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## **Supplemental Material**

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

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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 <sup>TM</sup> Trace Elements Whole Blood L-1; LOT 1103128	70	59 $\pm$ 12	55 $\pm$ 0.93
	Seronorm <sup>TM</sup> 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 <sup>TM</sup> Trace Elements Urine Blank OK4636	63	22 $\pm$ 2.8	24 $\pm$ 1.9
	Seronorm <sup>TM</sup> Trace Elements Urine NO2525	66	67 $\pm$ 7.1	73 $\pm$ 4.6
	NIST Standard reference material <sup>®</sup> 2670a	18	8 $\pm$ 3	7.4 $\pm$ 1.3
U-Se ( $\mu\text{g/L}$ ) 10 years	Seronorm <sup>TM</sup> Trace Elements Urine 1011644	41	14 $\pm$ 2.8	15 $\pm$ 0.52
	Seronorm <sup>TM</sup> Trace Elements Urine 1011645	39	70 $\pm$ 14	74 $\pm$ 2.8
	NIST Standard reference material <sup>®</sup> 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 <sup>a</sup>	U-Se <34 µg/L	U-Se ≥ 34 µg/L	p-value <sup>a</sup>
	(5 years; n=1214)	(5 years; n=20)		(10 years; n=1316)	(10 years; n=14)	
	Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	
<b>Mothers</b>						
Parity at GW8 <sup>b</sup>	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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<b>Children at birth</b>						
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
<b>Children at 5 years</b>						
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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<b>Children at 10 years</b>						
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 <sup>c</sup>	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.

<sup>a</sup> Mann-Whitney *U*-test, chi-squared, or Fisher's exact test

<sup>b</sup> GW8 corresponds to enrollment into MINIMat.

<sup>c</sup> Higher processing speed indicates faster response time

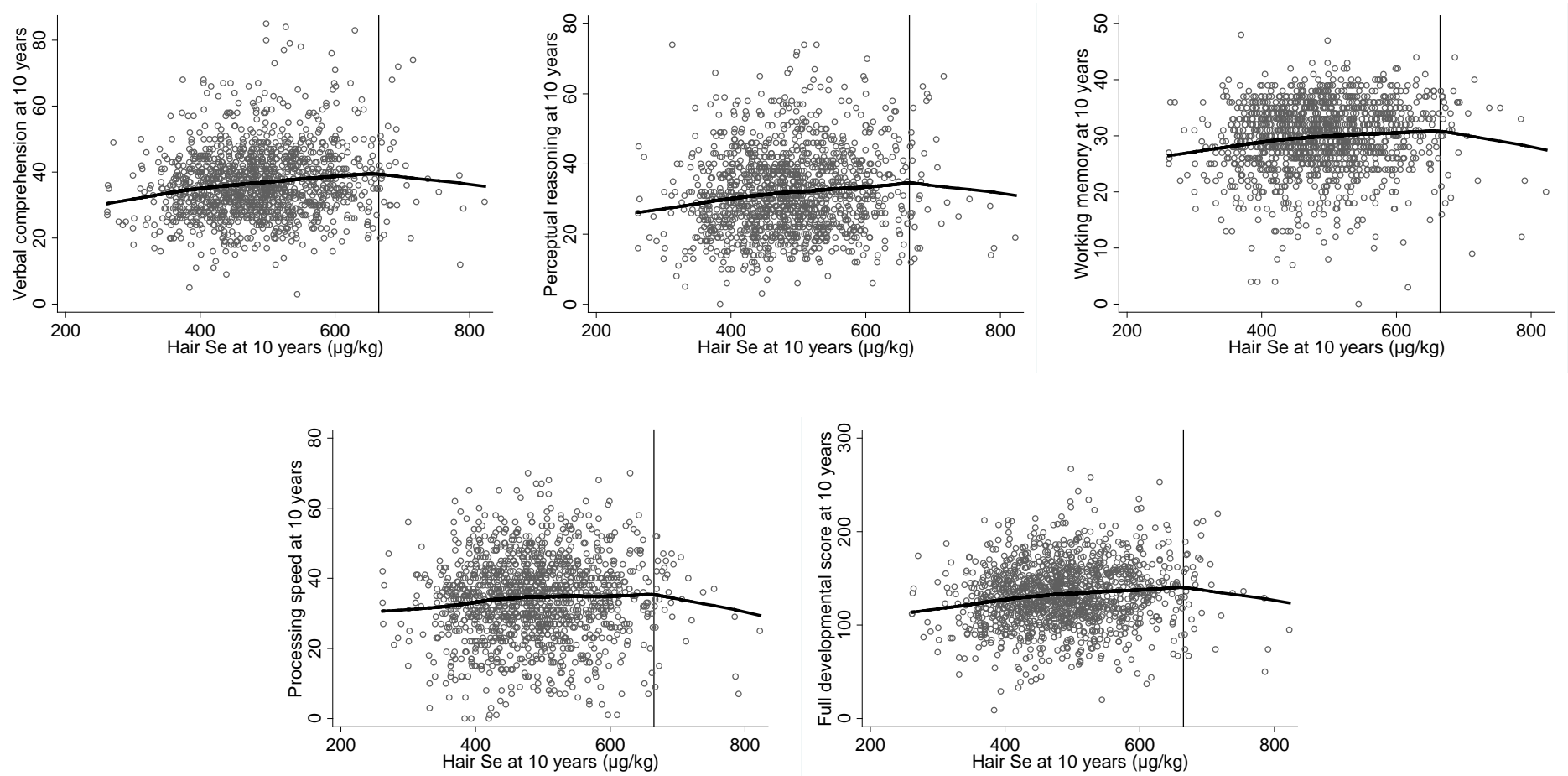




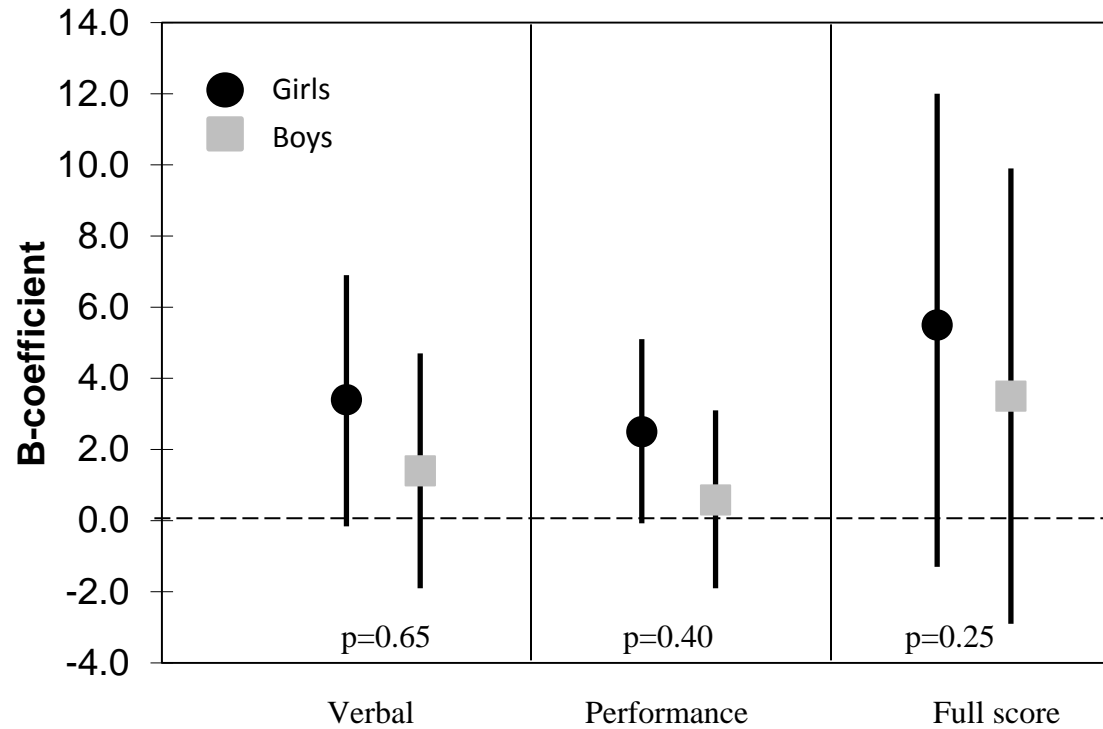




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**Supplemental Figure S4.** Scatter plots with smoothed lowess lines for all outcomes at 10 years and hair selenium (Se;  $\mu\text{g/kg}$ ) at 10 years. The vertical line at 665  $\mu\text{g/kg}$  represents the turning point used as the spline knot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