - 154	1.07	(0.87, 1.32)		0.533
145-149	1.45	(1.17, 1.79)		0.001
< 145	1.47	(1.15, 1.88)		0.002
Maternal current underweight (versus BMI ≥ 18.5)	0.89	(0.59, 1.34)		0.575
Rooms per household member				
Bedrooms	1.11	(0.85, 1.46)		0.432
Bathrooms	0.62	(0.42, 0.92)		0.017
Living areas ²	1.07	(0.66, 1.74)		0.795
Type of toilet				
None, bucket or hanging latrine	1.00			
Bore hole toilet ³	0.58	(0.24, 1.40)		0.226
Pour flush toilet	0.39	(0.17, 0.91)		0.030
Flush toilet with septic tank	0.37	(0.16, 0.85)		0.020
Flush toilet connected with sewerage system	0.46	(0.20, 1.07)		0.073

Toilet shared with other household (versus not shared)	1.33	(0.78, 2.28)	0.289
Main source of drinking water			
Unprotected source ⁴	1.00		
Public standpipe or other protected source ⁵	0.47	(0.33, 0.66)	<0.001
Piped into yard	0.21	(0.13, 0.36)	<0.001
Piped into house	0.35	(0.29, 0.41)	<0.001
Main method of garbage disposal			
Buried, burned or thrown	1.00		
Collected and thrown for recycling	1.01	(0.80, 1.29)	0.904
Collected irregularly by local authority	1.39	(1.02, 1.89)	0.035
Collected regularly by local authority	1.19	(1.02, 1.39)	0.029

Estimates based on mixed-effects Poisson regression models adjusted for all other variables above, and for clustering at the household level.

¹Stunting and BMI-for-age were classified using the CDC 2000 reference. ²Living areas include dining rooms but not kitchens;

³Bore hole toilet both with or without cover; ⁴Unprotected sources: unprotected dug well, or water taken directly from pond or stream; ⁵Protected sources: protected dug well or spring, or water from bottles or tanker truck.

Table S13. Crude prevalence of stunting across categories of number of risk factors.

	Overall		Normal height		Stunted ¹		<i>P</i>
Number of risk factors²							
0	1003	(26.5)	784	(78.2)	219	(21.8)	
1	2275	(60.0)	1610	(70.8)	665	(29.2)	
2	479	(12.6)	301	(62.8)	178	(37.2)	
3	34	(0.9)	17	(50.0)	17	(50.0)	<0.001

Differences between categories by stunting status were compared using Pearson's Chi squared test.

¹Stunting and BMI-for-age were classified using the CDC 2000 reference. ²Risk factors include any of the following: Malay ethnicity, child underweight, maternal height less than 145 cm, living in a household with unprotected drinking water source (unprotected dug well, or water taken directly from pond or stream), living in household with no bucket or

hanging latrine, and living in a household with a shared toilet.

Table S14. Relative risk of stunting¹ associated with co-occurring risk factors.

	Risk ratio (95% confidence interval)		<i>P</i>
Number of risk factors²			
0	1.00		
1	1.43	(1.22, 1.69)	<0.001
2	1.84	(1.50, 2.27)	<0.001
3	2.48	(1.51, 4.09)	<0.001
Female sex (versus male)	1.12	(0.99, 1.26)	0.074
Age	1.08	(1.06, 1.09)	0.000
Birth order			
1	1.00		
2	1.02	(0.88, 1.18)	0.774
3	0.97	(0.80, 1.18)	0.753
4+	0.99	(0.77, 1.26)	0.906
Maternal current underweight (versus BMI \geq 18.5)	0.87	(0.57, 1.31)	0.501
Rooms per household member			
Bedrooms	1.12	(0.84, 1.49)	0.452
Bathrooms	0.66	(0.43, 1.01)	0.055
Living areas³	1.00	(0.61, 1.65)	0.994
Main method of garbage disposal			
Buried, burned or thrown	1.00		
Collected and thrown for recycling	1.03	(0.80, 1.34)	0.800
Collected irregularly by local authority	1.24	(0.90, 1.71)	0.180
Collected regularly by local authority	1.13	(0.98, 1.31)	0.087

Estimates based on mixed-effects Poisson regression models adjusted for all other variables above, and for clustering at the household level.

¹Stunting and BMI-for-age were classified using the CDC 2000 reference. ²Risk factors include any of the following: Malay ethnicity, child underweight, maternal height less than 145 cm, living in a household with unprotected drinking water source (unprotected dug well, or water taken directly from pond or stream), living in household with no bucket or hanging latrine, and living in a household with a shared toilet. ³Living areas include dining rooms but not kitchens.

P for likelihood ratio test comparing this model with an identical model including number of risk factors as a continuous covariate: 0.704. In the continuous model, the linear increase in risk of stunting with each additional risk factor was 1.35 (95% confidence interval: 1.23, 1.49, *P* < 0.001).