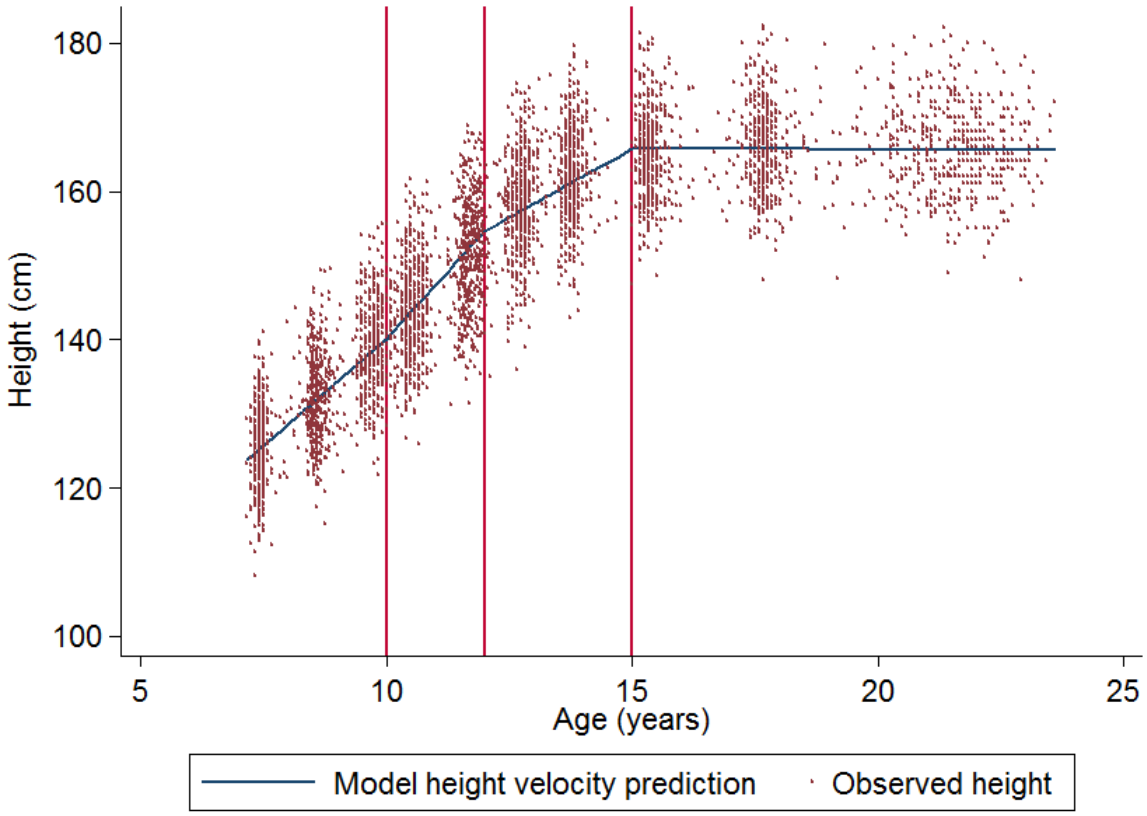
SUPPLEMENTARY MATERIAL

Appendix 1: Fitted Piecewise Mixed Effect Model for Height Trajectories from Age 7 to 21 years (Height Standardised Growth Measures), ALSPAC study, 1991-2014

Component	**Variable**		**Estimate**	**95% CI**
Fixed effects	Intercept		82.40	81.67, 83.13
	7-10 yrs slope		5.78	5.69, 5.86
	10-12 yrs slope		7.23	7.09, 7.38
	12-15 yrs slope		3.71	3.55,3.87
	15-21 yrs slope		-0.02	-0.05, 0.01
Random effects			**Estimate**	**SE**
Standard deviations	Intercept		5.05	0.44
	7-10 yrs slope		0.66	0.05
	10-12 yrs slope		1.34	0.06
	12-15 yrs slope		1.74	0.06
Correlations	Intercept	7-10 yrs slope	-0.47	0.08
	Intercept	10-12 yrs slope	-0.33	0.10
	Intercept	12-15 yrs slope	0.41	0.07
	7-10 yrs slope	10-12 yrs slope	-0.45	0.09
	7-10 yrs slope	12-15 yrs slope	-0.74	0.06
	10-12 yrs slope	12-15 yrs slope	-0.58	0.04

CI: confidence interval; SE: standard error

Predicted Mean Height Velocity and Observed Height Measures, ALSPAC study, 1991-2014



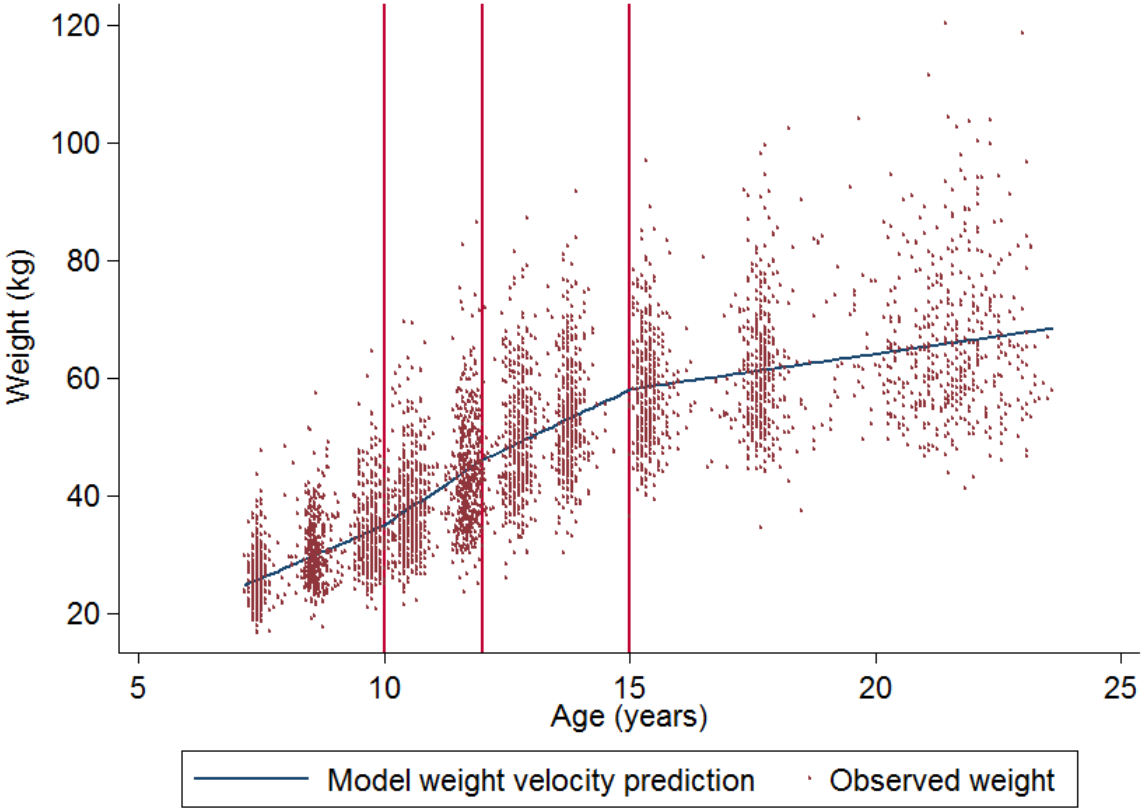
Height increased between ages 7 and 15, with a peak in height velocity between ages 10 to 12 years (7.23 cm/year (95% CI: 7.09, 7.38). Rates of height growth slowed to 3.71 cm/year (3.55, 3.78) between ages 12 and 15 years, with adult height attained by the end of this period.

Appendix 2: Piecewise Mixed Effect Model for Weight Trajectories from Age 7 to 21 years (Weight Standardised Growth Measures), ALSPAC study, 1991-2014

Component	Variable		Estimate	95% CI
Fixed effects	Intercept		-1.01	-2.10, 0.07
	7-10 yrs slope		3.60	3.49, 3.71
	10-12 yrs slope		5.53	5.27, 5.80
	12-15 yrs slope		4.01	3.82, 4.21
	15-21 yrs slope		1.21	1.10, 1.31
Random effects			**Estimate**	**SE**
Standard deviations	Intercept		5.55	0.19
	10-12 yrs slope		2.54	0.10
	12-15 yrs slope		1.92	0.08
	15-21 yrs slope		1.11	0.04
Correlations	Intercept	10-12 yrs slope	0.77	0.03
	Intercept	12-15 yrs slope	-0.41	0.05
	Intercept	15-21 yrs slope	0.12	0.05
	10-12 yrs slope	12-15 yrs slope	-0.47	0.04
	10-12 yrs slope	15-21 yrs slope	0.16	0.05
	12-15 yrs slope	15-21 yrs slope	0.03	0.06

CI: confidence interval; SE: standard error

Predicted Mean Weight Velocity and Observed Weight Measures, ALSPAC study, 1991-2014



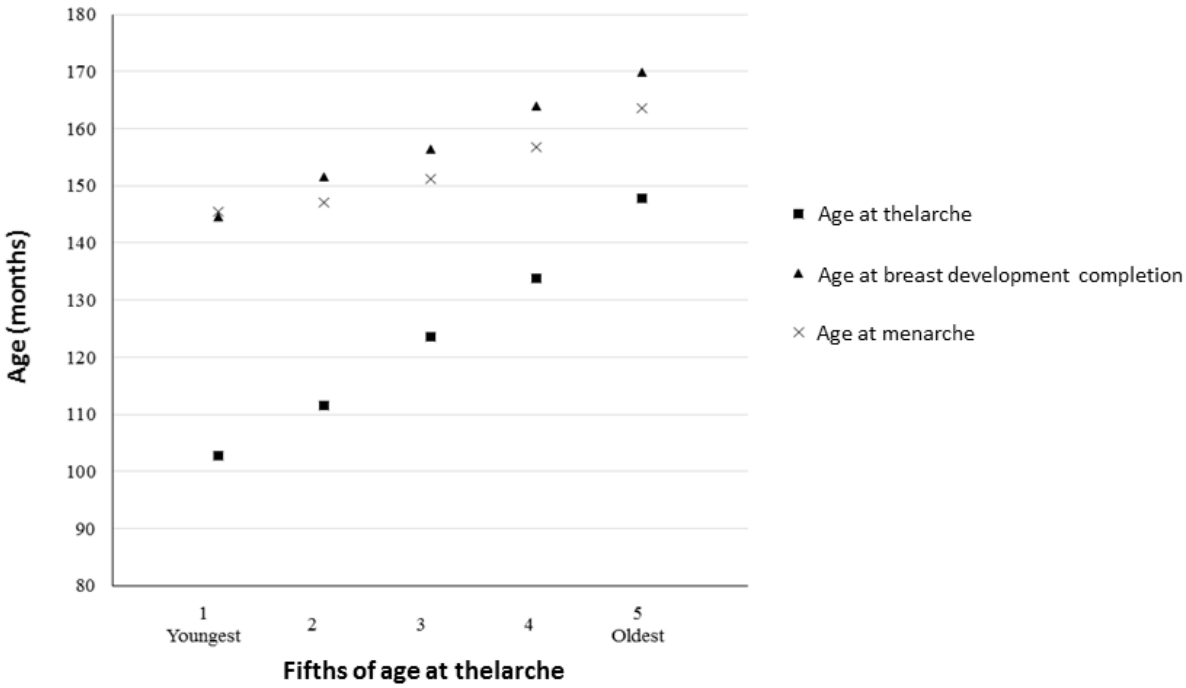
Rates of weight growth increased from 3.60 kg/year (3.49, 3.71) between ages 7 and 10 to 5.53 kg/year (5.27, 5.80) between ages 10 and 12 years. Weight velocity decreased thereafter, declining to 1.21 kg/year (1.10, 1.31) between ages 15 and 21 years.

Appendix 3: Agreement Between Fifths of Growth Measures at Different Ages, ALSPAC study, 1991-2014

Growth measure	Fifth agreement type	Fifth agreement between surveys at different ages: % (N)								
		7 & 8 years	**8 & 9 years**	**9 & 10 years**	**10 & 11 years**	**11 & 12 years**	**12 & 13 years**	**13 & 15 years**	**15 & 17 years**	**17 & 21 years**
Height	Same fifth	75.9 (327)	67.7 (291)	67.7 (306)	67.8 (309)	64.0 (292)	60.0 (264)	67.2 (283)	84.2 (347)	82.6 (369)
	± 1fifth	22.5 (97)	29.5 (127)	31 (140)	31.4 (143)	33.1 (151)	36.8 (162)	31.6 (133)	15.8 (65)	17.2 (77)
	± 2+ fifths	1.6 (7)	2.8 (12)	1.3 (6)	0.9 (4)	2.9 (13)	3.2 (14)	1.2 (5)		0.2 (1)
Weight	Same fifth	67.3 (280)	68.1 (286)	71.1 (327)	68.4 (314)	65.3 (295)	65.8 (287)	62.5 (263)	59.6 (245)	56.7 (253)
	± 1 fifth	30.3 (126)	30.0 (126)	28.3 (130)	31.2 (143)	32.5 (147)	32.6 (142)	33.7 (142)	37 (152)	37.4 (167)
	± 2+ fifths	2.4 (10)	1.9 (8)	0.7 (3)	0.4 (2)	2.2 (10)	1.6 (7)	3.8 (16)	3.4 (14)	5.8 (26)
DXA measures		**9 & 11 years**	**11 & 13.5 years**	**13.5 & 15.5 years**						
Body fat mass (%)	Same fifth	58.2 (255)	50.5 (221)	58.4 (244)						
	± 1 fifth	36.1 (158)	37.4 (164)	36.4 (152)						
	± 2+ fifths	5.7 (25)	12.1 (53)	5.3 (22)						
Body bone mass (%)	Same fifth	55.3 (242)	46.6 (204)	53.4 (223)						
	± 1 fifth	34.9 (153)	40.4 (177)	36.4 (152)						
	± 2+ fifths	9.8 (43)	13.0 (57)	10.3 (43)						

N: number of participants

Appendix 4: Relationship Between Fifths of Age at Thelarche and Median Age of Other Pubertal Measures, ALSPAC study, 1991-2014



Age at thelarche and age at breast development completion estimated as described in the Methods section.

Appendix 5: Mutually-Adjusted Associations of MRI Breast Measures with Height and Weight Trajectories, or Pubertal Development, or DXA measurements; ALSPAC study, 1991-2014

	MRI Breast Volume		MRI Fat Volume		MRI Water Volume		MRI ~~Percent~~% Water	
Variable [a]	**RC** [b]	**95% CI** [b]	**RC** [b]	**95% CI** [b]	**RC** [b]	**95% CI** [b]	**RC** [b]	**95% CI** [b]
Growth trajectories								
Birth length	1.04	0.97, 1.12	1.04	0.96, 1.12	1.05	0.98, 1.13	1.01	0.97, 1.04
Pre-pubertal height growth [c]	0.81	0.73, 0.91*	0.72	0.64, 0.81*	0.96	0.86, 1.07	1.18	1.12, 1.24*
Pubertal height growth [d]	0.84	0.75, 0.92*	0.78	0.70, 0.88*	0.90	0.81, 0.99*	1.07	1.03, 1.12*
Birth weight	0.96	0.89, 1.03	0.94	0.87, 1.02	1.00	0.93, 1.07	1.04	1.01, 1.07*
Pre-pubertal weight growth [e]	1.23	1.14, 1.34*	1.37	1.25, 1.50*	1.06	0.98, 1.15	0.86	0.83, 0.89*
Pubertal weight growth [f]	1.79	1.68, 1.89*	2.00	1.87, 2.14*	1.49	1.41, 1.59*	0.84	0.82, 0.86*
Pubertal development								
Age at menarche	1.01	0.94, 1.09	0.98	0.90, 1.08	1.05	0.99, 1.12	1.04	1.01. 1.07*
Age at thelarche [g]	0.90	0.84, 0.98*	0.87	0.79, 0.96*	0.96	0.90, 1.02	1.06	1.03, 1.10*
Age at breast completion [g]	0.86	0.80, 0.93*	0.87	0.79, 0.94*	0.85	0.81, 0.91*	0.99	0.96, 1.02
DXA measurements [h]								
Body fat mass (%)								
9 years	1.50	1.37, 1.65*	1.71	1.54, 1.89*	1.24	1.14, 1.35*	0.83	0.80, 0.85*
9 – 11 years	1.22	1.13, 1.32*	1.30	1.19, 1.42*	1.13	1.05, 1.21*	0.92	0.90, 0.95*
11 – 13.5 years	1.32	1.23, 1.42*	1.43	1.32, 1.55*	1.19	1.11, 1.26*	0.90	0.88, 0.92*

13.5 – 15.5 years	1.11	1.04, 1.19*	1.13	1.05, 1.22*	1.07	1.01, 1.13*	0.96	0.94, 0.99*
Body bone mass (%)								
9 years	0.98	0.91, 1.07	0.97	0.89, 1.06	1.01	0.94, 1.09	1.03	1.00, 1.06
9 – 11 years	0.92	0.86, 1.00*	0.91	0.84, 0.99*	0.95	0.89, 1.01	1.02	0.99, 1.06*
11 – 13.5 years	0.90	0.83, 0.98*	0.90	0.82, 0.99*	0.92	0.85, 0.99*	1.02	0.99, 1.05
13.5 – 15.5 years	0.94	0.88, 1.01	0.93	0.86, 1.01	0.95	0.89, 1.01	1.01	0.99, 1.03

CI: confidence interval; DXA: dual-energy X-ray absorptiometry; MRI: magnetic resonance imaging; RC: relative change per one standard deviation increment in the exposure variable of interest; * $P < 0.05$

[a] All growth variables, and growth differences across ages, were standardised (see Methods section).

[b] MRI breast measures were log transformed. Exponentiated estimated regression parameters are presented; 95% CI were calculated by exponentiating the original 95% CIs. RC estimates adjusted for age and menstrual phase at MRI examination and all the other variables in the same category, i.e. height/weight growth trajectories, pubertal development or DXA measures.

[c] Pre-pubertal height growth calculated as 'height at age of thelarche' – 'height at age 7 (±1) years'.

[d] Pubertal height growth calculated as 'height at age 21 years' – 'height at age of thelarche'.

[e] Pre-pubertal weight growth calculated as 'weight at age of thelarche' – 'weight at age 7 (±1) years'.

[f] Pubertal weight growth calculated as 'weight at age 21 years' – 'weight at age of thelarche'

[g] Age at thelarche and age at breast development completion estimated as described in the Methods section.

[h] DXA ~~percent~~% body bone and fat masses estimated as described in the Methods section.

Appendix 6: Mutually-Adjusted Associations of MRI Breast Fat and Water Volumes with Observed Measures of Height, Weight, DXA Body Fat and Bone Masses, and Markers of Pubertal Development; ALSPAC study, 1991-2014

	MRI Fat Volume						MRI Water Volume					
	Model 1 (N=287)		Model 2 (N=261)		Model 3 (N=244)		Model 1 (N=287)		Model 2 (N=261)		Model 3 (N=244)	
Variable [a]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]
Birth length	0.99	0.91, 1.07	1.05	0.97, 1.15	1.01	0.93, 1.10	1.02	0.95, 1.09	1.04	0.96, 1.13	1.02	0.95, 1.10
Pre-pubertal height growth [c]	0.79	0.67, 0.94*	0.89	0.75, 1.06	0.97	0.80, 1.17	0.96	0.83, 1.11	0.83	0.71, 0.98*	0.87	0.73, 1.04
Pubertal height growth [d]	0.79	0.69, 0.90*	0.85	0.75, 0.96*	0.83	0.72, 0.96*	0.90	0.80, 1.01	0.97	0.86, 1.09	0.95	0.84, 1.08
Birth weight	0.97	0.90, 1.06	0.96	0.89, 1.05	0.99	0.91, 1.07	1.02	0.95, 1.09	1.01	0.94, 1.09	1.02	0.95, 1.10
Pre-pubertal weight growth [e]	1.35	1.23, 1.48*	1.18	1.02, 1.35*	1.12	0.97, 1.28	1.06	0.98, 1.14	1.26	1.11, 1.43*	1.20	1.06, 1.36*
Pubertal weight growth [f]	1.99	1.86, 2.12*	1.84	1.70, 1.99*	1.86	1.72, 2.01*	1.50	1.41, 1.59*	1.44	1.34, 1.55*	1.46	1.36, 1.56*
Age at menarche	1.04	0.96, 1.13			1.06	0.97, 1.15	1.04	0.97, 1.12			1.05	0.97, 1.14
Age at thelarche [g]	0.96	0.82, 1.13			1.01	0.85, 1.21	1.07	0.93, 1.23			1.06	0.90, 1.25
Age at breast completion [g]	0.88	0.82, 0.94*			0.88	0.82, 0.94*	0.88	0.83, 0.93*			0.89	0.83, 0.94*
DXA body fat mass (%) [h]												
9 years			1.23	1.09, 1.38*	1.25	1.12, 1.40*			0.96	0.86, 1.06	0.97	0.87, 1.08
9 - 11 years			1.09	1.00, 1.18*	1.08	0.99, 1.17			0.98	0.91, 1.06	0.98	0.91, 1.05
11 – 13.5 years			1.11	1.02, 1.21*	1.12	1.03, 1.22*			1.02	0.94, 1.10	1.04	0.96, 1.12
13.5 – 15.5 years			0.99	0.92, 1.06	0.99	0.92, 1.05			0.97	0.91, 1.03	0.97	0.92, 1.03

	MRI Fat Volume						MRI Water Volume					
	Model 1 (N=287)		Model 2 (N=261)		Model 3 (N=244)		Model 1 (N=287)		Model 2 (N=261)		Model 3 (N=244)	
Variable [a]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]
DXA body bone mass (%) [h]												
9 years			1.00	0.92, 1.08	1.01	0.93, 1.09			1.04	0.97, 1.12	1.05	0.98, 1.13
9 - 11 years			0.96	0.89, 1.03	0.96	0.89, 1.03			0.96	0.90, 1.03	0.97	0.91, 1.04
11 – 13.5 years			0.95	0.88, 1.04	0.98	0.89, 1.06			0.91	0.84, 0.98*	0.94	0.87, 1.02
13.5 – 15.5 years			0.91	0.85, 0.97*	0.91	0.85, 0.97*			0.92	0.86, 0.98*	0.92	0.87, 0.98*

CI: confidence interval; DXA: dual-energy X-ray absorptiometry; MRI: magnetic resonance imaging; RC: relative change per one standard deviation increment in the exposure variable of interest; * $P < 0.05$

[a] All growth variables, and growth differences across ages, were standardised (see Methods section).

[b] MRI breast measures were log transformed. Exponentiated estimated regression parameters are presented; 95% CI were calculated by exponentiating the original 95% CIs. RC estimates adjusted for age and menstrual phase at MRI examination and the other variables included in the model. Model 1 includes all the height/weight growth trajectory variables and the pubertal development variables; Model 2 includes all the height/weight growth trajectory variables and the DXA measures; and Model 3 includes all the height/weight growth trajectory variables, the pubertal development variables, and the DXA measures.

[c] Pre-pubertal height growth calculated as 'height at age of thelarche' – 'height at age 7 (±1) years'.

[d] Pubertal height growth calculated as 'height at age 21 years' – 'height at age of thelarche'.

[e] Pre-pubertal weight growth calculated as 'weight at age of thelarche' – 'weight at age 7 (±1) years'.

[f] Pubertal weight growth calculated as 'weight at age 21 years' – 'weight at age of thelarche'

[g] Age at thelarche and age at breast development completion estimated as described in the Methods section.

[h] DXA ~~percent~~% body bone and fat masses estimated as described in the Methods section.

Appendix 7: Mutually-Adjusted Associations of MRI Breast Volume and ~~Percent~~% Water with Observed Measures of Height, Weight, DXA Body Fat and Bone Masses, and Markers of Pubertal Development Using Imputed Data (N=491); ALSPAC study, 1991-2014

	MRI Breast Volume						MRI ~~Percent~~% Water					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	RC [a]	95% CI [a]	RC [a]	95% CI [a]	RC [a]	95% CI [a]	RC [a]	95% CI [a]	RC [a]	95% CI [a]	RC [a]	95% CI [a]
Birth length	1.01	0.95, 1.08	1.02	0.96, 1.09	1.02	0.96, 1.08	1.01	0.98, 1.04	1.00	0.98, 1.03	1.00	0.98, 1.03
Pre-pubertal height growth [a]	0.92	0.83, 1.02	0.97	0.88, 1.07	1.00	0.90, 1.12	**1.09**	**1.04, 1.14***	0.99	0.96,1.03	0.98	0.94, 1.02
Pubertal height growth [b]	0.88	0.81, 0.95*	0.90	0.83, 0.97*	0.90	0.83, 0.98*	1.07	1.03, 1.11*	1.05	1.02, 1.09*	1.05	1.01, 1.08*
Birth weight	0.97	0.92, 1.03	0.98	0.92, 1.03	0.98	0.92, 1.04	1.03	1.01, 1.06*	1.03	1.01, 1.06*	1.03	1.01, 1.06*
Pre-pubertal weight growth [c]	1.26	1.18, 1.34*	1.14	1.05, 1.25*	1.15	1.05, 1.25*	0.86	0.84, 0.89*	0.98	0.95, 1.02	0.98	0.94, 1.02
Pubertal weight growth [d]	1.67	1.60, 1.75*	1.64	1.55, 1.73*	1.62	1.53, 1.71*	0.85	0.84, 0.87*	0.88	0.86, 0.90*	0.88	0.86, 0.90*
Age at menarche	1.03	0.96, 1.10			1.03	0.97, 1.11	1.01	0.99, 1.04			1.01	0.99, 1.04
Age at thelarche [e]	0.97	0.87, 1.07			0.98	0.88, 1.09	1.03	0.99, 1.08			1.01	0.98, 1.05
Age at breast completion	0.86	0.82, 0.91*			0.87	0.83, 0.92*	1.01	0.99, 1.04			1.00	0.98, 1.03*
DXA body fat mass (%)												
9 years			1.15	1.07, 1.24*	1.12	1.04, 1.21*			0.87	0.85, 0.90*	0.88	0.85, 0.90*
9 – 11 years			1.09	1.03, 1.16*	1.06	1.01, 1.12*			0.95	0.92, 0.97*	0.95	0.93, 0.97*

	MRI Breast Volume						MRI ~~Percent~~% Water					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	RC [a]	95% CI [a]	RC [a]	95% CI [a]	RC [a]	95% CI [a]	RC [a]	95% CI [a]	RC [a]	95% CI [a]	RC [a]	95% CI [a]
11 – 13.5 years			1.06	1.00, 1.13*	1.04	0.98, 1.12*			0.95	0.93, 0.97*	0.95	0.93, 0.98*
13.5 – 15.5 years			0.98	0.93, 1.03	0.98	0.93, 1.03			1.00	0.98, 1.02	1.00	0.98, 1.02
DXA body bone mass (%)												
9 years			0.98	0.92, 1.03	0.97	0.91, 1.02			1.03	1.00, 1.05*	1.03	1.01, 1.05*
9 – 11 years			0.99	0.94, 1.05	0.99	0.94, 1.04			1.01	0.99, 1.03	1.02	0.99, 1.04
11 – 13.5 years			0.96	0.90, 1.02	0.95	0.90, 1.01			1.01	0.98, 1.03	1.01	0.99, 1.04
13.5 – 15.5 years			0.93	0.88, 0.97*	0.94	0.90, 0.99*			1.02	1.00, 1.03	1.02	1.00, 1.03

CI: confidence interval; DXA: dual-energy X-ray absorptiometry; MRI: magnetic resonance imaging; RC: relative change per one standard deviation increment in the exposure variable of interest; * $P < 0.05$

[a] All growth variables, and growth differences across ages, were standardised (see Methods section).

[b] MRI breast measures were log transformed. Exponentiated estimated regression parameters are presented; 95% CI were calculated by exponentiating the original 95% CIs. RC estimates adjusted for age and menstrual phase at MRI examination and the other variables included in the model. Model 1 includes all the height/weight growth trajectory variables and the pubertal development variables; Model 2 includes all the height/weight growth trajectory variables and the DXA measures; and Model 3 includes all the height/weight growth trajectory variables, the pubertal development variables, and the DXA measures.

[c] Pre-pubertal height growth calculated as 'height at age of thelarche' – 'height at age 7 (±1) years'.

[d] Pubertal height growth calculated as 'height at age 21 years' – 'height at age of thelarche'.

[e] Pre-pubertal weight growth calculated as 'weight at age of thelarche' – 'weight at age 7 (±1) years'.

[f] Pubertal weight growth calculated as 'weight at age 21 years' – 'weight at age of thelarche'

[g] Age at thelarche and age at breast development completion estimated as described in the Methods section.

[h] DXA ~~percent~~% body bone and fat masses estimated as described in the Methods section.

Appendix 8: Mutually-Adjusted Associations of MRI Breast Fat and Water Volumes with Observed Measures of Height, Weight, DXA Body Fat and Bone Masses, and Markers of Pubertal Development Using Imputed Data (N=491); ALSPAC study, 1991-2014

	MRI Fat Volume						MRI Water Volume					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
Variable [a]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]
Birth length	1.01	0.94, 1.08	1.02	0.95, 1.10	1.02	0.95, 1.09	1.02	0.96, 1.08	1.02	0.96, 1.09	1.02	0.96, 1.08
Pre-pubertal height growth [c]	0.87	0.78, 0.98*	0.98	0.88, 1.09	1.02	0.90, 1.15	1.00	0.91, 1.11	0.97	0.88, 1.07	0.98	0.88, 1.10
Pubertal height growth [d]	0.83	0.76, 0.92*	0.86	0.79, 0.94*	0.87	0.79, 0.95*	0.94	0.87, 1.02	0.95	0.88, 1.03	0.95	0.87, 1.03
Birth weight	0.95	0.89, 1.02	0.96	0.90, 1.02	0.96	0.90, 1.02	1.00	0.95, 1.06	1.01	0.95, 1.06	1.01	0.96, 1.07
Pre-pubertal weight growth [e]	1.38	1.28, 1.48*	1.15	1.04, 1.27*	1.16	1.05, 1.27*	1.08	1.02, 1.15*	1.12	1.03, 1.22*	1.12	1.03, 1.22*
Pubertal weight growth [f]	1.85	1.76, 1.96*	1.78	1.67, 1.90*	1.75	1.64, 1.87*	1.42	1.36, 1.49*	1.44	1.36, 1.52*	1.42	1.35, 1.50*
Age at menarche	1.03	0.95, 1.11			1.03	0.95, 1.12	1.05	0.98, 1.11			1.05	0.98, 1.12
Age at thelarche [g]	0.94	0.83, 1.06			0.96	0.86, 1.08	1.00	0.90, 1.10			0.99	0.89, 1.10
Age at breast completion [g]	0.85	0.81, 0.90*			0.87	0.82, 0.92*	0.87	0.82, 0.92*			0.88	0.83, 0.93*
DXA body fat mass (%) [h]												
9 years			1.27	1.17, 1.38*	1.23	1.13, 1.33*			1.00	0.93, 1.08	0.98	0.91, 1.06
9 – 11 years			1.14	1.08, 1.21*	1.11	1.04, 1.18*			1.03	0.97, 1.10	1.01	0.95, 1.07

	MRI Fat Volume						MRI Water Volume					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
Variable [a]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]	RC [b]	95% CI [b]
11 – 13.5 years			1.11	1.04, 1.19*	1.09	1.01, 1.17*			1.01	0.94, 1.07	1.00	0.93, 1.07
13.5 – 15.5 years			0.98	0.93, 1.04	0.98	0.93, 1.04			0.98	0.93, 1.03	0.98	0.93, 1.02
DXA body bone mass (%) [h]												
9 years			0.96	0.91, 1.02	0.95	0.90, 1.02			1.00	0.95, 1.06	0.99	0.94, 1.05
9 – 11 years			0.99	0.94, 1.05	0.98	0.92, 1.04			1.00	0.95, 1.06	1.00	0.95, 1.06
11 – 13.5 years			0.96	0.90, 1.03	0.95	0.89, 1.02			0.96	0.91, 1.03	0.97	0.91, 1.03
13.5 – 15.5 years			0.92	0.87, 0.97*	0.93	0.89, 0.99*			0.94	0.90, 0.99*	0.96	0.91, 1.01

CI: confidence interval; DXA: dual-energy X-ray absorptiometry; MRI: magnetic resonance imaging; RC: relative change per one standard deviation increment in the exposure variable of interest; * $P < 0.05$

[a] All growth variables, and growth differences across ages, were standardised (see Methods section).

[b] MRI breast measures were log transformed. Exponentiated estimated regression parameters are presented; 95% CI were calculated by exponentiating the original 95% CIs. RC estimates adjusted for age and menstrual phase at MRI examination and all the variables included in the model. Model 1 includes all the height/weight growth trajectory variables and the pubertal development variables; Model 2 includes all the height/weight growth trajectory variables and the DXA measures; and Model 3 includes all the height/weight growth trajectory variables, the pubertal development variables, and the DXA measures.

[c] Pre-pubertal height growth calculated as 'height at age of thelarche' – 'height at age 7 (±1) years'.

[d] Pubertal height growth calculated as 'height at age 21 years' – 'height at age of thelarche'.

[e] Pre-pubertal weight growth calculated as 'weight at age of thelarche' – 'weight at age 7 (±1) years'.

[f] Pubertal weight growth calculated as 'weight at age 21 years' – 'weight at age of thelarche'

[g] Age at thelarche and age at breast development completion estimated as described in the Methods section.

[h] DXA ~~percent~~% body bone and fat masses estimated as described in the Methods section.

Appendix 9: Unadjusted (Marginal) Correlation Coefficients Among Predicted Measures of Child-Specific Height, Weight, Puberty and DXA Variables; ALSPAC study, 1991-2014

		Weight			Length/Height			Puberty (age at in yrs)		
		Birth	Pre-pubertal	Pubertal	Birth	Pre-pubertal	Pubertal	Menarche	Thelarche	Breast completion
Weight	Pre-pubertal growth	-0.0279								
	Pubertal growth	0.0842	-0.8592							
Height	Birth	0.6694	-0.0126	0.0684						
	Pre-pubertal growth	-0.0307	0.7845	-0.7396	0.0265					
	Pubertal growth	0.0828	-0.5059	0.5450	0.1118	-0.3549				
Puberty (age at in yrs)	Menarche	0.0315	0.3655	-0.1001	0.0040	0.2064	-0.1946			
	Thelarche	-0.0233	0.8898	-0.7848	0.0021	0.6756	-0.5197	0.5366		
	Breast completion	-0.0350	0.3869	-0.2385	-0.0194	0.2825	-0.2322	0.5110	0.4656	
DXA body fat mass (%)	9 yrs	-0.0167	-0.4261	0.2895	0.0319	0.0475	0.2963	-0.2717	-0.4506	-0.1403
	9-11 yrs	-0.0422	0.1008	-0.3230	-0.0724	0.1135	0.0119	0.2111	0.1804	0.0677
	11-13.5 yrs	-0.0189	-0.0523	-0.0019	-0.0425	-0.1816	0.2819	-0.3100	-0.1405	-0.1804
	13.5-15.5 yrs	-0.0110	0.0921	-0.0538	0.0072	-0.0107	0.0640	0.1033	0.0896	0.0325
DXA body bone mass (%)	9 yrs	0.0553	0.2986	-0.2029	-0.0002	-0.0536	-0.2014	0.1496	0.2901	0.0618
	9-11 yrs	0.0677	-0.2315	0.1040	0.0660	-0.2038	0.0627	-0.3712	-0.3111	-0.2373
	11-13.5 yrs	-0.0524	-0.1795	0.1302	0.0192	0.1581	-0.0632	-0.1692	-0.2185	-0.0262
	13.5-15.5 yrs	0.0665	0.0253	0.0436	0.0458	0.0303	0.0703	0.1711	0.0865	0.0756

		DXA body fat mass (%)				DXA body bone mass (%)		
		9 yrs	9-11 yrs	11-13.5 yrs	13.5-15.5y rs	9 yrs	9-11 yrs	11-13.5 yrs
DXA body fat mass (%)	9-11 yrs	-0.2508						
	11-13.5 yrs	-0.1595	-0.3095					
	13.5-15.5 yrs	-0.1880	-0.0444	-0.1564				
DXA body bone mass (%)	9 yrs	-0.7087	0.1319	0.1399	0.0979			
	9-11 yrs	0.2348	-0.5616	0.2042	0.0340	-0.1972		
	11-13.5 yrs	0.4818	-0.0614	-0.4288	-0.1059	-0.3200	-0.1675	
	13.5-15.5 yrs	0.0276	0.2183	-0.0322	-0.3930	0.0035	-0.1219	-0.2674