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## Body Mass Index and its Association with Linear Growth and Pubertal Development

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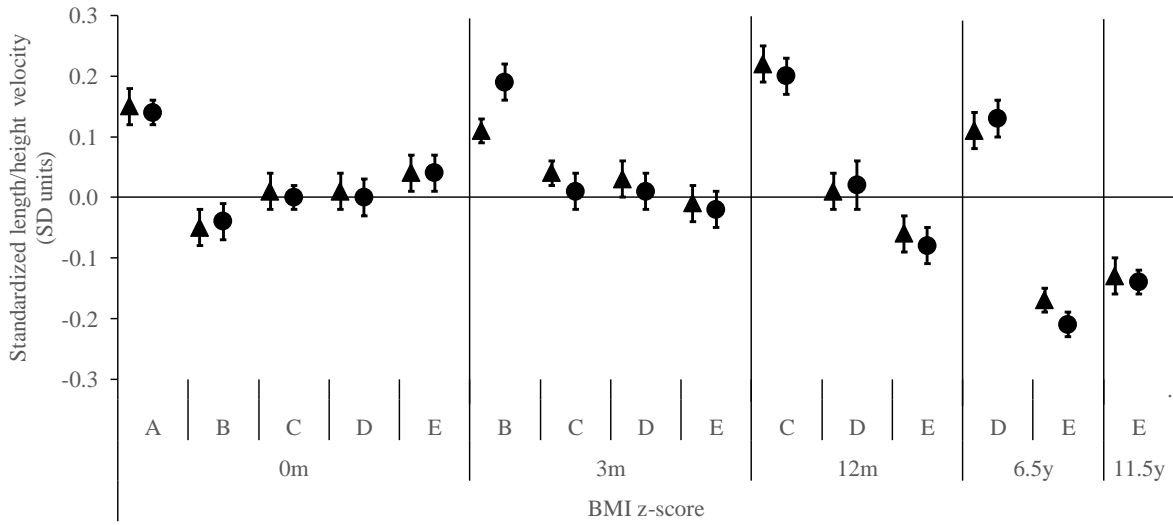
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SUPPLEMENTARY MATERIAL

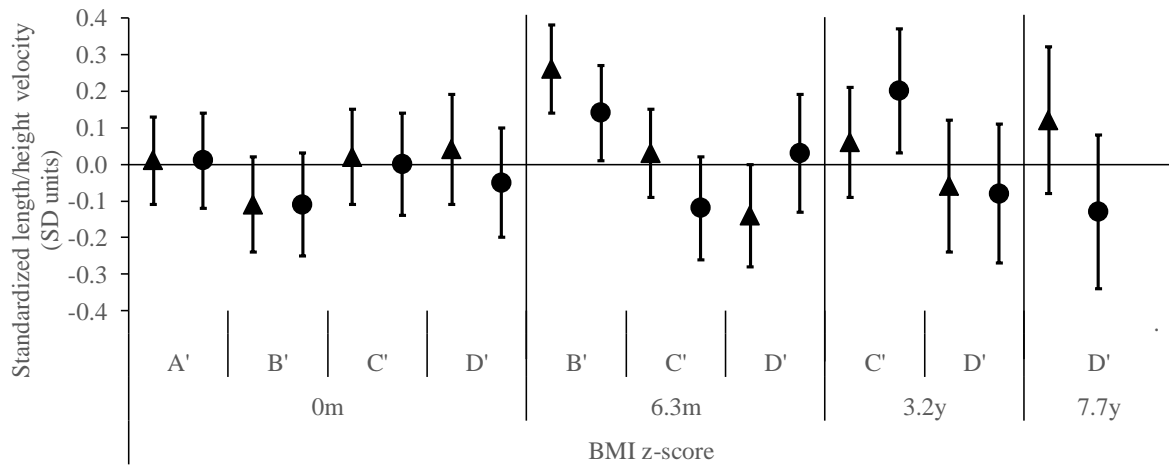
**Figure S1:** Complete-case analyses of associations of BMI z-score with standardized length/height velocity in (A) PROBIT and (B) Project Viva.

**A**



A = Length velocity 0–3 months; B = Length velocity 3–12 months; C: Length/height velocity 12 months to 6.5 years; D = Height velocity 6.5–11.5 years; E = Height velocity 11.5–16 years  
 ▲ = boys; ● = girls

**B**



A' = Length velocity 0–6.3 months; B' = Length/height velocity 6.3 months to 3.2 years; C: Height velocity 3.2–7.7 years; D' = Height velocity 7.7–12.9 years  
 ▲ = boys; ● = girl

SUPPLEMENTARY MATERIAL

**Table S1:** Associations of BMI z-score with standing height at 16 years, mediated by pubertal development at 11.5 years in PROBIT.

BMI z-score	Standing height at 16y (cm)		
	Model 1 <sup>a</sup>	Model 2 <sup>b</sup>	Model 3 <sup>c</sup>
<b>Boys (n=8,682)</b>		<b><math>\beta</math> (95% CI)</b>	
0m	0.56 (0.40,0.73)	0.57 (0.40,0.73)	0.56 (0.40,0.73)
3m	-0.01 (-0.16,0.13)	-0.03 (-0.17,0.12)	-0.03 (-0.18,0.11)
12m	0.14 (-0.02,0.30)	0.12 (-0.04,0.28)	0.12 (-0.04,0.28)
6.5y	0.27 (0.12,0.42)	0.22 (0.07,0.37)	0.21 (0.06,0.36)
11.5y	0.29 (0.12,0.46)	0.22 (0.05,0.39)	0.21 (0.04,0.39)
<b>Girls (n=8,099)</b>			
0m	0.53 (0.38,0.68)	0.53 (0.39,0.68)	0.53 (0.39,0.68)
3m	-0.07 (-0.21,0.08)	-0.08 (-0.22,0.07)	-0.08 (-0.23,0.07)
12m	0.03 (-0.13,0.19)	0.01 (-0.15,0.17)	0.01 (-0.15,0.16)
6.5y	0.10 (-0.05,0.25)	0.03 (-0.13,0.18)	0.04 (-0.12,0.19)
11.5y	-0.13 (-0.29,0.04)	-0.25 (-0.42,-0.08)	-0.22 (-0.39,-0.06)

<sup>a</sup> Adjusted for maternal and paternal education level, height and BMI; maternal age and smoking during pregnancy; gestational age at delivery; geographic region and BMI z-score at all previous time points.

<sup>b</sup> Model 1 + genital (for boys) or breast (for girls) development at 11.5 years.

<sup>c</sup> Model 1 + pubic hair stage at 11.5 years.

SUPPLEMENTARY MATERIAL

**Table S2:** Associations of overweight and obesity (vs. normal or underweight) with standardized length/height velocity in PROBIT.

	Standardized height velocity (SD units/year)				
	0-3m	3 - 12m	12m - 6.5y	6.5 - 11.5y	11.5 - 16y
<b>Boys (n=8,682)</b>					
<b>Overweight</b>					
<b>(vs. normal or underweight)</b>					
	<b>β (95% CI)<sup>a</sup></b>				
0m	<b>0.45 (0.12,0.79)<sup>b</sup></b>	-0.08 (-0.45,0.30)	0.05 (-0.34,0.44)	-0.17 (-0.58,0.23)	0.15 (-0.25,0.55)
3m	–	<b>0.47 (0.32,0.61)</b>	-0.01 (-0.16,0.14)	0.06 (-0.10,0.22)	-0.04 (-0.20,0.11)
12m	–	–	<b>0.26 (0.20,0.32)</b>	-0.00 (-0.06,0.06)	-0.05 (-0.11,0.01)
6.5y	–	–	–	<b>0.17 (0.11,0.24)</b>	<b>-0.26 (-0.33,-0.20)</b>
11.5y	–	–	–	–	<b>-0.15 (-0.20,-0.10)</b>
<b>Obese</b>					
<b>(vs. normal or underweight)</b>					
0m	<b>3.42 (2.45,4.38)</b>	0.71 (-0.37,1.79)	-0.57 (-1.61,0.47)	-0.19 (-1.23,0.86)	-0.19 (-1.18,0.80)
3m	–	0.40 (-0.05,0.85)	-0.01 (-0.50,0.48)	0.21 (-0.32,0.73)	-0.13 (-0.60,0.35)
12m	–	–	<b>0.45 (0.33,0.58)</b>	0.02 (-0.12,0.16)	-0.17 (-0.31,-0.03)
6.5y	–	–	–	<b>0.24 (0.14,0.35)</b>	<b>-0.42 (-0.52,-0.31)</b>
11.5y	–	–	–	–	<b>-0.21 (-0.29,-0.13)</b>
<b>Girls (n=8,099)</b>					
<b>Overweight</b>					
<b>(vs. normal or underweight)</b>					
0m	<b>0.44 (0.07,0.81)</b>	-0.11 (-0.52,0.30)	-0.09 (-0.52,0.34)	0.05 (-0.37,0.47)	-0.13 (-0.55,0.30)
3m	–	<b>0.37 (0.20,0.55)</b>	0.04 (-0.16,0.24)	-0.10 (-0.31,0.11)	0.03 (-0.18,0.23)
12m	–	–	<b>0.25 (0.18,0.32)</b>	-0.05 (-0.13,0.02)	-0.07 (-0.14,-0.01)
6.5y	–	–	–	<b>0.18 (0.10,0.26)</b>	<b>-0.34 (-0.42,-0.26)</b>
11.5y	–	–	–	–	<b>-0.14 (-0.20,-0.09)</b>
<b>Obese</b>					
<b>(vs. normal or underweight)</b>					
0m	<b>1.17 (0.40,1.95)</b>	0.35 (-0.49,1.18)	-0.77 (-1.65,0.12)	-0.51 (-1.38,0.36)	0.84 (-0.05,1.72)
3m	–	<b>0.92 (0.39,1.45)</b>	0.03 (-0.52,0.58)	0.08 (-0.48,0.64)	0.10 (-0.45,0.65)
12m	–	–	<b>0.49 (0.34,0.65)</b>	-0.07 (-0.23,0.10)	-0.12 (-0.28,0.04)
6.5y	–	–	–	<b>0.28 (0.14,0.42)</b>	<b>-0.51 (-0.64,-0.37)</b>
11.5y	–	–	–	–	<b>-0.16 (-0.25,-0.06)</b>

<sup>a</sup> Adjusted for maternal and paternal education level, height and BMI; maternal age and smoking during pregnancy; gestational age at delivery; geographic region and BMI z-score at all previous time points.

<sup>b</sup> Bold values indicate statistically significant associations at p<0.05.

SUPPLEMENTARY MATERIAL

**Table S3:** Associations of overweight and obesity (vs. normal or underweight) with standardized length/height velocity in Project Viva.

	Standardized height velocity (SD units/year)			
	0-6.3m	6.3m - 3.2y	3.2 - 7.7y	7.7 - 12.9y
<b>Boys (n=758)</b>	<b>β (95% CI)<sup>a</sup></b>			
<b>Overweight</b> (vs. normal or underweight)				
0m	0.06 (-0.28,0.40)	-0.15 (-0.53,0.23)	-0.01 (-0.40,0.38)	-0.12 (-0.53,0.28)
6m	–	<b>0.31 (0.03,0.58)<sup>b</sup></b>	0.04 (-0.25,0.34)	-0.01 (-0.32,0.30)
3.2y	–	–	0.17 (-0.12,0.47)	-0.12 (-0.48,0.24)
7.7y	–	–	–	0.08 (-0.17,0.33)
<b>Obese</b> (vs. normal or underweight)				
0m	-0.07 (-1.18,1.05)	-0.36 (-1.51,0.78)	0.10 (-1.15,1.36)	0.35 (-0.99,1.69)
6m	–	0.41 (-0.10,0.91)	-0.36 (-0.88,0.16)	-0.00 (-0.54,0.54)
3.2y	–	–	0.32 (-0.21,0.84)	0.08 (-0.45,0.62)
7.7y	–	–	–	-0.01 (-0.34,0.32)
<b>Girls (n=732)</b>				
<b>Overweight</b> (vs. normal or underweight)				
0m	-0.02 (-0.45,0.41)	-0.13 (-0.54,0.29)	0.16 (-0.26,0.58)	0.00 (-0.44,0.45)
6m	–	0.13 (-0.17,0.43)	-0.22 (-0.55,0.12)	0.17 (-0.22,0.55)
3.2y	–	–	0.10 (-0.26,0.45)	-0.18 (-0.61,0.26)
7.7y	–	–	–	-0.10 (-0.33,0.14)
<b>Obese</b> (vs. normal or underweight)				
0m	1.11 (-0.02,2.24)	-0.25 (-1.17,0.67)	0.22 (-0.80,1.25)	-0.31 (-1.45,0.84)
6m	–	0.24 (-0.52,1.00)	-0.02 (-0.90,0.86)	-0.10 (-1.09,0.90)
3.2y	–	–	-0.06 (-0.76,0.63)	-0.36 (-1.08,0.37)
7.7y	–	–	–	<b>-0.34 (-0.66,-0.01)</b>

<sup>a</sup> Adjusted for maternal and paternal education level, height and BMI; maternal age, smoking history and parity; gestational age at delivery; child ethnicity; breastfeeding initiation and BMI z-score at all previous time points.

<sup>b</sup> Bold values indicate statistically significant associations at p<0.05.

SUPPLEMENTARY MATERIAL

**Table S4:** Associations of overweight and obesity (vs. normal or underweight) with standing height, trunk and leg length, and pubertal development at 11.5 and 16 years in PROBIT.

	$\beta$ (95% CI) <sup>a</sup>				OR (95% CI) <sup>a,b</sup>		
	11.5y			16y	11.5y		16y
	Standing height (cm)	Trunk length (cm)	Leg length (cm)	Standing height (cm)	Genital development	Pubic hair stage	Pubic hair stage
<b>Boys (n=8,682)</b>							
<b>Overweight (vs. normal or underweight)</b>							
0m	0.24 (-2.52,3.00)	0.05 (-1.58,1.68)	0.18 (-1.75,2.11)	1.58 (-1.08,4.25)	1.06 (0.38,2.94)	0.52 (0.16,1.65)	1.91 (0.64,5.75)
3m	0.27 (-0.81,1.34)	<b>0.74 (0.09,1.39)</b>	-0.47 (-1.19,0.25)	-0.13 (-1.17,0.92)	1.18 (0.83,1.69)	1.26 (0.88,1.80)	1.20 (0.86,1.69)
12m	<b>0.52 (0.11,0.93)<sup>c</sup></b>	<b>0.38 (0.13,0.63)</b>	0.14 (-0.14,0.42)	0.32 (-0.08,0.71)	1.05 (0.92,1.21)	<b>1.20 (1.05,1.38)</b>	1.06 (0.93,1.21)
6.5y	<b>2.28 (1.82,2.74)</b>	<b>1.63 (1.36,1.90)</b>	<b>0.65 (0.34,0.95)</b>	0.39 (-0.04,0.83)	<b>1.44 (1.24,1.67)</b>	<b>1.61 (1.39,1.86)</b>	1.23 (1.06,1.43)
11.5y	<b>2.38 (1.96,2.80)</b>	<b>1.60 (1.36,1.85)</b>	<b>0.78 (0.50,1.06)</b>	0.44 (0.04,0.85)	<b>1.55 (1.34,1.78)</b>	<b>1.68 (1.46,1.94)</b>	1.23 (1.07,1.41)
16y	—	—	—	0.23 (-0.23,0.68)	—	—	1.14 (0.97,1.33)
<b>Obese (vs. normal or underweight)</b>							
0m	-1.49 (-8.76,5.79)	1.67 (-2.62,5.95)	-3.18 (-8.01,1.65)	-3.93 (-10.80,2.94)	0.85 (0.06,11.46)	1.84 (0.22,15.53)	2.38 (0.22,25.47)
3m	0.40 (-3.07,3.88)	0.35 (-1.69,2.40)	0.05 (-2.28,2.38)	0.45 (-2.73,3.63)	0.95 (0.32,2.81)	1.09 (0.34,3.48)	0.87 (0.32,2.34)
12m	0.51 (-0.41,1.42)	<b>0.86 (0.32,1.40)</b>	-0.35 (-0.95,0.24)	-0.23 (-1.12,0.66)	1.09 (0.82,1.46)	1.25 (0.93,1.68)	0.92 (0.68,1.25)
6.5y	<b>4.63 (3.91,5.34)</b>	<b>3.28 (2.85,3.71)</b>	<b>1.35 (0.85,1.84)</b>	<b>1.18 (0.47,1.90)</b>	1.27 (0.99,1.63)	<b>1.54 (1.20,1.98)</b>	1.24 (0.97,1.59)
11.5y	<b>4.05 (3.42,4.67)</b>	<b>2.64 (2.29,3.00)</b>	<b>1.40 (0.97,1.84)</b>	<b>1.15 (0.52,1.79)</b>	1.02 (0.83,1.26)	<b>1.35 (1.09,1.67)</b>	<b>1.27 (1.03,1.57)</b>
16y	—	—	—	0.17 (-0.59,0.92)	—	—	0.98 (0.76,1.26)
<b>Girls (n=8,099)</b>							
<b>Overweight (vs. normal or underweight)</b>							
0m	-0.08 (-3.09,2.93)	0.23 (-1.57,2.03)	-0.31 (-2.25,1.63)	-1.71 (-4.14,0.72)	1.46 (0.62,3.42)	1.28 (0.57,2.86)	1.39 (0.63,3.07)
3m	-0.34 (-1.77,1.09)	0.09 (-0.77,0.95)	-0.42 (-1.33,0.49)	0.11 (-1.08,1.29)	1.08 (0.71,1.65)	1.35 (0.90,2.03)	0.97 (0.65,1.42)
12m	0.14 (-0.36,0.64)	0.26 (-0.04,0.56)	-0.12 (-0.43,0.18)	-0.10 (-0.49,0.29)	1.12 (0.97,1.30)	1.07 (0.93,1.23)	0.99 (0.86,1.13)
6.5y	<b>2.90 (2.36,3.43)</b>	<b>2.07 (1.74,2.39)</b>	<b>0.82 (0.48,1.16)</b>	0.16 (-0.30,0.62)	<b>2.38 (2.02,2.81)</b>	<b>2.19 (1.87,2.58)</b>	<b>1.18 (1.01,1.37)</b>
11.5y	<b>2.09 (1.61,2.57)</b>	<b>1.62 (1.34,1.91)</b>	<b>0.46 (0.16,0.77)</b>	-0.05 (-0.45,0.35)	<b>2.53 (2.18,2.94)</b>	<b>2.16 (1.87,2.49)</b>	1.11 (0.96,1.27)
16y	—	—	—	<b>-0.64 (-1.08,-0.20)</b>	—	—	1.08 (0.94,1.25)
<b>Obese (vs. normal or underweight)</b>							
0m	-6.01 (-12.32,0.29)	-3.04 (-6.87,0.79)	-2.98 (-6.97,1.00)	-0.46 (-5.63,4.72)	0.36 (0.05,2.48)	0.22 (0.03,1.83)	1.03 (0.10,10.35)
3m	0.62 (-3.36,4.60)	0.38 (-2.03,2.80)	0.22 (-2.29,2.73)	-0.06 (-3.24,3.11)	1.33 (0.43,4.15)	1.96 (0.62,6.27)	1.01 (0.37,2.74)
12m	0.22 (-0.93,1.37)	0.08 (-0.62,0.78)	0.13 (-0.60,0.86)	-0.24 (-1.16,0.68)	1.20 (0.85,1.68)	1.33 (0.95,1.85)	1.03 (0.75,1.43)
6.5y	<b>4.72 (3.76,5.68)</b>	<b>3.13 (2.56,3.71)</b>	<b>1.58 (0.95,2.21)</b>	0.29 (-0.51,1.08)	<b>3.76 (2.82,5.00)</b>	<b>2.87 (2.16,3.82)</b>	1.09 (0.83,1.43)
11.5y	<b>2.40 (1.56,3.23)</b>	<b>2.14 (1.64,2.64)</b>	0.26 (-0.28,0.81)	-0.01 (-0.72,0.70)	<b>3.03 (2.33,3.95)</b>	<b>2.13 (1.66,2.75)</b>	1.04 (0.82,1.32)
16y	—	—	—	-0.42 (-1.32,0.47)	—	—	1.03 (0.76,1.39)

<sup>a</sup> Adjusted for maternal and paternal education level, height and BMI; maternal age and smoking during pregnancy; gestational age at delivery; geographic region; BMI z-score at all previous time points and age at measurement.

<sup>b</sup> OR (odds ratio) reflects relative odds of being in a higher Tanner stage category.

<sup>c</sup> Bold values indicate statistically significant associations at p<0.05.

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**Table S5:** Associations of overweight and obesity (vs. normal or underweight) with standing height, trunk and leg length, and pubertal development at 12.9 years in Project Viva.

	$\beta$ (95% CI) <sup>a</sup>			OR (95% CI) <sup>a,b</sup>	
	Standing height (cm)	Trunk length (cm)	Leg length (cm)	Pubertal score (units)	Pubic hair stage
<b><i>Boys (n=758)</i></b>					
<b>Overweight (vs. normal or underweight)</b>					
0m	-0.67 (-3.59,2.25)	0.09 (-1.64,1.82)	-0.76 (-2.62,1.10)	-0.10 (-0.36,0.15)	1.00 (0.49,2.03)
6.3m	0.77 (-1.45,3.00)	0.72 (-0.58,2.02)	0.05 (-1.35,1.45)	0.06 (-0.13,0.26)	1.21 (0.68,2.17)
3.2y	1.09 (-1.26,3.45)	1.03 (-0.37,2.42)	0.07 (-1.43,1.57)	0.05 (-0.16,0.25)	0.78 (0.39,1.59)
7.7y	<b>2.70 (1.01,4.40)<sup>c</sup></b>	0.99 (-0.05,2.02)	1.72 (0.65,2.79)	<b>0.21 (0.07,0.35)</b>	<b>1.71 (1.07,2.72)</b>
12.9y	1.21 (-0.44,2.86)	<b>1.46 (0.48,2.43)</b>	-0.25 (-1.28,0.79)	0.10 (-0.04,0.25)	1.21 (0.75,1.95)
<b>Obese (vs. normal or underweight)</b>					
0m	2.03 (-8.16,12.21)	1.87 (-4.75,8.50)	0.15 (-6.09,6.40)	0.22 (-0.71,1.14)	1.51 (0.14,16.46)
6.3m	-1.05 (-5.24,3.14)	-0.14 (-2.66,2.38)	-0.90 (-3.48,1.67)	0.01 (-0.32,0.35)	0.72 (0.25,2.08)
3.2y	<b>5.09 (1.13,9.06)</b>	<b>2.91 (0.52,5.30)</b>	2.18 (-0.42,4.78)	0.15 (-0.19,0.49)	1.77 (0.62,5.06)
7.7y	<b>4.17 (1.94,6.39)</b>	<b>1.58 (0.20,2.96)</b>	<b>2.58 (1.10,4.06)</b>	<b>0.25 (0.06,0.45)</b>	<b>2.37 (1.23,4.59)</b>
12.9y	0.71 (-1.83,3.25)	<b>1.56 (0.02,3.10)</b>	-0.85 (-2.45,0.74)	0.13 (-0.08,0.35)	0.94 (0.47,1.87)
<b><i>Girls (n=732)</i></b>					
<b>Overweight (vs. normal or underweight)</b>					
0m	0.42 (-2.57,3.41)	0.31 (-1.43,2.04)	0.11 (-1.78,2.01)	0.02 (-0.26,0.30)	1.08 (0.42,2.81)
6.3m	0.45 (-1.90,2.80)	0.49 (-0.99,1.98)	-0.04 (-1.57,1.49)	0.10 (-0.12,0.32)	1.57 (0.71,3.46)
3.2y	0.64 (-1.98,3.27)	0.68 (-0.89,2.25)	-0.04 (-1.71,1.62)	0.06 (-0.18,0.29)	1.10 (0.46,2.66)
7.7y	<b>1.94 (0.42,3.45)</b>	<b>1.25 (0.32,2.19)</b>	0.68 (-0.28,1.64)	<b>0.24 (0.10,0.38)</b>	1.59 (0.99,2.54)
12.9y	0.91 (-0.66,2.48)	<b>1.07 (0.11,2.03)</b>	-0.16 (-1.14,0.82)	<b>0.22 (0.08,0.37)</b>	1.28 (0.79,2.09)
<b>Obese (vs. normal or underweight)</b>					
0m	-1.19 (-8.24,5.86)	-0.51 (-4.84,3.82)	-0.68 (-5.37,4.01)	-0.15 (-0.77,0.48)	0.27 (0.04,1.94)
6.3m	-0.65 (-6.36,5.05)	0.05 (-3.53,3.63)	-0.70 (-4.42,3.01)	0.06 (-0.48,0.60)	1.12 (0.19,6.74)
3.2y	-1.09 (-5.92,3.74)	-0.44 (-3.36,2.48)	-0.65 (-3.74,2.45)	0.04 (-0.40,0.47)	1.41 (0.32,6.21)
7.7y	1.32 (-0.76,3.39)	1.05 (-0.24,2.34)	0.27 (-1.03,1.57)	<b>0.22 (0.03,0.42)</b>	1.87 (0.96,3.64)
12.9y	0.92 (-1.39,3.23)	1.27 (-0.18,2.73)	-0.35 (-1.81,1.11)	0.18 (-0.04,0.40)	1.31 (0.61,2.81)

<sup>a</sup> Adjusted for maternal and paternal education level, height and BMI; maternal age, smoking history and parity; gestational age at delivery; child ethnicity; breastfeeding initiation; BMI z-score at all previous time points and age at measurement.

<sup>b</sup> OR (odds ratio) reflects relative odds of being in a higher Tanner stage category.

<sup>c</sup> Bold values indicate statistically significant associations at p<0.05.



SUPPLEMENTARY MATERIAL

**Table S6:** Complete case analyses of associations of BMI z-score with standing height, trunk and leg length, and pubertal development at 11.5 and 16 years in PROBIT.

BMI z-score	$\beta$ (95% CI) <sup>a</sup>				OR (95% CI) <sup>a,b</sup>		
	11.5y			16y	11.5y		16y
	Standing height (cm)	Trunk length (cm)	Leg length (cm)	Standing height (cm)	Genital development	Pubic hair stage	Pubic hair stage
<b>Boys</b>							
0m	<b>0.39 (0.20,0.58)<sup>c</sup></b>	<b>0.23 (0.12,0.35)</b>	<b>0.16 (0.04,0.29)</b>	<b>0.57 (0.39,0.76)</b>	1.06 (1.00,1.14)	1.05 (0.99,1.13)	1.00 (0.94,1.07)
3m	0.09 (-0.08,0.26)	<b>0.12 (0.02,0.22)</b>	-0.04 (-0.15,0.07)	-0.03 (-0.19,0.13)	1.01 (0.96,1.07)	1.06 (1.00,1.13)	<b>1.08 (1.02,1.14)</b>
12m	<b>0.35 (0.17,0.54)</b>	<b>0.29 (0.19,0.40)</b>	0.05 (-0.08,0.17)	<b>0.23 (0.05,0.42)</b>	<b>1.06 (1.00,1.13)</b>	<b>1.09 (1.02,1.16)</b>	1.02 (0.96,1.08)
6.5y	<b>1.36 (1.19,1.53)</b>	<b>1.01 (0.91,1.10)</b>	<b>0.36 (0.25,0.48)</b>	<b>0.31 (0.14,0.48)</b>	<b>1.18 (1.11,1.25)</b>	<b>1.25 (1.17,1.32)</b>	<b>1.09 (1.03,1.15)</b>
11.5y	<b>1.67 (1.49,1.84)</b>	<b>1.16 (1.06,1.26)</b>	<b>0.52 (0.39,0.64)</b>	<b>0.41 (0.22,0.60)</b>	<b>1.31 (1.23,1.40)</b>	<b>1.43 (1.34,1.53)</b>	<b>1.28 (1.20,1.37)</b>
16y	—	—	—	0.23 (-0.01,0.47)	—	—	<b>1.28 (1.19,1.39)</b>
<b>Breast development</b>							
<b>Girls</b>							
0m	<b>0.33 (0.13,0.53)</b>	<b>0.15 (0.03,0.28)</b>	<b>0.19 (0.06,0.32)</b>	<b>0.54 (0.38,0.70)</b>	1.00 (0.94,1.06)	0.97 (0.91,1.03)	0.97 (0.92,1.03)
3m	0.09 (-0.11,0.29)	<b>0.20 (0.08,0.32)</b>	-0.11 (-0.24,0.02)	-0.05 (-0.21,0.10)	<b>1.11 (1.04,1.17)</b>	<b>1.12 (1.05,1.18)</b>	1.03 (0.97,1.08)
12m	<b>0.37 (0.15,0.59)</b>	<b>0.30 (0.17,0.43)</b>	0.08 (-0.06,0.22)	0.04 (-0.14,0.21)	<b>1.13 (1.06,1.21)</b>	<b>1.13 (1.06,1.20)</b>	1.04 (0.98,1.10)
6.5y	<b>1.64 (1.44,1.83)</b>	<b>1.19 (1.08,1.31)</b>	<b>0.45 (0.33,0.58)</b>	0.01 (-0.15,0.17)	<b>1.75 (1.65,1.86)</b>	<b>1.61 (1.51,1.71)</b>	<b>1.07 (1.01,1.13)</b>
11.5y	<b>1.65 (1.45,1.85)</b>	<b>1.32 (1.20,1.43)</b>	<b>0.33 (0.20,0.46)</b>	-0.16 (-0.33,0.01)	<b>2.50 (2.33,2.68)</b>	<b>2.00 (1.87,2.14)</b>	<b>1.08 (1.02,1.15)</b>
16y	—	—	—	<b>-0.66 (-0.87,-0.45)</b>	—	—	<b>1.07 (1.00,1.15)</b>

<sup>a</sup> Adjusted for maternal and paternal education level, height and BMI; maternal age and smoking during pregnancy; gestational age at delivery; geographic region; BMI z-score at all previous time points and age at measurement.

<sup>b</sup> OR (odds ratio) reflects relative odds of being in a higher Tanner stage category.

<sup>c</sup> Bold values indicate statistically significant associations at  $p < 0.05$ .

SUPPLEMENTARY MATERIAL

**Table S7:** Complete case analyses of associations of BMI z-score with standing height, trunk and leg length, and pubertal development at 12.9 years in Project Viva.

BMI z-score	$\beta$ (95% CI) <sup>a</sup>			OR (95% CI) <sup>a,b</sup>	
	Standing height (cm)	Trunk length (cm)	Leg length (cm)	Pubertal score (units)	Pubic hair stage
<b>Boys</b>					
Birth	-0.26 (-1.37,0.84)	0.11 (-0.49,0.71)	-0.40 (-1.12,0.33)	-0.01 (-0.09,0.07)	0.89 (0.67,1.19)
6.3m	-0.05 (-1.08,0.99)	-0.03 (-0.60,0.54)	-0.03 (-0.71,0.64)	0.00 (-0.07,0.08)	1.17 (0.90,1.52)
3.2y	0.93 (-0.44,2.30)	<b>0.94 (0.17,1.70)</b>	-0.01 (-0.91,0.89)	-0.01 (-0.11,0.10)	0.88 (0.62,1.23)
7.7y	<b>1.99 (0.46,3.52)<sup>c</sup></b>	0.48 (-0.38,1.34)	<b>1.51 (0.52,2.50)</b>	<b>0.13 (0.02,0.25)</b>	1.39 (0.93,2.08)
12.9y	<b>3.14 (1.50,4.78)</b>	<b>2.07 (1.16,2.98)</b>	1.08 (-0.01,2.18)	<b>0.13 (0.00,0.26)</b>	1.50 (0.96,2.35)
<b>Girls</b>					
Birth	0.34 (-0.43,1.11)	-0.04 (-0.54,0.46)	0.38 (-0.12,0.88)	-0.01 (-0.10,0.07)	1.10 (0.83,1.47)
6.3m	0.82 (-0.08,1.72)	0.65 (0.09,1.20)	0.17 (-0.42,0.76)	0.07 (-0.03,0.17)	1.35 (0.96,1.89)
3.2y	0.40 (-0.69,1.49)	0.31 (-0.36,0.98)	0.09 (-0.59,0.77)	0.03 (-0.09,0.16)	1.05 (0.69,1.61)
7.7y	<b>1.75 (0.44,3.05)</b>	<b>1.22 (0.42,2.03)</b>	0.52 (-0.27,1.32)	<b>0.18 (0.03,0.32)</b>	<b>1.68 (1.02,2.78)</b>
12.9y	<b>1.86 (0.52,3.20)</b>	<b>1.43 (0.62,2.24)</b>	0.42 (-0.42,1.26)	<b>0.40 (0.26,0.53)</b>	<b>1.76 (1.02,3.04)</b>

<sup>a</sup> Adjusted for maternal and paternal education level, height and BMI; maternal age, smoking history and parity; gestational age at delivery; child ethnicity; breastfeeding initiation; BMI z-score at all previous time points and age at measurement.

<sup>b</sup> OR (odds ratio) reflects relative odds of being in a higher Tanner stage category.

<sup>c</sup> Bold values indicate statistically significant associations at p<0.05.