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Can resource dilution explain differences in height by birth order and family size? A study of 389,287 male recruits in twentieth-century Netherlands

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Table 1: Height at age 18 by conscript education, father's occupation, place of birth, family size and religion (Univariate distributions)

Variable	N	%	Mean height, cm	Height SD
Birth order				
1	123,444	31.7%	177.8	6.5
2	104,687	26.9%	177.7	6.4
3	70,615	18.1%	177.4	6.4
4	39,451	10.1%	177.0	6.4
5	21,699	5.77%	176.7	6.3
6	12,271	3.35%	176.3	6.3
7	7,056	1.8%	176.2	6.4
8	4,151	1.1%	176.1	6.5
9+	5,913	1.5%	175.4	6.3
Family size				
1	19,680	5.1%	177.9	6.5
2	66,701	17.1%	178.2	6.5
3	76,553	19.7%	178.0	6.4
4	65,382	16.8%	177.6	6.4
5	48,719	12.5%	177.2	6.4
6	35,353	9.1%	176.8	6.3
7	25,366	6.5%	176.6	6.4
8	17,748	4.6%	176.4	6.3
9+	33,785	8.7%	175.9	6.4
Religion				
Roman-Catholic	160,646	41.3%	176.4	6.3
Protestant	159,626	41.0%	178.2	6.4
None	66,897	17.2%	178.1	6.4
Other and Unknown	2,118	0.5%	176.5	6.9
Place of Birth				

North/East Selected Cities	17,984	4.6%	178.7	6.5
Else North/East	102,214	26.3%	177.8	6.4
West selected cities	93,682	24.1%	177.8	6.5
Else West	83,925	21.6%	178.2	6.4
Zeeland	9,449	2.4%	177.0	6.2
South selected cities	24,256	6.2%	175.7	6.3
Else South	57,777	14.8%	175.2	6.2
Father's Occupation				
Laborers	41,027	10.5%	176.1	6.4
Domestic and Retail assistants	120,133	30.9%	176.7	6.4
Farming	46,319	11.9%	177.4	6.4
Clerical and self-employed	106,566	27.4%	178.2	6.3
Professional and managerial	56,808	14.6%	178.5	6.4
Unknown	18,434	4.7%	177.0	6.6
Education				
Less than primary	20,085	5.2%	174.8	6.6
Primary (6 years)	56,808	14.6%	175.8	6.4
Primary + 2 years	154,226	39.6%	177.2	6.3
Primary + 4 years	107,667	27.7%	178.2	6.3
Primary + 6 years	38,113	9.8%	179.0	6.3
Primary + 6+ years	12,388	3.2%	179.9	6.3
Height				
Less than 170 cm	42,204	10.8%	166.5	2.6
170-174 cm	85,525	22.0%	172.3	1.4
175-179 cm	118,031	30.3%	177.0	1.4
180-184 cm	90,923	23.4%	181.8	1.4
185 cm and greater	52,604	13.5%	187.9	2.9
All	389,287	100%	177.4	6.6

Table 2: Height at age 18 in relation to conscript birth order and family size, cm (SD) and number of observations

Family Size		1	2	3	4	5	6	7	8	9+	Total	Range
Birth order												
1 cm		177.9	178.2	178.0	177.6	177.3	177.1	176.8	176.5	176.4	177.8 8	1.6
SD		6.5	6.5	6.5	6.4	6.5	6.4	6.5	6.3	6.4	6.5	
n		19,680	33,602	26,018	17,318	10,579	6,551	4,029	2,401	3,266	123,444	
2 cm		-	178.2	177.9	177.5	177.3	176.9	176.9	176.6	176.3	177.7	1.9
SD		-	6.4	6.4	6.4	6.3	6.4	6.4	6.3	6.3	6.4	
n		-	33,099	26,770	17,528	10,694	6,536	4,066	2,538	3,456	104,687	
3 cm		-	-	178.0	177.6	177.2	176.8	176.5	176.5	176.0	177.4	1.5
SD		-	-	6.5	6.4	6.4	6.3	6.4	6.3	6.4	6.4	
N		-	-	23,765	17,241	11,330	6,981	4,557	2,749	3,992	70,615	
4 cm		-	-	-	177.6	177.3	176.8	176.4	176.3	176.2	177.0	1.4
SD		-	-	-	6.4	6.4	6.3	6.3	6.3	6.3	6.4	
N		-	-	-	13,295	8,877	6,218	4,250	2,652	4,159	39,451	
5 cm		-	-	-	-	177.1	176.9	176.6	176.2	175.9	176.7	1.2
SD		-	-	-	-	6.3	6.4	6.1	6.2	6.4	6.3	
n		-	-	-	-	7,239	4,772	3,216	2,397	4,075	21,699	
6 cm		-	-	-	-	-	176.5	176.5	176.3	175.7	176.3	0.8
SD		-	-	-	-	-	6.3	6.3	6.4	6.3	6.3	
N		-	-	-	-	-	4,295	2,640	1,809	3,527	12,271	
7 cm		-	-	-	-	-	-	176.4	176.3	175.9	176.2	0.5
SD		-	-	-	-	-	-	6.5	6.3	6.3	6.4	
N		-	-	-	-	-	-	2,608	1,586	2,862	7,056	
8 cm		-	-	-	-	-	-	-	176.2	176.0	176.1	0.2
SD		-	-	-	-	-	-	-	6.4	6.5	6.5	
N		-	-	-	-	-	-	-	1,616	2,535	4,151	
9+ cm		-	-	-	-	-	-	-	-	175.4	175.4	n.a.
SD		-	-	-	-	-	-	-	-	6.3	6.3	
n		-	-	-	-	-	-	-	-	5,913	5,913	
Total		177.9	178.2	178.0	177.6	177.2	176.8	176.6	176.4	176.0	177.4	
		6.5	6.5	6.4	6.4	6.4	6.4	6.4	6.3	6.4	6.4	
		19,680	66,701	76,553	65,382	48,719	35,353	25,366	17,748	33,785	389,287	
Range		n.a.	0	0.1	1.1	0.2	0.6	0.5	0.4	1.0		

Table 3: Height at age 18 in relation to conscript birth order and family size

Height cm change (95% confidence interval) associated with each unit increase in Birth order (1-9)

or Family size (1-9) as ordered categorical variables. Model D adjusted for selected covariates, from linear regression models.

	Model A Family Size		Model B Birth Order		Model C Family Size and Birth Order		Model D Family Size and Birth Order adjusted for Religion and Place of Birth	
	Non-manual	Manual	Non-manual	Manual	Non-Manual	Manual	Non-Manual	Manual
<i>Intercept</i>	178.6	177.4	178.6	177.4	178.6	177.4	177.3	176.1
<i>Family Size</i>								
1	Reference	Reference			Reference	Reference	Reference	Reference
2	.30 .15 to .45	.04 -.11 to .19	-	-	.32 .16 to .47	.03 -.12 to .19	.31 .15 to .46	.01 -.14 to .16
3	.22 .07 to .37	-.33 -.48 to -.18	-	-	.27 .12 to .43	-.35 -.50 to -.19	.35 .20 to .51	-.27 -.43 to -.12
4	-.13 -.28 to .02	-.69 -.84 to -.54	-	-	-.05 -.21 to .11	-.72 -.87 to -.56	.19 .03 to .35	-.55 -.70 to .39
5	-.49 -.65 to -.33	-.98 -1.13 to -.83	-	-	-.36 -.53 to -.19	-1.00 -1.17 to -.84	.03 -.14 to .20	-.73 -.89 to -.57
6	-.87 -1.04 to -.70	-1.31 -1.47 to -1.15	-	-	-.70 -.88 to -.52	-1.31 -1.49 to -1.14	-.17 -.35 to .01	-.97 -1.14 to -.80
7	-1.17 -1.35 to -.98	-1.51 -1.68 to -1.34	-	-	-.96 -1.16 to -.77	-1.51 -1.69 to -1.33	-.34 -.53 to -.14	-1.12 -1.30 to -.94
8	-1.45 -1.65 to -1.25	-1.64 -1.83 to -1.46	-	-	-1.23 -1.44 to -1.02	-1.63 -1.83 to -.43	-.52 -.73 to -.31	-1.20 -1.40 to -1.01
9+	-1.91 -2.08 to -1.74	-2.06 -2.22 to -1.90	-	-	-1.54 -1.74 to -1.35	-1.96 -2.14 to -1.78	-.76 -.95 to -.56	-1.49 -1.68 to -1.31
<i>Birth Order</i>								
1			Reference	Reference	Reference	Reference	Reference	Reference
2	-	-	-.04 -.12 to .03	-.08 -.16 to -.01	-.03 -.11 to .05	.01 -.07 to .09	-.06 -.14 to .02	-.02 -.09 to .06
3	-	-	-.34 -.43 to -.25	-.36 -.44 to -.27	-.13 -.22 to -.03	.04 -.05 to .13	-.16 -.25 to -.07	.02 -.07 to .11
4	-	-	-.76 -.87 to -.65	-.63 -.73 to -.53	-.22 -.34 to -.10	.06 -.05 to .17	-.23 -.35 to -.12	.05 -.06 to .16

5	-	-	-1.21 -1.35 to -1.07	-.91 -1.04 to -.78	-.38 -.53 to -.22	.01 -.13 to .15	-.39 -.54 to -.24	.005 -.13 to .14
6	-	-	-1.57 -1.76 to -1.39	-1.23 -1.39 to -1.06	-.50 -.70 to -.30	-.12 -.29 to .06	-.48 -.68 to -.29	-.10 -.27 to .08
7	-	-	-1.68 -1.92 to -1.44	-1.30 -1.51 to -1.09	-.42 -.68 to -.17	-.06 -.29 to .06	-.37 -.62 to -.11	-.02 -.24 to .20
8	-	-	-1.67 -1.98 to -1.35	-1.52 -1.79 to -1.25	-.25 -.58 to .08	-.17 -.45 to .12	-.19 -.52 to .14	-.10 -.38 to .18
9+	-	-	-2.55 -2.82 to -2.29	-1.99 -2.22 to -1.76	-1.02 -1.32 to -.73	-.51 -.76 to -.25	-.90 -1.20 to -.61	.45 -.70 to -.20
<i>Religion</i>								
Roman Catholic	-	-	-	-	-	-	-.79 -.87 to -.72	-.60 -.66 to -.53
<i>Place of Birth</i>								
North/East cities	-	-	-	-	-	-	2.32 2.16 to 2.47	2.35 2.20 to 2.50
North/East else	-	-	-	-	-	-	1.57 1.44 to 1.66	1.94 1.85 to 2.02
West cities	-	-	-	-	-	-	1.47 1.38 to 1.57	1.56 1.47 to 1.65
West else	-	-	-	-	-	-	1.94 1.85 to 2.04	2.28 2.19 to 2.37
South/Zeeland all							Reference	Reference
R	.11	.10	.08	.07	.11	.10	.18	.19

Non-manual: n=175,625; Manual: n=195,228; Unknown: n=18,434.

Table 4: Height at age 18 in relation to conscript birth order and family size

Height cm change (slope from linear regression coefficient (95% confidence interval) associated with each unit increase in Birth order (1-9) or Family size (1-9) modeled as continuous variable. Model D Adjusted for selected covariates.

	Model A Family Size		Model B Birth Order		Model C Family Size and Birth Order		Model D Family Size and Birth Order adjusted for Religion and Place of Birth	
	Non-manual	Manual	Non-manual	Manual	Non-Manual	Manual	Non-Manual	Manual
<i>Intercept</i>	179.5	178.0	179.0	177.3	179.6	178.0	178.0	176.5
<i>Family Size</i>	-.30 -.31 to -.28	-.29 -.30 to -.27	-	-	-.25 -.27 to -.24	-.28 -.29 to -.26	-.14 -.15 to -.12	-.15 -.17 to -.14
<i>Birth Order</i>	-	-	-.30 -.31 to -.28	-.24 -.25 to -.22	-.09 -.11 to -.07	-.02 -.04 to .00	-.08 -.11 to -.07	.005 -.01 to .03
<i>Religion</i>								
Roman Catholic	-	-	-	-	-	-	-.81 -.88 to -.74	-.64 .71 to -.58
<i>Place of Birth</i>								
North/East cities	-	-	-	-	-	-	2.32 2.15 to 2.47	2.35 2.20 to 2.50
North/East else	-	-	-	-	-	-	1.57 1.48 to 1.66	1.94 1.86 to 2.02
West cities	-	-	-	-	-	-	1.46 1.37 to 1.56	1.56 1.47 to 1.65
West else	-	-	-	-	-	-	1.94 1.85 to 2.04	2.28 2.19 to 2.37
South/Zeeland all							Reference	Reference
R	.10	.10	.08	.07	.11	.10	.18	.19

Non-manual: n=175,625; Manual: n=195,228; Unknown:n=18,434.

Figure 1: Height at age 18 (cm) by Family Size and Birth Order

By increasing Birth Order within Family Size



