Childhood socio-economic circumstances and adult height

Introduction

Height in adulthood is known to be strongly associated with socio-economic circumstances in childhood. Parent's educational level[1], father's socio-economic status[2-5], family income[6-8], large family size[2;8] and overcrowding in the home[1;2] have all been linked to adult height. Similarly, height in childhood and adolescence[2;9;10] and the tempo of growth throughout childhood[2;9] are both associated with socio-economic position of origin.

The majority of evidence on the association of childhood socio-economic circumstances and height derives from the UK and Sweden[1-5;8;10] and it is all from countries with market economies. In market economies aspects of socio-economic circumstances such as wealth and education are strongly linked to each other(REFS) and so it is difficult to assess which aspect or aspects of socio-economic circumstance in childhood are the proximal determinants of adult height.

The communist regimes which were in operation in Eastern Europe and the former USSR for the second half of the 20th century aimed to narrow the gap in material conditions between different social and educational groups with the result that wealth and education were less closely linked than in many other countries. The availability of anthropometric and socio-economic data on people who grew up under these regimes during this era may enable us to break the confounding present in studies currently available and allow us to assess the relative importance of education and assets in determining adult height.

Adult height is associated with morbidity and mortality, in particular from cardiovascular disease[11-20]. In recent years debate has focused on whether leg length has a stronger relationship with cardiovascular disease than full height[21-24]. Leg growth[22;25] and cardiovascular disease risk[13;26-38] are both associated with childhood socio-economic circumstances, and there may be a temporal association between the critical periods for these factors. In order to clarify the debate more evidence regarding leg length and socio-economic circumstances is required.

This paper has three objectives. Firstly to investigate the association between two self-reported indices of childhood conditions: parental education and presence of household assets. Secondly to examine whether these self-reported indices are each independently associated with adult height and its components. Thirdly, the paper will draw comparisons between the effects of childhood socio-economic circumstances on anthropometry in men and women and between the three countries in the study.

Methods

The HAPIEE cohort (Health, Alcohol and Psychosocial factors In Eastern Europe) consists of more than 28 000 men and women living in Russia, Poland and the Czech Republic all of whom were born between 1933 and 1957….

Participants completed a structured personal questionnaire which included questions regarding their mother's and father's education and household assets when they were aged ten (cold tap water, hot tap water, radio, refrigerator, kitchen and toilet in the home). Measurements were taken of participant's height and trunk length. Trunk length was measured as the height from the seat of the chair to the top of the participant's head whilst the participant was seated. Trunk length was subtracted from height to give leg length, and leg to trunk length ratio was calculated.

Linear regression assessed the associations between indicators of childhood socio-economic circumstances (mother's education, father's education and assets in the home at age 10) and anthropometric measures (height, leg length, trunk length and leg to trunk length ratio). Multivariate analyses were conducted separately for men and women and for the three countries. Multivariate analyses adjusted for year of birth, to control for any secular trends in anthropometry, and for each of the other measures of childhood socio-economic circumstances.

Results

The proportion of participants who had each asset varies between the three countries and in all cases, other than hot water and radio ownership, Russia had the smallest proportion and the Czech Republic the largest (data not shown). Reflecting this, the mean number of assets in the home at age ten was highest in the Czech Republic and lowest in Russia (table 1). Proportions of parents with the upper three levels of education (vocational, secondary, university) were similar in Russia and Poland, however of those remaining more Russians than Poles had parents who had not completed their primary education (table 1). Data for the educational level of participant's parents is currently unavailable for participants from the Czech Republic.

Czech men and women were the tallest of the three nationalities and Russian men and women were the shortest. The pattern was similar for leg length. Mean trunk length showed little between country variation and consequently mean leg to trunk ratio was lowest in Russia and highest in the Czech Republic for both men and women (table 1).

In both Russia and Poland there are strong positive associations between father's educational level and assets in childhood. In Poland children whose fathers have a university education have a mean number of household assets 3 greater than those whose fathers have incomplete primary education. In Russia the corresponding value is two (table 2).

Height is linearly associated with assets in childhood in men and women in all three countries and is linearly associated with mother's and father's education in men and women and in Russia and Poland (table 3). Similar associations are seen for leg and trunk length (data not shown). Leg to trunk length ratio is not consistently linearly associated with any measure of childhood socio-economic circumstances (data not shown).

Age adjusted regression analyses showed that height, leg length and trunk length are positively and linearly associated with assets in childhood in both sexes and in all countries, with the strongest association seen with height (table 4).

Adjustment for parent's education weakens the associations, particularly in Poland, however associations are all still statistically significant at the 95% level (table 4). Associations of height, leg length and trunk length with assets in childhood are slightly stronger in Russian than Polish men. Amongst women associations with height and leg length are stronger amongst Poles but with trunk length is stronger amongst Russians.

Leg to trunk length ratio does not consistently show a linear association with assets in childhood, although there is some indication of an association amongst Polish and Czech women (table 4).

Age adjusted linear regression showed an effect of father's education on anthropometric measures in both men and women in Poland and Russia (table 5). Particularly strong was the positive effect on height, leg length and trunk length of participant's father having a university education as compared to primary education. Absolute effects are strongest on height compared to other anthropometric measures, in men and in Poland.

After adjustment for assets in childhood effects are weakened but all, other than the association between leg length and father's education in Russian women, are still statistically significant at the 95% level.

Further adjustment for mother's education showed that father's education has an independent effect on Polish men's height, leg length and trunk length and on Polish women's height and trunk length (table 5).

There is no effect of father's education on leg to trunk length ratio in the Russian population, but there is a weak effect in Poland which remained statistically significant after adjustment for childhood assets (data not shown).

Age and asset adjusted associations of mother's education and anthropometric measures are similar to those with father's education (table 6). On further adjustment for father's education mother's education was shown to have an independent effect on height, leg length and trunk length in Russian men.

Discussion

Assets in childhood and mother's and father's education are all associated with anthropometric measures including leg length, trunk length and total height. The strongest associations are seen with total height, negating the suggestion that leg length is the most plastic anthropometric measure and the one which is most vulnerable to effects of low socio-economic position in childhood. These data suggest that all types of disadvantage during childhood can negatively affect all components of height.

Assets in childhood show a positive relationship with height in all subgroups, with the strongest association showing that Russian men who had all six assets have an increase in height of 1.8cm over those who had none of the assets.

Father's education has been shown to be of greater significance in Poland than Russia, with Polish men whose father was university educated 2.5cm taller than those whose father did not complete primary education. Mother's education appears to have greatest influence in Russia, where men whose mother has a university education are 3.1cm taller than those whose mother did not complete primary education. Russian women are the only subgroup that did not show an independent effect of either mother's or father's education on their height.

The data also show that there are differences between the different countries of Eastern Europe and the former USSR in terms of the effect of childhood disadvantage on growth.

Figures

Table 1 (1a). Description of childhood socioeconomic circumstances

Measure of SES in childhood		Czech Republic		Russia		Poland	
		Men	Women	Men	Women	Men	Women
Childhood assets score	N	3583	3924	3980	4783	4820	
	0 (%)	1.2	0.7	10.0	9.4	6.4	5.4
	1 (%)	3.3	2.3	35.8	32.8	13.2	11.9
	2 (%)	9.5	8.8	24.8	26.7	21.2	19.7
	3 (%)	17.7	18.5	10.3	11.8	15.8	15.8
	4 (%)	29.9	30.6	6.2	6.7	11.5	12.6
	5 (%)	17.8	18.0	4.7	4.9	12.2	12.2
	6 (%)	20.7	21.1	8.4	7.7	19.8	22.5
	Mean [SD]	4.1 [1.4]	4.1 [1.4]	2.1 [1.7]	2.2 [1.7]	3.3 [1.9]	3.5 [1.9]
Mother's education	N			4043	4829	5178	5440
	Less than primary (%)	-	-	25.5	28.7	10.5	10.0
	Primary (%)	-	-	31.8	30.3	51.7	51.8
	Vocational (%)	-	-	15.7	16.9	13.3	13.6
	Secondary (%)	-	-	21.4	19.8	20.4	20.2
	University (%)	-	-	5.5	4.3	4.1	4.5
Father's education	N	-	-	3939	4689	5168	5424
	Less than primary (%)	-	-	19.7	21.9	8.9	8.5
	Primary (%)	-	-	32.5	30.8	42.2	41.8
	Vocational (%)	-	-	18.0	19.5	20.9	20.9
	Secondary (%)	-	-	20.2	19.3	16.8	18.1
	University (%)	-	-	9.6	8.4	11.2	10.7
Anthropometry	N	3265	3857	4133	4919	4501	4754
Height (cm)	Mean [SD]	174.8 [6.5]	161.9 [6.1]	171.0 [6.4]	158.1 [6.0]	172.2 [6.3]	159.4 [5.9]
Leg length (cm)	Mean [SD]	84.8 [4.6]	77.1 [4.3]	80.7 [4.4]	73.0 [4.2]	81.8 [4.5]	74.3 [4.3]
Trunk length (cm)	Mean [SD]	90.0 [3.9]	84.8 [3.8]	90.3 [3.5]	85.1 [3.3]	90.4 [3.6]	85.1 [3.4]
Leg to trunk ratio	Mean [SD]	0.94 [0.1]	0.91 [0.1]	0.89 [0.1]	0.86 [0.1]	0.91 [0.1]	0.87 [0.1]

Table 2 (4.b) Mean amenities score, by father's educational level, country and sex

Parent's educational level		Russia				Poland			
		Men		Women		Men		Women	
		N	Mean amenities score [SD]	N	Mean amenities score [SD]	N	Mean amenities score [SD]	N	Mean amenities score [SD]
Father	< Primary	748	1.32 [1.20]	1009	1.47 [1.28]	423	1.84 [1.44]	422	1.96 [1.45]
	Primary	1246	1.92 [1.52]	1397	1.96 [1.28]	2030	2.54 [1.66]	2084	2.70 [1.70]
	Vocational	670	2.60 [1.70]	887	2.51 [1.68]	993	3.76 [1.78]	1007	3.86 [1.72]
	Secondary	764	2.36 [1.68]	877	2.65 [1.71]	804	4.32 [1.63]	893	4.53 [1.55]
	University	361	3.47 [2.00]	379	3.41 [1.96]	536	4.87 [1.43]	518	5.08 [1.34]
	p for trend		<0.001		<0.001		<0.001		<0.001
Mother	< Primary	1000	1.34 [1.21]	1357	1.47 [1.24]	498	2.05 [1.63]	496	2.13 [1.57]
	Primary	1237	1.96 [1.52]	1408	2.02 [1.48]	2484	2.73 [1.73]	2566	2.88 [1.74]
	Vocational	607	2.83 [1.79]	788	2.78 [1.74]	640	3.99 [1.69]	662	4.18 [1.67]
	Secondary	834	2.50 [1.69]	926	2.72 [1.71]	976	4.56 [1.58]	991	4.73 [1.48]
	University	211	3.74 [1.97]	201	3.73 [1.91]	194	4.85 [1.50]	224	5.11 [1.31]
	p for trend		<0.001		<0.001		<0.001		<0.001

Table 3 (21a). Association of height with measures of childhood socio-economic status, by sex and country.

SES measure		Czech Rep.				Russia				Poland			
		Men		Women		Men		Women		Men		Women	
		N	Mean height	N	Mean height	N	Mean height	N	Mean height	N	Mean height	N	Mean height
Amenities score	0	35	172.7	24	159.1	395	169.2	449	156.4	254	170.2	225	157.5
	1	100	171.6	75	158.8	1432	170.4	1584	157.2	567	170.0	514	157.8
	2	277	173.4	299	160.5	1006	170.9	1301	158.0	874	171.4	861	158.6
	3	519	173.9	611	160.8	428	171.6	582	159.2	663	171.6	690	158.8
	4	912	174.4	1026	161.4	260	172.5	349	159.1	488	172.7	543	159.5
	5	518	176.0	595	163.4	198	173.3	243	159.8	486	173.0	512	160.1
	6	602	176.5	716	164.0	379	174.0	415	161.3	832	174.4	959	161.3
	p for trend		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001
Mother's education	< Primary	-	-	-	-	1044	169.6	1395	156.8	469	170.7	467	158.1
	Primary	-	-	-	-	1320	170.8	1501	158.3	2330	171.4	2460	158.9
	Vocational	-	-	-	-	668	171.9	844	158.6	577	172.8	642	160.1
	Secondary	-	-	-	-	906	172.1	1010	159.4	923	173.9	949	160.4
	University	-	-	-	-	226	174.5	223	161.0	167	175.3	195	161.9
	p for trend	-	-	-	-		<0.001		<0.001		<0.001		<0.001
Father's education	< Primary	-	-	-	-	787	169.6	1040	156.8	397	170.2	393	158.0
	Primary	-	-	-	-	1309	170.8	1484	158.4	1883	171.2	1999	158.6
	Vocational	-	-	-	-	736	171.9	948	158.6	934	172.5	972	159.7
	Secondary	-	-	-	-	836	171.8	947	158.9	753	173.7	833	160.3
	University	-	-	-	-	385	172.9	407	159.9	490	174.7	503	161.3
	p for trend	-	-	-	-		<0.001		<0.001		<0.001		<0.001

or shall I put this here as table 3???

Table 55. Linear association of anthropometric measures with measures of childhood SEP (p for trend)

Anthropometry	SES measure	Czech Rep.		Russia		Poland	
		Men	Women	Men	Women	Men	Women
Height	Assets score	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Mother's education	-	-	<0.001	<0.001	<0.001	<0.001

	Father's education	-	-	<0.001	<0.001	<0.001	<0.001
Leg length	Assets score	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Mother's education	-	-	<0.001	<0.001	<0.001	<0.001
	Father's education	-	-	<0.001	<0.001	<0.001	<0.001
Trunk length	Assets score	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Mother's education	-	-	<0.001	<0.001	<0.001	<0.001
	Father's education	-	-	<0.001	<0.001	<0.001	<0.001
Leg to trunk length ratio	Assets score	0.255	0.032	0.852	<0.001	0.044	0.849
	Mother's education	-	-	0.581	0.042	0.004	0.176
	Father's education	-	-	0.480	0.042	0.001	0.357

Table 4 (46c). Association of anthropometric measures with assets in childhood

Sex	Anthropometric measure	Adjusted for	Czech Rep. *	p	Russia *	p	Poland *	p
Men	Height	Age	0.39 [0.09]	<0.001	0.40 [0.06]	<0.001	0.48 [0.05]	<0.001
		Age, parent's ed.	-	-	0.30 [0.07]	<0.001	0.24 [0.06]	<0.001
	Leg length	Age	0.20 [0.07]	0.003	0.22 [0.05]	<0.001	0.30 [0.04]	<0.001
		Age, parent's ed.	-	-	0.18 [0.05]	<0.001	0.15 [0.04]	0.001
	Trunk length	Age	0.18 [0.06]	0.001	0.18 [0.04]	<0.001	0.18 [0.03]	<0.001
		Age, parent's ed.	-	-	0.12 [0.04]	0.002	0.10 [0.03]	0.004
	Leg to trunk length ratio†	Age	0.37 [0.88]	0.673	0.73 [0.54]	0.171	1.52 [0.49]	0.002
		Age, parent's ed.	-	-	0.89 [0.57]	0.121	0.62 [0.55]	0.263
Women	Height	Age	0.43 [0.09]	<0.001	0.26 [0.06]	<0.001	0.38 [0.05]	<0.001
		Age, parent's ed.	-	-	0.22 [0.06]	<0.001	0.24 [0.06]	<0.001
	Leg length	Age	0.29 [0.06]	<0.001	0.11 [0.04]	0.009	0.25 [0.04]	<0.001
		Age, parent's ed.	-	-	0.09 [0.04]	0.046	0.17 [0.04]	<0.001
	Trunk length	Age	0.15 [0.05]	0.005	0.15 [0.03]	<0.001	0.13 [0.03]	<0.001
		Age, parent's ed.	-	-	0.13 [0.03]	<0.001	0.07 [0.03]	0.033
	Leg to trunk length ratio†	Age	1.84 [0.86]	0.033	-0.25 [0.52]	0.626	1.52 [0.50]	0.002
		Age, parent's ed.	-	-	-0.29 [0.55]	0.594	1.33 [0.57]	0.021

*regression coefficient [SE]
† $x10^{-3}$

Table 5 (45b). Age and asset adjusted association of anthropometric measures with father's education

Sex	Anthropo-metric measure	Country	Adjusted for	Father's educational level					p for trend
				< Primary*	Primary *	Vocational*	Secondary*	University*	
Men	Height (cm)	Russia	Age	-0.41 [0.28]	0	0.95 [0.29]	0.45 [0.28]	1.71 [0.36]	<0.001
			Age, assets	-0.41 [0.29]	0	0.84 [0.30]	0.35 [0.28]	1.31 [0.38]	<0.001
			Age, assets, mother's ed	-0.03 [0.30]	0	0.36 [0.32]	-0.26 [0.32]	0.46 [0.43]	0.877
		Poland	Age	-0.47 [0.33]	0	0.80 [0.24]	2.00 [0.26]	2.92 [0.31]	<0.001
			Age, assets	-0.46 [0.35]	0	0.59 [0.26]	1.59 [0.29]	2.34 [0.34]	<0.001
			Age, assets, mother's ed	-0.39 [0.37]	0	0.52 [0.27]	1.42 [0.35]	2.10 [0.45]	<0.001
	Leg length (cm)	Russia	Age	-0.06 [0.20]	0	0.46 [0.20]	0.16 [0.20]	1.04 [0.25]	<0.001
			Age, assets	-0.08 [0.20]	0	0.36 [0.21]	0.08 [0.20]	0.80 [0.27]	0.011
			Age, assets, mother's ed	0.19 [0.21]	0	0.01 [0.22]	-0.36 [0.22]	0.18 [0.30]	0.351
		Poland	Age	-0.29 [0.24]	0	0.37 [0.18]	1.14 [0.19]	1.92 [0.22]	<0.001
			Age, assets	-0.34 [0.25]	0	0.24 [0.19]	0.91 [0.21]	1.54 [0.25]	<0.001
			Age, assets, mother's ed	-0.26 [0.27]	0	0.17 [0.20]	0.76 [0.25]	1.33 [0.33]	<0.001
	Trunk length (cm)	Russia	Age	-0.35 [0.16]	0	0.49 [0.16]	0.29 [0.15]	0.66 [0.20]	<0.001
			Age, assets	-0.33 [0.16]	0	0.48 [0.16]	0.27 [0.16]	0.52 [0.21]	<0.001
			Age, assets, mother's ed	-0.22 [0.17]	0	0.35 [0.18]	0.10 [0.18]	0.27 [0.24]	0.143
		Poland	Age	-0.18 [0.19]	0	0.43 [0.14]	0.86 [0.15]	1.01 [0.18]	<0.001
			Age, assets	-0.13 [0.20]	0	0.36 [0.15]	0.68 [0.16]	0.80 [0.20]	<0.001
			Age, assets, mother's ed	-0.13 [0.21]	0	0.34 [0.15]	0.66 [0.20]	0.77 [0.26]	0.001
Women	Height (cm)	Russia	Age	-0.62 [0.24]	0	-0.07 [0.24]	-0.10 [0.24]	1.04 [0.32]	<0.001
			Age, assets	-0.55 [0.24]	0	-0.11 [0.24]	0.16 [0.25]	0.83 [0.34]	0.007
			Age, assets, mother's ed	-0.39 [0.25]	0	-0.31 [0.26]	-0.42 [0.28]	0.48 [0.38]	0.412
		Poland	Age	-0.19 [0.31]	0	0.70 [0.22]	1.28 [0.23]	2.12 [0.28]	<0.001
			Age, assets	-0.19 [0.32]	0	0.33 [0.24]	0.86 [0.26]	1.53 [0.32]	<0.001
			Age, assets, mother's ed	-0.15 [0.34]	0	0.30 [0.25]	0.77 [0.32]	1.40 [0.43]	0.002
	Leg length (cm)	Russia	Age	-0.29 [0.17]	0	-0.10 [0.17]	-0.14 [0.18]	0.56 [0.24]	0.029
			Age, assets	-0.24 [0.17]	0	-0.09 [0.18]	-0.14 [0.18]	0.52 [0.25]	0.082
			Age, assets, mother's ed	-0.14 [0.18]	0	-0.24 [0.19]	-0.32 [0.21]	0.27 [0.28]	0.836
		Poland	Age	0.08 [0.24]	0	0.36 [0.17]	0.64 [0.18]	1.46 [0.21]	<0.001
			Age, assets	0.13 [0.25]	0	0.09 [0.18]	0.34 [0.20]	1.05 [0.24]	<0.001

		Age, assets, mother's ed	0.22 [0.26]	0	0.03 [0.19]	0.19 [0.24]	0.82 [0.32]	0.107
Trunk length (cm)	Russia	Age	-0.33 [0.13]	0	0.03 [0.13]	0.04 [0.13]	0.47 [0.18]	<0.001
		Age, assets	-0.30 [0.13]	0	-0.02 [0.13]	-0.02 [0.14]	0.31 [0.18]	0.009
		Age, assets, mother's ed	-0.25 [0.14]	0	-0.07 [0.14]	-0.10 [0.15]	0.20 [0.20]	0.222
	Poland	Age	-0.27 [0.18]	0	0.34 [0.13]	0.64 [0.13]	0.66 [0.16]	<0.001
		Age, assets	-0.32 [0.18]	0	0.24 [0.14]	0.52 [0.15]	0.48 [0.18]	<0.001
		Age, assets, mother's ed	-0.37 [0.20]	0	0.27 [0.14]	0.58 [0.18]	0.58 [0.24]	0.001

*regression coefficient [SE]
† $x10^{-3}$

Table 6 (53). Age and asset adjusted association of anthropometric measures with mother's education

Sex	Anthropo-metric measure	Country	Adjusted for	Father's educational level					p for trend
				< Primary*	Primary*	Vocational*	Secondary*	University*	
Men	Height (cm)	Russia	Age	-0.38 [0.26]	0	0.70 [0.30]	0.77 [0.27]	3.17 [0.45]	<0.001
			Age, assets	-0.34 [0.27]	0	0.48 [0.31]	0.72 [0.28]	2.82 [0.47]	<0.001
			Age, assets, father's ed.	-0.32 [0.29]	0	0.42 [0.33]	0.72 [0.31]	2.77 [0.52]	<0.001
		Poland	Age	-0.27 [0.31]	0	0.69 [0.28]	1.85 [0.24]	3.08 [0.49]	<0.001
			Age, assets	-0.24 [0.32]	0	0.42 [0.30]	1.31 [0.27]	2.47 [0.52]	<0.001
			Age, assets, father's ed.	0.26 [0.34]	0	-0.06 [0.32]	0.28 [0.35]	0.95 [0.61]	0.441
	Leg length (cm)	Russia	Age	-0.20 [0.18]	0	0.23 [0.21]	0.37 [0.19]	2.02 [0.31]	<0.001
			Age, assets	-0.20 [0.19]	0	0.10 [0.22]	0.34 [0.19]	1.82 [0.33]	<0.001
			Age, assets, father's ed.	-0.24 [0.20]	0	0.12 [0.23]	0.44 [0.22]	1.92 [0.36]	<0.001
		Poland	Age	-0.02 [0.22]	0	0.37 [0.21]	1.18 [0.17]	2.19 [0.35]	<0.001
			Age, assets	-0.05 [0.23]	0	0.19 [0.22]	0.88 [0.19]	1.72 [0.38]	<0.001
			Age, assets, father's ed.	0.26 [0.24]	0	-0.09 [0.23]	0.29 [0.25]	0.84 [0.44]	0.323
	Trunk length (cm)	Russia	Age	-0.18 [0.14]	0	0.47 [0.16]	0.39 [0.15]	1.15 [0.25]	<0.001
			Age, assets	-0.14 [0.15]	0	0.39 [0.17]	0.38 [0.15]	1.00 [0.26]	<0.001
			Age, assets, father's ed.	-0.07 [0.16]	0	0.30 [0.18]	0.28 [0.17]	0.85 [0.29]	0.011
		Poland	Age	-0.25 [0.17]	0	0.32 [0.16]	0.67 [0.14]	0.89 [0.28]	<0.001
			Age, assets	-0.19 [0.18]	0	0.23 [0.17]	0.43 [0.15]	0.75 [0.29]	<0.001
			Age, assets, father's ed.	0.01 [0.19]	0	0.04 [0.18]	-0.02 [0.20]	0.12 [0.35]	0.928
Women	Height (cm)	Russia	Age	-0.44 [0.22]	0	-0.07 [0.25]	0.34 [0.24]	1.77 [0.42]	<0.001
			Age, assets	-0.44 [0.22]	0	-0.22 [0.25]	0.19 [0.24]	1.46 [0.44]	0.001
			Age, assets, father's ed.	-0.30 [0.24]	0	-0.37 [0.27]	-0.01 [0.28]	1.23 [0.47]	0.080
		Poland	Age	-0.37 [0.29]	0	0.80 [0.25]	1.07 [0.22]	2.29 [0.42]	<0.001
			Age, assets	-0.32 [0.30]	0	0.38 [0.27]	0.55 [0.25]	1.83 [0.45]	<0.001
			Age, assets, father's ed.	0.00 [0.32]	0	0.05 [0.29]	-0.15 [0.32]	0.89 [0.53]	0.634
	Leg length (cm)	Russia	Age	-0.19 [0.16]	0	0.10 [0.18]	0.22 [0.17]	0.89 [0.31]	0.002
			Age, assets	-0.19 [0.16]	0	-0.15 [0.19]	0.15 [0.18]	0.79 [0.32]	0.013
			Age, assets, father's ed.	-0.14 [0.18]	0	-0.19 [0.20]	0.09 [0.20]	0.72 [0.34]	0.113
		Poland	Age	-0.04 [0.22]	0	0.42 [0.19]	0.76 [0.16]	1.61 [0.32]	<0.001
			Age, assets	0.07 [0.23]	0	0.09 [0.21]	0.43 [0.19]	1.34 [0.34]	0.001

		Age, assets, father's ed.	0.18 [0.24]	0	-0.06 [0.22]	0.14 [0.25]	0.96 [0.40]	0.288
Trunk length (cm)	Russia	Age	-0.25 [0.12]	0	0.04 [0.14]	0.12 [0.13]	0.87 [0.23]	<0.001
		Age, assets	-0.24 [0.12]	0	-0.07 [0.14]	0.04 [0.13]	0.67 [0.24]	0.003
		Age, assets, father's ed.	-0.16 [0.13]	0	-0.18 [0.15]	-0.10 [0.15]	0.51 [0.26]	0.283
	Poland	Age	-0.34 [0.16]	0	0.38 [0.14]	0.32 [0.12]	0.68 [0.24]	<0.001
		Age, assets	-0.38 [0.17]	0	0.29 [0.15]	0.12 [0.14]	0.48 [0.26]	0.006
		Age, assets, father's ed.	-0.18 [0.18]	0	0.11 [0.16]	-0.29 [0.18]	-0.08 [0.30]	0.560

Reference List

1. Kuh DL,.Wadsworth M. Parental Height - Childhood Environment and Subsequent Adult Height in A National Birth Cohort. *Int.J.Epidemiol.* 1989;**18**:663-8.

2. Li L, Manor O, Power C. Early environment and child-to-adult growth trajectories in the 1958 British birth cohort. *Am J Clin Nutr* 2004;**80**:185-92.

3. Nystrom Peck AM,.Vagero DH. Adult Body Height and Childhood Socioeconomic Group in the Swedish Population. *J Epidemiol Community Health* 1987;**41**:333-7.

4. Kuh DL, Power C, Rodgers B. Secular Trends in Social-Class and Sex-Differences in Adult Height. *Int.J.Epidemiol.* 1991;**20**:1001-9.

5. Walker M, Shaper AG, Wannamethee G. Height and Social-Class in Middle-Aged British Men. *J Epidemiol Community Health* 1988;**42**:299-303.

6. Gigante DP, Horta BL, Lima RC, Barros FC, Victora CG. Early life factors are determinants of female height at age 19 years in a population-based birth cohort (Pelotas, Brazil). *Journal of Nutrition* 2006;**136**:473-8.

7. Monteiro CA, Benicio MHD, Gouveia ND. Secular Growth Trends in Brazil Over 3 Decades. *Annals of Human Biology* 1994;**21**:381-90.

8. Nystrom Peck AM,.Lundberg O. Short stature as an effect of economic and social conditions in childhood. *Social Science & Medicine* 1995;**41**:733-8.

9. Cole TJ. Secular trends in growth. *Proceedings of the Nutrition Society* 2000;**59**:317-24.

10. Billewicz WZ, Thomson AM, Fellowes HM. A Longitudinal-Study of Growth in Newcastle-Upon-Tyne Adolescents. *Annals of Human Biology* 1983;**10**:125-33.

11. Davey Smith G, Hart C, Upton M, Hole D, Gillis C, Watt G *et al*. Height and risk of death among men and women: aetiological implications of associations with cardiorespiratory disease and cancer mortality. *J Epidemiol Community Health* 2000;**54**:97-103.

12. Greig M, Pemberton J, Hay I, MacKenzie G. A prospective study of the development of coronary heart disease in a group of 1202 middle-aged men. *J Epidemiol Community Health* 1980;**34**:23-30.

13. Notkola V, Punsar S, Karvonen MJ, Haapakoski J. Socio-economic conditions in childhood and mortality and morbidity caused by coronary heart disease in adulthood in rural Finland. *Social Science & Medicine* 1985;**21**:517-23.

14. Hebert PR, Rich-Edwards JW, Manson JE, Ridker PM, Cook NR, O'Connor GT *et al*. Height and incidence of cardiovascular disease in male physicians. *Circulation* 1993;**88**:1437-43.

15. Nystrom Peck AM,.Vagero D. Adult body height, self perceived health and mortality in the Swedish population. *J Epidemiol Community Health* 1989;**43**:380-4.

16. Palmer JR, Rosenberg L, Shapiro S. Stature and the risk of myocardial infarction in women. *Am.J.Epidemiol.* 1990;**132**:27-32.

17. Walker M, Shaper A, Phillips A, Cook D. Short stature, lung function and risk of a heart attack. *Int.J.Epidemiol.* 1989;**18**:602-6.

18. Wamala SP, Mittleman MA, Horsten M, Schenck-Gustafsson K, Orth-Gomer K. Short stature and prognosis of coronary heart disease in women. *Journal of Internal Medicine* 1999;**245**:557.

19. Marmot MG, Shipley MJ, Rose G. Inequalities in Death - Specific explanations of a general pattern? *The Lancet* 1984;**323**:1003-6.

20. Silventoinen K, Kaprio J, Koskenvuo M, Lahelma E. The association between body height and coronary heart disease among Finnish twins and singletons. *Int.J.Epidemiol.* 2003;**32**:78-82.

21. Davey Smith G, Greenwood R, Gunnell D, Sweetnam P, Yarnell J, Elwood P. Leg length, insulin resistance, and coronary heart disease risk: The Caerphilly Study. *J Epidemiol Community Health* 2001;**55**:867-72.

22. Gunnell DJ, Davey Smith G, Frankel S, Nanchahal K, Braddon FE, Pemberton J *et al*. Childhood leg length and adult mortality: follow up of the Carnegie (Boyd Orr) Survey of Diet and Health in Pre-war Britain. *J Epidemiol Community Health* 1998;**52**:142-52.

23. Langenberg C, Hardy R, Breeze E, Kuh D, Wadsworth MEJ. Influence of short stature on the change in pulse pressure, systolic and diastolic blood pressure from age 36 to 53 years: an analysis using multilevel models. *Int.J.Epidemiol.* 2005;**34**:905-13.

24. Gunnell DJ, Whitley E, Upton MN, McConnachie A, Davey Smith G, Watt GCM. Associations of height, leg length, and lung function with cardiovascular risk factors in the Midspan Family Study. *J Epidemiol Community Health* 2003;**57**:141-6.

25. Wadsworth MEJ, Hardy RJ, Paul AA, Marshall SF, Cole TJ. Leg and trunk length at 43 years in relation to childhood health, diet and family circumstances; evidence from the 1946 national birth cohort. *Int.J.Epidemiol.* 2002;**31**:383-90.

26. Wamala SP, Lynch J, Kaplan GA. Women's exposure to early and later life socioeconomic disadvantage and coronary heart disease risk: the Stockholm Female Coronary Risk Study. *Int.J.Epidemiol.* 2001;**30**:275-84.

27. Lawlor DA, Davey Smith G, Ebrahim S. Association Between Childhood Socioeconomic Status and Coronary Heart Disease Risk Among Postmenopausal Women: Findings From the British Women's Heart and Health Study. *Am J Public Health* 2004;**94**:1386-92.

28. Bartley M, Sacker A, Firth D, Fitzpatrick R. Understanding social variation in cardiovascular risk factors in women and men: the advantage of theoretically based measures. *Social Science & Medicine* 1999;**49**:831-45.

29. Sparen P, Vagero D, Shestov D, Plavinskaja S, Parfenova N, Hoptiar V *et al*. Long term mortality after severe starvation during the siege of Leningrad: prospective cohort study. *BMJ* 2004;**328**:11.

30. Davey Smith G, Lynch J. Life course approaches to socioeconomic differentials in health. In Kuh D, Ben-Shlomo Y, eds. *A life course approach to chronic disease epidemiology*, pp 77-115. Oxford: Oxford University Press, 2004.

31. Davey Smith G, McCarron P, Okasha M, McEwen J. Social circumstances in childhood and cardiovascular disease mortality: prospective observational study of Glasgow University students. *J Epidemiol Community Health* 2001;**55**:340-1.

32. Claussen B, Davey Smith G, Thelle D. Impact of childhood and adulthood socioeconomic position on cause specific mortality: the Oslo Mortality Study. *J Epidemiol Community Health* 2003;**57**:40-5.

33. Wannamethee SG, Whincup PH, Shaper G, Walker M. Influence of fathers' social class on cardiovascular disease in middle-aged men. *The Lancet* 1996;**348**:1259-63.

34. Naess O, Hernes FH, Blane D. Life-course influences on mortality at older ages: Evidence from the Oslo Mortality Study. *Social Science & Medicine* 2006;**62**:329-36.

35. O'Rand AM,.Hamil-Luker J. Processes of cumulative adversity: Childhood disadvantage and increased risk of heart attack across the life course. *Journals of Gerontology Series B-Psychological Sciences and Social Sciences* 2005;**60**:117-24.

36. Naess O, Claussen B, Thelle DS, Smith GD. Cumulative deprivation and cause specific mortality. A census based study of life course influences over three decades. *J Epidemiol Community Health* 2004;**58**:599-603.

37. Beebe-Dimmer J, Lynch JW, Turrell G, Lustgarten S, Raghunathan T, Kaplan GA. Childhood and adult socioeconomic conditions and 31-year mortality risk in women. *Am.J.Epidemiol.* 2004;**159**:481-90.

38. Davey Smith G,.Hart C. Life-Course Socioeconomic and Behavioral Influences on Cardiovascular Disease Mortality: The Collaborative Study. *Am J Public Health* 2002;**92**:1295-8.