

Supplementary materials

Table s1: Summary of level-1 residuals (cm) from unadjusted mixed effects cubic models, by ethnicity and sex group

Age	Ethnicity	Level-1 residuals (observed-estimated*, in cm)					
		Boys			Girls		
		n [†]	Mean	SD	n	Mean	SD
3y visits	White	5,770	0.07	1.04	5,643	-0.09	1.25
	South Asian	552	0.01	0.99	513	-0.13	1.32
	Black African/Caribbean	191	0.02	1.09	157	-0.12	1.48
5y visits	White	6,084	-0.25	1.11	5,813	0.25	1.27
	South Asian	559	-0.04	1.06	540	0.43	1.30
	Black African/Caribbean	206	-0.12	1.06	186	0.47	1.39
7y visits	White	5,542	0.29	0.92	5,383	-0.21	1.14
	South Asian	491	0.07	1.03	495	-0.44	1.24
	Black African/Caribbean	189	0.16	0.92	164	-0.61	1.45
11y visits	White	5,207	-0.14	1.35	5,115	0.03	2.15
	South Asian	523	-0.05	1.52	504	0.13	2.31
	Black African/Caribbean	178	-0.08	1.37	160	0.25	2.31
14y visits	White	4,408	0.05	0.87	4,397	0.01	1.50
	South Asian	474	0.02	0.88	475	-0.03	1.65
	Black African/Caribbean	147	0.03	0.87	139	-0.08	1.50

*Height was predicted based on subject-specific growth trajectories.

[†] Number of observations available.

Table S2: Estimated differences in mean height (cm) (95% CI) between each ethnic minority group and White group, by age and sex from mixed effects cubic models ($n=15\ 239$ singletons)

	Age	Model 1	Model 2	Model 3	Model 4	Model 5	Sensitivity Analysis*
South Asian vs. White							
Boys	3y	0.5(0.2, 0.9)	0.6(0.2, 0.9)	1.3(1.0, 1.6)	1.3(1.0, 1.7)	1.4(1.1, 1.7)	2.2(1.9, 2.5)
	5y	0.4(0.0, 0.7)	0.4(0.1, 0.8)	1.2(0.8, 1.5)	1.2(0.9, 1.5)	1.3(0.9, 1.6)	2.0(1.7, 2.4)
	7y	0.4(0.0, 0.8)	0.4(0.0, 0.9)	1.2(0.8, 1.6)	1.2(0.8, 1.6)	1.3(0.9, 1.7)	2.1(1.7, 2.5)
	9y	0.5(0.0, 1.0)	0.5(0.0, 1.0)	1.3(0.8, 1.8)	1.3(0.8, 1.8)	1.4(0.9, 1.9)	2.2(1.7, 2.6)
	11y	0.5(-0.1, 1.0)	0.5(-0.1, 1.0)	1.2(0.7, 1.8)	1.3(0.7, 1.8)	1.3(0.8, 1.9)	2.1(1.6, 2.6)
	14y	-0.5(-1.2, 0.2)	-0.5(-1.2, 0.2)	0.2(-0.4, 0.9)	0.3(-0.4, 1.0)	0.3(-0.3, 1.0)	1.2(0.5, 1.8)
	Girls	3y	0.5(0.2, 0.9)	0.5(0.2, 0.9)	1.3(0.9, 1.6)	1.3(1.0, 1.7)	1.5(1.1, 1.9)
5y		-0.1(-0.5, 0.2)	-0.2(-0.5, 0.2)	0.6(0.3, 1.0)	0.6(0.3, 1.0)	0.8(0.5, 1.2)	1.7(1.4, 2.1)
7y		-0.1(-0.6, 0.3)	-0.2(-0.6, 0.3)	0.6(0.2, 1.0)	0.6(0.2, 1.1)	0.8(0.4, 1.3)	1.7(1.3, 2.1)
9y		-0.2(-0.7, 0.4)	-0.2(-0.7, 0.3)	0.6(0.1, 1.1)	0.6(0.1, 1.1)	0.8(0.3, 1.3)	1.7(1.2, 2.2)
11y		-0.7(-1.2, -0.1)	-0.7(-1.3, -0.1)	0.1(-0.5, 0.7)	0.1(-0.5, 0.7)	0.3(-0.3, 0.9)	1.2(0.6, 1.7)
14y		-3.2(-3.7, -2.7)	-3.2(-3.8, -2.7)	-2.5(-3.0, -1.9)	-2.4(-3.0, -1.9)	-2.3(-2.8, -1.7)	-1.4(-1.9, -0.9)
Black African/Caribbean vs. White							
Boys	3y	2.2(1.7, 2.7)	2.1(1.6, 2.6)	2.4(1.9, 2.9)	2.5(2.0, 2.9)	2.5(2.0, 3.0)	2.4(1.9, 2.8)
	5y	3.0(2.4, 3.6)	2.9(2.4, 3.5)	3.2(2.7, 3.8)	3.3(2.7, 3.8)	3.3(2.8, 3.9)	3.2(2.7, 3.7)
	7y	3.6(2.9, 4.2)	3.5(2.8, 4.1)	3.8(3.2, 4.4)	3.8(3.2, 4.5)	3.9(3.2, 4.5)	3.8(3.2, 4.4)
	9y	3.8(3.0, 4.5)	3.7(2.9, 4.4)	4.0(3.3, 4.7)	4.0(3.3, 4.8)	4.1(3.4, 4.8)	4.0(3.3, 4.7)
	11y	3.6(2.7, 4.5)	3.5(2.7, 4.4)	3.9(3.0, 4.7)	3.9(3.0, 4.7)	4.0(3.1, 4.8)	3.8(3.0, 4.6)
	14y	2.8(1.7, 3.9)	2.8(1.6, 3.9)	3.1(2.0, 4.2)	3.1(2.0, 4.2)	3.2(2.1, 4.3)	3.1(2.0, 4.1)
	Girls	3y	3.2(2.6, 3.8)	3.1(2.5, 3.7)	3.4(2.9, 4.0)	3.5(2.9, 4.0)	3.7(3.1, 4.2)
5y		3.5(2.9, 4.1)	3.4(2.8, 3.9)	3.7(3.2, 4.3)	3.8(3.2, 4.3)	4.0(3.4, 4.5)	3.7(3.2, 4.2)
7y		4.4(3.7, 5.1)	4.3(3.6, 5.0)	4.7(4.0, 5.4)	4.7(4.0, 5.4)	4.9(4.2, 5.6)	4.7(4.0, 5.3)
9y		5.3(4.4, 6.2)	5.2(4.3, 6.0)	5.5(4.7, 6.4)	5.5(4.7, 6.4)	5.7(4.9, 6.6)	5.5(4.7, 6.3)
11y		5.3(4.3, 6.3)	5.2(4.2, 6.2)	5.5(4.6, 6.5)	5.6(4.6, 6.5)	5.8(4.8, 6.7)	5.5(4.6, 6.4)
14y		2.3(1.4, 3.2)	2.2(1.3, 3.1)	2.5(1.6, 3.4)	2.6(1.7, 3.4)	2.8(1.9, 3.6)	2.6(1.8, 3.4)

Values are conditional means, estimated with covariates held constant (i.e. at mean values for continuous variables and reference levels for categorical variables).

Model 1: unadjusted model included ethnicity, age terms and interactions between ethnicity and age terms.

Model 2: model 1 + prenatal factors (maternal age, smoking during pregnancy, birth order).

Model 3: model 2 + birthweight.

Model 4: model 3 + infant feeding (breast feeding, early introduction to solid foods).

Model 5: model 4 + family SEC (maternal education, family income).

* adjusted as for model 5, plus mid-parental height (sample size $n=15\ 214$ singletons)

Appendix A: Pubertal measures

Table S3: Estimated ethnic differences in height with and without adjustment for puberty measures

	Boys			Girls		
	(1) Unadjusted (n=7,815)	(2) + voice change (n=6,108)	(3) + PDS (n=4,783)	(1) Unadjusted (n=7,424)	(2) + menarcheal age (n=4,513)	(3) + PDS (n=4,774)
SA-White						
3	0.5(0.2, 0.9)	0.6(0.2, 1.0)	0.6(0.2, 1.0)	0.5(0.2, 0.9)	0.4(0.0, 0.8)	0.5(0.1, 0.9)
5	0.4(0.0, 0.7)	0.5(0.1, 0.9)	0.4(0.0, 0.9)	-0.1(-0.5, 0.2)	-0.3(-0.8, 0.1)	-0.3(-0.7, 0.1)
7	0.4(0.0, 0.8)	0.5(0.1, 1.0)	0.5(0.0, 1.0)	-0.1(-0.6, 0.3)	-0.4(-0.9, 0.1)	-0.4(-0.9, 0.1)
9	0.5(0.0, 1.0)	0.6(0.1, 1.2)	0.5(-0.1, 1.1)	-0.2(-0.7, 0.4)	-0.5(-1.1, 0.1)	-0.4(-1.0, 0.2)
11	0.5(-0.1, 1.0)	0.6(0.0, 1.2)	0.5(-0.2, 1.1)	-0.7(-1.2, -0.1)	-1.0(-1.7, -0.4)	-0.9(-1.5, -0.2)
14	-0.5(-1.2, 0.2)	-0.4(-1.2, 0.3)	-0.5(-1.3, 0.3)	-3.2(-3.7, -2.7)	-3.5(-4.1, -2.9)	-3.3(-3.9, -2.7)
Black-White						
3	2.2(1.7, 2.7)	2.2(1.6, 2.8)	2.2(1.6, 2.9)	3.2(2.6, 3.8)	3.5(2.8, 4.3)	3.3(2.6, 4.1)
5	3.0(2.4, 3.6)	3.0(2.3, 3.6)	3.0(2.3, 3.7)	3.5(2.9, 4.1)	3.6(2.9, 4.3)	3.4(2.7, 4.2)
7	3.6(2.9, 4.2)	3.5(2.8, 4.3)	3.5(2.6, 4.4)	4.4(3.7, 5.1)	4.6(3.7, 5.4)	4.5(3.6, 5.4)
9	3.8(3.0, 4.5)	3.7(2.9, 4.6)	3.7(2.7, 4.7)	5.3(4.4, 6.2)	5.5(4.4, 6.5)	5.5(4.5, 6.5)
11	3.6(2.7, 4.5)	3.6(2.6, 4.6)	3.6(2.5, 4.7)	5.3(4.3, 6.3)	5.5(4.3, 6.7)	5.6(4.5, 6.8)
14	2.8(1.7, 3.9)	2.9(1.7, 4.1)	2.8(1.5, 4.2)	2.3(1.4, 3.2)	2.5(1.5, 3.6)	2.5(1.5, 3.5)

*n indicates the number of children included in the model. (1) Is the unadjusted model as presented in the paper; (2) adjusted for voice change (in boys) or menarcheal age (in girls); (3) adjusted for PDS score at 14 years.

Pubertal measures available in the Millennium Cohort Study: At 11 years, parents were asked to rate their child's pubertal development ('has definitely not started', 'has barely started' or 'has definitely started'). At 14-year, children were asked to rate their own pubertal development ('has definitely not started', 'has barely started', 'has definitely started', or 'seems to have completed'). There were five gender-specific questions on: growth spurt, body hair, skin changes, voice change and facial hair in boys; growth spurt, breast development, body hair, skin changes, and menarche (yes/no) in girls.

Voice change: is classified as 'has not started', 'has barely started' or 'has definitely started'. Parental report on the stage of voice change at 11 years was used. If it was missing or not available and child's self-report was 'has not started' at 14-year visits, voice change at 11 years was treated as 'has not started'.

Menarcheal age: was recorded in years if girls were reported to have started to menstruate. Menarcheal age reported by parents at 11-year visits was used. If this was missing or not applicable, self-reported menarcheal age at 14-year visits was used. This variable was used as a continuous variable in the model.

PDS (pubertal development scores): Peterson PDS score was derived based on the methods provided in Petersen AC *et al* [*J Youth Adolesc.* 1988;17(2):117-133]. The following scoring system was used to assign scores to response options for puberty measures - has not started (score 1), has barely started (score 2), has definitely started (score 3). For onset of menarche, it was score 1 for

'no' and 4 for 'yes'. The PDS score was calculated as mean score of all five puberty measures. Individuals who had item non-response for three or more puberty measures were excluded.