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Supplemental Material

Early-Life Selenium Status and Cognitive Function at 5 and 10 Years of Age in Bangladeshi Children

Helena Skröder, Maria Kippler, Fahmida Tofail, and Marie Vahter

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Supplemental Table S1. Reference materials, recommended values and obtained values for selenium in blood and urine.

Biomarker and time point	Reference material	N	Recommended value (mean \pm SD; $\mu\text{g/kg}$ or L)	Obtained value (mean \pm SD; $\mu\text{g/kg}$ or L)
Ery-Se ($\mu\text{g/kg}$) GW14 (alkali method)	Seronorm TM Trace Elements Whole Blood L-1; LOT 1103128	70	59 \pm 12	55 \pm 0.93
	Seronorm TM Trace Elements Whole Blood L-2; LOT 1103129	69	112 \pm 23	116 \pm 2.2
U-Se ($\mu\text{g/L}$) 5 years	Seronorm TM Trace Elements Urine Blank OK4636	63	22 \pm 2.8	24 \pm 1.9
	Seronorm TM Trace Elements Urine NO2525	66	67 \pm 7.1	73 \pm 4.6
	NIST Standard reference material [®] 2670a	18	8 \pm 3	7.4 \pm 1.3
U-Se ($\mu\text{g/L}$) 10 years	Seronorm TM Trace Elements Urine 1011644	41	14 \pm 2.8	15 \pm 0.52
	Seronorm TM Trace Elements Urine 1011645	39	70 \pm 14	74 \pm 2.8
	NIST Standard reference material [®] 2670a	5	8 \pm 3	7.8 \pm 0.08

Abbreviations: Ery-Se, erythrocyte selenium; U-Se, urinary selenium

Supplemental Table S2. Main characteristics of mothers and children included in the study, by urinary selenium at 5 (n=1234) and 10 years (n=1330) above and below spline knot at 34 µg/L.

Characteristic	U-Se <34 µg/L	U-Se ≥ 34 µg/L	p-value ^a	U-Se <34 µg/L	U-Se ≥ 34 µg/L	p-value ^a
	(5 years; n=1214)	(5 years; n=20)		(10 years; n=1316)	(10 years; n=14)	
	Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	
Mothers						
Parity at GW8 ^b	1.5 ± 1.4	1.4 ± 1.2	0.84	1.5 ± 1.4	1.5 ± 1.7	0.81
SES at GW8	-0.15 ± 2.3	-0.24 ± 2.1	0.71	-0.12 ± 2.3	-0.47 ± 2.4	0.54
Ery-Se at GW14 (µg/g Hb)	0.45 ± 0.11	0.46 ± 0.12	0.69	0.45 ± 0.11	0.45 ± 0.12	0.76
Ery-Zn at GW14 (µg/kg)	8123 ± 2327	8217 ± 1967	0.83	8161 ± 2293	7237 ± 2379	0.22
Ery-Mn at GW14 (µg/kg)	20 ± 7.4	21 ± 5.9	0.18	20 ± 7.5	18 ± 7.1	0.15
Ery-As at GW8 (µg/kg)	7.7 ± 8.3	6.5 ± 5.3	0.95	7.5 ± 8.1	6.2 ± 7.1	0.41
Ery-Cd at GW8 (µg/kg)	1.1 ± 0.71	0.99 ± 0.52	0.99	1.1 ± 0.69	0.76 ± 0.35	0.13
Ery-Pb at GW14 (µg/kg)	76 ± 44	89 ± 37	0.058	77 ± 45	76 ± 50	0.79
Raven's score at 5 years	25 ± 12	24 ± 11	0.72	25 ± 12	25 ± 11	0.81
Education at 5 years (years)	4.6 ± 4.0	5.8 ± 3.4	0.14	4.6 ± 4.0	4.4 ± 3.4	0.82
Education at 10 years	5.1 ± 3.7	5.9 ± 3.4	0.26	5.2 ± 3.7	4.9 ± 3.2	0.81
Fathers education at 5 years	4.9 ± 4.5	6.0 ± 3.8	0.23	5.1 ± 4.5	2.4 ± 3.2	0.026
Fathers' education at 10 years	5.3 ± 4.3	5.4 ± 3.9	0.93	5.4 ± 4.3	3.3 ± 3.4	0.059

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Children at birth						
Birth weight (g)	2700 ± 390	2680 ± 510	0.97	2700 ± 390	2800 ± 287	0.37
Gestational age at birth (weeks)	39 ± 2.1	39 ± 2.3	0.57	39 ± 2.1	39 ± 2.3	0.40
Children at 5 years						
Age (years)	5.4 ± 0.13	5.4 ± 0.12	0.49	5.4 ± 0.13	5.4 ± 0.13	0.42
HAZ (z-score)	-1.6 ± 0.92	-1.4 ± 1.0	0.63	-1.6 ± 0.92	-1.7 ± 0.97	0.68
HOME	8.5 ± 4.8	9.4 ± 5.1	0.42	8.6 ± 4.9	6.0 ± 2.9	0.048
Tester (% children per tester)	8/77/15	0/75/25	0.27	8/78/14	7/71/21	0.61
School type (%none/Primary/ Madrasa/Kindergarten/ Maktab/Non-formal)	20/23/5/6/30/16	30/25/10/10/25	0.23	20/23/5/6/29/17	29/21/0/0/50/0	0.34
U-Se (µg/L)	13 ± 5.6	39 ± 7.5	<0.001	14 ± 6.5	14 ± 4.7	0.45
U-As (µg/L)	101 ± 117	164 ± 236	0.25	102 ± 119	69 ± 57	0.56
U-Cd (µg/L)	0.28 ± 0.26	0.62 ± 0.75	0.039	0.29 ± 0.28	0.28 ± 0.17	0.70
U-Pb (µg/L)	4.6 ± 3.4	6.9 ± 9.0	0.044	4.6 ± 3.6	3.7 ± 1.7	0.51
Full developmental score	79 ± 22	82 ± 25	0.47	79 ± 22	67 ± 17	0.073
Verbal score	33 ± 11	33 ± 9.8	0.61	33 ± 11	27 ± 9.4	0.082
Performance score	34 ± 7.8	33 ± 8.3	0.44	34 ± 7.8	30 ± 9.2	0.11

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Children at 10 years						
Age (years)	9.5 ± 0.095	9.5 ± 0.095	0.50	9.5 ± 0.095	9.5 ± 0.11	0.83
HAZ (z-score)	-1.4 ± 0.94	-1.2 ± 1.1	0.35	-1.4 ± 0.95	-1.6 ± 0.84	0.53
HOME	27 ± 4.9	27 ± 4.6	0.74	27 ± 5.0	27 ± 6.0	0.92
Tester (%children per tester)	28/26/25/21	10/30/35/25	0.30	27/25/23/25	21/14/36/29	0.62
School type (% none/madrasa/ NGO/primary/English medium)	10/3/76/10/1	10/5/75/10/0	0.76	<1/10/3/77/10	0/14/7/79/0	0.32
Years of schooling	3.1 ± 1.0	3.3 ± 0.86	0.26	3.1 ± 1.0	2.9 ± 1.0	0.62
SES	0.0054 ± 2.6	0.34 ± 3.1	0.78	0.0056 ± 2.6	-0.23 ± 2.7	0.83
U-Se (µg/L)	15 ± 6.1	18 ± 5.1	0.0032	14 ± 5.3	43 ± 8.9	<0.001
U-As (µg/L)	108 ± 126	81 ± 77	0.42	107 ± 123	75 ± 39	0.71
U-Cd (µg/L)	0.29 ± 0.23	0.29 ± 0.16	0.62	0.29 ± 0.21	0.74 ± 0.66	<0.001
U-Pb (µg/L)	1.9 ± 1.5	2.4 ± 3.4	0.69	1.9 ± 1.3	2.3 ± 1.5	0.14
Hair Se (µg/kg)	487 ± 84	527 ± 91	0.029	487 ± 84	500 ± 93	0.58
Hair Hg (µg/kg)	800 ± 513	879 ± 599	0.66	799 ± 686	836 ± 487	0.71
Water Mn (µg/L)	909 ± 1187	1280 ± 1152	0.15	889 ± 1156	784 ± 851	0.90
Full developmental score	133 ± 33	138 ± 28	0.32	133 ± 33	117 ± 23	0.052
Verbal comprehension	37 ± 11	37 ± 9.7	0.72	37 ± 11	33 ± 6.5	0.14
Perceptual reasoning	32 ± 12	35 ± 8.7	0.088	32 ± 12	26 ± 6.5	0.070
Working memory	30 ± 6.1	30 ± 6.0	0.97	30 ± 6.2	27 ± 6.3	0.070
Processing speed ^c	34 ± 12	36 ± 13	0.66	34 ± 12	31 ± 11	0.35

Abbreviations: Ery-As, erythrocyte arsenic; Ery-Cd, erythrocyte cadmium; Ery-Mn, erythrocyte manganese; Ery-Pb, erythrocyte lead; Ery-Zn, erythrocyte zinc; Ery-Se, erythrocyte selenium; GW, gestational week; Hair Hg, hair mercury; Hair Se, hair selenium; HAZ,

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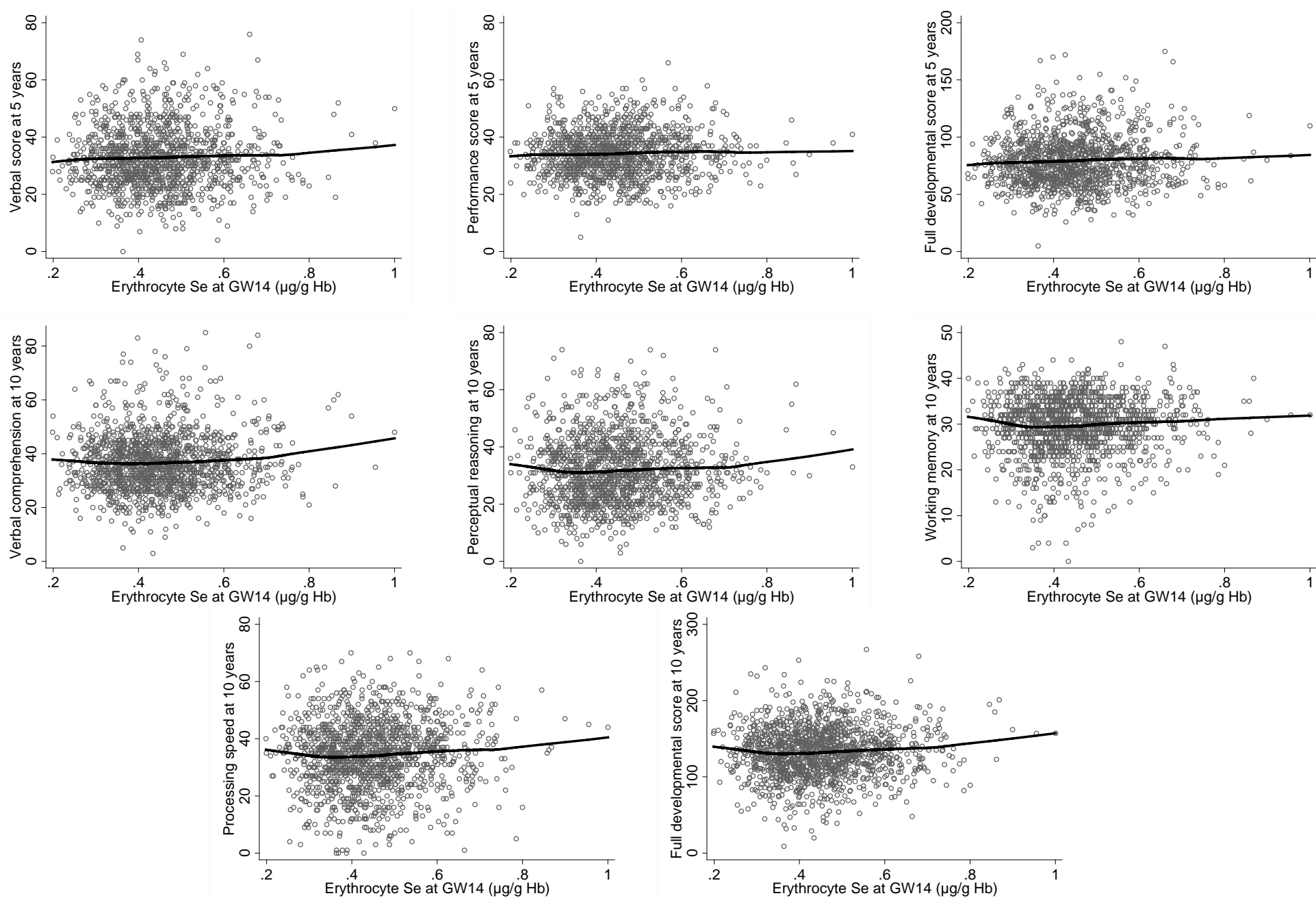
height-for-age z-score; HOME, quality and quantity of children's stimulation at home assessed using a modified version of Home Observation for Measurement of the Environment; NGO, non-governmental organization; SES, socioeconomic status assessed via a wealth index based on information on family ownership of e.g. assets, housing structure, and dwelling characteristics (Gwatkin DR et al. 2000); U-As, urinary arsenic; U-Cd, urinary cadmium; U-Pb, urinary lead; U-Se, urinary selenium.

^a Mann-Whitney *U*-test, chi-squared, or Fisher's exact test

^b GW8 corresponds to enrollment into MINIMat.

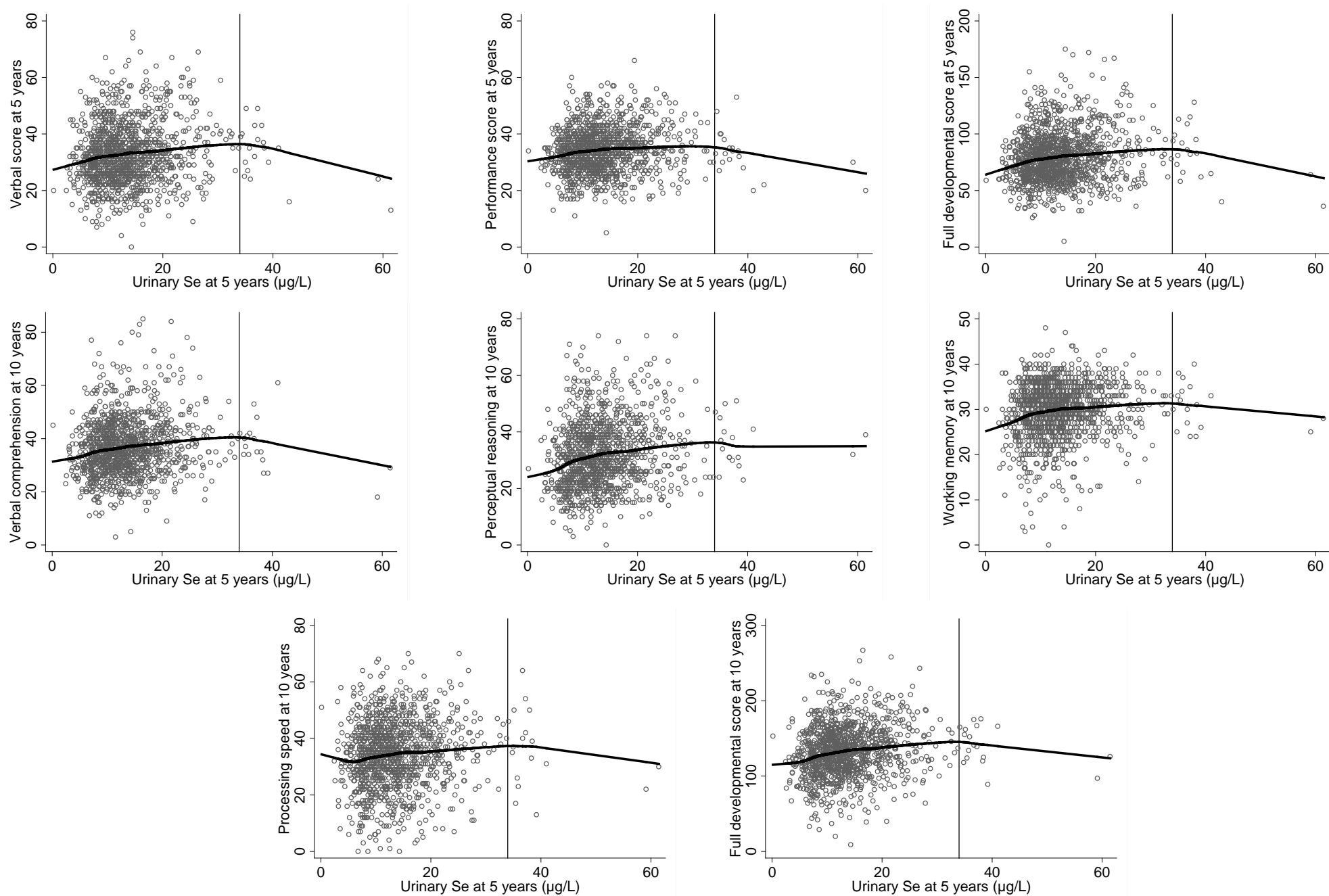
^c Higher processing speed indicates faster response time

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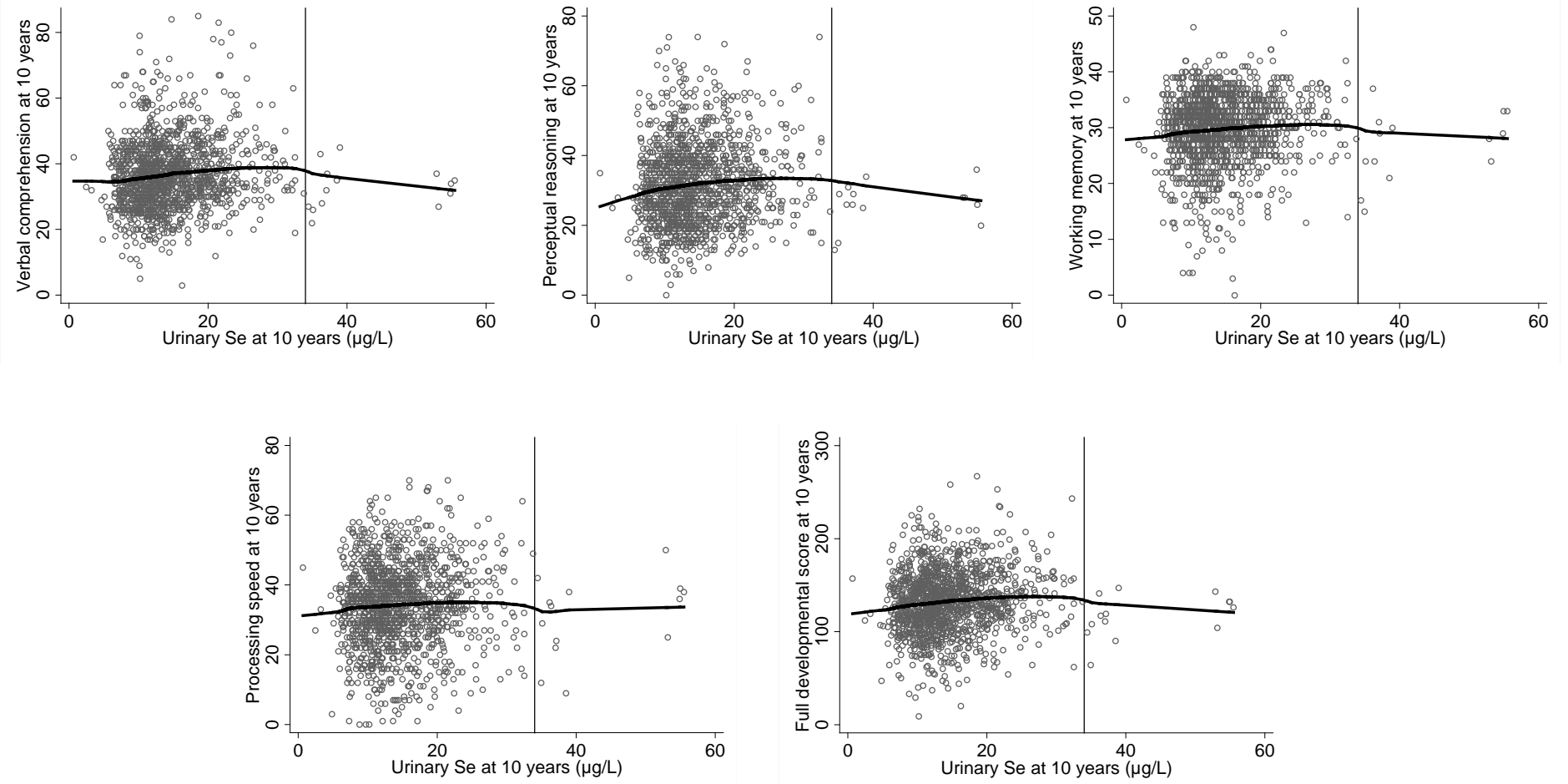
Supplemental Figure S1. Scatter plots with smoothed lowess lines for all outcomes at 5 and 10 years and erythrocyte selenium (Se; µg/g Hb) at gestational week 14.

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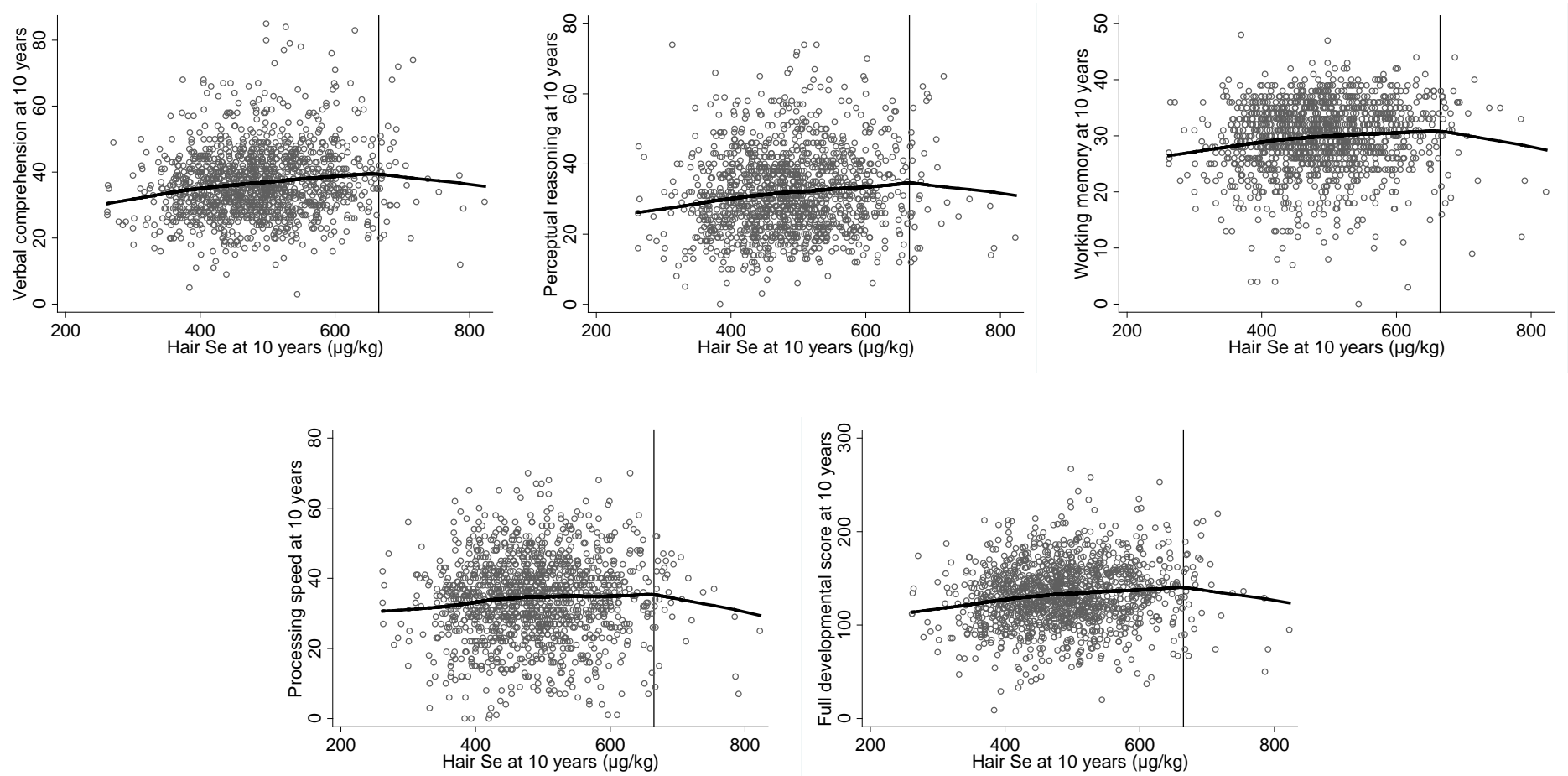
Supplemental Figure S2. Scatter plots with smoothed lowess lines for all outcomes at 5 and 10 years and urinary selenium (Se; µg/L) at 5 years. The vertical line at 34 µg/L represents the turning point used as the spline knot in the linear spline regression analyses.

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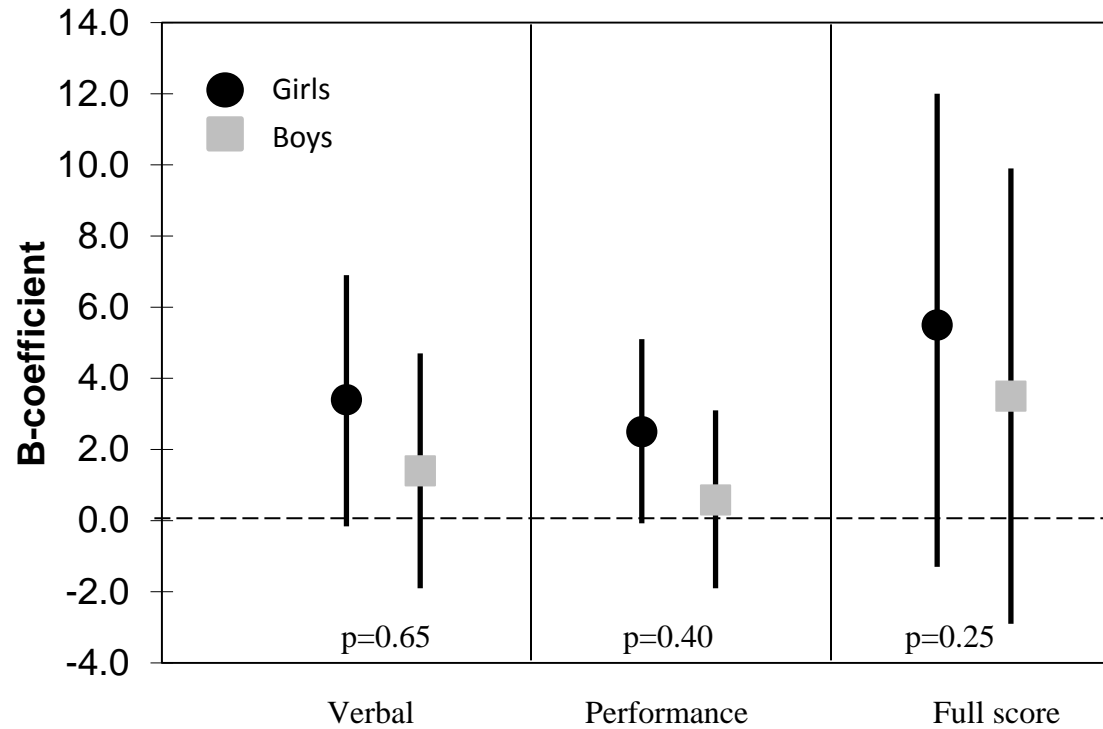


Supplemental Figure S3. Scatter plots with smoothed lowess lines for all outcomes at 10 years and urinary selenium (Se; µg/L) at 10 years. The vertical line at 34 µg/L represents the turning point used as the spline knot in the linear spline regression analyses.

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Supplemental Figure S4. Scatter plots with smoothed lowess lines for all outcomes at 10 years and hair selenium (Se; $\mu\text{g/kg}$) at 10 years. The vertical line at 665 $\mu\text{g/kg}$ represents the turning point used as the spline knot in the linear spline regression analyses.



Supplemental Figure S5. Estimates (B-coefficient) and 95% CI (straight line) for associations between all outcomes at 5 years and erythrocyte selenium (per 0.5 $\mu\text{g/g}$ Hb) at gestational week 14, stratified by gender (n=608 girls and 652 boys). P-value for difference between estimates (Wald-test). Adjustments: parity and family SES at enrollment, birth weight, Hb at GW14, age at testing, HAZ, HOME, tester, school type, mothers' cognitive function, and paternal education (all assessed at 5 year follow-up).